Radford Army Ammunition Plant

FACT SHEET
SWMUs 40 and 71
(December 2009)

Introduction

This fact sheet describes the recommended action for contaminated soil at Solid Waste Management Unit (SWMU) 40 – Nitro Landfill and SWMU 71 – Flash Burn Area at Radford Army Ammunition Plant (RFAAP). This alternative was recommended in accordance with the Resource Conservation and Recovery Act of 1976 (RCRA), the Hazardous and Solid Waste Amendments of 1984 (HSWA), the RFAAP RCRA permit requirements (USEPA, 2000) (EPA ID No. VA1210020730), and the Final RCRA Corrective Action Plan (USEPA, 1994), as applicable.

Background

SWMU 40 is an approximate 2 acre landfill area and SWMU 71 comprises an approximate 2,250 square foot (ft^2) area conterminous with the southwestern corner of the landfill. 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. 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 (Dames & Moore 1992).

The RFAAP RCRA Corrective Action Permit identified SWMUs 40 and 71 as areas of concern that had the potential to pose a threat or potential threat to human health and the environment.

RCRA Facility Investigation (RFI)/Corrective Measures Study (CMS)

RFI field efforts were conducted at the sites from 2002 through 2007. Based on the results of the RFI investigation and risk assessments, the primary site-related chemical of concern (COC) identified in soil at SWMU 40 was aluminum. COCs were not identified in soil for SWMU 71. Chloroform was identified as a COC in site groundwater at levels above its United States Environmental Protection Agency (USEPA) tap-water risk-based screening level (T-RBC) but below the MCL for trihalomethanes. Chloroform was not detected in soil at the sites.

The RFI fate and transport assessment and risk assessments identified a requirement to evaluate corrective measures for SWMU 40 but did not indicate a requirement to evaluate corrective measures at SWMU 71 based on the current and future scenarios evaluated. Corrective measures objectives (CMOs) identified for SWMU 40 included: 1) maintain containment of the landfill material at the site and implement necessary controls to prevent future uncontrolled human exposure to this landfill material, and 2) implement any necessary measures to stabilize and repair the landfill cover at the northern edge of the landfill area to prevent any further mass transport of soil material in this area.

Corrective Measure Alternative Recommendation

Two corrective measures alternatives for SWMU 40 in addition to a baseline no further action alternative were developed for the site including:

- Alternative No. 1: No Further Action;
- Alternative No. 2: Institutional Controls, Engineering Controls, and Long-Term Monitoring and Maintenance:
- Alternative No. 3: Excavation of Soil/Landfill Material and Offsite Disposal for Clean Closure and Unrestricted Land Use.

The three alternatives were evaluated with respect to criteria specified in Attachment D of the RFAAP RCRA Permit (EPA 2000) and criteria for evaluating corrective measures alternatives in Section IV Part E of the RCRA Corrective Plan guidance document (EPA 1994a).

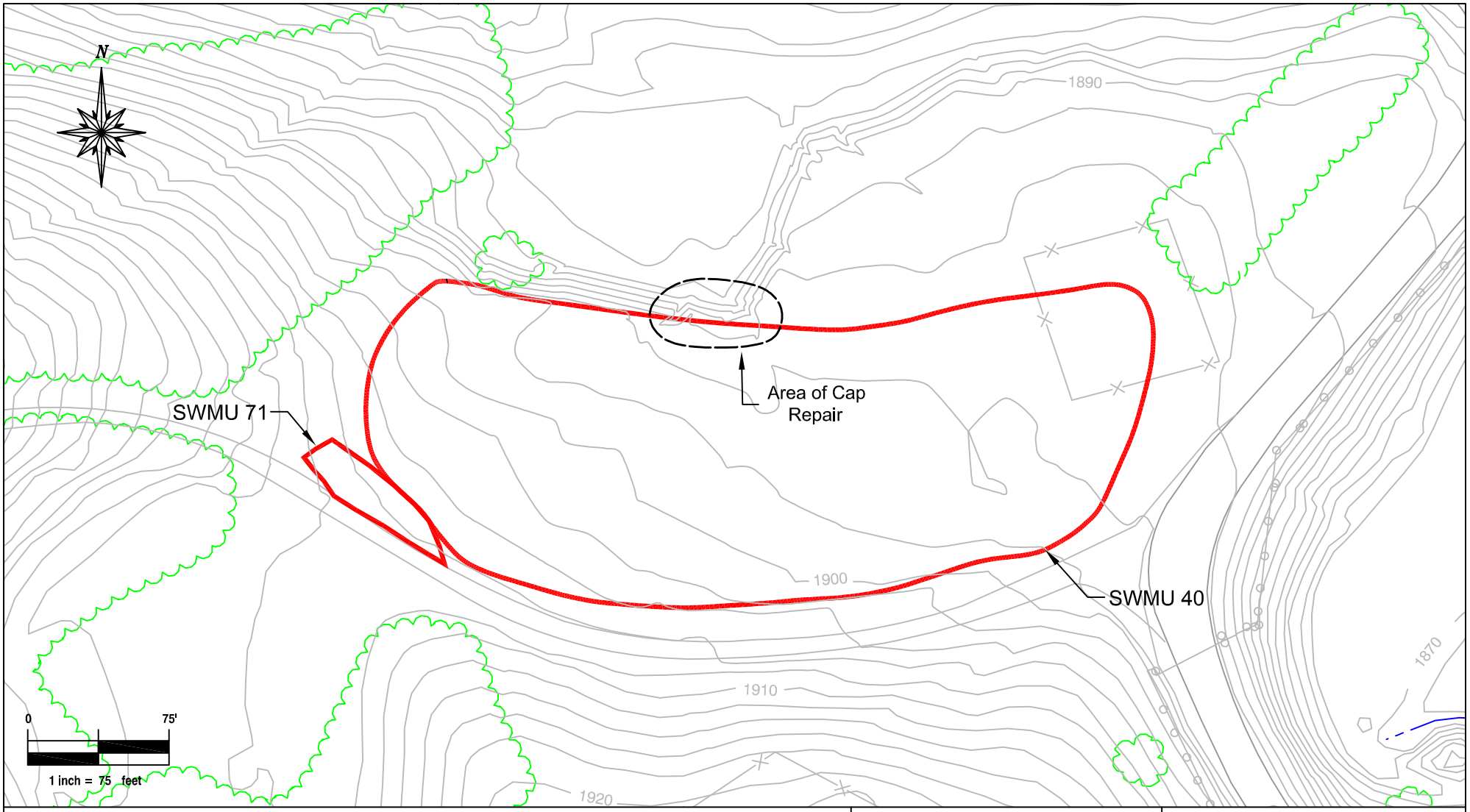
Alternative Two was selected as the final recommended alternative for SWMU 40 because it will: 1) effectively achieve each of the CMOs by providing for continued containment of landfill material at the site, preventing future uncontrolled human health exposure to the waste material, repairing the small areas of the cap that have eroded, and achieve the required CMOs at one eighth the total cost of Alternative 3 expressed as total dollars and at one eighteenth the total cost of Alternative 3 when costs are expressed as net present value. Implementation of Alternative Three would exceed the established CMOs but would require transferring waste material from landfill to another at significant cost without reduction of volume or toxicity.

Implementation of Alternative Two, including implementation of ICs, is expected to be completed in less than six months, with cap repairs requiring less than 30 days to complete after site mobilization. This time frame is considered an estimate and the actual time to complete the corrective measures will be subject to site-specific conditions.

Implementation of Alternative Two will include the following:

- Repairs to the landfill cap;
- Implementation of ICs.
- LTM for 30 years including: inspection and maintenance of the landfill cap, semi-annual sampling of three groundwater monitoring wells for five years followed by annual sampling for 25 years, and preparation of annual LTM reports.

The data, findings, assessments, and recommendations were repoted in the SWMUs 40 and 71 RFI/CMS Report (Final), April 2009, and approved by the USEPA and VDEQ in June 2009.



Legend

Topographic Contour (feet mean sea level)

SWMU Area

FIGURE 1
Corrective Measures Alternative 2 - Engineering Controls

Date: January 2008	Job Number: 21354880
Prepared By: DBC	Reviewed By: JOS
Scale: 1" = 75'	File Name: Fig.10-1 Corr.Meas.2

SWMUs 40 and 71

RFI/CMS Report
Radford Army Ammunition Plant
Radford, Virginia

URS Group, Inc.
5540 Falmouth Street
Suite 201
Richmond, Virginia 23320

Radford Army Ammunition Plant

FACT SHEET
SWMU 45
(December 2009)

Introduction

The United States Environmental Protection Agency (USEPA) issued a RCRA Corrective Action Permit to the U.S. Department of the Army (Army) and Alliant Ammunition and Powder Company (Alliant) on October 31, 2000. Within the RCRA Corrective Action permit (Part II, Section D.4), there is a provision allowing for Solid Waste Management Units (SWMUs) or Areas of Concern (AOCs) which are determined to represent negligible or minimal impact to be investigated in accordance with the EPA approved Site Screening Process (SSP). This SSP was completed to assess whether there had been releases of hazardous substances, pollutants, contaminants, hazardous wastes, or hazardous constituents to the environment from SWMU 45, and determine whether the site should proceed further through the RCRA facility investigation (RFI) process, be the subject of an interim removal action or be considered for no further action. For the SSP, the following five distinct tasks were undertaken:

- Performance of a Desktop Audit and site visit to determine the scope of the SSP site-specific Work Plan(s);
- Development of an SSP site-specific Work Plan outlining a Sampling and Analysis Plan as well as a risk screening plan (human health and ecological, as appropriate) for EPA approval;
- Performance of SSP field work in accordance with the approved SSP Work Plan;
- Evaluation of SSP data and completion of pre-remedial risk screening; and
- Determination of the need for further investigation of the SSA, an interim removal action at the SSA or preparation of a No Further Action Decision Document, per the RCRA Corrective Action permit, based on results of the SSP and risk screening.

This fact sheet describes the recommended action for contaminated soil at Solid Waste Management Unit (SWMU) 45 – an inactive, sanitary landfill located in the north-central section of the Main Manufacturing Area (MMA) at Radford Army Ammunition Plant (RFAAP).

Background

SWMU 45 comprises an approximate 3.4-acre study area located in the northwest section of the MMA at RFAAP on the alluvial terrace south of the New River and east of calcium sulfate drying bed/disposal areas (SWMU 38 and AOC Q).

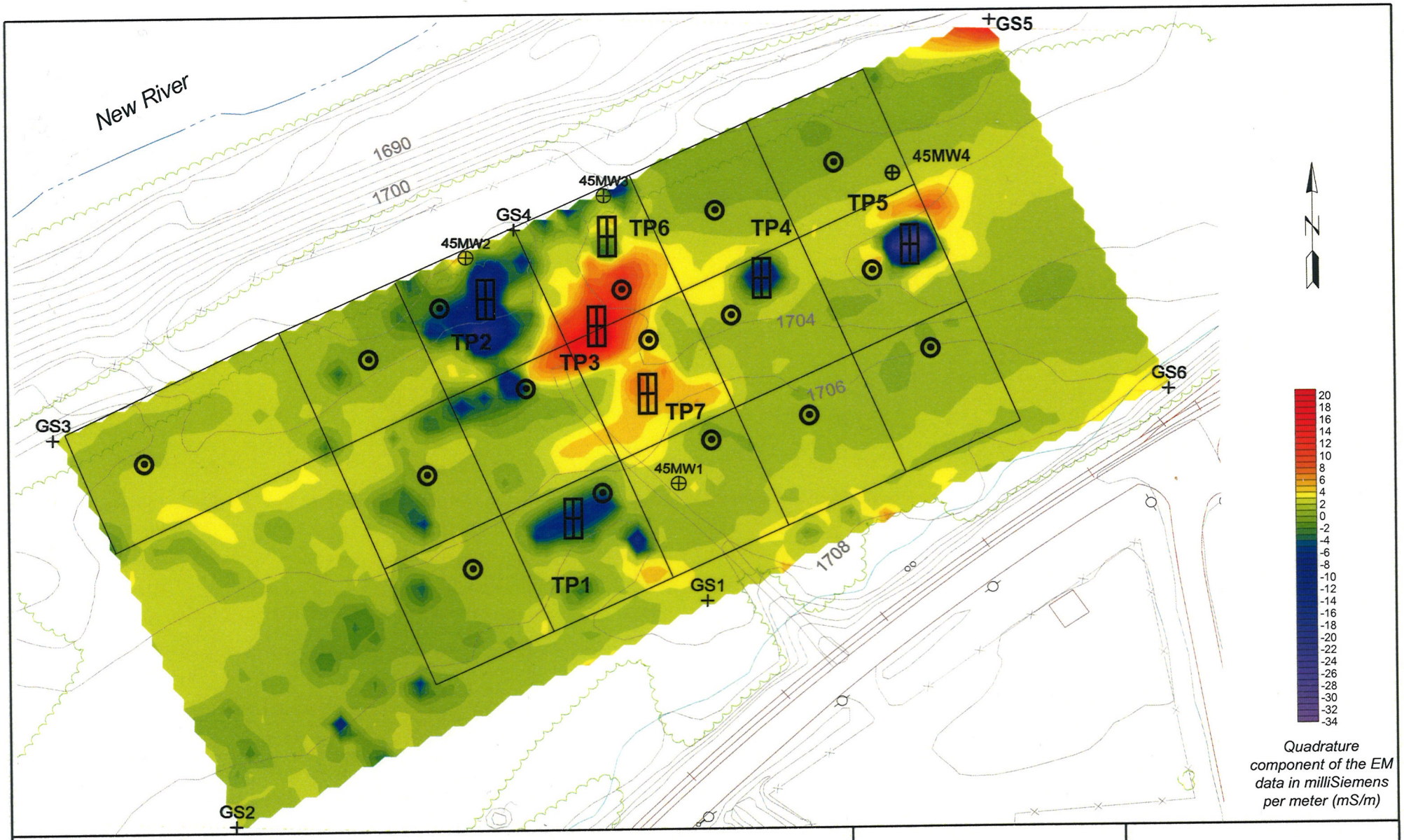
The RFAAP RCRA Corrective Action Permit identified SWMU 45 as an area of concern that had the potential to pose a threat or potential threat to human health and the environment. A Verification Investigation (VI) was conducted by Dames & Moore in 1992. The objective of the VI was to evaluate whether toxic or hazardous contaminants were present and had the potential of migrating beyond the boundaries of the identified SWMU. The VI included a geophysical survey of an approximate 5-acre study area, and installation and sampling of three groundwater monitoring wells. The reconnaissance-level geophysics survey was conducted using the EM-31 in conductivity mode and a proton magnetometer. The survey covered an area of 250 by 600 ft and shows the summary interpretation of the geophysical data including three potential burial areas and a potential metallic object anomaly.

SSP Investigation

The site screening process field efforts were conducted at the site in 2008. Sixteen direct push borings and seven test pits were used to characterize soil conditions at SWMU 45. Groundwater samples were collected from existing wells 45MW1, 45MW2, 45MW3, and newly installed monitoring well 45MW4 in May 2008. An additional groundwater sample was collected from 45MW2 in August 2008. The investigation identified a 0.2 acre area containing sanitary landfill material (milk cartons, bottles, etc.). In addition, the investigation also identified three areas where metallic and other debris were located within the surficial soil (0-2 feet

below ground surface) totaling approximately 0.1 acres. The SSP evaluation resulted in a recommendation of no further action for the site.

These data, findings, assessments, and recommendations are contained in the SWMU 45 SSP Report, January 2009, and is currently being reviewed by the USEPA and Virginia Department of Environmental Quality (VDEQ).



= Monitoring Well

= Test Pit Location

= Direct Push Soil Sample Location

Scale: 1 inch = 105 feet

0 105 feet 210

Geophysical Survey Data provided by: ATS International Advanced Technical Services

FIGURE 1
SSP Sample Locations

Date: August 2008	URS Project #: 11656351
Prepared by: DBC	Approved by: JOS
Scale: As Shown	File Name: Fig1 Sam.Locs

SWMU 45
SSP Investigation Report
Radford Army Ammunition Plant
Radford, Virginia

URS Group, Inc.
540 Falmouth Street
Suite 201
Richmond, Virginia 23230

Radford Army Ammunition Plant

FACT SHEET
SWMU 54
Propellant Burning Ash Disposal Area

(December 2009)

Introduction

This fact sheet describes the approved recommended action for contaminated soil and groundwater at Solid Waste Management Unit (SWMU) 54 – Propellant Burning Ash Disposal Area at Radford Army Ammunition Plant (RFAAP). This alternative was recommended in accordance with the Resource Conservation and Recovery Act of 1976 (RCRA), the Hazardous and Solid Waste Amendments of 1984 (HSWA), the RFAAP RCRA permit requirements (USEPA, 2000) (EPA ID No. VA1210020730), and the Final RCRA Corrective Action Plan (USEPA, 1994), as applicable.

Background

SWMU 54 is a former disposal area situated on approximately 5 acres within the easternmost section of the Horseshoe Area. In the late 1970s, ash from propellant burning operations at SWMU 13 was reportedly disposed of at the site. Propellant ash is a residue resulting from the burning of waste explosives, propellants, and laboratory wastes. The SWMU consists of two non-contiguous areas (Area A and Area B). Area A is an approximate 0.58-acre (approximately 100 by 320 feet (ft)), triangular shaped disposal area in the southeastern portion of the site. Area B is an approximate 1.09-acre area (approximately 240 by 240 ft) in the northwestern portion of the site.

The RFAAP RCRA Corrective Action Permit identified SWMU 54 as an area of concern that had the potential to pose a threat or potential threat to human health and the environment. In 1999 an interim measure was conducted at Area A and Area B of SWMU 54 which consisted of the excavation of "hot spot" areas of lead and explosives in soil. Approximately 1,827 tons of soil were excavated and disposed offsite at the Pinewood South Carolina Landfill. Based on the results of the interim actions, additional investigation of both Area A and Area B was recommended to confirm the effectiveness of the interim action, as well as, evaluate and assess current conditions at the sites and provide recommendations regarding potential corrective measure requirements at the sites.

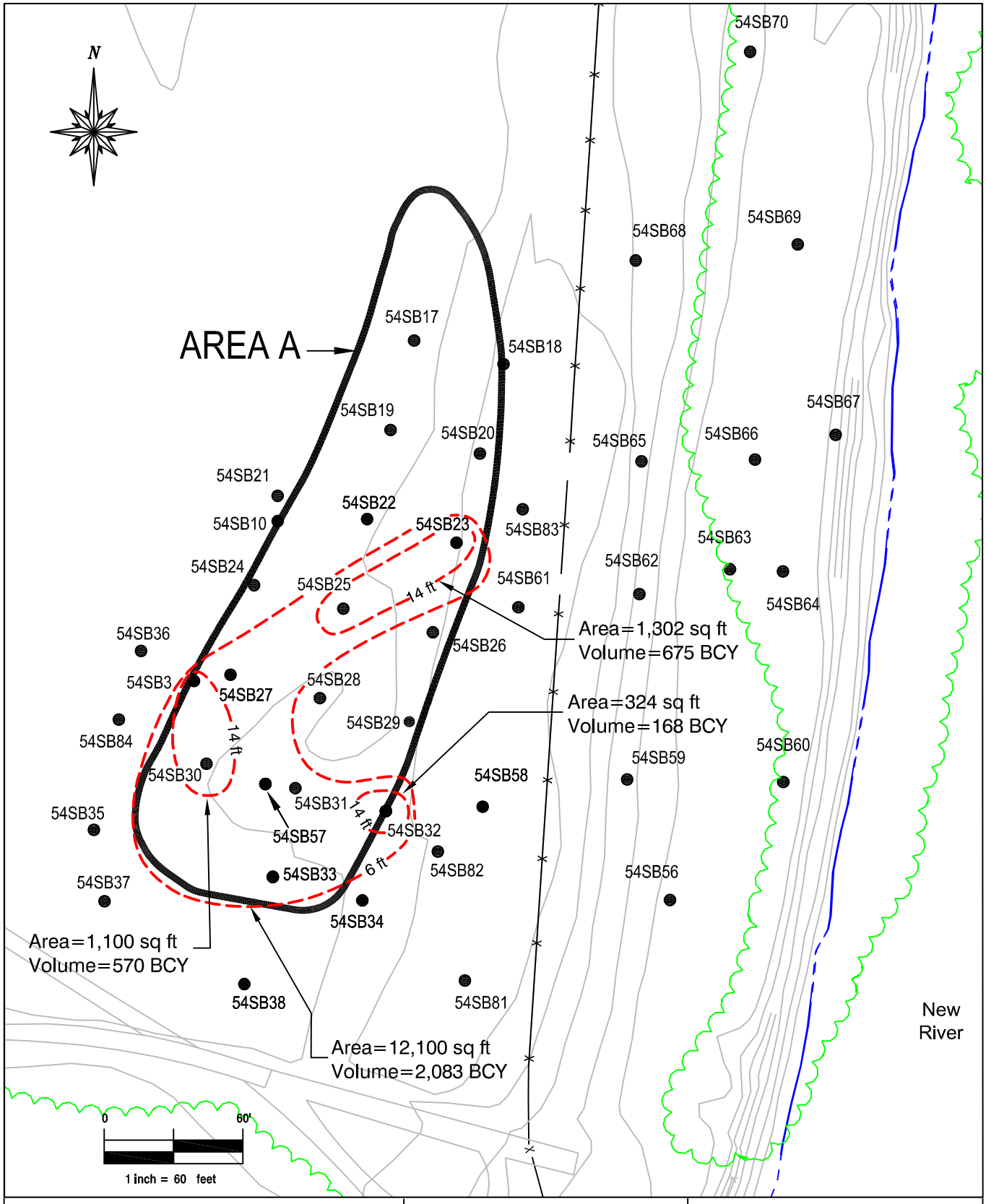
RCRA Facility Investigation (RFI)/Corrective Measures Study (CMS)

These additional RFI field efforts were conducted from 2002 through 2007. The primary site-related chemicals of concern identified in soil at the site are those associated with propellant ash including lead, explosives (2,4,6-trinitrotoluene (2,4,6-TNT), dinitrotoluenes (DNTs), cyclotrimethylenetrinitramine (RDX), and nitroglycerin), and dioxins. The concentration of explosives in soil was less than 1% and therefore considered non-reactive. Explosives (2,4,6-TNT, DNTs, and RDX) and perchlorate were detected in site groundwater at levels of concern, with the release occurring from Area A. The detected concentrations of explosives and perchlorate during the last round of groundwater sampling in September 2007 were low levels below the tap water risk-based concentration with the exception of the sample from one of the ten site monitoring wells. Groundwater impacts were not detected at disposal unit wells at Area B at levels of concern. Due to the nature and extent of the chemicals of potential concern (COPCs) at the sites and the presence of contaminants in groundwater, the corrective measures assessed for the sites focused on the soil migration to groundwater pathway which was determined to be protective of groundwater and surface water of the adjacent New River, as well as, human and ecological receptors.

The RFI/CMS resulted in the recommendation of excavation of Soil at Area A and Area B, Offsite Disposal, and Monitored Natural Attenuation (MNA) of Groundwater. The recommended corrective measure will effectively achieve the corrective measures objectives (CMOs) and remedial goals (RGs) while also providing for future unrestricted use of the site. Removal of the soil source areas will prevent future leaching

of COPCs to groundwater and allow for continued attenuation of COPCs in groundwater to levels at or below RGs; thereby restoring groundwater. The soil component of the corrective measure is expected to be completed in less than one year. MNA is expected to require five years or less of performance groundwater monitoring to demonstrate achievement of CMOs and RGs.

These data, findings, assessments, and recommendations were reported in the RFI Report for Solid Waste Management Unit 54 (Final), September 2008, and approved by the U.S. Environmental Protection Agency (USEPA) Region III and the Virginia Department of Environmental Quality (VDEQ) in October 2008.



Legend

- Approximate SWMU Boundary
- Soil Boring Location
- Remedial Boundary
- 6 ft/14 ft — Estimated Average Depth of Removal
- BCY — Bank Cubic Yards

Figure 1a

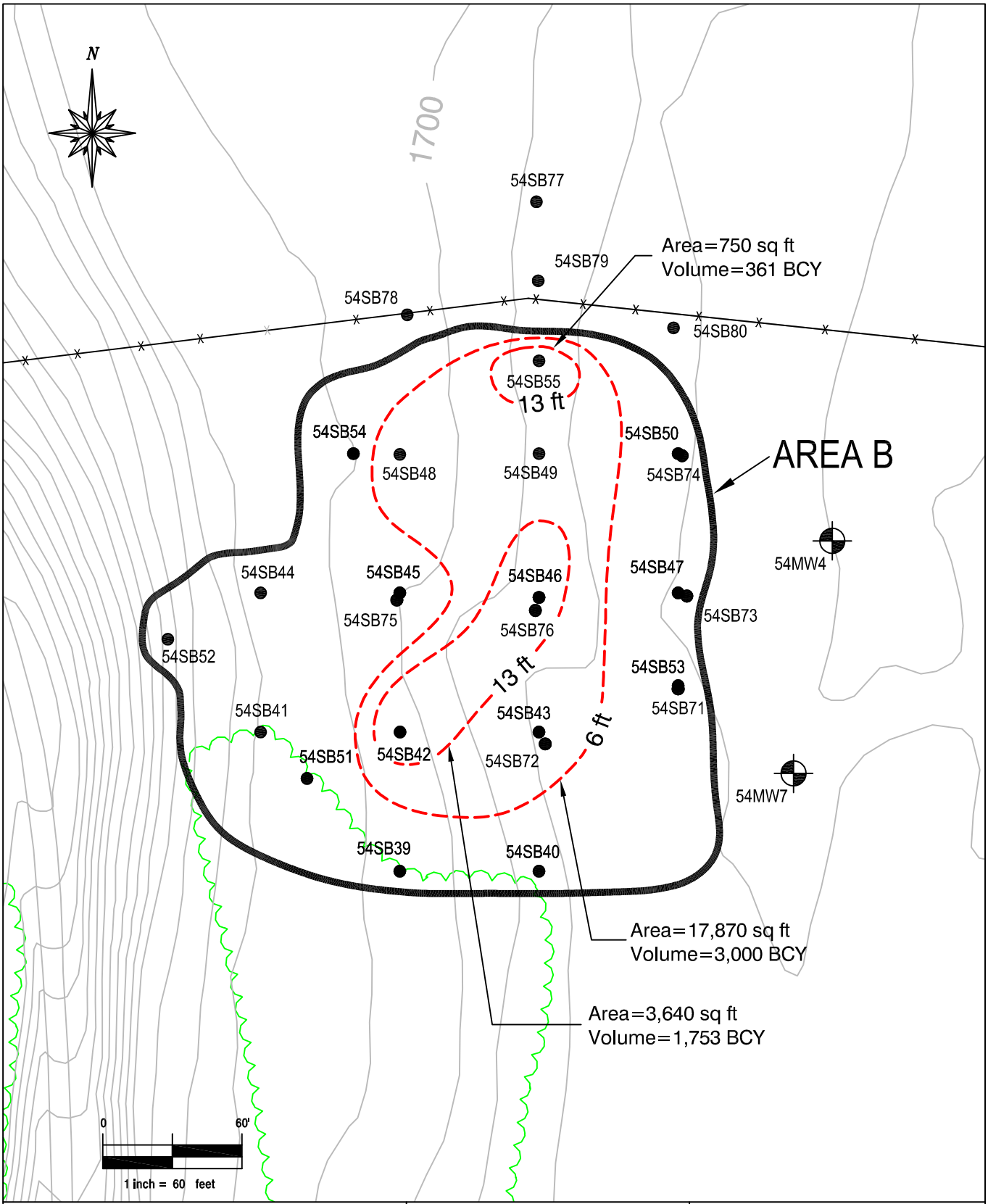
Area A - Remedial Boundaries for Soil

Date: April 2007	URS Project #: 21355035
Prepared by: DBC	Approved by: CLD
Scale: 1 inch = 60 feet	File Name: Fig8-1 A Rem Bound

SWMU 54

RCRA Facility Investigation
Radford Army Ammunition Plant
Radford, Virginia

URS Group, Inc.
5540 Falmouth Street
Suite 201
Richmond, Virginia 23230



Legend

- Approximate SWMU Boundary
- Soil Boring Location
- Remedial Boundary
- 6 ft/13 ft — Estimated Average Depth of Removal
- BCY — Bank Cubic Yard

Figure 1b

Area B - Remedial Boundaries for Soil

Date: April 2007	URS Project #: 21355035
Prepared by: DBC	Approved by: CLD
Scale: 1 inch = 60 feet	File Name: Fig8-3 B Rem.Bound

SWMU 54

RCRA Facility Investigation
Radford Army Ammunition Plant
Radford, Virginia

URS Group, Inc.
5540 Falmouth Street
Suite 201
Richmond, Virginia 23230

Radford Army Ammunition Plant

FACT SHEET
SWMU 57
(December 2009)

Introduction

This fact sheet describes the recommended action for contaminated soil at Solid Waste Management Unit (SWMU) 57 – the Pond by Buildings 4931 and 4928 at Radford Army Ammunition Plant (RFAAP). This alternative was recommended in accordance with the Resource Conservation and Recovery Act of 1976 (RCRA), the Hazardous and Solid Waste Amendments of 1984 (HSWA), the RFAAP RCRA permit requirements (USEPA, 2000) (EPA ID No. VA1210020730), and the Final RCRA Corrective Action Plan (USEPA, 1994), as applicable.

Background

SWMU 57 is a 0.06-acre area (2,600 ft^2) consisting of an inactive, fabricated, asphalt-lined pond and associated piping. SWMU 57 is an inactive fabricated unit historically used as an acid-settling pond.

The RFAAP RCRA Corrective Action Permit identified SWMU 57 as an area of concern that had the potential to pose a threat or potential threat to human health and the environment. SWMU 57 was a part of the Site Screening Process (SSP) investigation completed in 2007 which resulted in the recommendation of a focused RFI for the site.

RCRA Facility Investigation (RFI)/Corrective Measures Study (CMS)

The RCRA facility investigation (RFI) field efforts were conducted at the site in 2008. The primary site-related chemicals of concern identified in soil at the site were metals (antimony, aluminum, cadmium, chromium, iron, and manganese). Chloroform was detected in site groundwater at levels above its USEPA tap-water risk-based screening level (T-RBC) but below the maximum contaminant level (MCL) for trihalomethanes.

The RFI risk assessment and fate and transport assessments identified a requirement to evaluate corrective measures for SWMU 57. The corrective measures objective (CMO) established for SWMU 57 was to mitigate the potential risks/hazards that have been identified for evaluated future hypothetical industrial receptors for exposure to soil (construction workers) at the site. Remedial goals were established for industrial soil, residential soil, and groundwater with consideration of risk, background levels in soil, and applicable and or relevant and appropriate requirements (ARARs), such as established drinking water MCLs. Maximum detected concentrations in groundwater were below remedial goals established for groundwater, and therefore, development of corrective measures specifically to address constituent concentrations in groundwater was not required.

Corrective Measure Alternative Recommendation

Three corrective measures alternatives were developed in addition to a baseline no further action alternative including:

- Alternative One: No Further Action;
- Alternative Two: Institutional Controls, Engineering Controls, and Long-Term Monitoring;
- Alternative Three: Soil Excavation and Offsite Disposal for Industrial Land Use, Institutional Controls, and Long-Term Monitoring; and
- Alternative Four: Excavation of Soil and Offsite Disposal for Clean Closure and Unrestricted Land Use.

The four alternatives were evaluated with respect to criteria specified in Attachment D of the RFAAP RCRA Permit and criteria for evaluating corrective measures alternatives in Section IV Part E of the RCRA Corrective Plan guidance document . Alternatives Three and Four were found to meet the established CMO, with Alternative Three allowing for future industrial use of the site without controls and Alternative Four exceeding the CMO by allowing for clean closure with unrestricted land use. Alternative Four was selected as the final alternative for SWMU 57 because: 1) it meets the established CMO, 2) it has the highest overall comparative ranking with approximately the same present value cost as the next highest ranked alternative (Alternative Three), which provides for future industrial land use without controls, and 3) it provides for clean closure and unrestricted land use without long-term monitoring (LTM) requirements.

Corrective Measure Alternative Four will consist of the following:

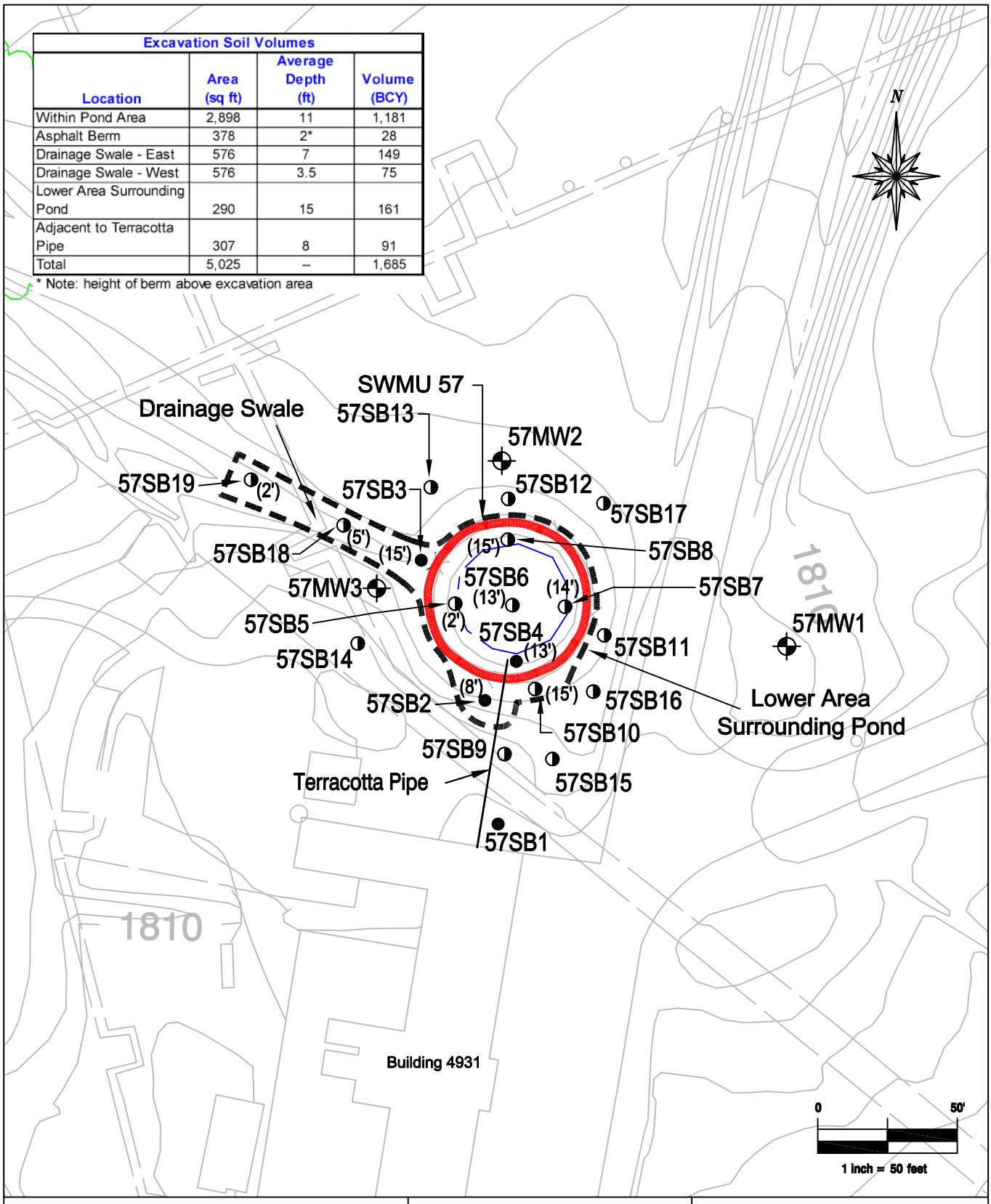
- Preparation of remedial implementation plans;
- Preparation of the site for excavation activities including removal of the perimeter fence surrounding the pond, dewatering the pond as necessary, and stabilizing material in the pond before excavation;
- Excavation of the pond area and associated surrounding soil with COC concentrations above residential RGs;
- Site restoration including backfilling, final grading, and restoration of vegetative cover;
- Abandonment of existing monitoring wells; and
- Preparation of closure documentation and reports.

Implementation of Alternative Four is expected to be completed in less than six months after site mobilization. This time frame is considered an estimate and the actual time to complete the corrective measures will be subject to site-specific conditions.

The data, findings, assessments, and recommendations are contained in the SWMU 57 RFI/CMS Report (Final), September 2009, and approved by the USEPA Region III and the Virginia Department of Environmental Quality (VDEQ) in September 2009.

Excavation Soil Volumes			
Location	Area (sq ft)	Average Depth (ft)	Volume (BCY)
Within Pond Area	2,898	11	1,181
Asphalt Berm	378	2*	28
Drainage Swale - East	576	7	149
Drainage Swale - West	576	3.5	75
Lower Area Surrounding Pond	290	15	161
Adjacent to Terracotta Pipe	307	8	91
Total	5,025	--	1,685

* Note: height of berm above excavation area



Legend

- Approximate SWMU Boundary
- Topographic Contour
- SSP Soil Sample Location
- RFI Sample Location
- Monitoring Well Location
- Excavation Area
- (2') Approximate Depth of Excavation
- Aboveground Piping
- Vegetation
- Fence
- (BCY) Bank Cubic Yard

FIGURE 1

Excacation Area - Alternative 4

Date: May 2008	URS Project #: 11656421
Prepared by: DBC	Approved by: JOS
Scale: 1 inch = 50 feet	File Name: Fig.8-2 Ex.Area

SWMU 57

RFI/CMS Report
Radford Army Ammunition Plant
Radford, Virginia

URS Group, Inc.
5540 Falmouth Street
Suite 201
Richmond, Virginia 23230

Radford Army Ammunition Plant

FACT SHEET
SSP Report for SWMUs 13, 37, 38, 46, 57, 68, 69, and AOCs A, F, Q
(December 2009)

Introduction

The United States Environmental Protection Agency (USEPA) issued a RCRA Corrective Action Permit to the U.S. Department of the Army (Army) and Alliant Ammunition and Powder Company (Alliant) on October 31, 2000. Within the RCRA Corrective Action permit (Part II, Section D.4), there is a provision allowing for Solid Waste Management Units (SWMUs) or Areas of Concern (AOCs) which are determined to represent negligible or minimal impact to be investigated in accordance with this EPA approved Site Screening Process (SSP). This SSP was completed to assess whether there had been releases of hazardous substances, pollutants, contaminants, hazardous wastes, or hazardous constituents to the environment from 11 sites at RFAAP, and determine whether the sites should proceed further through the RCRA facility investigation (RFI) process, be the subject of an interim removal action or be considered for no further action. For the SSP, the following five distinct tasks were undertaken:

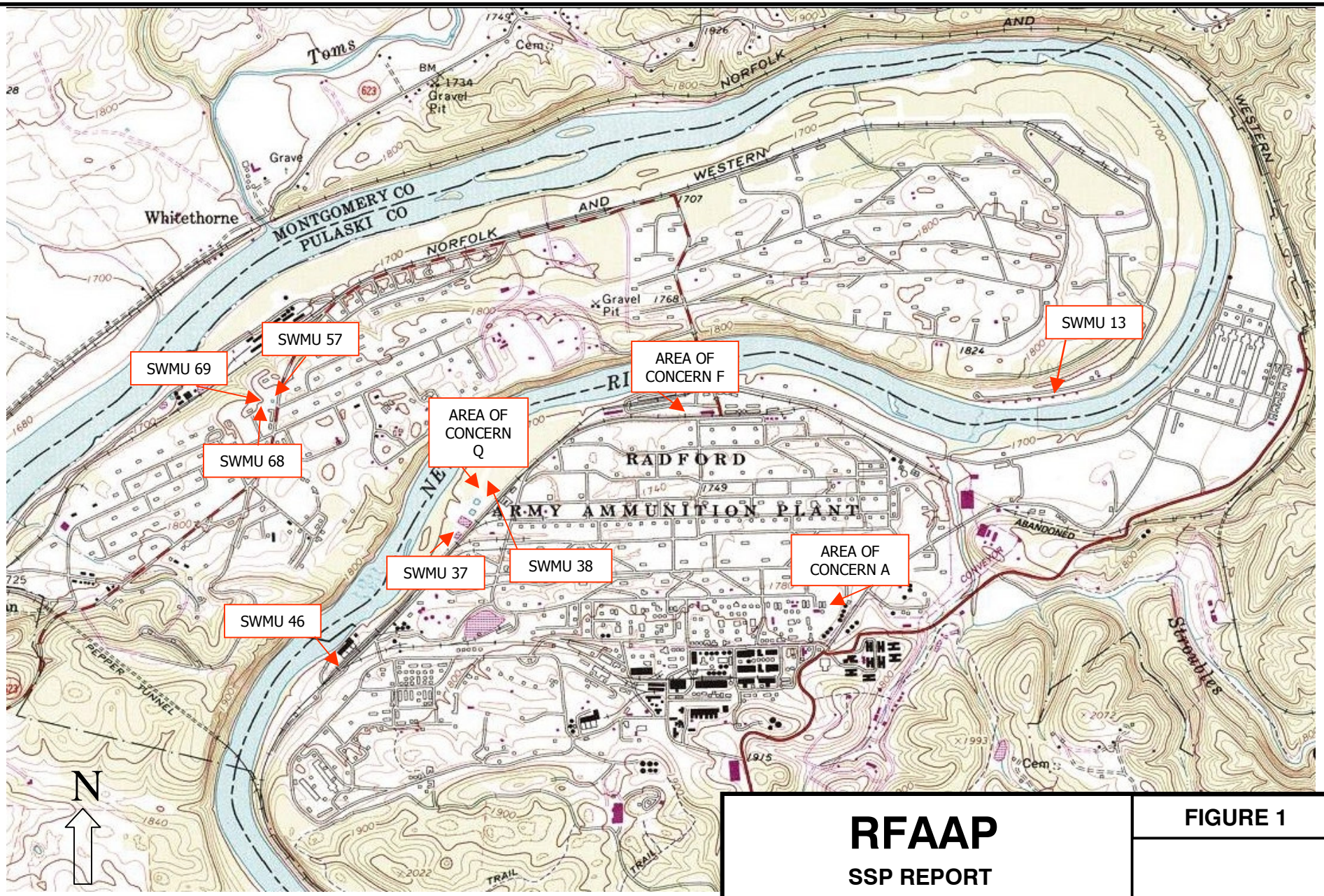
- Performance of a Desktop Audit and site visit to determine the scope of the SSP site-specific Work Plan(s);
- Development of an SSP site-specific Work Plan outlining a Sampling and Analysis Plan as well as a risk screening plan (human health and ecological, as appropriate) for EPA approval;
- Performance of SSP field work in accordance with the approved SSP Work Plan;
- Evaluation of SSP data and completion of pre-remedial risk screening; and
- Determination of the need for further investigation of the SSA, an interim removal action at the SSA or preparation of a No Further Action Decision Document, per the RCRA Corrective Action permit, based on results of the SSP and risk screening.

Conclusions and Recommendations

Based on the results of the SSP evaluations the following recommendations were made:

- SWMU 13 –focused RFI;
- SWMU 37 – focused RFI;
- SWMU 38 – focused RFI;
- SWMU 46 – No Further Action;
- SWMU 57 – focused RFI
- SWMU 68 – No Further Action;
- SWMU 69 – No Further Action;
- AOC A – focused RFI;
- AOC F – No Further Action; and
- AOC Q – focused RFI.

These data, findings, assessments, and recommendations were reported in the Site Screening Process Report for Solid Waste Management Units 13, 37, 38, 46, 57, 68, 69, and Areas of Concern A, F, Q (Final), May 2007, and approved by the USEPA Region III and the Virginia Department of Environmental Quality (VDEQ) in May 2007. Decisions Documents regarding no further action for SWMUs 46, 68, 69, and AOC Q were approved by the USEPA and VDEQ in October 2007. The recommended RFI investigations for SWMUs 13, 37, 38, 57, and AOCs A and Q are currently in progress.



RFAAP

SSP REPORT

FIGURE 1

SITE LOCATION MAP

Date: *June 2004*	**Prepared by:** *KDC/TDH*
Scale: *1" = 2000'*	**File Name:** *Figure 1-1.ppt*

Radford Army Ammunition Plant

FACT SHEET
SSP for SSAs 18, 72, 30, 79, 60, and 77

(December 2009)

The United States Environmental Protection Agency (USEPA) issued a RCRA Corrective Action Permit to the U.S. Department of the Army (Army) and Alliant Ammunition and Powder Company (Alliant) on October 31, 2000. Within the RCRA Corrective Action permit is a listing of 31 identified Site Screening Areas (SSAs) which may be investigated in accordance with the EPA approved Site Screening Process (SSP). This SSP will determine whether there have been releases of hazardous substances, pollutants, contaminants, hazardous wastes, or hazardous constituents to the environment from an SSA, and determine whether an SSA should proceed further through the RFI process, be the subject of an interim removal action or be considered for no further action. For the SSP, the following five distinct tasks will be undertaken:

- Performance of a Desktop Audit and site visit to determine the scope of the SSP site-specific Work Plan(s);
- Development of an SSP site-specific Work Plan outlining a Sampling and Analysis Plan as well as a risk screening plan (human health and ecological, as appropriate) for EPA approval;
- Performance of SSP field work in accordance with the approved SSP Work Plan;
- Evaluation of SSP data and completion of pre-remedial risk screening; and
- Determination of the need for further investigation of the SSA, an interim removal action at the SSA or preparation of a No Further Action Decision Document, per the RCRA Corrective Action permit, based on results of the SSP and risk screening.

The sites for this SSP include:

- SSA 18 – Sulfuric Acid Recovery Plant
- SSA 72 – Oleum Plant Acidic Wastewater Sump
- SSA 30 – Asbestos Disposal Trench No. 1
- SSA 79 – Asbestos Disposal Trench No. 2
- SSA 60 – Rubble Pile East of Administration Building
- SSA 77 – Garbage Incinerator

The field work for this investigation has been completed and the SSP report is currently underway.

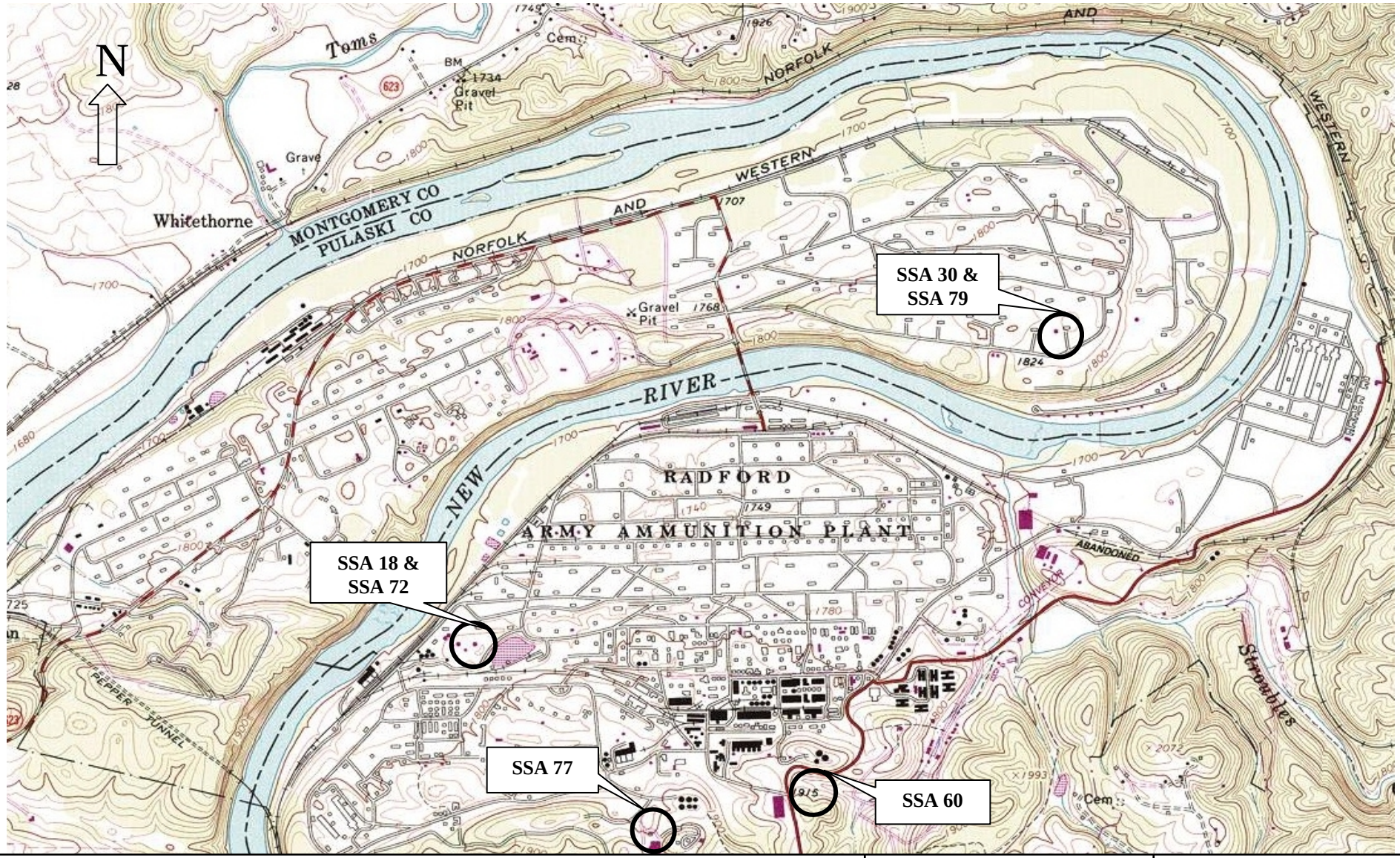


FIGURE 1

Site Location Map

Date: October 2008	URS Project #: 11656351
Prepared by: DBC	Approved by: JOS
Scale: *1" = 2000'*	File Name: Fig1-1 SiteLoc

MWP Addendum 028 –
SSP Investigation for SSAs 18, 72, 30, 79, 60, and 77
Radford Army Ammunition Plant
Radford, Virginia

URS Group, Inc.
540 Falmouth Street
Suite 201
Richmond, Virginia 23230