UNITED STATES

ENVIRONMENTAL PROTECTION AGENCY

REGION III

FINAL DECISION AND RESPONSE TO COMMENTS
RADFORD ARMY AMMUNITION PLANT

EPA ID NO. VA1210020730

RADFORD, VIRGINIA

APRIL 2012

PURPOSE

The United States Environmental Protection Agency (EPA) is issuing this Final Decision and Response to Comments (FDRTC or Final Decision) selecting the Final Remedy for certain Corrective Action Units at the Radford Army Ammunition Plant, located in Radford, Virginia (hereinafter RAAP or Facility). The Final Decision is issued pursuant to the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA) of 1976, and the Hazardous and Solid Waste Amendments (HSWA) of 1984, 42 U.S.C. Sections 6901, et seq.

On May 25, 2011, EPA issued a Statement of Basis (SB) which described the information gathered during environmental investigations at the Facility and proposed a Final Remedy for the Facility. The SB is hereby incorporated into this Final Decision by reference and made a part hereof as Attachment A.

The initial requirements for the Corrective Action process were specified in a RCRA permit issued by EPA to the Facility in 1989 (No. VA1210020730). On October 31, 2000, EPA reissued the permit pursuant to Section 3004(u) of RCRA, 42 U.S.C. Section 6924(u). The reissued permit currently governs corrective action at the Facility (hereafter the RCRA Corrective Action Permit).

Corrective Action Units at the Facility consist of Solid Waste Management Units (SWMUs), Areas of Concern (AOCs), Facility Screening Areas (SSAs) and Miscellaneous Units (MUs). This FDRTC selects the remedies that EPA evaluated under RAAP's RCRA Corrective Action Permit issued by the EPA in October 2000.

EPA will modify the RCRA Corrective Action Permit to require implementation of the Final Remedy following the issuance of this FDRTC. A separate public review and comment period will provide the public opportunity to review and comment on the proposed modified permit independently.

Consistent with the public participation provisions under RCRA, EPA solicited public comment on its proposed Final Remedy. On May 25, 2011, notice of the Statement of Basis was published in the Roanoke Times, Roanoke, Virginia newspaper. The sixty (60)-day comment period ended on July 25, 2011; however, a request was made and granted to extend the public comment period until August 31, 2011. A public hearing was held at the Montgomery-Floyd Regional Library Christiansburg Branch in Christiansburg, Virginia on June 27, 2011. All of the comments received by EPA during the public comment period are included as Attachment B, PUBLIC COMMENTS AND RESPONSE TO COMMENTS.

Comments on the proposed remedy were received from residents at the public hearing, via mail, and via electronic mail. All of the comments received during the public comment period were reviewed by EPA and are addressed in Attachment B. Based on comments received during the public comment period EPA has determined it is not necessary to modify its proposed final remedy as set forth in the SB; thus, the remedy proposed in the SB is the Final Remedy selected by EPA for the Facility. EPA is, however, acknowledging minor factual background errors in the SB as described in more detail in Attachment B.

FINAL DECISION

The selected remedies for individual units at the Facility (SWMUs, AOCs, SSAs and MUs) are described using the following terminology:

- No Further Action (NFA)
- Engineering Controls (ECs)
- Institutional Controls (ICs)

No Further Action

EPA has selected NFA for the following units based on audit, operational history, and investigations where the data has demonstrated these units present no unacceptable risk to human health or the environment: Building 4343 and the FLFA; SWMUs 6, 8, 9, 17, 31, 35, 36, 37, 38, 39, 41A, 46, 50, 57, 58, 59, 61, 68, 69, 71, 75, and 76; SSAs 2, 3, 11, 12, 18, 19, 20, 21, 22, 23, 24, 25, 33, 34, 55, 56, 60, 63, 64, 65, 66, 67, 70, 73, 78, 80, and 81; MUs 1 through 9; and AOCs A, F, O, P, and Q.

Engineering Controls

ECs are physical designs or structures used to manage environmental or health risks by placing a barrier between the contamination and the rest of the site, to limit exposure pathways. EPA has selected ECs as components of Final Remedy for SWMU 40 and SSAs 30 and 79.

Institutional Controls

ICs are non-engineered instruments that help to minimize the potential for human exposure to contamination and/or protect the integrity of the selected remedy. EPA has selected ICs as components of the Final Remedy for SWMU 40, and SSAs 30 and 79; EPA has selected ICs as the Final Remedy for SWMUs 13, 41, 43, 45, 51 and SSAs 72 and 77.

DECLARATION

Based on the Administrative Record compiled for the corrective action at the Radford Army Ammunition Plant, I have determined that the remedy selected in this Final Decision and Response to Comments is protective of human health and the environment.

Date: 4/2/12

Abraham Ferdas, Director
Land and Chemicals Division
U.S. Environmental Protection Agency, Region III

Attachment A: Statement of Basis (May 2011)
Attachment B: Public Comments and Response to Comments

ATTACHMENT A

STATEMENT OF BASIS

I. INTRODUCTION

This Statement of Basis (SB) presents the United States Environmental Protection Agency's (EPA) proposed remedies for certain Corrective Action Units at the Radford Army Ammunition Plant (RFAAP or Facility), located in Radford, Virginia. The Corrective Action Units consist of Solid Waste Management Units (SWMUs), Areas of Concern (AOCs) and Site Screening Areas (SSAs) at the RFAAP. Specifically, this document summarizes the proposed remedies that EPA and RFAAP developed and evaluated under RFAAP's Resource Conservation and Recovery Act (RCRA) Corrective Action Permit issued by the EPA in October 2000, pursuant to Section 3004(u) of the, 42 U.S.C. Section 6925. At a later time. EPA will be soliciting comments on a proposed remedy for the remaining portions of the facility.

This document explains EPA's rationale for recommending the proposed remedies. This document also summarizes information that can be found in the work plans and reports submitted by RFAAP to EPA and the Virginia Department of Environmental Quality (VDEQ) during the RCRA Facility Investigation (RFI) and Corrective Measures Study (CMS) processes. To gain a more comprehensive understanding of the RCRA activities that have been conducted at the Facility, EPA encourages the public to review these documents, which are found on the RFAAP online repository, discussed in **Section VI**.

The public may participate in the remedy selection process by reviewing the SB and the documents contained in the Administrative Record and by submitting written comments to EPA during the public comment period. Public participation is discussed in detail in **Section VI**. EPA will address all significant comments submitted in response to the proposed remedies described in this SB document. EPA will make a final remedy decision and issue a Final Decision and Response to Comments after information submitted during the public comment period has been considered. If EPA determines that new information or public comments warrant a modification to the proposed remedies, EPA may modify the proposed remedies or select other alternatives. Therefore, the public is encouraged to review and comment on the proposed remedies described in this document and/or any additional options not previously identified and/or studied.

After issuance of the Final Decision and Response to Comments EPA will propose the reissuance of the RCRA Corrective Action Permit to implement the selected remedies. A separate public review and comment period will provide the public opportunity to review and comment on the proposed permit independently.

II. FACILITY BACKGROUND

A. Installation Location

RFAAP is located in the mountains of southwest Virginia in Pulaski and Montgomery counties and it consists of two noncontiguous areas: the Main Manufacturing Area

(MMA) and the New River Unit (NRU). The MMA is located approximately five miles northeast of the city of Radford, Virginia, which is approximately ten miles west of Blacksburg and 47 miles southwest of Roanoke. The NRU is located about six miles west of the MMA, near the town of Dublin, and is not covered under the Corrective Action Permit. All of the units described in this SB document are in the MMA **(Figure 1)**.

RFAAP lies in one of a series of narrow valleys typical of the western range of the Appalachian Mountains. Oriented in a northeast-southwest direction, the valley is approximately 25 miles long, eight miles wide at the southeast end and narrowing to two miles at the northeast end. RFAAP lies along the New River in the relatively narrow northeastern corner of the valley. The New River divides RFAAP into two areas. The Horseshoe Area (which is part of the MMA) lies within a meander of the New River.

RFAAP began manufacturing propellants in 1941 and continues that work today. RFAAP has also produced TNT on an intermittent basis.

B. Environmental Investigation/Contamination Assessment Overview

The initial requirements for the corrective action process were specified in a RCRA permit issued by the EPA in 1989 (No. VA1210020730). On October 31, 2000, the permit was reissued. The reissued permit currently governs corrective action at the Facility. Various investigations and actions have been completed and reports have been submitted to the EPA and the Commonwealth of Virginia, since 1989. This SB document presents the results of those investigations.

The RFAAP has separate permits issued by the Commonwealth of Virginia to manage operations pertaining to RCRA Subpart C, D and X. Additionally, the Commonwealth of Virginia regulates four closed RCRA Hazardous Waste Management Units via a Post-Closure Care Permit.

The primary contaminants of concern at RFAAP include metals and explosives. Groundwater under the Facility has been impacted. RFAAP attempted to delineate the occurrence and flow of the groundwater, however, such efforts were complicated by the presence of karst geology (highly fractured and channelized limestone). Based on RFAAP's delineation efforts, it appears that the groundwater under the Facility eventually discharges to the New River. Current data do not suggest that off-site groundwater has been impacted.

For certain units where it was unlikely that any kind of release to environmental media had occurred, RFAAP performed desktop audits of data and/or operational history and determined that there was no risk to human health or the environment from those units. These units were typically grouped together by location or similar processes, and RFAAP submitted the Corrective Action Unit Evaluations to EPA in 2010. EPA concurred with RFAAP's recommendation of No Further Action (NFA) for these units, which are listed

in **Table 1.** A fact sheet summarizing the Corrective Action Unit Evaluations can be found in **Attachment 2.**

Other units were investigated for potential impacts to media (typically soils and/or groundwater) and if the data demonstrated that a unit presented no risk to human health or the environment, the unit has been recommended for No Further Action. A description of each unit can be found in **Attachment 3**. These units are also listed in **Table 1.**

The remaining units, which are described below in **Section III** of this SB document, were determined to have releases to soil and/or groundwater that exceeded EPA screening criteria. Screening criteria for groundwater was based on drinking water standards (maximum contaminant levels or risk based tapwater levels) and the criteria for soil were both residential and industrial use scenarios. For these units, risks were evaluated and remedies have been proposed. Risks typically involve human exposure to soil and/or groundwater through various pathways. The proposed remedies seek to either remove the risk altogether, typically through Interim Measures (IMs) of soil removal, or to remove or control the exposure pathways through Engineering Controls (ECs) and Institutional Controls (ICs). All of these proposed remedies are described in **Section IV, Proposed Remedies.**

III. SUMMARY OF ENVIRONMENTAL INVESTIGATIONS AND INTERIM MEASURES

The units discussed in this Section were determined to have releases to soil and/or groundwater that exceeded EPA screening criteria.

A. BUILDING 4343

Building 4343 is a 545 square foot building located in the west central portion of the horseshoe area and was built in 1956. The horseshoe area is located in a long bend of New River in the northeastern portion of the RFAAP property (**Figure 1**). The building was converted to conduct cadmium plating operations in 1965.

Rinse water from the cadmium plating process contained cyanide, cadmium and chromium. This water, now known as process water, was collected and stored in lead lined catch tanks located on the northeast corner of the building. When a sufficient amount of process water was collected, it was treated with a chlorine solution to neutralize the cyanide. The process water was transported, via underground pipes, to the process water ditch north of Building 4343. The amount of cadmium and chromium present in the process was not considered sufficient to require further treatment.

1. 1996 Cadmium Sampling Event

In 1996, surface soil samples were collected around Building 4343 to assess the extent of cadmium contamination. Analytical results indicated that concentrations of cadmium

exceeded EPA screening levels in four of the five samples collected. Based on these results, an additional investigation was recommended to delineate the extent of the elevated cadmium concentrations.

2. 1999 RCRA Facility Investigation

A RFI was conducted in 1999 at Building 4343 to characterize the extent of cadmium concentrations detected during the 1996 investigation. Surface and subsurface soil samples were collected from the vicinity of Building 4343 and along the drainage ditches. Sludge samples were collected from sumps associated with the building and wipe samples were collected from the concrete floor inside the building.

Analytical results indicated that metals were detected in soil at concentrations above residential risk based screening levels in surface samples, and metals detected in the sump sludge were above industrial risk based screening levels. Inspections of both the interior and exterior sumps prior to sampling gave no indication that there were cracks or breaks in either of the sumps and no indications of pathways to the subsurface through the sumps.

3. 2004 RCRA Facility Investigation/Corrective Measures Study (RFI/CMS)

Additional field samples were collected in 2002, and a combined Building 4343 RCRA Facility Investigation/ Corrective Measures Study Report was approved in February 2004. Potential human and ecological receptors and exposure pathways were evaluated as part of the 2004 RFI. A risk assessment was prepared based on these pathways and receptors for the CMS. The greatest potential for exposure to chemicals was likely to result from the ingestion of chemicals in food, sediment and groundwater.

In the risk assessment, no unacceptable cancer risks were identified for industrial and construction workers under current and future land use conditions. However, non-cancer risk exceeded EPA screening criteria due to surface soil cadmium contamination. Future land use risk calculations indicated that adult and child residential populations and excavation workers had an unacceptable non-cancer risk associated with cadmium in the contaminated soil at Building 4343.

Based on the findings set forth in the 2004 RFI, it was determined that soil contamination existed at Building 4343. Preliminary remedial goals were based on EPA Office of Solid Waste and Emergency Response (OSWER) directives and VDEQ Voluntary Remediation Program guidelines, where available. For contaminants that did not have published directives, clean up levels were calculated using the EPA risk based acceptable range of exposure. The future land use for Building 4343 was identified as industrial, however, both residential and industrial exposure scenarios were used to determine clean up levels.

4. Interim Measures

Based upon the 2004 Building 4343 RFI/CMS, EPA, VDEQ and the Army agreed that interim measures should be performed in this area to mitigate the threat of a contaminant release, migration, and/or exposure to the public and the environment, as well as facilitate clean close out of the unit. An IM work plan was approved in October 2006 which proposed:

- Soil Delineation Sampling and Excavation – Delineation and excavation of soil containing metals above the residential remedial goal;
- Sump Removal – Removal of the two sumps and piping where elevated metals have been identified;
- Building 4343 Demolition – Demolition of Building 4343 including outside concrete water tank supports;
- Waste Characterization and Off Site Disposal; and,
- Site Restoration.

An Interim Measures Completion Report was submitted and subsequently approved in January 2007. Approximately 636 cubic yards of contaminated soil and 366 tons of demolition debris, including 6.04 tons of recycled steel, were transported to the appropriate disposal sites. All materials removed from the unit were tested for hazardous waste, and those materials that were determined to be hazardous were disposed of in an appropriate RCRA hazardous waste landfill. The area was filled with 636 cubic yards of clean fill, and 539 cubic yards of topsoil was used to return the area to surrounding landscape levels. The entire 2.5 acre unit was hydroseeded to finalize site restoration.

The excavation of contaminated soils reduced the concentrations of sludge containing explosives to below residential risk based screening concentrations. Because the interim measures undertaken meet the corrective action objectives for the unit and are protective of human health and the environment, no further action is proposed for this unit.

B. FORMER LEAD FURNACE AREA

The Former Lead Furnace Area (FLFA) encompasses approximately 34,000 square feet in the Main Manufacturing Area of RFAAP (**Figure 1**). The Main Manufacturing Area is located in the southwest portion of RFAAP. The FLFA is located in the southeast portion of Solid Waste Management Area (SWMU) 17A – the Stage and Burn Area. SWMU 17A is an active unit where large metallic items considered contaminated with combustible compounds were collected in large piles and burned. These operations were ended in 2002, and the area is now used for occasional or emergency burning only. The area immediately surrounding the FLFA consists of a maintained grassy area and the gravel burn area which is associated with SWMU 17A.

The primary function of the FLFA was to melt and cast recovered lead for salvage. Typical operations in the area involved melting the lead in a tank with an overhead

heater, then pouring the molten lead into molds. The furnace area was operational during World War II. No documentation is available to accurately determine the date of closure, although operations at the unit were not active after World War II.

1. 1992 RCRA Verification Investigation

In 1992 a Verification Investigation (VI) was performed to determine the extent of contamination at the FLFA. Soil samples were collected from the site and tested for metals. Sample results indicated that the concentrations of metals exceeded industrial risk based screening levels. A baseline risk assessment was performed as part of the VI. The risk assessment determined that inhalation of dust contaminated with metals was expected to be moderate to high for site workers.

2. 1996 RCRA Facility Investigation

A RFI was conducted in 1996 to investigate the potential contamination at SWMU 17. Groundwater samples were taken from the FLFA as part of this RFI. While metals were detected in groundwater samples from the FLFA, the groundwater samples were negative for explosives.

3. 1998 RCRA Facility Investigation

A RFI was conducted in 1998 to evaluate the extent of lead contaminated soil associated with the FLFA. Soil samples were collected to determine the lateral and vertical extents of the lead contamination. Sample results indicated that the concentrations of lead in the soil at the FLFA did not exceed residential risk based screening levels at the FLFA, but lead contamination at this unit did extend beyond the areas identified in the 1992 VI.

4. 2002 RCRA Facility Investigation

A RFI was conducted in 2002 to further delineate lead containing soil and characterize unit media for previously untested parameters. The draft RFI report was prepared in August 2005. This report indicated that volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, herbicides, and explosives compounds did not exceed industrial or residential screening levels. Metals (predominantly lead), dioxins/furans, and polychlorinated biphenyls (PCBs), predominantly in surface soil, are the constituents of concern at the FLFA based on exceedances of residential screening criteria.

5. 2008 RCRA Facility Investigation / Corrective Measures Study

Additional RFI field work was conducted in 2007, and a combined Former Lead Furnace Area Facility Investigation/ Corrective Measures Study Report was approved in October 2008. Potential human and ecological receptors and exposure pathways were evaluated as part of the 2008 RFI. A risk assessment was prepared based on these pathways and

receptors, and concluded that the greatest potential for exposure to chemicals was likely to result from the ingestion of chemicals in food, sediment and groundwater.
Human health risk assessment results for the FLFA indicated that the cancer risk to current and future industrial and construction workers, and adult residents fell within the EPA target risk range. Future on-site child residents had an unacceptable non-cancer risk associated with metals in the soil and groundwater. Off-site residents did not have any unacceptable cancer risk associated with groundwater exposure, although off-site child residents had an unacceptable non-cancer risk associated with groundwater contaminated with metals.

For groundwater, the chemicals selected as constituents of potential concern for the FLFA were not identified in the assessment as originating from the FLFA.

Based on the findings set forth in the 2008 RFI, it was determined that soil and groundwater contamination existed at the FLFA. However, given the limited detections and low concentrations of constituents of potential concern in groundwater samples from the FLFA, additional groundwater investigation or remediation is not recommended for this unit.

Preliminary remedial goals were based on EPA OSWER directives and VDEQ guidelines, where available. For contaminants that did not have published directives, clean up levels were calculated using the EPA risk based acceptable range of exposure. The future land use for the FLFA was identified as industrial, however, both residential and industrial exposure scenarios were used to determine clean up levels.

6. Interim Measures

Based upon the 2008 FLFA RFI/CMS, EPA, VDEQ and the Army agreed that interim measures should be performed at the unit to mitigate the threat of a contaminant release, migration, and/or exposure to the public and the environment, as well as facilitate clean close out of the unit. The interim measures were outlined in an approved November 2008 Work Plan and included:

- Soil Delineation Sampling and Excavation – Delineation of the contaminated soil that exceeds residential risk based screening levels and excavation of the delineated areas such that the remaining soil is below risk based screening guidelines;
- Waste Characterization and Off Site Disposal; and,
- Site Restoration

An Interim Measures Completion Report was approved by EPA in February 2010. Approximately 468 cubic yards or 702 tons of contaminated soil was removed. All materials removed from the unit were tested for hazardous wastes, and those materials that were determined to be hazardous were disposed of in an appropriate RCRA hazardous waste landfill. Additionally, 690 cubic yards of topsoil was used to return the area to pre-excavation grades. The entire area was hydroseeded to finalize site restoration.

The excavation of contaminated soils reduced contaminant concentrations to below residential risk based screening levels. Because the interim measures undertaken meet the corrective action objectives for the unit and are protective of human health and the environment, no further action is proposed for this unit.

C. SOLID WASTE MANAGEMENT UNIT 39

SWMU 39 consists of two unlined and bermed earthen ponds which are located in the horseshoe area of RFAAP. The horseshoe area is located in a long bend of New River in the northeastern portion of the RFAAP property (**Figure 1**). The earthen pools received scrubber and pre-cooler quench water from incinerator exhaust. The ponds were excavated approximately 6 to 8 feet below the natural grade and contain no drainage outlet. The excavated material was used to create the earthen berm that surrounds each pond. The pond areas are completely fenced in with a total area of approximately 135,000 square feet.

1. 1987 EPA RCRA Facility Assessment

EPA conducted an assessment at RFAAP in 1987 to evaluate potential hazardous waste and hazardous constituent releases and to determine the appropriate corrective actions, as necessary. The assessment consisted of a preliminary review and evaluation of available unit information, personnel interviews, and a visual inspection of the unit. During the 1987 Visual Site Inspection, environmental samples were not collected as part of the inspection and no visible signs of release were observed at SWMU 39. A sample was collected in September 1983 from one of the settling ponds for characterization. Analysis from the sample did not exhibit any hazardous waste characteristics as provided in 40 Code of Federal Regulations (CFR) Section 261.34.

2. 1992 Verification Investigation

In 1992 a VI was performed to evaluate potential leaching of constituents that had accumulated in the unlined settling ponds. Surface soil and composite samples were analyzed for metals, SVOCs, and explosives. Metals were detected in samples from each settling pond within the SMWU. No SVOCs or explosives were detected in the soil samples.

3. 1998 RCRA Facility Investigation

A RFI was conducted in 1998 to further characterize the nature and extent of contamination identified in the 1992 VI at the settling ponds through the investigation of surface and subsurface soil. Soil borings were advanced within the ponds to confirm the 1992 VI composite sample results and assess the vertical extent of the detected concentrations. In addition, groundwater monitoring wells were placed north and south of the settling ponds to assess the nature and extent of constituent migration in soil and groundwater outside of the ponds.

Results indicated that metals, i.e., lead, copper, chromium, exceeded risk based screening levels to a depth of 2 feet, while samples from greater than 2 feet were below risk based screening levels.

4. 2002 RCRA Facility Investigation

A RFI was conducted in 2002 to further characterize the nature and extent of the soil contamination identified in the 1998 RFI. Surface and subsurface soil samples were collected and analyzed for metals, pesticides, dioxins, VOCs and explosives.

Results indicated that dioxins and metals exceeded risk based screening levels. Pesticides, herbicides and explosives were detected at levels well below risk based screening levels.

5. 2005 RCRA Facility Investigation / Corrective Measures Study

The combined SWMU 39 RCRA Facility Investigation/Corrective Measures Study Report was approved by EPA in June 2005. Potential human and ecological receptors and exposure pathways were evaluated using data from the 2002 investigation. A risk assessment was prepared based on these pathways and receptors, which concluded that the greatest potential for exposure to chemicals was likely to result from the ingestion of chemicals in food. Surface water and sediment exposure pathways were not identified, and there are no aquatic receptors at the unit.

In the risk assessment, no unacceptable risks were identified for industrial and construction workers under current land use conditions. However, lead risk was calculated separately from the other metals in the human health risk assessment, and soil lead concentrations were determined to be above the criterion for blood lead levels in exposed populations in both current and future land use scenarios. Future land use risk calculations indicated that child residential populations and excavation workers had an unacceptable non-cancer hazard associated with surface soil contaminants.

Preliminary remedial goals were based on EPA OSWER directives, where available. For contaminants that did not have published directives, clean up levels were calculated using the EPA risk based acceptable range of exposure. The future land use for SWMU was identified as industrial, however, both residential and industrial exposure scenarios were used to determine clean up levels.

6. Interim Measures

Based upon the 2005 RFI/CMS, RFAAP performed interim measures at SWMU 39 to mitigate the threat of a contaminant release, migration, and/or exposure to the public and the environment, as well as facilitate clean close out of the unit. An IM Work Plan was prepared in July 2008. The interim measures included:

- Soil Delineation Sampling and Excavation – Delineation of the contaminated soil that exceeded residential risk based screening levels and excavation of the delineated areas such that the remaining soil was below risk based screening guidelines;
- Waste Characterization and Off Site Disposal; and,
- Site Restoration

An Interim Measures Completion Report was approved in February 2010. Approximately 2,754 cubic yards, or 4,131 tons, of contaminated soil was removed from the two ponds. All materials removed from the site were tested for hazardous wastes, and those materials that were determined to be hazardous were disposed of in an appropriate RCRA hazardous waste landfill. The site was backfilled with 18,650 cubic yards of general fill. 2790 cubic yards of topsoil were placed on top of the general fill to return the area to pre-excavation grade. The entire area was hydroseeded to finalize site restoration.

The excavation of contaminated soils reduced contaminant concentrations to below residential risk based screening levels. Because the interim measures undertaken meet the corrective action objectives and are protective of human health and the environment, no further action is proposed for this unit.

D. SOLID WASTE MANAGEMENT UNIT 51

SWMU 51 consists of one trench, approximately 140 feet long, 23 feet wide, and 14 feet deep, located in the horseshoe area of RFAAP. The horseshoe area is located in a long bend of New River in the northeastern portion of the RFAAP property (**Figure 1**). The trench has been filled to natural grade with soil and is covered by grass and weeds. A barbed wire fence surrounds SWMU 51.

During the production of TNT, an alkaline, red-colored aqueous waste is generated (red water). This waste stream is composed of TNT purification by products, air pollution scrubber water, washwater from cleaning of production equipment and facilities and washwater from product washdown operations.

An unknown quantity of TNT neutralization sludge from the treatment of waste products generated during the production of TNT was disposed of in the trench in the 1970s. The sludge consists of TNT by products and other associated explosive compounds. The source of the sludge was from the RFAAP Red Water Treatment Plant neutralization basin. In addition to sludge disposal, an estimated 10 tons of red water ash was disposed of in the trench from 1968 to 1972. Red water was concentrated by evaporation and the sludge was burned in rotary kilns. The ash from these kilns was disposed of in SWMU 51. Wastewater treatment sludge from the manufacturing and processing of explosives is identified as an EPA hazardous waste solely for its reactivity.

1. 1987 EPA RCRA Facility Assessment

The EPA conducted an assessment at RFAAP in 1987 to evaluate potential hazardous waste or hazardous constituent releases and to determine the appropriate corrective actions, as necessary. The assessment consisted of a preliminary review and evaluation of available unit information, personnel interviews, and a visual inspection of the unit. During the 1987 Visual Site Inspection, environmental samples were not collected as part of the inspection. The assessment concluded that low levels of TNT constituents detected in groundwater monitoring wells were indicators of SWMU 51 disposal activities.

2. 1992 Installation Assessment

In 1992 an Installation Assessment was conducted by aerial photograph analysis. Aerial photographs from 1937 through 1986 were analyzed to identify features which may have represented potential groundwater or surface water contamination sources at RFAAP.

The aerial photographic analysis at SWMU 51 indicated that activity was first noted at the unit in 1975, where a trench that appeared to be empty was visible in the photograph. By 1981 the trench had been filled and a revegetating ground scar was the sole feature that remained.

3. 1992 RCRA Facility Investigation

A RFI was conducted in 1992 to evaluate potential contamination from site activities. Groundwater samples were analyzed from metals, VOCs, SVOCs, and explosives. Results indicated that VOCs, SVOCs, explosives and metals were present at the time of the investigations above risk based groundwater screening levels. Based on the investigation results, the RFI recommended a Corrective Measures Study for the purpose of isolating the waste and preventing site contamination generation.

4. 2001 Facility Wide Background Study

A Facility Wide Background Study was conducted to characterize the naturally occurring background soil inorganic concentrations. These background concentrations were used to establish a baseline for inorganic compounds of concern at RFAAP. One set of background values for both surface and subsurface soils at RFAAP were obtained from the study. Inorganic constituents detected at concentrations exceeding either residential or industrial risk based screening levels were compared to the background concentrations to assess whether these metals were present at concentrations greater than naturally occurring levels. Metals at concentrations less than the background values were not considered unit-related constituents, but are still used in the risk assessment process.

5. 2002 Geophysical Survey

A geophysical survey was conducted at SWMU 51 in August and September 2002 to characterize the lateral and vertical extent of the former TNT neutralization sludge disposal trench. This information was used to develop the CMS. Based on the results of

the geophysical survey, the volume of waste was estimated to be approximately 2,300 square feet in area with an average thickness of 11 feet.

6. 2008 RCRA Facility Investigation / Corrective Measures Study

An RFI/CMS Report for SWMU 51 was completed in 2008. Potential human and ecological receptors and exposure pathways were evaluated as part of the 2008 RFI. A risk assessment was prepared based on these pathways and receptors. The risk assessment concluded that the greatest potential for exposure was likely to result from the ingestion of chemicals in food, sediment and groundwater.

In the risk assessment, no unacceptable risks were identified for industrial and construction workers under current land use conditions. However, lead risk was calculated separately from the other metals in the human health risk assessment, and current soil lead concentrations were determined to be above the criterion for blood lead levels in exposed populations in both current and future land use scenarios. Future land use risk calculations indicated that adult and child residential populations and excavation workers had an unacceptable risk associated with TNT byproducts and constituents, metals, and dioxins/furans contained in the sludge and the contaminated soil beneath the sludge at SWMU 51.

Based on the findings set forth in the 2008 RFI, it was determined that soil contamination existed at SWMU 51. Preliminary remedial goals were based on EPA OSWER directives and VDEQ Voluntary Remediation Program guidelines, where available. For contaminants that did not have published directives, clean up levels were calculated using the EPA risk based acceptable range of exposure. The future land use for SWMU 51 was identified as industrial, however, both residential and industrial exposure scenarios were used to determine clean up levels.

7. Interim Measures

Based upon the 2008 SWMU 51 RFI/CMS, EPA agreed that interim measures should be performed at SWMU 51 to mitigate the threat of a contaminant release, migration, and/or exposure to the public and the environment. An IM work plan was prepared in July 2008, which proposed:

- Site Preparation;
- Soil Delineation Sampling and Excavation – Delineation of the sludge material and contaminated soil under the sludge material and excavation of the delineated areas such that the remaining soil is below industrial risk based screening guidelines to a depth of 15 feet below ground surface;
- Waste Characterization and Off Site Disposal; and,
- Site Restoration

An Interim Measures Completion Report was approved by EPA in February 2010. Approximately 1,245 cubic yards, or 1,867 tons of contaminated soil was removed from

SWMU 51. All materials removed from the unit were tested for hazardous wastes, and those materials that were determined to be hazardous were disposed of in an appropriate RCRA hazardous waste landfill. The site was backfilled with 730 cubic yards of general fill. Four hundred and fifty cubic yards of topsoil were placed over the general fill to return the area to pre-excavation grade. The entire area was hydroseeded to finalize site restoration.

EPA is proposing the implementation of Institutional Controls (ICs) to prevent future residential use of this unit. In the case of SWMU 51, ICs will also prevent future digging below fifteen (15) ft below the ground surface. ICs described in more detail in **Section IV** and **Table 2** of this SB.

E. SOLID WASTE MANAGEMENT UNITS 40 AND 71

SWMU 40 and 71 are located within the south-central portion of the MMA at RFAAP (**Figure 1**). SWMU 40 is a 2-acre undeveloped open grass-covered area, with the exception of a gravel covered area used for temporary storage of asbestos located at the eastern edge of the unit. SWMU 71 is a 2,250 square foot area that is conterminous with the southern edge of SWMU 40. A paved road is located immediately south of SWMU 71 and undeveloped land borders SWMU 40 to the north and west.

SWMU 40 was used in the 1970s and early 1980s for the burial of paper, office trash, concrete, and rubber tires. The unit was not permitted as a solid waste landfill by the Commonwealth of Virginia. Operations ceased and the unit was closed with a clay cap and grass cover.

SWMU 71 is a gravel covered area located between SWMU 40 and a paved road. Metal process pipes potentially contaminated with propellant were flash-burned from approximately 1962 to 1982 at SWMU 71. Oil-soaked straw was used as a fuel source. The pipes were reused or sold for recycling after flash burning.

1. 1987 EPA RCRA Facility Assessment

The EPA conducted an assessment at RFAAP in 1987 to evaluate potential hazardous waste or hazardous constituent releases and to determine the appropriate corrective actions, as necessary. The assessment consisted of a preliminary review and evaluation of available unit information, personnel interviews, and a visual inspection of the unit.

2. 1992 Installation Assessment

The Environmental Photographic Interpretation Center (EPIC), under the direction of EPA, performed an assessment of multiple SWMUs at RFAAP using selected aerial photographs from 1937 to 1986. Activity was first noted at SWMU 40 in a 1971 photograph and indicated significant filling with three fill faces interpreted in the SWMU

40 area. The 1986 photograph indicated most of the unit was re-vegetated with the exception of the northeast corner where evidence of recent filling was visible.

3. 1992 Verification Investigation

In 1992 a VI was performed to evaluate potential leaching of hazardous constituents from the closed landfill at SWMU 40. Surface soil and composite samples were analyzed for metals, petroleum hydrocarbons, and explosives. No explosives were detected in the soil samples, and petroleum hydrocarbons were detected at concentrations below the VDEQ action level.

4. 1994 Verification Investigation: Phase II

Based on the results of the 1992 VI, 12 additional soil samples were collected from SWMU 71 to define the horizontal and vertical distribution of detected analytes. Metals were identified as a potential concern in subsurface soil.

5. 1996 Dye Trace Study and RFI

In 1993 and 1994 a dye tracing study was performed at SWMU 17. SWMU 17 is located approximately 200 feet east of SWMU 40. As part of the Dye Trace Study, a RFI was conducted to determine if groundwater contamination had occurred in SWMU 17. A monitoring well in SWMU was also utilized to determine if contamination from SWMU 17 had moved into bedrock fractures with connection to the New River. Results indicate that contamination from SWMU 17 may be migrating west toward SWMU 40 and the New River.

6. 2009 RCRA Facility Investigation / Corrective Measures Study

Potential human and ecological receptors and exposure pathways were evaluated as part of a 2009 RFI. A risk assessment was prepared based on these pathways and receptors. In the risk assessment, no unacceptable risks were identified for industrial and construction workers under current land use conditions. The risk assessment indicated that under an unlikely future hypothetical scenario, where land use of SWMU 40 would change from closed landfill to developed commercial/ industrial property, the calculated non-cancer hazard for future hypothetical construction workers would be above the EPA target hazard for inhalation of aluminum. Potential risks could be posed to human health under a hypothetical residential scenario where land use changed and landfill material did not remain contained and in place.

The human health risk assessment did not identify any chemicals of potential concern at SWMU 71 that exceeded risk based regulatory guidelines. Unacceptable non-cancer risk resulting from potential contact with SWMU 71 materials was not present, thus no remedial actions are necessary to address risk to human health at SWMU 71.

Ecological risk results for terrestrial receptors in potential contact with the SWMU materials indicated an unacceptable risk was not present in SWMU 40 and 71 due to the

spatial distribution of contamination, and thus no remedial actions are necessary to address ecological concerns.

Based on the following considerations, corrective measures were developed for SWMU 40:

- Current land use of the unit is undeveloped industrial consisting of a 2-acre closed landfill; and,
- Land use of the unit is unlikely to change in the future due to the presence of a closed landfill contained by a surface cap and cover;

No unacceptable risks were identified for human receptors in potential contact with SWMU 71 materials; therefore, no further action is warranted to address human health concerns.

Institutional/Engineering Controls and long term monitoring (LTM) are being proposed as the final remedy for SWMU 40. The LTM is proposed for 30 years and will include the following: installation of an additional downgradient monitoring well, quarterly sampling of four groundwater monitoring wells for one year, seasonal sampling (every 9 months) for years 2 – 5, and annual sampling for years 6 - 25, as well as preparation of annual LTM reports. The LTM is described in more detail in the 2011 SWMU 40 Interim Measures Work Plan. Engineering Controls (ECs) will consist of repairs to the existing landfill cap, long term inspection and maintenance of the cap, and a clear marking of the capped area. ICs will include prevention of residential use, an earth-moving restriction, and a restriction on potable use of groundwater. ECs and ICs are described in more detail in **Section IV** and **Table 2**.

F. SOLID WASTE MANAGEMENT UNIT 57

SWMU 57 is a 2,600 square foot asphalt lined pond and associated piping located in the western section of the horseshoe area at RFAAP. The horseshoe area is located in a long bend of New River in the northeastern portion of the RFAAP property (**Figure 1**). The SWMU is an inactive fabricated unit historically used as an acid settling pond. The exact date of decommission for the pond is not available in accessible historical documents, although aerial photographs from 1986 noted that liquid appeared to be present in the pond.

1. 1987 EPA RCRA Facility Assessment

The EPA conducted an assessment at RFAAP in 1987 to evaluate potential hazardous waste or hazardous constituent releases and to determine the appropriate corrective actions, as necessary. The assessment consisted of a preliminary review and evaluation of available unit information, personnel interviews, and a visual inspection of the unit.

2. 1992 Verification Investigation

In 1992 a VI was performed to evaluate potential contamination associated with sediment in the pond. Sediment samples were analyzed for metals, VOCs and SVOCs. Metals were detected in the SWMU sediment samples, but no VOCs or SVOCs were detected.

3. 1992 Installation Assessment (Aerial Photograph Interpretation)

The EPIC, under the direction of EPA, performed an assessment of multiple SWMUs at RFAAP using selected aerial photographs from 1937 to 1986. Activity at SWMU 57 was first noted on a 1962 aerial photograph. The interpretation of the 1971 photograph indicated the presence of a "pond" containing liquid. This area remained unchanged through the 1986 photograph, although a drainage way extending from the "pond" to the New River was noted.

4. 2007 Site Screening Process

The Site Screening Process (SSP) was designed using specific human health and ecological screening processes to assess whether releases of hazardous substances, pollutants, contaminants, hazardous wastes, or hazardous constituents had occurred to the environment at the unit, and whether further investigations or action were appropriate at the unit.

Soil samples were obtained from in and around the SWMU to evaluate for the presence or absence of chemicals in soil potentially associated with previous use as a settling pond. Results of the sampling indicated that metals and VOCs were the only chemicals of potential concern identified at the unit that required additional investigation. The SSP resulted in the recommendation of a focused RFI for soil and groundwater media at the unit.

5. 2009 RCRA Facility Investigation/Corrective Measures Study

Potential human and ecological receptors and exposure pathways were evaluated as part of the 2009 RFI. A risk assessment was prepared based on these pathways and receptors for the CMS.

The greatest potential for exposure to chemicals is likely to result from the ingestion of chemicals in food. Surface water and sediment exposure are not exposure pathways associated with SWMU 57, and no aquatic receptors were identified for the unit.

In the risk assessment, no unacceptable risks were identified for construction workers under current land use conditions. Future hypothetical land use risk calculations indicated that future construction workers and future child residents had an unacceptable non-cancer hazard associated with surface soil contaminants. Future hypothetical lifetime residential cancer risk calculations indicated an unacceptable cancer risk associated with elevated concentrations of metals in surface soils. Potential constituents

of concern in groundwater samples were below risk based screening levels, and therefore, do not require the development of corrective measures to address the contamination.

There is adequate information to conclude that the potential exists for an adverse ecological impact to terrestrial plants and soil invertebrates due to metals in the soil, the American robin due to exposure to metals in the soil, and amphibians due to metals, PCBs, and SVOCs in soil within the pond area. No other significant potential impacts to ecological receptors due to unit related activities were identified.

Based on the findings set forth in the 2009 RFI, it has been determined that soil contamination exists at SWMU 57. In the Corrective Measures Study preliminary remedial goals were based on EPA OSWER directives, where available. For contaminants that did not have published directives, clean up levels were calculated using the EPA risk based acceptable range of exposure. The future land use for SWMU 57 was identified as industrial; however, both residential and industrial exposure scenarios were used to determine clean up levels.

Source removal to below residential screening levels is the proposed remedy for this unit; as a result land use will be unrestricted (without controls or monitoring requirements).

Hazardous Constituent	Remedial Goal (mg/kg)
Aluminum	40,041
Antimony	13.2
Manganese	2,543
Cadmium	23.2
Chromium	65.3
Iron	50,962

G. SOLID WASTE MANAGEMENT UNIT 13

SWMU 13 is the Area Outside the Open Burning Ground. It consists of a 1.6 acre area between the Open Burning Ground (OBG) and the north bank of the New River in the western section of the Horseshoe Area. The study area is located topographically downhill from the OBG and likely received drainage from the OBG prior to the reconfiguration of the OBG to prevent stormwater runoff from the unit offsite. Open burning of waste and off-specification energetic products has been performed continuously at the OBG since manufacturing operations began at RFAAP in 1941. Open detonation has not been conducted. A RCRA Subpart X Permit (VA1210020730) was issued by the VDEQ in October 2005 for open burning at the OBG.

1. 1987 EPA RCRA Facility Assessment

The EPA conducted an assessment at RFAAP in 1987 to evaluate potential hazardous waste or hazardous constituent releases and to determine appropriate corrective actions, as necessary. The assessment consisted of a preliminary review and evaluation of available unit information, personnel interviews, and a visual inspection of the unit.

During the 1987 Visual Site Inspection (VSI), environmental samples were not collected as part of the inspection. The assessment concluded that various signs of release from the burn pans were evident during the April 1987 VSI; specifically, remnants of incompletely combusted propellant were present throughout the area. The area evaluated in the 1987 RFA is the currently permitted OBG, not the limited study area outside of the OBG that currently comprises SWMU-13.

2. 1992 Installation Assessment (Aerial Photograph Interpretation)

In 1992 the EPIC, under the direction of the EPA, conducted an assessment of multiple SWMUs at RFAAP using selected aerial photographs from 1937 to 1986. Activity at the Open Burning Ground was first noted in a 1949 aerial photograph. The area comprising SWMU 13 was vegetated and undeveloped. Analysis of aerial photographs from 1962, 1971, 1981 and 1986 indicate that the area between the OBG and the New River has historically been undeveloped and vegetated.

3. 1997 New River and Tributaries Study

In 1997, a study of the New River and Tributaries was conducted by Parsons, Inc. to evaluate migration pathways along the New River and its tributaries to assess potential adverse effects to human health and the environment. Surface water and sediment samples were analyzed for VOCs, SVOCs, pesticides, PCBs, explosives, and target analyte list (TAL) metals. Metals and SVOCs were detected in sediment samples collected adjacent to and downstream of SWMU 13. Barium and lead were detected in surface water samples collected adjacent to SWMU 13 at concentrations below residential risk screening levels.

4. 2005 to 2008 OBG Soil and Groundwater Monitoring for RCRA Subpart X Permit

Soil and groundwater were monitored at the OBG from 2005 to 2008 as part of RFAAP's RCRA Subpart X permit. A component part of the OBG monitoring included collecting samples from the SWMU 13 area. Soil and groundwater samples collected in SWMU 13 during this time period were analyzed for VOCs, SVOCs, metals and explosives. Metals were detected in soil samples obtained from SWMU 13 at concentrations exceeding residential risk screening levels. Groundwater samples were collected at the northern boundary of SWMU 13. Analytical results indicated that carbon tetrachloride and perchlorate were detected at levels exceeding the groundwater protection standards set forth in the VDEQ's Subpart X Permit.

5. 2007 Site Screening Process Investigation Report

In 2007, a SSP Investigation was conducted by URS using specific human health and ecological screening processes to assess whether releases of hazardous substances,

pollutants, hazardous wastes or hazardous constituents have occurred to the environment at SWMU 13, and whether further investigation or action or no further action is appropriate for the unit. The SSP Investigation at SWMU 13 included 5 soil borings and two surface water and sediment samples from the New River adjacent to SWMU 13. The SSP investigation resulted in the identification of lead as the primary constituent of concern requiring further investigation and assessment at SWMU 13. The SSP recommended a focused RFI for soil within SWMU 13 and for sediment within the adjacent New River.

6. 2008 New River Investigation and Sampling for SWMU 54 RFI

In 2008, sediment samples were collected along the New River by URS concurrent with the RFI conducted at SWMU 54. Three samples were collected adjacent to SWMU 13. Analytical results of the sediments samples indicated that lead concentrations in New River sediment adjacent to SWMU 13 were below the human health residential screening level. Explosives were detected in one sample collected adjacent to SWMU 13 at concentrations below residential risk based screening levels. Attributing lead and other chemicals detected in sediment samples to a specific source or sources is not possible given the complex transient flow and depositional patterns in the river Although the sediment sampling results did not indicate the unit had historically significantly affected the New River based on the detected lead concentrations at the study area, an assessment of the study area as a potential future source of lead loading in the New River was conducted using soil loss assessments. Based on the sediment sampling results and the results of the annual and 10-year storm event soil loss assessments, potential SMWU 13 related releases to the New River are not considered to pose current or future significant risk to the river.

7. 2010 RCRA Facility Investigation

In 2010, a RFI was performed by URS to fill data gaps identified during the 2007 SSP and to further evaluate potential releases to soil from historical activities at the adjacent OBG. The RFI assessed the nature and extent of lead in soil. Lead was identified in the SSP and previous investigations as the primary indicator chemical for evaluating releases to soil. A nature and extent assessment was conducted for other chemicals of potential concern (COPCs) identified during the SSP including explosives, nitroglycerin, semi-volatile organic compounds, and metals. The results of the human health risk assessment did not indicate a requirement for further action for soil in the SWMU 13. The results of the screening level ecological risk assessment indicated there is adequate information to conclude that ecological risks were not significant at SWMU 13, and therefore, there was no need for further action for soil at the RFI study area on the basis of ecological risk. The results of the soil loss assessment for the unit with regard to potential current of future impacts to the New River did not indicate the need further action for soil at SWMU 13. Based on the results of the RFI, HHRA, and SLERA, no further action beyond the implementation of institutional controls to prevent future digging at the RFI study area was recommended.

8. Final RFI Approval

On August 26, 2010 the EPA approved the 2010 RFI Report with its recommendation of institutional controls to prevent future digging and residential use as the final remedy. EPA is proposing institutional controls as the final remedy for this unit. These controls are described in more detail in **Section IV**.

H. SOLID WASTE MANAGEMENT UNITS 41A AND 41B

SWMU 41 is located in the southeastern portion of the RFAAP Main Manufacturing Area. The unit consists of two non-contiguous disposal areas (SWMU 41A and SWMU 41B) for red water ash. Red water ash is a byproduct of combustion of TNT production wastewater. SWMU 41A is a 0.19 acre former unlined lagoon area that received rinsate from red water ash-transport vehicle rinsing. SWMU 41B is a 0.36 acre natural clay-lined landfill containing red water ash. From approximately 1967 to 1974 and again from 1983 to 1986, RFAAP manufactured TNT by the continuous type process, which employed chemical recycling and resulted in a smaller quantity of more concentrated waste than older batch-type operations. In TNT manufacture, a red colored wastewater, known as red water, is produced. Red water generated from continuous type process TNT manufacturing was concentrated by evaporation and the residue burned in rotary kilns located in the former TNT manufacturing area. The ash produced from these kilns was disposed of in SWMU 41B from 1967 to 1971. Beginning in 1972, red water was concentrated by evaporation and sold to the paper industry, and SWMU 41 was deactivated.

1. 1987 EPA RCRA Facility Assessment

The EPA conducted an assessment at RFAAP in 1987 to evaluate potential hazardous waste or hazardous constituent releases and to determine the appropriate corrective actions, as necessary. The assessment consisted of a preliminary review and evaluation of available unit information, personnel interviews, and a visual inspection of the unit. The assessment reported that no data indicating releases has been collected for SMWU 41A or SWMU 41B.

2. 1992 Installation Assessment – EPIC Aerial Photograph Analysis

The EPIC, through the EPA and the U.S. Army Toxic and Hazardous Materials Agency, provided aerial photographic analysis of 42 known SWMUs at RFAAP. Aerial photographs from 1937 to 1986 were analyzed to identify features that may have represented potential groundwater or surface water constituent sources at RFAAP. Activity at SWMU 41 was first noted in a 1970 photograph and reportedly continued through the 1986 photographs. SWMU 41A was depicted as a lagoon in the northern portion of SWMU 41 that was filled in the 1975 and 1981 photographs. SWMU 41B was noted as having received considerable amounts of fill material between 1981 and 1986.

The unit was depicted as "significantly filled" and devoid of vegetation in the 1986 aerial photograph.

3. 1992 Verification Investigation

A VI was conducted in 1992 by Dames and Moore and included sampling soil, surface water, and groundwater. Soil samples were analyzed for metals, SVOCs, and explosives. Metals were detected in collected soil samples at concentrations above residential risk screening levels. However, metals were below their RFAAP facility wide background point estimates. Surface water samples were analyzed for metals, SVOCs, explosives, total organic carbon, total organic halogens, and pH. Detected constituents were below applicable screening levels. Groundwater samples were analyzed for metals, SVOCs, explosives, total organic carbon, total organic halogens, and pH. Concentrations of metals and SVOCs in groundwater were above risk screening levels.

4. 2002 Geophysical Survey

Argonne National Laboratory conducted a geophysical survey of SWMU 41B in 2002 to assist in the delineation of potential red water ash burial locations within the unit. Subsurface information obtained by the geophysical surveys was used to focus RFI field investigations on characterizing the nature and extent of burial areas at SWMU 41B. Buried material was estimated to be ten feet below ground surface.

5. 2005 RCRA Facility Investigation

A draft RFI was submitted to the Army by URS Corporation in 2005, but the report was never submitted to the regulatory agencies. The RFI was designed to characterize chemical concentrations in soil at SWMU 41, evaluate potential releases to groundwater, surface water, and sediment in the unit area, and evaluate potential risks to human health and the environment for identified COPCs. Sampling and analysis at SWMU 41 included soil sampling, surface water and sediment sampling, and groundwater sampling from existing monitoring wells. PCBs and VOCs were identified as COPCs in soil that exceeded residential risk screening levels at SWMU 41A. Metals were the primary COPCs in the soil and groundwater at SWMU 41B. No evidence of residual waste in the former lagoon area was observed in the soil borings completed within SWMU 41A. Human health COPCs were not identified for surface water samples. No groundwater samples were obtained from SWMU 41A at that time.

Potential human and ecological receptors and exposure pathways were evaluated as part of a 2005 RFI. The human health risk assessment did not identify any COPCs in unit media that exceeded risk based regulatory guidelines for potential receptors.

The screening level ecological risk assessment concluded that there were no potential adverse impacts to terrestrial wildlife from unit media at SWMU 41A or SWMU 41B, therefore remedial measures to address ecological concern are not warranted.

6. 2010 RCRA Facility Investigation

An RFI was conducted in 2010 by Shaw Environmental to further characterize SWMU 41. From 2007 to 2010 additional RFI activities included the collection and chemical analysis of surface water samples, sediment samples, direct push groundwater samples from SWMU 41A and groundwater well samples from SWMU 41B. Explosives, PAHs, SVOCs and metals were above screening levels in unit media. Since SWMU 41A was a former lagoon that received rinsate from ash transport vehicle rinsing, dioxins/furans and explosives were the only constituents detected above risk based screening levels that were attributable to past practices at the unit. Based on the nature and extent assessment of Area A it did not appear as though unit media had been significantly impacted as a result of former unit activities. In an attempt to better characterize the potential for impacts to groundwater, a groundwater monitoring well was installed in late 2010 at SWMU 41A to obtain representative groundwater quality data. The data indicated that there is no unacceptable risk to human health or the environment associated with SWMU-41A.

Potential human and ecological receptors and exposure pathways were evaluated as part of the RFI. The risks associated with five exposure scenarios were calculated at the unit: current/hypothetical future maintenance workers, hypothetical future industrial workers, hypothetical future excavation workers, hypothetical future adult residents, and hypothetical future child residents. Exposure scenarios for off-site adult and child residents were also evaluated for potential exposures to groundwater in the event that groundwater migrates off site in the future. Hypothetical future lifetime adult resident and hypothetical future child resident exposure scenarios resulted in a total cancer risk that was within the acceptable risk range of 10E-4 to 10E-6 for SWMUs 41A and 41B.

The screening level ecological risk assessment concluded that due to the fact that no rare, threatened or endangered wildlife species have been confirmed in the SWMU 41A study area, and the relatively small size of the unit, corrective measures solely to address ecological concerns are not warranted at SWMU 41A.

7. 2011 Final Remedy Proposal

In March 2011, EPA approved the final RFI, which proposed:

- ❖ No unacceptable risks were identified for human or ecological receptors in potential contact with SWMU 41A materials; therefore, no further action is warranted to address human health or ecological concerns

- ❖ Institutional Controls to prevent earth moving and future residential use have been proposed as the final remedy for SWMU 41B. They are described in more detail in Section IV.

Therefore EPA is proposing no further action for SWMU 41A and institutional controls for SWMU 41B. These controls are described in more detail in **Section IV**.

I. SOLID WASTE MANAGEMENT UNIT 43

SWMU 43 is a closed unlined sanitary landfill located immediately adjacent to the New River in the northeast section of the Main Manufacturing Area. SWMU 43 consists of two adjacent approximately 1.5-acre cells divided by a central drainage ditch. Based on geophysics and aerial photography, the landfill extends east-west approximately 700 feet on either side of the drainage ditch. The north and south boundaries are the river bank and the paved roadway, respectively. The landfill has a north-south dimension of approximately 150 feet. The former trench-fill operation reportedly received at least 300 tons of paper and refuse over its active life. The landfill was reportedly operated from 1958 to the early 1970s.

1. 1987 EPA RCRA Facility Assessment

The EPA conducted an assessment at RFAAP in 1987 to evaluate potential hazardous waste or hazardous constituent releases and to determine the appropriate corrective actions, as necessary. The assessment consisted of a preliminary review and evaluation of available unit information, personnel interviews, and a visual inspection of the unit. The visual inspection of the unit noted that no known releases were documented for the unit.

2. 1992 Verification Investigation

In 1992 a VI was performed to determine whether hazardous contaminants were migrating beyond the boundaries of the identified SWMU. The investigation involved the installation and sampling of groundwater monitoring wells and the sampling of groundwater seeps in the vicinity of the unit. Two surface water and six groundwater samples were collected and analyzed for VOCs, metals, total organic carbon, total organic halogens, and pH. Metals were detected in the surface water samples at concentrations above EPA drinking water maximum contaminant levels (MCLs) promulgated at 40 C.F.R. Part 141 pursuant to Section 1412 of the Safe Drinking Water Act, 42 U.S.C. Section 300g-1. VOCs and metals were detected in groundwater at concentrations above risk screening levels and MCLs, respectively.

3. 2010 RCRA Facility Investigation

A geophysical survey of SWMU 43 and additional field sampling was conducted by Shaw in 2007 to determine the landfill boundaries and to obtain current analytical data for the unit to complete site characterization. The geophysical survey identified the boundaries of the landfill cells and did not detect any anomalies indicative of buried debris. Soil samples were collected for analysis and the six existing groundwater monitoring wells were sampled in order to assess potential contaminant migration from the landfill cells. Soil samples were analyzed for VOCs, SVOCs, PAHs, pesticides, PCBs, herbicides, explosives, dioxins/furans and metals. Groundwater samples were analyzed for VOCs, SVOCs, PAHs, pesticides, PCBs, herbicides, explosives, metals and perchlorate. Of the thirty soil samples collected, residential screening level exceedances were limited to one PAH, two PCBs, one explosive, two metals and four dioxins/furans. One VOC and five metals were detected above groundwater risk screening levels.

Potential human and ecological receptors and exposure pathways were evaluated as part of a 2010 RFI. A risk assessment was prepared based on these pathways and receptors. In the risk assessment, no unacceptable risks were identified for industrial and construction workers under current land use conditions. The human health risk assessment did not identify any COPCs in soil that posed an unacceptable risk to human health or the environment. Risks associated with exposures to COPCs in groundwater were above the acceptable risk range for the potential future industrial worker, potential future lifetime resident, and potential future child resident. These risks were attributed primarily to PCE and arsenic. Potential future migration of COPCs in groundwater to surface water at the New River was evaluated in the risk assessment. Total risk associated with exposures to off-site surface water by off-site recreation users was within the acceptable risk range.

The screening level ecological risk assessment concluded that although there may be potential adverse impacts to terrestrial wildlife from unit media, corrective measures to address ecological concern were not warranted because of the relatively small size of the unit and no threatened or endangered species have been confirmed at the unit.

In October 2010 a groundwater sampling event was conducted to confirm the groundwater quality for VOCs at the unit. The results were within (or below) the range of previous data.

4. 2010 Final Remedy Proposal – Institutional Controls

On January 28, 2011, EPA approved the 2010 final RFI Report that proposed institutional controls to prevent residential use and digging at SWMU 43. EPA is proposing institutional controls to prevent residential use and earth moving activities as the final remedy for this unit. They are described in more detail in **Section IV** and summarized in **Table 2.**

J. SOLID WASTE MANAGEMENT UNIT 45

SWMU 45, the Inactive Sanitary Landfill, consists of a 3.4 acre area in the northwest section of the Main Manufacturing Area. The New River is located approximately 200 feet north-northwest of the unit. Historical records indicate that the landfill was in operation from 1957 to 1961. Previous investigations determined that a variety of waste, including scrap metal, may have been disposed of in the landfill.

1. 1987 RCRA Facility Assessment (RFA)

In 1987, the EPA conducted an assessment at SWMU 45 to evaluate potential hazardous waste or hazardous chemical releases and to determine the appropriate corrective actions, as necessary. The assessment consisted of a preliminary review and evaluation of available unit information, personnel interviews, and a visual inspection of the unit. Environmental samples were not collected at SWMU 45 as part of the inspection. At the

time of the RFA, the area identified by site personnel as the landfill was "indistinguishable from the surrounding area as a landfill site." According to the RFA, the disposal unit began operation in the 1970s but was not active at the time of the visual unit inspection conducted in 1986.

2. 1992 Verification Investigation

In 1997, a VI was conducted by Dames and Moore to evaluate whether toxic or hazardous constituents were present and had the potential of migrating beyond the boundaries of the identified SWMUs. The VI included a geophysical survey of an approximate 5-acre study area and installation and sampling of three groundwater monitoring wells. Groundwater samples were collected at SWMU 45 monitoring wells for analysis of VOCs, SVOCs, explosives, TAL metals, total organic carbon, total organic halogens, and pH. VOCs and metals were detected at levels above risk based screening levels.

3. 1992 Installation Assessment – EPIC Aerial Photograph Analysis

In 1992, an Aerial Photograph Analysis by the EPIC was conducted of 42 known SWMUs at RFAAP. Activity at SWMU 45 was first noted in aerial photography at this unit in 1949, which included substantial clearing, possible fill activity, light-toned mounded material, and staining. The unit appeared to have been enlarged by clearing between 1949 and 1954 with access roads and open storage of containers visible in 1954; however; most of the unit appeared to be in the early stages of revegetation. By 1962, the unit appeared to be revegetating and evidence of mounded material and staining was absent. In 1966, a possible trench and a dark-toned material were visible in the photograph. By 1971, most of the area was revegetating except for a small ground scarred area. By 1975, the unit appears to be revegetated except for a small ground scarred. By 1986, the unit appeared to be inactive and revegetating.

4. 2007 Geophysical Investigation

A geophysical investigation of SWMU 45 was conducted in April 2007 by ATS International, Inc. Results of the geophysical survey were used to better delineate landfill boundaries at the unit, provide data to guide the SSP investigation at the unit, and confirm that existing monitoring wells were appropriately positioned to detect potential releases to groundwater. Anomalies identified during the geophysical investigation were further investigated. In addition to potential landfill area, areas of metal debris were identified within the boundary of SWMU 45. Other types of solid waste, such as paper, cans, bottles or plastic were not observed during the post-survey reconnaissance.

5. 2010 Site Screening Process Report

In 2010, a RCRA SSP investigation was conducted by URS. The SSP was designed to assess whether hazardous substances, pollutants, chemicals, hazardous wastes, or

hazardous constituents had been released into the environment at the unit evaluated, whether further investigation or an interim removal action was appropriate at a unit, or whether no further action at a unit was appropriate. The SSP investigation identified limited areas of landfill material (0.18 acres) and surficial metallic debris (0.12 acres). In addition to the established SSP human heath risk screening process, a quantitative human health risk assessment was performed for the SSP to evaluate potential residential hazards identified by the screening and evaluate what further actions, if any, should be undertaken at the unit based on human health risk. The results of the risk assessment indicate that the calculated unit-related cancer risks and were within EPA target ranges for Superfund sites (1E-06 to 1 E-04). A screening level ecological risk assessment was also performed at SWMU 45 as part of the SSP. The results of the screening level ecological risk assessment indicated there is adequate information to conclude that ecological risks are negligible at SWMU 45; therefore, there is no need for further action at this SSP unit on the basis of ecological risk. Groundwater samples collected from 4 unit monitoring wells in May 2008 indicated that contaminant concentrations had decreased to acceptable levels.

6. 2010 No Further Action Determination

On March 29, 2010, the EPA approved the SSP Report. Based on the results of the SSP investigation, HHRA, and SLERA, institutional controls to prevent future earth moving activities at SWMU 45 are being proposed as the final remedy for this unit. These controls are described in more detail in **Section IV** and **Table 2.**

K. SITE SCREENING AREAS 18, 30, 60, 72, 77 and 79

Site Screening Areas (SSA) 18, Sulfuric Acid Recovery Plant – Waste Acid Treatment Facility, and SSA 72, the Oleum Plant Acidic Wastewater Sump, are located in the Oleum Plant area of RFAAP. SSA 30, Asbestos Disposal Trench No. 1, and SSA 79, Asbestos Disposal Trench No. 2, are co-located in the Horseshoe Area of RFAAP. SSA 60, the Rubble Pile East of the Administration Building, is adjacent to the main administration building near the main gate to RFAAP. SSA 77, the Garbage Incinerator (Building 7219), is located adjacent to shipping and receiving in the Main Manufacturing Area.

- SSAs 18 and 72 operated from 1976 until 1987, when the Oleum Plant was rendered inactive due to TNT manufacturing processes ceasing at RFAAP in 1986.

- SSAs 30 and 79 were used for disposal of asbestos containing material from 1982 to 1987. The units received 250 to 500 pounds of double bagged asbestos containing material per day when asbestos removal activities were ongoing at RFAAP.

- ❖ SSA 60 was created in 1985 to accept demolition waste cleaned up from the remains of an explosion in the Nitroglycerin Area Number 1 and highway construction debris for anticipated use as a parking lot. Fill activities ceased at the unit in 1988.

- ❖ SSA 77 operated as a garbage incinerator from the 1940s until 1974, when it was shutdown, rendered inactive, and equipment was removed. The unit was reconstructed and improved in 1953, and garbage incineration operations were reactivated. Incineration operations ceased at the reconstructed unit in 1974. SSA 77 is inactive with no plans to reactivate.

1. 1987 EPA RCRA Facility Assessment

The EPA conducted an assessment at RFAAP in 1987 to evaluate potential hazardous waste or hazardous constituent releases and to determine the appropriate corrective actions, as necessary. The assessment consisted of a preliminary review and evaluation of available unit information, personnel interviews, and a visual inspection of the unit. During the 1987 Visual Site Inspection (VSI), environmental samples were not collected as part of the inspection. The VSI for SSA 18 (listed as Unit 18 in the RFA), SSA 72 (listed as Unit 72 in the RFA) indicated that no visible signs of releases were observed during the site inspection. For SSA 60 (listed as Unit 60 in the RFA) the RFA indicated there were no documented releases. For SSA 77 (listed as Unit 77 in the RFA), the RFA did not identify a historical release. The assessment indicated that the closure status of SSA 30 (listed as Unit 30 in the RFA) was uncertain due to the active status of SSA 79 (listed as Unit 79 in the RFA). The RFA indicated that no data indicating releases at SSAs 30 and 79 had been collected.

2. 1992 Installation Assessment (SSAs 30, 79, and 77)

The EPIC, under the direction of EPA, performed an assessment of multiple SWMUs at RFAAP using selected aerial photographs from 1937 to 1986 (EPA 1992a). A photogeologic analysis was performed to locate waste management areas, identify the location of sinkholes that existed prior to the construction of the RFAAP, and map fracture traces.

- ❖ SSAs 30 and 79: A specific assessment was not conducted for the asbestos disposal trenches; however, an assessment was conducted for adjacent SWMU 51. The aerial photographic analysis of SWMU 51 indicated that activity was first noted at SWMU 51 in 1975, where an empty trench was visible on the photograph. By 1981, the trench had been filled and a re-vegetating ground scar was the sole remaining feature.

- ❖ SSA 77: A specific assessment was not conducted for the garbage incinerator; however, an assessment was conducted for adjacent SWMU 17. The aerial photographic analysis of SWMU 17 indicated that activity was noted from 1949

to 1986, where mounded material, containers, and possible stains were noted within the SWMU 17 area.

3. 1992 RCRA Facility Investigations (SSAs 30, 79 and 77)

- SSAs 30 and 79: In 1992, Dames & Moore reported the results of an RFI conducted at SWMU 51 located adjacent to SSA 30 and SSA 79. The RFI focused on evaluating potential releases to groundwater in the area of SWMU 51 and at adjacent landfill areas to the east and north of the unit. Samples collected from monitoring wells around the periphery of the SSA 30 and SSA 79 area were analyzed for VOCs, SVOCs, explosives, dissolved metals, total organic carbon, total organic halogens, and pH. One SVOC and one explosive were detected at concentrations above applicable screening levels.

- SSA 77: The RFI conducted by Dames and Moore at SWMU 17 in 1992 included the installation of a piezometer to monitor static water levels adjacent to SSA 77. Groundwater samples were not collected from this piezometer for this investigation.

4. 1996 RCRA Facility Investigation at SWMU 17 (SSA 77)

Parsons Engineering Science conducted an RFI at SWMU 17, which is located adjacent to SSA 77, in 1996. As part of the RFI, groundwater samples were collected from monitoring wells in the vicinity of SSA 77 for analysis of explosives, total/dissolved metals, total organic carbon and total organic halogens. Explosives were not detected in these samples. One dissolved metal was detected at a level above its MCL.

5. 2000 Acid Sewer Survey (SSAs 18 and 72)

From 1998 to 2000, an Acid Sewer Survey and Investigation was conducted on the entire RFAAP acid sewer infrastructure to determine the condition of the sewers. Videotaping of the interior lines was conducted and submitted to the EPA. An assessment of the 260 ft long 6-inch diameter plastic, gravity acid sewer line that extends from the acidic wastewater sump (SSA 72) to the SAR wastewater treatment plant (SSA 18) was not conducted as part of the acid sewer survey. Deteriorated or broken sections of sewer lines were repaired or replaced within active areas. No actions were undertaken in the area of SSA 18 due to the inactive status of the SAR Plant wastewater system and treatment facility.

6. 2002 Geophysical Survey at SWMU 51 (SSAs 30 and 79)

A geophysical survey was conducted in the SWMU 51 area in 2002 by Argonne National Laboratory to characterize the lateral and vertical extent of the former TNT

neutralization-sludge disposal trench. The survey showed a high conductivity anomaly and low resistivity anomaly in the general trench area.

7. 2004 Oleum Plant Site Screening Investigation (SSA 72)

A Site Screening Investigation was conducted in 2004 by Draper Aden Associates to characterize potential contamination at the Oleum Plant. Two soil samples and one water sample from the acidic wastewater sump were collected from SSA 72. Soil samples were analyzed for VOCs, SVOCs, PAHs, explosives and metals. The water sample was analyzed for perchlorate. VOCs, SVOCs, PAHs and metals were detected in collected soil samples from SSA 72. PAHs were detected above applicable residential screening levels. Perchlorate was not detected in the water sample collected from SSA 72.

8. 2006 Eastern Horseshoe Area Groundwater Sampling (SSAs 30 and 79)

In 2006, Shaw reported the results of an area wide groundwater sampling event in the eastern horseshoe area of RFAAP. Groundwater samples were obtained from wells in the vicinity of SSA 30 and 79 as part of the event. Samples were analyzed for VOCs, SVOCs, pesticides, PCBs, dioxin/furans, PAHs, metals and perchlorate. VOCs, pesticides and metals were detected in these samples. Detected constituent concentrations were below MCLs.

9. 2007 Oleum Plant Environmental Baseline Study (SSAs 18 and 72)

An environmental baseline study of the Oleum Plant area was conducted in 2007 by Ecology and Environment, Inc. Soil and groundwater samples were collected from the area encompassing SSA 18 and a water sample was collected from the sump at SSA 72. Samples were analyzed for VOCs, SVOCs, PCBs, pesticides, explosives, metals, nitrate/nitrite and perchlorate. VOCs, PCBs, pesticides and metals were detected in one or more soil samples. Detected constituent concentrations in soil were below applicable screening levels and/or background soil concentrations. VOCs, SVOCs, pesticides, explosives, and metals were detected in one or more groundwater samples. With the exception of chloroform and perchlorate, detected constituent concentrations in groundwater, were below screening levels. Metals and two pesticides were detected at concentrations above applicable screening levels for the water sample obtained from the acidic wastewater sump at SSA 72.

10. 2008 RCRA Facility Investigation/ Corrective Measures Studies (SSAs 30, 79 and 77)

- SSA 30 and 79: An RFI/CMS was conducted by Shaw in 2008 at SWMU 51 located adjacent to SSA 30 and SSA 79. Soil samples were limited to the immediate area of the SWMU 51 trench. Soil samples were analyzed for VOCs, SVOCs, pesticides, PCBs, herbicides, explosives, metals and dioxins/furans. The

soil samples were not analyzed for asbestos. Groundwater data from the 2006 Eastern Horseshoe Area Groundwater sampling were used in the RFI assessment (see Section H).

- SSA 77: An RFI/CMS was conducted by Shaw at the Former Lead Furnace Area (FLFA), which is located adjacent to SSA 77, in 2008 to characterize potential contamination of soil and groundwater at the unit. Soil samples were not collected from the SSA 77 building area. The septic tank and terracotta pipe associated with SSA 77 are located within the FLFA unit, but this area has been remediated. As part of the RFI, groundwater samples were collected from wells in the vicinity of SSA 77 and analyzed for organics, PAHs, explosives, herbicides, metals and perchlorate. Organic chemical concentrations were below their applicable MCLs. One metal was above the screening level due to elevated sample turbidity.

11. 2010 Site Screening Process Report

A SSP report presented the results and findings of the RCRA investigations for SSAs 18, 30, 60, 72, 77 and 79 at RFAAP. The SSP was designed to assess whether hazardous substances, pollutants, chemicals, hazardous wastes, or hazardous constituents had been released into the environment at the units evaluated, whether further investigation (i.e., risk assessment or RFI) or an interim action was appropriate at a unit, or whether no further action at a unit was appropriate. Five steps were completed for the SSP following the approved guidance document including: 1) performance of a desktop audit and site visit to develop the scope of the SSP Work Plan, 2) preparation of a SSP unit specific Work Plan, 3) performance of the field work in accordance with the approved SSP Work Plan, 4) evaluation of the SSP data and completion of pre-remedial risk screening, and 5) assessment of the need for further investigation, interim removal action, or preparation of a "No Further Action" Decision Document, per the RCRA Corrective Action permit based on the results of the SSP and risk screening.

Human health and ecological risk screenings were conducted for each unit. SSAs 30 and 79 were assessed together due to their proximity and similar historical activities. Background levels of metals were the risk drivers for each of the units except SSA 72 (one PAH and one PCB) and SSA 77 (dioxins). SSAs 72 and 77 had unit related risks equal to or above SSP thresholds for the residential scenarios but below SSP thresholds for the industrial scenarios. The remaining units had site related risks below SSP thresholds for the residential scenario and industrial scenario. The results of the ecological risk assessments indicated that there is information sufficient to conclude that ecological risks were considered negligible for SSAs 18, 30, 60, 77, and 79. An ecological risk assessment was not conducted at SSA 72 due to the small size of the unit and the nature of previous activities at the unit. Potential for ecological risk at SSA 72 was considered negligible.

L. 2010 No Further Action Determination

In November 2010, EPA agreed with the following proposed actions for SSAs 18, 30, 60, 72, 77 and 79, and is proposing these actions as the final remedies for these SSAs as follows:

- ❖ SSAs 18 and 60 – No Further Action based on the results of the human health screening, ecological risk screening, and SSL evaluation;
- ❖ SSAs 72 and 77 – No Further Action beyond the implementation of institutional controls to prevent future residential use and to restrict future earth moving;
- ❖ SSAs 30 and 79 – No Further Action beyond the implementation of Institutional and Engineering Controls to maintain this unit as a closed solid waste management unit due to the presence of bagged asbestos containing material at the unit within the trenches. Engineering Controls will include maintenance of the soil cover to prevent erosion and potential exposure of asbestos, as well as a clear marking of the area. Institutional Controls will prevent future residential use of the area, as well as a restriction of earth-moving activities. ECs and ICs are described in more detail in **Section IV** and **Table 2.**

IV. PROPOSED REMEDY

The proposed remedy(s) for each individual unit can be described using the following terminology:

- No Further Action
- Soil Removal
- Engineering Controls
- Institutional Controls

A. No Further Action

For certain units where it was unlikely that any kind of release to environmental media had occurred, RFAAP performed desktop audits of data and/or operational history to determine that there was no risk to human health or the environment. These units were typically grouped together by location or similar processes, and RFAAP submitted the Corrective Action Unit Evaluations to EPA in 2010. EPA concurred with the recommendation of NFA for these units, which are listed in **Table 1.** A fact sheet summarizing the Corrective Action Unit Evaluations can be found in **Attachment 2.**

Other Units being recommended for No Further Action have been investigated for potential impacts to media (typically soils and/or groundwater) and the data demonstrate

that the unit presents no risk to human health or the environment in its present condition. In such cases the impacted media is evaluated, reasonable assumption as to the potential receptors is applied, and the data is compared to site screening levels. If the Facility screening levels have not been exceeded, the unit is recommended for NFA. These units are also presented in **Table 1,** and summaries can be found in **Attachment 3.**

The NFA recommendations were memorialized in documents the Army and EPA refer to as "Decision Documents," or in letters from EPA to the Army concurring with the findings and recommendations of the final action report until the decision is presented for public comment in a Statement of Basis.

B. Soil Removal

For several units where initial data indicated that screening levels were exceeded (Building 4343, FLFA, SWMU 39, SWMU 51), interim measures were implemented to mitigate exposure. These interim measures typically involved a source removal action, or excavation and disposal of impacted soils. Following the implementation of the interim measure, confirmatory sampling was performed to demonstrate the effectiveness of the interim measure. The data were then evaluated in a quantitative risk evaluation (either comparison with screening levels or a risk assessment) and if the analysis concluded that there was no risk to human health or the environment, a designation of NFA was recommended.

The only unit described in this SB for which EPA is recommending source removal as the final remedy is SWMU 57.

C. Engineering Controls

Engineering Controls are physical designs or structures used to manage environmental or health risks by placing a barrier between the contamination and the rest of the site, thus limiting exposure pathways. At the RFAAP Facility, ECs will be part of the final remedy for SWMUs 40, 30, and 79 in the form of clay covers over buried waste that will be left in place (**see Table 2**). These covers will be clearly defined and periodically inspected to ensure that integrity is maintained and the control remains protective.

D. Institutional Controls

Institutional Controls are generally non-engineered mechanisms such as administrative and/or legal controls that minimize the potential for human exposure to contamination and/or protect the integrity of a remedy. Under EPA's proposed remedies, some concentrations of contaminants will remain in the groundwater and/or soil at the Facility above levels appropriate for residential and domestic uses. As a result, those proposed remedies will require the implementation of ICs in order to restrict use of the Facility property and groundwater to prevent exposure to contaminants while such contaminants

remain in place. These ICs will be implemented through permit conditions and incorporated into the Facility Master Plan.

In the event Facility property is transferred or leased, equivalent ICs will be put into terms and conditions of the deed or lease during the transfer process, which are no less restrictive than the ICs in EPA's FDRTC. Furthermore, the transferee or lessee will be responsible for ensuring IC compliance by any future users.

There are three types of ICs proposed for RFAAP:

- Restrict future residential use: Certain units (see **Table 2**) shall not be used for residential purposes unless it is demonstrated to EPA that such use will not pose a threat to human health or the environment or adversely affect or interfere with the selected remedy and EPA provides prior written approval for such use.
- Restrict future earth moving activities: For certain units (see **Table 2**), no earth moving activities, including digging, construction and drilling, may be done unless such activities are conducted in accordance with a Health & Safety Plan that was approved by EPA, and that was prepared by an appropriately qualified person familiar with the environmental conditions at the Facility.
- A restriction on potable use of groundwater within 100 yards of monitoring wells at SWMU 40, , unless it is demonstrated to EPA that such use will not pose a threat to human health and EPA provides written approval for such use (see **Table 2**).

As an added precaution the RFAAP will post signs at each of the units where ICs are being implemented. At a minimum the signs will be visible and legible from at least 25 feet and posted at access entrances to the individual units. All units where Institutional Controls are recommended as part of the final remedy are summarized in **Table 2**.

V. EVALUATION OF EPA'S PROPOSED REMEDY DECISION

This section provides a description of the criteria EPA uses to evaluate proposed remedies under the Corrective Action Program. The criteria are applied in two phases. In the first phase, EPA evaluates three criteria, known as Threshold Criteria. In the second phase, EPA sometimes uses seven balancing criteria to select among alternative solutions, if more than one is proposed. The remedies being proposed in this SB meet the threshold criteria established by EPA, as described below. Because EPA is not selecting among alternatives, a complete evaluation of the balancing criteria is not necessary.

The following sections are a summary of EPA's evaluation of the Threshold Criteria. Section A summarizes the Threshold Criteria for the units where the proposed remedy is no further action. Section B, referred to as "All Other Units," summarizes the Threshold Criteria for units where the proposed final remedy falls under the categories of soil removal, engineering controls, institutional controls, monitored natural attenuation, or some combination of the above.

A. Units Proposed for No Further Action

1. Protect Human Health and the Environment - EPA's proposed remedy for the no further action units is protective of human health and the environment because these units either had no potential for releases to the environment, or have been investigated and found to contain no contamination above EPA screening levels.

2. Achieve Media Cleanup Objectives - EPA's proposed no further action remedy achieves media cleanup objectives because these units either had no potential for releases to the environment, or have been investigated and found to contain no contamination above EPA screening levels.

3. Remediating the Source of Releases - In all remedy decisions, EPA seeks to eliminate or reduce further releases of hazardous wastes or hazardous constituents that may pose a threat to human health and the environment. The no further action units do not contain any sources of unacceptable contamination, and, therefore, remediating the source of releases is not necessary.

B. All Other Units

1. Protect Human Health and the Environment - EPA's proposed remedies protect human health and the environment by adequately eliminating, reducing, or controlling unacceptable risk through a combination of interim measures to remove contaminated soil from the Facility, and through the implementation of institutional and engineering controls to prevent potential future exposure. These controls prevent the use of impacted groundwater at the Facility, prevent or control the exposure to impacted soil through capping and earth moving restrictions, and control future land use by preventing residential use of areas where contamination above residential and/or industrial screening levels remains in place.

2. Achieve Media Cleanup Objectives - EPA's proposed remedies meet the appropriate cleanup objectives based on assumptions regarding current and reasonably anticipated land and groundwater use(s). The anticipated future land use for the Facility is industrial. The majority of Facility soils contain contaminant concentrations that are below the EPA residential or industrial screening levels. For those areas where contaminant concentrations are above the EPA residential and/or industrial soil screening levels, institutional and engineering controls will be implemented to manage potential direct contact risks.

3. Remediating the Source of Releases - In all remedy decisions, EPA seeks to eliminate or reduce further releases of hazardous wastes or hazardous constituents that may pose a threat to human health and the environment. Wherever possible and practical at RFAAP, EPA is proposing excavation and off-site disposal of contaminated soil (whether already completed as an interim measure, or being proposed in the case of SMWU 57) as the final remedy. At units where contamination is left in place, sources

will be capped and monitored to ensure that no future releases occur and controls will be in place to prevent earth moving activities and residential use at these units.

VI. PUBLIC PARTICIPATION

Radford AAP routinely conducts Restoration Advisory Board (RAB) meetings in accordance with the Facility Installation Restoration Program (IRP). The investigations and associated remedial actions at the Facility have been presented and discussed at these meetings. The RAB meetings are advertised in the local newspaper and open to the public.

Written comments on this Statement of Basis will be accepted during the 60-day public comment period. A final decision regarding the selected remedies proposed for the Facility will not be made until the public comment period has closed and all comments have been evaluated and addressed. Based on new information or comments from the public, EPA may modify the proposed remedies.

Following review of the comments, EPA will publish its final decision in the "Final Decision and Response to Comments" document. The Final Decision document will explain EPA's rationale for the selected remedy. The proposed remedy in this Statement of Basis is a preliminary determination and should another remedy be selected based upon public comment or new information, any significant differences from this Statement of Basis will be explained in the Final Decision document.

The Final Decision document will be incorporated into the Administrative Record and made available to the public in the information repositories described below.

The public comment period will last 60 calendar days from the **date of the** public notice, in order to provide an opportunity for public comment and involvement during the evaluation of this proposal. This Statement of Basis provides only a summary description of the investigations and activities performed at this site. EPA encourages the public to review the documents in the Administrative Record in order to gain a more comprehensive understanding of the activities that have been conducted at the site and the proposals under consideration. The information repository is available for review at http://www.radfordaapirp.org/inforepo/online-index.htm and at:

Montgomery-Floyd Regional Library
Christiansburg Branch
125 Sheltman Road
Christiansburg, VA 24073
Phone: (540) 382-6965

Written comments on the proposed remedy, or on any other issues related to this proposal, may be submitted to EPA by mail, fax, or email to:

Erich Weissbart
Remedial Project Manager
Office of Remediation (3LC20)
U.S. Environmental Protection Agency
1650 Arch Street
Philadelphia, PA 19103-2029
Phone: (215) 814-3284
Email: Weissbart.Erich@epa.gov

Written comments must be postmarked within 60 calendar days of the public notice. EPA will review the comments received from the public as part of the process of reaching a final decision regarding the most appropriate remedies for the Facility. EPA will address all comments received during the public comment period in the Final Decision and Response to Comments document.

If the comments are such that significant changes are made in the proposed corrective action identified by the EPA, then EPA may seek additional public comments on the revised corrective action proposal. If sufficient public interest is shown, EPA will hold a public hearing to accept oral comments on the proposed remedies and the alternatives. Comments made at the hearing would be transcribed, and a copy of the transcript would be added to the Administrative Record. You may request a public hearing or additional information by mailing, faxing, or e-mailing to the above address.

All media inquiries should be directed to the EPA Region 3 Office of External Affairs at (215) 814-3427.

Attachment 1

Tables and Figure

Table 1: Units Recommended for No Further Action (NFA)			
Location	**Description**	**Documentation**	**Remedial Action Performed**
SWMU 6	Acid Wastewater Lagoon	Decision Document October 9, 2002	Excavated and removed as part of PBS construction project.
SWMU 8	CaSO4 Treatment/Disposal Area	Decision Document October 16, 2006	SSP data did not exceed risk threshold criteria. Although not required, area was excavated and removed as part of PBS construction project.
SWMU 9	CaSO4 Treatment/Disposal Area	EPA-approved Corrective Action Unit Evaluation (2010) Recommends No Further Action	NFA based on data from similar units (SWMU 8, 35, 36, 37, 38, and AOC Q).
SWMU 17	Air Curtain Destructor and Open Burning	EPA-approved Corrective Action Unit Evaluation (2010) Recommends No Further Action	SWMU 17-B, C, D and E require no further action based on closure under VSWMR-PBR 179.
SWMU 31	Ground Coal Ash Settling Lagoons	RFI Recommended NFA - RFI Approved December 14, 2009	RFI addendum resulted in conclusion of no risk to human health or the environment. EPA concurred with findings.
SWMU 35	CaSO4 Treatment/Disposal Area	RFI approved November 2010	RFI resulted in conclusion of no risk to human health or the environment. EPA concurred with findings.
SWMU 36	CaSO4 Drying Bed	Decision Document October 16, 2006	SSP data did not exceed risk threshold criteria. Although not required, area was excavated and removed as part of PBS construction project.
SWMU 37	CaSO4 Treatment/Disposal Area	RFI approved November 2010	RFI resulted in conclusion of no risk to human health or the environment. EPA concurred with findings.
SWMU 38	CaSO4 Treatment/Disposal Area	RFI approved November 2010	RFI resulted in conclusion of no risk to human health or the environment. EPA concurred with findings.
SWMU 39	Wastewater Ponds at Propellant Incinerator	Approved Interim Measures Closure Report - April 1, 2010	Excavation and removal per RFI/CMS recommendation.
SWMU 41 A	Red Water Ash Burial Ground	RFI approved February 2011	RFI resulted in conclusion of no risk to human health or the environment. EPA concurred with findings.
SWMU 46	Propellant Burial	Decision Document September 21, 2007	SSP data did not exceed risk threshold criteria.
SWMU 50	CaSO4 Treatment/Disposal Area	RFI Recommended NFA - RFI Approved October 23, 2009	RFI resulted in conclusion of no risk to human health or the environment. EPA concurred with findings.
SWMU 58	Rubble Pile	Decision Document December 16, 2004	RFI resulted in conclusion of no risk to human health or the environment. EPA concurred with findings.

Table 1: Units Recommended for No Further Action (NFA) (Continued)			
Location	**Description**	**Documentation**	**Remedial Action Performed**
SWMU 59	Bottom Ash Pile	RFI Recommended NFA - RFI Approved October 23, 2009	RFI resulted in conclusion of no risk to human health or the environment. EPA concurred with findings.
SWMU 61	Mobile Waste Oil Tanks	EPA-approved Corrective Action Unit Evaluation (2010) Recommends No Further Action	Tanks were decommissioned, removed from site and scrapped as part of SPCC compliance.
SWMU 68	Chromic Acid Treatment Plant Tanks	Decision Document September 21, 2007	SSP data did not exceed risk threshold criteria.
SWMU 69	Pond by Chromic Acid Treatment Plant Tanks	Decision Document September 21, 2007	SSP data did not exceed risk threshold criteria.
SWMU 71	Flash Burn Parts Area	RFI Recommended NFA - RFI Approved June 30, 2009	RFI resulted in conclusion of no risk to human health or the environment.
SWMU 75	Waste Oil Underground Storage Tanks (Inert Gas Plant)	Decision Document September 21, 2007	Closure was addressed under Virginia Petroleum Storage Tank regulations.
SWMU 76	Waste Oil Underground Storage Tanks (Inert Gas Plant)	Decision Document September 21, 2007	Closure was addressed under Virginia Petroleum Storage Tank regulations.
SSA 18	Sulfuric Acid Recovery Plant - Waste Acid Treatment	SSP Approved November 2010	SSP data did not exceed risk threshold criteria.
SSA 60	Rubble Pile East of Administration Building	SSP Approved November 2010	SSP data did not exceed risk threshold criteria.
SSA 2	TNT Wastewater Equalization Basin (Active)	EPA-approved Corrective Action Unit Evaluation (2010) Recommends No Further Action	Evaluation of data and/or operational history (desktop audit) resulted in conclusion of no risk to human health or the environment.
SSA 3	TNT Wastewater Treatment Unit (Active)		
SSA 11	Nitroglycerin 1 Pretreatment Plant (Active)		
SSA 12	Nitroglycerin 2 Pretreatment Plant (Active)		
SSA 19	The A-B Line Acidic Wastewater Treatment Plant (Active)		
SSA 20	C Line Acidic Wastewater Treatment Plant		
SSA 21	Continuous Automated Single-Base Line		
SSA 22	Wastewater Holding Lagoons		

Table 1: Units Recommended for No Further Action (NFA) (Continued)			
Location	**Description**	**Documentation**	**Remedial Action Performed**
SSA 23	Wastewater Holding Lagoons	EPA-approved Corrective Action Unit Evaluation (2010) Recommends No Further Action	Evaluation of data and/or operational history (desktop audit) resulted in conclusion of no risk to human health or the environment.
SSA 24	Wastewater Holding Lagoons		
SSA 25	Wastewater Holding Lagoons		
SSA 33	Treatment Plant for Solids from Wastewater Treatment (Active)		
SSA 34	Treatment Plant for Solids from Wastewater Treatment (Active)		
SSA 55	Sewage Treatment Plant (Northeast Section) (Active)		
SSA 56	Sewage Treatment Plant (Northwest Section) (Active)		
SSA 63	C-Line Boiling Tub House Settling Pits (Active)		
SSA 64	Nitrocellulose C-Line Collection Sump (Active)		
SSA 65	Nitrocellulose A-B Line Acidic Water Settling Pits (Active)		
SSA 66	Nitrocellulose A-B Line Neutral Water Settling Pits (Active)		
SSA 67	Main Acid Sewer Sumps (Active)		
SSA 70	Heavy Equipment Maintenance Shop Tractor Steam Cleaning Area		
SSA 73	Main Lab Waste Container Storage Area (Active)		
SSA 78	Rubble Pile Southwest of Unit 51		
SSA 80	Drainage Ditch for C-Line Wastewater Treatment and Plant Runoff (Active)		
SSA 81	Red Water Treatment Plant (Active)		
MU-1	Sewer Systems (submitted 1/2003)		

Table 1: Units Recommended for No Further Action (NFA) (Continued)			
Location	**Description**	**Documentation**	**Remedial Action Performed**
MU-2	Drainage Ditches (including tributaries of Stroubles Creek) (Active)	EPA-approved Corrective Action Unit Evaluation (2010) Recommends No Further Action	Evaluation of data and/or operational history (desktop audit) resulted in conclusion of no risk to human health or the environment.
MU-3	Abandoned Building at Increment Area No. 3		
MU-4	TNT/DNT Plant Area (Active)		
MU-5	Nitroglycerin Facility (Active)		
MU-6	Oleam Plant Area		
MU-7	Buildings / Demolishion Debris with exposed red conductive flooring material		
MU-8	Automated Single Base Area		
MU-9	Suspect Discarded Munitions along New River		
AOC A	Nitrocellulose Rainwater Ditch	RFI Recommended NFA - RFI Approved October 23, 2009	RFI resulted in conclusion of no risk to human health or the environment. EPA concurred with findings.
AOC F	Former Drum Storage Area	Decision Document September 21, 2007	SSP data did not exceed risk threshold criteria.
AOC O	Underground Fuel Oil Spill	EPA concurred with VDEQ March 3, 2009 Closure Letter - April 29, 2009	Closure was addressed under Virginia Petroleum Storage Tank regulations - VDEQ Approved Closure March 3, 2009.
AOC P	Battery Storage Area	RFI approved November 2010	RFI resulted in conclusion of no risk to human health or the environment. EPA concurred with findings.
AOC Q	CaSO4 Treatment/Disposal Area	RFI approved November 2010	RFI resulted in conclusion of no risk to human health or the environment. EPA concurred with findings.
AOC Bldg 4343	Former Cadmium Plating Facility	Approved Interim Measures Closure Report - June 8, 2007	Excavation and removal per RFI/CMS final remedy.
AOC FLFA	Former Lead Furnace Area	Approved Interim Measures Closure Report - April 1, 2010	Excavation and removal per RFI/CMS final remedy.
RFAAP - 047	Buildings 1549,1041,1034	RFI Recommended NFA - RFI Approved October 23, 2009	RFI resulted in conclusion of no risk to human health or the environment.

Table 2: Units with Proposed Institutional/Engineering Controls			
Location	**Description**	**Proposed Institutional Control(s)**	**Proposed Engineering Control(s)**
SWMU 13	Area Between the Open Burning Ground and the New River	Restriction on future earth moving, residential use	
SWMU 40	Landfill Nitro Area	Restriction on future earth moving, residential use, and potable groundwater use	Maintain Cover
SWMU 41 B	Red Ash Burial Ground	Restriction on future earth moving, residential use	
SWMU 43	Sanitary Landfill #2	Restriction on future earth moving, residential use	
SWMU 45	Landfill #3	Restriction on future earth moving, residential use	
SWMU 51	TNT Waste Neutralization Pits	Restriction on future digging below 15 ft, residential use	
SSA 30	Asbestos Disposal Trench #1	Restriction on future earth moving, residential use	Maintain Cover
SSA 72	Oleum Plant Acidic Wastewater Sump	Restriction on future earth moving, residential use	
SSA 77	Garbage Incinerator	Restriction on future earth moving, residential use	
SSA 79	Asbestos Disposal Trench #2	Restriction on future earth moving, residential use	Maintain Cover

Attachment 2

Corrective Action Unit Evaluations Fact Sheet

FACT SHEET – CORRECTIVE ACTION UNIT EVALUATIONS

RFAAP RCRA Corrective Action Permit Number VA 1210020730

1.0 FACILITY BACKGROUND

Radford Army Ammunition Plant (RFAAP) is located near the town of Radford, Virginia, on approximately 4,111 acres in Pulaski and Montgomery counties. The New River flows adjacent to the site, and the surrounding lands are a mix of residential and agricultural properties. RFAAP was built in the early 1940s to support military ammunition requirements during World War II, and today is the only active full spectrum military propellant manufacturing center in the United States.

The RCRA Corrective Action Permit that expired October 31, 2010 contained a listing of all of the Corrective Action Units at the facility (Attachment A of the Permit). Upon review of the listing, ***specific*** Site Screening Areas (SSAs) and Miscellaneous Units (MUs) may not meet the criteria that define a RCRA Corrective Action Unit. It was concluded that these sites should be evaluated using a programmatic or geographic basis to evaluate their inclusion in the upcoming renewal of the RCRA Corrective Action Permit for RFAAP. The investigations of each of the respective groupings were described in individual reports. A short summary of each programmatic or geographic grouping is provided in this fact sheet. The groupings are:

- Acidic Wastewater Treatment Plants
  - SSA 63, 64, 65, 66, 67 and SWMU 9
- Rocket Area Wastewater Holding Lagoons
  - SSA 22, 23, 24, and 25
- TNT Area Units
  - SSA 2, 3, 81; MU 2 and 4
- Nitroglycerin Area Units
  - SSA 11 and 12; MU 5
- Assorted Units
  - SSA 70, 80 and SWMU 61
- SWMU 17
- Units Requiring No Additional Study or Evaluation
  - SSA 19, 20, 21, 33, 34, 55, 56, 73, and 78
  - MU 1, 3, 6, 7, 8, and 9

2.0 UNIT DESCRIPTIONS AND EVALUATIONS

2.1 Acidic Wastewater Treatment Plants

The units discussed are SSAs that are currently, or were previously, involved in the treatment of acidic wastewaters at the RFAAP Facility. They are designated as SSA 63, 64, 65, 66, 67 and Solid Waste Management Unit 9 (SWMU-9), respectively. Each of these units meets the definition of a process component in a wastewater treatment train. All of the Units are currently active, with the exception of SSA 64, which was demolished and removed from the ground. As active units, they are inspected, maintained and regulated under the Facility Virginia Pollutant Discharge Elimination System (VPDES) Permit. As the majority of these units have handled only acidic wastewater, there is limited potential for the release of hazardous wastes from these units.

SSA 66 currently only manages storm water and during its operational period it only managed neutral (non-acidic) wastewater. Therefore, SSA 66 never managed acidic wastewater, and the pH of the wastewater it did treat was not considered corrosive, and by definition not hazardous.

Migration Pathways Analysis

The SSAs, with the exception of SSA 64, are maintained as active units and therefore receive regular inspections and maintenance, thereby eliminating the migration pathways to soil and groundwater. SSA 64 has been demolished, and soil surrounding SSA 64 was removed after demolition of the unit. Surface water discharge is regulated under VPDES permit at Outfall 005 and 007.

Basis for Removal from the RCRA Corrective Action Permit

The units described above, with the exception of SSA 64, are currently regulated, maintained and inspected in accordance with the RFAAP Facility VPDES Permit as active unit, and have no history or indication of release. SSA 64 has been demolished and all potentially impacted soils were excavated. No migration pathways exist for the unit.

2.2 Rocket Area Wastewater Holding Lagoons

The units discussed are SSAs that serve as wastewater lagoons within the Rocket Area at the RFAAP Facility. They are designated as SSA 22, 23, 24 and 25, respectively. All of the units are not actively receiving stormwater from the Rocket Area. Precipitation is the primary source for the water in the lagoons. The lagoons are lined with a chlorinated

polyethylene liner to prevent infiltration into the soil and groundwater. In addition, the lagoons have never received wastewater from the Rocket Area. As these units have handled only stormwater, there is limited potential for the release of hazardous wastes from these units.

Migration Pathways Analysis

The lagoons are lined with a chlorinated polyethylene liner. The liners are in good repair and exhibit no loss of integrity. No sediment is present within the lagoons. The lagoon liners prevent the infiltration of water contained in the lagoon to soil and groundwater. There is no evidence of connectivity between the lagoons and surface water. The lagoons range in depth from 12 feet to 20 feet below ground surface, which prevents surface runoff from the lagoons. Evaporation is the primary mechanism for water loss from the lagoons.

Basis for Removal from the RCRA Corrective Action Permit

There is no documentation or indication that any hazardous substances/wastes have been released to the environment at the Rocket Area Wastewater Holding Lagoons.

2.3 TNT Area Units

The units discussed are SSAs that serve as wastewater treatment components, drainage ditches, and a historical explosion site in the TNT Area at the RFAAP Facility. They are designated as SSA 2, 3, 81, and MU 2 and 4, respectively. All of the units are located within an active production area of the RFAAP Facility. The wastewater treatment components no longer treat hazardous waste, and are regulated as a VPDES wastewater treatment unit. The drainage ditches are monitored under Stormwater Pollution Prevention Plan (SWPP) or VPDES permits. The explosion site has no evidence of contaminant release associated with the May 1974 explosion.

Migration Pathway Analysis

The wastewater treatment components are contained in concrete structures that are seamless and have no evidence of degradation. The integrity of the concrete prohibits the infiltration of water contained in the units to soil and groundwater. No migration pathway exists from the wastewater treatment components to surface water.

The majority of the drainage ditches convey water in concrete lined ditches. The integrity of the concrete inhibits the infiltration of water contained in the ditches to soil and groundwater. The remaining unlined ditches convey surface water to outfalls monitored under the RFAAP VPDES permit.

The majority of the former explosion area is currently covered in impervious materials. The integrity of those materials prohibits the infiltration of water to soil and groundwater. The majority of stormwater in the TNT area is conveyed in concrete lined ditches as described above.

Basis for Removal from the RCRA Corrective Action Permit

There is no documentation or indication that a reportable quantity of hazardous substances/wastes has been released from SSA 2, 3 and 81, and MU 2 and 5. In addition, wastewater treatment units are excluded from RCRA regulation under 40 CFR 261.4, as they are regulated as VPDES wastewater treatment units under the Clean Water Act. Drainage ditches associated with MU 2 are monitored under SWPP or wastewater VPDES Permit.

2.4 Nitroglycerin Area Units

The units discussed are SSAs that serve as (1) wastewater pretreatment facilities, and (2) a historical explosion site in the Nitroglycerin Area of the RFAAP Facility. They are designated as SSA 11, 12 and MU 5, respectively. All of the units are located within an active production area of the RFAAP Facility. SSA 11 was utilized as a pretreatment facility to remove nitrate esters from wastewater produced during the manufacture of propellant and nitroglycerin. The unit is currently listed as active but idle; therefore no waste is being actively treated at the facility. SSA 12 historically served as the pretreatment facility for wastewater produced in the manufacture of nitroglycerin. Modifications to wastewater treatment process in the Nitroglycerin Area resulted in SSA 12 being downgraded to a wastewater pumping station. Currently, all wastewater from the Nitroglycerin Area is treated at the Biological Wastewater Treatment Plant.

An explosion occurred in 1993 at a storage facility within the Nitroglycerin Area. A post-accident investigation indicated that all energetic materials were consumed during the explosion. Additionally, all debris and soil surrounding the explosion site was removed, and the site was backfilled with clean fill.

Migration Pathway Analysis

The stainless steel tanks that were part of the treatment process at SSA 11 and 12 are seamless and have no evidence of degradation. The unit is in good repair and exhibits no loss of integrity. The integrity of the stainless steel tanks prohibits the infiltration of wastewater to soil, groundwater and surface water.

Structural material and surface soil associated with the 1993 explosion was removed from the site during clean-up procedures and was replaced with clean fill. There is no migration pathway from the unit to soil, groundwater or surface water.

Basis for Removal from the RCRA Corrective Action Permit

There is no indication of a release of hazardous materials from SSA 11, 12 and MU 5. In addition, wastewater treatment units are excluded from RCRA regulation under 40 CFR 261.4, as they are regulated as VPDES wastewater treatment units under the Clean Water Act. In the event hazardous wastewater escapes the units, the waste will be regulated by RCRA.

2.5 Assorted Units

The units discussed are SSAs that serve as an oil water separator (OWS) at the tractor cleaning area, a ditched conveyance for C-line wastewater treatment and plant runoff, and mobile waste oil tanks. They are designated as SSA 70, 80 and SWMU 61, respectively. SSA 70 and 80 are located within active production areas of the RFAAP Facility. The mobile waste oil tanks (SWMU 61) are no longer present at the Facility, as they were closed out and scrapped in compliance with Spill Prevention, Control, and Countermeasures (SPCC) regulations.

The OWS was upgraded in 1999 with a fiberthane coated steel unit with a 550 gallon capacity. Soil samples collected at the time of removal of the original OWS indicated no release had occurred. The tractor cleaning area, and the oil water separator was rendered inactive in 2000, and no plans exist to activate the facility.

The ditched conveyance is a grass lined ditch that collects stormwater runoff around the C-line treatment plant and flows directly to the New River via VPDES regulated Outfall 005.

The Mobile Waste Oil Tanks listed as SWMU 61 were shop-built above ground tanks of approximately 100-gallon capacity that were mounted to trailers for the collection and storage of used oil from various vehicles and stationary equipment located throughout the RFAAP. These mobile tanks are no longer present at the RFAAP, as they were closed out and scrapped in compliance with the recent Spill Prevention, Control, and Countermeasures (SPCC) regulations.

Migration Pathway Analysis

Soil surrounding the original oil water separator was removed during the installation of the 550-gallon capacity oil water separator in 1999 and replaced with clean fill. Sampling of the removed soil indicated no release had occurred. The integrity of the new

oil water separator tank prohibits the infiltration of water contained in the unit to soil and groundwater. Any recovered water is discharged to a nearby stormwater ditch that is regulated by VPDES Permit.

Laboratory analysis of soil from the C-Line ditch indicated that soil pH has not increased or decreased in comparison to soil pH from other areas of RFAAP. Given the lack of historical evidence of spills in the area, and the laboratory results, there has been no migration of contaminants to soil, groundwater or surface water at SSA 80. Any stormwater conveyed by the ditch is covered by VPDES permit at Outfall 005.

The mobile tanks were utilized for the collection and storage of used oil on an as needed basis. Incidental discharge of waste oil may have discolored the soil beneath the mobile tanks during active use, but there are no records of spills or cleanup actions performed in the area of the mobile tanks. The tanks were closed out and scrapped in accordance with SPCC regulations upon deactivation. No migration pathways exist for soil, groundwater and surface water.

Basis for Removal from the RCRA Corrective Action Permit

There is no documentation or indication that a reportable quantity hazardous substances/wastes has been released to the environment from these facilities.

2.6 SWMU 17

The units discussed are components of SWMU 17. SWMU 17 is a contaminated waste burning area located in the south-central part of the Main Manufacturing Area at RFAAP. Components of SWMU 17 as described in the 1987 RCRA Facility Assessment (RFA) include:

- 17A – Stage and Burn Area,
- 17B – ACD Staging Area,
- 17C – Air Curtain Destructor (ACD)
- 17D – ACD Ash Staging Area, and
- 17E – Runoff Drainage Basin

Two subsequent investigations of the site were conducted. They include the 1992 RCRA Facility Investigation (RFI) and a 1996 RFI.

SWMU 17A (Stage and Burn Area) was originally an open burn pile located directly on the ground surface. The unit was re-engineered in 2002 to convey stormwater run-off from the area to a separate holding tank. Stormwater run-on is controlled by a

constructed berm. In addition, an impervious surface was installed beneath the drainage system, thereby eliminating any mobility of historical contaminants at the site.

Each of the Component Units of SWMU 17B, C, D, and E were closed in accordance with the Virginia Solid Waste Management Regulations (VSWMR) under Permit By Rule (PBR) Number 179 in August 2005. Since 2005 RFAAP has elected to make alternative use of components 17B and 17E.

SWMU 17B is currently a 90 day RCRA staging area that is regulated under by VDEQ as a less than 90 day accumulation area. The concrete at SWMU 17B is in good repair and exhibits no loss of integrity.

SWMU 17C and 17D were decommissioned in 2005 and are no longer active units at RFAAP.

SWMU 17E is currently active as a secondary containment basin for materials stored at SWMU 17B. The basin is concrete lined, and the concrete is in good repair and exhibits no loss of integrity. SWMU 17E is only actively used in the event of spills at SWMU 17B. To date, no spills from 17B have been reported.

Migration Pathway Analysis

The re-engineering of the Stage and Burn Area included the installation of a drainage system that conveys stormwater run-off from the burn area into a holding tank located outside the burn area. Stormwater run-on is controlled by a constructed berm. Materials remaining after burning are tested for any remaining explosive residue. If explosives remain the materials are re-combusted. No pathway is present for movement of potential contaminants to soil or groundwater. Any combustion byproducts remaining after burning disposed of at an appropriate solid waste facility. Steel materials that remain after combustion are recycled. An impervious surface was installed beneath the drainage system at SWMU 17A that prevents movement of historical contaminants to groundwater. SWMU 17B and 17E are concrete lined. The concrete is in good repair and exhibits no loss of integrity. There is no evidence of connectivity between these areas and soil or groundwater.

All surface water from the Stage and Burn area is conveyed to a holding tank located outside SWMU 17A. Fluids originating from SWMU 17B are conveyed to SWMU 17E. The settling basin is lined with concrete. The concrete is in good repair and exhibits no loss of integrity. There is no evidence of connectivity between SWMU 17 and surface water.

Basis for Removal from the RCRA Corrective Action Permit

SWMUs 17 B, C, D and E will be removed from the RCRA Corrective Action Permit because units 17 C and D are permanently closed, and units 17 B and E are regulated under the VDEQ Hazardous Waste Program.

Unit 17A will be retained in the RCRA Corrective Action Permit until RFAAP determines that the site is longer needed as an active unit, at which time the site will be closed in accordance with the RCRA Corrective Action Permit.

2.6 Units Requiring No Additional Study or Evaluation

These sites represent a subset of the Site Screening Areas (SSAs) and Miscellaneous Units (MUs) that require no additional study or evaluation beyond an administrative review to support a determination of being exempt from future consideration under the RCRA Corrective Action Permit. The units are designated as SSA 19, 20, 21, 33, 34, 55, 56, 73, 78 and MU 1, 3, 6, 7, 8, and 9, respectively. The MUs are associated with the acid and industrial sewers, the abandoned buildings at Increment Area Number 3, the Oleum Plant area, the buildings and/or demolition debris with exposed conductive flooring, the Automated Single Base Area, and the discarded munitions along the New River proximate to the ballistics range.

3.0 CONCLUSIONS

The data collected during each of the respective investigations indicate that that these units present no risk to human health or the environment. The investigations document that these units are eligible for removal from the Corrective Action Permit and no further action is required at any of the units.

Attachment 3
No Further Action (NFA) Unit Summaries

DESCRIPTION AND SUMMARY OF ENVIRONMENTAL INVESTIGATIONS FOR NO FURTHER ACTION (NFA) UNITS

AOC A: NITROCELLULOSE RAINWATER DITCH

AOC A, Nitrocellulose Rainwater Ditch, located directly east of the mix house (Building 1508) driveway, is a former unlined ditch less than a twentieth of an acre in size that receives runoff from the Nitrocellulose A-Line. The ditch was converted to an open concrete culvert approximately 3.5 feet (ft) wide in the 1990s. To the east of the ditch is a steep grassy slope with numerous utility poles and support structures.

A. 1987 EPA RCRA Facility Assessment

In 1987, under authority of the 1984 Hazardous and Solid Waste Amendments (HSWA), EPA conducted a RCRA Facility Assessment at RFAAP to evaluate releases of

hazardous waste or hazardous waste constituents and to implement corrective actions, as necessary. The assessment consisted of a preliminary review and evaluation of available site information, personnel interviews, and a visual inspection of the site. During the 1987 Visual Site Inspection, the area was devoid of vegetation and discolored soil was observed.

B. 2002 Site Screening Process

Beginning in 2002, URS Corporation commenced a RCRA Site Screening Process (SSP) of AOC A. Three soil borings were advanced adjacent to the concrete swale, one boring was advanced in the center of the swale, and a fifth boring was advanced at the terminus of the swale to evaluate for the presence or absence of chemicals in surface and subsurface soil. Soil samples were analyzed for TCL VOCs, TCL SVOCs, PAHs, explosives (including nitroglycerin and PETN), and TAL inorganics. Surface soil samples were also analyzed for TCL pesticides, TCL PCBs, and TCL herbicides. Sample results published in the SSP Report (URS, 2007) indicated the presence of select heavy metals, SVOCs, explosives, and PCBs exceeding the residential soil screening levels. The risk assessment performed during the SSP indicated that cumulative human health risk screens failed for residential and industrial surface soil (carcinogenic and noncarcinogenic), residential total soil (carcinogenic and noncarcinogenic), and industrial total soil (carcinogenic), but passed for industrial total soil noncarcinogenic.

C. 2009 RCRA Facility Investigation

In 2008, ARCADIS performed additional work under an RFI to supplement the data previously collected at AOC-A and complete the source area characterization and impact delineation. RFI sampling was designed to verify the presence of 2,4- DNT and 2,6-DNT in surface soil at previously sampled locations and to delineate the horizontal and vertical extent of constituents in soil. A total of 33 samples from 18 locations were collected and analyzed for PCBs by EPA Method 8082 and 2,4-DNT, 2,6-DNT, and DNT mix by EPA Method 8270C. Explosives 2,4-DNT, 2,6-DNT, and DNT mix were detected in 2008 above screening levels in the surface samples collected from the two soil boring areas with previous detections. However, concentrations were less than the screening levels in the soil samples collected from the delineation locations, indicating DNT was limited the immediate vicinity of an area of approximately 100 square feet at the north end of the concrete stormwater conveyance. Similarly, one PCB (Aroclor-1254) and iron were detected at or marginally above industrial screening levels in a very small area currently covered by concrete. Because this area was capped with a concrete surface water conveyance, mobilization of these compounds was not considered to be a concern. These compounds were not detected in the samples collected at greater depths, which confirmed that vertical transport was not occurring. Additionally, the levels of metals in the soil were consistent with background levels at RFAAP. There were no current future development plans for AOC A and active industrial operations were expected to remain at the site. The results of the screening level human health risk assessment indicated that the observed levels of constituents in soil did not pose an unacceptable risk to either current commercial/industrial workers or to hypothetical future residents. Based on the

data presented, the RFI report recommended clean closure with no further action at AOC A.

D. 2009 No Further Action Determination

EPA approved the RFI for AOC A on October 23, 2009, agreeing with the No Further Action recommendation. EPA determined that the proposed decision of No Further Action for this unit is protective of human health and the environment and that no further corrective action or controls are necessary.

AOC F: FORMER DRUM STORAGE AREA

AOC F, Former Drum Storage Area, is a constructed 50 ft by 50 ft gravel-covered area located approximately 300 feet south of the New River. AOC F is flanked on three sides by maintained grass areas and by an asphalt-paved road to the north. Overhead lines traverse the site's western boundary. Empty drums from throughout RFAAP (including the Nitroglycerin Area, Rocket Area, and Green Line) were stacked on their sides at AOC F prior to being sold for recycling. The drums were reportedly rinsed prior to being stored. The drums may have contained diethyl phthalate, sodium hydrosulfide, ethyl lactate/butyl acetate solvent mix, dinitro-propylamine, waste oil or oily water, and 2-nitro-diphenylamine.

A. 1992 Verification Investigation

In 1992, Dames & Moore conducted a Verification Investigation at AOC F that included collection of four surface soil samples from within the limits of the gravel storage area for analysis of volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). Three VOCs were detected at concentrations below their adjusted residential risk based concentrations (R-RBCs).

B. 2007 Site Screening Process

In 2007, URS Corporation (URS) prepared the Site Screening Process Report (SSP), which detailed findings of soil and groundwater sampling and subsequent screening assessments and evaluations at AOC F during 2006. As part of the SSP investigation, twelve soil samples were collected from four boring locations and analyzed for target compound list (TCL) volatile organic compounds, TCL semi-volatile organic compounds, polynuclear aromatic hydrocarbons, explosives, and target analyte list inorganics. Four selected surface soil samples were also analyzed for TCL pesticides, TCL polychlorinated biphenyls, and herbicides. The site passed the residential and industrial cumulative risk screening, lead exposure assessment, iron "margin of exposure" assessment, and screening level ecological risk assessment. Two chemicals in soil, chromium and dieldrin, exceeded their calculated site-specific soil screening levels for the soil-to-groundwaer pathway; therefore, one monitoring well was installed to evaluate potential leaching to groundwater. Evaluation of the soil-to-groundwater migration pathway for pesticides and chromium did not indicate leaching of pesticides or

chromium to groundwater at levels above the adjusted tap water risk based concentration. AOC F passed the SSP, resulting in a recommendation of no further action (URS, 2007).

C. 2007 No Further Action Determination

EPA approved and signed the AOC F Decision Document on September 21, 2007. EPA determined that the proposed decision of No Further Action for this unit is protective of human health and the environment and that no further corrective action or controls are necessary.

AOC O: UNDERGROUND FUEL OIL SPILL

AOC O, Underground Fuel Oil Spill, consists of a subsurface area impacted by an historic release of petroleum from a 269,000-gallon fuel oil aboveground storage tank (AST) situated on a concrete base, surrounded by a concrete secondary containment system. The site is located in the east section of the MMA, southwest of the Inert Gas Plant, on the southeast side of a northeastward sloping drainage valley. The AST in AOC O was reportedly built in the early 1970s, at the time of the first oil shortage in order to alleviate supply problems. Two additional 269,000-gallon ASTs are situated adjacent to AOC O. The AST immediately to the southwest of AOC O also contained fuel oil, while the AST further southwest contained alcohol.

A. 1983 Petroleum Release Investigation

An underground oil spill was detected when one of the five monitoring wells installed for the 1982 investigation of downgradient HWMU 4, the Former Acidic Wastewater Lagoon, was found to contain approximately 6 inches of free product. An Oil Audit was then performed by USACE in 1982, which reported a fuel leakage of approximately 3,000 gallons originating from an underground pipeline connecting the fuel oil AST to a nearby filling station. In 1983, four additional monitoring wells were installed to characterize groundwater flow and quality at the petroleum release site.

B. 1987 EPA RCRA Facility Assessment

AOC O was defined as an "Area of Concern" in the 1987 RCRA Facility Assessment (RFA). At the time of the RFA, oily water was visible in the ditch northeast of the site (USEPA, 1987). A facility visit by plant personnel in 1990 indicated that the leaking line was not a fuel line connected to the filling station as described in 1982, but instead was a discharge line connecting the northeastern-most fuel tank to a pumping station. After this discovery, the discharge line was replaced with an aboveground line.

C. 1994 RCRA Facility Investigation

In 1994, a RCRA Facility Investigation (RFI) was performed by Dames & Moore, Inc., which involved a soil gas survey, and the collection of soil, groundwater, surface water, and sediment samples. Field work performed during this RFI spanned the years 1992

through 1994. No petroleum-saturated soil or free product was apparently discovered during the performance of this RFI.

D. 2008 RCRA Facility Investigation/Corrective Measures Study

In 2008, an RFI/CMS was performed by Shaw Environmental, Inc. in order to obtain current analytical data to complete site characterization and perform human health and ecological risk assessments. Data collected during this RFI revealed no highly impacted soil or groundwater; therefore, monitored natural attenuation of the dissolved-phase petroleum plume was recommended. Upon review of this information, RFAAP requested that the site be transferred from the RCRA Corrective Action program to the Virginia Petroleum Storage Tank Program, which is administered by the Virginia Department of Environmental Quality (VDEQ). AOC O was subsequently reported to the VDEQ and recorded as Petroleum Complaint number PC-2009-2046A. Upon review of the RFI, the VDEQ in March 2009 stated that acceptable site characterization and abatement measured had been achieved, and that no further action was necessary for this petroleum release.

E. 2009 No Further Action Determination

April 29, 2009, the EPA agreed that closure of AOC O would occur under the VDEQ Petroleum Program, and that a No Further Action Decision will be issued under RFAAP's RCRA Permit. EPA determined that the proposed decision of No Further Action for this unit is protective of human health and the environment and that no further corrective action or controls are necessary.

AOC P: Spent Battery Storage Area

Area of Concern (AOC) P, the Spent Battery Storage Area, is located in the northern portion of the Main Manufacturing Area of RFAAP, adjacent to the New River and east of the main bridge over the New River. AOC P is a 10,000 square foot area at the center of a scrap yard that was formerly used for the storage of shredded scrap metal, decommissioned tanks, powder cans, and batteries prior to shipment.

A. 1987 EPA RCRA Facility Assessment

The USEPA conducted an assessment at RFAAP in 1987 to evaluate potential hazardous waste or hazardous constituent releases and implement corrective actions, as necessary. The assessment consisted of a preliminary review and evaluation of available site information, personnel interviews, and a visual inspection of the site. During the 1987 Visual Site Inspection (VSI), environmental samples were not collected as part of the inspection. AOC P is identified as the Scrap Metal Salvage Yard in the 1987 RFA. The assessment concluded that there was a high potential for any residual contamination to penetrate the soils to groundwater and/or migrate to surface water.

B. 1992 Verification Investigation

In 1992 a Verification Investigation (VI) was conducted by Dames and Moore to determine if the soil at AOC P had been impacted from potential leakage from spent batteries stored at the site. Surface and subsurface soil samples were analyzed for metals and pH. Metals were detected at concentrations greater than soil screening criteria at the time of the investigation. The pH results indicated that the soil samples varied from neutral to slightly basic.

C. 2007 RCRA Facility Investigation

In 2007, a RCRA Facility Investigation (RFI) was performed to fill data gaps identified during the 1992 VI and to further evaluate potential releases to site media from historical activities at AOC P. The RFI assessed the nature and extent of metals in soil, which were identified in the VI as the primary indicators for evaluating releases to site media. In addition, release, nature and extent assessments were conducted for other chemical classes of potential concern (COPCs) including, polychlorinated biphenyls (PCBs), pesticides, herbicides, volatile organic compounds (VOCs), and polynuclear aromatic hydrocarbons (PAHs). The results of the human health risk assessment (HHRA) did not indicate a requirement for further action for soil or groundwater at AOC P. The results of the screening level ecological risk assessment (SLERA) indicated there may be potential adverse impacts to terrestrial wildlife from site media. However, because no rare, threatened or endangered wildlife species have been confirmed at the site, and because AOC P has a relatively small area (less than 0.25 acres), and groundwater migration to the New River was determined to not be a significant ecological concern, remedial measures to address ecological concerns were not warranted.

Based on the results of the RFI, HHRA, and SLERA, which showed limited risk to theoretical receptors, no further action was recommended for AOC P.

D. 2010 No Further Action Determination

On November 4, 2010 the EPA agreed that no unacceptable risks were identified for human receptors in potential contact with AOC P materials; therefore, no further action is warranted to address human health or ecological concerns.

RFAAP-047: BUILDINGS 1549, 1041 AND 1034

RFAAP-047 includes Buildings 1034, 1041, and 1549 as locations where historical chlorinated solvent use has occurred. Building 1034 is a 10,000 ft^2 former nitrocellulose laboratory, which is now utilized as an electrical and refrigeration shop. Building 1041 is a 1,200 ft^2 former degreasing shop, which now a scale maintenance and cleaning shop. Building 1549 is a 2,400 ft^2 area maintenance shop. Each building is constructed of cinderblocks with typical slab-on-grade construction. Each of the buildings was originally constructed in the 1940s, during general construction of the Main

Manufacturing Area. The buildings are believed to have been in continuous use through present day.

A. 2008 RCRA Facility Investigation

In 2008, an RFI was conducted at RFAAP-047 to assess the environmental conditions of Buildings 1034, 1041, and 1549. The RFI was initiated as a result of groundwater investigations completed at HWMU-5, a closed surface impoundment located north of the three buildings. Investigations at HWMU-5 identified persistent, low-level concentrations of trichloroethene (TCE) in shallow overburden groundwater northeast of the HWMU. The Draft Alternate Source Demonstration for Trichloroethene (Draper Aden, 2007) identified Buildings 1034, 1041 and 1549 as potential alternate sources of the TCE, based on their upgradient locations and documented historical solvent use. The primary objective of the RFAAP-047 RFI was to determine whether or not one or more of the subject buildings was a potential source of TCE or other constituents. The secondary objective was to complete comprehensive RFIs at each of the buildings.

The RFI was completed in three phases of field work completed between May 2008 and July 2009. During Phase 1, soil, soil gas and grab groundwater samples were collected around the perimeter of each building, targeting potential release pathways, such as doorways. Soil gas samples were collected beneath each building slab. During the first phase of investigation, TCE was detected in one soil-gas sample collected at Building 1041. Additional soil and groundwater samples were then collected during Phase 2 to delineate constituents detected in samples collected during Phase 1. Phase 2 also included vertical-aquifer profile borings on a transect downgradient of Building 1041. Groundwater samples collected during Phase 1 and 2 were grab samples from temporary points. Groundwater samples were turbid, resulting in unrepresentative levels of metals in the groundwater. During Phase 3 additional temporary well points were installed near Buildings 1041 and 1549 and filtered and unfiltered groundwater samples were collected and analyzed for metals to evaluate the concentrations of metals in the dissolved phase. No site-related volatile organic compounds (VOCs) were detected in either soil or groundwater samples at concentrations greater than the industrial Regional Screening Levels.

During Phase 1, Aroclor 1254 was detected in one soil sample collected on the south side of Building 1041, at a level greater than the protection of groundwater screening level. However, no Aroclors were detected in the delineation samples, which indicated a limited area of extent.

No potential ongoing sources were indentified and the hypothesis that one or more of the buildings is, or was formerly, a source of chlorinated VOCs to groundwater was not supported by the data. It was concluded using data gathered during this RFI and additional investigations conducted at areas further downgradient that the source of the TCE in groundwater was HWMU 5. A risk assessment was conducted to evaluate current and future exposure to groundwater, soil and soil gas under current/future industrial and hypothetical future residential land-use scenarios. While groundwater was

not currently used as a potable water source and it was not expected to be used for this purpose in the future, the risk assessment conservatively included this exposure pathway. Results of the risk analysis for groundwater indicated elevated risks and hazards due primarily to the elevated arsenic concentration present in local geology. With the exception of potential risks associated with one groundwater sample, potential risks and hazards for industrial and residential exposures at RFAAP-047 were within USEPA's generally acceptable risk range. Therefore, clean closure with no further action was recommended for Buildings 1034, 1041 and 1549.

B. 2009 No Further Action Determination

EPA approved the RFI with no Further Action recommendation by letter dated October 23, 2009. EPA determined that the proposed decision of No Further Action for this unit is protective of human health and the environment and that no further corrective action or controls are necessary.

SWMU 6: ACID WASTEWATER LAGOON

SWMU 6 lies in the central part of the main manufacturing area, approximately 2,000 feet northwest of the administration area. The unit was a tear-drop shaped catch pond for run-off from the nitrocellulose operation. The lagoon was approximately 80 by 30 feet at its widest point, with an unknown depth. SWMU 6 was unlined and contained no overflow controls, but was inspected under normal operating conditions by facility personnel. The lagoon was rendered inactive in 1980, and excavation was planned following completion of the SWMU 6 Soil Sampling Results Report (URS, 2001) to accommodate the construction of nitrocellulose settling tanks as part of the Production Base Support project. This construction project resulted in the removal of SWMU-6.

A. 1987 EPA RCRA Facility Assessment

In 1987, under authority of the 1984 Hazardous and Solid Waste Amendments (HSWA), EPA conducted a RCRA Facility Assessment at RFAAP to evaluate releases of hazardous waste or hazardous waste constituents and to implement corrective actions, as necessary. The assessment consisted of a preliminary review and evaluation of available site information, personnel interviews, and a visual inspection of the site. During the 1987 Visual Site Inspection, environmental samples were not collected as part of the inspection and no visible signs of release were observed at SWMU 6. A total of six soil samples had been collected prior to the 1987 report, which indicated trace amounts of nitrocellulose in three of the six samples.

B. 2001 Soil Sampling and Reporting

In 2001, URS Corporation (URS) was tasked by United States Army Corps of Engineers, Baltimore District to perform soil sampling and reporting at SWMU 6. The objective of this sampling was to collect and analyze subsurface soil samples from SWMU 6 and perform an evaluation of the resultant data with respect to RCRA hazardous waste

characteristics and EPA Risk-Based Concentrations (RBCs). Soil sampling at SWMU 6 was necessary to properly manage excavated soils that will be generated as part of the Production Base Support (PBS) project to construct nitrocellulose settling tanks at SWMU 6. The planned depth of excavation was 25 feet. The SWMU 6 sampling program results would allow RFAAP to properly manage the excavated material during construction and prevent future sampling under the tanks once the construction was complete. The SWMU 6 Soil Sampling Results Report (URS, 2001) presented a detailed comparison of Facility data to EPA Region III RBCs for the residential and industrial scenarios. Based on Maximum Detected Concentration (MDC) comparisons, the inorganic constituents aluminum, arsenic, chromium, iron, manganese, thallium, and vanadium were reported as present in the residual soil (i.e. depth greater than 25 feet, post excavation and construction of the new facility) greater than the Residential RBCs. Subsequently, the data was compared to background point estimates as established in the Facility-Wide Background Study (IT Corp., 2002).

Of the inorganic constituents, only one detection at 49,600 mg/kg of the 14 residual samples taken for aluminum was greater than the background point estimate of 40,041 mg/kg. This detection of aluminum was well below the Industrial RBC value of 200,000 mg/kg. The PBS project has been completed and during its construction, the entire footprint of SMWU 6 was excavated to depth and removed. Given the active, industrial nature at the location and immediate vicinity of former SWMU 6, the depth below ground surface, the lack of viable pathways, and the toxicity of the constituent, this single detection associated with the former SWMU 6 was not considered a risk that needs to be addressed with further study or controls.

C. 2010 No Further Action Determination

EPA approved the SWMU 6 Sampling Results Report by letter dated June 12, 2001. EPA determined that the proposed decision of No Further Action for this unit is protective of human health and the environment and that no further corrective action or controls are necessary.

SWMU 8: CALCIUM SULFATE SETTLING LAGOONS (A-B LINE ACIDIC WASTEWATER)

SWMU 8, Calcium Sulfate Settling Lagoons (A+B Line Acidic Wastewater), originally consisted of two unlined below-grade earthen lagoons located in the northeast section of the Main Manufacturing Area along the south bank of the New River. Each rectangular lagoon was approximately 200 feet long, 150 feet wide and 10 feet deep. It was estimated that these lagoons began operation in the early 1950's during the Korean War. The lagoons were operated on an alternating basis to accommodate maintenance and dredging. The adjacent sludge drying beds are SWMU 35 and SWMU 36. SWMU 8 managed neutralized, formerly acidic wastewater from the A+B Line Acidic Wastewater Treatment Plant. Both lagoons have since been replaced with concrete tanks. Four previous investigations have been conducted at SWMU 8.

A. 1987 EPA RCRA Facility Assessment

In 1987, under authority of the 1984 Hazardous and Solid Waste Amendments (HSWA), EPA conducted a RCRA Facility Assessment at RFAAP to evaluate releases of hazardous waste or hazardous waste constituents and to implement corrective actions, as necessary. The assessment consisted of a preliminary review and evaluation of available site information, personnel interviews, and a visual inspection of the site. During the 1987 Visual Site Inspection, environmental samples were not collected as part of the inspection and no visible signs of release were observed at SWMU 8.

B. 1992 Verification Investigation

In 1992, a Verification Investigation was performed by Dames & Moore, which included the collection of one sludge sample from each of the two lagoons, within the top foot of calcium sulfate. Parameters analyzed included VOCs, SVOCs and TCLP metals. Chloroform and 1, 1, 1 -tricloroethane were the only VOCs detected in either calcium sulfate samples. Reported concentrations were significantly lower than the corresponding HBN. No SVOCs were detected in either sample. Barium, chromium and silver were reported at detectable concentrations in the TCLP extract, which indicated that leachable levels of these metals were available from lagoon sludge. However, results were reported less the regulatory levels specified in 40 CFR 261.24.

C. 1998 Interim Remedial Action

In 1998, an Interim Remedial Action was undertaken at SWMU 8 by Alliant Techsystems, Inc. in support of a project to install a concrete settling tank to replace the earthen lagoon that was the Eastern Lagoon of SWMU 8. The purpose of the Interim Remedial Action was to remove any contaminated material from the lagoon and determine that levels of contamination in the remaining soils were below regulatory levels. Demolition and removal activities were contracted and performed in December 1997 and January 1998. These activities included the removal of all calcium sulfate, structures that would not be associated with the new tanks, and approximately 24 inches of the earthen material lining the lagoons. The sampling and analysis of the remaining sub-soil occurred June of 1998, at that time seven randomly distributed samples were collected from the surface of the excavated lagoon. The analytical results were determined to be below the clean-up goals of the Corrective Actions Permit.

D. 2004 Soil Sampling and Screening Assessments

In 2004, URS Corporation (URS) performed soil sampling and subsequent screening assessments and evaluations at SWMU 8 Western Lagoon. The objectives of this screening assessment were to evaluate the presence or absence of hazardous constituents in soil and $CaSO_4$ sludge, and assess soil and $CaSO_4$ sludge to be removed from SWMU 8 during construction activities for RCRA hazardous waste characteristics. The results of the human health and ecological risk screening indicated that no unacceptable risk was associated with unrestricted reuse of the SWMU 8 area. Based on this apparent lack of

risk to human health and the environment, the Army selected No Further Action as the preferred remedial alternative for SWMU 8.

E. 2006 No Further Action Determination

EPA approved and signed the SWMU 8 Decision Document on October 16, 2006. EPA determined that the proposed decision of No Further Action for this unit is protective of human health and the environment and that no further corrective action or controls are necessary.

SWMU 31: GROUND COAL ASH SETTLING LAGOONS

SWMU 31, Ground Coal Ash Settling Lagoons, consists of three connected unlined settling lagoons that were constructed and first used in the 1950s. The primary settling lagoon received water carrying fly ash and bottom ash from Power House No. 2 from the 1950s until the late 1980s. The secondary and tertiary lagoons were designed to receive the primary lagoon discharge. Facility representatives indicate that the water currently flowing into the primary settling lagoon consists of either overflow from the drinking water settling tanks or backwash from the cleaning of the filters at the drinking water settling tanks at Water Plant 4330. The water treatment plant has also been active since the 1950s and is the only currently active discharge to the lagoons.Five previous investigations have been conducted at SWMU 31.

A. 1987 EPA RCRA Facility Assessment

In 1987, under authority of the 1984 Hazardous and Solid Waste Amendments (HSWA), EPA conducted a RCRA Facility Assessment at RFAAP to evaluate releases of hazardous waste or hazardous waste constituents and to implement corrective actions, as necessary. The assessment consisted of a preliminary review and evaluation of available site information, personnel interviews, and a visual inspection of the site. During the 1987 Visual Site Inspection, environmental samples were not collected as part of the inspection and no visible signs of release were observed at SWMU 31. However, chemical samples were required in accordance with the RFAAP 1989 RCRA permit.

B. 1992 Verification Investigation

In 1992, a Verification Investigation (VI) was performed by Dames & Moore. Three composite sediment samples, one from each of the three settling lagoons, were collected for waste characterization. Samples were composited from the top one foot of sediment beneath the water/sediment interface from three locations in each lagoon. Samples were analyzed for metals and semi-volatile organic compounds (SVOCs). Analytical results indicated that thallium exceeded the industrial screening level in one sample collected from the secondary lagoon. Thallium was not detected in samples from the other two lagoons. Beryllium exceeded background in the three samples, but was below residential screening level in all of them. One SVOC (naphthalene) were detected at concentrations above the SSL in the samples from the primary and tertiary lagoons, but was below the SSL in the sample from the secondary lagoon. Naphthalene was below the residential

screening level in the three samples. Naphthalene is a PAH associated with petroleum products such as commercial coal tar, gasoline, solvents, power plant emissions, and coal ash and cinders. The remaining metals and SVOCs were below screening levels in the three samples. The report recommended that groundwater samples be collected to assess whether metals are migrating from the lagoons at significant concentrations.

C. 1996 RCRA Facility Investigation

In 1996, a RCRA Facility Investigation (RFI) was performed by Parsons Engineering Science, Inc. The RFI objectives included the assessment of lagoon sediment disposal characteristics and migratory characteristics of metals from the lagoons. Investigative activities included the installation of four monitoring wells and the collection and analysis of sediment, subsurface soil, and groundwater samples. Sediment sample results indicated that the lagoon sediments were within Toxicity Characteristic Leaching Procedure (TCLP) regulatory limits for each parameter. Sediment samples were collected for disposal classification purposes; therefore, analytical results of the sediment were not suitable for use in a risk assessment. Samples from monitoring wells indicated that beryllium, chromium, and lead exceeded their tap water risk based concentrations (RBCs) in several of the monitoring wells. Due to this information, RFI report recommended that additional lagoon sediments coupled with New River surface water and sediment samples be collected to define the nature and extent of heavy metals and allow for risk assessment of the sediment pathway.

D. 1999 RCRA Facility Investigation

In 1999, an RFI was performed by ICF Kaiser Engineers, Inc. to augment the existing data set and refine the contamination assessment. Data needs were supplemented through the sampling of surface water/sediment (discrete), subsurface soil, and groundwater for metals, SVOC, and PAH analyses. One surface water sample was collected at each of the three lagoon outfalls and analyzed for metals, SVOCs, and PAHs. Analysis of surface water results indicated that aluminum exceeded its MCL in each of the three samples, with concentrations ranging from 297 µg/L to 738 µg/L. The remaining metals and PAH/SVOCs were below tap water RBCs and MCLs. Three sediment samples were collocated to assess whether the sediment accumulating in the lagoons was a contamination source for subsurface soil and groundwater. One sediment sample was collected at the outfall of each lagoon and analyzed for metals, SVOCs, and PAHs. Only benzo(a)pyrene exceeded the residential screening level in two sediment samples. Four soil borings were advanced near the existing monitoring wells and two soil samples were collected from each boring to comply with the RCRA permit. Samples were analyzed for metals, SVOCs, and PAHs. Organic constituents were not detected above residential screening criteria and metals were below background levels in all eight samples. During the previous RFI, samples were not analyzed for SVOCs, which were specified in the RCRA permit for this SWMU. In order to meet the requirements of the RCRA permit for assessing the nature and extent of contamination, groundwater samples were collected from the four existing SWMU 31 wells. Samples were analyzed for total and dissolved metals, SVOCs, PAHs, TOC, and TOX. Benzo(a)pyrene, benzo(b)fluoranthene, bis(2-

ethylhexyl)phthalate exceeded their tap water RBCs nad/or MCLs in several of the monitoring wells. Six metals (aluminum, arsenic, chromium, iron, manganese, and vanadium) exceeded tap water RBCs and/or MCLs in the total metals analysis. Aluminum was the only metal to exceed its MCL in the dissolved metals analysis. None of the metals exceeded tap water RBCs in the dissolved metal analyses. The report recommended that deep lagoon sediments, coupled with additional surface water and groundwater samples be collected.

E. 2007 RCRA Facility Investigation

In 2007, Shaw Environmental, Inc. performed an RFI to complete characterization and risk assessment at SWMU 31. Data from the previous investigations was combined with data collected in 2002 to evaluate the nature and extent of contamination and to assess potential impacts to human health and/or ecological receptors. Risk assessments performed on data collected during this RFI indicated minimal to no risk to current workers at the site with the major risk driver being arsenic. The risk assessment calculated elevated risks to future residential receptors, and it concluded that aquatic biota may be impacted by lagoon surface water and sediment. It was recommended that a Corrective Measures Study (CMS) be conducted to evaluate potential remedial alternatives for the site. However, based on limited impacts presented in the current and two previous RFIs, the recommended CMS for SWMU 31 does not appear to be warranted.

F. 2009 RCRA Facility Investigation Addendum

In 2009 ARCADIS prepared an RFI addendum that recommended no further action for SWMU 31. EPA agreed that the proposed decision of No Further Action for this unit is protective of human health and the environment and that no further corrective action or controls are necessary.

SWMU 36: CALCIUM SULFATE DRYING BEDS

SWMU 36: Calcium Sulfate Drying Beds, originally consisted of three earthen, unlined impoundments for drying of sludge that was periodically removed from SWMU 8. SWMU 36 is located east of SWMU 8 in the northeast section of the Main Manufacturing Area along the south bank of the New River. Each rectangular drying bed was approximately 200 feet long by 80 feet wide. Two previous investigations have been conducted at SWMU 36.

A. 1987 EPA RCRA Facility Assessment

In 1987, under authority of the 1984 Hazardous and Solid Waste Amendments (HSWA), EPA conducted a RCRA Facility Assessment at RFAAP to evaluate releases of hazardous waste or hazardous waste constituents and to implement corrective actions, as necessary. The assessment consisted of a preliminary review and evaluation of available site information, personnel interviews, and a visual inspection of the site. During the

1987 Visual Site Inspection, environmental samples were not collected as part of the inspection and no visible signs of release were observed at SWMU 36.

B. 2004 Soil Sampling and Screening Assessment Report

In 2004, URS Corporation (URS) performed soil sampling and subsequent screening assessments and evaluations at SWMU 36. The objectives of this screening assessment were to evaluate the presence or absence of hazardous constituents in soil and $CaSO_4$ sludge, and assess soil and $CaSO_4$ sludge to be removed from SWMU 36 during construction activities for RCRA hazardous waste characteristics. The results of the human health and ecological risk screening indicated that no unacceptable risk was associated with unrestricted reuse of the SWMU 36 area. Based on this apparent lack of risk to human health and the environment, the Army selected No Further Action as the preferred remedial alternative for SWMU 36.

C. 2006 No Further Action Determination

EPA approved and signed the SWMU 36 Decision Document on October 16, 2006. EPA determined that the proposed decision of No Further Action for this unit is protective of human health and the environment and that no further corrective action or controls are necessary.

SOLID WASTE MANAGEMENT UNITS 35, 37, 38 and AREA OF CONCERN Q

SWMU 35, 37, 38 and Area of Concern (AOC) Q, Calcium Sulfate Drying Beds, are located in the Main Manufacturing Area (MMA) of RFAAP. The sites consist of four separate calcium sulfate drying beds. SWMU 35 is a 0.29 acre calcium sulfate drying bed located in the northeast section of the MMMA. The drying bed is an enclosed depression area located approximately 5 feet from surrounding areas. SWMU 35 has been an inactive site since approximately 1980. The site was previously used for the drying of sludge removed from SWMU 8. SWMU 37, 38 and AOC Q are inactive units located along the New River in the northwestern section of the MMA. SWMU 37 is a densely vegetated area comprising approximate 0.62 acres. SWMU 38 is a smaller, densely vegetated area comprising approximately 0.23 acres. AOC Q is a densely wooded depression comprising approximately 0.076 acres and is located immediately to the west and adjacent to the northwestern corner of SWMU 38. SWMU 37 and 38 are inactive units previously used for the drying of sludge removed from SWMU 9, and AOC Q was reportedly used as a sludge drying bed when SWMU 38 was full.

A. 1987 EPA RCRA Facility Assessment (SWMU 35, 37, 38 and AOC Q)

The USEPA conducted an assessment at RFAAP in 1987 to evaluate potential hazardous waste or hazardous constituent releases and implement corrective actions, as necessary. The assessment consisted of a preliminary review and evaluation of available site information, personnel interviews, and a visual inspection of the site. During the 1987 Visual Site Inspection (VSI), environmental samples were not collected as part of the inspection. The VSI concluded that there was no visual evidence of release from SWMU 35, 37, and 38. AOC Q is identified an alleged abandoned lagoon in the 1987 RFA.

B. 1990 Geophex Hydrogeologic and Environmental Investigation of the Equalization Basin of the [Biological] Wastewater Treatment Plant (SWMU 10 and 35)

In 1990 a hydrogeologic and environmental investigation of the Biological Wastewater Treatment Plant Equalization Basin (SWMU 10) was conducted by Geophex, Ltd. The investigation included sampling groundwater in the vicinity of SWMU 35. Groundwater samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and Toxicity Characteristic Leaching Procedure (TCLP) metals, and reactivity. The concentration of one SVOC in one sample collected from a well in the vicinity of SWMU 35 was above its respective screening level.

C. 1991 Bioplant (SWMU 10) Environmental Site Investigation (SWMU 10 and 35)

In 1991 an environmental site investigation was performed by Dames and Moore to collected data in support of a proposed construction project to replace the SWMU 10 equalization basin with two new tanks. One soil sample and two sludge samples were collected from SWMU 35 to assess possible sources of chemicals detected in groundwater near SWMU 10 and 35. Soil and sludge samples were analyzed for VOCs, SVOCs, Target Analyte List (TAL) metals, TCLP metals, and explosives. Limited metals, SVOCs, and explosives were detected at concentrations above their respective human health and/or ecological screening levels.

In addition to soil and sludge samples, a groundwater sample was collected from a well in the vicinity of SWMU 35. The groundwater sample was analyzed for VOCs, SVOCs, and explosives. Chemicals detected in groundwater were at concentrations below their respective screening levels.

D. 1992/1994 Verification Investigation (SWMU 10 and 35)

In 1992 a Verification Investigation (VI) was conducted by Dames and Moore to evaluate whether toxic or hazardous constituents were present and had or would have the potential to migrate beyond the boundaries of SWMU 35 and SWMU 10. Three groundwater samples and one sludge sample were collected from SWMU 35 in support of the VI. Groundwater samples were analyzed for VOCs, SVOCs, explosives, TAL metals (total and dissolved), and general water quality parameters. Other than total metals and nitrates, detected chemicals in groundwater were below their respective screening levels. Although total metal concentrations were above their respective screening levels due to

sample turbidity, the dissolved metals concentrations were below their respective screening levels.

The sludge sample was analyzed for VOCs, SVOCs and TCLP metals. Detected chemical concentrations in the sludge sample were below their respective screening levels with the exception of phenanthrene which was above its ecological screening level.

E. 1992 Verification Investigation (SWMU 37, 38 and AOC Q)

In 1992, as part of a VI, Dames and Moore collected and analyzed three samples of sludge from SWMU 37, 38 and AOC Q to evaluate whether hazardous chemical concentrations exceeded human health risk based screening levels. Samples were analyzed for VOCs, SVOCs and TCLP metals. Chemical concentrations detected in site samples were below their respective screening levels.

F. 1992 Installation Assessment – EPIC Aerial Photograph Analysis (SWMU 35, 37, 38 and AOC Q)

The Environmental Photographic Interpretation Center (EPIC), through the US EPA and the U.S. Army Toxic and Hazardous Materials Agency, provided aerial photographic analysis of 42 known SWMUs at RFAAP. Aerial photographs from 1937 to 1986 were analyzed to identify features that may have represented potential groundwater or surface water constituent sources at RFAAP. The aerial photographic of SWMU 35 indicated that activity was first noted at the site in 1962, where one lagoon was visible. The SWMU 35 lagoon remained present through the 1986 aerial photograph. Activity at SWMU 37, 38 and AOC Q was first noted in a 1962 photograph. The 1962 photograph depicted AOC Q as lagoon containing possible liquid. The 1971 aerial photograph depicted AOC Q as re-vegetated. SWMU 37 and 38 consisted of one lagoon each, although the lagoons did not appear to contain liquid. Both lagoons were present in the 1986 photograph; SWMU 37 contained liquid and SWMU 38 appeared empty.

G. 2004 Soil Screening Report for SWMUs 8 and 36

As part of a project to remove and replace the remaining earthen western lagoon of SWMU 8 and the SWMU 36 drying beds with an engineered tank in 2004, URS conducted a site screening investigation to assess the conditions of soil and calcium sulfate sludge at SWMUs 8 and 36. The project was conducted to specifically assess the presence or absence of hazardous constituents in soil and calcium sulfate sludge and to assess whether soil and calcium sulfate sludge would be a RCRA managed waste. Based upon the results and conclusions of the site screening report the material could be left in place as is as no further action was necessary to ensure protection of human health or the environment and it is not a RCRA managed waste. However the material was excavated and removed during the construction project and the site screening investigation results assisted RFAAP with proper management of the excavated material.

H. 2007 Site Screening Process Investigation (SWMU 37, 38 and AOC Q)

In 2007 URS conducted a site screening process (SSP) investigation to assess whether releases of hazardous substances, pollutants, hazardous wastes, or hazardous constituents have occurred in the environment at the sites evaluated, and whether further investigation, action, or no further action is appropriate for the site. Soil samples were collected and analyzed for VOCs, SVOCs, polynuclear aromatic hydrocarbons (PAHs), explosives and TAL metals. One sample from each site was also analyzed for pesticides, polychlorinated biphenyls (PCBs) and herbicides. VOCs, SVOCs, PAHs, PCBs, explosives and metals were detected at all sites. Additionally, pesticides were detected in the SWMU 37 sample.

A human health risk screening was conducted to determine if any detected contaminants were chemicals of potential concern for human health and the environment. PCBs, explosives and metals were identified as constituents of potential concern (COPCs) for SWMU 37 and PCBs, VOCs and metals were identified as COPCs for SWMU 38. No COPCs were identified for AOC Q. The SSP recommended a focused RCRA Facility Investigation (RFI) for soil and groundwater media at the sites based on detected concentrations above site specific screening levels for the soil to groundwater migration pathway for trichloroethene (TCE) at SWMU 37, the lack of groundwater data for the sites, and the results of the human health and ecological risk screening. The RFI was to focus on metals, explosives (in sludge), PCBs, pesticides, and VOCs (groundwater only).

I. 2010 RCRA Facility Investigation (SWMU 35, 37, 38 and AOC Q)

Potential human and ecological receptors and exposure pathways were evaluated as part of a 2010 RFI conducted by URS. For SWMUs 37, 38, and AOC Q, the RFI was a focused RFI per the recommendation of the 2007 SSP. SWMU 38 and AOC Q were assessed as one site for the 2010 RFI due to the close proximity of the two sites. Metals, PCBs and one explosive were identified as the primary COPCs for soil at SWMU 35, metals and PCBs were the primary soil COPCs at SWMU 37, and the primary COPCs in soil for SWMU 38/AOC Q were metals and one PCB. Potential site-related COPCs identified in groundwater at SWMU 35, SWMU 37, and SWMU 38/AOC Q were limited to one metal and one VOC.

A human health risk assessment was performed to evaluate the potential human health effects associated with previous activities at the site. Receptors evaluated included: current/future construction worker, hypothetical future commercial worker, hypothetical future adult resident, hypothetical future child resident, and hypothetical future lifetime resident. The results of the risk assessments indicated that the site-related carcinogenic risks and noncarcinogenic hazards are within USEPA target ranges for each receptor evaluated. The results of the human health risk assessments did not indicate a requirement for further action for the sites.

A screening level ecological risk assessment was conducted at the sites to evaluate potential ecological risks associated with previous activities at the sites. Ecological risk

results for indicated that there was no need for further action at the sites on the basis of ecological risk.

J. 2010 No Further Action Determination

On November 4, 2010, the EPA agreed that based on the RFI, no unacceptable risks were identified for human or ecological receptors in potential contact with SWMUs 35, 37, 38 and AOC Q materials; therefore, no further action is recommended for these units.

SWMU 46: PROPELLANT BURIAL

SWMU 46: Propellant Burial is an enclosed depression located in the northwest section of the MMA, approximately 240 ft southeast of the New River. Approximately one ton of propellants and propellant-impacted soil was reportedly buried at this location as the result of a railcar spill in the 1950's. No other activities have been associated with SWMU 46.

The area surrounding SWMU 46 is relatively flat with a moderate slope to the northwest towards the New River. A "BURIED EXPLOSIVE WASTE" sign is located at site. The immediate site area is a localized depression between the railroad tracks to the southeast and the asphalt roadway and parking area to the northwest. Four previous investigations have been conducted at SWMU 46.

A. 1987 EPA RCRA Facility Assessment

In 1987, under authority of the 1984 Hazardous and Solid Waste Amendments (HSWA), EPA conducted a RCRA Facility Assessment at RFAAP to evaluate releases of hazardous waste or hazardous waste constituents and to implement corrective actions, as necessary. The assessment consisted of a preliminary review and evaluation of available site information, personnel interviews, and a visual inspection of the site. During the 1987 Visual Site Inspection, environmental samples were not collected as part of the inspection and no visible signs of release were observed at SWMU 46.

B. 1992 Verification Investigation

Dames and Moore conducted a Verification Investigation at SWMU 46 in October 1991 to evaluate soil contamination from the one-time release of waste propellants. Four test pits were excavated to a depth of five feet in the area identified as the buried explosives waste area. Visual evidence of contamination or disturbed soil was not encountered (Dames and Moore, 1992). Two soil samples were collected at a depth of approximately one foot from the separate test pits and analyzed for TAL metals and explosives. Explosives were not detected in the samples. TAL metal results were below background point estimates and residential risk based concentrations, except for thallium in one sample at a concentration above the adjusted industrial risk based concentration.

C. 1997 Risk Evaluation

In 1997, the United States Army Center for Health Promotion and Preventive Medicine (USACHPPM) conducted a Relative Risk Site Evaluation in the SWMU 46 area. A Geoprobe® was used to advance eleven borings to a depth of five to nine feet below ground surface at three areas thought to represent a potential burial site (USACHPPM, 1997). Evidence of propellant was not reported in the borings and the soil was reported to appear undisturbed (USACHPPM, 1997).

D. 2007 Site Screening Process Report

In 2007, URS Corporation (URS) prepared the Site Screening Process Report (SSP), which detailed findings of soil and groundwater sampling and subsequent screening assessments and evaluations at SWMU 46 during 2006. As part of the SSP investigation, six soil samples were collected from two boring locations and analyzed for target compound list (TCL) volatile organic compounds, TCL semi-volatile organic compounds, polynuclear aromatic hydrocarbons, explosives, and target analyte list inorganics. A selected surface sample was also analyzed for TCL pesticides, TCL polychlorinated biphenyls, and herbicides. Explosives were not detected in the six samples. The site passed the residential and industrial cumulative risk screening, lead exposure assessment, iron "margin of exposure" assessment and screening level ecological risk assessment. One chemical in the soil, trichloroethene (TCE), exceeded its calculated site-specific soil screening level for the soil-to-groundwater pathway; therefore, one monitoring well was installed to evaluate potential leaching of TCE to groundwater. Evaluation of the soil-to-groundwater migration pathway for TCE and related degradation products did not indicate detectable concentrations of these VOCs in groundwater. SWMU 46 passed the SSP, resulting in a recommendation of no further action.

E. 2007 No Further Action Determination

EPA approved and signed the SWMU 46 Decision Document on September 21, 2007. EPA determined that the proposed decision of No Further Action for this unit is protective of human health and the environment and that no further corrective action or controls are necessary.

SWMU 50: CALCIUM SULFATE TREATMENT/DISPOSAL AREA

SWMU 50, Calcium Sulfate Treatment/Disposal Area, is an area approximately 295 ft long by 320 ft wide with topography that slopes gently to the south towards the New River, which is located 700 ft to the south. SWMU 50 was apparently used to manage material removed from calcium sulfate drying beds (SWMUs 35, 36, 37, 38, and Area of Concern Q) until 1982, when calcium sulfate and fly ash were permitted to be disposed of in nearby Solid Waste Permit 353 (aka Fly Ash Landfill No. 2, which incorporates

SWMUs 27, 29, and 53). The site is no longer being used as a calcium sulfate treatment/disposal area. Four previous investigations have been conducted at SWMU 50.

A. 1987 EPA RCRA Facility Assessment

In 1987, under authority of the 1984 Hazardous and Solid Waste Amendments (HSWA), EPA conducted a RCRA Facility Assessment at RFAAP to evaluate releases of hazardous waste or hazardous waste constituents and to implement corrective actions, as necessary. The assessment consisted of a preliminary review and evaluation of available site information, personnel interviews, and a visual inspection of the site. The assessment indicated that inactive SWMUs 48, 49, and 50 are contiguous, and no distinction could be made by visual observation. During a site inspection in April 1987, there were no visual signs of release; however, some residue of what appeared to be calcium sulfate was noted at SWMU 50.

B. 1992 Verification Investigation

In 1992, a Verification Investigation was performed by Dames & Moore to evaluate whether toxic or hazardous contaminants were present and/or had the potential to migrate beyond the boundaries of SWMU 50. Two samples of disposed sludge were analyzed for TCLP metals, VOCs, and SVOCs. The results of the chemical analyses indicated that VOCs, SVOCs and TCLP metals were detected in the sludge samples. However, no reported concentrations exceeded the HBNs or TCLP waste characterization criteria.

C. 2002 RCRA Facility Investigation

In 2002, Shaw Environmental, Inc. performed an RFI characterization of SWMU 50, with the collection of nine additional soil samples. Results from these soil samples indicated only a few detections of VOCs, SVOCs, metals, and/or PCBs that exceeded the residential screening levels and/or the Facility Wide Background levels. None of the detected constituents exceeded the industrial screening levels. The preliminary draft RFI utilized the combined data set from the 1992 and 2002 investigations to assess the two sites and perform a human health and ecological risk assessments. At the time, RFAAP was considering a regional groundwater study and the groundwater component of the human health risk assessment was not included. Subsequently, a site-specific approach to groundwater investigations was adopted and the preliminary draft RFI report was never submitted or finalized.

D. 2007 RCRA Facility Investigation

In 2007, Shaw Environmental, Inc. performed an RFI field investigation at SWMU 50 to further assess the potential horizontal and vertical migration of constituents. A total of ten soil borings and two monitoring wells were advanced at SWMU 50, and analytical data generated from this RFI investigation, in conjunction with the existing data, provided a sufficient data set for completion of a Nature and Extent of Contamination Assessment, Fate and Transport Evaluation, a Human Health Risk Assessment, and Screening Level Ecological Risk Assessment at SWMU 50. The primary analytes

detected at SWMU 50 above screening levels were chloroform, two PAHs (benzo(a)pyrene and benzo(b)fluoranthene), PCB-1254, five metals (chromium, copper, lead, mercury and nickel) and seven dioxins/furans (1,2,3,6,7,8-HXCDD, OCDD, total PECDD, total HXCDD, total HPCDD, total HXCDF and total HPCDF). Chloroform while detected in only one soil sample but was not detected in groundwater at the site. Similarly PAHs were detected in soil but not in groundwater. PCB-1254 detections in soil were scattered and did not exhibit a pattern indicating a source or hotspot of PCB. There is no evidence that there were ever activities at the site that would be known to cause a release of PCB. Additionally, the PCBs were detected in surface soil samples and are highly immobile in the environment and were not detected in groundwater. The five metals had a low frequency of detection above their screening levels. Dioxins/furans were considered ubiquitous in soil at RFAAP, from anthropogenic sources such as combustion and incineration of municipal waste, coal, wood, and fuel.

Risks and hazards to current workers associated with exposure to soil at the site were within or below acceptable limits. In addition, risks and hazards were within acceptable limits for hypothetical future residential soil receptors. The SLERA concluded that based on uncertainties of toxicity, the fact that no wildlife RTE species have been confirmed at the SWMU study area, alternative exposure and/or toxicity factors that could be used, and the relatively small size of SWMU 50 (2.06 acres), remedial measures solely to address ecological concerns were not warranted for soil.

Groundwater data from SWMUs 48, 49, 50 and 59 were assessed together for the human health risk assessment as they adjacent to each other. The results of that assessment indicated that additional steps are needed to remediate the contaminants of interest (COIs) carbon tetrachloride (CT) and trichloroethene (TCE) in groundwater underneath these sites. The nature and extent of these constituents suggests that SWMU 49 is the source area and remediation of the affected groundwater under SWMUs 50 and 59 will be associated with SWMU 49.

As the current and future risks and hazards for human and ecological receptors associated with soil at SWMU 50 were within acceptable ranges and any groundwater effort deferred to SWMU 49, the soil at SWMU 50 would require no further action.

E. 2009 No Further Action Determination

EPA approved the RFI recommending No Further Action for SWMU 50 by letter dated October 23, 2009. EPA determined that the proposed decision of No Further Action for this unit is protective of human health and the environment and that no further corrective action or controls are necessary.

SWMU 58: RUBBLE PILE

SWMU 58, Rubble Pile, is a covered debris pile roughly triangular in shape with each side approximately 300 feet long with a maximum height of 35 feet above the natural

ground surface. According to facility representatives interviewed during a March 1990 facility visit, SWMU 58 was used as a one-time construction debris disposal site in 1979. During clearing activities prior to the construction of the Continuous Automated Multi-Base Line, pine trees and surface debris were pushed into a pile and then covered with dirt and fill material. It is believed that vegetation (trees/brush) from the clearing activities was burned to reduce the volume of the pile. It is also believed that no other materials were disposed at SWMU 58. Four previous investigations have been conducted at SWMU 58.

A. 1987 EPA RCRA Facility Assessment

In 1987, under authority of the 1984 Hazardous and Solid Waste Amendments (HSWA), EPA conducted a RCRA Facility Assessment at RFAAP to evaluate releases of hazardous waste or hazardous waste constituents and to implement corrective actions, as necessary. The assessment consisted of a preliminary review and evaluation of available site information, personnel interviews, and a visual inspection of the site. During the 1987 Visual Site Inspection, environmental samples were not collected as part of the inspection and no visible signs of release were observed at SWMU 58.

B. 1992 Verification Investigation

In 1992, a Verification Investigation was performed by Dames & Moore, which included collection and analysis of three surface soil samples from the Rubble Pile for target analyte list (TAL) metals, target compound list (TCL) volatile organic compounds (VOCs), and TCL semivolatile organic compounds (SVOCs). Samples were collected from beneath the cover material along the edges of the Rubble Pile at a depth of 0-1 ft below the pile surface. A total of 19 TAL metals were detected in the samples. Thallium was the sole constituent found to exceed screening levels at the site. Thallium was detected above its residential (0.55 mg/kg) and industrial (7.2 mg/kg) screening levels in two of the surface soil samples at concentrations of 11.8 mg/kg and 11.4 mg/kg. Thallium was not detected in the third sample. TCL VOCs and TCL SVOCs were not detected in the soil samples.

C. 1998 RCRA Facility Investigation

In 1998, ICF Kaiser Engineers (ICF KE) performed an RFI to assess the vertical extent of constituents detected during the 1992 VI. Five subsurface soil samples were collected from three soil borings advanced in the Rubble Pile and analyzed for TAL metals, TCL VOCs, TCL SVOCs, and polynuclear aromatic hydrocarbons (PAHs). One PAH [benzo(a)pyrene] and one VOC [trichloroethene (TCE)] were detected in the fill material of the Rubble Pile at concentrations between residential and industrial screening levels. Both samples were collected at 15-17 ft below the pile surface. Iron was the sole metal found to exceed its background (50,962 mg/kg) (IT, 2001) and industrial screening level (31,000 mg/kg). Iron was detected above these screening levels at concentrations of 51,000 mg/kg in one subsurface soil sample (46-48 ft below pile surface) and 64,200 mg/kg in a second subsurface soil sample (38-40 ft below pile surface). Both samples

were collected from native soil immediately above bedrock. Thallium concentrations were below background (IT, 2001) in the five soil samples collected at the site.

D. 2002 RCRA Facility Investigation

In 2002, Shaw Environmental, Inc. performed an RFI field investigation at SWMU 58 to further assess the potential horizontal and vertical migration of constituents from the Rubble Pile, and characterize site soil for previously untested analyte classes, which included pesticides, polychlorinated biphenyls (PCBs), herbicides, explosives (including nitroglycerin [NG] and pentaerythritol tetranitrate [PETN]), and dioxins/furans. In addition, soil samples were analyzed for total organic carbon (TOC), grain size, and pH to assess the bioavailability and mobility of constituents in the soil. This data, in conjunction with the existing data, provided a sufficient data set for completion of a Nature and Extent of Contamination Assessment, Fate and Transport Evaluation, and a Human Health and Screening Level Ecological Risk Assessment at SWMU 58. The results of this RFI indicated no unacceptable risk associated with unrestricted reuse of the SWMU 58 area.

E. 2004 No Further Action Determination

EPA approved and signed the SWMU 58 Decision Document on December 16, 2004. EPA determined that the proposed decision of No Further Action for this unit is protective of human health and the environment and that no further corrective action or controls are necessary.

SWMU 59: BOTTOM ASH PILE

SWMU 59, Bottom Ash Pile, is an area approximately 270 ft long by 145 ft wide with topography that slopes gently to the south towards the New River, which is located 700 ft to the south. SWMU 59 was apparently used to manage ash generated from the coal-fired power plant in the Horseshoe Area. It should be noted that calcium sulfate and fly ash were permitted to be disposed of in nearby Solid Waste Permit 353 (aka Fly Ash Landfill No. 2, which incorporates SWMUs 27, 29, and 53). Activity was first noted at the site in 1986 aerial photography, where a large area of dark toned material was visible. The storage pile of ash was approximately 100 ft long by 50 ft wide and 20 ft high in 1987. The ash pile is no longer visible at the site and the site is no longer being used in the same manner. It can be assumed that this pile or similar piles have existed at RFAAP since operation of the coal-fueled power plant began. Four previous investigations have been conducted at SWMU 59.

A. 1987 EPA RCRA Facility Assessment

In 1987, under authority of the 1984 Hazardous and Solid Waste Amendments (HSWA), EPA conducted a RCRA Facility Assessment at RFAAP to evaluate releases of

hazardous waste or hazardous waste constituents and to implement corrective actions, as necessary. The assessment consisted of a preliminary review and evaluation of available site information, personnel interviews, and a visual inspection of the site. The assessment indicated that ash was being removed from SWMU 59 and used to top gravel roads and as cover material on several landfills throughout RFAAP. During a site inspection in April 1987, there were no visual signs of release.

B. 1992 Verification Investigation

In 1992, a Verification Investigation was performed by Dames & Moore to evaluate whether toxic or hazardous contaminants were present and/or had the potential to migrate beyond the boundaries of SWMU 59. Two shallow soil samples were collected from immediately below bottom ash at SWMU 59, and analyzed for TAL metals and SVOCs. The results of the chemical analyses indicated arsenic was present above the screening level.

C. 2002 RCRA Facility Investigation

In 2002, Shaw Environmental, Inc. performed an RFI characterization of SWMU 59, with the collection of six additional soil samples. Results from these soil samples indicated only a few detections of VOCs, SVOCs, metals, and/or PCBs that exceeded the residential screening levels and/or the Facility Wide Background levels. None of the detected constituents exceeded the industrial screening levels. The preliminary draft RFI utilized the combined data set from the 1992 and 2002 investigations to assess the two sites and perform a human health and ecological risk assessments. At the time, RFAAP was considering a regional groundwater study and the groundwater component of the human health risk assessment was not included. Subsequently, a site-specific approach to groundwater investigations was adopted and the preliminary draft RFI report was never submitted or finalized.

D. 2007 RCRA Facility Investigation

In 2007, Shaw Environmental, Inc. performed an RFI field investigation at SWMU 59 to further assess the potential horizontal and vertical migration of constituents. A total of ten soil borings and one monitoring well were advanced at SWMU 59, and analytical data generated from this RFI investigation, in conjunction with the existing data, provided a sufficient data set for completion of a Nature and Extent of Contamination Assessment, Fate and Transport Evaluation, a Human Health Risk Assessment, and Screening Level Ecological Risk Assessment at SWMU 59. The primary analytes detected at SWMU 59 above screening levels were one PAH (benzo(a)pyrene), PCB-1254, one metal (manganese), and five dioxins/furans (OCDD, total PECDD, total HXCDD, total HPCDD, and total HXCDF). Benzo(a)pyrene was detected in five out of 25 soil samples above its screening level but not in groundwater. PCB-1254 concentrations were greater than the residential screening level in two out of 27 samples

but not in groundwater. None of the sample concentrations were greater than the industrial screening level. Additionally, PCBs are highly immobile in the environment. Manganese was detected above its screening level in two out of 28 samples. Only two dioxins/furans were detected (in 1 and 2 out of 25 samples tested) and at relatively low concentrations. Dioxins/furans were considered ubiquitous in soil at RFAAP, from anthropogenic sources such as combustion and incineration of municipal waste, coal, wood, and fuel.

Risks and hazards to current workers associated with exposure to soil at the site were within or below acceptable limits. In addition, risks and hazards were within acceptable limits for hypothetical future residential soil receptors. The SLERA concluded that based on uncertainties of toxicity, the fact that no wildlife RTE species have been confirmed at the SWMU study area, alternative exposure and/or toxicity factors that could be used, and the relatively small size of SWMU 59 (0.57 acres), remedial measures solely to address ecological concerns were not warranted for soil.

Groundwater data from SWMUs 48, 49, 50 and 59 were assessed together for the human health risk assessment as they adjacent to each other. The results of that assessment indicated that additional steps are needed to remediate the contaminants of interest (COIs) carbon tetrachloride (CT) and trichloroethene (TCE) in groundwater underneath these sites. The nature and extent of these constituents suggests that SWMU 49 is the source area and remediation of the affected groundwater under SWMUs 50 and 59 will be associated with SWMU 49.

As the current and future risks and hazards for human and ecological receptors associated with soil at SWMU 59 were within acceptable ranges and any groundwater effort deferred to SWMU 49, the soil at SWMU 59 would require no further action.

E. 2009 No Further Action Determination

EPA approved the RFI with No Further Action recommendation by letter dated October 23, 2009. EPA determined that the proposed decision of No Further Action for this unit is protective of human health and the environment and that no further corrective action or controls are necessary.

SWMU 68: CHROMIC ACID TREATMENT PLANT TANKS

SWMU 68, Chromic Acid Treatment Plant Tanks, is an area that consisted of two 4,000-gallon aboveground, open top tanks (ASTs) with associated pumps, piping, and appurtenances. These ASTs were used to treat chromic acid wastewater generated during the reconditioning of rocket motors beginning in 1958. Storm water drainage and treated wastewater from SWMU 68 was discharged to a 12,000-gallon settling pond (SWMU 69), where chromium-hydroxide precipitated prior to discharge of treated wastewater to the New River. In July 1997, the site underwent closure including the removal of the two treatment ASTs, appurtenances, and impacted soil). Four previous investigations have been conducted at SWMU 68.

A. 1987 EPA RCRA Facility Assessment

In 1987, under authority of the 1984 Hazardous and Solid Waste Amendments (HSWA), EPA conducted a RCRA Facility Assessment at RFAAP to evaluate releases of hazardous waste or hazardous waste constituents and to implement corrective actions, as necessary. The assessment consisted of a preliminary review and evaluation of available site information, personnel interviews, and a visual inspection of the site. During the 1987 Visual Site Inspection, environmental samples were not collected as part of the inspection and no visible signs of release were observed at SWMU 68.

B. 1992 Verification Investigation

In 1992, Dames & Moore conducted a Verification Investigation at SWMU 68 to evaluate surface soils in the vicinity of the treatment tanks for impact as a result of past spills, leaks, or overflows of waste chromic acid (Dames and Moore, 1992). Two surface soil samples were collected from a depth of 0 to 6 inches below Ground surface (bgs) and analyzed for pH and TAL metals. TAL metals results did not exceed both background point estimates and an adjusted risk based concentrations, except for thallium, which was detected in both samples at concentrations above the adjusted industrial risk based concentration and the Draft Biological Technical Assistance Group (BTAG) screening level.

C. 1997 Closure Activities

In July 1997, the site underwent closure including removal of the two treatment ASTs, appurtenances, and impacted soil. ICF Kaiser Engineers, Inc. began closure documentation activities at SWMU 68, which included excavation of twelve test pits and collection of associated samples. One sample and one duplicate soil sample were collected within each assumed homogeneous 8 ft by 8 ft by 4 ft sample grid. Each sample was collected from approximately 4 to 5 ft bgs and was analyzed for TAL metals. Two contingency samples were also collected from 8.0 to 8.5 feet bgs from test pits in the northwest and southwest quadrants. TAL metals results did not exceed both the Facility-wide background point estimates and an adjusted RBC (or Draft BTAG screening level), except for aluminum in one sample and iron in two samples. A draft Closure Plan was prepared by ICF Kaiser and submitted by RFAAP to the EPA Region III and VDEQ in October 1997. EPA Region III responded in March 1998 with a completeness review and requested revisions to the draft Closure Plan. RFAAP revised the Plan to comply with the EPA revision request and resubmitted the Final Closure Plan to EPA Region III and VDEQ in April 1998. Based on the results of the investigation, "no further action" was recommended for this site (ICF Kaiser, 1998).

D. 2007 Site Screening Process Report

In 2007, URS Corporation (URS) prepared the Site Screening Process Report (SSP), which detailed findings of soil sampling and subsequent screening assessments and evaluations at SWMU 68 during 2006. As part of the SSP investigation, nine soil

samples were collected from three boring locations and analyzed for target compound list (TCL) volatile organic compounds, TCL semi-volatile organic compounds, polynuclear aromatic hydrocarbons, explosives, and target analyte list inorganics. A selected surface sample was also analyzed for TCL pesticides, TCL polychlorinated biphenyls, and herbicides. The site passed the residential and industrial cumulative risk screening, lead exposure assessment, iron "margin of exposure" assessment, soil screening level evaluation for the soil to groundwater pathway, and screening level ecological risk assessment. SWMU 68 passed the SSP, resulting in a recommendation of no further action (URS, 2007).

E. 2007 No Further Action Determination

EPA approved and signed the SWMU 68 Decision Document on September 21, 2007. EPA determined that the proposed decision of No Further Action for this unit is protective of human health and the environment and that no further corrective action or controls are necessary.

SWMU 69: POND BY CHROMIC ACID TREATMENT TANKS

SWMU 69, Pond by Chromic Acid Treatment Tanks, is a 0.012-acre depressed, grassed area that was once a shallow settling pond with a 12,000-gallon capacity that collected treated wastewater containing chromium-hydroxide sludge from SWMU 68, the Chromic Acid Treatment Tanks. The pond was bermed and approximately one to two feet deep. The supernatant from SWMU 69 discharged to a perennial stream that flows to the New River. In accordance with the recommendations included in the 1992 Verification Investigation Report for SWMU 69, interim measures were implemented and SWMU 69 underwent closure, including removal of impacted soil (Dames & Moore, 1994). The SWMU 69 Closure Report was prepared by Dames & Moore and submitted by RFAAP to the EPA Region III and the VDEQ. Approximately 700 cubic yards of material were excavated during the closure and investigation activities and disposed of at RFAAP Fly Ash Landfill # 2. After confirmatory sampling, the excavation(s) were backfilled with clean fill supplied and graded to reestablish the pre-existing drainage way. Four previous investigations have been conducted at SWMU 69.

A. 1987 EPA RCRA Facility Assessment

In 1987, under authority of the 1984 Hazardous and Solid Waste Amendments (HSWA), EPA conducted a RCRA Facility Assessment at RFAAP to evaluate releases of hazardous waste or hazardous waste constituents and to implement corrective actions, as necessary. The assessment consisted of a preliminary review and evaluation of available site information, personnel interviews, and a visual inspection of the site. During the 1987 Visual Site Inspection, environmental samples were not collected as part of the inspection and no visible signs of release were observed at SWMU 69.

B. 1992 Verification Investigation

In 1992, Dames and Moore performed a Verification Investigation (VI), which included sampling of the pond sediment, standing water, and surface soil samples down slope of the pond. The sediment and surface water samples from the pond indicated that the concentration of several TAL metals exceeding background point estimate concentrations, adjusted R-RBCs, I-RBCs, the Draft Biological Technical Assistance Group (BTAG) screening levels, and surface water MCLs. The VI recommended the implementation of interim measures, including the closure of SWMU 69 with subsequent excavation of impacted soil.

C. 1994 Closure Report

In 1994, Dames and Moore submitted the SWMU 69 Closure Report. Approximately 700 cubic yards of material were excavated during the closure and investigation activities and disposed of at RFAAP Fly Ash Landfill #2. After confirmatory sampling, the excavations were backfilled with clean fill supplied and graded to reestablish the pre-existing drainage way.

D. 2007 Site Screening Process Report

In 2007, URS Corporation (URS) prepared the Site Screening Process Report (SSP), which detailed findings of soil sampling and subsequent screening assessments and evaluations at SWMU 69 during 2006. As part of the SSP investigation, nine soil samples were collected from three boring locations and analyzed for target compound list (TCL) volatile organic compounds, TCL semi-volatile organic compounds, polynuclear aromatic hydrocarbons, explosives, and target analyte list inorganics. A selected surface sample was also analyzed for TCL pesticides, TCL polychlorinated biphenyls, and herbicides. The site passed the residential and industrial cumulative risk screening, lead exposure assessment, iron "margin of exposure" assessment, soil screening level evaluation for the soil to groundwater pathway, and screening level ecological risk assessment. SWMU 69 passed the SSP, resulting in a recommendation of no further action (URS, 2007).

E. 2007 No Further Action Determination

EPA approved and signed the SWMU 69 Decision Document on September 21, 2007. EPA determined that the proposed decision of No Further Action for this unit is protective of human health and the environment and that no further corrective action or controls are necessary.

SWMU 75: WASTE OIL UNDERGROUND STORAGE TANK (INERT GAS PLANT)

SWMU 75, Waste Oil Underground Storage Tank (Inert Gas Plant) is the area of a former 750-gallon underground storage tank (UST) utilized for the storage of used oil from RFAAP. An active compressor building operates 50 feet to the west. SWMU 75

currently consists of gravel with overhead steam piping and an upward sloping grassed area across the asphalt road adjacent to the south. The former UST was a single-walled tank installed in 1973 with a capacity of 750 gallons. The UST stored used oil and hydraulic fluids that were generated in a nearby compressor building. The contents of the UST were reportedly pumped into 55-gallon drums for use as fuel at the Hazardous Waste Incinerator. Use of the UST ceased in June 1991 and the UST was removed from the ground in June 1995. Three previous investigations have been conducted at SWMU 75.

A. 1987 EPA RCRA Facility Assessment

In 1987, under authority of the 1984 Hazardous and Solid Waste Amendments (HSWA), EPA conducted a RCRA Facility Assessment at RFAAP to evaluate releases of hazardous waste or hazardous waste constituents and to implement corrective actions, as necessary. The assessment consisted of a preliminary review and evaluation of available site information, personnel interviews, and a visual inspection of the site. During the 1987 Visual Site Inspection, environmental samples were not collected as part of the inspection and there were visible signs of discolored soil around the tank access port observed at SWMU 75.

B. 1995 Closure and Removal Action

In 1995, ATK conducted a removal and closure of the UST at SWMU 75. Five soil samples were collected from the excavation of the former UST, one sample from each of the sidewalls and one from the bottom of the excavation. Soil samples were analyzed for Total Petroleum Hydrocarbons (TPH). Results indicate that concentrations of TPH exceeding the Virginia Department of Environmental Quality (VDEQ) release reporting threshold of 100 mg/kg were present in samples collected from two locations of the excavation: on the south wall (1,400 mg/kg), and on the bottom of the excavation near the southern end (130 mg/kg). A site characterization report was prepared and submitted to the VDEQ, including an amended Form 7530-1 (Notification of Underground Storage Tanks) indicating tank closure (ATK, 1995). According to VDEQ database records, the release reported during the SWMU 75 UST closure was assigned Petroleum Complaint number PC-95-1099. Records on PC-95-1099 indicate that the file was closed in October 1995. Closure correspondence from the VDEQ stated that acceptable site characterization and abatement measures had been achieved. The correspondence also stated that, "There does not appear to be a current or potential risk to human health or the environment" (VDEQ, 1995).

C. 2003 Site Screening Process Report

In 2003, URS Corporation (URS) conducted a desktop Site Screening Process (SSP) during the preparation of Work Plan Addendum 16, which summarized findings of soil sampling and related data pertaining to SWMU 75. During this SSP, RFAAP and URS concluded that no further action was necessary at SWMU 75 (URS, 2003).

D. 2007 No Further Action Determination

EPA approved and signed the SWMU 75 Decision Document on September 21, 2007. EPA determined that the proposed decision of No Further Action for this unit is protective of human health and the environment and that no further corrective action or controls are necessary.

SWMU 76: WASTE OIL UNDERGROUND STORAGE TANKS

SWMU 76, Waste Oil Underground Storage Tanks, formerly consisted of two underground storage tanks (USTs) for used oil collection adjacent to the southeast perimeter of SWMU 17. The location of the former USTs lies along the southeastern embankment of SWMU 17. Non-related buildings are located to the south and gravel roads and wooded areas surround SWMU 17 and SWMU 76. The capacity of one UST was 5,500 gallons and the capacity of the second UST was 2,650 gallons. Used oil from machinery and vehicle engines throughout RFAAP was collected in the Mobile Waste Oil Tanks (SWMU 61) and stored in the SWMU 76 tanks prior to being sold to an off-post firm for reclamation. The two USTs at SWMU 76 were removed from the ground and closed in June 1991. Three previous investigations have been conducted at SWMU 76.

A. 1987 EPA RCRA Facility Assessment

In 1987, under authority of the 1984 Hazardous and Solid Waste Amendments (HSWA), EPA conducted a RCRA Facility Assessment at RFAAP to evaluate releases of hazardous waste or hazardous waste constituents and to implement corrective actions, as necessary. The assessment consisted of a preliminary review and evaluation of available site information, personnel interviews, and a visual inspection of the site. During the 1987 Visual Site Inspection, environmental samples were not collected as part of the inspection and there were visible signs of discolored soil around the tank access port observed at SWMU 76.

B. 1991 UST Removal and Closure

In 1991, Hercules performed removal of the two USTs at SWMU 76. During UST, a spill of oily wastewater and sludge occurred from the 5,500-gallon UST. Approximately 250 gallons of the oily wastewater sludge, which was not evacuated from the UST before removal, drained into a trench alongside the UST as it was being removed from the ground. Samples of the oily wastewater sludge spill were collected and sent for laboratory analysis. The tests indicated the spilled material exhibited hazardous waste characteristics for lead. The oily wastewater sludge was removed from the containment area using a suction pump and placed in a waste oil storage tank for off-site treatment and disposal. The remaining material within the trench was absorbed with an absorbent

compound (Hercules 199 1 b). Approximately 13 cubic yards of oil-absorbed material were removed from the area and disposed of off-site.

As part of the clean-up activities from the spill, Hercules collected soil samples from one foot below the tank level and analyzed for TPH by EPA Method 418.1. Since lead was detected in the oily wastewater sludge sample, analysis for total lead in addition to the TPH analysis was conducted on the soil samples collected from under the spill area. Analytical results indicate that the TPH concentration in one soil was 1,590 mg/kg before the spill cleanup and less than 60 mg/kg TPH after the spill cleanup was completed (Hercules 1991). Concentrations of total lead (63,000 mg/kg) and leachable lead (2,900 mg/L) still remained present in samples collected from under the spill area after clean-up. A lead furnace operated during World War II near this area and may have been a contributing source of lead. This Former Lead Furnace Area (FLFA) was investigated as part of Work Plan Addendum No. 12 to complete the characterization of this area. Soil borings have been advanced adjacent to SWMU 76 and samples were collected as part of the FLFA investigation. An oily wastewater spill Site Check Report was prepared and submitted to the Virginia State Water Control Board (now part of the VDEQ) including an amended Form 7530-1 indicating tank closure. According to VDEQ database records, the release reported during SWMU 76 UST closure was assigned Petroleum Complaint number PC-91-1777. VDEQ correspondence indicated that acceptable site check measures for the suspected petroleum UST release have been achieved, and no further UST investigation was required at that time. VDEQ records further indicate tank closure was completed and the file closed in September 1992 (VDEQ, 1992).

C. 2003 Site Screening Process Report

In 2003, URS Corporation (URS) conducted a desktop Site Screening Process (SSP) during the preparation of Work Plan Addendum 16, which summarized findings of soil sampling and related data pertaining to SWMU 76. During this SSP, RFAAP and URS concluded that the ongoing assessment of subsurface constituents identified at the FLFA adjacent to SWMU 76 and future closure procedures at SWMU 17 would address any remaining issues potentially related to the coincident SWMUs (SWMU 76 and FLFA); therefore, no additional field activities were proposed for the investigation of this former UST site. (URS, 2003).

D. 2007 No Further Action Determination

EPA approved and signed the SWMU 76 Decision Document on September 21, 2007. EPA determined that the proposed decision of No Further Action for this unit is protective of human health and the environment and that no further corrective action or controls are necessary.

SITE SCREENING AREAS 18, 30, 60, 72, 77 and 79

Site Screening Areas (SSA) 18, Sulfuric Acid Recovery Plant – Waste Acid Treatment Facility, and SSA 72, the Oleum Plant Acidic Wastewater Sump, are located in the Oleum Plant area of RFAAP. SSA 30, Asbestos Disposal Trench No. 1, and SSA 79, Asbestos Disposal Trench No. 2, are co-located in the Horseshoe Area of RFAAP. SSA 60, the Rubble Pile East of the Administration Building, is adjacent to the main administration building near the main gate to RFAAP. SSA 77, the Garbage Incinerator (Building 7219), is located adjacent to shipping and receiving in the Main Manufacturing Area.

- SSAs 18 and 72 operated from 1976 until 1987, when the Oleum Plant was rendered inactive due to TNT manufacturing processes ceasing at RFAAP in 1986.

- SSAs 30 and 79 were used for disposal of asbestos containing material from 1982 to 1987. The sites received 250 to 500 pounds of double bagged asbestos containing material per day when asbestos removal activities were ongoing at RFAAP.

- SSA 60 was created in 1985 to accept demolition waste cleaned up from the remains of an explosion in the Nitroglycerin Area Number 1 and highway construction debris for anticipated use as a parking lot. Fill activities ceased at the site in 1988.

- SSA 77 operated as a garbage incinerator from the 1940s until 1974, when it was shutdown, rendered inactive, and equipment was removed. The site was reconstructed and improved in 1953, and garbage incineration operations were reactivated. Incineration operations ceased at the reconstructed site in 1974. SSA 77 is inactive with no plans to reactivate.

A. 1987 EPA RCRA Facility Assessment

The USEPA conducted an assessment at RFAAP in 1987 to evaluate potential hazardous waste or hazardous constituent releases and implement corrective actions, as necessary. The assessment consisted of a preliminary review and evaluation of available site information, personnel interviews, and a visual inspection of the site. During the 1987 Visual Site Inspection (VSI), environmental samples were not collected as part of the inspection. The VSI for SSA 18 (listed as Unit 18 in the RFA), SSA 72 (listed as Unit 72 in the RFA) indicated that no visible signs of releases were observed during the site inspection. For SSA 60 (listed as Unit 60 in the RFA) the RFA indicated there were no documented releases. For SSA 77 (listed as Unit 77 in the RFA), the RFA did not identify a historical release. The assessment indicated that the closure status of SSA 30 (listed as Unit 30 in the RFA) was uncertain due to the active status of SSA 79 (listed as Unit 79 in the RFA). The RFA indicated that no data indicating releases at SSAs 30 and 79 had been collected.

B. 1992 Installation Assessment (SSAs 30, 79, and 77)

The Environmental Photographic Interpretation Center (EPIC), under the direction of USEPA, performed an assessment of multiple SWMUs at RFAAP using selected aerial photographs from 1937 to 1986 (USEPA 1992a). A photogeologic analysis was performed to locate waste management areas, identify the location of sinkholes that existed prior to the construction of the RFAAP, and map fracture traces.

- ❖ SSAs 30 and 79: A specific assessment was not conducted for the asbestos disposal trenches; however, an assessment was conducted for adjacent SWMU 51. The aerial photographic analysis of SWMU 51 indicated that activity was first noted at SWMU 51 in 1975, where an empty trench was visible on the photograph. By 1981, the trench had been filled and a re-vegetating ground scar was the sole remaining feature.

- ❖ SSA 77: A specific assessment was not conducted for the garbage incinerator; however, an assessment was conducted for adjacent SWMU 17. The aerial photographic analysis of SWMU 17 indicated that activity was noted from 1949 to 1986, where mounded material, containers, and possible stains were noted within the SWMU 17 area.

C. 1992 RCRA Facility Investigations (SSAs 30, 79 and 77)

- ❖ SSAs 30 and 79: In 1992, Dames & Moore reported the results of an RFI conducted at SWMU 51 located adjacent to SSA 30 and SSA 79. The RFI focused on evaluating potential releases to groundwater in the area of SWMU 51 and at adjacent landfill areas to the east and north of the site. Monitoring wells sampled around the periphery of the SSA 30 and SSA 79 area and samples collected from those wells were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), explosives, dissolved metals, total organic carbon, total organic halogens, and pH. One SVOC and one explosive were detected at concentrations above applicable screening levels.

- ❖ SSA 77: The RFI conducted by Dames and Moore at SWMU 17 in 1992 included the installation of a piezometer to monitor static water levels adjacent to SSA 77. Groundwater samples were not collected from this piezometer for this investigation.

D. 1996 RCRA Facility Investigation at SWMU 17 (SSA 77)

Parsons Engineering Science conducted an RFI at SWMU 17, which is located adjacent to SSA 77, in 1996. As part of the RFI, groundwater samples were collected from monitoring wells in the vicinity of SSA 77 for analysis of explosives, total/dissolved metals, total organic carbon and total organic halogens. Explosives were not detected in these samples. One dissolved metal was detected at a level above its maximum contaminant level (MCL).

E. 2000 Acid Sewer Survey (SSAs 18 and 72)

From 1998 to 2000, an Acid Sewer Survey and Investigation was conducted on the entire RFAAP acid sewer infrastructure to determine the condition of the sewers. Videotaping of the interior lines was conducted and submitted to the USEPA. An assessment of the 260 ft long 6-inch diameter plastic, gravity acid sewer line that extends from the acidic wastewater sump (SSA 72) to the SAR wastewater treatment plant (SSA 18) was not conducted as part of the acid sewer survey. Deteriorated or broken sections of sewer lines were repaired or replaced within active areas. No actions were undertaken in the area of SSA 18 due to the inactive status of the SAR Plant wastewater system and treatment facility.

F. 2002 Geophysical Survey at SWMU 51 (SSAs 30 and 79)

A geophysical survey was conducted in the SWMU 51 area in 2002 by Argonne National Laboratory to characterize the lateral and vertical extent of the former TNT neutralization-sludge disposal trench. The survey showed a high conductivity anomaly and low resistivity anomaly in the general trench area.

G. 2004 Oleum Plant Site Screening Investigation (SSA 72)

A Site Screening Investigation was conducted in 2004 by Draper Aden Associates to characterize potential contamination at the Oleum Plant. Two soil samples and one water sample from the acidic wastewater sump were collected from SSA 72. Soil samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polyaromatic hydrocarbons (PAHs), explosives and metals. The water sample was analyzed for perchlorate. VOCs, SVOCs, PAHs and metals were detected in collected soil samples from SSA 72. PAHs were detected above applicable residential screening levels. Perchlorate was not detected in the water sample collected from SSA 72.

H. 2006 Eastern Horseshoe Area Groundwater Sampling (SSAs 30 and 79)

In 2006, Shaw reported the results of an area wide groundwater sampling event in the eastern horseshoe area of RFAAP. Groundwater samples were obtained from wells in the vicinity of SSA 30 and 72 as part of the event. Samples were analyzed for VOCs, SVOCs, pesticides, PCBs, dioxin/furans, PAHs, metals and perchlorate. VOCs, pesticides and metals were detected in these samples. Detected constituent concentrations were below MCLs.

I. 2007 Oleum Plant Environmental Baseline Study (SSAs 18 and 72)

An environmental baseline study of the Oleum Plant area was conducted in 2007 by Ecology and Environment, Inc. Soil and groundwater samples were collected from the area encompassing SSA 18 and a water sample was collected from the sump at SSA 72. Samples were analyzed for VOCs, SVOCs, PCBs, pesticides, explosives, metals, nitrate/nitrite and perchlorate. VOCs, PCBs, pesticides and metals were detected in one or more soil samples. Detected constituent concentrations in soil were below applicable

screening levels and/or background soil concentrations. VOCs, SVOCs, pesticides, explosives, and metals were detected in one or more groundwater samples. With the exception of chloroform and perchlorate, detected constituent concentrations in groundwater, were below applicable screening levels. Metals and two pesticides were detected at concentrations above applicable screening levels for the water sample obtained from the acidic wastewater sump at SSA 72.

J. 2008 RCRA Facility Investigation/ Corrective Measures Studies (SSAs 30, 79 and 77)

- SSA 30 and 79: An RFI/CMS was conducted by Shaw in 2008 at SWMU 51 located adjacent to SSA 30 and SSA 79. Soil samples were limited to the immediate area of the SWMU 51 trench. Soil samples were analyzed for VOCs, SVOCs, pesticides, PCBs, herbicides, explosives, metals and dioxins/furans. The soil samples were not analyzed for asbestos. Groundwater data from the 2006 Eastern Horseshoe Area Groundwater sampling were used in the RFI assessment (see Section H).

- SSA 77: An RFI/CMS was conducted by Shaw at the Former Lead Furnace Area (FLFA), which is located adjacent to SSA 77, in 2008 to characterize potential contamination of soil and groundwater at the site. Soil samples were not collected from the SSA 77 building area. The septic tank and terracotta pipe associated with SSA 77 are located within the FLFA site, but this area has been remediated. As part of the RFI, groundwater samples were collected from wells in the vicinity of SSA 77 and analyzed for organics, PAHs, explosives, herbicides, metals and perchlorate. Organic chemical concentrations were below their applicable MCLs. One metal was above its applicable screening level due to elevated sample turbidity.

K. 2010 Site Screening Process Report

A Site Screening Process (SSP) report presented the results and findings of the RCRA investigations for SSAs 18, 30, 60, 72, 77 and 79 at RFAAP. The SSP was designed to assess: whether releases of hazardous substances, pollutants, chemicals, hazardous wastes, or hazardous constituents have occurred to the environment at the sites evaluated, whether further investigation (i.e., risk assessment or RCRA Facility Investigation (RFI)) or an interim removal action is appropriate at a site, or whether no further action (NFA) at a site is appropriate. Five steps were completed for the SSP following the approved guidance document including: 1) performance of a desktop audit and site visit to develop the scope of the SSP Work Plan, 2) preparation of a SSP site specific Work Plan, 3) performance of the field work in accordance with the approved SSP Work Plan, 4) evaluation of the SSP data and completion of pre-remedial risk screening, and 5) assessment of the need for further investigation, interim removal action, or preparation of a "No Further Action" Decision Document, per the RCRA Corrective Action permit based on the results of the SSP and risk screening.

Human health and ecological risk screenings were conducted for each site. SSAs 30 and 79 were assessed together due to their proximity and similar historical activities. Background levels of metals were the risk and hazard drivers for each of the sites except SSA 72 (one PAH and one PCB) and SSA 77 (dioxins). SSAs 72 and 77 had site related risk/hazards equal to or above SSP thresholds for the residential scenarios but below SSP thresholds for the industrial scenarios. The remaining sites had site related risks and hazards below SSP thresholds for the residential scenario and industrial scenario. The results of the ecological risk assessments indicated that there is adequate information to conclude that ecological risks were considered negligible for SSAs 18, 30, 60, 77, and 79. An ecological risk assessment was not conducted at SSA 72 due to the small size of the site and the nature of previous activities at the site. Potential for ecological risk at SSA 72 was considered negligible.

L. 2010 No Further Action Determination

In November 2010, EPA agreed with the following proposed actions for the SSAs 18, 30, 60, 72, 77 and 79:

- SSAs 18 and 60 – No Further Action based on the results of the human health screening, ecological risk screening, and SSL evaluation;

- SSAs 72 and 77 – No Further Action beyond the implementation of institutional controls to prevent future residential use and to restrict future digging;

- SSAs 30 and 79 – No Further Action beyond the implementation of Institutional and Engineering Controls to maintain this site as a closed solid waste management unit due to the presence of bagged asbestos containing material at the site within the trenches. Engineering Controls (ECs) will include maintenance of the soil cover to prevent erosion and potential exposure of asbestos, as well as a clear marking of the area. Institutional Controls (ICs) will prevent future residential use of the area, as well as a restriction of earth-moving activities. ECs and ICs are described in more detail in **Section IV** and **Table 2**.

ATTACHMENT B

PUBLIC COMMENTS AND

RESPONSE TO COMMENTS

ATTACHMENT B

EPA Response to Comments in italics

Comment Number 1; Ms. Nancy Mignone from the hearing:
I have a comment in regards to SWMU 41-A and B. On page 22 of the Statement of Basis, the text on SWMU 41A and B reads, quote: In an attempt to better characterize the potential for impact to groundwater, a groundwater monitoring well was installed in late 2010 at SWMU 41A to obtain representative groundwater quality data. The data indicated here that there was no unacceptable risk to human health or the environment associated with SWMU 41A. No data were referenced in the Statement of Basis to substantiate the above conclusion. The data that supports this conclusion justifying no further action at this site, needs to be published in a table in the Statement of Basis along with corresponding residential risk levels for each chemical. Also, in contrast to this conclusion about SWMU 41 reached from the 2010 data, the RAAP online information repository index, section 2011—02 from February 2011, I presume prepared by Shaw Environmental states, "Continued groundwater monitoring has not been proposed as part of the long-term monitoring of the site," but justification for this approach has not been provided. Several constituents were detected above screening criteria, "tap water, regional screening levels, RSLs, and/or maximum contaminant levels, MCLs" in groundwater at both SWMU 41-A and B, and tetrachloroethylene "TCE, arsenic, TCDD TE, and 2,6- dinitrotoluene" were found to be the risk drivers in HHRA. It appears that future groundwater monitoring may be warranted in the installation of permanent wells or other appropriate monitoring points at SWMU 41 should be considered. The solution to this problem was stated in the RAAP information repository as no change in land use in perpetuity and administrative controls to minimize worker risk. However, since groundwater at SWMU 41 can migrate through fractures in karst terrain on or near where it lies, the risks of contamination of the arsenal well, which provides municipal water on a regular basis to the communities of Prices Fork and Merrimac is a real and present danger. The arsenal well needs to be tested for these carcinogens and contaminants as well as residential groundwater wells within a mile of the plant. I also request the deadline for public comment regarding proposals for the Radford site be extended to Monday, August 29th, to allow more time to review the information. In addition, the task funding from the EPA, which would help with review of this information has not yet been granted. Time is running out, making an additional 30 days to review the information to be more germane. Thank you very much for allowing me to speak. I appreciate it.

EPA disagrees with the concerns expressed by the commenter as set forth above but does note that the public comment period was extended to August 31, 2011. There were a number of investigations of SWMUs 41A and B beginning in 1992. Various consultants for the Army characterized soil, sediment, surface water and groundwater. Soil data collected from SWMU 41A revealed single exceedances of residential screening levels for PCB-1254 (surface soil sample) and 2,3,7,8-TCDD TE; however, additional vertical delineation revealed concentrations below residential screening levels. Two organic constituents were detected above the soil transfer to groundwater screening level (SSL) but neither was detected above site-specific (calculated using site soil parameters) SSLs nor were they detected in groundwater samples.

At SWMU 41B there were some constituents detected in soil above default SSLs, but not site-specific SSLs, nor were these constituents reported in groundwater. Therefore EPA concluded that leaching of volatile or semivolatile organic constituents to groundwater was unlikely to occur at levels of concern.

There are four installed groundwater monitoring wells: 41MW1 and 41MW2 located in the footprint of SWMU 41B; 41MW3 located between SWMU 41A and SWMU 41B; and, 41MW4 located in the footprint of SWMU 41A.

Groundwater sampling results from August 27, 2007 from 41MW1, 41MW2, and 41MW3 showed risk-based screening level exceedances of tetrachloroethene (PCE), arsenic, cobalt, and vanadium. A single exceedance of the arsenic MCL from 41MW2 of 7.9 parts per billion (arsenic MCL = 5 ppb) was reported.

Three additional groundwater samples were collected in August of 2007 from direct push sample points and temporary wells. The samples were quickly obtained but could only be used for groundwater characterization because monitoring wells were not constructed. The samples, reported as turbid, showed metals concentrations that were likely higher than actual. The results from the push-probe investigation (primarily from 41GW03) report a large number of exceedances of both groundwater metal screening levels and MCLs for aluminum, arsenic, beryllium, chromium, iron, lead, manganese, nickel , vanadium, and zinc. The samples were filtered, analyzed for dissolved metals and only cobalt and manganese exceeded the screening levels. Filtering removed the sediment contributing to the turbidity and the elevated metals.

An additional monitoring well was installed and sampled October 2010 (41MW4) as a replacement for the direct push results from August 2007. The results, presented in Table 4-6 of SWMU 41 RCRA Facility Investigation Report, show aluminum and iron above their respective secondary maximum contaminant levels (secondary maximum contaminant levels are non-enforceable guidelines for contaminants that may have cosmetic effects in drinking water [see http://water.epa.gov/drink/contaminants/upload/mcl-2.pdf]). Additionally, there were a number of semi-volatile organic constituents, chloroform, and mercury all detected above their risk-based screening levels from a duplicate sample.

The primary basis for potentially requiring ongoing groundwater monitoring is because of tapwater screening level exceedances. However, tapwater screening levels are frequently lower than EPA promulgated MCLs and are typically the starting point of groundwater characterization because they are the most conservative risk based concentrations. Based on the results of the Human Health Risk Assessment, EPA has concluded that land use (Institutional Controls) controls preventing residential development for SWMU 41B will be protective of human health and the environment.

It is Region 3 policy that groundwater be restored to its most beneficial use - drinking water. Since there was only a single MCL exceedance for arsenic at this unit and it was not duplicated in subsequent sampling and there is no other groundwater contamination reported above MCLs, no groundwater remedy is warranted. While the conclusion of the unit specific risk assessment is that there are unacceptable risks for hypothetical future child and lifetime residents due to

arsenic, PCE, and semi-volatiles in groundwater, given the institutional control and given that the current use of the property is industrial, there is no actual risk to adult or children residents. Moreover, given that the concentrations are so low (exceeding screening levels but not exceeding MCLs) there is no off-site risk from groundwater contamination regardless of the geology. The soil contamination reported from the unit was also minimal, and the soil contamination does not correlate with groundwater data except for PCE and manganese. As stated previously, actual reported groundwater concentrations are so low (low parts per billion) that the concentrations will attenuate to below laboratory reporting limits as groundwater flows away from the unit. Surface water samples collected from Stroubles Creek confirm this by reporting non-detect for contaminants of concern.

Comment Number 2 (via email) from Ms. Devawn Oberlender

The following comments concentrate on SWMUs 41A and B, but the points apply equally as well to many of the other SWMUs in the EPA proposal. In sum, these overall comments are:

1) There are not enough samples to adequately characterize the nature, extent, and magnitude of contaminated media (especially soil and groundwater contamination, but also sediment), resulting in significant uncertainties that undermine EPA's findings, remedies, and acceptance of "no further action;"

> *EPA disagrees with this comment and notes that, contrary to the comment, numerous samples were collected and the characterization was sufficient. In 2005 thirteen surface and twenty-four subsurface soil samples were collected from 13 soil borings. Seven surface water and seven sediment samples were also collected at that time. In 2007 three surface water and four sediment samples were collected (also see response to General Comment Number 1). Additionally, groundwater data confirmed the lack of impact from the units and conservative Human Health Risk Assessments concluded current risk is negligible. Institutional controls preventing future exposure to hypothetical residents are appropriate.*

2) Likewise, there are not enough samples to adequately characterize the extent and magnitude of the wastes left in place;

> *See response to Comment 2, number 1 immediately above.*

3) In accepting RAAP's proposals, EPA ignores its preference for waste/source removal, the use of engineered controls, and minimizing reliance on institutional/land use controls and long-term maintenance;

> *The remedy proposed and selected at the Facility satisfies the statutory requirement that it be protective of human health and the environment. The Final Remedy does include source removal and source control components as well as institutional controls. The remedial strategy was thoroughly evaluated as set forth in the various reports included in the Administrative Record and is consistent with the objectives and requirements of applicable EPA guidance. Finally, the remedy selection process for the Facility included*

an evaluation which considered the three remedy selection criteria described in Section V of the SB.

4) The VADEQ permit often defers taking appropriate action at RAAP HWMUs (e.g., groundwater monitoring adequate to delineate plumes, and implementation of groundwater remedies) because the HWMUs are within or near a SWMU covered by the "EPA facility-wide corrective action permit," but this EPA proposal too often fails to adequately delineate the SWMU plumes let alone include the HWMU plumes, and equally frequently fails to implement any groundwater remedy beyond institutional controls…i.e., don't use the groundwater).

EPA disagrees with this comment for the following reasons: First, there are very few groundwater plumes of contamination onsite as borne out by groundwater monitoring results; second, none of the units addressed in this Final Decision, including SWMUs 41A and B, have associated contaminated groundwater plumes; and finally, EPA is unaware of any units regulated by VADEQ where unit corrective action has been deferred to EPA site-wide Corrective Action.

5) SWMU 41 (Red Water Ash Landfill). RAAP has asked EPA to violate its own guidelines and rules, and EPA is proposing to do so, in accepting the RAAP procedures and "no further action" (NFA) request, regarding SWMUs 41A and 41B. EPA clearly recognized that RAAP failed to take a sufficient number of samples to adequately characterize the area when it asked for more soil and groundwater monitoring at 41A and 41B, but instead of doing so RAAP has asked EPA to accept a faulty rationale which EPA now wrongly proposes to accept. RAAP has taken too few samples to adequately characterize the nature and extent of the waste (ash) and contaminated media (soil and groundwater) resulting in significant uncertainties regarding the extent of contamination, appropriate remedies, and the risk-based NFA finding. EPA needs to insist on more waste (ash) and media (soil, groundwater) samples to fully understand the situation before considering RAAP's proposal. EPA needs to explain why they are not requiring waste removal as part of the remedy at 41B, especially given EPA's strong and long-standing preference for seeking clean closure by removing waste in order to avoid the need for use of institutional controls and perpetual monitoring and care.

EPA disagrees with this comment and notes that SWMU 41B was fully characterized and evaluated for risk consistent with EPA policy and guidance. There is no unacceptable risk for maintaining SWMU 41 in its current state. (also see the response to 3). The remedial strategy was thoroughly evaluated in the various reports and is consistent with the objectives and requirements of applicable EPA guidance. Finally, the remedy selection process for the Facility included an evaluation which considered the three remedy selection criteria described in Section V of the SB.

6) By accepting this NFA, EPA will not only be approving the prohibition on future residential development at the site (and hopefully also playgrounds, schools, and parks), it will also be approving a prohibition on future groundwater extraction at this site. EPA needs to explain why they think the groundwater is not worthy of protection at this site since it appears that groundwater contamination is the primary transport mechanism of contamination from the site.

EPA needs to explain why they are approving a remedy that is not protective of the groundwater at this site and explain how this can be justified when it is inconsistent with EPA policy.

> *EPA wants to clarify that a no further action designation means that the use of the land and groundwater has no restrictions. There are no Institutional Controls implemented at this unit because there are no unacceptable risks identified. Additionally there are no groundwater restrictions on either SWMU 41A or 41B because the only current risk identified at SWMU 41B are activities that would disturb the buried waste. Therefore ICs implemented at SWMU 41B are consistent with the current industrial and projected future industrial land use at the site. EPA is prohibiting future residential use for a limited number of the corrective action units evaluated that total a very small footprint of the entire Facility. The majority of corrective action units with selected remedies have no land use restrictions (i.e. no prohibition of residential use). With respect to groundwater, all the units were evaluated pursuant to EPA policy and guidance and other than SWMU 40 there is no unacceptable risk from groundwater use. (Also see response to Commenter number 1.)*

7) Elsewhere VADEQ and EPA have stated that the (contaminated) groundwater discharges into the New River and that the resultant dilution results in negligible concentrations and therefore negligible risks. This has two problems: 1) because of the karst topography, neither agency can prove that all discharge is into the New River (in fact, they admit this), and 2) EPA has repeatedly said dilution is not an acceptable solution.

> *EPA disagrees with this comment for the following reasons. First, RAAP conducted numerous groundwater studies under EPA and VADEQ oversight and both agencies have concluded that there are no plumes of contamination discharging to the river addressed in the Final Decision. Second, given the results of the groundwater studies, namely that there is no groundwater contamination, the fact that the terrain is karst is of no concern. Third, based on its review of relevant studies and documents, EPA has concluded that all groundwater from the Facility discharges to the New River. EPA agrees that dilution is an unacceptable solution where there is contaminated groundwater which is not the case here.*

8) This remedy shifts future IC costs, liability, and potential future cleanup to the State or local community, whoever will ultimately become stewards of this land. The RAAP states in their RFI (p.2) that "the RAAP Army believes that Institutional Controls to prevent residential development and groundwater extraction and use are protective of human health and the environment." RAAP further states that the SWMU 41B ICs will also include a prohibition on digging at the site, and that "the transferee or lessee will be responsible for ensuring IC compliance by any future users." EPA is proposing to accept this despite EPA's longstanding belief that ICs are not very effective, are difficult to transfer to new owners (which is the intent here) and to enforce, and are especially problematic when applied to groundwater use (EPA's preference is to protect water resources to drinking water use).

> *EPA acknowledges the concern raised by the commenter but notes that an enforceable document in the form of a RCRA 3004(u) permit will likely be issued to RAAP for*

implementation of the final remedy. EPA disagrees with the commenter's point that ICs are not effective. Based on its review of the studies conducted at the Facility, EPA has concluded that ICs are the appropriate remedy for the SWMUs addressed in this Final Decision. Furthermore the use of ICs appropriately addresses the potential risk in a manner that is consistent with current and projected future industrial land use at the site.

9) RAAP has applied industrial use standards, asserting institutional controls will be used, in order for RAAP to ignore numerous contaminant exceedences of residential use levels[1].

[1] In accepting non-residential use, which can be done under EPA rules, EPA has proposed to ignore its own preferences to a) minimize the use of institutional controls and thereby b) seek the highest future use level of residential. In RAAP's favor on this issue is that in the foreseeable future RAAP will continue to operate and thereby provide adequate land use and institutional controls. Against RAAP on this issue is that it is hard for EPA to ignore the residential exceedences when they further have determined that the extent of the contamination has not been fully and properly characterized' i.e., what is the full extent of present and future contamination and thus the extent of the necessary institutional controls.

Unfortunately for RAAP, SWMU 41 also exceeds industrial use standards which RAAP then proposes EPA ignore using faulty arguments. RAAP argues there are only a limited number of industrial exceedences. Unfortunately, this could be due to insufficient number of ash and soil samples to fully characterize hot spots. More importantly, RAAP applies a 10-4 risk level when a 10-6 risk level is more appropriate given the data uncertainties (lack of enough samples to be confident that RAAP has come even close to identifying the hottest spots/highest concentrations to use in its risk assessment).

EPA disagrees with this comment. Consistent with EPA guidance, the data from the unit were initially compared to screening levels, residential and industrial, which are not cleanup levels. Based on the screening, a quantitative risk assessment was conducted to evaluate the unit. The result of the quantitative risk assessment concluded there was only a risk to future residences from ingestion of groundwater. See the response to Commenter 2, number 1) above that addresses insufficient samples.

10) RAAP argues that the small size of the site minimizes its impacts/risks and therefore the costs of remedial measures are not warranted. This fails to recognize that because of the small size of the site, the costs of the appropriate remedial measures are also minimized, and ignores the fact that leaving waste in place means increased long-term care and costs.

EPA disagrees with this comment. The risk from excavating SWMU 41B is greater than the risk of leaving the waste in place with ICs. Additionally, there is no unacceptable risk to maintaining SWMU 41B in its current state. Given the current and projected future use of the Facility, the selection of ICs for SWMU 41B is an appropriate remedy.

11) It appears that RAAP combined the results of the ash and soil samples to reach conclusions about the frequency, distribution, and concentration of contaminants which appear to be based on the faulty assumption that the distribution of contaminants at the sites would be homogeneous and/or randomly and evenly distributed. This appears to be a faulty assumption leading to faulty conclusions. The distribution of contaminants at the site would be expected to be quite heterogeneous and would be expected to have "hot spots." For example at 41B, "waste ash" would presumably be distinctly different and more contaminated than the "soil media" that

overlies, underlies, or borders it. At 41A, the contaminated material and residue that was discharged or disposed at the site (presumably containing metals, dioxins, HE, etc.) would again be quite heterogeneous and the resulting distribution would be expected to be highly variable and/or contain "hot spots." The Army has conducted numerous studies at other sites, including TNT leach beds that demonstrate that HE contamination in surface samples at TNT leach beds had extreme distribution and great variance between sample locations (Tom Jenkins, et al). It appears that RAAP concluded that most of the detections are relatively low (with the exception of a few "outliers") to justify the insufficient number of samples. However, the few outliers (having greater variance) could very well represent the higher concentration ash samples. The fact that there are outliers suggests that there are hot spots (perhaps representing ash) that have higher concentration that have not been fully characterized.

> *A sample of the ash was collected and analyzed for Toxicity Characteristic Leaching Procedure parameters and since the results were found to be below regulatory limits the buried ash is not considered a hazardous waste. Discrete sampling and laboratory analysis of ash and soil samples from SWMU 41B concluded the same; in fact, the ash samples were not found to have significantly different results than the soil. The sampling program conducted was biased towards locations where contamination was likely to be the highest; in other words, a heterogeneous distribution was assumed. The number of samples was previously addressed above Commenter 2, Number 1.*

12) RAAP proposes a non-protective final remedy at 41B, which was a landfill for the disposal of "red water ash." According to the 1987 RFA, "it is reported that the landfill does not did not have a liner or leachate collection system. The cover does not meet any design criteria, and no known formal closure took place." RAAP proposes to leave the waste ash "in place" which is overlain by clay fill material which is not constructed or designed to minimize the need for further maintenance nor to control, minimize, or eliminate the release of contaminants to prevent threats to human health or the environment. Essentially, the "cover" is not designed and constructed as an engineered cap to prevent infiltration of rainwater and the generation of leachate and subsequent migration of contaminants from the buried ash. There does not appear to be any run-on or run-off controls to divert rainwater and protect the clay cover from erosion. There is no requirement to conduct long term maintenance to ensure that the clay cover is maintained with sufficient vegetation to reduce erosion on what appears to be a fairly steep gradient. In fact, there are no plans to conduct long term maintenance of the cover to ensure its integrity and to reduce infiltration of rainwater and protect the waste ash from eventual erosion and exposure.

It appears that RAAP groups the ash sample results with the soil sample results in the summary tables such that it is impossible to determine which samples are ash and which are soil. Further, it is impossible to tell if a sufficient number of samples of ash were collected to determine its nature and extent. Likewise, it is impossible to determine if a sufficient number of soil samples were collected.

The waste ash would be expected to have the highest concentrations of contamination at the site and would be expected to serve as the main source of any continuing releases at the site. It is important therefore for RAAP to segregate this data and gather enough samples to fully characterize the extent (volume and concentrations) of this material before EPA can reasonably deviate from its policy to remove all waste as the preferred RCRA and Superfund remedy.

It appears only one sample was collected for perchlorate analyses and it is not clear whether this sample was of soil or ash. One sample is not sufficient for characterizing the nature and extent of any perchlorate contamination at the site.
The bottom line is that RAAP needs to demonstrate that leaving ash "in place" is consistent with a NFA and must do more sampling/monitoring of the buried waste ash, sediment, surface water, soil, and groundwater before EPA can determine the appropriate remedies and consider a NFA finding.

EPA disagrees with the comment for the following reasons. First, the remedy for SWMU 41B is not NFA; SWMU 41B has a Final Remedy consisting of ICs and will be enforced by the RCRA Permit. Second, the ash and soil were fully characterized; groundwater was characterized and risk was quantified. The conclusion of the studies conducted at SWMU 41B is that there is a risk to potential future residents. Third, there were four surface water and three groundwater samples collected for SWMU 41B in 2005 that were analyzed for perchlorate, among the other constituents, and perchlorate was not detected. Perchlorate is a highly mobile anion and based on the history of the unit would be detected in the groundwater if it were present. Finally, SWMU 41B is not a RCRA regulated landfill, but rather is a solid waste management unit and not subject to regulations that pertain to either hazardous or solid waste landfills. Based on the current and future land use, and the results of the risk assessment, the remedy of ICs is consistent with the level of risk.

Comment Number 3 (via mail) from Grant Hallock
Dear Sir:
I believe that Radford Arsenal should be shut down. Their inviormental (sic) record is bad. They have just paid $20,000 for flagrant inviormental (sic) violations.
The arsenal is situated in large populations of the area, this was not so when first started in the thirties some 80 years ago.
To prevent a huge tradgedy (sic) in the future, I pray you will consider my advice.

EPA acknowledges the concerns raised by the commenter but notes that the Agency, within the context of this Final Decision and Response to Comments, addressed the impacts of releases of hazardous wastes and hazardous constituents at and from the facility on human health and the environment. As described in detail in the Statement of Basis, incorporated by reference into this FDRTC, EPA determined that releases from the units with selected Final Remedies at the Facility have been addressed so that there is no unacceptable risk to human health and the environment. Consistent with EPA guidance, EPA selected either excavation and disposal or institutional controls as the remedy for those units where risk to human health and/or the environment was identified.

General Comment Number 4 (via email) from Jim McKenna, Radford Army Ammunition Plant:
1. Section I Introduction, page 1
There should be a statement either in the introduction or elsewhere that the ultimate goal is to get to the sites addressed in this Statement of Basis (SB) to Complete Without Controls or Complete With Controls, following the 2003 "Final Guidance on Completion of Corrective Action Activities at RCRA Facilities." The guidance is attached. It is suggested that this can be done by

inserting the following statement at the end of paragraph 1in Section I: "The sites listed in Table 1are understood and declared to be Complete Without Controls and the sites listed in Table 2 are understood and declared to be Complete With Controls".

2. Section III, B. Former Lead Furnace Area, 3. 1998 RCRA Facility Investigation, page 6
For clarity, suggest the following edit/addition in underlined italics:
"A RFI was conducted in 1998 to evaluate the extent of lead contaminated soil associated with the FLFA. Building foundations and surrounding soil were removed in March and May 1998. Soil samples were collected ..."

3. Section III, K Facility Screening Areas 18, 30, 60. 72., 77 and 79, L. 2010 No Further Action Determination, page 31
Two typographical errors, heading should read: "12." instead of "L." and the date in first sentence should read "On January 28, 2011 EPA agreed ... instead of "In November 2010 ..."

4. Section IV. Proposed Remedy, D. Institutional Controls, page 33
RFAAP does not have a "Facility Master Plan" and any permit condition would be implemented through various yet to be determined internal contract and procedural mechanisms. Suggest this sentence be reworded simply as follows: "These ICs will be implemented through permit conditions."

5. Section IV. Proposed Remedy, D. Institutional Controls, page 33
Request that the restriction on potable water use at SWMU 54 be removed as the final remedy has not been approved for this site therefore it is premature to apply any restriction at this time. Through approved work plans, interim measures have been taken to completely remove the source and Radford AAP is in the process of implementing monitored natural attenuation (MNA). Based on the data collected to date it is anticipated that the groundwater can be returned to unrestricted use at this site. Currently the site is within the plant's boundaries and will remain so for the foreseeable future, in any case well beyond the period in which an assessment and determination on the effectiveness of the MNA effort will likely be made.

6. Table 1 Units Recommended for No Further Action (NFA), Attachment 1
SWMU 35, 37, 38 Documentation should read RFI approved November 4, 2010, currently it reads November 2010.
SWMU 76, delete the parenthetical "(Inert Gas Plant)"
SSA 18 and 60 Documentation should read SSP approved January 28, 2011, currently it reads November 2010.
AOC P Documentation should read RFI approved November 4, 2010, currently it reads November 2010.
AOC Q Documentation should read RFI approved November 4, 2010, currently it reads November 2010.

7. The following comments for Section III address errors in the discussion of how preliminary remedial goals were developed or how site risks were described in approved documents. In each instance inaccurate text is identified with its replacement text. Incorporation of these comments will not affect the remedy selection.

A. Building 4343, 3. 2004 RCRA Facility Investigation/Corrective Measures Study (RFI/CMS), page 4 The sentence, "The greatest potential for exposure to chemicals was likely to result from the ingestion of chemicals in food, sediment and groundwater"
needs to replaced with

"Direct ingestion of soil and ingestion of food with accumulated contaminants of potential concern are the primary pathways for ecological terrestrial wildlife receptors. The overall recommendation for this site is removal to depth thereby addressing ecological risks. After soil removal, clean fill was placed to existing grade."
The sentences, "Preliminary remedial goals were based on EPA Office of Solid Waste and Emergency Response (OSWER) directives and VDEQ Voluntary Remediation Program guidelines, where available. For contaminants that did not have published directives, clean up levels were calculated using EPA risk based acceptable range of exposure."
need to be replaced with
"Preliminary remedial goals, clean up levels were calculated using EPA risk based acceptable range of exposure."

B. Former Lead Furnace Area, 5. 2008 RCRA Facility Investigation/Corrective Measures Study, pages 6 &7
The sentence, "A risk assessment was prepared on these pathways and receptors, and concluded that the greatest potential for exposure to chemicals was likely to result from the ingestion of chemicals in food, sediment and groundwater"
needs to replaced with
"Direct ingestion of soil and ingestion of food with accumulated contaminants of potential concern are the primary pathways for ecological terrestrial wildlife receptors. The overall recommendation for this site is removal to depth thereby addressing ecological risks. After soil removal, the site was regraded."
The sentence, "Preliminary remedial goals were based on EPA Office of Solid Waste and Emergency Response (OSWER) directives and VDEQ Voluntary Remediation Program guidelines, where available. "
needs to be replaced with
"Preliminary remedial goals were based on EPA Office of Solid Waste and Emergency Response (OSWER) directives."

C. Solid Waste Management Unit 39, 5. 2005 RCRA Facility Investigation/Corrective Measures Study, page 9
The sentence, "A risk assessment was prepared on these pathways and receptors, which concluded that the greatest potential for exposure to chemicals was likely to result from the ingestion of chemicals in food."
needs to replaced with
"Direct ingestion of soil and ingestion of food with accumulated contaminants of potential concern are the primary pathways for ecological terrestrial wildlife receptors. The overall recommendation for this site is removal to depth thereby addressing ecological risks. After soil removal, clean fill was placed to existing grade."

D. Solid Waste Management Unit 51, 6. 2005 RCRA Facility Investigation/Corrective Measures Study, page 12
The sentence, "The risk assessment concluded that the greatest potential for exposure to chemicals was likely to result from the ingestion of chemicals in food, sediment and groundwater" needs to replaced with

"There were no observable adverse effects from the screening level ecological risk assessment and further action to address ecological concerns are not warranted for surface soil. In any case, the overall recommendation for this site is removal to depth. After soil removal, clean fill was placed to existing grade."

F. Solid Waste Management Unit 57, 5. 2009 RCRA Facility Investigation/Corrective Measures Study, pages 16 and 17
Page 16, the sentences, "The greatest potential for exposure to chemicals is likely to result from ingestion of chemicals in food. Surface water and sediment exposure are not exposure pathways associated with SWMU 57, and no aquatic receptors were identified for the unit."
need to replaced with
"Direct ingestion of soil and ingestion of food with accumulated contaminants of potential concern are the primary pathways for ecological terrestrial wildlife receptors. The overall recommendation for this site is removal within the pond area thereby addressing ecological risks. After soil removal, the area will be brought to grade and eliminate the potential habitat for amphibians."
Page 17, the sentences, "In the Corrective Measures Study, preliminary remedial goals were based on the EPA OSWER directives, where available. For contaminants that did not have published directives, clean up levels were calculated using the EPA risk based acceptable range of exposure." need to be replaced with
"In the Corrective Measures Study, preliminary remedial goals, clean up levels were calculated using EPA risk based acceptable range of exposure."

EPA agrees with the clarifying information provided by the commenter and thus the clarifying information is hereby incorporated into the FDRTC. The single instance of a correction was the potable water use restriction on SWMU 54, which was text that was inadvertently left in the SB; there is no potable water use restriction on SWMU 54 as the remedy has yet to be selected.

General Comment Number 5 submitted by Heather Govenor (via email)
June 24, 2011

Building 4343 (EPA response in italics immediately following numbered comments)
2004 RCRA Facility Investigation

1. Please specify if the 2004 RFI risk evaluations included assessment of data collected in 1996 and 1999 in addition to 2002 data.

   The risk evaluations included the 1999 and 2002 data. Samples from 1996 were analyzed using TCLP methodology (which is appropriate for disposal characterization, but not for risk assessment).

2. Please specify which human receptors (current, future, industrial, construction, residential, etc.) and which ecological receptors (terrestrial plants and invertebrates, specific upper trophic level receptors) were included in the risk evaluation.

Human Receptors: *Current and future maintenance worker, future excavation worker, future adult resident, future child resident. See also Section 6 of the RFI/CMS report (http://www.radfordaapirp.org/inforepo/Library/2004-02.pdf)*
Ecological Receptors: *short-tailed shrew, American robin, the red fox, the meadow vole, and red-tailed hawk. See also Section 7 of the RFI/CMS report (http://www.radfordaapirp.org/inforepo/Library/2004-02.pdf)*

3. The text states that "The greatest potential for exposure to chemicals was likely to result from the ingestion of chemicals in food, sediment and groundwater." Please clarify if this is human exposure or ecological exposure. Also, what sediment is present at the site? Should this be "soil"?

   The sentence quoted describes exposure by both human and ecological receptors. The overall recommendation for this site is removal to depth, which means that all potential human and ecological risks of concern associated with soil at this location will be eliminated.

4. Please provide the conclusions of the ecological risk assessment. The text appears to provide only human health risk conclusions.

   From the executive summary of the report:

   "A screening level ecological risk assessment (SLERA) was performed to provide an estimate of current and future ecological risk associated with potential hazardous substance releases at Building 4343. In the risk characterization, Tier 1 and Tier 2 chemicals of potential ecological concern (COPEC) environmental effects quotients (EEQs) and HIs (summed EEQs) were estimated for the five selected receptor species. The Tier 1 EEQs were based on very conservative exposure assumptions, such as maximum intakes rates, minimum body weights, maximum bioconcentration factors (BCFs), area use factors of 100 percent, and maximum detected COPEC concentrations in surface soil. The Tier 1 EEQs were considerably greater than 100 for the five receptor species. The short-tailed shrew was predicted to be the most impacted, followed by the American robin, the red fox, the meadow vole, and red-tailed hawk.

   More realistic Tier 2 EEQs were also elevated, however, they were considerably lower than the Tier 1 estimates. Tier 2 HIs (rounded to two significant figures), were 280 for the American robin, 800 for the short-tailed shrew, 66 for the meadow vole, 1.4 for the red fox, and less than 1 for the red-tailed hawk. Cadmium was the COPEC contributing the most to the summed EEQ for each of the five wildlife receptors, while the robin was potentially impacted by concentrations of chromium and dichlorodiphenyl-trichloroethane (DDT), in addition to cadmium. Exposure pathways of most concern, based on the results of the food-chain modeling, were earthworm ingestion and plant ingestion. Incidental soil ingestion was also a significant contributor to the total estimated hazard for the meadow vole.

   A potential reduction in wildlife food supply was evaluated using a direct contact toxicity evaluation for soil invertebrates (such as earthworms) exposed to COPECs in surface soil. Maximum detected concentrations were used to estimate a Tier 1 EEQ, and EPCs more appropriate for invertebrate populations [e.g., the 95% upper confidence limit

(UCL) concentration] were used to estimate a Tier 2 EEQ. Tier 1 EEQs ranged from 0.2 to 4,550, with both chromium and cadmium having EEQs above 1,000. If chromium is assumed to be in the trivalent form, and not hexavalent, the chromium EEQ drops from 4,550 to 57. Tier 2 EEQs ranged from 0.1 to 1,215, with both chromium and cadmium having EEQs above 500. If chromium is assumed to be in the trivalent form, and not hexavalent, the chromium EEQ drops from 558 to 7. Based on the Tier 2 EEQ results, and assuming chromium is in the trivalent form (based on site-specific information), cadmium, chromium, and zinc are the direct contact COPECs in soil that are estimated to adversely impact the terrestrial invertebrate community, and therefore potentially reduce the food supply for higher trophic level wildlife such as the American robin, and short-tailed shrew."

5. Please specify the chemicals for which remediation goals were developed – the text mentions cadmium but implies multiple clean up levels were determined. Please provide the clean up goals (numeric values), and the basis of the goals (residential value, screening value, etc).

Identification of Remedial Goals for Cadmium in Building 4343 Soil

Medium	*Receptor*	*Calculated RG (HI=1.0)*	*Background (mg/kg)*	*Industrial RG (mg/kg)*	*Residential RG (mg/kg)*
Industrial Scenarios					
Surface and Total Soil	*Maintenance Worker*	*4,030*	*0.69*	*276*	*---*
Surface and Total Soil	*Industrial Worker*	*895*	*0.69*		
Total Soil	*Excavation Worker*	*276*	*0.69*		
Residential Scenarios					
Total Soil	*Adult Resident*	*629*	*0.69*	*---*	*70.3*
Total Soil	*Child Resident*	*70.3*	*0.69*		

Interim Measures

6. Please specify the metals that were remediated.
   As noted above, and in Section 8 of the RFI/CMS, cadmium was the only contaminant of concern for the site.

7. Please specify who approved the Interim Measures Completion Report – EPA? VDEQ? Other?
   The Army, EPA and VDEQ approved the IM Completion Report

Building 4343 (EPA note: *The comments are titled Building 4343 but it is apparent from the report titles and dates that the questions are for the Former Lead Furnace Area (FLFA)*)
1992 RCRA Verification Investigation

8. The text states that "inhalation of dust contaminated with metals was expected to be moderate to high for site workers." Should this read "*potential risk* from inhalation of dust...."?

   The SB accurately reflects the text in the reference report. The sentence in question specifies that the risk from inhalation of dust contaminated with metals was expected to be moderate to high for site workers.

9. Please specify which metals exceeded industrial risk based screening levels.

   Antimony, Lead Mercury and Thallium

1996 RCRA Facility Investigation

10. Was groundwater the only media collected for the 1996 RFI? Did any of the detected metals exceed screening criteria?

    In addition to groundwater, surface water and sediment samples were collected from a spring where groundwater likely discharges. The following metals exceeded screening criteria: Lead (surface water and sediment), beryllium (GW) and antimony (GW)

1998 RCRA Facility Investigation

11. Was lead the only metal analyzed in soil in 1998? If other metals exceeded screening levels in 1992, please indicate if they were also analyzed in 1998; if they were not analyzed, please explain why. Did the lead screening value change significantly from 1992 to 1998? Please explain exceedances of industrial screening values in 1992 but no lead exceedances of (presumably more conservative) residential screening values in 1998.

    According to the 1992 Verification Investigation, lead was the only metal required to be analyzed in soil during the 1998 RCRA Facility Investigation, and analytical results for lead were used to guide the clean-up and removal of lead contaminated soil associated with the lead smelting operations from World War Two. While there were lead exceedances of both industrial and residential criteria in 1998, the majority of the soil with concentrations exceeding the clean up criteria was removed and therefore screening values from 1992 are immaterial. The 2002 and 2007 sampling events were intended to delineate any remaining lead.

2008 RCRA Facility Investigation/Corrective Measures Study

12. Please identify what data were included in the risk evaluation presented in the 2008 RFI (1992? 1996? 1998? 2002? 2008?)

    Data from all of these investigations except 1998 soil data were used in the 2008 RFI. Data from soil that was removed in 1998 was excluded because it was no longer present onsite and therefore did not present a risk to human or ecological receptors.

13. Who approved the RFI/CMS on October 2008 – the EPA? VDEQ? Other?

    The Army, EPA and VDEQ approved the RFI/CMS.

14. Please specify the human health exposure pathways and ecological receptors that were included in the risk evaluations.

Human Health: Current and future maintenance workers, future industrial worker, future excavation worker, future adult resident (onsite), future child resident(onsite), future lifetime resident(onsite), , future adult resident (offsite), future child resident(offsite), future lifetime resident(offsite), Inhalation, ingestion and dermal absorption were all evaluated. Table E1-1, Appendix E of the 2008 Former Lead Furnace Area RFI/CMS report gives the complete rationale for each receptor and pathway (http://www.radfordaapirp.org/inforepo/Library/2008-10.pdf).
Ecological Receptors: short-tailed shrew, American robin, the red fox, the meadow vole, and red-tailed hawk. See also Section 7 of the RFI/CMS report (http://www.radfordaapirp.org/inforepo/Library/2008-10.pdf).

15. The text indicates that "the greatest potential for exposure to chemicals was likely to result from the ingestion of chemicals in food, sediment, and groundwater." Please specify that this is human exposure. What sediment is at the site? Should this say "soil"?

The sentence quoted describes exposure by both human and ecological receptors. The overall recommendation for this site is removal to depth, which means that all potential human and ecological risks associated with soil at this location will be eliminated. Sediment samples were obtained from the FLFA area during both the 1996 and 2007 investigations.

16. Please provide the conclusions of the ecological risk assessment.

From the Executive Summary:

> *"A screening level ecological risk assessment (SLERA) (Section 7.0) was performed to provide an estimate of current and future ecological risk associated with potential hazardous substance releases at the FLFA. The Tier 2 lowest observable adverse effect level-based food chain assessment results suggested potential adverse impacts to terrestrial wildlife (risk driver in parenthesis), such as the short-tailed shrew [copper, lead, hexachlorobenzene, TCDD toxicity equivalent (TE), zinc, hexachlorobutadiene, and Aroclor-1254], American robin (lead, copper, DDT, DDE, zinc, and chromium), and meadow vole (copper, lead, and zinc), as estimated environmental effects quotients (EEQs) were all above 1. The direct contact assessment results for soil invertebrates suggested that a reduction in wildlife food supply was possible due to the following chemicals of potential ecological concern (COPECs) in surface soil (arsenic, barium, copper, lead, nickel, and zinc). Based on the results of the SLERA conducted at the FLFA, further action to address ecological concerns was recommended for surface soil. The recommended further action included an evaluation of the residual ecological hazards that were estimated to remain at the site following a proposed cleanup to address human health concerns."*

17. The text indicates that unacceptable non-cancer risk was indicated for metals in groundwater (for future on-site and off-site child residents). The COPCs are not identified as originating from the FLFA – please indicate where the chemicals may be coming from and what, if

anything, is being done to determine the source of contamination. Please provide additional justification for excluding groundwater remediation (currently based on limited detections and "low" concentrations). Presumably the low concentrations still are indicated to pose risk. Was this human health risk evaluation based on the assumption of exposure to the maximum detected concentration in site media? Or was it based on the 95% Upper Confidence Limit of the mean or the arithmetic mean concentration? (i.e., How conservative was the assessment?)

As stated in Section 8.1 of the CMS:

"For groundwater, the HHRA selected PCE, chloroform, and vanadium as Constituents Of Interest (COI) for a residential and/or industrial future-use scenario. The maximum detected concentrations were used for the COIs in the HHRA. However, chloroform and PCE were not detected in the on-site well (LFMW01) and are present in upgradient wells from the FLFA, indicating that the FLFA is not the source of these constituents in groundwater. In addition, the low level chloroform detections (below MCL) are attributable to leaking potable water supply lines throughout the installation. Chloroform has also been detected at other sites downgradient from water supply lines at similar concentrations (Area O, for example). PCE was only detected in a single well (17MW-2), and the concentration was below its MCL. Vanadium was detected in a single groundwater sample (10 samples total) at a concentration of 20 ug/l, which exceeded the tapwater screening concentration in effect at the time of the investigation. It should be noted that the current EPA tapwater screening concentration for vanadium (2011) is 78 ug/l, and the concentration of vanadium in the single well sample would not pose an unacceptable risk. Therefore, CMOs for groundwater were not developed and these analytes are not discussed further in the CMS."

18. Please identify the chemicals identified as constituents of potential concern in soil, preliminary remediation goals, and the basis for PRGs.

COI	***Medium***	***Calculated RG (lesser of HI=1.0 or $1x10^{-5}$ risk)***	***Selected RG (mg/kg)***
Industrial Scenarios			
*Arsenic**	*Surface Soil*	*79*	*18*
	Surface Soil	*18*	
Residential Scenarios			
Copper	*Total Soil*	*2890*	*2890*
Lead	*Total Soil*	*n/a*	*400*
Dioxins/Furans as TCDD TE	*Total Soil*	*n/a*	*0.001*
Aroclor-1254	*Surface Soil*	*n/a*	*1*

COI	*Medium*	*Calculated RG (lesser of HI=1.0 or 1x10^{-5} risk)*	*Selected RG (mg/kg)*
	Subsurface Soil		*25*

**Arsenic is a Constituent Of Interest only under the industrial scenario. The rest of the analytes are only COIs under the residential scenario.*

USEPA has published recommended residential and industrial cleanup levels for lead (USEPA, 1998, 2003), Aroclor-1254 (USEPA, 1998), and dioxins/furans (USEPA, 1998) in soil. Copper and arsenic clean up levels were calculated using the EPA risk based acceptable range of exposure.

Interim Measures

19. Who approved the Interim Measures Work Plan – EPA? VDEQ? Army?
    The Army, EPA and VDEQ approved the RFI/CMS.

20. Again, please specify the chemicals of concern and remediation goals.
    See EPA response to comment 18 above.

Solid Waste Management Unit 39

2005 RFI/CMS

21. Text indicates that the 2005 RFI used data from the 2002 investigation. Why were the 1998 soil data not included in the risk evaluations presented in the RFI/CMS?
    1998 soil samples were also included in the risk assessment presented in the RFI/CMS.

22. Please specify which human health exposure scenarios and which ecological receptors were included in the risk evaluations.

    Human Health Receptors: current maintenance workers, future maintenance workers, future excavation workers, future adult residents, and future child residents. . See also Section 6 of the RFI/CMS report (http://www.radfordaapirp.org/inforepo/Library/2005-01.pdf)
    Ecological Receptors: short-tailed shrew, American robin, the red fox, the meadow vole, and red-tailed hawk. See also Section 7 of the RFI/CMS report (http://www.radfordaapirp.org/inforepo/Library/2005-01.pdf)

23. Text indicates that the "greatest potential for exposure to chemicals was likely to result from the ingestion of chemicals in food." Please verify that this is for human health exposures.

    The sentence quoted describes exposure by ecological receptors, not human health exposure. However, the overall recommendation for this unit is removal to depth, which means that all potential ecological risks, as well as human risks of concern associated with soil at this location, are eliminated.

24. It is not clear how surface water and sediment exposure pathways were identified. Presumably the earthen ponds hold water at least temporarily following rain events. Please elaborate on the absence of aquatic habitat.

Surface water and sediment exposure pathways were identified; however, the reason they are no longer considered aquatic habitat is because the ponds no longer exist. The depressions were filled up to the level of the surrounding ground surface and they are no longer earthen ponds.

25. Please indicate the conclusions of the ecological risk assessment. [Note that in more than one of these site summaries, text indicates clean up levels based on residential (human health) exposures, but there is no indication that risk to ecological receptors was acceptable. Please verify and indicate that clean-up based on risk to human health is also protective of ecological receptors.]

Based on Radford's analysis of the reduction of ecological risk, EPA has concluded that clean-up to human health criterion would be protective of ecological receptors. The remedy at this unit also included restoring the ponds to the surrounding grade after removal of the source area, which effectively placed a soil cap greater than 2 feet over the unit which thereby prevents ecological exposures.

Interim Measures

26. Please specify contaminants of concern and clean-up values and the basis of clean-up values.

Residential clean up criteria were selected. USEPA has published recommended residential cleanup levels for lead (400 mg/kg USEPA, 1998, 2003, and dioxins/furans (0.001 mg/kg USEPA, 1998) in soil. Arsenic and vanadium clean up levels were calculated using the EPA risk based acceptable range of exposure (see table immediately below).

Analyte	*Medium*	*Receptor*	*Calculated RG (lesser of HI=1.0 or $1x10^{-5}$ risk)*	*Background (mg/kg)*	*Industrial RG (mg/kg)*	*Residential RG (mg/kg)*
Industrial Scenarios						
Arsenic	*Surface and Total Soil*	*Maintenance Worker*	*39.7*	*15.8*	*15.8*	---
	Surface and Total Soil	*Industrial Worker*	*8.75*	*15.8*		
	Total Soil	*Excavation Worker*	*65.8*	*15.8*		
Vanadium	*Surface and Total Soil*	*Maintenance Worker*	*1,440*	*108*	*144*	---
	Surface and Total Soil	*Industrial Worker*	*321*	*108*		
	Total Soil	*Excavation Worker*	*144*	*108*		
Residential Scenarios						
Arsenic	*Total Soil*	*Adult Resident*	*5.0*	*15.8*	---	*15.8*
	Total Soil	*Child Resident*	*2.8*	*15.8*		
Vanadium	*Total Soil*	*Adult Resident*	*288*	*108*	---	*108*
	Total Soil	*Child Resident*	*37.7*	*108*		

Solid Waste Management Unit 51

2008 RFI/ CMS

27. Text indicates that "the risk assessment concluded that the greatest potential for exposure was likely to result from the ingestion of chemicals in food, sediment and groundwater." There is no prior indication of "sediment" at the SWMU – should this say "soil"? Please specify the human health and ecological receptors that were evaluated in the RFI.

    EPA agrees with the commenter and acknowledges the error; "sediment" should be deleted and replaced with "soil". The sentence quoted describes exposure by both human and ecological receptors. The overall recommendation for this site is removal to depth, which means that all potential human and ecological risks of concern associated with soil at this location will be eliminated.

28. Please specify the results of the ecological risk assessment.

    From the executive summary:

    "The Tier 2 no observable adverse effect level based food chain assessment results suggest potential adverse impacts to terrestrial wildlife for some chemicals (with chemical hazard driver in parenthesis following the wildlife species), such as the meadow vole (arsenic), short-tailed shrew (arsenic and TCDD), and American robin (zinc) via terrestrial invertebrate ingestion. However, more realistic lowest observable adverse

effect level based food chain assessment results suggest there is no potential adverse impacts as no individual chemical had an ecological effects quotient greater than or equal to one.
The direct contact assessment results for soil invertebrates suggest that a reduction in wildlife food supply is not likely due to chemicals of potential ecological concern (COPECs) in surface soil, and the potential for direct contact toxicity is not significant enough to recommend further action at SWMU 51.
Migration of COPECs in groundwater to surface water and sediment of the New River was determined unlikely due to the distance of this receptor area from the site and therefore was not deemed to be an ecological concern.
Based on the results of the SLERA conducted at SWMU 51; the fact that no wildlife rare, threatened, or endangered species have been confirmed at the SWMU 51 study area; the low level of calculated risk; and, the very small size of the SWMU (0.31 acres), further action to address ecological concerns is not warranted for surface soil."

Interim Measures

29. Please specify contaminants of concern and clean-up values and the basis of clean up values (industrial risk based screening values).

Shallow (< 15 feet) Soil Remedial Goals

Chemical	*Selected Cancer RG (TR =10^{-5})*	*Selected NC Hazard (HI=1)*	*Selected RG (0-15 ft bgs interval)*
1,3-Dinitrobenzene	*na*	*0.8*	***0.8***
2,4-Dinitrotoluene	*1.2*	*15.4*	***1.2***
2,6-Dinitrotoluene	*1.2*	*7.7*	***1.2***
Dioxins (TCDD TE)	*na*[a]	*na*[a]	***0.001***
Lead	*na*[a]	*na*[a]	***400***
Nitroglycerin	*47.7*	*0.76*	***0.8***
2-Nitrotoluene	*na*	*91*	***91.0***
4-Nitrotoluene	*51.0*	*31*	***30.8***
2,4,6-Trinitrotoluene	*31.9*	*4.4*	***4.4***
Aluminum	*na*	*1180*	***40041***[b]
Arsenic	*bkgd*	*na*	***15.8***
Iron	*na*	*bkgd*	***50962***
Manganese	*na*	*bkgd*	***2543***
Vanadium	*na*	*bkgd*	***108***

Deep Soil (> 15 ft) Remedial Goals

Analyte	Residential RBC	Industrial/ Commercial RBC	RFAAP Background	Maximum Deep Soil Concentration	Minimum Sludge Concentration	Selected RG	RG Source
Explosives (mg/kg)							
1,3-Dinitrobenzene	7.8	100	na	0.32	0.1	7.8	r-RBC
2,4,6-Trinitrotoluene	21	95	na	22	64	43	Avg of Min Sludge and Max Deep Soil
2,4-Dinitrotoluene	0.95	4.2	na	42	79	60.5	Avg of Min Sludge and Max Deep Soil
2,6-Dinitrotoluene	0.95	4.2	na	11	17	14	Avg of Min Sludge and Max Deep Soil
2-Nitrotoluene	780	10000	na	93	100	10000	r-RBC
4-Nitrotoluene	310	1800	na	45	60	310	r-RBC
Nitroglycerin	7.8	100	na	6.7	3300	67	10X Max deep soil
Metals (mg/kg)							
Aluminum	78000	1000000	40041	27700	8620	40041	Background
Lead	400	800	26.8	18.3	10.4	400	USEPA Interim Lead Clean-up Goal
Dioxins/Furans (ng/kg)							
2,3,7,8-TCDD TE	4.3	19	na			1000 ug/kg	OSWER Directive 9200.4-26 (USEPA 1998)

SWMUs 40 and 71

2009 RFI/CMS

30. Please specify which human health pathways and ecological receptors were evaluated in the RFI.

Although the site is likely to remain industrial in nature, both industrial and residential scenarios were assessed for human health including the ingestion, dermal contact, and inhalation pathways. Ecological receptors assessed for the site included terrestrial plants, soil invertebrates and microbial communities, and terrestrial wildlife (meadow vole, short-tailed shrew, red fox, American robin, and red-tailed hawk).

31. Text indicates that ecological risk was not unacceptable based on the spatial distribution of contamination. Please clarify what this means.

The existing text in the SB (last paragraph on page 14) states : "Ecological risk results for terrestrial receptors in potential contact with the SWMU materials indicated an unacceptable risk was not present in SWMU 40 and 71 due to the spatial distribution of contamination, and thus no remedial actions are necessary to address ecological concerns."
Per the RFI/CMS report Executive Summary under the SLERA section and Section 7: "SWMU 40: After consideration of spatial distribution of data at the site, the results of the SLERA, background concentrations, and the isolated nature of the landfill material in place at the site; there is adequate information to conclude that ecological risks are negligible and therefore there is no need for further action at the site on the basis of ecological risk. SWMU 71: After consideration of spatial distribution of data at the site, the results of the SLERA, background concentrations, and site characteristics; there is adequate information to conclude that ecological risks are negligible and therefore there is no need for further action at the site on the basis of ecological risk."

32. Was risk based on arithmetic or 95% UCL of the mean contaminant concentrations acceptable? Was there a low frequency of exceedances of screening values? Was there no indication of hot spots of contamination?

Per the RFI/CMS report Executive Summary under the SLERA section and Section 7, the refined risk assessments, which utilize the 95% UCLs, resulted in the conclusion that

ecological risks to receptors assessed at both SWMUs were negligible. Hot spots were not identified at the SWMU. With the exception of plants and invertebrates which are assessed using "screening levels", risks to terrestrial wildlife receptors are calculated on a dose intake basis rather than by a screening level basis; therefore, a frequency of exceedances is not available.

33. Institutional/Engineering Controls to limit human exposure to contaminants appears to be an appropriate strategy for soil contamination. However, for groundwater, an IC including restriction on potable use of groundwater does not appear to be protective: The 1996 Dye Trace Study and RFI concluded that contamination from SWMU 17 may be migrating west toward SWMU 40 and the New River – is it not also possible that groundwater from SWMU 40 is migrating toward the New River (which is a potable water source)? Please specify the COCs in groundwater that initiated the IC restricting potable use of groundwater at SWMU 40 (presumably those to be evaluated in the LTM program), and provide evidence that groundwater from SWMU 40 is not migrating to the New River (and therefore that the IC is sufficient to protect human health).

As discussed in the RFI/CMS Section 8.1.1, chloroform was detected in groundwater at levels above its tap water risk-based screening level (T-RBC) but below the EPA maximum contaminant level (MCL) drinking water standard, which is 80 ug/l. Based on the reported low concentration of a single constituent and the distance to the river from where the constituent was detected, migration to the New River is not a concern. As presented in RFI/CMS Section 10.2.3, regular groundwater monitoring also will be conducted as part of long term monitoring activities to monitor groundwater conditions in the landfill area to verify both the effectiveness of landfill containment and to confirm that significant releases have not occurred to groundwater that would pose a potential risk to human health and the environment.

SWMU 57

2009 RFI/CMS

34. Please specify which human health exposure pathways and ecological receptors were evaluated.

Although the site is likely to remain industrial in nature, both industrial and residential scenarios were assessed for human health including the ingestion, dermal contact, and inhalation pathways. Ecological receptors assessed for the site included terrestrial plants, soil invertebrates and microbial communities, terrestrial wildlife (meadow vole, short-tailed shrew, red fox, American robin, and red-tailed hawk), and amphibians.

35. Text indicates that the "greatest potential for exposure… is … from the ingestion of chemicals in food." Please specify that this relates to human health exposure.

The second paragraph in the SB states: "The greatest potential for exposure to chemicals is likely to result from the ingestion of chemicals in food. Surface water and sediment exposure are not exposure pathways associated with SWMU 57, and no aquatic receptors

were identified for the unit." The sentence quoted describes exposure to ecological receptors, not human health exposure.

36. Please clarify the lack of an aquatic exposure pathway at the SWMU. The 1992 Verification Investigation indicated metals detected in "sediment" from the lined ponds. Based on the asphalt lining of the ponds and presence of a drainage way extending from the pond to the New River, surface water is likely to have accumulated from precipitation events. As such, aquatic habitat may be present.

    In addition, the text indicates that "no aquatic receptors were identified for the unit," but later indicates potential risk to amphibians due to metals, PCBs, and SVOCs in "soil within the pond area." The evaluation of potential risk to amphibians implies aquatic habitat is both present at the site and was evaluated. Please clarify. Also, please clarify if "soil" within the pond area was evaluated as "soil" (compared to soil screening values) or was evaluated as "sediment" (compared to sediment screening values).

    - *Per Section 1.4.3.2 of the workplan (WPA 021) for the RFI/CMS at the site: "Due the small size of the site (0.027 acre) and the proximity to the New River (approximately 1500 feet), SWMU 57 would likely not be an attractive habitat to aquatic receptors with the exception of amphibians. Since amphibians were observed within the unit at the time of the July 2005 site visit, if the soil/sediment within the SWMU is to remain in place (i.e., no removal is proposed as part of the corrective measures) a qualitative assessment of potential impacts to amphibians will be conducted. SWMU 57 and the associated surrounding area will be assessed with respect to terrestrial receptors; therefore, soil represents the primary potential exposure medium for ecological receptors. Receptor categories and the species selected to represent the wildlife categories include: plant communities, soil invertebrate/microbial communities, omnivorous birds: American Robin (Turdus migratorius), carnivorous birds: Red-Tailed Hawk (Buteo jamaicensis), herbivorous animals: Meadow Vole (Microtus pennsylvanicus), omnivorous mammals: Red Fox (Vulpes vulpes); and carnivorous mammals: Short-Tailed Shrew (Blarina brevicauda)."*
      As outlined in WPA 021, plants, invertebrates, terrestrial wildlife, and amphibians were assessed as presented in Section 7 of the RFI/CMS, which resulted in the identification of a potential risk to plants, invertebrates and wildlife at the site due to metals and a potential risk to amphibians at the site due to metals, pesticides, total PCBs (polycyclic chlorinated biphenyls), one SVOC (semi-volatile organic compound), and high molecular weight PAHs (polyaromatic hydrocarbons). As presented in Section 7.2.3 of the RFI/CMS, elevated concentrations are primarily located within the pond area or its appurtenances.
      The overall recommendation for the unit was soil removal within the pond area and its appurtenances thereby addressing ecological risks at the SWMU 57. After soil removal, the area was brought to the same grade as the surrounding terrain eliminating the potential habitat for amphibians and therefore the unit requires no further action and was proposed as a completed remedy.

37. Please verify that potential ecological risks were considered in the identification of clean up levels. The remediation goals indicated are each less than current USEPA Ecological Soil Screening Levels with the exception of chromium (Eco-SSL = 57 mg/kg)(i.e., presumably human health risk was the more sensitive risk endpoint for these metals). Was chromium not identified as a COPC for ecological receptors?

Per the RFI/CMS RFI Section 8.1 last paragraph and Section 11.2.1, ecological risks were considered for the remediation area. The remedial goal established for chromium was equivalent to background levels at the Facility. The second to the last paragraph states: "In the Corrective Measures Study preliminary remedial goals were based on EPA OSWER directives, where available. For contaminants that did not have published directives, clean up levels were calculated using the EPA risk based acceptable range of exposure." The remedial goals were calculated using EPA risk-based criteria. The calculated remedial goals were then compared to background concentrations and the greater value was selected as the remedial goal.

SWMU 13

2010 RFI

38. Please specify which human health exposure scenarios and ecological receptors were evaluated in the RFI.

Industrial, residential, and adolescent trespasser scenarios were assessed for human health including the ingestion, dermal contact, and inhalation pathways. Ecological receptors assessed for the site included terrestrial plants, soil invertebrates and microbial communities, and terrestrial wildlife (meadow vole, short-tailed shrew, red fox, American robin, and red-tailed hawk).

SWMU 41A and 41B

2005 RFI

39. Please specify the human health exposure scenarios and ecological receptors that were evaluated in the RFI.

The 2005 RFI was never finalized and was superseded by the 2010 RFI. The 2010 RFI incorporated the data from the 2005 sampling effort [see 2010 RFI]. The human health exposure scenarios and ecological receptors were included in the 2010 RFI.

40. Text specifies that there were no "adverse impacts to terrestrial wildlife." What about aquatic impacts? Surface water and sediment were collected – were they evaluated as part of the ecological risk assessment?

This RFI was never finalized and was superseded by the 2010 RFI. The 2010 RFI incorporated the data from the 2005 sampling effort. Aquatic receptors were evaluated in the 2010 RFI (Great Blue Heron and Mink).

2010 RFI

This section specifies the human health exposure scenarios evaluated – this is what I am requesting be identified for the other SWMUs.

41. Please specify which ecological receptors were evaluated.

Terrestrial receptors: Meadow Vole, Short-tailed Shrew, Red Fox, American Robin, and Red-tailed Hawk
Aquatic Receptors: Great Blue Heron and Mink

SWMU 43

2010 RFI

42. Please specify which human health exposure scenarios and which ecological receptors were evaluated. The text indicates that the "human health risk assessment did not identify any COPCs in soil that posed an unacceptable risk to human health or the environment." Please delete "or the environment" or indicate how the HHRA assessed potential environmental (ecological) risk. Risk from ("primarily") PCE and arsenic in groundwater to potential adult and child residents was indicated. Potential risk to off-site recreational users (groundwater to surface water exposure pathway) was indicated to be acceptable. The New River is a drinking water source – please identify how potential risk to off-site *residents* who receive their potable water from the New River was evaluated and demonstrate that no unacceptable risk is indicated.

***Human Health receptors**: current/future maintenance worker, future industrial worker, future excavation worker, future adult resident, future child resident, and lifetime resident. Off-site adult and child residents were evaluated for potential exposures to groundwater in the event that groundwater migrates off site in the future. Off-site recreational users were evaluated to address potential future migration of COPCs in groundwater and springs/seeps at SWMU 43 to surface water at the New River.*
***Ecological Receptors**:*

- *Terrestrial receptors: Meadow Vole, Short-tailed Shrew, Red Fox, American Robin, and Red-tailed Hawk*
- *Aquatic Receptors: Great Blue Heron and Mink*

Mixing models were used to evaluate what portion of the water would be derived from New River flow and what portion is derived from groundwater. Those values were then used in the risk assessment. The offsite residential scenarios used in the risk assessment are much more conservative estimates of risk because they assume that the residents would be drinking the groundwater directly (without any mixing with New River water). The offsite recreational user was also evaluated for exposure to groundwater constituents from springs/seeps and river water.

SWMU 45

2010 SSP

43. Please specify which human health exposures and which ecological receptors were evaluated for risk.

Human health risk screenings for both industrial scenarios were completed for the unit. Due to the results of the human health risk screenings, a human health risk assessment was completed for the units. Although the unit is likely to remain industrial in nature, both industrial and residential scenarios were assessed for the human health risk assessment including the ingestion, dermal contact, and inhalation pathways. Ecological receptors assessed for the unit included terrestrial plants, soil invertebrates and microbial communities, and terrestrial wildlife (meadow vole, short-tailed shrew, red fox, American robin, and red-tailed hawk).

SSAs 18, 30, 60, 72, 77, and 79

2010 SSP

44. Please specify which human health exposures and which ecological receptors were evaluated for risk.

Although the units are likely to remain industrial in nature, human health risk screenings were completed for both industrial and residential scenarios. Ecological receptors assessed for the units included terrestrial plants, soil invertebrates and microbial communities, and terrestrial wildlife (meadow vole, short-tailed shrew, red fox, American robin, and red-tailed hawk).

Table 1

45. SWMU 71 – Please indicate if the EPA concurred with the findings of the RFI for SWMU 71.

Table 1 indicates that the RFI recommending NFA for the site was approved by EPA on June 30, 2009.

46. AOC Bldg 4343 – Please specify that EPA approved of the Interim Measures Report.

EPA approved the Interim Measures Report.

47. AOC Bldg 4343 – The text (p. 7) indicates that the "Interim Measures Completion Report" was approved in February 2010. Table says "Interim Measures Closure Report" with a date of April 1, 2010. Please verify title and dates of report.

B4343 Interim Measures Completion Report. EPA Approval Date: June 8, 2007
FLFA Interim Measure Completion Report. EPA Approval Date: April 1, 2010

48. RFAAP-047 – Please add that the EPA concurred with the findings of the RFI (as specified in Attachment 3) to be consistent with other entries in the table.

Although the Statement of Basis is not modified for the Final Decision EPA previously concurred with the findings of the RFI.

Public Comment on Statement of Basis, Radford Army Ammunition Plant, June 24, 2011, Submitted by Laura Olah, Executive Director, Citizens for Safe Water Around Badger (CSWAB) E12629 Weigand's Bay South Merrimac, WI 53561
(608) 643-3124
info@cswab.org

As part of the current and upcoming public comment on cleanup decisions at Radford Army Ammunition Plant -- a "sister" plant to Wisconsin's Badger Army Ammunition Plant -- we strongly encourage U.S. EPA to require environmental monitoring for all six isomers of dinitrotoluene (DNT) in all media in order to assure full and accurate characterization of potential risks to human health and the environment.

In addition to appropriate testing for all forms of DNT, it is also critical that testing and consideration of all potential degradation and biotransformation products of DNT be integrated in site characterization, remedy selection, risk assessments, and other decisions that may affect human health and the environment.

For DNT degradation products/impurities found in groundwater that are not currently regulated, CSWAB has successfully petitioned the State to establish health advisory levels (HALs) for drinking water. For o-, m- and p-nitrotoluene, Wisconsin has adopted HALs of 0.15, 200 and 2 micrograms per liter, respectively. State health officials are currently considering our petition for HALs for 6 additional degradation products of DNT: 4-amino-2-nitrotoluene, 4-amino-3-nitrotoluene, 2-amino-4-nitrotoluene, 2-amino-6-nitrotoluene, 2-amino-3-nitrotoluene, and 3-amino-4-nitrotoluene.

Given the both fate and transport and the relative toxicity of the impurities, degradation and biotransformation products of DNT may great vary from 2,4- and 2,6-DNT, these additions are imperative to assure the protection of human health and the environment.

Please see attached documents and maps for additional supportive information. And please let us know if there is any additional information or documentation that would be helpful.

Thank you for the opportunity to comment on this important decision-making process.

EPA Response:

- *Unlike Badger Army Ammunition Plant, dinitrotoluene (DNT) is not a contaminant of major concern at Radford; it is not a risk driver. There appear to be few instances of DNT exceedances of health based screening concentrations, and to date, in areas where*

screening concentrations were exceeded, corrective actions have been taken. EPA will continue to include DNT in any future investigations at Radford; however, remediation at the majority of the units has been completed.

- *It is not cost effective to perform analysis for the minor isomers of DNT when there is little evidence that the primary DNT isomers, 2,4- and 2,6- are present at significant concentrations at Radford.*

- *The minor DNT isomers are toxicologically similar to the 2,4- and 2,6- isomers. Therefore, EPA is not missing a different or unique potential adverse effect by analyzing for the major isomers only. In addition, the significant conservatism inherent in EPA risk methodologies ensures that risks are always overestimated and remedies are protective.*

- *Neither EPA nor any state other than Wisconsin has promulgated standards for drinking water for the minor isomers of DNT to date. EPA has developed a toxicity criterion for DNT mixtures which can be used to assess risk, and supporting studies for this criterion included research on technical grade DNT, which includes the minor isomers.*

- *Single (or a limited number) of screening level exceedances for a contaminant does not necessarily translate into an unacceptable risk in the comprehensive baseline risk assessment.*