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FINAL

Decision Document for Radford Army Ammunition Plant - New River Unit (RAAP-044)

Radford Army Ammunition Plant
Radford, Virginia

Prepared for:
Radford Army Ammunition Plant

November 2011

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
Street address: 629 East Main Street, Richmond, Virginia 23219
Mailing address: P.O. Box 1105, Richmond, Virginia 23218
TDD (804) 698-4021
www.deq.virginia.gov

Douglas W. Domenech
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

July 24, 2013

Mark A. Lee, Commander
US Army Environmental Command
2450 Connell Rd
JBSA Ft Sam Houston, TX 78234-7664
Official Business

Re: Final Decision Document for the Radford Army Ammunition Plant – New River Unit (RAAP – 44), Radford, Virginia

Dear Colonel Lee:

The Virginia Department of Environmental Quality staff has reviewed the Final Decision Document (DD) for RAAP - 44. We concur with the selected remedial alternative as outlined in the Decision Document signed April 2013.

Should you have any questions concerning this letter please feel free to contact Jim Cutler at (804) 698-4498.

Sincerely,

Durwood Willis

Durwood Willis, Director
Office of Remediation Programs

cc: Jay Stewart, BAE
Aziz Farahmand, VDEQ-BRRO
Robert Thomson, EPA Region III (3HS13)

From: McKenna, James J CIV (US) <james.j.mckenna16.civ@mail.mil>
Sent: Friday, May 17, 2013 8:13 AM
To: Cutler,Jim
Cc: Kalinowski, Chris; Wisbeck, Diane; Alberts, Matt (US SSA); Stewart, Jay (US SSA); MaryAnn Bogucki - Radford (maryann.bogucki@baesystems.com); Meyer, Tom NAB02; Mendoza, Richard R Jr CIV (US); Davie, Robert N III CIV (US); beth lohman (ealohman@deq.virginia.gov)
Subject: Acknowledgement letter for the NRU Decision Document and RTCs to DEQ comments on the draft NRU LUCIP (UNCLASSIFIED)
Attachments: 13-0900-071 NRU (RAAP-044) Decision Document.pdf

Classification: UNCLASSIFIED
Caveats: FOUO

Jim Cutler,

Please see attached file for the subject letter for the signed decision document and response to comments on the draft NRU LUCIP.

Thank you for your support of the Radford AAP Installation Restoration Program,

Jim McKenna

PS Diane, Chris, please retain this letter and email for the correspondence file.

Classification: UNCLASSIFIED
Caveats: FOUO

Classification: UNCLASSIFIED
Caveats: FOUO

BAE SYSTEMS

ORDNANCE SYSTEMS INC.
Radford Army Ammunition Plant
P.O. Box 1
Radford, VA 24143
Telephone (540) 639-7631
Fax (540) 639-8588

May 15, 2013

Mr. James L. Cutler, Jr.
Virginia Department of Environmental Quality
629 East Main Street
Richmond, VA 23219

Subject: Transmittal Acknowledgement,
Final Decision Document for Radford Army Ammunition Plant, New River Unit (RAAP-044) November 2011

Dear Mr. Cutler:

This letter is to acknowledge transmittal of the subject document that was sent to you May 15, 2013. Enclosed is a copy of the 15 May 2013 transmittal email.

Please coordinate with and provide any questions or comments to myself at (540) 639-7785 or Mr. Jim McKenna, ACO Staff (540) 731-5782.

Sincerely,

Jay Stewart
Environmental Manager
BAE Systems, Ordnance Systems Inc.

cc: E. A. Lohman
Virginia Department of Environmental Quality
Blue Ridge Regional Office
3019 Peters Creek Road
Roanoke, VA 24019

Rich Mendoza
US Army Environmental Center
2450 Connell Rd., Bldg. 2264, 1st Fl, Rm126
Attn: Richard Mendoza
San Antonio, TX 78234-7664

Tom Meyer
Corps of Engineers, Baltimore District
ATTN: CENAB-EN-HM
10 South Howard Street
Baltimore, MD 21201

bc: BAE Administrative File
J. McKenna, ACO Staff
Rob Davie-ACO Staff
Environmental File

Coordination: J. McKenna

Alberts, Matt (US SSA)

From: McKenna, James J CIV (US) <james.j.mckenna16.civ@mail.mil>
Sent: Wednesday, May 15, 2013 10:45 AM
To: Cutler,Jim
Cc: Kalinowski, Chris; diane.wisbeck@arcadis-us.com; Alberts, Matt (US SSA); Stewart, Jay (US SSA); Bogucki, MaryAnn (US SSA); Meyer, Tom NAB02; Mendoza, Richard R Jr CIV (US); Davie, Robert N.; beth lohman (ealohman@deq.virginia.gov)
Subject: FW: NRU Decision Document and RTCs to DEQ comments on the draft NRU LUCIP (UNCLASSIFIED)
Attachments: 20111111 NRU Decision Document - Rev20130513 signed.pdf; 2012 12 14 LUCIP_Cutler RTC.PDF

Classification: UNCLASSIFIED
Caveats: FOUO

Jim Cutler,

Please see attached files for the subject signed decision document and response to comments on the draft NRU LUCIP.

As a reminder, there is DEQ follow up action on documents that we have previously coordinated review and comment on and anticipated concurrence but were pending for the Decision Document to be signed by the Army. These actions are listed below.

1. the NRU Decision Document signed by the Army, attached to this email 2. the Response Action Completion and Closure Report for the BLA, IAA and WBG, NRU (RAAP-044) September 2011, originally sent via email 09/19/2011 3. the attached response to comments on the Land Use Control Implementation Plan, originally sent via email 12/14/2012

If you have questions or concerns, please do not hesitate to contact me.

Thank you for your support of the Radford AAP Installation Restoration Program,

Jim McKenna

PS Resending as I left Beth Lohman off of the earlier email that I sent.

Classification: UNCLASSIFIED
Caveats: FOUO

Classification: UNCLASSIFIED
Caveats: FOUO

From: McKenna, James J CIV (US) <james.j.mckenna16.civ@mail.mil>
Sent: Monday, June 18, 2012 1:19 PM
To: Cutler,Jim
Cc: Wisbeck, Diane; Kalinowski, Chris; Mendoza, Richard R Jr CIV (US);
Meyer, Tom NAB02; Bob Winstead (bob.winstead@baesystems.com);
Jeremy Flint (jeremy.flint@atk.com); Davie, Robert N III CIV (US)
Subject: FW: NRU DD
Attachments: 20111111.NRU Decision Document - final.pdf

Jim C., Forwarding you the latest I have for the subject document. Per earlier conversation, this is to assist in your review of our responses to DEQ comments on the draft document. Thanks, JJM

From: Kalinowski, Chris [Chris.Kalinowski@arcadis-us.com]
Sent: Monday, June 18, 2012 11:35 AM
To: McKenna, James J CIV (US)
Cc: Wisbeck, Diane
Subject: RE: NRU DD
Hi Jim,

From your email below, it appears that you don't have a copy of the Final DD document for the NRU. Here is a copy of the final document in both Word and PDF format.

Chris

From: McKenna, James J CIV (US) [mailto:james.j.mckenna16.civ@mail.mil]
Sent: Monday, June 18, 2012 11:25 AM
To: Cutler,Jim
Cc: Mendoza, Richard R Jr CIV (US); Meyer, Tom NAB02; Wisbeck, Diane; Kalinowski, Chris
Subject: NRU DD

Jim,

Per conversation this morning, attached is a copy of the latest version of the NRU DD that I have which was attached to an 11/16/2011 email from Chris. I think it correlates to our responses to DEQ comments so hopefully it will assist in your review of our responses. Note it's in track changes and I don't have a copy of the version that went forward for USAEC signature.

If you have questions or concerns, please contact me.

Thanks,
JJM

affiliates. Nothing herein is intended to constitute the offering or performance of services where otherwise restricted by law.

From: McKenna, James J CIV (US) <james.j.mckenna16.civ@mail.mil>
Sent: Monday, June 18, 2012 11:25 AM
To: Cutler,Jim
Cc: Mendoza, Richard R Jr CIV (US); Meyer, Tom NAB02; Wisbeck, Diane; Kalinowski, Chris
Subject: NRU DD
Attachments: 20111111 NRU Decision Document - final.pdf

Jim,

Per conversation this morning, attached is a copy of the latest version of the NRU DD that I have which was attached to an 11/16/2011 email from Chris. I think it correlates to our responses to DEQ comments so hopefully it will assist in your review of our responses. Note it's in track changes and I don't have a copy of the version that went forward for USAEC signature.

If you have questions or concerns, please contact me.

Thanks,
JJM

From: McKenna, James J CIV (US) <james.j.mckenna16.civ@mail.mil>
Sent: Thursday, May 24, 2012 2:23 PM
To: Cutler, Jim (DEQ)
Cc: Mendoza, Richard R Jr CIV (US); Meyer, Tom NAB02; Kalinowski, Chris; Wisbeck, Diane; Davie, Robert N III CIV (US)
Subject: NRU DD and response to DEQ comments
Attachments: 20111025 Response to VDEQ Comments on DD chngacptd.pdf

Jim C.

After our earlier call today I spoke with Rich. He said it was ok to forward our responses to DEQ comments on the NRU DD. They are in the attached file. His number is 210 466 1692 if you want to call him.

Rest of Radford NRU team is ccd for their situational awareness.

I'll be on leave and out until Monday June 11, 2012. I think Rich is in today but will be out until Tuesday May 29.

Thanks, JJM

From: Cutler, Jim (DEQ) [James.Cutler@deq.virginia.gov]
Sent: Thursday, May 24, 2012 10:34 AM
To: McKenna, James J CIV (US)
Subject: RE: RAB Member plant site tour Wed 27 June 2012 600pm EST
Jim,

Do you have Rich's phone #?

Thanks,

Jim

From: McKenna, James J CIV (US) [mailto:james.j.mckenna16.civ@mail.mil]
Sent: Thursday, May 24, 2012 7:33 AM
To: Joe Parrish ATC; David Allbee; 'heather.govenor@gmail.com'; Steve cole; Steve cole; Bob Winstead (bob.winstead@baesystems.com); Cutler, Jim (DEQ); Weissbart.Erich@epamail.epa.gov
Cc: Alberts, Matt (US SSA); Paige Holt (paige.holt@atk.com); Jeremy Flint (jeremy.flint@atk.com); Davie, Robert N III CIV (US); Gunter, Karen V CIV (US); Timothy.Leahy@shawgrp.com; Meyer, Tom NAB02
Subject: RAB Member plant site tour Wed 27 June 2012 600pm EST

Joe, David, Heather and Steve and other RAB Members,

Reminder that our annual RAB member site tour is scheduled as above in the subject line. As before, we will meet at the Visitor Center parking lot, at the Main Entrance, just off of the Route 114. If we can get started at 600PM then we will have more daylight and can see more. Please let me know whether or not you will attend on or before June 21, 2012.

Since we went the New River Unit last year and the cleanup is nearly complete, I think it would be good to alternate and tour the Main Manufacturing Area this year. Briefly, recall that all that remains for the New River Unit cleanup is for the US Army Environmental Command to sign the Record of Decision and RFAAP to follow up with land use controls at 3 areas. I can discuss and refresh everyone's memory during our tour.

Thank you in advance for your support of the Radford AAP Installation Restoration Program.

Jim McKenna
540 731 5782

PS Karen, this is a heads up for visitor's request for Joe, David, Heather, Steve, Jim Cutler and Erich Weissbart. I'll be in touch as they confirm.

Comments and Responses on the
Draft Decision Document
New River Unit RFAAP 044
Radford Army Ammunition Plant
October 2011

Item No.	Report Reference	COMMENT	RESPONSE
Commenter: Jim Cutler (VDEQ) – email comments to Jim McKenna (RFAAP) dated October 12, 2011			
1	Page 2 and 3	VDEQ suggests that the discussion of project costs be removed from Section 1 of the Decision Document.	*The Army has elected to keep the discussion of project costs within Section 1 of the Decision Document. Providing projected costs within Section 1 allows the reader to understand the costs associated with the selected remedies without having to refer to the more complex discussions provided in Section 2 of the document.*
2	Page 3 and 4	VDEQ suggests a revision to the discussion on the implementation of Land Use Controls that would require the Army to submit a land use control implementation plan (LUCIP) to VDEQ for review and approval within 180 days of execution of the Decision Document.	*The Army has elected not to revise the discussion on the implementation of Land Use Controls. The Army will be preparing/submitting a LUCIP for VDEQ review and approval, but is opposed to committing to a 180-day submittal/approval time frame within the context of the Decision Document.*
3	Page 5 VDEQ Signature	Please remove the VDEQ signature line from the Decision Document. Rather than sign the document, VDEQ will issue a concurrence letter.	*Agreed. The VDEQ signature line has been removed from the Decision Document.*
4	Table 10	The entirety of the Pollutant Discharge Elimination System (VPDES) Permit Regulation is listed as to be considered (TBC). DEQ suggests that 9 VAC 25-31-50(A) is the only substantive provision of this regulation that is an Applicable ARAR for the remedial actions proposed in this decision document. The suggested section is a prohibition from discharging pollutants into surface waters. Please amend the table to reflect this applicable substantive provision.	*Agreed. Table 10 of the Decision Document has been updated so that it no longer references the entirety of the VPDES Regulation. The updated table only references the Applicable 9 VAC 25-31-50(A) of the VPDES Regulations*

Comments and Responses on the
Draft Decision Document
New River Unit RFAAP 044
Radford Army Ammunition Plant
October 2011

Item No.	Report Reference	COMMENT	RESPONSE
5	Table 11	DEQ requests that the Virginia Threatened and Endangered Species regulation 4 VAC 15-20-130 to 140 and 2 VAC 5-320-10 be listed as a Relevant and Appropriate ARAR. Virginia Code section 29.1-563 to 570 authorizes the adoption of the federal endangered species list as well as designating threatened and endangered species specific to Virginia. Virginia prohibits by regulation the "taking" of any threatened or endangered species. Because endangered species are not expected to be on site these regulations are not considered applicable. However, if at any point during remediation such species are encountered, site activities must be tailored to comply with these regulations and should be listed as relevant and appropriate.	*The Army respectfully disagrees with this recommendation. The Army does not list State and Federal endangered species acts as ARARs because they do not meet the criteria for being applicable (an objective determination of whether the requirement specifically addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at a CERCLA site) nor do they fit as relevant and appropriate because none of the evaluation factors found in 40 CFR Sec. 300.400(g)(2)(i) through (viii) can be applied to the ESA or State ESA. However, the Army acknowledges that although it is not listed as an ARAR it would apply if an endangered species were encountered.* *This is consistent with the presentation of OSHA regulations and DOT regulations, they apply to all situations whether or not there is a CERCLA action. There is no need to list them separately.*
6	Table 12	Please be advised Virginia Solid Waste Regulation 9 VAC 20-80-10 to 790 has been repealed and should be removed from the table. The applicable Virginia Solid Waste Regulation sections are 9 VAC 20-81- 40(B)(C), 45, 90(A)(1) and 95. Because the onsite actions are expected to generate wastes which will be characterized for offsite disposal.	*Agreed. Table 12 of the Decision Document has been updated to remove the repealed regulation. The applicable regulations (9 VAC 20-81- 40(B)(C), 45, 90(A)(1) and 95) have been added to Table 12.*

From: Cutler, Jim (DEQ) [mailto:James.Cutler@deq.virginia.gov]
Sent: Wednesday, October 12, 2011 2:25 PM
To: McKenna, Jim J Mr CIV USA AMC
Subject: NRU DD

Jim,

I've enclosed my suggested redline changes to the DD. Nothing major- mostly clarifying some IC requirements. Note that Army signs the DD and VDEQ will issue a concurrence letter (Durwood's signature).

Also listed below are additional comments referring to the ARARs tables.

Table 10

The entirety of the Pollutant Discharge Elimination System (VPDES) Permit Regulation is listed as to be considered (TBC). DEQ suggests that 9 VAC 25-31-50(A) is the only substantive provision of this regulation that is an Applicable ARAR for the remedial actions proposed in this decision document. The suggested section is a prohibition from discharging pollutants into surface waters. Please amend the table to reflect this applicable substantive provision.

Table 11

DEQ requests that the Virginia Threatened and Endangered Species regulation 4 VAC 15-20-130 to 140 and 2 VAC 5-320-10 be listed as a Relevant and Appropriate ARAR. Virginia Code section 29.1-563 to 570 authorizes the adoption of the federal endangered species list as well as designating threatened and endangered species specific to Virginia. Virginia prohibits by regulation the "taking" of any threatened or endangered species. Because endangered species are not expected to be on site these regulations are not considered applicable. However, if at any point during remediation such species are encountered, site activities must be tailored to comply with these regulations and should be listed as relevant and appropriate.

Table 12

Please be advised Virginia Solid Waste Regulation 9 VAC 20-80-10 to 790 has been repealed and should be removed from the table.

The applicable Virginia Solid Waste Regulation sections are 9 VAC 20-81-40(B)(C), 45, 90(A)(1) and 95. Because the onsite actions are expected to generate wastes which will be characterized for offsite disposal.

Please feel free to contact me if you have any questions or comments.

Thanks,

Jim

James L. Cutler Jr.

Federal Facilities Project Manager

Office of Remediation Programs

Virginia Dept. of Environmental Quality

804-698-4498

Classification: UNCLASSIFIED
Caveats: FOUO

Classification: UNCLASSIFIED
Caveats: FOUO

From: Cutler, Jim (DEQ) <James.Cutler@deq.virginia.gov>
Sent: Monday, August 22, 2011 9:12 AM
To: McKenna, James J CIV (US); Kalinowski, Chris
Cc: Mendoza, Richard R Jr CIV (US); Ryan, Susan M CIV USARMY IMCOM AEC (US); Flint, Jeremy; Wisbeck, Diane; paige.holt@atk.com; jerome.redder@atk.com; Davie, Robert N Mr CIV USA AMC; Case, Joy L Ms CIV USA AMC; Wisbeck, Diane; Meyer, Tom NAB02
Subject: RE: Revised Decision Document for Radford NRU (UNCLASSIFIED)

Me, too.

-----Original Message-----
From: McKenna, Jim J Mr CIV USA AMC [mailto:jim.mckenna@us.army.mil]
Sent: Mon 8/22/2011 9:07 AM
To: Kalinowski, Chris; Cutler, Jim (DEQ)
Cc: Mendoza, Richard R Mr CIV USA IMCOM AEC; Ryan, Susan M Ms CIV USA IMCOM AEC; Flint, Jeremy; Wisbeck, Diane; paige.holt@atk.com; jerome.redder@atk.com; Davie, Robert N Mr CIV USA AMC; Case, Joy L Ms CIV USA AMC; Wisbeck, Diane; Meyer, Tom NAB02
Subject: RE: Revised Decision Document for Radford NRU (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: FOUO

Got it.

-----Original Message-----
From: Kalinowski, Chris [mailto:Chris.Kalinowski@arcadis-us.com]
Sent: Monday, August 22, 2011 8:58 AM
To: McKenna, Jim J Mr CIV USA AMC; Cutler,Jim
Cc: Mendoza, Richard R Mr CIV USA IMCOM AEC; Ryan, Susan M Ms CIV USA IMCOM AEC; Flint, Jeremy; Wisbeck, Diane; paige.holt@atk.com; jerome.redder@atk.com; Davie, Robert N Mr CIV USA AMC; Case, Joy L Ms CIV USA AMC; Wisbeck, Diane; Meyer, Tom NAB02
Subject: RE: Revised Decision Document for Radford NRU (UNCLASSIFIED)

All,

Please see the attached PDF which contains all of the figures for the Draft Decision Document for Radford NRU that Jim McKenna sent out earlier today. The file size is fairly large so please confirm that you have received.

Thank you!
-Chris

-----Original Message-----
From: McKenna, Jim J Mr CIV USA AMC [mailto:jim.mckenna@us.army.mil]
Sent: Monday, August 22, 2011 8:37 AM
To: Cutler,Jim
Cc: Kalinowski, Chris; Mendoza, Richard R Mr CIV USA IMCOM AEC; Ryan, Susan M Ms CIV USA IMCOM AEC; Flint, Jeremy; Wisbeck, Diane; paige.holt@atk.com; jerome.redder@atk.com; Davie, Robert N Mr CIV USA AMC; Case, Joy L Ms CIV USA AMC; Wisbeck, Diane; Meyer, Tom NAB02

Subject: Revised Decision Document for Radford NRU (UNCLASSIFIED)
Importance: High

Classification: UNCLASSIFIED
Caveats: FOUO

Jim,

Per 08/12/2011 conversation with Rich Mendoza, attached is the NRU Decision Document with tables that Rich plans to go forward for signature by the USAEC Commander.

I don't have the figures but they may be too large for me to email.

Chris, Diane please forward the figures to Jim Cutler and this distribution.

Thank you in advance,
JJM

Classification: UNCLASSIFIED
Caveats: FOUO

Classification: UNCLASSIFIED
Caveats: FOUO

DEPARTMENT OF THE ARMY
US ARMY INSTITUTE OF PUBLIC HEALTH
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MARYLAND 21010-5403

MCHB-IP-REH

25 JUL 2011

MEMORANDUM FOR Office of Environmental Quality, Radford Army Ammunition Plant (SJMRF-OP-EQ/Mr. Jim McKenna), P.O. Box 2, Radford, VA 24143-0002

SUBJECT: Review of Internal Draft Decision Document for Radford Army Ammunition Plant – New River Unit (RFAAP-044), Radford, Virginia, June 2011

1. The Army Institute of Public Health reviewed the subject document on behalf of the Office of The Surgeon General pursuant to Army Regulation 200-1 (Environmental Protection and Enhancement). We appreciate the opportunity to review this report.

2. We concur that the proposed remedies are protective of human health and the environment.

3. This document was reviewed by Mr. Jeffrey Leach, Environmental Health Risk Assessment Program. He can be reached at DSN 584-2953, commercial (410) 436-2953 or electronic mail, Jeff.Leach@us.army.mil.

FOR THE DIRECTOR:

JEFFREY S. KIRKPATRICK
Portfolio Director, Health Risk Management

CF:
HQDA (DASG-PPM-NC)
USACE (CEHNC-CX-ES)
PHCR-North

DEPARTMENT OF THE ARMY
US ARMY INSTITUTE OF PUBLIC HEALTH
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MARYLAND 21010-5403

MCHB-IP-REH

24 MAR 2011

MEMORANDUM FOR Office of Environmental Quality (SJMRF-OP-EQ/ Mr. Jim McKenna), Radford Army Ammunition Plant, P.O. Box 2, Radford, VA 24143-0002

SUBJECT: Internal Draft Decision Document for New River Unit (RAAP-044), Radford Army Ammunition Plant, Virginia, March 2011

1. The Army Institute of Public Health reviewed the subject document on behalf of the Office of The Surgeon General pursuant to Army Regulation 200-1 (Environmental Protection and Enhancement). We appreciate the opportunity to review the Decision Document.

2. We concur with the selected remedies for the New River Unit study areas as being protective of human health and the environment.

3. The document was reviewed by Mr. Dennis Druck, Environmental Health Risk Assessment Program. He can be reached at DSN 584-2953, commercial (410) 436-2953 or electronic mail, dennis.druck@us.army.mil.

FOR THE DIRECTOR:

JEFFREY S. KIRKPATRICK
Portfolio Director, Health Risk Management

CF:
HQDA (DASG-PPM-NC)
IMCOM-NE (IMNE-PWD-E)
USACE (CEHNC-CX-ES)
USAEC (IMAE-CD/Mr. Rich Mendoza)

FINAL

Decision Document for Radford Army Ammunition Plant – New River Unit (RFAAP-044)

Radford Army Ammunition Plant,
Radford, Virginia

November 2011

Table of Contents

Tables

Figures

Radford Army Ammunition Plant – New River Unit (RFAAP-044)

1. Declaration for the Decision Document

1.1 Site Name and Location

Radford Army Ammunition Plant (RFAAP) is an active, government-owned, contractor operated facility. RFAAP consists of two noncontiguous units: the Main Manufacturing Area (MMA) and the New River Unit (NRU). This Decision Document has been prepared for RFAAP-NRU (CERCLIS ID # VASFN030555), which is located off of Bagging Plant Road, near the town of Dublin, in Pulaski County, Virginia (**Figure 1**). This Decision Document specifically addresses six Study Areas that were identified within the boundaries of the RFAAP-NRU facility and facility-wide groundwater. The six Study Areas are identified below and their locations within RFAAP-NRU are presented in **Figure 2**:

- Building Debris Disposal Trench (BDDT)
- Bag Loading Area (BLA)
- Igniter Assembly Area (IAA)
- Northern Burning Ground (NBG)
- Rail Yard (RY)
- Western Burning Ground (WBG)

The environmental investigation, characterization, remedial design, and cleanup activities at RFAAP-NRU are being managed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); although the site is not listed on the National Priorities List (NPL).

1.2 Statement of Basis and Purpose

This Decision Document documents the Selected Remedies for each of the six Study Areas and groundwater at the RFAAP-NRU. The Selected Remedies were chosen by the United States Department of the Army (Army) in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The decision to select each of the remedies presented herein was based on the contents of the Administrative Record File for RFAAP-NRU.

The Army is the lead agency for the environmental investigation and cleanup activities conducted at RFAAP-NRU. The Virginia Department of Environmental Quality (VDEQ), which is serving as the lead review agency, has concurred with each of the Selected Remedies.

1.3 Assessment of the Site

The results of the Remedial Investigation (RI) and Feasibility Study (FS) process for RFAAP-NRU concluded that response actions are required for the BDDT, BLA, IAA, and WBG Study Areas. The

response actions that have been selected in this Decision Document for these Study Areas are necessary to protect the public health and welfare or the environment from actual or threatened releases of hazardous substances.

Response Actions are not required for the RY and NBG Study Areas or for groundwater at the RFAAP-NRU facility. The environmental investigations and risk assessments completed at the RY Study Area and for facility-wide groundwater did not identify any contaminants or hazardous substances that would present unacceptable risks or hazards to current or potential future users of the site. A soil removal action completed at the NBG Study Area in 2009 removed the constituents (i.e., lead and chromium) that had presented unacceptable risk for that study area. Following the 2009 removal action, the Army and VDEQ concluded that no further actions were required for the NBG Study Area to protect human health or the environment.

1.4 Description of the Selected Remedies

The remedies that have been selected for RFAAP-NRU will satisfy remedial action objectives (RAOs) and applicable or relevant and appropriate requirements (ARARs). The remedies will be implemented in 2011. The remedies for the BDDT, BLA, IAA, and WBG Study Areas are outlined below.

Building Debris Disposal Trench

The Selected Remedy for the BDDT site was Institutional Controls (ICs) to address benzo(a)pyrene in soil. The major components of this remedy include:

- Establish land use controls that would prohibit residential development of the site and/or utilization of the site for schools, child-care facilities and playgrounds.
- Annual inspections, a 5-year statutory review, and long-term management to ensure that the rip-rap liner and downgradient vegetation are maintained in the BDDT to prevent erosion/migration of surface soils.
- The projected present worth cost of implementing the selected remedy for the BDDT is $146,000. The project cost is based on the assumption that the annual inspections, 5-year reviews, and site maintenance activities will be conducted.

Bag Loading Area

The response action selected for the BLA study area addresses constituents of concern (COCs) in soil and flooring material. The major components of the Selected Remedy include:

- Removal and approved off-site disposal of the conductive flooring material present in the building remnants.

- Excavation and approved off-site disposal of surface soils located adjacent to former buildings, so as to reduce risk and hazard levels to those appropriate for commercial/industrial land use.
- Establish land use controls that would prohibit residential development of the site and/or utilization of the site for schools, child-care facilities and playgrounds. The land use controls would also prohibit the occupation or utilization of the building remnants for industrial or commercial purposes.
- The projected present worth cost of implementing the selected remedies for the BLA is $833,000. The project cost is based on the assumption that the annual inspections and 5-year reviews will be conducted.

Igniter Assembly Area

The IAA Study Area is very similar to the BLA in terms of both the COCs and the source materials (i.e., COCs were leached to soil from conductive flooring in building remnants). As such, the RAOs for the IAA site are nearly identical to those established for the BLA. The major components of the Selected Remedy for the IAA include:

- Removal and approved off-site disposal of the conductive flooring material present in the building remnants.
- Excavation and approved off-site disposal of surface soils located adjacent to former buildings, so as to reduce risk and hazard levels to those appropriate for unrestricted/residential use.
- Establish land use controls that would prohibit the occupation or utilization of the building remnants for industrial or commercial purposes.
- The projected present worth cost of implementing the selected remedies for the IAA is $1,115,000.

Western Burning Ground

The Selected Remedy to address lead and chromium in sediment at the WBG includes the following major component:

- Excavation and approved off-site disposal of lead and chromium impacted sediments so that the site would be available for unrestricted/residential development.

- The projected present worth cost of implementing the selected remedies for the WBG is $282,000.

The Selected Remedies for the BDDT, BLA, IAA and WBG Study Areas are intended to be the final remedies for the RFAAP-NRU facility. Because the Selected Remedies for the BDDT, BLA, and IAA will result in contaminants and/or source materials left on-site that would not allow for unrestricted use, a land use control (LUC) plan will be implemented and a statutory review will be conducted within 5 years after initiation of the response action (i.e., signature date of this Decision Document). The statutory reviews will be conducted on 5-year intervals thereafter, to ensure that the remedies continue to be

protective/effective. While the projected present worth cost estimates were based on the assumption that the annual inspections, site maintenance and 5-year administrative review would be conducted, the LUCs will remain in place in perpetuity, or until such time that it can be documented that constituent concentrations at the Study Areas no longer present unacceptable risks under a residential/unrestricted land use scenario.

1.5 Statutory Determination

The Selected Remedies for the RFAAP-NRU study areas are protective of human health and the environment, comply with Federal and State requirements that are applicable or relevant and appropriate to the remedial actions, are cost-effective, utilize permanent solutions and alternative treatment technologies to the maximum extent practical. The remedies for RFAAP-NRU employ material (source materials, soil, and sediment) removal, off-site disposal, and land-use controls as the principal elements; therefore, the selected remedies do not satisfy the statutory preference for treatment as the principal element. Treatment technologies were evaluated as part of the FS for RFAAP-NRU but were not selected due to implementability concerns and conflicts with the overall cleanup objectives for the site.

A statutory review will be conducted within five years after initiation of the response actions for the BDDT, BLA, and IAA Study Areas (i.e., signature date on this Decision Document) to ensure that the remedies are, or will be, protective of human health and the environment. This review is a requirement of CERCLA because the remedies that have been selected for these areas will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that would allow for unlimited use and unrestricted exposure.

1.6 Decision Document Data Certification Checklist

The following information is provided in the Decision Summary section of this Decision Document. Additional Information can be found in the Administrative Record file for RFAAP-NRU:

- Site descriptions and background information on the six Study Areas and groundwater located within RFAAP-NRU (Section 2.5)
- Summaries of the Constituents of Concern (COCs) and their respective concentrations identified at the BDDT, BLA, IAA, and WBG Study Areas (Sections 2.5 and 2.7);
- Baseline risk represented by the COCs at the BDDT, BLA, IAA, and WBG Study Areas (Section 2.7);
- Cleanup levels established for the identified COCs and the basis for these levels (Section 2.8);
- How source materials are addressed (Sections 2.11 and 2.12);
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment (Section 2.6);

- Potential land and groundwater use that will be available at the site as a result of the Selected Remedies (Section 2.12);
- Estimated capital, annual operations and maintenance (O&M), and total present-worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (Section 2.12);
- Key factor(s) that led to selecting the remedies (Section 2.12); and
- Responses to public comments received during the RI, FS and Proposed Plan phases of the CERCLA process (Section 3).

1.7 Authorizing Signatures and Support Agency Acceptance of Remedy

The Army, as the lead agency, and VDEQ, as the primary review agency, have determined that the remedies discussed in the preceding sections are appropriate to ensure protection of human health and the environment for the current and foreseeable future use of the RFAAP-NRU property.

U.S. DEPARTMENT OF THE ARMY

Mark A. Lee
Colonel, U.S. Army
Commanding

11 Apr. 13
Date

2. Decision Summary

2.1 Site Name, Location, and Description

Radford Army Ammunition Plant (RFAAP) is a propellant and explosives manufacturing facility located in the mountains of southwestern Virginia. The facility consists of two noncontiguous units, which are known as the Main Manufacturing Area (RFAAP-MMA) and the New River Unit (RFAAP-NRU). RFAAP-MMA is located in Montgomery County, near the City of Radford, while RFAAP-NRU is located in Pulaski County, near the town of Dublin (**Figure 1**). RFAAP-MMA and RFAAP-NRU were originally established as separate units during World War II (WWII) as part of the war effort. The two units were consolidated after WWII and all active manufacturing operations at RFAAP-NRU were discontinued. RFAAP-NRU now only serves as a storage facility for the on-going operations at RFAAP-MMA. Although both units are owned by the Army, they are currently operated and maintained by Alliant Techsystems, Inc. (ATK) under contract to the Army.

The Army is conducting environmental investigation and cleanup activities at both RFAAP-NRU and RFAAP-MMA as part of the Army's Installation Restoration Program (IRP). The IRP is a component of the Defense Environmental Restoration Program which provides funding for the cleanup of active/operating Department of Defense sites. The IRP activities at RFAAP-NRU (CERCLIS ID # VASFN0305556) are being managed and performed in accordance with the requirements outlined CERCLA, as amended by SARA and the NCP; however, it should be noted that the site is not listed on the NPL. The Army is serving as the lead agency for the IRP activities at RFAAP-NRU and the Virginia Department of Environmental Quality (VDEQ) is serving as the primary regulatory review agency. The IRP activities at RFAAP-MMA are being conducted separately from those at RFAAP-NRU; therefore, the RFAAP-MMA will not be addressed in this document.

2.2 Site History and Enforcement Activities

The RFAAP-NRU facility was constructed in 1940 and was originally known as the New River Ordnance Works (NROW). The facility was operated as a powder bag loading plant for artillery, cannon, and mortar projectiles during World War II. All active manufacturing operations at the RFAAP-NRU reportedly ceased in 1945 at the end of the war, at which time the facility was consolidated with RFAAP-MMA. Since the consolidation of the two facilities, RFAAP-NRU has served primarily as a storage facility for ATK's on-going propellant and explosives manufacturing operations conducted at RFAAP-MMA. The storage operations at RFAAP-NRU are conducted in secured, magazine buildings located throughout the eastern half of the property.

In total, the RFAAP-NRU property encompasses approximately 3,000 acres. Access to the facility is controlled by perimeter fencing and permanently stationed security guards. Other than the on-going munitions storage operations, the only other current land uses within the secured boundaries of RFAAP-NRU include a few agricultural tracts located in the eastern portion of the facility. There are no residences or

offices located within the RFAAP-NRU boundaries, and the only recreational activities at the facility consist of controlled game hunting and fishing. There are no plans to change ownership or land use at RFAAP-NRU.,

The Army conducted environmental investigations at RFAAP-NRU from 1997 to 2010 to identify potential impacts associated with historical use of the property. The investigations identified and focused on six separate Study Areas located within the RFAAP-NRU boundaries (**Figure 2**). The study areas included: two former manufacturing areas known as the Bag Loading Area (BLA) and the Igniter Assembly Area (IAA); a former train loading/unloading area known as the Rail Yard (RY); two former burning ground sites (the Northern Burning Ground [NBG] and the Western Burning Ground [WBG]); and a former disposal area known as the Building Debris Disposal Trench (BDDT). Groundwater, which was identified as a facility-wide resource, was also included in the environmental investigations at RFAAP-NRU. **Table 1** provides a summary of the various phases of investigation and remediation completed at each Study Area.

In July of 2009, the Army submitted an Environmental Investigation/Cost Analysis (EE/CA) Report to VDEQ that streamlined the cleanup process for the NBG Study Area. The cleanup actions for the NBG were completed in December of 2009, and documented in a Response Action Completion and Closure Report (ARCADIS 2010a).

A Remedial Investigation (RI) Report was submitted to VDEQ in June 2010 that summarized the environmental investigations and baseline risk assessments conducted for the remainder of the study areas at RFAAP-NRU, as well as for facility-wide groundwater. The Feasibility Study (FS) Report was submitted to VDEQ in September 2010 that outlined the remedial action objectives for the BDDT, BLA, IAA, and WBG Study Areas at RFAAP-NRU, and provided a detailed evaluation of the available response actions for each of these sites. VDEQ approved the FS document in a letter dated October 22, 2010.

2.3 Community Participation

In fulfillment of the public participation requirements outlined in CERCLA and the NCP, the Army has maintained an open communications policy regarding the environmental investigation and cleanup activities at RFAAP-NRU. Following is a summary of some of the community relations activities that have been performed to date.

- **Administrative Record File** - Consistent with requirements of CERCLA Section 113(k), the Army and Radford Army Ammunition Plant have maintained an Administrative Record File that contains all of the final documents associated with the Installation Restoration Program activities at RFAAP-NRU and RFAAP-MMA. The Administrative Record is maintained at Building 220, RFAAP-MMA in Radford, Virginia. A duplicate of the Administrative Record file (on CDs) is also maintained at the Montgomery-Floyd Regional Library – Christiansburg Branch located at 125 Sheltman Street in Christiansburg, VA.

The Administrative Record File contains information used to support RFAAP-NRU decision-making associated with CERCLA issues.

- **On-Line Information Repositories** – In addition to the Administrative Record file maintained at the Montgomery-Floyd Regional Library, an electronic information repository is maintained on-line at http://www.radfordaapirp.org/inforepo/online-index.htm. This on-line repository contains records of all documents included in the Administrative Record. The on-line repository is the most readily available means of accessing the Administrative Record for the public due to security at RFAAP.
- **Restoration Advisory Board (RAB)** – The RAB has been formed to facilitate public input in the CERCLA cleanup at RFAAP-NRU. The RAB includes representatives from the Army, USEPA, VDEQ, as well as residents from the surrounding area. The RAB meets quarterly and has conducted on site tours.
- **Public Notices** – The Army publishes legal notices in the *New River Current* section of the *Roanoke Times* newspaper to inform the public when new documents have been made available as part of the Administrative Record, and/or to inform the public of the dates of public meetings or other important events. This information is also provided to the local towns' websites for posting.
- **Public Meetings** – The Army has conducted public meetings and solicited public input on key documents related to the environmental cleanup activities at RFAAP-NRU. Specifically, public meetings were held to solicit public input on the Engineering Evaluation/Cost Analysis (EE/CA) that was performed prior to the soil removal action at the NBG project site and the Proposed Plan that was prepared to outline the Army's Preferred Response Actions for the RFAAP-NRU.
- **Fact Sheets -** Fact sheets describing the status of the Installation Restoration Program (IRP) activities have been displayed during the RAB Meetings and are available for review as part of the Administrative Record file. The fact sheets are also available through the On-Line Information Repositories.

The Proposed Plan, which provides a summary of the environmental concerns at RFAAP-NRU and documents the Army's preference for the Selected Alternatives, was submitted to the public in September 2010. The Proposed Plan was made available to the public in both the Administrative Record File at the Montgomery-Floyd Regional Library and in the electronic Information Repository noted above. The notice of availability for this document was published in the Sunday *New River Current* section of the *Roanoke Times* newspaper on September 26, 2010. A public comment period was held from September 26 to October 26, 2010 during which the public was encouraged to submit any questions or concerns regarding the proposed response actions at RFAAP-NRU. In addition, a public meeting was held on October 19, 2010 where representatives from the Army, and VDEQ were available to answer questions and accept comments regarding the remedial actions under consideration. Response to the comments received during this period is provided in Section 3 of this Decision Document.

2.4 Scope and Role of Response Actions

The Selected Remedies outlined in this Decision Document are intended to be the final CERCLA response actions required for the RFAAP-NRU facility. The response actions address source materials, soil, and/or sediment contamination that have been identified at the BDDT, BLA, IAA, and WBG Study Areas. The response actions are required because risk assessments have concluded that the COCs in these Study Areas present potentially unacceptable risk and/or hazard levels for humans under current or hypothetical land use scenarios. At a minimum, the Selected Remedies will enable the Study Areas to be utilized for industrial/ commercial land use, which fits with the current and reasonably anticipated future use of the facility. For Study Areas where the Selected Remedies will leave contaminants in place at concentrations that would not allow for totally unrestricted/residential development (i.e., BDDT, BLA, and IAA), the remedies will include land use controls to restrict development to commercial/ industrial uses. Five-year reviews will also be conducted for the BDDT, BLA, and IAA to ensure the remedies continue to be protective. The Selected Remedies for the BDDT, BLA, IAA, and WBG Study Areas will all be completed and in place during 2011.

The results of the Remedial Investigation and Risk Assessment for RFAAP-NRU concluded that there were no contaminants of concern at the RY Study Area or in groundwater at the facility that would preclude industrial or residential use, or development, of those resources. While the environmental investigations at the NBG Study Area had identified lead and chromium in surface soil at unacceptable concentrations, a soil removal action was completed at that site in 2009 as part of an Engineering Evaluation/Cost Analysis (EE/CA) that resulted in the site being available for unrestricted use. VDEQ has agreed to the finding of No Action for the NBG and RY study areas as well as facility-wide groundwater. As part of this finding, all groundwater monitoring wells located at the facility will be abandoned in 2011.

2.5 Summary of Site Characteristics and Investigations

This section of the Decision Document presents a brief summary of the background information and nature and extent of contamination for each of the six Study Areas at RFAAP-NRU and for facility-wide groundwater. A comprehensive summary of the environmental investigations, sampling strategies, detected constituents, and risk assessments completed at the BDDT, BLA, IAA, RY, WBG Study Areas, and for facility-wide groundwater, are provided in the Remedial Investigation Report (ARCADIS 2010C). This information is presented for the NBG Study Area in the EE/CA that was prepared for that site (ARCADIS 2009).

2.5.1 Building Debris Disposal Trench (BDDT)

2.5.1.1 Site Background Information

The BDDT Study Area is located within an approximately 5-acre area near the southern boundary of RFAAP-NRU (**Figure 2**) consisting of rolling grass-covered hills. The BDDT area includes what was formerly a natural drainage channel that had eroded into the clay soils between two hills. This drainage channel directs surface water runoff from the surrounding area towards a small unnamed stream that runs through the southwestern portion of the facility. An approximately 600 ft long section of the natural depression formed by the drainage channel was historically utilized for the disposal of miscellaneous building debris derived from the dismantling of various structures at RFAAP-NRU. The debris consisted of concrete, wood, and rusted/broken drums of a black, tarry substance believed to be roofing tar.

The building debris and all visibly stained soils were removed from the site during site investigation and restoration activities completed in 1998. The excavated materials were replaced with clean fill material and the trench was lined with geotextile fabric and filled with riprap to prevent erosion of the underlying soil. The area downgradient of the riprap covered portion of the trench widens into a gently sloping, delta shaped area that is covered with a thick grass groundcover. This grassy area is a natural depositional area for any soils that washed out of the debris area prior to the site restoration activities. An aerial photograph of the BDDT area is included as **Figure 3** that depicts the layout of the site.

2.5.1.2 Nature and Extent of Contamination

The multiple environmental investigations completed at the BDDT Study Area focused on identifying and delineating potential impacts to soil within and downgradient of the former disposal trench, as well as to sediment and surface water in the downgradient unnamed stream. The findings of the investigations and risk assessment concluded that benzo(a)pyrene in soil was a COC for the site. The source of the benzo(a)pyrene is believed to be related to the building debris that had previously been located at the site. No constituents were identified as COCs for sediment or surface water in the unnamed stream downgradient of the BDDT. **Table 2** provides a summary of the benzo(a)pyrene detections in soil at the site.

Extensive delineation sampling completed at the BDDT has indicated that the soils containing benzo(a)pyrene at concentrations above applicable screening levels are confined to the former disposal area (i.e., underneath the rip-rap) and the downgradient depositional area. With the exception of one small area immediately downgradient of the rip-rap, the elevated benzo(a)pyrene detections in these areas are confined to surface soils. In the area immediately downgradient of the rip-rap, the elevated benzo(a)pyrene concentrations extend to a depth of 4 ft bgs.

The riprap/liner system in the former disposal area of the site, as long as it is kept in place, effectively prevents exposure to the impacted soils as well as prevents erosion that would lead to potential migration of the COCs. Since the completion of the site restoration activities in 1998, a thick grass groundcover has also become established in the downgradient depositional area. The grass groundcover, combined with the relatively gentle slope of this area, appears to have effectively prevented the further migration of the COCs deposited in surface soil in this portion of the site. However, the grass ground cover alone would not prevent potential unacceptable exposure under the hypothetical future residential scenario.

2.5.2 Bag Loading Area (BLA)

2.5.2.1 Site Background Information

The BLA is located within an approximately 25-acre area near the southern boundary of RFAAP-NRU. The BLA ran two powder bag production lines during the period from 1941 through 1943. These bag loading operations and related materials handling activities were conducted in seven buildings located throughout the BLA study area. Three additional buildings located at the BLA were reportedly utilized for office/support activities related to BLA operations. The BLA buildings were all connected by a perimeter road and a series of elevated walkway platforms that ran across the site. There are no surface water bodies at the BLA; however, a small unnamed stream does pass through RFAAP-NRU to the north of the site. The locations of the buildings, roads, walkways, and other relevant site features at the BLA are depicted in **Figure 4**.

After the manufacturing operations were discontinued at RFAAP-NRU, the ten buildings at the BLA were dismantled. All of the wooden components of the BLA buildings (e.g., roofs, walls, stairs, etc.) and walkway platforms were taken down and removed from the site. The electrical transformers, utility lines, and process equipment were also removed from the site. Today, all that remains of the BLA buildings are the concrete floors and a few concrete walls. There are also some residual lead-based paints and asbestos containing building materials left on some of the building remnants.

2.5.2.2 Nature and Extent of Contamination

The environmental investigations completed at the BLA Study Area focused on identifying and delineating potential impacts to soil around the former buildings, walkways, electrical transformers, and area drainage ditches, as well as to sediment and surface water in an unnamed stream located downgradient of the site. The findings of the environmental investigations and risk assessment activities for the BLA Study Area concluded that copper, lead, Aroclor 1254, benzo(a)pyrene and asbestos were all COCs in soil at the site. No COCs were identified for sediment or surface water.

The primary source of lead, copper, and asbestos in soil was identified as the degrading conductive flooring material located in the seven former buildings at the BLA. Surface and subsurface soil sampling completed

at the BLA has indicated that these constituents, particularly the concentrations contributing to the unacceptable risks, were confined to shallow surface soils in the immediate vicinity of the buildings with conductive flooring. Due to the relatively flat topography in the vicinity of the buildings there were no direct migration pathways to carry the COCs any significant distance from the buildings. These constituents were not detected at elevated concentrations in subsurface soil, sediment, or surface water. **Table 2** provides a summary the relative concentrations of the COCs detected in soil at the BLA.

The PAH compound benzo(a)pyrene was detected in surface soil samples collected from several areas of the site including next to former BLA buildings, walkway platforms, and area roadways. The exact source of the benzo(a)pyrene is unknown; however, it can likely be attributed to materials (e.g., tar) that were used in building and road construction. Benzo(a)pyrene is also a natural byproduct of combustion and could have been deposited during fires used to help clear the site.

The PCB compound Aroclor 1254 was detected at concentrations above its soil screening level in a surface soil sample collected near one of the former BLA buildings and one former electrical transformer location. Delineation/confirmation sampling indicated that presence of Aroclor 1254 is isolated and confined to surface soils in the immediate vicinity of the former building and transformer.

2.5.3 Igniter Assembly Area (IAA)

2.5.3.1 Site Background Information

The IAA is the second of the two historical manufacturing areas located at RFAAP-NRU. The IAA study area, located in the western portion of RFAAP-NRU, was utilized for the assembly of igniter charges for artillery, cannon, and mortar projectiles; as well as shipping and handling of materials related to the IAA operations from 1941 through 1943. Approximately 36 buildings were located throughout the IAA, 29 of which contained a conductive flooring material similar to that located at the BLA. The IAA buildings are all connected by roads and a series of sidewalks that run across the approximately 43-acre site in the western portion of RFAAP-NRU. There are no surface water bodies at the IAA; however, a series of drainage ditches are present at the site. The locations of the buildings, roads, walkways, and other relevant site features at the IAA are depicted in **Figure 5**.

After the manufacturing operations were discontinued at RFAAP-NRU, the buildings at the IAA were dismantled in a similar fashion to the BLA. All of the wooden components of the IAA buildings (e.g., roofs, walls, stairs, etc.) and walkway platforms were taken down and removed from the site, as were the electrical transformers, utility lines, and process equipment. All that remains of the former IAA buildings are concrete floors and concrete walls. Some residual lead-based paints and asbestos building materials also remain on some of the building remnants.

2.5.3.2 Nature and Extent of Contamination

Much like the BLA, the environmental investigations completed at the IAA Study Area focused on identifying and delineating potential impacts to soil around the former buildings, walkways, electrical transformers, and area drainage ditches located at the site. The findings of the investigations and risk assessment activities for the IAA Study Area concluded that copper, lead, Aroclor 1254, and asbestos were COCs for soil. There were no COCs identified for surface water or sediment at this site. **Table 2** provides a summary the relative concentrations of the COCs detected in soil at the IAA.

The primary source of lead, copper, and asbestos in soil at the IAA was identified as the degraded conductive flooring material that was located in the building remnants spread throughout the site. Extensive surface and subsurface soil delineation sampling completed at the IAA has indicated that these constituents, particularly the concentrations contributing to the unacceptable risks, were confined to surface soils within a few feet of the buildings with conductive flooring. Due to the relatively flat topography in the vicinity of the buildings there were no direct migration pathways to carry the COCs any significant distance from the buildings. These constituents were not identified as COCs in subsurface soil, indicating that migration into deeper soils was not occurring.

The PCB compound Aroclor 1254 was detected at concentrations above its soil screening level in a surface soil sample collected near one of the former IAA buildings and one former electrical transformer location. Delineation/confirmation sampling indicated that presence of Aroclor 1254 is isolated and confined to surface soils in the immediate vicinity of the former building and transformer.

2.5.4 Northern Burning Ground (NBG)

2.5.4.1 Site Background Information

The NBG is an approximately 3-acre site located in the northwest portion of RFAAP-NRU, east of Gate 20. Anecdotal evidence suggests that burning operations were historically conducted at the NBG to remove energetics from metal components used in the former manufacturing activities at the site. Much of the NBG Study Area is heavily wooded, with the exception of a small area in the central portion of the site where the burning operations were conducted. No buildings have ever been located at the NBG site, and the only remaining evidence of the former burning operations included fence posts marking the entrance to the burn area and isolated burned debris in the shallow subsurface.. The NBG Study Area is surrounded by a perimeter dirt road and a drainage ditch to the north. The topography of the site is relatively flat with the exception of the northern portion of the site that slopes towards the drainage ditch. An aerial photography of the NBG Study Area depicting the site features is presented as **Figure 6**.

2.5.4.2 Nature and Extent of Contamination

The environmental investigations and baseline risk assessments for the NBG Study Area concluded that lead and chromium in soil were the only COCs present at the site. Lead was detected at concentrations above screening thresholds for both industrial and residential land use scenarios. Chromium was determined to present a potential non-cancer hazard under a residential land use scenario. The elevated detections of lead and chromium were well delineated and confined to surface soils in the central portion of the site where the former burning ground operations were conducted. Many of the other constituents that had been detected at the site were also collocated in this area. Site maps depicting the constituent concentrations detected at each of the sample locations at the NBG are presented in the EE/CA (ARCADIS 2009).

Based on the findings of the EE/CA, a non-time critical removal action was performed at the NBG in December 2009. This removal action included the excavation of lead and chromium impacted surface soils throughout an approximately 5,500 square foot area in the central portion of the NBG. The depth of the excavation throughout much of the area was approximately 1-foot; however, the depth of excavation extended to 4-feet in a few isolated areas. Once the excavation activities were completed, the site was backfilled with clean material from off-site and the area was revegetated with grasses to prevent erosion. Confirmation samples collected from the perimeter and base of the excavated area during the removal action confirmed that the excavation effectively removed the soils containing lead and chromium at concentrations above established industrial and residential cleanup levels. The details of the removal action, including site maps depicting the results of the confirmation samples, are presented in the Response Action Completion and Closure Report for the Northern Burning Ground (ARCADIS 2010a).

2.5.5 Rail Yard (RY)

2.5.5.1 Site Background Information

The RY is located within an approximately 54-acre open area in the central portion of RFAAP-NRU. The RY was used for loading and unloading rail cars and the temporary storage of rail cars. The area contained three parallel sets of tracks and several spurs so that cars could be rearranged. Four of the spurs at the north end of the site were surrounded by earthen berms. Three open transfer platforms and one bermed transfer platform are located along the southernmost track for loading and unloading the trains. A decommissioned sewer line runs southwest from a building foundation to a branch of the RFAAP-NRU sewer system that is no longer in use. Small tributaries to an unnamed creek that flows through RFAAP-NRU are located to the south of the RY area. One of these tributaries is dammed to form a small pond. An aerial photograph of the RY Study Area is included as **Figure 7** that depicts the relevant features of the site.

The environmental investigations conducted at the RY focused on the most likely sources of potential contaminant releases at the site, which included the areas where historical train loading, unloading, and maintenance activities were performed. Raw materials used in the historical manufacturing activities at the RFAAP-NRU and packaged explosives/propellants manufactured at the facility were unloaded/loaded onto train cars from four transfer platforms. Routine maintenance was likely performed on trains in the yard as well. Explosives, propellants, degreasers, cleaning agents, and lubricants would be included among the potential contaminants to have been released at the site. These releases would most likely have occurred along the tracks, spurs, and at the transfer platforms present at the site. PCB containing electrical transformers formerly located at the site could also have contributed to releases at the site.

2.5.5.2 Nature and Extent of Contamination

Although the environmental investigations conducted at the RY found isolated detections of a few constituents of potential concern, there was no pattern of spatial distribution or indication of any specific source areas. The risk assessment did not identify any true COCs for the site under the current and anticipated future industrial/commercial land use or hypothetical residential land use scenarios. There are no unacceptable risks or hazards at the RY; therefore, no response actions or land use restrictions are required for the RY study area.

2.5.6 Western Burning Ground (WBG)

2.5.6.1 Site Background Information

The WBG is a former burning ground located in the southwestern portion of the RFAAP-NRU, south of the IAA. The burning operations conducted at the WBG area were performed to decontaminate materials that had been in contact with explosive/energetic compounds and to dispose of excess and non-compliant explosive/energetic materials from the BLA and IAA operations. The main burn area was approximately 170 ft long by 100 ft wide and is surrounded on three sides by an approximately 4 ft high earthen berm. The burning operations were conducted directly on-ground surface or in a portable burning cage within the bermed area. The soil from the former burning area was removed from the site during a 1999 site investigation, and the area was backfilled with clean fill material. No buildings have ever been located at the WBG study area.

A dirt access road runs parallel to the open side of the former burn area leading to an unnamed pond located to the south of the WBG. This shallow pond, which is approximately 3.6 acres in size, was constructed during the early 1990s. The pond is fed by Wiggins Spring, a natural spring located at the head (i.e., northwest corner) of the pond. The pond also collects surface water drainage from the surrounding area. The pond drains under an earthen dam via a constant level drain on the southeastern side of the

pond. The effluent flows into a tributary of the unnamed creek that flows through the southwest portion of the RFAAP NRU. A site map depicting the relevant features of the WBG site is presented as **Figure 8**.

2.5.6.2 Nature and Extent of Contamination

The environmental investigations completed at the WBG Study Area focused on identifying and delineating potential impacts to soil within and downgradient of the former burning ground, as well as to sediment and surface water in the adjacent pond and downgradient stream. The investigations also included fish tissue sampling in the pond. The initial environmental investigations conducted at the WBG found isolated detections of a few constituents of potential concern (COPCs) in soil. However, following the 1999 sampling event, during which the impacted soils from the former burn area were removed from the site, the residual concentrations of the detected constituents in soil were not found to present unacceptable risks or hazards under the current and anticipated future industrial/commercial land use scenario. Likewise, no unacceptable risks or hazards were identified with soil for the hypothetical future residential land use scenario. Therefore, no COCs were identified for soil at the WBG Study Area.

While no COCs were identified in soil at the WBG, the investigations and risk assessment for the site did find that there were potentially unacceptable risks associated with exposure to pond sediments under a residential land use scenario. The COCs in sediment driving these unacceptable risks are chromium and lead. Extensive delineation sampling has indicated that the elevated concentrations of these COCs were confined to a small area near the northern bank of the pond. This area is thought to have been a collection point for runoff from the former burn area prior to construction of the pond and access road. Lead was not detected in the fish tissue samples collected from the pond and chromium levels in the fish tissue samples were within normal limits, indicating that wildlife are not being adversely impacted by the COCs. No COCs were identified in surface water. **Table 2** provides a summary the relative concentrations of the COCs detected in sediment at the WBG.

2.5.7 Site-Wide Groundwater (GW)

2.5.7.1 Site Background Information

RFAAP-NRU and the surrounding region are located in an area dominated by karst groundwater systems. In general terms, groundwater flow in karst systems occurs in convergent bedrock conduit networks that are similar in configuration to the tributary systems in streams. Infiltration enters the karst system through sinkholes, when the residuum is clay-rich like at RFAAP-NRU, and groundwater flows through successively larger conduits as flow is contributed from the tributary network. Groundwater flow in karst systems is governed by the base-elevation of discharge points such as springs and the geometry of the conduit networks. From a conceptual perspective, the conduit networks act as collector systems for the groundwater and the springs provide monitoring points that integrate flow across the system.

The environmental investigations conducted at RFAAP-NRU did not identify any known sources of groundwater contamination at the facility. The majority of the constituents detected in soil at the facility are not typical groundwater contaminants, especially at the detected concentrations. As discussed in the individual study area discussions, the detected constituents were typically confined to surface soils indicating that infiltration was not a significant migration pathway. Furthermore, there are no sinkholes or other significant recharge areas in the immediate vicinity of any of the identified Study Areas that would provide a direct pathway for contaminants to enter the karst flow networks.

A total of 11 groundwater monitoring wells were installed at RFAAP-NRU in 2007 to assist in the facility-wide groundwater investigation. These wells were strategically placed at, or in the vicinity of, the Study Areas where constituents were identified in soil. The monitoring well network included two monitoring wells at the BLA, four monitoring wells at the IAA/RY, two monitoring wells at the NBG, and three monitoring wells at the WBG. The groundwater monitoring wells were sampled in 2007, 2008, and 2010.

In addition to sampling the monitoring well network, the groundwater investigations at RFAAP-NRU included the collection of spring water samples during the 2009 and 2010 sampling events. Due to the karst nature of the site and the fact that springs serve as groundwater collectors for a fairly wide area, springs serve as excellent indicators of overall groundwater quality. Each of the four springs known to exist within RFAAP-NRU were sampled concurrent with the monitoring well sampling events performed in 2009 and 2010. **Figure 9** illustrates the locations of the 11 groundwater monitoring wells and four springs included in the RFAAP-NRU groundwater investigation.

2.5.7.2 Nature and Extent of Contamination

The results of the environmental investigations and risk assessment activities at RFAAP-NRU concluded that there are no COCs for groundwater and that no action is required for groundwater at the facility. VDEQ has agreed with the recommendation of No Action for groundwater. The eleven monitoring wells at RFAAP-NRU will be abandoned in accordance with VDEQ guidance.

2.6 Current and Potential Future Land and Resource Use

RFAAP-NRU is an active military installation that currently serves as a storage facility for the on-going propellant manufacturing operations at RFAAP-MMA. There are no active manufacturing operations currently on-going at RFAAP-NRU and the buildings that housed the historical manufacturing operations at the facility have been dismantled and are not suitable for any use. The storage facilities at RFAAP-NRU consist of magazines that are primarily located throughout the eastern portion of the RFAAP-NRU facility. There are no magazines, or any active operations, located at any of the Study Areas discussed in this Decision Document. There are no residences or offices located within the RFAAP-NRU boundaries.

The majority of the land area consists of undeveloped grasslands, heavily forested areas, and agricultural tracts. Small ponds located throughout the property, including the one located at the WBG Study Area are occasionally used for fishing, and limited hunting for deer and turkey is permitted during hunting season. A security fence currently surrounds the Installation, and the perimeter is regularly patrolled. Access by authorized personnel is limited to the guarded entrances. Public access is restricted.

RFAAP-NRU is anticipated to remain an active military installation in the future with land use remaining unchanged or limited to military/industrial development; therefore, the current industrial/commercial land use scenario is not anticipated to change. At a minimum, all of the response actions outlined in this Decision Document will leave RFAAP-NRU in a condition suitable for industrial/commercial development; although some of the response actions will result in the areas being suitable for unrestricted/residential development. In the event that RFAAP-NRU was closed and declared excess property, any land use restrictions mandated by the response actions will be legally recorded and incorporated into the provisions for the new land use. Although future residential use of RFAAP-NRU is unlikely, the Army requires that future residential use be considered when evaluating long-term closure scenarios for sites with potential environmental contamination.

Groundwater at RFAAP-NRU is not an actively utilized resource. Groundwater is not used as drinking water nor is it used for irrigation or as a wash water source. However, it should be recognized that due to the karst nature of the site, groundwater underlying RFAAP-NRU does discharge to surface at several spring locations throughout the facility. These springs contribute to surface water streams that run through the facility and onward to off-site properties. These streams may be used for irrigation and/or drinking water for livestock on downgradient agricultural properties. The potential also exists that groundwater may become a utilized resource in the future should RFAAP-NRU be further developed by the Army or if the property is divested for outside development.

2.7 Summary of Site Risks

Baseline human-health risk assessments (HHRA) and ecological risk assessments (ERA) were performed for the six Study Areas and facility-wide groundwater at RFAAP-NRU utilizing the data collected throughout the multiple phases of remedial investigation. The baseline risk assessments estimate what risks would be posed by the constituents detected at the Study Areas if no actions were taken and identify the exposure pathways that need to be addressed by remedial actions. The nature of the identified risks provides the basis for taking action. This section of the Decision Document summarizes the results of the baseline risk assessments for RFAAP-NRU.

2.7.1 Summary of Human Health Risk Assessment

The HHRA for the RFAAP-NRU study sites characterized potential risks in a manner consistent with the risk assessment principles and practices established by the USEPA Risk Assessment Guidance for Superfund (USEPA 1989). The HHRAs for the BDDT, BLA, IAA, RY, WBG, and Facility-Wide Groundwater are presented in great detail within the Remedial Investigation (RI) report (ARCADIS 2010). The baseline HHRA for the NBG was presented in the Engineering Evaluation/Cost Analysis (EE/CA) for the NBG (ARCADIS 2009). All of the site-specific risk assessments included an evaluation of the potential risks posed by any identified contaminants under the current industrial/commercial land use scenarios, as well as hypothetical future land use scenarios. The risk assessment for the current land use scenario evaluated potential exposures to site workers and trespassers. The risk assessment for the future land use scenarios included an evaluation of potential exposures to construction workers, adult residents, and child residents. **Figure 10** presents a summary of the exposure routes (e.g., ingestion, inhalation, dermal exposure, etc.) evaluated for each of the potential receptors.

As discussed in Section 2.5, the environmental investigations and risk assessments for the Study Areas and facility-wide groundwater only identified COCs/risk-drivers for the BDDT, BLA, IAA, and WBG study areas. There are no risk drivers for the NBG and RY study areas or for facility-wide groundwater. The nature of the unacceptable risks and and/or hazards at the BDDT, BLA, IAA, and WBG are briefly outlined below.

<u>Building Debris Disposal Trench</u>

- Benzo(a)pyrene in soil within the rip rap and downgradient depositional areas was found to contribute to an excess lifetime cancer risk (ELCR) ($4x10^{-4}$) that is greater than the USEPA acceptable range of $1x10^{-6}$ to $1x10^{-4}$ for the residential land use scenario.

<u>Bag Loading Area</u>

- Copper in soil was found to contribute to a non-cancer hazard index (HI) of 3 for the construction worker exposure scenario. The USEPA uses a threshold HI of 1 to identify unacceptable risks
- Copper and Aroclor 1254 in soil were also found to contribute to an HI of 12 for the child resident exposure scenario.
- Benzo(a)pyrene in soil was identified as the primary contributor to an unacceptable ELCR of $1x10^{-3}$ for the residential land use scenario.
- Lead in soil was found to contribute to fetal blood lead levels above the threshold value of 10 for the site worker, construction worker, and adult resident exposure scenarios. Lead was also found to contribute to unacceptable blood lead levels for the child resident exposure scenario.
- Activity based sampling performed at the BLA indicated that asbestos in soil located immediately adjacent to the buildings had the potential to generate airborne asbestos fibers at concentrations above air action levels (AALs) for the site worker and residential exposure scenarios. The detected asbestos concentrations in air were lower than the AAL for the construction worker scenario.

Igniter Assembly Area

- The HI was equal to 1 for the site worker and 3 for the construction worker scenario. While the HI for the construction worker was above the threshold (primarily due to copper and Aroclor 1254), when the constituents were evaluated for target organ/critical effects the HI did not exceed 1; therefore no constituents were identified as risk drivers.
- Aroclor 1254 and copper in soil were the primary contributors to an unacceptable HI of 13 for the child resident exposure scenario.
- Lead in soil was found to contribute to a predicted fetal blood levels for an adult resident that was higher than the benchmark of 10 µg/dL.
- Activity based sampling performed at the IAA indicated that asbestos in soil located immediately adjacent to the buildings had the potential to generate airborne asbestos fibers at concentrations above AALs for the site worker and residential exposure scenarios. The detected asbestos concentrations in air were lower than the AAL for the construction worker scenario.

Western Burning Ground

- Chromium in pond sediment was found to contribute to an unacceptable non-cancer HI of 6 for the child resident exposure scenario.
- Lead in the pond sediments was also found to contribute to elevated fetal blood lead levels for the site resident.

Table 3 provides a summary of the calculated risks and hazards for each of the exposure scenarios at the BDDT, BLA, IAA, and WBG Study Areas.

2.7.2 Summary of Ecological Risk Assessment

The methods, procedures, and results of the ERA for the BDDT, BLA, IAA, RY, WBG, and Site-Wide Groundwater are presented in great detail within the RI report (ARCADIS, 2010c). The baseline risk assessment for the NBG was presented in the EE/CA (ARCADIS, 2009). The potential exposure pathways for potential aquatic and terrestrial ecological receptors at the RFAAP-NRU are presented in **Figure 11**. The results of the ERAs for the Study Areas at RFAAP-NRU indicated that there were a few constituents at each of the study areas that had the potential for adverse ecological impacts to individual receptors. However, when the limited spatial distribution and background concentrations of the constituents were taken into consideration, the ERAs concluded that there was no potential for population level ecological effects to terrestrial or aquatic receptors at any of the Study Areas. Therefore, no COCs or drivers for remedial action have been identified for RFAAP-NRU from an ecological risk standpoint.

2.7.3 Basis for Action

The baseline risk assessments for the BDDT, BLA, IAA, and WBG concluded that the COCs detected at those Study Areas contributed to potential human-health risks and/or hazards at levels that were higher than

the USEPA's generally acceptable ranges. Therefore, the response actions selected in this Decision Document have been deemed necessary to protect public health or welfare or the environment from actual or threatened releases of pollutants or contaminants that may present an imminent and substantial endangerment to public health or welfare.

2.8 Remedial Action Objectives and Clean-up Levels

This section presents the remedial action objectives (RAOs) and numerical cleanup levels that were established in the Feasibility Study to guide the remedial action selection and design process.

2.8.1 Remedial Action Objectives

Site-specific RAOs have been established for the BDDT, BLA, IAA, and WBG Study Areas at RFAAP-NRU. The RAOs are intended to provide a clear statement of the intended outcome of the required remedial actions and how the actions will reduce the risk and/or hazards associated with the site. The RAOs also provide the design basis used to develop and evaluate the feasibility of many of the response action alternatives that were considered for each of the Study Areas.

The following sections discuss the RAOs that were established for each of the Study Areas. Note that RAOs were not required for the NBG and RY Study Areas, or for groundwater, because no actions are required for those sites.

2.8.1.1 Building Debris Disposal Trench Soils

The general RAOs that were established for the BDDT are to:

- Minimize the potential for COCs present in soil to migrate to other areas, including the downgradient creek.
- Prevent human exposure to COCs in surface soils that could lead to risks or hazards for the designated use.

2.8.1.2 Bag Loading Area and Igniter Assembly Area Soils and Conductive Flooring

The general RAOs for the BLA and IAA are to:

- Minimize the potential for future releases of COCs from the conductive flooring to the surrounding environment.
- Prevent human exposure to COCs in soil and the flooring material that would lead to an unacceptable risk or hazard for the designated use.

- Minimize the potential for COCs present in surface soils to migrate to other areas.

2.8.1.3 Western Burning Ground Sediments

The general Remedial Action Objectives for the WBG are to:

- Prevent the potential for human exposure to COCs in pond sediments that could lead to risks or hazards for the designated use.
- Minimize the potential for COCs present in pond sediment to migrate to other areas.

2.8.2 Numerical Cleanup Levels

Numerical Remedial Action Levels (RALs) were established for each of the COCs/risk drivers at the BDDT, BLA, IAA, and WBG Sites to help guide the selection and design of the remedial alternatives. A detailed discussion of the methods and procedures used to calculate each of the RALs is provided in the Feasibility Study Report (ARCADIS 2010b). The site-and- scenario-specific RALs are summarized in the following table. Note that the RAL for asbestos is the same for both the residential and industrial exposure scenarios.

Driver	Applicable Study Area	RAL for the Hypothetical Future Resident Scenario	RAL for the Current and Anticipated Future Industrial Scenario
Aroclor 1254	BLA, IAA	0.23 mg/kg	NA
Benzo(a)pyrene	BLA, BDDT	0.025mg/kg	NA
Copper	BLA, IAA	3,044 mg/kg (a)	11,533 mg/kg
Lead	BLA, IAA	400 mg/kg (a)	624 mg/kg
Asbestos	BLA, IAA	0.1%	0.1%
Chromium (sediment)	WBG	1,358 mg/kg	NA
Lead (sediment)	WBG	1,100 mg/kg	NA

2.9 Description of Alternatives

This section of the Decision Document describes the various response action alternatives that were considered for the BDDT, BLA, IAA, and WBG Study Areas. These alternatives were developed based on an initial screening of all available technologies and controls conducted as part of the FS. Each of these alternatives was presented to the public within the Proposed Plan. Due to the similarities between the BLA and IAA Study Areas, the response action alternatives for these Study Areas are nearly identical and will be discussed together.

2.9.1 Building Disposal Debris Trench Soils

Four remedial action alternatives were developed and evaluated for the benzo(a)pyrene impacted soils at the BDDT Study Area.

- Alternative BDDT SL-1: No Action
- Alternative BDDT SL-2: Institutional Controls
- Alternative BDDT SL-3: Partial Excavation, Transportation, Disposal, and Institutional Controls
- Alternative BDDT SL-4: Excavation, Transportation, Disposal

Alternatives BDDT SL-2 and BDDT SL-3 would result in COCs being left in place that could present risks to future receptors if land use were to change; Therefore implementation of these alternatives would require the use of land-use controls (LUCs) and 5-year CERCLA reviews to ensure they continue to be effective. Alternative BDDT SL-4 would result in a reduction in risks and hazards to levels that would be acceptable for unrestricted residential development; therefore LUCs and 5-year CERCLA reviews would not be required.

2.9.1.1 Alternative BDDT-SL-1: No Action

CERCLA and the NCP require that a "No Action" alternative be considered when evaluating the available response actions for any given site. This alternative provides a baseline by which the remaining remedial alternatives can be evaluated. Under Alternative BDDT SL-1, all administrative controls would cease, no further site monitoring or oversight would be performed, and no remedial action would take place to prevent contact with COCs at the BDDT. There is no cost associated with the No Action Alternative because no activity would be performed.

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

2.9.1.2 Alternative BDDT SL-2: Institutional Controls

Alternative BDDT SL-2, the Selected Alternative for the BDDT, utilizes Institutional Controls (ICs) (e.g., administrative and engineering controls) to: 1) to ensure that the rip-rap area and depositional area vegetation are maintained to prevent erosion and transport of PAHs in soils; and 2) prevent future residential land use of the study area. These IC objectives would be met indefinitely or until the property is transferred at which time a deed restriction on the property would be placed. The risk assessment conducted for the BDDT site concluded that the potential risks and hazards are within USEPA's generally acceptable risk range for the current and anticipated future industrial/commercial land use of the site. The existing erosion

control measures (i.e., rip-rap lined trench and downgradient vegetation) effectively prevent erosion and migration of the surface soil. The Institutional Controls that will be implemented for the site will simply prevent residential development of the site and ensure that the existing erosion control measures continue to prevent migration of impacted surface soils. There will be no restrictions to industrial/commercial use of the property and there will be no health-based requirement to restrict or monitor intrusive activities. Inspections and maintenance would be performed on an annual basis to ensure that the ICs remain effective, and the findings will be documented in annual reports and 5-year CERCLA reviews.

Estimated Capital Cost	$42,000
Estimated Annual O&M Cost	$251,000
Total Estimated Present-Worth Cost	$146,000

2.9.1.3 Alternative BDDT SL-3: Partial Excavation, Transportation, Disposal, and Institutional Controls

Alternative BDDT SL-3 is more aggressive than BDDT SL-2 in that it would include the excavation and off-site disposal of COC impacted surface soils from the depositional area downgradient of the rip-rap covered portion of the site. The excavation area would be dictated by the PRGs that have been developed for the residential land use scenario. The excavated soils would be transported to an approved off-site disposal facility. The area would be backfilled with clean material from an off-site source and revegetated to prevent erosion into the unnamed creek downgradient of the site.

The COC impacted soils located underneath the trench liner and rip-rap covered portion of the site would be left in place. The risk assessment confirmed that these soils would pose unacceptable risks under a residential land use scenario. Therefore, ICs would still need to be implemented for the site similar to those listed for Alternative BDDT SL-2 to protect and maintain the rip-rap. Restrictions would still be placed on the site to prevent residential/unrestricted development of the site. As with Alternative BDDT SL-2, inspections and maintenance would be performed on an annual basis for the rip-rap area and documented in annual reports and 5-year CERCLA reviews. However, the depositional area would no longer require maintenance or long-term controls.

Estimated Capital Cost	$432,000
Estimated Annual O&M Cost	$251,000
Total Estimated Present-Worth Cost	$537,000

2.9.1.4 Alternative BDDT SL-4: Excavation, Transportation, Disposal

Alternative BDDT SL-4 is the most aggressive of the alternatives evaluated for the BDDT Study Area. Under this alternative, soils from the depositional area of the site, as well as soils underneath the rip-rap covered

portion of the site, would be excavated to remove soils containing COCs at concentrations above the residential clean up levels. The excavated soils would be transported to an approved off-site disposal facility. Upon completion of the excavation activities, the area would be backfilled with clean soils from an approved off-site source. The depositional area would be revegetated and the rip-rap would be placed back in the trench to prevent erosion. This alternative would yield a site where the residual risks and hazards are within the USEPA's acceptable risk and hazard range for both residential and industrial land use. Therefore, there would be no need to implement ICs. The site would be available for unrestricted land use.

Estimated Capital Cost	$856,000
Estimated Annual O&M Cost	$0
Total Estimated Present-Worth Cost	$856,000

2.9.2 Bag Loading Area and Igniter Assembly Area Surface Soils

Four remedial action alternatives were developed and evaluated for the COC impacted soils at the BLA and IAA Study Areas.

- Alternative BLA/IAA SL-1: No Action
- Alternative BLA/IAA SL-2: Institutional Controls
- Alternative BLA/IAA SL-3: Vegetative Soil Cover and Institutional Controls
- Alternative BLA/IAA SL-4: Excavation, Transportation, Off-Site Disposal and Institutional Controls

Alternatives BLA/IAA SL-2 and BLA/IAA SL-3 would result in COCs being left in place that could present risks to future receptors if land use were not restricted; therefore implementation of these alternatives would require the use of land-use controls (LUCs) and 5-year CERCLA reviews to ensure they continue to be effective. Alternative BLA/IAA SL-4 allows for the option of excavating to achieve industrial or residential clean-up goals. If conducted to industrial clean up goals, implementation of Alternative BLA/IAA SL-4 requires the use of ICs to prevent future residential level exposures. If conducted to residential clean-up goals, implementation of Alternative BLA/IAA SL-4 would not require ICs.

2.9.2.1 Alternative BLA/IAA SL-1: No Action

Alternative SL-1 includes no further remedial action for the reduction, control, or monitoring of potential human health or ecological risks associated with impacted surface soil, and therefore has no associated cost. It is a readily implementable alternative. However, it includes no controls to restrict land use and minimize the potential for direct contact with surface soil. The "No Action" alternative is required by NCP and USEPA guidance as a baseline with which to compare other remedial action alternatives.

Study Area:	BLA	IAA
Estimated Capital Cost	$0	$0
Estimated Annual O&M Cost	$0	$0
Total Estimated Present-Worth Cost	$0	$0

2.9.2.2 Alternative BLA/IAA SL-2: Institutional Controls

Alternative SL-2 utilizes ICs as the sole means of managing risks at the BLA and IAA by maintaining current industrial/commercial use of the property, controlling access to the area with COCs at concentrations above industrial PRGs to minimize exposure pathways/duration; and requiring implementation of special handling procedures, health and safety procedures, and permitting prior to disturbance of soils at sites where risks remain. Administrative and engineering controls would be maintained and/or implemented at the BLA and/or IAA study areas to ensure no contact with soil occurs by industrial users or construction workers that could result in an unacceptable risk. Additionally they would prevent future residential land use of the areas. These IC objectives would be met indefinitely or until the property is transferred at which time deed restrictions would be placed on the property. Annual inspections and maintenance would be performed and documented in annual reports and CERCLA 5-year reviews.

Study Area:	BLA	IAA
Estimated Capital Cost	$84,000	$118,000
Estimated Annual O&M Cost	$251,000	$251,000
Total Estimated Present-Worth Cost	$188,000	$223,000

2.9.2.3 Alternative BLA/IAA SL-3: Vegetative Soil Cover and Institutional Controls

Alternative SL-3 includes the installation of a vegetative soil cover in areas of the BLA and/or IAA study areas where COCs are present at concentrations above the industrial clean-up levels. The soil cover would consist of a compacted 8-inch thick soil layer placed over the existing surface soils. A 6-inch topsoil layer will be placed over the compacted soil layer followed by seeding to establish vegetation and prevent erosion. Based on the data collected during the site investigations, the cover would be placed around the perimeter of all the buildings that had conductive flooring and would extend to a minimum of 2-feet from the building edges. Confirmation sampling would be conducted prior to the final construction of the cover to confirm the exact extent of its placement. The soil cover would effectively prevent human exposure to the underlying COCs as well as prevent migration.

This alternative requires that institutional controls (ICs) be implemented to ensure that the vegetative cap is maintained and that land use is restricted to industrial/ commercial. Unrestricted (i.e., residential) closure could not be achieved by this alternative because COCs would be left in place. This alternative would

preclude unrestricted/residential development of the property. Annual inspections and maintenance would be performed and documented in annual reports and CERCLA 5-year reviews.

Study Area:	BLA	IAA
Estimated Capital Cost	$209,000	$233,000
Estimated Annual O&M Cost	$252,000	$260,000
Total Estimated Present-Worth Cost	$314,000	$341,000

2.9.2.4 Alternative BLA/IAA SL-4: Excavation, Transportation, Off-Site Disposal and Institutional Controls

Alternative SL-4, which is the Selected Alternative for both the BLA and IAA study areas, includes the excavation and off-site disposal of surface soils that contain constituents that contribute to the majority of the risk at the site (i.e., COCs at concentrations greater than the industrial clean-up levels at the BLA and residential clean-up levels at the IAA). Within the BLA and IAA, unacceptable potential risks currently exist under the industrial land use scenario (i.e., site worker and construction worker scenarios) and the hypothetical future residential land use scenario.

The extent of the excavation activities can be designed to only target the areas that contain COCs at concentrations above the industrial clean-up levels; or the programs can be expanded to also cover the areas that contain COCs at concentrations above the residential clean-up levels. While the same general RAOs were established for the BLA and IAA, it should be noted that the final soil cleanup levels that have been selected for the two sites are different. The response action for soil at the BLA will target industrial cleanup levels, while the response action for the soil at the IAA will target residential cleanup levels.

At the IAA, the extent of the excavation activities for the residential level clean-up scenario at the IAA would be very similar to that proposed for the industrial scenario, because the COCs under both the industrial and residential scenarios are generally co-located. The excavation would likely only need to be expanded around a limited number of the IAA former buildings where the COCs extend to further distances from the buildings. Therefore, the excavations will be expanded to meet the residential levels. The site could achieve clean closure for soils and ICs would not be required. However, it should be noted that the buildings at the BLA and IAA contain residual lead based paint and asbestos containing materials (unrelated to the conductive flooring material), that would preclude unrestricted/residential development of the site unless they are removed.

At the BLA, the extent of the excavation for the residential clean-up scenario would need to be expanded significantly due to the wide-spread nature of the benzo(a)pyrene detections at the site. The resulting excavation volume under the residential scenario would be approximately 10 times greater than under the industrial scenario. Therefore, the response action for soil at the BLA will target industrial cleanup levels. At the BLA, the extent of the excavation activities for the industrial clean-up scenarios would include, at a

minimum, soils located within 2-feet of the former buildings containing the conductive flooring material. The excavation footprint would be expanded in areas where there is visual evidence that soils have been impacted by the degraded conductive flooring. The footprint would also be expanded in areas where confirmation sampling indicated COC concentrations above the industrial clean-up levels. Since the excavation will only be conducted to meet the industrial clean-up levels, ICs and an inspection program, similar to those discussed for the other alternatives, would still be required for the site.

Study Area:	BLA	IAA
Estimated Capital Cost	Industrial $251,000 Residential $601,000	Industrial $323,000 Residential $335,000
Estimated Annual O&M Cost	Industrial $148,000 Residential $0	Industrial $147,000 Residential $0
Total Estimated Present-Worth Cost	Industrial $312,000 Residential $601,000	Industrial $384,000 Residential $335,000

2.9.3 Bag Loading Area and Igniter Assembly Area Conductive Flooring

Four remedial action alternatives were developed and evaluated for the conductive flooring materials at the BLA and IAA Study Areas.

- Alternative BLA/IAA CF-1: No Action
- Alternative BLA/IAA CF-2: Institutional Controls
- Alternative BLA/IAA CF-3: Removal of Degraded Flooring and Off-Site Disposal
- Alternative BLA CF-4: Removal of Degraded Flooring, Capping (Epoxy) Intact Flooring, and Off-Site Disposal

Alternatives BLA/IAA CF-2 and BLA CF-4 would result in conductive flooring (which has been identified as a source material) being left in place that could present risks to future receptors if land use were not restricted; therefore implementation of these alternatives would require the use of land-use controls (LUCs) and 5-year CERCLA reviews to ensure they continue to be effective. Alternative BLA/IAA CF-3 would result in the

complete removal of the conductive flooring material from the BLA and IAA Study Areas thus eliminating any potential risks/hazards or need for future controls.

2.9.3.1 Alternative CF-1: No Action

Alternative CF-1 includes no further remedial action for the reduction, control, or monitoring of potential human health or ecological risks associated with impacted surface soil, and therefore has no associated cost. It is a readily implementable alternative. However, it includes no controls to restrict land use and minimize the potential for direct contact with lead-impacted surface soil. The "No Action" alternative is required by NCP and USEPA guidance as a baseline with which to compare other remedial action alternatives.

Study Area:	BLA	IAA
Estimated Capital Cost	$0	$0
Estimated Annual O&M Cost	$0	$0
Total Estimated Present-Worth Cost	$0	$0

2.9.3.2 Alternative CF-2: Institutional Controls

Under Alternative CF-2, administrative and engineering controls would be maintained and/or implemented at the BLA and/or IAA study areas to ensure no contact with flooring material occurs by industrial users or construction workers that could result in an unacceptable risk. Additionally they would prevent future residential land use of the area These IC objectives would be met indefinitely or until the property is transferred at which time deed restrictions on the property would be placed.

Study Area:	BLA	IAA
Estimated Capital Cost	$54,000	$61,000
Estimated Annual O&M Cost	$182,000	$182,000
Total Estimated Present-Worth Cost	$129,000	$136,000

2.9.3.3 Alternative CF-3: Removal of Degraded Flooring and Off-Site Disposal

Under Alternative CF-3, the Selected Alternative, the conductive flooring material within the 7 former BLA and 29 former IAA buildings would be removed and transported off site to an appropriate landfill permitted to accept the material. Prior to disposal, the removed flooring material will be characterized to determine whether it needs to be disposed of as hazardous or non-hazardous. Removed materials would be transported by truck to the receiving landfill after pre-acceptance of the material.

The conductive flooring material would be removed from the underlying concrete by mechanical scraping or high pressure water utilizing approved asbestos abatement techniques. The flooring removal activities would be conducted under the supervision of a certified asbestos abatement contractor and supervisor to ensure appropriate health and safety protocols, as they relate to asbestos, are employed. Containment systems would be utilized to ensure that the material is confined to the work zones and does not impact surrounding areas.

This alternative would remove all of the flooring from the site; thus negating the potential for human exposure to the material on-site as well as the potential for the material to migrate to different areas. Therefore, there would no need for an annual inspection program or ICs as they relate to the flooring material.

Study Area:	BLA	IAA
Estimated Capital Cost	$521,000	$787,000
Estimated Annual O&M Cost	$0	$0
Total Estimated Present-Worth Cost	$521,000	$787,000

2.9.3.4 Alternative BLA CF-4: Removal of Degraded Flooring, Capping (Epoxy) Intact Flooring, and Off-Site Disposal

Alternative BLA CF-4 only pertains to the BLA, and addresses both degraded and intact flooring materials. As in Alternative CF-3, all degraded flooring material at the BLA would be removed and transported off site to an appropriate landfill permitted to accept the material.

However, under this alternative, the intact sections of flooring at the BLA (i.e., the sheltered first floor of the two storing buildings [Buildings 404 and 407]) would be treated and sealed. This treatment process would consist of the application of an epoxy resin designed to prevent the direct contact of the conductive flooring materials with human receptors. This process of sealing or capping with epoxy coating would also provide protection against potential weathering of the flooring materials, reducing the likelihood of future exposure and/or release to the environment. All waste characterization, health and safety protocols, and construction approach will be implemented as in Alternative CF-3.

As portions of the conductive flooring would be left in place under this option, ICs would be utilized to maintain the protective cap. Long-term inspections and maintenance of the protective cap would be conducted after implementation, unless the building remnants are demolished and removed from the site. Long-term maintenance would include performing and documenting annual inspections, conducting 5 year reviews, and maintenance of the epoxy cap to ensure the integrity and effectiveness of the cover. Maintenance may include reapplication of the epoxy coating as deemed necessary, and inspection of engineered land use controls.

Study Area:	BLA	IAA
Estimated Capital Cost	$795,000	-
Estimated Annual O&M Cost	$251,000	-
Total Estimated Present-Worth Cost	$899,000	-

2.9.4 Western Burning Ground Sediments

Three remedial action alternatives were developed and evaluated for the COC impacted sediments at the WBG Study Area.

- Alternative WBG SD-1: No Action
- Alternative WBG SD-2: Institutional Controls
- Alternative WBG SD-3: Excavation, Transportation, and Off-Site Disposal

Alternatives WBG SD-2 would result in COCs being left in place that could present risks to future residential receptors if land use at RFAAP-NRU were to change; therefore, implementation of this alternative would require the use of land-use controls (LUCs) and 5-year CERCLA reviews to ensure it continues to be effective. Alternative WBG SD SD-3 would result in a reduction in site risks and hazards to levels that would be acceptable for unrestricted residential development; therefore LUCs and 5-year CERCLA reviews would not be required.

2.9.4.1 Alternative WBG SD-1: No Action

Alternative WBG SD-1 includes no further remedial action for the reduction, control, or monitoring of potential human health or ecological risks associated with impacted sediment, and therefore has no associated cost. It is a readily implementable alternative; however, it includes no controls to restrict land use and minimize the potential for direct contact with lead-impacted surface soil. The “No Action” alternative is required by NCP and USEPA guidance as a baseline with which to compare other remedial action alternatives.

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

2.9.4.2 Alternative WBG SD-2: Institutional Controls

The risk assessment for the WBG area concluded that risks at the site are within acceptable ranges for the current and anticipated future industrial/commercial land use and for the construction worker scenario (i.e., excavation activities). The risks are also within the USEPA's generally acceptable risk range for recreational use of the area including the fishing rodeo that has been conducted at the site on a periodic basis. Furthermore, the risk assessment concluded that there would be no change in the risk/hazard levels for the site in the event that the pond was drained.

Under Alternative WBG SD-2, administrative and engineering controls would be maintained and/or implemented to ensure no residential land use of the area. These IC objectives would be met indefinitely or until the property is transferred at which time deed restrictions would be placed on the property.

Estimated Capital Cost	$44,000
Estimated Annual O&M Cost	$182,000
Total Estimated Present-Worth Cost	$119,000

2.9.4.3 Alternative WBG SD-3: Excavation, Transportation, and Off-Site Disposal

Alternative WBG SD-3, the Selected Alternative, is more aggressive than WBG SD-2 in that it would be conducted with the objective of achieving residential level clean up goals. Alternative SD-3 includes the excavation and off-site disposal of pond sediments that contain COCs at concentrations above the residential clean-up levels. This alternative would allow for unrestricted future development/utilization of the site because risks would be within acceptable ranges for residential use. There would be no restrictions to land use at the site; therefore, ICs would not be a necessary component of this alternative.

Based on historical delineation sampling conducted in the sediments containing lead and chromium above their respective clean-up levels are co-located in a relatively small area near the northern bank of the pond. The sediment removal excavation activities would be conducted with standard sediment excavation techniques. However, significant site preparation work would likely need to be conducted in advance to provide access to the work area. The excavated sediment would be transported off site to an appropriate landfill permitted to accept the material.

Following completion of sediment removal activities, the impacted areas will be restored to pre-construction conditions to the extent practicable, including re-establishment of aquatic vegetation, as necessary.

Estimated Capital Cost	$282,000
Estimated Annual O&M Cost	$0
Total Estimated Present-Worth Cost	$282,000

2.10 Summary of Comparative Analysis of Alternatives

Section 300.430(e)(9)(iii) of the NCP lists nine standard criteria against which each of the available remedial alternatives must be assessed. These evaluation criteria are described below:

Threshold Criteria – Threshold Criteria must be met for the response action alternative to be eligible for selection as a remedial option.

1. Overall Protectiveness of Human Health and the Environment
2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Primary Balancing Criteria - Primary Balancing Criteria are used to weigh major trade-offs among remedial action alternatives.

3. Long-term Effectiveness and Permanence
4. Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment
5. Short-term Effectiveness
6. Implementability
7. Cost

Modifying Criteria – Modifying Criteria take into consideration the support of government agencies and the public for the available response actions.

8. State/Support Agency Acceptance
9. Community Acceptance

The following sections present a comparative analysis of each of the Response Action Alternatives that were developed for the BDDT, BLA, IAA, and WBG versus the nine criteria.

2.10.1 Overall protectiveness of Human Health and the Environment

There are no unacceptable ecological risks present at any of the study areas, thus only protection to human health was evaluated. In addition, the No-Action Alternatives for each of the study areas would not provide any protection of human-health.

2.10.1.1 BDDT Soil Alternative

The selected Alternative BDDT SL-2, which uses ICs to control the exposure pathways, affords protection of human health by limiting access and activities at the sites (i.e., preventing residential development) thereby reducing the potential for unacceptable exposure to COCs. In addition to ICs, Alternative BDDT SL-2 also

provides for the maintenance of the rip-rap and downgradient vegetation, which helps further reduce the potential for unacceptable human exposure to COCs. Alternative BDDT SL-3 removes COC impacted soil within the downgradient deposition area, and employs ICs to protect against the residential risk drivers remaining from COC impacted soil within the trench. Alternative, BDDT SL-4, would provide excellent protection to human-health by physically removing all soils that contain COCs that lead to the unacceptable risks/hazards at the site.

2.10.1.2 BLA and IAA Soil Alternatives

Alternative BLA/IAA SL-2, which uses ICs to control the exposure pathways, affords protection of human health by limiting access to the sites, thus reducing, but not eliminating, the potential for contact with COCs. Alternative BLA/IAA SL-3 provides protection of human-health through installation of a soil barrier that would minimize the potential for human contact with COCs at concentrations above industrial clean-up levels and utilization of ICs to restrict development to activities that would not result in unacceptable exposures. The selected Alternative BLA/IAA SL-4, is most protective of human health because this option would remove soils containing the higher concentrations of COCs from the site, and only leave soils that are appropriate for the designated land use; thus eliminating the potential for unacceptable exposure. Alternative SL-4 also includes an option to expand the excavation to achieve the residential clean-up levels, as opposed to only achieving the industrial levels. Naturally, the option to remediate to residential levels would be most protective within a respective alternative.

2.10.1.3 BLA and IAA Conductive Flooring Alternatives

Alternative BLA/IAA CF-2, which uses ICs to maintain current land use and manage the exposure pathways, affords protection of human health but will not prevent the release of COCs to the environment due to future weathering of the conductive flooring material. The selected Alternative BLA/IAA CF-3 is most protective of human health and the environment. It eliminates on-site risks by removing all of the conductive flooring from the sites. Alternative BLA CF-4 is similar to BLA CF-3 in that flooring material would be removed. However, Alternative BLA CF-4 only entails removal of all degraded flooring. Any intact flooring would be contained on-site to prevent the potential for future releases or human exposure.

2.10.1.4 WBG Sediment Alternatives

Alternative WBG SD-2 provides protection of human-health through use of ICs to maintain the current land use, which does not pose any unacceptable risks or hazards. The selected Alternative WBG SD-3 is most protective of human health because it reduces risk to levels acceptable for residential use by removing the sediments that are the driver for risk at the site.

2.10.2 Compliance with ARARs

All of the alternatives presented for the BLA, IAA, BDDT, and WBG study areas would comply with the applicable ARARs from federal and state laws.

2.10.3 Long Term Effectiveness and Permanence

2.10.3.1 BDDT Soil Alternatives

Alternative BDDT SL-4, excavation and off-site disposal, provides excellent long-term reliability and effectiveness because it completely removes the COC impacted soils that are driving the unacceptable risks at the site. Therefore, risks would not be expected to change even in the event that the rip-rap liner or vegetation was removed or damaged. The selected Alternative BDDT SL-2, and Alternative BDDT SL-3 are both moderately effective as they both utilize ICs. ICs provide good long-term reliability and effectiveness by maintaining current land use under which risks are acceptable, by managing exposure pathways, and by ensuring land use does not change in the future resulting in unacceptable risks. The long-term reliability of the No Action Alternative (BDDT SL-1) is poor because it provides no means to mitigate risk at the site.

2.10.3.2 BLA and IAA Soil Alternatives

The selected Alternative BLA/IAA SL-4, which entails excavation and off-site disposal, would rank slightly more reliable and effective than Alternative BLA/IAA SL-3 because the contaminants are permanently removed from the site rather than being controlled in place by a vegetative cover that could potentially be damaged. However, Alternatives BLA/IAA SL-3 and BLA/IAA SL-4 both provide (good) long-term reliability and effectiveness because they protect against exposure to contaminated surface soil and would prevent the transport of COCs to other areas of the site. ICs still must be implemented for both of these alternatives because COCs will be left in place at levels that would preclude unlimited use of the site, unless the excavation alternative (BLA/IAA SL-4) was expanded to excavate to residential levels.

For BLA/IAA SL-4, the option to remediate to the residential PRG will provide the greatest (excellent) long-term reliability and effectiveness, because it removes the source of the risk, and will not require long term maintenance of ICs or an inspection program. Alternative BLA/IAA SL-2, which only relies on ICs, also provides (good) long-term reliability and effectiveness for the BLA and IAA. The ICs could be implemented on a permanent basis which should effectively reduce risks to site receptors. The long-term reliability of the No Action Alternative (BLA/IAA SL-1) is poor because it provides no means to mitigate risk at the site.

2.10.3.3 BLA and IAA Conductive Flooring Alternatives

The selected Alternative, BLA/IAA CF-3, provides excellent long-term reliability and effectiveness because it includes a complete removal of the flooring material from the BLA and IAA study areas. This would eliminate the potential for future exposures to COCs in the flooring as well as eliminate the potential for COCs in the flooring to impact adjacent soils. Alternative BLA CF-4 provides good long term reliability and effectiveness. However, BLA CF-4 did not rank as excellent because the epoxy capping of the intact flooring will require periodic maintenance and inspection to assure that it remains effective.

Alternative BLA/IAA CF-2 provides adequate long-term reliability and effectiveness for the BLA and IAA sites by implementing permanent ICs to control exposure to the flooring. However, this alternative would not prevent the conductive flooring from continuing to wash COCs to surrounding soils. The long-term reliability of the No Action Alternative, CF-1, is poor because it provides no means to mitigate risk at the site.

2.10.3.4 WBG Sediment Alternatives

The selected Alternative WBG SD-3 provides excellent long-term reliability and effectiveness because it removes sediment containing high concentrations of lead and chromium from the site. There is no source material located on-site so there is minimal chance of the pond sediments being impacted by materials from the WBG study area. Alternative WBG SD-2 also provides good long-term reliability and effectiveness by maintaining current land use under which risks are acceptable, by managing exposure pathways, and by ensuring land use does not change in the future resulting in unacceptable risks. The long-term reliability of the No Action Alternative, SD-1, is poor because it provides no means to mitigate risk at the site.

2.10.4 Reduction of Toxicity, Mobility, and Volume through Treatment

2.10.4.1 BDDT Soil Alternatives

The No Action Alternative, BDDT SL-1 would not result in any reduction in the toxicity, mobility, or volume of wastes present at the BDDT study area. The selected Alternative BDDT SL-2, which utilizes ICs, would not reduce the toxicity or volume of the COC impacted soils at the site, but it would control the mobility of the COCs by including provisions for maintaining the rip-rap cover and downgradient vegetation; both of which control erosion and transport of COC impacted soils. Alternatives BDDT SL-3 and BDDT SL-4, both of which include excavation of impacted soils, would eliminate the long-term mobility of the COC impacted soils by removing it from the site and disposing of the material in an approved off-site landfill. The toxicity and volume of the contaminants would not be eliminated by Alternatives BDDT SL-3 and BDDT SL-4; however, the toxicity and volume would be transferred to the off-site landfill.

2.10.4.2 BLA and IAA Soil Alternatives

The No Action Alternative (BLA/IAA SL-1) does not contribute to the reduction in the toxicity, mobility, or volume of wastes present at the site. Alternative BLA/IAA SL-2 would not reduce the toxicity or volume of waste at the site, but it could reduce the mobility of the contaminants present in soil by implementing ICs that would prevent disturbance of the impacted soils. Alternative BLA/IAA SL-3 would also reduce the mobility of the contaminants through the use of a vegetative cap; however, this would not reduce the toxicity or volume of the waste at the site. The selected Alternative BLA/IAA SL-4 rates as good to excellent because the excavation activities would result in the reduction of both the mobility and volume of contaminants present on the site. The toxicity and volume of the contaminants would not be eliminated by Alternative BLA/IAA SL-4; however, the toxicity and volume would be transferred to the off-site landfill

2.10.4.3 Conductive Flooring Alternatives

Alternatives BLA/IAA CF-1 (No Action) and BLA/IAA CF-2 (ICs only) would not result in any reduction in the toxicity, mobility, or volume of wastes present at the BLA and IAA. The selected Alternative BLA/IAA CF-3 would eliminate the mobility of the flooring material by removing it from the site and disposing of the material in an approved off-site landfill. Alternative BLA CF-4, which only pertains to the BLA, would eliminate the mobility of the degraded flooring material by removing it from the site and disposing of the material in an approved off-site landfill and would eliminate the mobility of the intact floor material by treating and sealing the material. The toxicity and volume of the contaminants would not be eliminated by Alternatives BLA/IAA CF-3 and BLA CF-4; however, the toxicity and volume would be transferred to the off-site landfill.

2.10.4.4 WBG Sediment Alternatives

The No Action Alternative (WBG SD-1) does not contribute to the reduction in the toxicity, mobility, or volume of COC impacted sediments at the WBG. Alternative WBG SD-2 would not reduce the toxicity or volume of waste at the site, but it would reduce the mobility of the contaminants present in sediment by implementing ICs that would prevent disturbance of the impacted sediments. Based on historical sampling results, the mobility of the contaminants in pond sediments has been minimal due to the relatively still waters in the pond.

The toxicity and volume of the contaminants would be removed from the site under selected Alternative WBG SD-3. However, the excavation activities included in Alternative WBG SD-3 will result in the disturbance of the sediments which could result in the contaminants being spread to other areas of the pond.

2.10.5 Short term effectiveness

2.10.5.1 BDDT Soil Alternatives

The selected Alternative BDDT SL-2 provides the best short term effectiveness because it does not require handling of materials, thus minimizing the potential for short term exposure to COCs. The short-term effectiveness is less for Alternatives BDDT SL-3 and BDDT SL-4, both of which include excavation, because these options include material handling and generation of waste that could result in exposure of site workers to COCs during implementation. The No Action Alternative SL-1 does not require any handling of material over the short term and thus received a rating of adequate to good for the short term.

2.10.5.2 BLA and IAA Soil Alternatives

Alternative BLA/IAA SL-3 and selected Alternative BLA/IAA SL-4 provide less short-term effectiveness (adequate to good) compared to Alternative BLA/IAA SL-2 (excellent). The short-term effectiveness is less for Alternatives BLA/IAA SL-3 and BLA/IAA SL-4 because material handling and dust generation could occur with these remedies. Alternative BLA/IAA SL-2 mitigates risk at the site by maintaining current land use and managing exposure pathways and does not pose a risk to the community, workers, or environment. No Action Alternative BLA/IAA SL-1 includes no controls and therefore is not effective in the short term.

2.10.5.3 BLA and IAA Conductive Flooring Alternatives

Alternatives BLA/IAA CF-3 and BLA CF-4 provide less short-term effectiveness (adequate to good) compared to Alternative BLA/IAA CF-2 (excellent). The short-term effectiveness is less for Alternatives BLA/IAA CF-3 and BLA CF-4 because material handling and dust generation during removal of flooring material has the potential to occur with these remedies. Alternative BLA/IAA CF-2 mitigates risk at the site by maintaining current land use and managing exposure pathways and does not pose a risk to the community, workers, or environment. No Action Alternative CF-1 is not effective in the short term because it does not control exposure or migration potential of the flooring, and thus received a rating of poor.

2.10.5.4 WBG Sediment Alternatives

Selected Alternative WBG SD-3 provides less short-term effectiveness (adequate to good) compared to Alternative WBG SD-2 (excellent). The short-term effectiveness is less for Alternative WBG SD-3 because material handling and generation of waste will occur with this remedy. Alternative WBG SD-2 mitigates risk at the site by maintaining current land use and managing exposure pathways and does not pose a risk to the community, workers, or environment. No Action Alternative WBG SD-1 does not require any handling of material over the short term and thus received a rating of adequate to good for the short term.

2.10.6 Implementability

2.10.6.1 BDDT Soil Alternatives

Alternatives BDDT SL-1 and BDDT SL-2 are the most readily implementable alternatives for BDDT soil. For the selected Alternative BDDT SL-2, minimal effort is required to implement ICs, with the exception of the long term inspection and reporting program. Alternatives BDDT SL-3 and BDDT SL-4 are readily implementable but will require an engineering design prior to implementation as part of the excavation, transportation, and disposal of contaminated soils. A level of difficulty is also added to Alternative BDDT SL-4 due to the need to remove the rip-rap to access the underlying COC impacted soils.

2.10.6.2 BLA and IAA Soil Alternatives

Alternatives BLA/IAA SL-1 and SL-2 require minimal effort to implement in the short term. However, BLA/IAA SL-2 does require some coordination over the long term to ensure that the annual inspection and reporting programs are performed.

Alternative BLA/IAA SL-3 and selected Alternative BLA/IAA SL-4 both include on-site remedial actions that will require the preparation of work plans, health and safety plans, and site work with heavy equipment. Both alternatives will also require site clearing and preparation activities to implement. However, the extent of the excavation activities would be fairly minimal and could be implemented fairly easily. If the excavation were expanded at the BLA site to include COCs detected at concentrations above the residential PRGs, the volume of soil to be excavated would go up considerably and make implementation much more difficult.

2.10.6.3 BLA and IAA Conductive Flooring Alternatives

Alternatives BLA/IAA CF-1 and BLA/IAA CF-2 are the most readily implementable alternatives for the conductive flooring because minimal effort is required to leave the flooring in place. Selected Alternative BLA/IAA CF-3 and Alternative BLA CF-4 will be more difficult to implement due to the scheduling, coordination, site preparation and physical removal activities that are included under these alternatives. However, both of these alternatives utilize standard construction materials and methods for asbestos abatement and can be performed by personnel with adequate experience.

2.10.6.4 WBG Sediment Alternatives

As with the other No-Action Alternatives and those that involve ICs, Alternatives WBG SD-1 and WBG SD-2 are easily implementable. Selected Alternative WBG SD-3, which includes excavation and off-site disposal of sediments, would be much more difficult to implement due to the need to perform excavation, transport, and disposal of COC impacted sediments. While these activities can be performed using standard

techniques, the topography of the site does add an increased level of difficulty and will require significant site preparation activities.

2.10.7 Cost

2.10.7.1 BDDT Soil Alternatives

There is no cost associated with BDDT SL-1 because no action of any kind would be implemented. Of the remaining alternatives, the project life-cycle costs for BDDT SL-2 ($146,000) are much less than those for BDDT SL-3 ($537,000) and BDDT SL-4 ($856,000). Although the selected Alternative BDDT SL-2 includes expenses for inspection and maintenance of ICs, they are far outweighed by the upfront capital costs for performing a removal action to residential standards under BDDT SL-3 and BDDT SL-4. Furthermore, Alternative BDDT SL-3 would still require ICs to maintain the rip rap area because COCs would remain in place.

2.10.7.2 BLA and IAA Soil Alternatives

There is no cost associated with BLA/IAA SL-1 at the BLA or IAA because no action of any kind would be implemented. The cost of implementing the ICs for Alternative BLA/IAA SL-2 at the BLA and IAA are $188,000 and $223,000, respectively, with the majority of the costs associated with the annual inspections and reporting associated with this alternative.

The costs of the two active alternatives, BLA/IAA SL-3 (Vegetative Soil Cover) and selected Alternative BLA/IAA SL-4 (Excavation and Disposal) are much higher than the Alternative BLA/IAA SL-2. At the BLA, the cost of BLA SL-3 is approximately $314,000, while the cost of BLA SL-4 would vary between $312,000 (excavation targeted for industrial level cleanup) and $601,000 (residential level cleanup). At the IAA, the cost of IAA SL-3 is approximately $341,000, while the cost of IAA SL-4 would vary between $384,000 (excavation targeted for industrial level cleanup) and $335,000 (residential level cleanup). The cost of the residential level cleanup under Alternative IAA SL-4 at the IAA is actually less than for the industrial level clean up because the savings in not having to perform annual inspections and reporting outweigh the cost of the additional excavation activities.

2.10.7.3 BLA and IAA Conductive Flooring Alternatives

There is no cost associated with BLA/IAA CF-1 because no action of any kind would be implemented. The cost of implementing the ICs for Alternative CF-2 at the BLA and IAA are $129,000 and $136,000, respectively. The cost of the selected removal action alternative, BLA/IAA CF-3, is considerably more than BLA/IAA CF-2 at $521,000 for the BLA and $787,000 for the IAA. The cost of the last alternative, BLA CF-4,

which only applies to the BLA, is $899,000. The cost of BLA CF-4 is greater than BLA CF-3 due to the ICs and O&M that are required for this alternative.

2.10.7.4 WBG Sediment Alternatives

There is no cost associated with WBG SD-1 because no action of any kind would be implemented. Of the remaining alternatives, the project life-cycle costs for WBG SD-2 ($119,000) are less than those for the selected Alternative WBG SD-3 ($282,000). Although WBG SD-2 includes expenses for inspection and maintenance of ICs, they are far outweighed by the upfront capital costs for performing a removal action to residential standards under WBG SD-3.

2.10.8 State Acceptance

VDEQ has served as the lead review agency for the CERCLA investigation and cleanup activities at RFAAP-NRU. VDEQ has reviewed all documents related to the CERCLA activities and has agreed that each of the Army's Selected alternatives are appropriate for the remediation of RFAAP-NRU.

2.10.9 Community Acceptance

The community has accepted the selected alternatives for the BLA, IAA, BDDT and WBG study areas. No substantive comments related to the remedial alternatives were received during the public comment period. Community acceptance is also addressed in the Responsiveness Summary included in Section 3 of this Decision Document.

2.11 Principal Threat Wastes

The NCP establishes an expectation that treatment will be used to address the principal threats posed by a site wherever practicable (NCP §300.430[a)][1][iii][A]). Identifying principal threat wastes combines concepts of both hazard and risk. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Conversely, non-principal wastes are those source materials that generally can be reliably contained and that would present only a low risk in the event of exposure. The manner in which principal threats are addressed generally will determine whether the statutory preference for treatment as a principal element is satisfied.

The selected remedial approach for these sites will result in the complete removal and off-site disposal (in an approved disposal facility) of the conductive flooring materials that constitute the principal threat wastes. This remedial approach will completely remove the source materials that had contributed the bulk of the COCs detected in surface soil at the BLA and IAA sites.

2.12 Selected Remedies

The final remedies for the BDDT, BLA, IAA, and WBG Study Areas were selected from the available remedial alternatives following the public comment period for the Proposed Plan based on: 1) the requirements of CERCLA; 2) the ability to achieve the RAOs; 3) the comparative analysis of alternatives; and 4) consultation with the public and VDEQ. This section discusses the Selected Remedies for the BDDT, BLA, IAA, and WBG Study Areas in further detail.

2.12.1 Building Disposal Debris Trench

Alternative BDDT SL-2: Institutional Controls was chosen as the selected remedy for the BDDT soils.

2.12.1.1 Summary of the Rationale for the Selected BDDT Remedy

The risk assessment for the BDDT Study Area concluded that the risks and hazards associated with the site are within generally acceptable levels for the current and anticipated future industrial/commercial land use scenario. Unacceptable risks/hazards are only present under a hypothetical residential land use scenario due to benzo(a)pyrene in soil. Therefore, the use of institutional controls and land use restrictions designed to prevent future residential development will be sufficiently protective of human-health and an active removal option will not be required for the site.

Alternative BDDT SL-2 was recommended over Alternative BDDT SL-3 (Partial Excavation, Transportation, Off-Site Disposal, and Institutional Controls) and BDDT SL-4 (Excavation, Transportation, and Disposal). While both of these alternatives would have been slightly more protective for the long term management of the site, the life cycle costs for both alternatives were significantly higher than BDDT SL-2. Furthermore, Alternative BDDT SL-3 would not have removed the requirement for ICs for the rip-rap area because COCs (benzo[a]pyrene) would remain in that area at concentrations that would prohibit residential development of the site.

2.12.1.2 Description of the Selected BDDT Remedy

While there are unacceptable risks present at the BDDT under a hypothetical future residential scenario, there are no unacceptable risks for the current and anticipated future industrial utilization of the site. The existing rip-rap liner in the main section of the former trench and the established vegetation in the downgradient depositional area already prevent the mobilization of the impacted surface soils located in these areas. Therefore, the purpose of implementing ICs at the BDDT would be: 1) to ensure that the rip-rap area and downgradient vegetation are maintained to prevent erosion and transport of impacted soils; 2) to ensure that land use is restricted to activities that would not lead to unacceptable exposure; and 3) restrict residential development of the rip-rap covered and depositional areas of the site.

A Land Use Control Implementation Plan (LUCIP) will be prepared for RFAAP-NRU to define responsibilities and procedures for implementing, managing, enforcing and tracking land use controls. As it relates to the BDDT, the primary objective of the LUCIP will be to prevent residential use of BDDT; more specifically the rip rap and depositional areas where benzo(a)pyrene is present at concentrations above levels appropriate for residential land use . Access restrictions are already in place at RFAAP by virtue of it being an active military installation. However, in the event that RFAAP-NRU closed and was declared excess property, the LUCIP will require the land use restrictions be legally recorded as appropriate and incorporated into the provisions for the new land use. As a RFAAP-specific GIS database has not been established, the LUCIP will also record the boundary coordinates for the BDDT land use controls. The land use controls for the BDDT will include the following actions:

- Access regulations are in place at the New River Unit of RFAAP. The NRU is enclosed in perimeter fencing and access to the NRU is limited to authorized personnel only. The existing perimeter fence that surrounds the RFAAP-NRU facility will continue to be maintained in accordance with the existing requirements for this active energetics storage facility.
- An information sign will be installed at the main entrance to RFAAP-NRU (i.e., gate 20) to inform site workers and visitors of the restrictions to land use at the facility.
- Annual inspections will be performed to ensure that the BDDT property is not utilized for residential purposes and that the information signs and fence are properly maintained. Inspections will also be performed to ensure that the rip-rap liner and downgradient vegetation at the BDDT remain in place to prevent erosion/migration of surface soils that contain COCs. In the event, that the rip-rap liner or downgradient vegetation areas are compromised, silt fencing will be erected to minimize soil transport and repairs will be completed as quickly as possible.
- The annual inspections and any required maintenance will be documented with CERCLA 5-Year Reviews.
- The LUCs for the BDDT will remain in place in perpetuity, or until such time that it can be documented that constituent concentrations at the site no longer present unacceptable risks for residential/ unrestricted land use

2.12.1.3 Summary of the Estimated BDDT Remedy Cost

The net present worth of the project life cycle costs for implementing ICs as the Selected Remedy at the BDDT is estimated to be $146,000. This cost estimate includes the funding requirements for the following remedy components:

- Surveying the footprint of the area requiring residential land use restrictions and documenting the coordinates in the LUCIP.
- Installation of an information sign at Gate 20

- Annual site inspections to verify that the site is not being utilized for residential purposes and that the rip-rap and vegetation area are in good condition.
- Maintenance of the rip-rap and vegetation area (minor annuals costs plus contingency for larger scale repairs)
- Reporting for annual inspections and 5-Year Reviews
- Preparation of the final Remedial Action Work Plan (RAWP), Completion Report and LUCIP.

A detailed cost breakdown for implementing this remedy is presented in **Table 4**. For the purposes of this cost estimate it is assumed that the annual inspections, 5-year reviews, and site maintenance activities will be conducted for a period of 30-years. The annual costs associated with these long-term activities have been discounted to reflect the current present worth. This cost estimate is based on the best available information regarding the anticipated scope of the remedial activities. Changes to the cost elements are likely to occur as a result of new information and data collected during the final implementation plan. This is an order of magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

2.12.1.4 Expected Outcomes of the Selected BDDT Remedy

The requirement for preventing residential development of the BDDT site will be in place in perpetuity, unless a future remedial action is conducted at the site that can document that constituent concentrations at the site no longer present unacceptable risks under a residential land use scenario. The residential land use restrictions will remain in place even if the RFAAP-NRU property is closed and sold as excess property. Other than preventing residential use and maintaining the rip-rap and vegetation areas, there are no other restrictions for the site. Generally allowable uses will include industrial / commercial development and recreational use. In addition, there will be no health-based restrictions for intrusive activities (e.g., utility maintenance or repair).

2.12.2 Bag Loading Area

Alternative BLA SL-4: Excavation, Transportation, Off-Site Disposal and Institutional Controls is the Selected Remedy for soil at the BLA. Alternative BLA CF-3 Removal and Disposal of Asbestos Containing Flooring Materials is the Selected Remedy for the BLA conductive flooring.

2.12.2.1 Summary of the Rationale for the Selected BLA Remedies

Alternative BLA SL-4: Excavation, Transportation, Off-Site Disposal and Institutional Controls is the Selected Remedy for soil at the BLA. Under this alternative, soil containing asbestos, lead, and copper at concentrations above the industrial RALs will be excavated and removed from the site, so that the site will be suitable for the current and anticipated future industrial/commercial land use scenario. Institutional

controls will be required over the long term because the site will not be remediated to levels suitable for residential land use. COCs including lead, copper, Aroclor 1254, and benzo(a)pyrene will remain in place at concentrations that could present unacceptable risks for residential land use.

Alternative BLA CF-3 Removal and Disposal of Asbestos Containing Flooring Materials is the Selected Remedy for the BLA conductive flooring. The degrading conductive flooring serves as a continuing source of contaminants to surface soil surrounding the BLA buildings. In its degraded state, the conductive flooring also presents an exposure risk to receptors that may come into contact with it.

2.12.2.2 Description of the Selected BLA Remedies

The Selected Remedy for soil at the BLA will include the excavation and off-site disposal of surface soils that contain COCs (i.e., copper, lead, and asbestos) at concentrations that present unacceptable health risks for the current and anticipated future industrial/commercial land use scenario (i.e., soil containing COCs above the industrial level RALs presented for the BLA in Section 2.8.2). At a minimum the excavation footprint will include surface soil located within 2 ft to a depth of 1 foot from the open sides of the seven buildings at the BLA that contained conductive flooring material (i.e., the areas where conductive flooring material was able to wash off the building pads onto the soil). The excavation areas will be expanded beyond the 2 ft boundary in areas where there is visible surface staining or degraded conductive flooring material in soil. It is estimated that the total footprint of the excavation area at the BLA will be approximately 3,300 ft^2. A site map depicting planned excavation areas at the BLA is presented as **Figure 12**.

Prior to the start of excavation activities, existing vegetation within the proposed work areas will be cleared and grubbed and disposed of on-site or at an approved off-site disposal facility. The excavation activities will be performed utilizing conventional excavation equipment. In most areas, the depth of the excavation will extend to a depth of 1 ft bgs. The excavated material will be placed directly into roll-off containers or dump trucks and transported to a pre-approved disposal facility under manifest. Although historical sampling indicates that soil at the site is not hazardous, waste characterization samples will be collected from the excavated waste to confirm the disposal requirements. If necessary, the soil may be mixed with a stabilization media at the disposal facility to reduce the potential for leachable constituents.

Confirmation sampling will be conducted during the removal activity. The confirmation sampling program will include the collection of samples for field screening and laboratory analysis to ensure that soils with concentrations above the industrial RALs are not left in place. The field screened samples will be analyzed for copper and lead using XRF. The laboratory samples will be analyzed for copper, lead, and asbestos. If necessary, the excavation footprint will be expanded based on the results of the confirmation sampling program.

Upon completion of the excavation activities, the excavated areas will be backfilled with clean soil imported from off site. Samples of the backfill material will be submitted for laboratory analysis to ensure that contaminants are not imported to the site. The backfilled areas will be graded to promote positive drainage and seeded with grass to minimize the potential for erosion. Additionally, storm water, erosion and sediment controls, such as silt fence, will be installed around the perimeter of the areas of disturbance to minimize erosion and sediment transport until the vegetation is established.

The Selected Remedy for the conductive flooring material at the BLA will include the removal of all conductive flooring material from the seven former buildings at the site (approximately 16,000 square feet of flooring). Removal will likely occur by scraping the surface of the flooring material to dislodge and collect the asbestos containing material. The conductive flooring removal activities will be performed using asbestos abatement protocols under the supervision of a certified asbestos abatement supervisor to ensure appropriate health and safety procedures, as they relate to asbestos and the other COCs, are employed.

Once removed, the conductive flooring materials will be transported off site to an appropriate landfill permitted to accept the material. Prior to disposal, the removed flooring material will be characterized to determine whether it is hazardous or non-hazardous.

Although the soil excavation and conductive flooring removal actions at the BLA will reduce the health risks associated with the site and remove the contaminant source materials, land-use restrictions will still be required for the BLA. Aroclor 1254, benzo(a)pyrene, lead, and copper will be left in place at concentrations that could present potential health risks under a residential land use scenario; therefore, the site will not be appropriate for unrestricted use. A LUCIP will be prepared for RFAAP-NRU to define responsibilities and procedures for implementing, managing, enforcing and tracking land use controls. As it relates to the BLA, the primary objective of the LUCIP will be to prevent residential use of BLA (due to the residual COCs in soil) and restrict access to the BLA building remnants. Access restrictions are already in place at RFAAP by virtue of it being an active military installation. However, in the event that RFAAP-NRU closed and was declared excess property, the LUCIP will require the land use restrictions be legally recorded as appropriate and incorporated into the provisions for the new land use. As a RFAAP-specific GIS database has not been established, the LUCIP will also record the boundary coordinates for the BLA land use controls. The land use controls for the BLA will include the following actions:

- Access regulations are in place at the New River Unit of RFAAP. The NRU is enclosed in perimeter fencing and access to the NRU is limited to authorized personnel only. The existing perimeter fence that surrounds the RFAAP-NRU facility will continue to be maintained in accordance with the existing requirements for this active energetics storage facility.
- An information sign will be installed at the main entrance to RFAAP-NRU (i.e., gate 20) to inform site workers and visitors of the restrictions to land use at the facility.

- Annual inspections will be performed to ensure that the BLA property is not utilized for residential purposes and that the information signs and fence are properly maintained. Inspections will also be performed to ensure that access to the BLA building remnants is controlled.
- The annual inspections and any required maintenance will be documented with CERCLA 5-Year Reviews.
- The LUCs for the BLA will remain in place in perpetuity, or until such time that it can be documented that constituent concentrations at the site no longer present unacceptable risks for residential/unrestricted land use.

2.12.2.3 Summary of the Estimated Cost for the BLA Remedies

The net present worth of the project life cycle costs for implementing the Selected Remedy for soil at the BLA is estimated to be $312,000. This cost estimate includes the potential funding requirements for the following remedy components:

- Site preparation and clearing work prior to excavation.
- Excavation, transportation, and disposal of impacted soils
- Site restoration activities (backfilling excavations with clean fill, seeding, removal of erosion controls)
- Confirmation sampling.
- Surveying the footprint of the area requiring residential land use restrictions and documenting the coordinates in the LUCIP.
- Installation of an information sign at Gate 20
- Annual site inspections to verify that the site is not being utilized for residential purposes and that site vegetation prevents erosion.
- Reporting for annual inspections and 5-Year Reviews
- Preparation of the final RAWP, Completion Report and LUCIP.

The net present worth of the project life cycle costs for implementing the Selected Remedy for conductive flooring at the BLA is estimated to be $521,000. This cost estimate includes the potential funding requirements for the following remedy components:

- Site preparation work (e.g., structural evaluations and asbestos surveys in site building remnants)
- Complete removal, transportation, and off-site disposal of conductive flooring material. This work will be performed following asbestos abatement protocols due to the presence of asbestos in the flooring material.
- Preparation of the final RAWP and Completion Report.

A detailed cost breakdown for implementing the selected remedies for soil and conductive flooring at the BLA is presented in **Tables 5 and 6**. For the purposes of these cost estimates it is assumed that the annual inspections, 5-year reviews, and site maintenance activities required for the site will be conducted for a period of 30-years. The annual costs associated with these long-term activities have been discounted to reflect the current present worth. The cost estimates are based on the best available information regarding the anticipated scope of the remedial activities. Changes to the cost elements are likely to occur as a result of new information and data collected during the final implementation plan. These are order of magnitude engineering cost estimates that are expected to be within +50 to -30 percent of the actual project costs.

2.12.2.4 Expected Outcomes of the Selected BLA Remedies

Following completion of the conductive flooring removal and soil excavation activities at the BLA, land use controls will be put in place to restrict residential land use of the site due to the remaining COCs that were found to present unacceptable health risks for residential land use scenarios. The land use controls will also be required to restrict access to the building remnants at the BLA due to the presence of residual lead-based paints and non-flooring asbestos materials. The requirement for preventing residential development of the BLA site will be in place in perpetuity, unless a future remedial action is conducted at the site that can document that constituent concentrations in soil at the site no longer present unacceptable risks under a residential land use scenario. The residential land use restrictions will remain in place even if the RFAAP-NRU property is closed and sold as excess property. Other than preventing residential use and restricting access to the building remnants, there are no other restrictions for the site. Generally allowable uses will include industrial / commercial development and recreational use. In addition, there will be no health-based restrictions for intrusive activities (e.g., utility maintenance or repair).

2.12.3 Igniter Assembly Area

The Army selected Alternative IAA SL-4: Excavation, Transportation, Off-Site Disposal and Institutional Controls selected for soil at the IAA and Alternative IAA CF-3: Removal and Disposal of Asbestos Containing Flooring Materials for the IAA conductive flooring.

2.12.3.1 Summary of the Rationale for the Selected IAA Remedies

Alternative IAA SL-4: Excavation, Transportation, and Off-Site Disposal is the Selected Remedy for soil at the IAA. Under this alternative, soil containing asbestos, lead, and Aroclor 1254 at concentrations above the residential RALs will be excavated and removed from the site. Institutional controls would not be required for soil under this alternative because the site will be remediated to levels suitable for residential land use.

Alternative IAA CF-3 Removal and Disposal of Asbestos Containing Flooring Materials is the Selected Remedy for the IAA conductive flooring. The degrading conductive flooring serves as a potential continuing source of contaminants to surface soil surrounding the IAA buildings. In its degraded state, the conductive flooring also presents an exposure risk to receptors that may come into contact with it.

2.12.3.2 Description of the Selected IAA Remedies

The Selected Remedy for soil at the IAA will include the excavation and off-site disposal of surface soils that contain COCs (i.e., copper, lead, asbestos, and Aroclor- 1254) at concentrations that present unacceptable health risks for the current and anticipated future industrial/commercial land use scenario as well as for the hypothetical future residential land use scenario (i.e., soil containing COCs above the residential level RALs presented for the IAA in Section 2.8.2). At a minimum the excavation footprint will include surface soil located within 0-2 ft from the open sides of the 29 buildings at the IAA that contained conductive flooring material (i.e., the areas where conductive flooring material was able to wash off the building pads onto the soil). The excavation areas will be expanded beyond the 2 ft boundary in areas where there is visible surface staining or degraded conductive flooring material in soil. The excavation activities will also include two small areas where Aroclor 1254 was identified at concentrations above the residential RALs. It is estimated that the total footprint of the excavation area at the IAA will be approximately 3,300 ft^2. A site map depicting planned excavation areas at the IAA is presented as **Figure 13**.

Prior to the start of excavation activities, existing vegetation within the proposed work areas will be cleared and grubbed and disposed of on-site or at an approved off-site disposal facility. The excavation activities will be performed utilizing conventional excavation equipment. In most areas, the depth of the excavation will extend to a depth of 1 ft bgs. The excavated material will be placed directly into roll-off containers or dump trucks and transported to a pre-approved disposal facility under manifest. Although historical sampling indicates that soil at the site is not hazardous, waste characterization samples will be collected from the excavated waste to confirm the disposal requirements. If necessary, the soil may be mixed with a stabilization media at the disposal facility to reduce the potential for leachable constituents.

Confirmation sampling will be conducted during the removal activity. The confirmation sampling program will include the collection of samples for field screening and laboratory analysis to ensure that soils with concentrations above the residential RALs are not left in place. The field screened samples will be analyzed for copper and lead using XRF. The laboratory samples will be analyzed for copper, lead, asbestos. The samples will also be analyzed for Aroclor 1254 in the areas where this COC was detected during the remedial investigations. If necessary, the excavation footprint will be expanded based on the results of the confirmation sampling program.

Upon completion of the excavation activities, the excavated areas will be backfilled with clean soil imported from off site. Samples of the backfill material will be submitted for laboratory analysis to ensure that

contaminants are not imported to the site. The backfilled areas will be graded to promote positive drainage and seeded with grass to minimize the potential for erosion. Additionally, storm water, erosion and sediment controls, such as silt fence, will be installed around the perimeter of the areas of disturbance to minimize erosion and sediment transport until the vegetation is established.

The Selected Remedy for the conductive flooring material at the IAA will include the removal of all conductive flooring material from the 29 former buildings at the site (approximately 25,000 square feet of flooring). Removal will likely occur by scraping the surface of the flooring material to dislodge and collect the asbestos containing material. The conductive flooring removal activities will be performed using asbestos abatement protocols under the supervision of a certified asbestos abatement supervisor to ensure appropriate health and safety procedures, as they relate to asbestos and the other COCs, are employed.

Once removed, the conductive flooring materials will be transported off site to an appropriate landfill permitted to accept the material. Prior to disposal, the removed flooring material will be characterized to determine whether it is hazardous or non-hazardous.

Land use restrictions will not be required for the IAA due to soil or conductive flooring upon completion of the Selected Remedies. However, ICs will still be required for the IAA to restrict access to the building remnants at the site due to the presence of residual lead-based paints and non-flooring asbestos materials. The restrictions on the building remnants will be documented in the LUCIP that is being prepared for RFAAP-NRU.

2.12.3.3 Summary of the Estimated Cost for the IAA Remedies

The net present worth of the project life cycle costs for implementing the Selected Remedy for soil at the IAA is estimated to be $335,000. This cost estimate includes the potential funding requirements for the following remedy components:

- Site preparation and clearing work prior to excavation.
- Excavation, transportation, and disposal of impacted soils.
- Site restoration activities (backfilling excavations with clean fill, seeding, removal of erosion controls).
- Confirmation sampling.
- Preparation of the final RAWP and Completion Report.

The net present worth of the project life cycle costs for implementing the Selected Remedy for conductive flooring at the IAA is estimated to be $787,000. This cost estimate includes the potential funding requirements for the following remedy components:

- Site preparation work (e.g., structural evaluations and asbestos surveys in site building remnants)
- Complete removal, transportation, and off-site disposal of conductive flooring material
- Preparation of the final RAWP and Completion Report.

A detailed cost breakdown for implementing the selected remedies for soil and conductive flooring at the IAA is presented in **Tables 7 and 8**. The Selected Remedies will not require any long term monitoring, inspection, or reporting for soil or conductive flooring because the remedies have been designed to achieve residential clean up goals appropriate for unrestricted site use. However, it should be noted that land use controls will still be put in place to restrict access to the IAA building remnants due to the presence of residual lead-based paints and asbestos materials. The cost estimates are based on the best available information regarding the anticipated scope of the remedial activities. Changes to the cost elements are likely to occur as a result of new information and data collected during the final implementation plan. These are order of magnitude engineering cost estimates that are expected to be within +50 to -30 percent of the actual project costs.

2.12.3.4 Expected Outcomes of the Selected IAA Remedies

The Selected Remedy for Soil at the IAA will reduce the risks associated with the site to levels that will be acceptable for residential land use. Therefore, there will be no need to restrict land-use at the site due to the presence of soil contamination. Likewise, the Selected Remedy for conductive flooring at the site will completely remove the conductive flooring material from the 29 site buildings and there will be no need to perform long term inspections, maintenance, or reporting associated with the flooring. The only restrictions to site use will be the result of residual lead-based paint and non-flooring asbestos materials in the building remnants at the IAA. The land-use restrictions will restrict access to the building remnants and prohibit use of the structures for residential or commercial purposes. The restrictions on building use will be in place in perpetuity, unless a future remedial action is conducted at the site that can document the successful abatement of the residual lead paint and asbestos materials. The restrictions will remain in place even if the RFAAP-NRU property is closed and sold as excess property.

Other than restricting access to the building remnants, there are no other restrictions for the site. Generally allowable uses will include residential, industrial / commercial development and recreational use. In addition, there will be no health-based restrictions for intrusive activities (e.g., utility maintenance or repair).

2.12.4 Western Burning Ground Sediment

Alternative WBG SD-3: Excavation, Transportation, and Off-Site Disposal is the Selected Remedy for the WBG pond sediments.

2.12.4.1 Summary of the Rationale for the Selected WBG Remedy

Although the risk assessment for the WBG concluded that the risks and hazards associated with the site are within acceptable levels for the current and reasonably anticipated future industrial/commercial land use, the Selected Remedy (WBG SD-3) will increase the level of protection to human-health and the environment by reducing the levels of lead and chromium in pond sediments to levels that will be suitable for residential development. Alternative WBG SD-3 is recommended over Alternative WBG SD-2 (Institutional Controls) because of the additional level of protection that it affords and because it eliminates the need to place long term restrictions on land use/development at the site. Furthermore, the life-cycle costs associated with Alternative WBG SD-3 ($282,000) are only slightly more expensive than WBG SD-2 ($119,000).

2.12.4.2 Description of the Selected WBG Remedy

The Selected Remedy for the WBG includes the excavation and off-site disposal of pond sediments that contain lead and chromium at concentrations above the residential RALs presented in Section 2.8.2. The target excavation area is confined to an approximately 50 ft by 25 ft area (i.e.,1250 ft^2). Considering that the sediment depth is approximately 1.5 to 2 ft deep, approximately 70 yd^3 of sediment will be removed. The excavated sediment will be transported off site by truck to an appropriate landfill permitted to accept the material. **Figure 14** presents the conceptual plans for the sediment removal action at the WBG.

Given the shallow depth of the unnamed pond located at the WBG, and the proximity of the target removal area to shore, it is expected that sediment removal will be conducted mechanically from shore using conventional excavation equipment (e.g., long-reach excavators). The excavated sediments will be placed into a bermed stabilization area consisting of aggregate and geotextile that will be used for sediment dewatering and stabilization. Within this area it is anticipated that dredged/excavated material will be allowed to gravity dewater, and if necessary be mixed with appropriate stabilization materials (e.g., Portland cement, Cement Kiln Dust, Lime Kiln Dust) to reduce the water content before being loaded for transport and disposal. Waste characterization samples will be collected prior to excavation to evaluate whether the material can be disposed of as a non-hazardous or hazardous waste.

Following completion of sediment dredging, the area impacted by remedial activities (i.e., the removal area and stabilization pad) will be restored to pre-construction conditions to the extent practicable.

The sediment removal activities will achieve the residential cleanup levels that have been established for the site. As such there will be no need to restrict the future use or development of the site. This remedy will not require any long term monitoring, inspections, or maintenance and there will be no requirement for 5-year reviews.

2.12.4.3 Summary of the Estimated WBG Remedy Cost

The net present worth of the project life cycle costs for implementing the Selected Remedy for sediment at WBG is estimated to be $282,000. This cost estimate includes the potential funding requirements for the following remedy components:

- Site preparation work (e.g., decontamination pads, water barriers, dewatering area)
- Excavation and dewatering of sediments, including stabilization if necessary.
- Transportation and off-site disposal of sediments.
- Site Restoration.
- Preparation of the final RAWP and Completion Report.

A detailed cost breakdown for implementing the Selected Remedy for sediment at the WBG is presented in **Table 9**. The Selected Remedy will not require any long term monitoring, inspection, or reporting because the remedy has been designed to achieve residential clean up goals appropriate for unrestricted site use. The cost estimate is based on the best available information regarding the anticipated scope of the remedial activities. Changes to the cost elements are likely to occur as a result of new information and data collected during the final implementation plan. These are order of magnitude engineering cost estimates that are expected to be within +50 to -30 percent of the actual project costs.

2.12.4.4 Expected Outcomes of the Selected WBG Remedy

The Selected Remedy for sediment at the WBG will reduce the risks associated with the site to levels that will be acceptable for residential land use. Therefore, there will be no need to restrict land-use at the site due to the presence of contaminants. The site will be available for unrestricted development. Generally allowable uses will include residential, industrial / commercial development and recreational use. There will be no requirement for restricting the fishing rodeo that is occasionally held at the WBG area pond.

2.13 Statutory Determination

In accordance with the statutory requirements of Section 121 of CERCLA, the Selected Remedial Actions are required to:

- Protect human health and the environment
- Comply with ARARs
- Be cost-effective
- Use permanent solutions and alternative treatment technologies to the maximum extent practicable

- Satisfy the preference for treatment that reduces contaminant toxicity, mobility, or volume as a principal element

The manner in which the Selected Remedies for the RFAAP-NRU study areas satisfy the above requirements, and any applicable regulatory review requirements, is discussed in the following sections.

2.13.1 Protection of Human Health and the Environment

Implementation of the Selected Remedies for the BDDT, BLA, IAA, and WBG Study Areas at RFAAP-NRU will be protective of human health and the environment. At a minimum, the Selected Remedies employ the removal and off-site disposal of all media (i.e., soil, sediment, and source materials) that were found to present unacceptable risks under the current and anticipated future industrial/commercial land use-scenario at RFAAP-NRU. The soil and sediment removal actions planned for the IAA and WBG Study Areas go beyond this requirement and will achieve cleanup levels appropriate for residential land-use. Land-use restrictions will be implemented and maintained to prevent residential development/exposure for the areas where the remedies are only protective to industrial/commercial standards (i.e., BDDT and BLA). Land-use restrictions will also be utilized to prohibit access to the building remnants at the BLA and IAA due to residual lead-based paint and asbestos materials that will be left in place.

2.13.2 Compliance with ARARs

The remedies that have been selected for the BDDT, BLA, IAA, and WBG Study Areas will comply with ARARs. **Tables 10, 11, and 12** present the chemical, location, and action specific ARARs.

2.13.3 Cost-Effectiveness

The remedies that have been selected for the BDDT, BLA, IAA, and WBG Study Areas are deemed to be cost effective as the costs are proportional to the overall effectiveness. Although, the selected remedies for the BLA, IAA, and WBG are not the least expensive of the available remedial alternatives, the additional level of protection afforded by these remedies warrants the additional costs.

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

The remedies that have been selected for the BDDT, BLA, IAA, and WBG Study Areas at RFAAP-NRU use permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable. The Selected Remedies for the BLA and IAA employ the permanent solutions of excavation and off-site disposal of soil containing COCs at concentrations above the specified clean up levels and the complete removal and off-site disposal of the conductive flooring material identified as the primary

contaminant source material at the sites. Likewise, the Selected Remedy for the WBG employs the permanent solution of excavation and off-site disposal of the sediments containing COCs at concentrations above the specified clean up levels.

While on-site treatment of the soil, sediments, and/or source materials at the BDDT, BLA, IAA, and WBG Study Areas was evaluated during the FS process, treatment was deemed to be impractical due to the nature of the site and the identified COCs. Due to the nature of the COCs treatment was also unlikely to provide a permanent solution.

2.13.5 Preference for Treatment as a Principal Element

The remedies that have been selected for RFAAP-NRU employ material (source materials, soil, and sediment) removal, off-site disposal, and land-use controls as the principal elements; therefore, the selected remedies do not satisfy the statutory preference for treatment as the principal element. Treatment technologies were evaluated as part of the FS for RFAAP-NRU but were not selected due to implementability concerns and conflicts with the overall cleanup objectives for the site.

2.13.6 Five Year Review Requirements

The Remedies that have been selected for the BDDT and BLA Study Areas will result in hazardous substances or contaminants remaining on site in surface soil at concentrations that have been found to present potential health risks under a hypothetical residential land use scenario. The building remnants at the BLA and IAA Study Areas will also be left in place with residual lead-based paints and non-flooring asbestos materials that will require access restrictions to be put in place. In accordance with Section 121(c) of CERCLA, 5-year statutory reviews will be conducted for the BDDT, BLA, and IAA Study Areas to ensure that the Selected Remedies are effective and continue to be protective of human-health and the environment.

There will be no statutory review requirement for the NBG, RY, or WBG Study Areas, or for site-wide groundwater at RFAAP-NRU. The remedial investigations conducted at the facility concluded that there are no unacceptable risks associated with the RY Study Area or groundwater at the facility. The remedial actions that were completed at the NBG Study Area and those that are planned for the WBG Study Area will also result in those sites being available for unrestricted use.

2.14 Documentation of Significant Changes

All written and verbal comments submitted during the October 2010 public meeting and comment period were reviewed, and it was determined that no significant changes to the remedies, as outlined in the 2010

Proposed Plan, were necessary or appropriate. Therefore, the Selected Remedies discussed in this Decision Document all reflect the Army's Preferred Alternatives outlined in the Proposed Plan.

3. Responsiveness Summary

The Army submitted the Proposed Plan for RFAAP-NRU for public review on September 26, 2010 and provided a 30-day comment period (which ended October 26, 2010) during which the Army would accept comments on the proposed remedies. The Army also conducted a Public Meeting on October 19, 2010 at the New River Competitiveness Center in Radford, Virginia during which representatives of the Army and VDEQ were available to answer questions from the public regarding the proposed remedial actions for RFAAP-NRU. Most of the comments received during the public meeting and comment period were related to the investigation findings, public outreach programs, and the potential impacts to the community during performance of the remedial actions.

Below is a summary the general questions received from the public during the open comment period and public meeting and the Army's responses.

1. *A citizen expressed concern that off-site groundwater may have the potential to have been adversely impacted by contaminants originating from the NRU property. Particular concern was expressed about the potential for contaminants to have spread to off-site drinking water wells, including contaminants that may not have been detected in groundwater during the site investigation due to the karst environment. Does the Army have any plans to conduct additional groundwater investigations (e.g., additional groundwater sampling, tracer studies, etc) for the facility and will the Army sample off-site drinking water wells?*

The Army understands the public's concern about maintaining groundwater quality, especially in areas such as those that surround RFAAP-NRU where groundwater may be utilized as a primary source of drinking water for families and/or livestock. The Army shares these concerns and has conducted a thorough investigation of groundwater quality at RFAAP-NRU to determine if groundwater quality has been adversely impacted by historical operations at the facility, or other potential on-site sources. The groundwater investigations included the collection of groundwater samples from monitoring wells and springs located throughout the RFAAP-NRU facility. The monitoring wells were installed in locations believed to have the highest potential for contamination (i.e., the monitoring wells were placed in areas in and/or downgradient of where soil contamination had been detected). While monitoring wells are useful tools for evaluating groundwater quality, the spring samples are believed to provide an even better indicator of overall groundwater quality at the facility because they serve as groundwater collectors in a karst system (i.e., groundwater drains towards springs).

The results of the groundwater investigations and risk assessment concluded that groundwater has not been adversely affected by historical operations at RFAAP-NRU and there is no risk associated with groundwater at the facility. These findings are not-unexpected because the constituents of concern that have been identified in soil at the various study areas within RFAAP-NRU (e.g., lead, copper, benzo[a]pyrene, Aroclor-

1254, asbestos) do not readily dissolve in groundwater or surface water under ambient conditions, and the contaminant concentrations in soil are not indicative of those they would be expected to result in leaching to groundwater. Rather, most of the constituents detected at the facility tend to adsorb quickly to soil particles and other solids, which is why they have primarily been detected in surface soils, and not in groundwater, surface water, or even subsurface soils. Constituents that would be more typically associated with groundwater contamination problems such as chlorinated solvents and petroleum hydrocarbons have not been detected in soil, groundwater, or surface water at the facility and there are no identified storage areas for these constituents currently on-site.

Considering that 1) no adverse impacts to groundwater have been identified on-site at the RFAAP-NRU facility to date, 2) few contaminants have been detected in soil that would be expected to contribute to any potential future groundwater problems, and 3) the study areas at the facility are not located in the vicinity of sinkholes or other direct groundwater recharge areas that would be expected to quickly introduce contaminants to groundwater, the Army has no reason to believe that on-site or off-site groundwater has been (or will be) impacted by any contaminants originating from the facility. Therefore, the Army has concluded that additional groundwater investigations are unnecessary and would not provide any additional insight into groundwater quality at the facility. VDEQ agreed with this assessment and has not recommended any additional sampling. As such, the Army has no plans to sample off-site wells or collect any additional on-site samples. In fact, the Army plans to abandon the monitoring wells that are present on-site in conjunction with the remedial activities planned for the BLA, IAA, and WBG.

2. Will the Army provide public access to the environmental data collected from RFAAP-NRU and any health studies/evaluations that have been performed?

The Army has maintained a policy of full disclosure as it relates to the environmental cleanup process at RFAAP-NRU in accordance with public involvement requirements under CERCLA. One of the actions that the Army takes as part of this policy is to maintain an administrative record of all final documents/reports that have been prepared to document the environmental investigation and cleanup activities performed at RFAAP-NRU. In an effort to make the documents available to the widest audience possible, the Army has made electronic copies of all reports available for public review. They are maintained in a document repository at the Montgomery-Floyd Regional Library at 125 Sheltman Street in Christiansburg, Virginia and on the RFAAP Installation Restoration Program (IRP) website (http://www.radfordaapirp.org).

For a summary of all environmental data collected from RFAAP-NRU, the Army refers the public to two documents in particular within the administrative record. The first document is the June 2010 Remedial Investigation (RI) Report for RFAAP-NRU (ARCADIS 2010c) which discusses the BLA, IAA, BDDT, RY, and WBG study areas as well as facility-wide groundwater. The second document is the July 2009 Engineering Evaluation/Cost Analysis (EE/CA) Report (ARCADIS 2009) that was prepared to summarize the

environmental data collected from the NBG study area at RFAAP-NRU. These documents present background information on the facility and detailed summaries of all environmental data collected from the referenced sites in the form of text, summary tables, and figures. In addition, the RI and EE/CA reports present the findings of the human-health and ecological risk assessments that were performed for each of the referenced sites. The risk assessments evaluate the likelihood of health problems for humans or environmental receptors based on the nature and concentrations of the constituents detected at the site. The risk assessment included within the RI Report also includes a discussion of the health effects associated with the various classes of constituents detected at RFAAP-NRU.

3. *Will flow in the unnamed stream be interrupted during the proposed remediation activities? Will the Army be collecting any additional surface water samples from the stream to evaluate water quality and potential effects on downstream receptors?*

The Army understands that the unnamed stream that flows through the southwestern portion of RFAAP-NRU is an important surface water resource and that water from this stream is utilized for agricultural purposes on properties located downstream of the facility. The remediation activities that have been proposed for RFAAP-NRU will in no way impede flow within this stream nor will contaminants be introduced into the stream during the performance of the remediation activities. The soil excavation and flooring removal activities that have been proposed for the BLA and IAA sites are located at fairly significant distances from the unnamed stream, and standard sedimentation and erosion control measures will be utilized to prevent any erosion of disturbed soils from these sites towards the stream during performance of the work. Best Management Practices will be utilized during the sediment removal action that has been proposed for the WBG site, and pond outfall monitoring will be performed to ensure that sediments disturbed in the pond during the removal action are not transported into the unnamed stream.

The Army has no plans to conduct any additional surface water samples from the unnamed stream that flows through RFAAP-NRU. Extensive sediment and surface water sampling was conducted within the unnamed stream that flow through the facility during the course of environmental investigation and no adverse impacts were identified to surface water quality.

4. *Will new entrances/roads be constructed to provide access to the NRU for this work? Will major earth moving equipment or machinery be used on public roads or right-of-ways? Will there be any impact on traffic?*

The remediation activities that have been proposed for RFAAP-NRU will not require the construction of any new access /entrance roads to the facility. All equipment and personnel utilized to perform remediation activities will enter RFAAP-NRU through the main entrance to the facility (Gate 20) which is located off of Bagging Plant Road. All of the work will be conducted within the confines of RFAAP-NRU and will not require any earth-moving activities on, or in the immediate vicinity of, public roads or right-of-ways. While

the proposed work will require that large trucks enter and exit the facility on occasion for equipment deliveries and waste shipments, the arrival/departure schedule for these trucks will be staggered so as to cause minimal interruption of traffic flow on Bagging Plant Road.

5. What measures will be taken to minimize noise associated with the remediation activities?

The Army recognizes the detrimental effects that noise pollution can have on residential communities. The remediation activities that have been proposed for RFAAP-NRU will require the utilization of some mechanical earth moving equipment, site clearing equipment, and power tools that do have the potential to create some localized noise in the designated work areas. However, the work areas are well within the boundaries of RFAAP-NRU and are not expected to contribute any significant noise pollution to the surrounding community. Nevertheless, it should be noted that work will only be performed during daylight hours so as to further ensure that residents in the surrounding area will not be disturbed by noise associated with the remediation activities.

6. A citizen expressed concern about the transport of airborne contaminants during performance of the remediation activities. How will transport of airborne contaminants/particulates/ asbestos be minimized during performance of the work? Will air monitoring be performed to help ensure that contaminants do not affect air quality on adjacent properties?

As discussed in the Proposed Plan, the removal actions that have been proposed for the BLA and IAA study areas will require removal of asbestos containing materials and excavation of contaminated soils; therefore, the Army understands the public's concern over potential impacts to air quality. However, the Army would like to assuage these concerns by ensuring that all necessary precautions will be taken to prevent the spread of any airborne contaminants.

Standardized asbestos abatement techniques will be utilized to prevent the spread of asbestos or any other contaminants of concern during performance of the flooring removal activities. These techniques include: 1) wetting the flooring material to minimize the potential for asbestos fibers to become airborne; 2) constructing fully contained enclosures around the flooring removal areas to contain any asbestos materials that may become airborne during the abatement activities; 3) maintaining the enclosures under negative air pressure so that air within the enclosures does not leave the containment without being filtered to remove any airborne particulates; and 4) applying a lockdown encapsulant to all surfaces inside the containment areas to prevent the release of any residual contaminants following completion of the abatement activities. All of the asbestos containing flooring material will be containerized in double-lined plastic bags that have been specifically designed for the transport and disposal of asbestos containing wastes. Air monitoring will be conducted throughout the abatement activities that will include the collection of samples from upwind, downwind, and immediately outside the work area enclosures to make sure that asbestos fibers are not

released to the environment during the work. If airborne asbestos is detected outside of the protected areas, all work will be suspended until the source of the asbestos release is contained.

While the soil excavation activities at the BLA and IAA will not require the construction of enclosures, the soil excavation work area will be wetted to prevent the release of dust that may contain contaminants or asbestos. The soil will be direct loaded into roll-off boxes to minimize soil handling and maintained wet to prevent the release of dust. The roll-off boxes will be covered during transport to the disposal facility to ensure that dust and contaminants are not released. An air monitoring program will be conducted throughout the soil excavation activities that is similar in scope to what will be performed for the flooring removal actions. Air samples will be collected upwind and downwind of the soil excavation activities. These samples will be analyzed for asbestos and dust. If the sampling indicates that asbestos or dust are present at concentrations above applicable thresholds the excavation activities will be suspended immediately until measures can be taken to prevent the release.

In addition to the protective measures that will be utilized during performance of the work, the Army would like to assure the public that the flooring removal and excavation activities will be conducted in fairly small work areas that will minimize the potential for significant releases to occur. The areas for the proposed remediation activities are also located at fairly significant distances from the property boundaries, which will further minimize the potential for off-site receptors to be impacted by airborne contaminants in the highly unlikely event that a release were to occur.

7. *A citizen expressed concern that the newspaper is not an effective means of communicating with the public. Will the Army consider using an alternative means of communicating with the public and local media (e.g., letters, TV announcements, email)? How would the Army communicate any immediate risks/threats to the public (e.g., release during remedial activities)?*

The Army and Radford Army Ammunition Plant have a Community Relations Plan that is used to guide the public outreach efforts related to the IRP at RFAAP. Local newspapers (The New River Current section of The Roanoke Times) are only one of the tools that RFAAP utilizes to inform the community of milestone events, such as dates for public meetings and when important documents are available for review. As discussed earlier, RFAAP-NRU also maintains a publicly accessible IRP website that contains up to date information on important dates, document availability, meeting summaries, etc. An information repository containing all published documents related to the IRP is maintained at the Montgomery-Floyd Regional Library at 125 Sheltman Street in Christiansburg, Virginia. Copies of the newspaper notices for quarterly RAB meetings and IRP related public meetings are provided to the local towns' websites for posting. Interested parties may also contact Ms. Joy Case in the public relations office at RFAAP to request that they be sent email notifications of the public notices [Phone: (540) 731-5762; e-mail: joy.case@us.army.mil].

In the highly unlikely event that there were any incident at RFAAP-NRU that presented an immediate risk to the surrounding community, RFAAP would notify local emergency officials and media outlets (e.g., TV and

radio). If necessary, individual households may be notified via telephone, or in person. However, the Army would like to assure the public that the techniques that will be utilized during remediation activities will minimize the chance for a release to occur, especially one that would impact off-site areas. Furthermore, the contaminants that are the target of the remediation activities at RFAAP-NRU do not present any immediate health risks to the surrounding community. Potential health risks associated with the contaminants and concentrations that have been identified at RFAAP-NRU are generally associated with long term exposure scenarios.

8. Will the Army conduct meetings with the public to keep them informed of on-going environmental activities at the NRU? Will the public be provided a forum for communicating concerns to the Army and/or VDEQ?

The Army conducts quarterly Restoration Advisory Board (RAB) meetings that are open for the public to attend. These meetings provide an open forum for the Army to update the public on the status of on-going environmental investigations and clean-up activities at RFAAP- NRU as well as at the main manufacturing area of RFAAP in Radford, VA. These meetings also provide a forum for the public to ask questions and express any concerns that they may have. Public notice of RAB meeting dates are published in local newspapers as well as on the IRP website (http://www.radfordaapirp.org/comminv/RAB.htm). These notices are also provided to the local towns' websites for posting. For those unable to attend the RAB meetings, meeting notes are published on the RAB website. Members of the public are also encouraged to contact Ms. Joy Case in the public relations office at RFAAP (see contact information in response to comment #7).

9. How will the Army notify residents when the remediation activities are complete?

The flooring and soil removal actions at the BLA and IAA will likely be performed concurrently and will take approximately 2-3 months to complete. The sediment removal action at the WBG site is fairly small in scale and will likely take less than 1-week to complete. Upon completion of the remediation activities, the Army will prepare a Remedial Completion report that will certify that the actions have been completed and that the remediation goals of the project have been achieved. The Completion Reports will be available for public review within the Administrative Record that is maintained at the Montgomery-Floyd Regional Library in Christiansburg, VA, and on-line at http://www.radfordaapirp.org/. The Public will also be updated on Remediation Progress during the quarterly RAB meetings and on the IRP website. Interested parties may also inquire as to the status of IRP activities with Ms Joy Case in the RFAAP Public Relations Office.

10. A citizen expressed interest in whether WWII Era artifacts from the facility's operational past are present on-site, and if so, what efforts would be made to collect and preserve them.

The buildings utilized for the WWII Era manufacturing operations at RFAAP-NRU have all been dismantled and all equipment removed from the site. All that remains of the former manufacturing facilities at the site are concrete building pads, and in some cases concrete walls.

The Army has already captured the historic significance of WWII Era ordnance manufacturing operations in an existing context study entitled **Historic Context for the World War II Ordnance Department's Government-Owned Contractor-Operated (GOCO) Industrial Facilities 1939-1945**, as well compiled documentation of nine WWII Era GOCO Plants. In accordance with the Program Comment for World War II and Cold War Era (1939-1974) Army Ammunition Production Facilities and Plants issued by the Advisory Council on Historic Preservation (ACHP) in 2006, the Army has complied with its responsibilities under Section 106 of the National Historic Preservation Act with regards to the effect of remediation activities on these types of properties. As such, no special measures will be put into place to locate and identify artifacts within the proposed work areas prior to performing the proposed remediation activities at RFAAP-NRU.

11. *During review of a draft version of this Decision Document, VDEQ suggested that the discussion of project costs be removed from Section 1 of the document.*

The Army elected to keep the discussion of project costs within Section 1 of the Decision Document. Providing projected costs within Section 1 allows the reader to understand the costs associated with the selected remedies without having to refer to the more complex discussions provided in Section 2 of the document.

12. *During review of a draft version of this Decision Document, VDEQ suggested a revision to the discussion on the implementation of Land Use Controls that would require the Army to submit a land use control implementation plan (LUCIP) to VDEQ for review and approval within 180 days of execution of the Decision Document.*

The Army elected not to revise the discussion on the implementation of Land Use Controls. The Army will be preparing/submitting a LUCIP for VDEQ review and approval, but is opposed to committing to a 180-day submittal/approval time frame within the context of the Decision Document.

13. *VDEQ requested to be removed as a signatory on this Decision Document. Rather than sign the document, VDEQ will issue a concurrence letter.*

The VDEQ signature line was removed from Page 5 of this Decision Document.

14. *VDEQ noted that the entirety of the Pollutant Discharge Elimination System (VPDES) Permit Regulation was listed as to be considered (TBC) in a draft version of Table 10. VDEQ suggested that 9 VAC 25-31-50(A) is the only substantive provision of this regulation that is applicable for the remedial actions proposed in this decision document. The suggested section is a prohibition from discharging pollutants into surface waters.*

Table 10 of the Decision Document was updated so that it no longer references the entirety of the VPDES Regulation. The updated version of Table 10 only references the applicable section [9 VAC 25-31-50(A)] of the VPDES Regulations.

15. *VDEQ recommended that the Virginia Threatened and Endangered Species regulation 4 VAC 15-20-130 to 140 and 2 VAC 5-320-10 be listed as a Relevant and Appropriate ARAR in Table 11. Virginia Code section 29.1-563 to 570 authorizes the adoption of the federal endangered species list as well as designating threatened and endangered species specific to Virginia. Virginia prohibits by regulation the "taking" of any threatened or endangered species. Because endangered species are not expected to be on site these regulations are not considered applicable. However, if at any point during remediation such species are encountered, site activities must be tailored to comply with these regulations and should be listed as relevant and appropriate.*

The Army respectfully disagrees with this recommendation and did not list Virginia Threatened and Endangered Species Regulations to Table 11. The Army does not list State and Federal endangered species acts as ARARs because they do not meet the criteria for being applicable (i.e., an objective determination of whether the requirement specifically addresses a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at a CERCLA site) nor do they fit as relevant and appropriate because none of the evaluation factors found in 40 CFR Section 300.400(g)(2)(i) through (viii) can be applied to the ESA or State ESA. However, the Army acknowledges that although Virginia Threatened and Endangered Species Regulations are not listed as ARARs, they would apply if an endangered species were encountered during performance of the work and the Army would comply fully with the requirements of the regulation.

16. *During review of a draft version of this Decision Documen, VDEQ noted that Virginia Solid Waste Regulation 9 VAC 20-80-10 to 790 was listed in Table 12. VDEQ noted that the applicable Virginia Solid Waste Regulation sections are 9 VAC 20-81- 40(B)(C), 45, 90(A)(1) and 95. These regulations are applicable because the onsite actions are expected to generate wastes which will be characterized for offsite disposal.*

Agreed. Table 12 of the Decision Document has been updated to remove the repealed regulation. The applicable regulations (9 VAC 20-81- 40(B)(C), 45, 90(A)(1) and 95) have been added to Table 12.

4. References

Advisory Council on Historic Preservation (ACHP), 2006. Program Comment for World War II and Cold War Era (1939-1974) Army Ammunition Production Facilities and Plants. Washington, DC. August.

ARCADIS, 2010a. Response Action Completion and Closure Report for the Northern Burning Ground, New River Unit (RAAP-044). Radford Army Ammunition Plant, Radford, Virginia. October

ARCADIS, 2010b.Feasibility Study Report, New River Unit (RAAP-044). Radford Army Ammunition Plant, Radford, Virginia. August.

ARCADIS, 2010c. Remedial Investigation Report, New River Unit (RAAP-044), Radford Army Ammunition Plant, Radford, Virginia. June.

ARCADIS, 2009. Engineering Evaluation/Cost Analysis, Northern Burning Ground, New River Unit (RAAP-044), Radford Army Ammunition Plan, Radford, Virginia. July.

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Shaw. 2004. Internal Draft New River Unit Investigation Report: BDDT, BLA, IAA, NBG, RY & WBG, Radford Army Ammunition Plant, Radford, Virginia. February.

URS, 2003. Master Work Plan, Radford Army Ammunition Plant, Radford, Virginia. August.

U.S. Army, 2010. Proposed Plan for New River Unit, Radford Army Ammunition Plant, Radford, Virginia. September.

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U.S. Environmental Protection Agency (USEPA). 2008. Oak Ridge National Laboratory (ORNL) Regional Screening Levels (RSLs). Available at: http://epa-prgs.ornl.gov/chemicals/faq.shtml.

USEPA, 1999. A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents. EPA 540-R-96-031. OSWER 9200-1-23P.

USEPA, 2001 Comprehensive Five-Year Review Guidance. **EPA 540-R-01-007** *OSWER No. 9355.7-03B-P*

Tables

Table 1
Summary of Historical Investigations Completed at RFAAP-NRU
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Investigation	Date	Author	Activities Performed (1)
Building Debris Disposal Trench			
Preliminary Sampling	1997	Alliant TechSystems	This initial assessment of the site was performed to identify potential impacts associated with the debris disposal area. The assessment included the collection of 1 soil sample, 1 surface water sample from the downgradient stream, and 1 sample of a tarry substance leaking from a drum.
Independent Sampling	1998	Gannett Fleming	This investigation was performed at the direction of the USEPA to evaluate potential impacts to the unnamed stream downgradient of the BDDT area. The investigation included samples of surface water and sediment within the stream.
Remedial Investigation	1998	ICF Kaiser Engineers	The first extensive investigation conducted at the site to identify the extent of impacts associated with the site. The activities completed during this phase of investigation included: a geophysical investigation to identify buried waste; removal of all debris and stained soils from the disposal trench; collection of soil samples from the base of the excavated area and from the downgradient depositional area; co-located surface and sediment samples from the unnamed stream; and placement of clean fill and rip-rap in the former disposal area.
Remedial Investigation	2002	Shaw	This event included the collection of soil samples to delineate the vertical extent of impacts within the depositional area. Sediment and surface water samples were also collected from the downgradient stream to further evaluate the potential for impacts to sediment or surface water quality.
Additional Characterization	2004	Shaw	This sampling event was performed to delineate the extent of PAH's in soil within the depositional area downgradient of the former disposal area.
Remedial Investigation	2008	ARCADIS	This final sampling event was conducted to confirm that the impacts to soil within the depositional area were fully delineated and to confirm the declining trend of PAHs in the stream sediments.

Table 1
Summary of Historical Investigations Completed at RFAAP-NRU
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Investigation	Date	Author	Activities Performed (1)
Bag Loading Area			
Preliminary Sampling	1997	Dames and Moore	Initial assessment of the lateral and vertical distribution of organic and inorganic contamination in surface and subsurface soils around Building 407.
Independent Sampling	1997-1998	Gannett Fleming	This investigation included the collection of soil and conductive flooring samples from Building 405.
Conductive Flooring Assessment	2002	USACE	The United States Army Corp of Engineers completed a conductive flooring assessment to evaluate the composition of the flooring material.
Remedial Investigation	2002	Shaw	This sampling event included the collection of soil samples from the areas surrounding the buildings with conductive flooring, former electrical transformer locations. Sediment and surface water samples were also collected from area drainage ditches and the unnamed stream located to the north of the BLA.
Asbestos & Lead Investigation	2005	Shaw	This investigation was performed to evaluate the extent of asbestos material and lead-based paint in the site buildings.
Remedial Investigation	2008	ARCADIS	The intent of this investigation was to delineate the extent of PAHs, inorganics, and asbestos in surface soil surrounding building with conductive flooring material.
Supplemental Remedial Investigation	2009	ARCADIS	The intent of this investigation was to enhance the delineation of the asbestos in surface soils around buildings containing conductive flooring and to evaluate potential airborne asbestos exposure risks associated with the asbestos in soil.

Table 1
Summary of Historical Investigations Completed at RFAAP-NRU
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Investigation	Date	Author	Activities Performed (1)
Igniter Assembly Area			
Preliminary Sampling	1997	Dames and Moore	Initial assessment of the lateral and veridical distribution of organic and inorganic contamination in surface and subsurface soils around the site.
Independent Sampling	1997-1998	Gannett Fleming	Additional sampling of surface and subsurface soil; in addition, samples of the conductive flooring material were also collected.
Additional Characterization	1998	Dames and Moore	This sampling event was performed to enhance the characterization and delineation of organic and inorganic constituents around Building 8102.7.
Remedial Investigation	1998	ICF Kaiser Engineers	The intent of this investigation was to further characterize the nature and extent of target constituents at the IAA through surface, subsurface, and flooring samples.
Conductive Flooring Assessment	2002	USACE	The United States Army Corp of Engineers completed a conductive flooring assessment to further evaluate the composition of the flooring material.
Remedial Investigation	2002	Shaw	This sampling event was performed to provide additional characterization of soil located adjacent to site buildings, former transformer locations, and in area drainage ditches.
Asbestos & Lead Investigation	2005	Shaw	This investigation was performed to evaluate the extent and impact of asbestos material and lead-based paint in the site buildings.
RI Investigation	2008	ARCADIS	The intent of this investigation was to delineate the extent of PAHs, inorganics, and asbestos in surface soil surrounding building with conductive flooring material and PCBs at former transformer locations.
Supplemental RI Investigation	2009	ARCADIS	The intent of this investigation was to enhance the delineation of the asbestos in surface soils around buildings containing conductive flooring and to evaluate potential airborne asbestos exposure risks associated with the asbestos in soil.

Table 1
Summary of Historical Investigations Completed at RFAAP-NRU
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Investigation	Date	Author	Activities Performed (1)
Northern Burning Ground			
Independent Sampling	1997	Gannett Fleming	
Remedial Investigation	1998 - 1999	ICF Kaiser Engineers	The was the first extensive investigation conducted to identify potential impacts associated with the historical burning operations at the site. The activities completed during this phase of investigation included: a geophysical investigation to identify buried debris and identify the bounds of the former burning area; soil samples from the former burning area and surrounding area to identify the nature and extent of constituents at the site.
Remedial Investigation	2002	Shaw	The intent of this phase of investigation was to further define the nature and extent of constituents at the site. Additional soil samples were collected from the former burning area and surrounding low lying areas. Sediment samples were also collected from the drainage ditch that received surface water runoff from the site.
Additional Delineation Sampling	2004	Shaw	The sampling event was performed to bound the horizontal and vertical extent of elevated metals concentrations in site soils.
Response Action and Confirmation Sampling	2009	ARCADIS	ARCADIS performed a removal action at the NBG in 2009 that included the excavation and off-site disposal of lead and chromium impacted soils. Confirmation samples were collected to document that the removal action successfully achieved the remediation goals that had been established for the site.

Table 1
Summary of Historical Investigations Completed at RFAAP-NRU
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Investigation	Date	Author	Activities Performed (1)
Rail Yard			
Independent Sampling	1997 - 1998	Gannett Fleming	This initial sampling event included the collection of soil samples near the loading platforms and transformer locations, and sediment samples from a crawl space, sewer, and area drainage ditches. The intent of this investigation was to evaluate the potential for contamination resulting from historical operations.
Remedial Investigation	1998	ICF Kaiser Engineers	This phase of investigation included the collection of surface and subsurface soil samples from areas where the historical rail car loading, unloading, and maintenance activities were performed.
Baseline Investigation	2002	Shaw	This sampling event included the collection of multiple surface soil samples across the site to develop an understanding of the existing concentration of constituents in soil. This data would be used to establish baseline conditions so that the effects of possible future uses at the RY can be evaluated.
Remedial Investigation	2002	Shaw	During this phase of investigation surface and subsurface soil samples were collected at former transformer locations and other areas that had previously been uncharacterized. Sediment and surface water samples were collected from the pond and tributaries of the unnamed stream that flows near the RY.

Table 1
Summary of Historical Investigations Completed at RFAAP-NRU
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Investigation	Date	Author	Activities Performed (1)
WBG			
Independent Sampling	1997	Gannett Fleming	Initial investigation to characterize contamination resulting from site activities; surface soil, sediment, and surface water samples were collected.
Remedial Investigation	1998 - 1999	ICF Kaiser Engineers	This was the first extensive investigation conducted at the site to characterize and delineate the extent of impacts associated with the historical burning operations. The first phase of the investigation included a geophysical survey to identify buried debris. Soil sampling was then performed to define the extent of the former burning operations. A test pitting program was then performed throughout the former burn area to remove impacted soils. Confirmation sampling was performed that the test pitting successfully removed the soils containing constituents at concentrations above screening levels. Sediment and surface water samples were also collected from the pond located adjacent to the WBG.
Remedial Investigation	2002	Shaw	This investigation was conducted to further evaluate soil quality north and west of the former burn area, near a former transformer station. In addition, surface water and sediment samples were collected from the pond, downgradient stream, and area drainage ditches.
Additional Characterization	2004	Shaw	This investigation was performed to characterize and delineate constituents present in soil outside the former burning area. The investigation also included an extensive evaluation of potential impacts to the unnamed pond, that included the collection of additional sediment and surface water samples, as well as a fish bioaccumulation study.
Remedial Investigation	2008	ARCADIS	The intent of this sampling was to finalize the characterization and delineation of constituents in pond and stream sediments and surface water.

Table 1
Summary of Historical Investigations Completed at RFAAP-NRU
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Investigation	Date	Author	Activities Performed (1)
Groundwater			
Groundwater Investigation	2007	Shaw	Initial groundwater investigation at the facility. Included the installation and sampling of 11 groundwater monitoring wells.
Remedial Investigation	2008	ARCADIS	This sampling event included the collection of groundwater samples from all eleven groundwater monitoring wells and 4 spring locations. The main purpose of this event was to verify that the metals detected during the initial sampling event were related to elevated turbidity levels and did not reflect dissolved phase concentrations.
Remedial Investigation	2010	ARCADIS	This sampling event also included the collection of groundwater samples from all eleven groundwater monitoring wells and 4 spring locations. Performed at the request of VDEQ to further verify lack of COCs.

(1) A detailed summary of each phase of investigation at the BDDT, BLA, IAA, RY, WBG and Groundwater is provided in the Remedial Investigation Report (ARCADIS 2010c)

(2) A detailed summary of the investigations completed at the NBG is provided in the Engineering Evaluation/Cost Analysis Report (ARCADIS 2009), and a summary of the remedial actions completed at the NBG is provided in the Response Action Completion and Closure Report (ARCADIS 2010a)

Table 2
Contaminants of Concern for the BDDT, BLA, IAA, and WBG Study Areas
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Exposure Point	Contaminant of Concern	Concentrations Detected		Frequency of Detection	Exposure Point Concentration (mg/kg)	EPC Calculation Method [a]
		Min (mg/kg)	Max (mg/kg)			
Building Debris Disposal Trench						
BDDT - Soil	Benzo(a)pyrene	0.0089	57	45 / 63	Whole Site: 6.92 Rip Rap Area Only: 5.35	95th UCL
Bag Loading Area						
BLA - Soil	Aroclor 1254	0.0066	8.3	9 / 20	1.869	95th UCL
	Benzo(a)pyrene	0.0049	39	39 / 44	16.14	95th UCL
	Copper	21	72,000	47 / 47	19,489	95th UCL
	Lead	9.82	58,000	47 / 47	2,020	Average
	Asbestos	0.1%	9.4%	10 / 29	NA	NA
Igniter Assembly Area						
Exposure Point	**Contaminant of Concern**	**Concentrations Detected**		**Frequency of Detection**	**Exposure Point Concentration (mg/kg)**	**EPC Calculation Method [a]**
		Min (mg/kg)	**Max (mg/kg)**			
IAA - Soil	Aroclor 1254	0.0049	12	18 / 61	3.697	95th UCL
	Copper	5.13	56,500	139 / 139	9,523	95th UCL
	Lead	6.4	16,200	139 / 139	642	Average
	Asbestos	0.10%	17.20%	7 / 22	NA	NA
Western Burning Ground						
Exposure Point	**Chemical of Concern**	**Concentrations Detected**		**Frequency of Detection**	**Exposure Point Concentration (mg/kg)**	**EPC Calculation Method [a]**
		Min (mg/kg)	**Max (mg/kg)**			
WBG - Sediment	Chromium	5.17	15,400	28 / 28	6,048	95th UCL
	Lead	5.61	109,000	32 / 32	3,610	Average

mg/kg: milligrams per kilogram

[a] The exposure point concentration (EPC) was the upper confidence level on the mean (UCL) or the maximum concentration where the UCL was incalculable.

Exposure to lead is evaluated by predicting resultant blood lead levels using the arithmetic average (avg).

The UCLs were calculated using ProUCL 4.0. The UCL used is the one recommended by ProUCL 4.0.

Asbestos exposure is not evaluated by exposure point concentration

Table 3
Summary of Human-Health Risk Assessments for the BDDT, BLA, IAA, and WBG
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Study Area	Site worker	Construction Worker	Adult Resident	Child Resident	Total Resident	Primary Risk Drivers
	Excess Lifetime Cancer Risk [a]					
BDDT	7×10^{-5}	2×10^{-6}	1×10^{-4}	3×10^{-4}	**4×10^{-4}**	benzo(a)pyrene
BLA	1×10^{-4}	7×10^{-6}	2×10^{-4}	8×10^{-4}	**1×10^{-3}**	benzo(a)pyrene
IAA	1×10^{-4}	6×10^{-6}	1×10^{-4}	4×10^{-4}	**5×10^{-4}**	2,4-Dinitrotoluene(1)
WBG	1×10^{-5}	5×10^{-7}	2×10^{-5}	3×10^{-5}	5×10^{-5}	none
	Hazard Index [b]					
	Site worker	**Construction Worker**	**Adult Resident**	**Child Resident**	**Total Resident**	**Primary Risk Drivers**
BDDT	0.6	1	0.6	**5**	-	Cobalt(2)
BLA	0.8	3	1	**12**	-	Copper Aroclor 1254
IAA	1.3	**3**	1	**13**	-	Copper Aroclor 1254
WBG	0.4	0.5	0.8	**6**	-	Chromium
	Predicted Blood Lead Levels [c]					
	Site worker	**Construction Worker**	**Adult Resident**	**Child Resident(3)**	**Total Resident**	**Primary Risk Drivers**
BLA	Adult(4): 4.9 µg/dL Fetal(4): **17** µg/dL	Adult: 5.2 µg/dL Fetal: **18** µg/dL	Adult: 6.5 µg/dL Fetal: **23** µg/dL	**10.9 - 18.4**	-	Lead
IAA	Adult: 2.8 µg/dL Fetal: 9.9 µg/dL	Adult: 2.8 µg/dL	Adult: 3.2 µg/dL Fetal: **11** µg/dL	4.4 - 8.2	-	Lead
WBG - soil	Adult: 2.0 µg/dL Fetal: 7.1 µg/dL	Adult: 2.0 µg/dL	Adult: 2.1 µg/dL Fetal: 7.3 µg/dL	2.9 - 5.5	-	None
WBG - sediment	-	-	Adult: 2.8 µg/dL Fetal: **10** µg/dL	-	-	Lead

Notes:
- = Not applicable
µg/dL - Microgram(s) per deciliter
bolded values exceed target risk/hazard thresholds

[a] Compare to USEPA generally acceptable risk range of $1x10^{-6}$ to $1x10^{-4}$
[b] Compare to USEPA generally acceptable threshold HI of 1
[c] Compare to targe blood lead level of 10 µg/dL
(1) While 2,4-dinitrotoluene was found to be the primary contributor to an elevated ELCR for the residential land use scenario at the IAA, this constituent was not identified as a true risk driver for the site. 2,4-Dinitrotoluene was only detected in two samples collected at a single location at the site and was not found in subsequent sampling events.
(2) The driver for the elevated HI for the BDDT child resident scenario was identified as cobalt. However, cobalt was not determined to be a true risk driver for the site because the elevated HI was based on a single detection of cobalt that was at a concentration slightly outside the naturally occuring background conditions. There are no sources for cobalt releases at the site, so the elevated concentration was determined to be naturally occuring.
(3) The child blood lead level ranges were calculated using USEPA Integrated Exposure Uptake Biogenetic Model for Lead in Children (IEUBK) and represents range in seven years

(4) The adult and fetal blood lead levels were calculated using USEPA Adult Lead Methodology (ALM). The adult blood lead levels represent 50th Percentile/Geometric Mean. The fetal blood lead levels represent THE 95th percentile result.

Table 4
Projected Costs for Implementing the Selected Response Action for Soil at the BDDT
New River Unit, Radford Army Ammunition Plant, Radford Virginia

ITEM		QUANTITY	UNITS	UNIT COST	CAPITAL COST	ANNUAL O & M COST	PRESENT WORTH COST
I. ADMINISTRATIVE AND ENGINEERING ACTIONS							
1. Survey/Document Footprint of Area Requiring Land-Use Controls		1.0	LS	$4,250	$4,250		
2. Sign Installation		1.0	Each	$1,025	$1,025		
Subtotal:					$5,275	$0	$0
II. ANNUAL INSPECTION AND FIVE YEAR REVIEWS (30-YEAR PERIOD)							
1. Annual Inspection and Reporting		30.0	Year	$2,280		$68,400	$28,300
2. Five Year Review		6.0	Each	$15,000		$90,000	$37,200
3. Annual O&M		30.0	Year	$2,000		$60,000	$24,800
Subtotal:					$0	$218,400	$90,300
SUBTOTAL (I and II)					$5,275	$218,400	$90,300
III. IMPLEMENTATION COSTS							
1. Administration and Legal	5% of Capital Costs				$300		
2. CMI Plan / LUCIP Draft		1.0	LS	$20,000	$20,000		
3. Completion Report / Finalize LUCIP		1.0	LS	$15,000	$15,000		
4. Cost Contingency	25% of Capital Costs				$1,300		
5. O&M Contingency	15% of O&M Costs					$32,800	$13,600
Subtotal:					$36,600	$32,800	$13,600
A. TOTAL CAPITAL COSTS					$41,875		
B. TOTAL ANNUAL COSTS						$251,200	
C. TOTAL PRESENT WORTH OF ANNUAL COSTS							$103,900
TOTAL PRESENT WORTH OF CAPITAL AND ANNUAL COSTS (A + C)							$146,000

LS - Lump Sum
LF - Linear Foot

Present worth cost is calculated using 7.0% interest in 2011 dollars.

Table 5
Projected Costs for Implementing the Selected Response Action for Soil at the BLA
New River Unit, Radford Army Ammuntion Plant, Radford, Virginia

ITEM		QUANTITY	UNITS	UNIT COST	CAPITAL COST	ANNUAL O & M COST	PRESENT WORTH COST
I. ADMINISTRATIVE ACTIONS							
1. Land-Use Controls		1.0	LS	$3,250	$3,250		
2. Sign Installation		40.0	Each	$205	$8,200		
Subtotal:					$11,450	$0	$0
II. GENERAL ACTIONS/SITE PREPARATION							
1. Mobilization/Demobilization		1.0	LS	$20,000	$20,000		
2. Clear and Grub		5.0	Day	$3,000	$15,000		
3. Utility Clearance		1.0	Day	$2,000	$2,000		
4. Install, Maintain, and Remove Erosion and Sediment Controls		2000	LF	$5	$10,000		
5. XRF Rental		2	Week	$3,500	$7,000		
6. Surveying		1.0	Day	$2,500	$2,500		
7. MEC (UXO)		0.0	Day	$2,800	$0		
8. Decontamination Controls		1.0	LS	$5,000	$5,000		
Subtotal:					$61,500	$0	$0
III. EXCAVATION, DISPOSAL, AND BACKFILL							
1. Excavation, Transportation and Disposal of Impacted Soil		130	CY	$167	$21,710		
2. Excavation Confirmation Sampling		45.0	Each	$500	$22,500		
3. Import and Place Common Borrow		150	ton	$20	$3,000		
4. Import and Place Top Soil		61	CY	$28	$1,711		
5. Waste Characterization		7.0	each	$770	$5,390		
6. Site Restoration		1.0	LS	$7,500	$7,500		
Subtotal:					$61,811	$0	$0
IV. O&M, ANNUAL INSPECTION AND FIVE YEAR REVIEW							
1. Annual Inspection and Reporting		30.0	Each	$2,280		$68,400	$28,300
2. Five Year Review		6.0	Each	$10,000		$60,000	$24,800
Subtotal:					$0	$128,400	$53,100
SUBTOTAL (I, II, III, and IV)					$134,761	$128,400	$53,100
V. IMPLEMENTATION COSTS							
1. Administration and Legal	5% of Capital Costs			$20,000	$6,700		
2. CMI Plan		1.0	LS	$20,000	$20,000		
3. Procurement	18% of Capital Costs				$24,300		
4. Construction Management	12% of Capital Costs				$16,200		
5. Completion Report		1.0	LS	$15,000	$15,000		
6. Cost Contingency	25% of Capital Costs				$33,700		$0
7. O&M Contingency	15% of O&M Costs					$19,300	$8,000
Subtotal:					$115,900	$19,300	$8,000
A. TOTAL CAPITAL COSTS					$250,661		
B. TOTAL ANNUAL COSTS						$147,700	
C. TOTAL PRESENT WORTH OF ANNUAL COSTS							$61,100
TOTAL PRESENT WORTH OF CAPITAL AND ANNUAL COSTS (A + C)							$312,000

CY - Cubic Yard
LF - Linear Foot
LS - Lump Sum
SY - Square Yard

Present worth cost is calculated using 7.0% interest in 2011 dollars.

Table 6
Projected Costs for Implementing the Selected Response Action for Conductive Flooring at the BLA
New River Unit, Radford Army Ammunition Plant, Radford Virginia

ITEM		QUANTITY	UNITS	UNIT COST	CAPITAL COST	ANNUAL O & M COST	PRESENT WORTH COST
I. ADMINISTRATIVE ACTIONS							
1. Land-Use Controls		0	LS	$4,250	$0		
2. Pre-Work Coordination		1	LS	$10,000	$10,000		
Subtotal:					$10,000	$0	$0
II. GENERAL ACTIONS/SITE PREPARATION							
1. Focused Asbestos Survey		0	LS	$20,000	$0		
2. Focued Asbestos Survey Report		0	LS	$5,000	$0		
3. Structural Evaluation of Bldg 404 and 407		1	LS	$10,000	$10,000		
4. Mobilization/Demobilization		1	LS	$20,000	$20,000		
5. Dust Suppression Systems and Air Monitoring		30	day	$1,500	$45,000		
6. Decontamination Controls		1	LS	$5,000	$5,000		
Subtotal:					$80,000	$0	$0
III. CONDUCTIVE FLOOR ABATEMENT							
1. Remove Conductive Flooring		19000	SF	$10	$190,000		
2. Waste Characterization		7	each	$770	$5,390		
3. Transportation and Disposal		70	CY	$100	$7,037		
4. Site Restoration		1	LS	$5,000	$5,000		
Subtotal:					$207,427	$0	$0
SUBTOTAL (I, II, and III)					$297,427	$0	$0
IV. IMPLEMENTATION COSTS							
1. Administration and Legal	5% of Capital Costs				$14,900		
2. CMI Plan		1	LS	$25,000	$25,000		
3. Procurement	18% of Capital Costs				$53,500		
4. Construction Management	12% of Capital Costs				$35,700		
5. Completion Report		1	LS	$20,000	$20,000		
6. Cost Contingency	25% of Capital Costs				$74,400		$0
7. O&M Contingency	15% of O&M Costs					$0	$0
Subtotal:					$223,500	$0	$0
A. TOTAL CAPITAL COSTS					$520,927		
B. TOTAL ANNUAL COSTS						$0	
C. TOTAL PRESENT WORTH OF ANNUAL COSTS							$0
TOTAL PRESENT WORTH OF CAPITAL AND ANNUAL COSTS (A + C)							$521,000

CY - Cubic Yard
LF - Linear Foot
LS - Lump Sum
SY - Square Yard

Present worth cost is calculated using 7.0% interest in 2011 dollars.

Table 7
Projected Costs for Implementing the Selected Response Action for Soil at the IAA
New River Unit, Radford Army Ammuntion Plant, Radford, Virginia

ITEM		QUANTITY	UNITS	UNIT COST	CAPITAL COST	ANNUAL O & M COST	PRESENT WORTH COST
I. ADMINISTRATIVE ACTIONS							
1. Land-Use Controls		0.0	LS	$3,250	$0		
Subtotal:					$0	$0	$0
II. GENERAL ACTIONS/SITE PREPARATION							
1. Mobilization/Demobilization		1.0	LS	$20,000	$20,000		
2. Clear and Grub		7.0	Day	$2,300	$16,100		
3. Utility Clearance		1.0	Day	$2,000	$2,000		
4. Install, Maintain, and Remove Erosion and Sediment Controls		3000	LF	$5	$15,000		
5. XRF Rental		2	Week	$3,500	$7,000		
6. Surveying		1.0	Day	$2,500	$2,500		
7. MEC (UXO)		0.0	Day	$2,800	$0		
8. Decontamination Controls		1.0	LS	$5,000	$5,000		
Subtotal:					$67,600	$0	$0
III. EXCAVATION, DISPOSAL, AND BACKFILL							
1. Excavation, Transportation and Disposal of Impacted Soil		325	ton	$167	$54,275		
2. Excavation Confirmation Sampling		80.0	Each	$500	$40,000		
3. Import and Place Common Borrow		325	ton	$20	$6,500		
4. Import and Place Top Soil		140	CY	$28	$3,920		
5. Waste Characterization		10	each	$770	$7,700		
6. Site Restoration		1.0	LS	$7,500	$7,500		
Subtotal:					$119,895	$0	$0
SUBTOTAL (I, II, and III)					$187,495	$0	$0
IV. IMPLEMENTATION COSTS							
1. Administration and Legal	5% of Capital Costs			$20,000	$9,400		
2. CMI Plan		1.0	LS	$20,000	$20,000		
3. Procurement	18% of Capital Costs				$33,700		
4. Construction Management	12% of Capital Costs				$22,500		
5. Completion Report		1.0	LS	$15,000	$15,000		
6. Cost Contingency	25% of Capital Costs				$46,900		$0
7. O&M Contingency	15% of O&M Costs					$0	$0
Subtotal:					$147,500	$0	$0
A. TOTAL CAPITAL COSTS					$334,995		
B. TOTAL ANNUAL COSTS						$0	
C. TOTAL PRESENT WORTH OF ANNUAL COSTS							$0
TOTAL PRESENT WORTH OF CAPITAL AND ANNUAL COSTS (A + C)							$335,000

CY - Cubic Yard
LF - Linear Foot
LS - Lump Sum
SY - Square Yard

Present worth cost is calculated using 7.0% interest in 2011 dollars.

Table 8
Projected Costs for Implementing the Selected Response Action for Conductive Flooring at the IAA
New River Unit, Radford Army Ammunition Plant, Radford Virginia

ITEM		QUANTITY	UNITS	UNIT COST	CAPITAL COST	ANNUAL O & M COST	PRESENT WORTH COST
I. ADMINISTRATIVE ACTIONS							
1. Land-Use Controls		0	LS	$4,250	$0		
2. Pre-Work Coordination		1	LS	$10,000	$10,000		
Subtotal:					$10,000	$0	$0
II. GENERAL ACTIONS/SITE PREPARATION							
1. Mobilization/Demobilization		1	LS	$20,000	$20,000		
2. Dust Suppression Systems and Air Monitoring		30	day	$1,500	$45,000		
3. Decontamination Controls		1	LS	$5,000	$5,000		
Subtotal:					$70,000	$0	$0
III. CONDUCTIVE FLOOR ABATEMENT							
1. Remove Conductive Flooring		25000	SF	$14	$360,000		
2. Waste Characterization		7	each	$770	$5,390		
3. Transportation and Disposal		93	CY	$100	$9,259		
4. Site Restoration		1	LS	$5,000	$5,000		
Subtotal:					$379,649	$0	$0
SUBTOTAL (I, II, and III)					$459,649	$0	$0
IV. IMPLEMENTATION COSTS							
1. Administration and Legal	5% of Capital Costs				$23,000		
2. CMI Plan		1	LS	$25,000	$25,000		
3. Procurement	18% of Capital Costs				$82,700		
4. Construction Management	12% of Capital Costs				$55,200		
5. Completion Report		1	LS	$20,000	$20,000		
6. Cost Contingency	25% of Capital Costs				$114,900		$0
7. O&M Contingency	15% of O&M Costs					$0	$0
Subtotal:					$320,800	$0	$0
A. TOTAL CAPITAL COSTS					$780,449		
B. TOTAL ANNUAL COSTS						$0	
C. TOTAL PRESENT WORTH OF ANNUAL COSTS							$0
TOTAL PRESENT WORTH OF CAPITAL AND ANNUAL COSTS (A + C)							$780,000

CY - Cubic Yard
LF - Linear Foot
LS - Lump Sum
SY - Square Yard

Present worth cost is calculated using 7.0% interest in 2011 dollars.

Table 9
Projected Costs for Implementing the Selected Response Action for Sediment at the WBG
New River Unit, Radford Army Ammunition Plant, Radford Virginia

ITEM		QUANTITY	UNITS	UNIT COST	CAPITAL COST	ANNUAL O & M COST	PRESENT WORTH COST
I. ADMINISTRATIVE ACTIONS							
1. Land-Use Controls		0.0	LS	$2,050	$0		
2. Pre-Work Coordination		1.0	LS	$5,000	$5,000		
Subtotal:					$5,000	$0	$0
II. GENERAL ACTIONS/SITE PREPARATION							
1. Mobilization/Demobilization		1	LS	$25,000	$25,000		
2. Clear and Grub		2	Day	$3,000	$6,000		
3. Utility Location		1	Day	$2,000	$2,000		
4. Install, Maintain, and Remove Erosion and Sediment Controls		500	LF	$5	$2,500		
5. Surveying		2	Day	$1,500	$3,000		
6. Decontamination Pad (includes labor to perform decon)		1	LS	$5,000	$5,000		
Subtotal:					$43,500	$0	$0
III. SEDIMENT EXCAVATION, DEWATERING, TRANSPORT AND DISPOSAL							
1. Construct Sediment Dewatering Basin		1	LS	$20,750	$20,750		
2. Excavation of Sediment via Excavator		2	Day	$2,000	$4,000		
3. Stabilize Sediment with Portland Cement		1	LS	$5,000	$5,000		
4. Waste Characterization							
A. Decontamination water		2	each	$1,000	$2,000		
B. Stabilized Sediment		5	each	$1,000	$5,000		
5. Excavation/Confirmation Sampling - Laboratory Samples		12	each	$215	$2,580		
6. XRF Rental for Field Sampling		1	Week	$5,000	$5,000		
7. Dewatering/Water Treatment Equipment		1	Week	$5,000	$5,000		
8. Transportation and Disposal of Stabilized Sediment		160	ton	$265	$42,400		
9. Site Restoration		1	LS	$5,000	$5,000		
10. Backfill		0	CY	$35	$0		
Subtotal:					$96,730	$0	$0
SUBTOTAL (I, II, and III)					$145,230	$0	$0
IV. IMPLEMENTATION COSTS							
1. Administration and Legal	5% of Capital Costs				$7,300		
2. CMI Plan		1	LS	$30,000	$30,000		
3. Procurement	18% of Capital Costs				$26,100		
4. Construction Management	12% of Capital Costs				$17,400		
5. Completion Report		1	LS	$20,000	$20,000		
6. Cost Contingency	25% of Capital Costs				$36,300		
7. O&M Contingency	15% of O&M Costs					$0	$0
Subtotal:					$137,100	$0	$0
A. TOTAL CAPITAL COSTS					$282,330		
B. TOTAL ANNUAL COSTS						$0	
C. TOTAL PRESENT WORTH OF ANNUAL COSTS							$0
TOTAL PRESENT WORTH OF CAPITAL AND ANNUAL COSTS (A + C)							$282,000

CY - Cubic Yard
LF - Linear Foot
LS - Lump Sum
SY - Square Yard

Present worth cost is calculated using 7.0% interest in 2011 dollars.

Table 10
Potential Chemical-Specific ARARs and TBC Guidance
New River Unit, Radford Army Ammunition Plant Radford, Virginia

Media	Authority	Requirement	Status	Requirement Synopsis
Soil	State Regulatory Requirement	Virginia Hazardous Waste Management Regulations: 9 VAC 20-60-420, 440, 460-500.	Applicable	Defines and lists hazardous waste and provides standards for the management/handling of hazardous waste applicable to generators, transporters, and disposal facilities.
	Federal Criteria, Advisories, and Guidance	USEPA Region III Risk-Based Concentrations (RBCs) Table	To Be Considered	These values are concentrations corresponding to fixed levels of risk (i.e., a hazard quotient of 1 or a lifetime cancer risk of 10^{-6}, whichever occurs at a lower concentration) in water, air, fish tissue, and soil. There are no RBCs for sediment; therefore the soil screening levels will be used instead.
	Federal Criteria, Advisories, and Guidance	USEPA Regional Screening Levels Table 2008	To Be Considered	Provides preliminary remediation goals for constituents in soils.
	Federal Criteria, Advisories, and Guidance	USEPA Revised Interim Soil Lead Guidance for CERLA sites and RCRA Corrective Action Facilities (OSWER Directive 9355.4-12)	To Be Considered	The screening level for lead in soil for residential use is 400 mg/kg. There are no screening levels for sediment; therefore the soil screening levels will be used instead.
	Federal Criteria, Advisories, and Guidance	USEPA Region III Biological Technical Assessment Group (BTAG) Screening Levels	To Be Considered	Region III has established ecologically based screening levels for remediation sites. There are no screening levels for sediment; therefore the soil screening levels will be used instead.
Surface Water	State Regulatory Requirement	Virginia Water Quality Standards - Criteria for Surface Water 9VAC 25-260-140	Applicable	Provides preliminary remediation goals for constituents in surface water.
	State Regulatory Requirement	Virginia Water Quality Standards – Antidegradation Policy 9 VAC25-260-30	To Be Considered	Requires that, at a minimum, the level of water quality necessary to protect existing uses shall be maintained and protected.

Table 10
Potential Chemical-Specific ARARs and TBC Guidance
New River Unit, Radford Army Ammunition Plant Radford, Virginia

Media	Authority	Requirement	Status	Requirement Synopsis
Surface Water	State Regulatory Requirement	Virginia Water Quality Standards – Numerical Criteria for dissolved oxygen, pH, and maximum temperature 9 VAC 25-260-50	To Be Considered	Provides numerical ranges for dissolved oxygen, pH, and temperature for surface water bodies that must be maintained..
	State Regulatory Requirement	Pollutant Discharge Elimination System (VPDES) Permit Regulation: 9 VAC 25-31-50(A)	Applicable	This regulation prohibits the discharge of pollutants to sate surface waters, except when in compliance with a VPDES permit.
	Federal Criteria, Advisories, and Guidance	Clean Water Act (33 USC 1314), USEPA Office of Water, Federal Ambient Water Quality Criteria	Applicable	AWQCs are criteria for protection of freshwater and marine aquatic life which have been developed for 95 carcinogenic and noncarcinogenic compounds. These standards also would apply to any stormwater or applied water that flows from a regulated unit to the land surface.

Table 11
Potential Location-Specific ARARs and TBC Guidance
New River Unit, Radford Army Ammunition Plant Radford, Virginia

Authority	Requirement	Status	Requirement Synopsis
Federal Regulatory Requirements	Resource Conservation and Recovery Act (RCRA) – Location Standards (40 CFR 264.18)	Applicable	This regulation outlines the requirements for constructing a RCRA facility on a 100-year floodplain. The facility must be designed, constructed, operated, and maintained to avoid washout by a 100-year flood, unless waste may be removed safely before floodwater can reach the facility or no adverse effects on human health and the environment would result if washout occurred. This will be applicable to the disposal facility utilized for the waste.
	Executive Order 11990: Protection of Wetlands (40 CFR 6, Appendix A)	To Be Considered	Federal agencies are required to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands.
	RCRA, 40 CFR 268	Applicable	Land disposal restrictions apply to land disposal of listed or characteristic hazardous materials disposed off site, or excavated treated and disposed on site If off-site disposal of contaminated media is necessary, LDR requirements will be met (Subtitle C Disposal)
	Guidance for Caps	To Be Considered	Evaluating Cover Systems for Solid and Hazardous Waste. (September 1982) EPA OSW-00-00-867 If a cap is part of the remedy this guidance will be followed
	40 CFR 262.34	Applicable	The exemption for ninety-day accumulation Storage of waste materials at the site for less than 90 days
	National Emission Standards for Hazardous Air Pollutants 40 CFR 61.145 and 150	Relevant and Appropriate	The handling transportation and disposal of asbestos containing material will be managed and disposed in accord with Part 61
Federal Guidance	Storm Water Pollution Prevention Plan for Construction EPA 833-R-06 -008-May 2007	To be Considered	Guidance document for the management of surface water during construction projects. This guidance document will be consulted for relevant and appropriate management practices for preventing pollution as a result of construction activities.

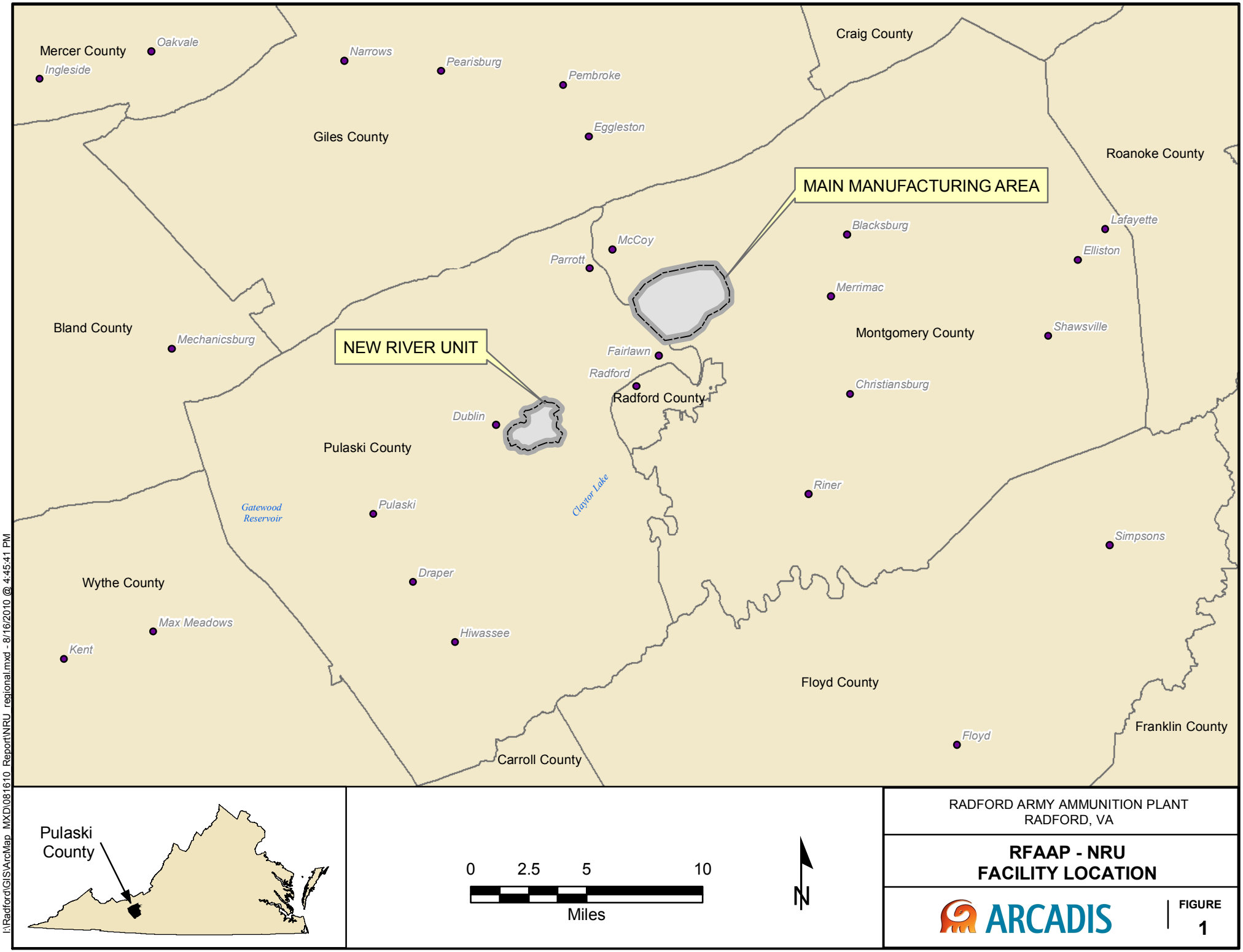
Table 11
Potential Location-Specific ARARs and TBC Guidance
New River Unit, Radford Army Ammunition Plant Radford, Virginia

Authority	Requirement	Status	Requirement Synopsis
Federal Regulatory Requirements	Resource Conservation and Recovery Act (RCRA) – Location Standards (40 CFR 264.18)	Applicable	This regulation outlines the requirements for constructing a RCRA facility on a 100-year floodplain. The facility must be designed, constructed, operated, and maintained to avoid washout by a 100-year flood, unless waste may be removed safely before floodwater can reach the facility or no adverse effects on human health and the environment would result if washout occurred. This will be applicable to the disposal facility utilized for the waste.
	Executive Order 11990: Protection of Wetlands (40 CFR 6, Appendix A)	To Be Considered	Federal agencies are required to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands.
	Endangered Species Act (16 USC 1531 et seq., 50 CFR 402)	Applicable	This law requires that action be taken to conserve endangered or threatened species. In addition, actions must not destroy or adversely modify critical habitat.
	Migratory Bird Treaty Act (16 USC 703 *et seq*)	Applicable	Actions taken or funded which result in the killing, hunting, taking, or capturing or any migratory birds, part, nest, or egg is unlawful.
	RCRA, 40 CFR 268	Applicable	Land disposal restrictions apply to land disposal of listed or characteristic hazardous materials disposed off site, or excavated treated and disposed on site If off-site disposal of contaminated media is necessary, LDR requirements will be met (Subtitle C Disposal)
	Guidance for Caps	To Be Considered	Evaluating Cover Systems for Solid and Hazardous Waste. (September 1982) EPA OSW-00-00-867 If a cap is part of the remedy this guidance will be followed
Federal Regulatory Requirements	40 CFR 262.34	Applicable	The exemption for ninety-day accumulation Storage of waste materials at the site for less than 90 days
	National Emission Standards for Hazardous Air Pollutants 40 CFR 61.145 and 150	Relevant and Appropriate	The handling transportation and disposal of asbestos containing material will be managed and disposed in accord with Part 61

Table 12
Potential Action-Specific ARARs and TBC Guidance
New River Unit, Radford Army Ammunition Plant Radford, Virginia

Authority	Requirement	Status	Requirement Synopsis
State Regulatory Requirements Continued	Emission Standards for Toxic Pollutants from New and Modified Sources (Rule 6-5): 9 VAC 5-60-300 to 370	To Be Considered	Provides regulations for the control and abatement of air pollution. Only the substantive provisions of this regulation could be considered as ARARs.
	Virginia Air Quality Standards: 9 VAC 5-30-60 and 65	Applicable	Provides long-range goals for particulate matter ambient air quality throughout the state of Virginia in order to protect the public health and welfare.
	Virginia Stormwater Management Program Permit Regulations: 4 VAC 50-60-10 to 240	To be Considered	The regulation provides a framework for the administration, implementation and enforcement of the procedures and requirements in conjunction with the issuance of a VSMP permit. Only the substantive provisions of this regulation could be considered as ARARs.
	Virginia Pollution Abatement Regulations: 9 VAC 25-32-10 to 300	To be Considered	This regulation delineates the procedures and requirements to be followed in connection with the VPA permits issued pursuant to the state water control law. Only the substantive provisions of this regulation could be considered as ARARs.
	Virginia Water Protection Permit Program Regulations: 9 VAC 25-210-10 to 260	To be Considered	Regulation governing the standards used for wetland delineation and the application and issuance of a VWP permit. Only the substantive provisions of this regulation could be considered as ARARs.
	Regulations Governing the Transportation of Hazardous Materials: 9 VAC 20-110-60	Applicable	The purpose of this rule is to establish that nothing contained within Virginia's Regulations Governing the Transportation of Hazardous Materials shall apply to regular military or naval forces of the United States. The purpose of these regulations is to regulate the transportation of hazardous materials and to maintain a register of shippers transporting hazardous and radioactive materials.
	Virginia Solid Waste Regulations 9 VAC 20-81-40(B)(C), -45, -90(A)(1), and -95	Applicable	These regulations define the requirements and prohibitions on the disposal of waste materials.
	Erosion and Sediment Control: 4 VAC 50-30-10 to 110	Applicable	This regulation is the basis for the administration, implementation, and enforcement of erosion and sediment control certification.

Figures


Mercer County
Oakvale
Ingleside
Narrows
Pearisburg
Pembroke
Craig County
Giles County
Eggleston
Roanoke County
MAIN MANUFACTURING AREA
Blacksburg
Lafayette
McCoy
Elliston
Parrott
Merrimac
Bland County
Mechanicsburg
NEW RIVER UNIT
Montgomery County
Shawsville
Fairlawn
Radford
Christiansburg
Radford County
Dublin
Pulaski County
Riner
Gatewood Reservoir
Pulaski
Claytor Lake
Simpsons
Draper
Wythe County
Max Meadows
Hiwassee
Kent
Floyd County
Floyd
Franklin County
Carroll County
Pulaski County
0
2.5
5
10
Miles
N
RADFORD ARMY AMMUNITION PLANT
RADFORD, VA
RFAAP - NRU
FACILITY LOCATION
ARCADIS
FIGURE
1
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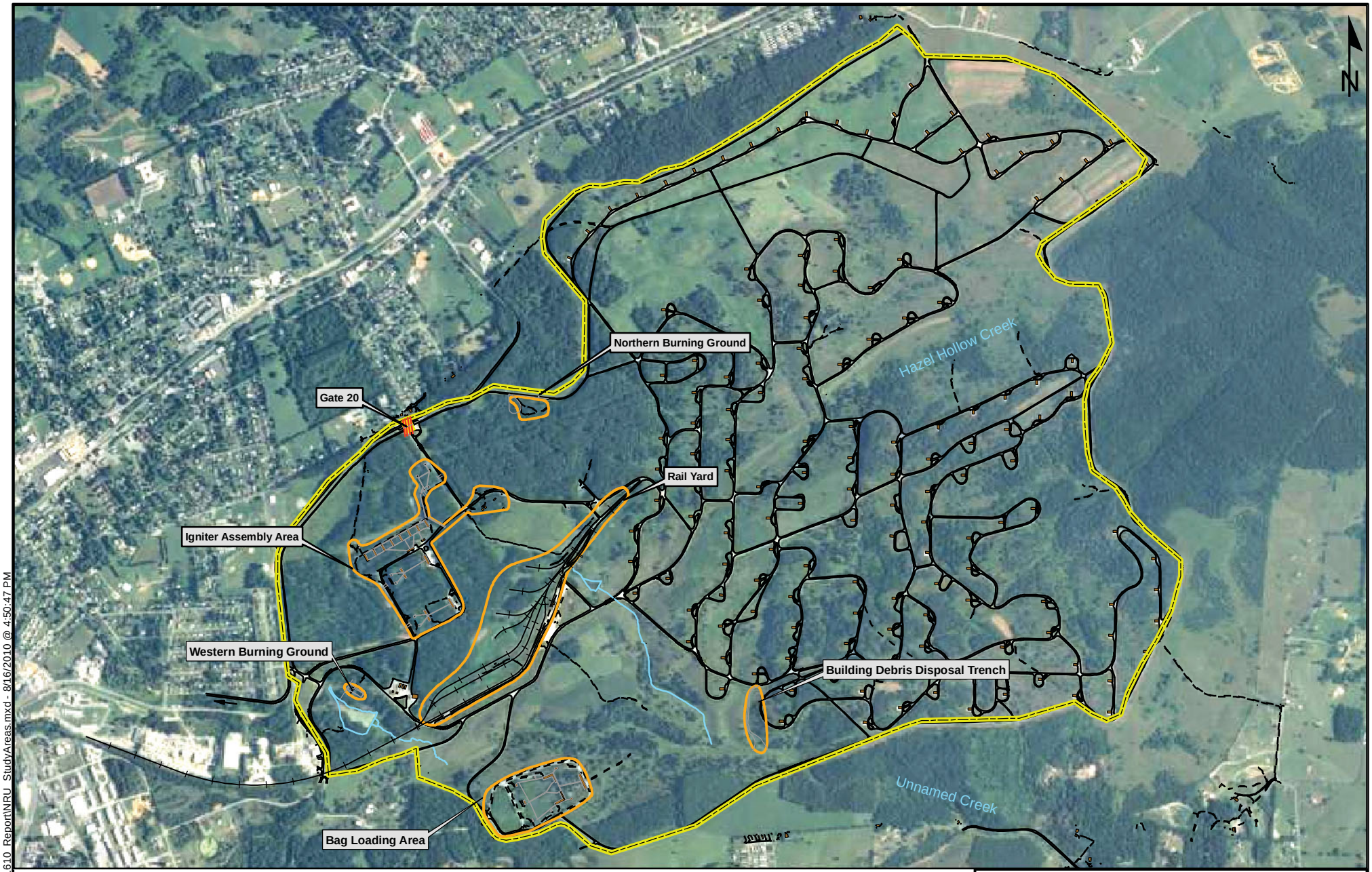

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LEGEND

- SITE FEATURES
- RAIL SPUR
- SURFACE WATER
- PAVED ROADS
- DIRT ROADS
- STUDY AREA
- NRU BOUNDARY
- BUILDINGS

NOTES:

1. GIS SPATIAL LAYERS OBTAINED FROM SHAW ENVIRONMENTAL, INC. AS REFERENCED IN THEIR REPORT TITLED NRU ADDITIOANL CHARACTERIZATION SAMPLING & GROUNDWATER INVESTIGATION DATA REPORT IN OCTOBER 2007.

0 900 1,800 Feet

GRAPHIC SCALE

RADFORD ARMY AMMUNITION PLANT
RADFORD, VA

RFAAP - NRU STUDY AREAS

ARCADIS

FIGURE 2

LEGEND

- SITE FEATURES
- SURFACE WATER
- TRENCH
- PAVED ROADS
- DIRT ROADS
- RIPRAP
- STUDY AREA
- BUILDINGS
- INSTALLATION BOUNDARY

0 150 300 Feet

GRAPHIC SCALE

RADFORD ARMY AMMUNITION PLANT
RADFORD, VA

BUILDING DEBRIS DISPOSAL TRENCH SITE LAYOUT

ARCADIS

FIGURE 3

NYC: SER 4/AIT: DB: TBR LD: TBR PIC: TL
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Legend

- PAVED ROADS
- DIRT ROADS
- SITE FEATURES
- SURFACE WATER
- FORMER RAISED WALKWAY PLATFORMS
- STUDY AREA
- INSTALLATION BOUNDARY

FORMER BUILDINGS

- NO CONDUCTIVE FLOORING
- YES CONDUCTIVE FLOORING

NOTE:
BUILDINGS 404 AND 405 WERE TWO STORY BUILDINGS

0 200 400 Feet

GRAPHIC SCALE

RADFORD ARMY AMMUNITION PLANT
RADFORD, VA

BAG LOADING AREA SITE LAYOUT

ARCADIS

FIGURE 4

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LEGEND

- SEWER LINE
- SITE FEATURES
- RAIL SPUR
- SURFACE WATER
- CULVERT
- PAVED ROADS
- DIRT ROADS
- FORMER BUILDINGS
  - NO CONDUCTIVE FLOORING
  - YES CONDUCTIVE FLOORING
- STUDY AREA
- INSTALLATION BOUNDARY

0 340 680 Feet

GRAPHIC SCALE

RADFORD ARMY AMMUNITION PLANT
RADFORD, VA

IGNITER ASSEMBLY AREA SITE LAYOUT

ARCADIS

FIGURE 5

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Legend

- MONITORING WELLS
- PAVED ROADS
- DIRT ROADS
- LOW AREA
- DRAINAGE DITCH
- CULVERT
- STUDY AREA
- NRU BOUNDARY

0 60 120 Feet

GRAPHIC SCALE

THE NORTHERN BURNING GROUND AT THE NEW RIVER UNIT
RADFORD ARMY AMMUNITION PLANT
RADFORD, VA

NORTHERN BURNING GROUND SITE LAYOUT

ARCADIS

FIGURE 6

NYC: SER 4/AIT: DB: TBR LD: TBR PIC: TL
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Radford (GP08RAAP.00PM)

LEGEND

- SITE FEATURES
- RAIL SPUR
- SURFACE WATER
- PAVED ROADS
- DIRT ROADS
- BUILDINGS
- STUDY AREA
- INSTALLATION BOUNDARY

0 425 850 Feet

GRAPHIC SCALE

RADFORD ARMY AMMUNITION PLANT
RADFORD, VA

RAIL YARD SITE LAYOUT

ARCADIS

FIGURE 7

NYC: SER 4/AIT: DB: TBR LD: TBR PIC: TL
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LEGEND

- MONITORING WELL
- TOP OF BERM
- FORMER BURN CAGE
- BREAK BETWEEN ASPHALT AND DIRT ROAD
- UNLINED DRAINAGE DITCH
- TEST PIT AREA (1999 RI)
- SURFACE WATER
- PAVED ROADS
- DIRT ROADS
- BUILDINGS
- STUDY AREA
- INSTALLATION BOUNDARY

0 100 200 Feet

GRAPHIC SCALE

N

RADFORD ARMY AMMUNITION PLANT
RADFORD, VA

WESTERN BURNING GROUND SITE LAYOUT AND MONITORING WELL LOCATION

ARCADIS

FIGURE 8

NYC: SER 4/AIT: DB: TBR LD: TBR PIC: TL
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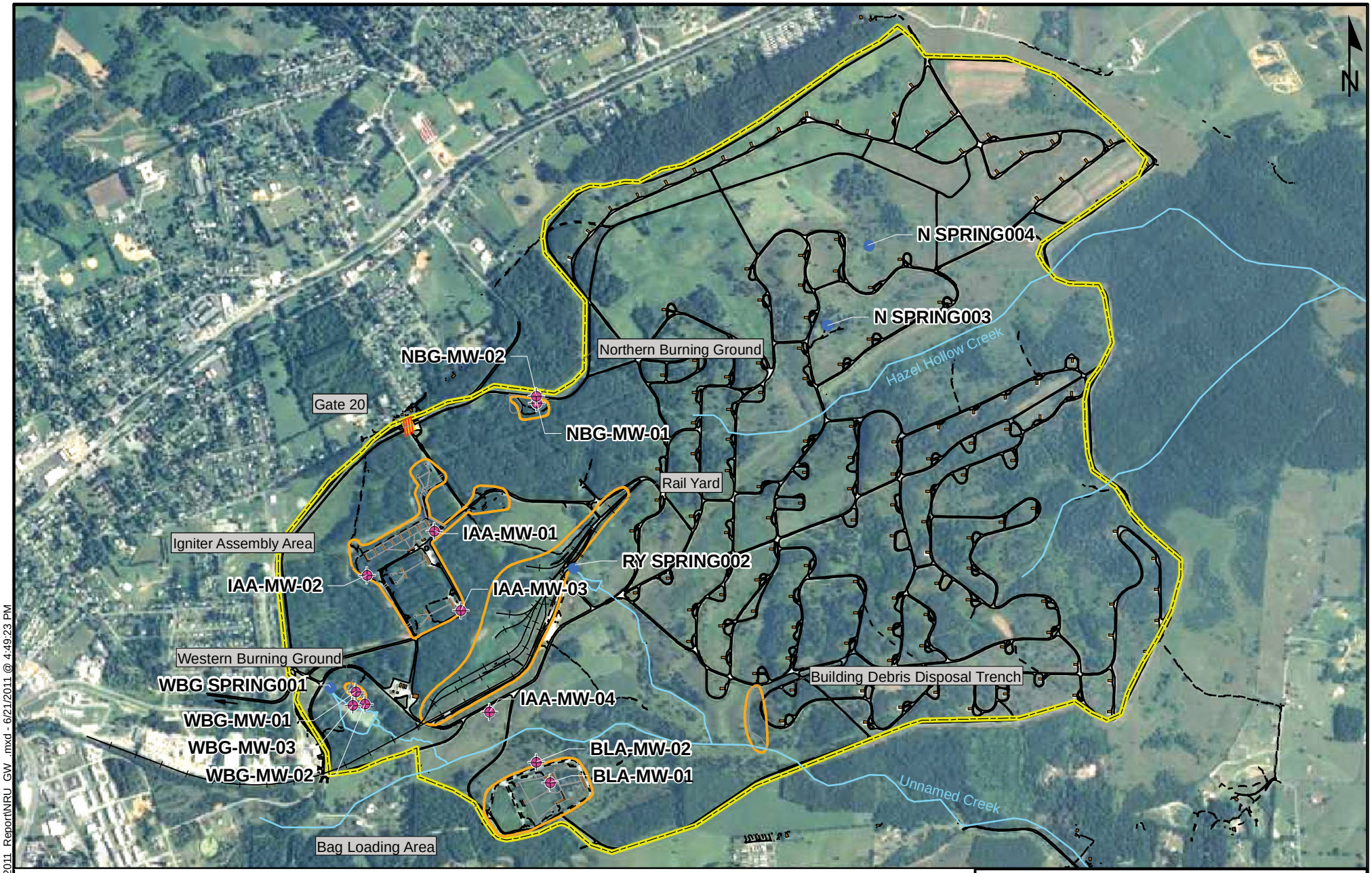

LEGEND

- SPRINGS
- MONITORING WELLS
- SITE FEATURES
- RAIL SPUR
- SURFACE WATER
- PAVED ROADS
- DIRT ROADS
- STUDY AREA
- INSTALLATION BOUNDARY
- BUILDINGS

NOTES:

1. GIS SPATIAL LAYERS OBTAINED FROM SHAW ENVIRONMENTAL, INC. AS REFERENCED IN THEIR REPORT TITLED NRU ADDITIOANL CHARACTERIZATION SAMPLING & GROUNDWATER INVESTIGATION DATA REPORT IN OCTOBER 2007.

0 900 1,800 Feet

GRAPHIC SCALE

RADFORD ARMY AMMUNITION PLANT
RADFORD, VA

GROUNDWATER MONITORING WELL AND SPRING SAMPLE LOCATIONS

ARCADIS

FIGURE 9

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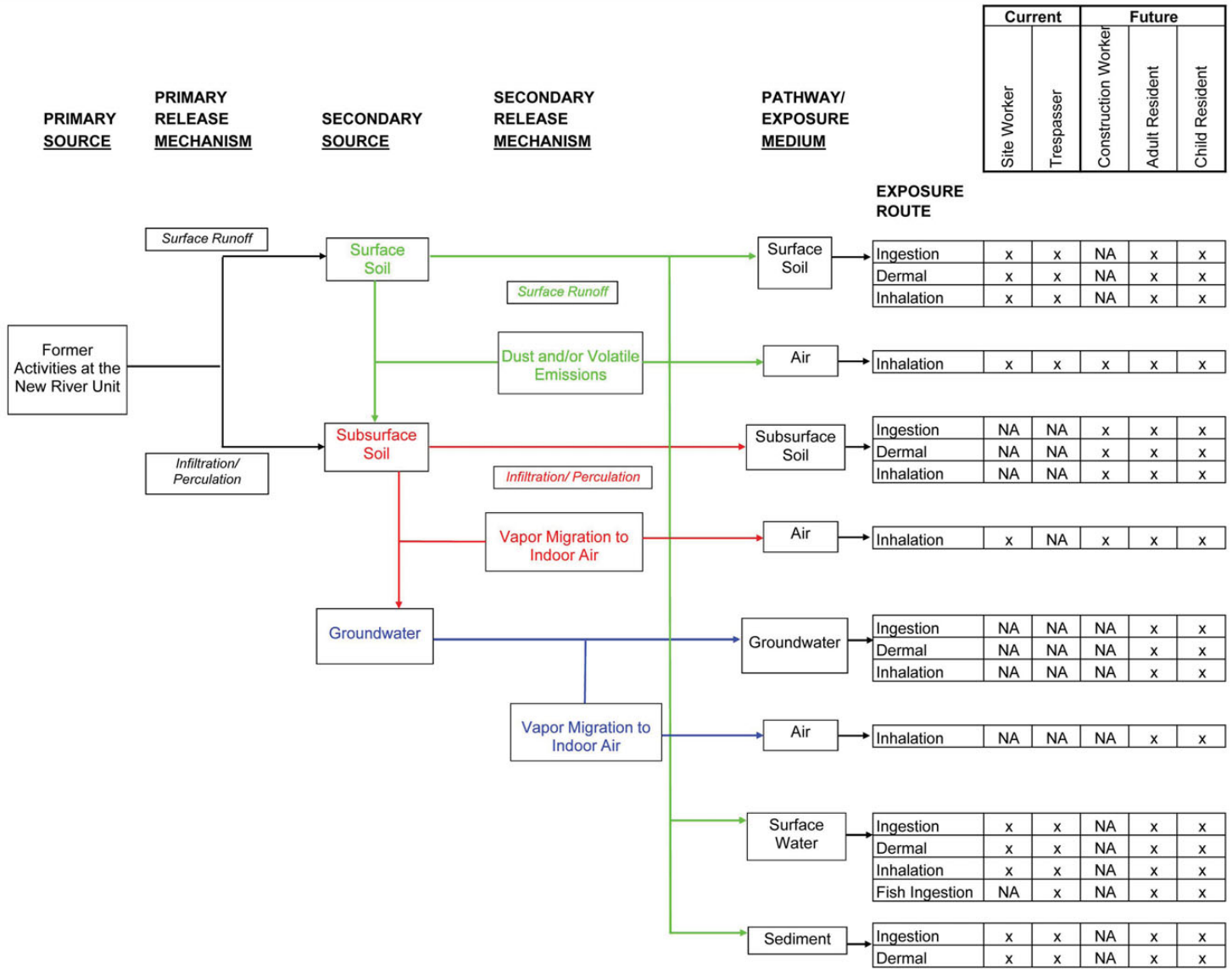
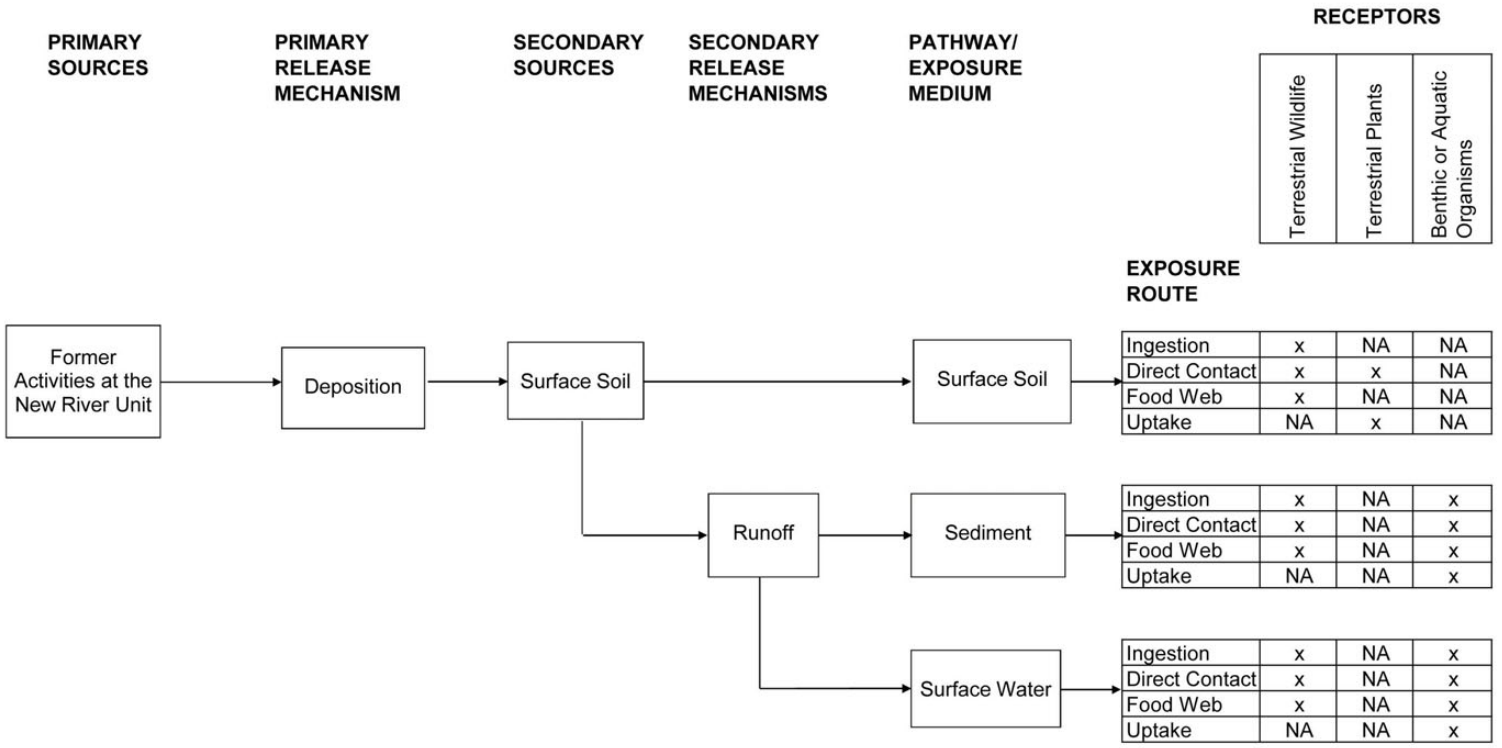


NA Pathway not applicable.
x Potential pathway.

ARCADIS

Conceptual Site Model for Potential Human Health Receptors
New River Unit
Radford Army Ammunition Plant
RADFORD, VIRGINIA

Figure
10

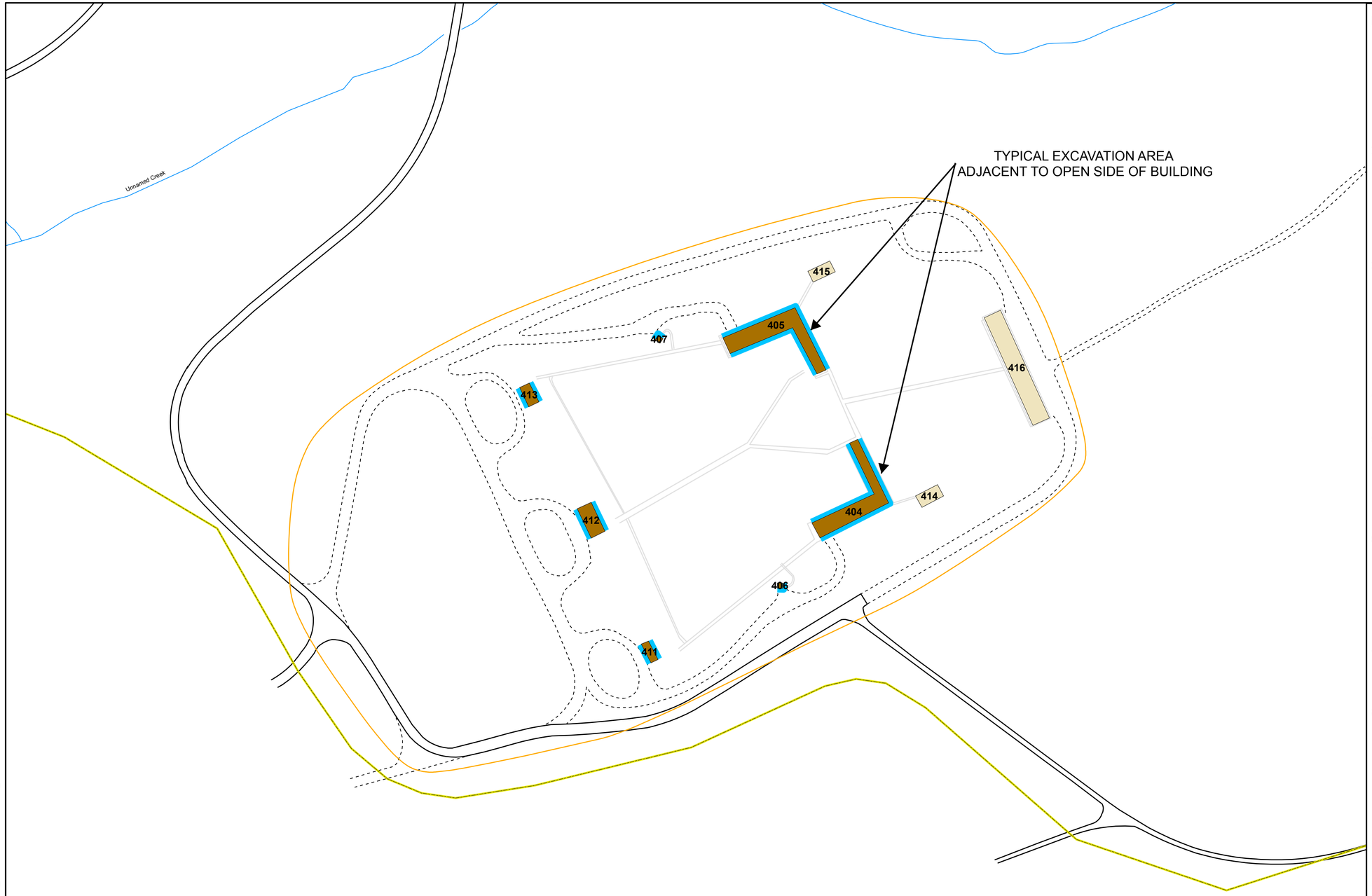


NA Pathway not applicable.
x Potential pathway.

ARCADIS

Conceptual Site Model for Potential Ecological Receptors
New River Unit
Radford Army Ammunition Plant
RADFORD, VIRGINIA

Figure 11



NOTES:

1. EROSION AND SEDIMENT CONTROLS ARE TO BE PLACED DOWN GRADIENT OF DISTURBANCE AREAS, AS DETERMINED BY THE ENGINEER. ALL EROSION AND SEDIMENT CONTROLS ARE TO REMAIN IN PLACE UNTIL THE SITE IS STABILIZED WITH VEGETATION AND APPROVED FOR REMOVAL BY THE ENGINEER.

2. STABILIZED CONSTRUCTION ENTRANCES AND TEMPORARY ACCESS ROADS SHALL BE CONSTRUCTED AS DEPICTED ON CONSTRUCTION DRAWING #3. THE LOCATION OF STABILIZED CONSTRUCTION ENTRANCES AND TEMPORARY ACCESS ROADS SHALL BE FIELD DETERMINED BY THE ENGINEER.

3. THE CLEARING OF VEGETATION FOR SITE ACCESS SHALL BE KEPT TO A MINIMUM. ABOVE GROUND PORTIONS OF THE CLEARED VEGETATION SHALL BE CHIPPED AND DISPOSED OF ON-SITE. PORTIONS OF THE VEGETATION THAT ARE BELOW GROUND AND WITHIN THE EXCAVATION AREA SHALL BE HANDLED AND DISPOSED OF AS ASBESTOS CONTAINING MATERIAL.

4. REMOVAL OF CONDUCTIVE FLOORING WILL OCCUR AT THE BUILDINGS AS INDICATED BY THIS FIGURE.

5. EXCAVATION OF SOIL WILL PRIMARILY OCCUR ON THE OPEN SIDES OF THE BUILDINGS WHERE THERE ARE PATHWAYS FOR THE CONDUCTIVE FLOORING TO HAVE WASHED OFF OF THE BUILDING PADS ONTO THE ADJACENT SOIL AS DEPICTED IN THIS DRAWING, OR AS DETERMINED BY THE ENGINEER.

6. THE INITIAL EXCAVATION EXTENT WILL EXTEND HORIZONTALLY 2 FEET FROM THE BASE OF AFFECTED BUILDINGS, AND PROCEED VERTICALLY TO A DEPTH OF 1 FOOT. HOWEVER, THE FINAL EXCAVATION EXTENT WILL BE FIELD DETERMINED BY THE ENGINEER BASED UPON FIELD ANALYSIS, LABORATORY ANALYSIS, AND VISUAL CONFIRMATION.

7. ALL EXCAVATED SOIL AND CONDUCTIVE FLOORING SHALL BE DISPOSED OF AT THE PERMITTED LANDFILL PRE-APPROVED BY THE ENGINEER.

8. UPON RECEIPT OF CONFIRMATION SAMPLING RESULTS INDICATING THAT THE FINAL EXCAVATION EXTENT HAS BEEN ACHIEVED, THE EXCAVATION AREAS SHALL BE BACKFILLED AND GRADED TO MATCH THE EXISTING GRADE.

Remedial Action Levels for Soil at the BLA	
Driver	**PRG**
Copper	11,533 mg/kg
Lead	624 mg/kg
Asbestos	0.1% by weight

LEGEND

- OPEN SIDE OF BUILDING, ADJACENT SOILS TO BE EXCAVATED
- PAVED ROADS
- DIRT ROADS
- SITE FEATURES
- SURFACE WATER
- FORMER RAISED WALKWAY PLATFORMS
- STUDY AREA
- INSTALLATION BOUNDARY
- FORMER BUILDINGS
  - NO CONDUCTIVE FLOORING
  - YES CONDUCTIVE FLOORING

NOTE:
BUILDINGS 404 AND 405 ARE TWO STORY BUILDINGS

N

0 200 400 Feet

GRAPHIC SCALE

RADFORD ARMY AMMUNITION PLANT
RADFORD, VA

BAG LOADING AREA REMOVAL ACTION PLANS

ARCADIS

DRAWING 12

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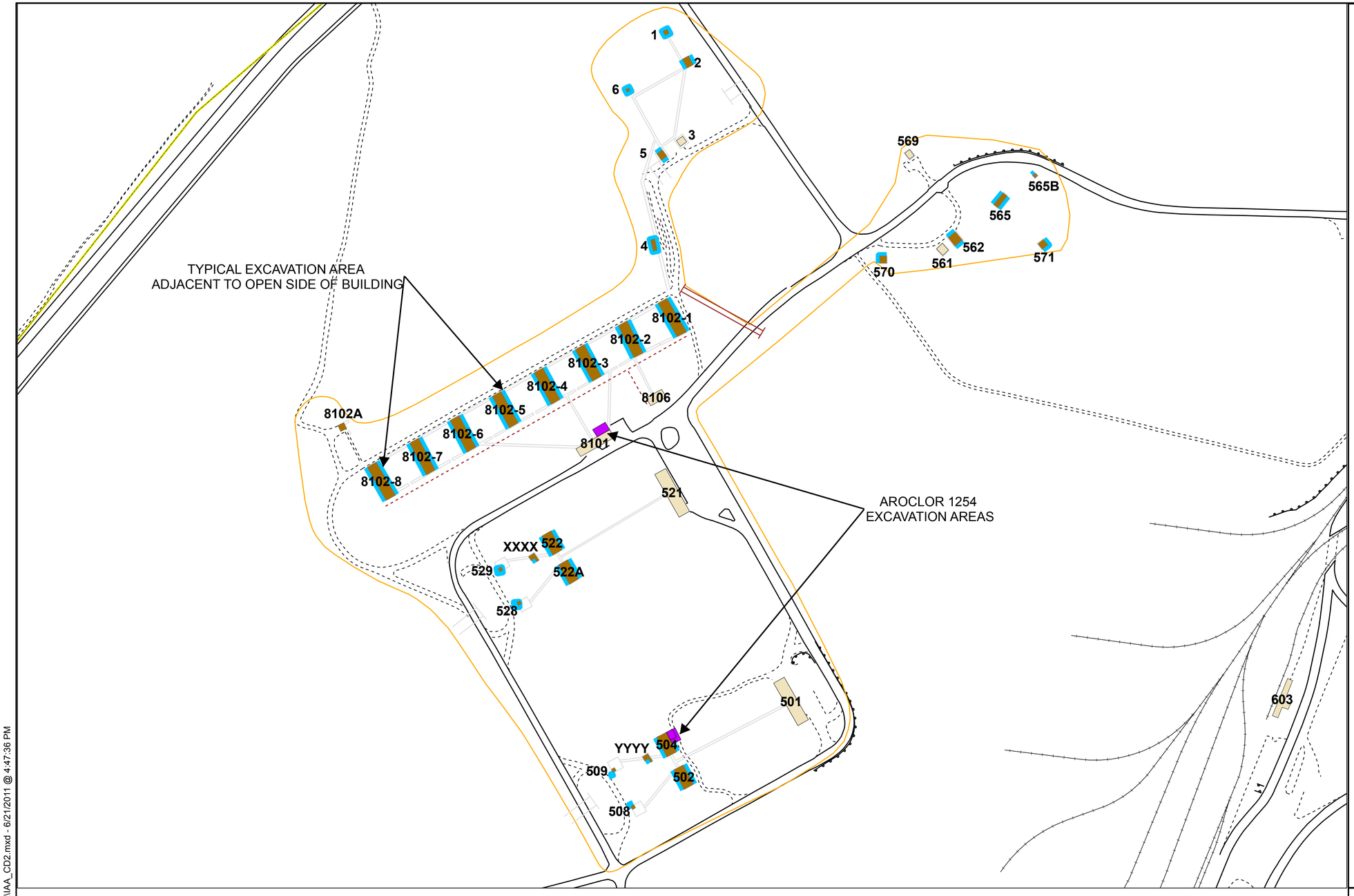

NOTES:

1. EROSION AND SEDIMENT CONTROLS ARE TO BE PLACED DOWN GRADIENT OF DISTURBANCE AREAS, AS DETERMINED BY THE ENGINEER. ALL EROSION AND SEDIMENT CONTROLS ARE TO REMAIN IN PLACE UNTIL THE SITE IS STABILIZED WITH VEGETATION AND APPROVED FOR REMOVAL BY THE ENGINEER

2. STABILIZED CONSTRUCTION ENTRANCES AND TEMPORARY ACCESS ROADS SHALL BE CONSTRUCTED AS DEPICTED ON CONSTRUCTION DRAWING #3. THE LOCATION OF STABILIZED CONSTRUCTION ENTRANCES AND TEMPORARY ACCESS ROADS SHALL BE FIELD DETERMINED BY THE ENGINEER.

3. THE CLEARING OF VEGETATION FOR SITE ACCESS SHALL BE KEPT TO A MINIMUM. ABOVE GROUND PORTIONS OF THE CLEARED VEGETATION SHALL BE CHIPPED AND DISPOSED OF ON-SITE. PORTIONS OF THE VEGETATION THAT ARE BELOW GROUND AND WITHIN THE EXCAVATION AREA SHALL BE HANDLED AND DISPOSED OF AS ASBESTOS CONTAINING MATERIAL.

4. REMOVAL OF CONDUCTIVE FLOORING WILL OCCUR AT THE BUILDINGS AS INDICATED BY THIS FIGURE.

5. EXCAVATION OF SOIL WILL PRIMARILY OCCUR ON THE OPEN SIDES OF THE BUILDINGS WHERE THERE ARE PATHWAYS FOR THE CONDUCTIVE FLOORING TO HAVE WASHED OFF OF THE BUILDING PADS ONTO THE ADJACENT SOIL AS DEPICTED IN THIS DRAWING, OR AS DETERMINED BY THE ENGINEER.

6. SOILS THAT EXCEED THE REMEDIAL ACTION LEVEL FOR AROCLOR 1254 WILL REQUIRE EXCAVATION, AS INDICATED ON THIS DRAWING. THE EXCAVATION AREAS FOR AROCLOR 1254 ARE NOT TO SCALE AS DEPICTED ON THIS DRAWING FOR ILLUSTRATION PURPOSES. THE ACTUAL EXCAVATION EXTENT FOR AROCLOR 1254 WILL BE FIELD DETERMINED BY THE ENGINEER.

7. THE INITIAL EXCAVATION EXTENT WILL EXTEND HORIZONTALLY 2 FEET FROM THE BASE OF AFFECTED BUILDINGS, AND PROCEED VERTICALLY TO A DEPTH OF 1 FOOT. HOWEVER, THE FINAL EXCAVATION EXTENT WILL BE FIELD DETERMINED BY THE ENGINEER BASED UPON FIELD ANALYSIS, LABORATORY ANALYSIS, AND VISUAL CONFIRMATION.

8. ALL EXCAVATED SOIL AND CONDUCTIVE FLOORING SHALL BE DISPOSED OF AT THE PERMITTED LANDFILL PRE-APPROVED BY THE ENGINEER.

9. UPON RECEIPT OF CONFIRMATION SAMPLING RESULTS INDICATING THAT THE FINAL EXCAVATION EXTENT HAS BEEN ACHIEVED, THE EXCAVATION AREAS SHALL BE BACKFILLED AND GRADED TO MATCH THE EXISTING GRADE.

Remedial Action Levels for Soil at the IAA	
Driver	**PRG**
Copper	3,043 mg/kg
Lead	400 mg/kg
Aroclor 1254	0.21 mg/kg
Asbestos	0.1% by weight

LEGEND

- AROCLOR 1254 EXCAVATION AREAS
- OPEN SIDE OF BUILDING, ADJACENT SOILS TO BE EXCAVATED
- PAVED ROADS
- DIRT ROADS
- SITE FEATURES
- RAIL SPUR
- SURFACE WATER
- CULVERT
- STUDY AREA
- INSTALLATION BOUNDARY
- FORMER BUILDINGS
- NO CONDUCTIVE FLOORING
- YES CONDUCTIVE FLOORING

N

0 300 600 Feet

GRAPHIC SCALE

RADFORD ARMY AMMUNITION PLANT
RADFORD, VA

IGNITER ASSEMBLY AREA REMOVAL ACTION PLANS

ARCADIS

DRAWING 13

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POTENTIAL STABILIZED CONSTRUCTION ENTRANCE

B 1 2

UNLINED DRAINAGE DITCH

POTENTIAL DIRT ACCESS ROAD

C 1 2

PARKING

ADMINISTRATIVE STAGING AREA

WBGMW01

TRUCK LOADING AND DECONTAMINATION PAD

DEWATERING AREA

WBG-MW-02

WBG-MW-03

EXCAVATION WORK AREA

POTENTIAL SILT FENCE LOCATION

A 1 2

SEDIMENT REMOVAL AREA

UNNAMED POND

PRIMARY SITE ACCESS

225 224 223 221 222

N

0 30 60 120

SCALE: FEET

WBG-MW-03

EXCAVATION WORK AREA

CP-1 WBGSD17 WBGSD25 WBGSW/SD10 WBGSD24 WBG-SE004 WBG-SW004 CP-2 WBG-SE003 WBG-SW003 WBG-SE002 WBG-SW002 WBGSD18 WBG-SE001 CP-3 CP-4 CP-5 WBGSD22 WBGSD21 WBGSD11 WBGSD19 WBGSD20 WBGSD6

0 10 20

SCALE: FEET

LEGEND:

- MONITORING WELL
- WBGSW/SD10 — SEDIMENT SAMPLE LOCATION
- CP-1 — CONTROL POINT
- TREE LINE
- UNLINED DRAINAGE DITCH
- DIRT ACCESS ROAD
- RAILROAD
- 222 — EXISTING BUILDING
- TRAFFIC PATTERN
- GUARD RAIL
- SF — SF — SF — FILT FENCE

NOTES:

1. BASEMAP AND LINE WORK OBTAINED FROM NEW RIVER UNIT ADDITIONAL CHARACTERIZATION SAMPLING & GROUNDWATER INVESTIGATION DATA REPORT (SHAW ENVIRONMENTAL, 2007).
2. ALL LOCATIONS ARE IN FEET AND REFER TO NORTH AMERICAN DATUM OF 1983. AND NORTH AMERICAN VERTICAL DATUM 1988.
3. SITE DEVELOPMENT DIMENSIONS, FEATURES, BOUNDARIES, AND LOCATIONS DEPICTED ARE APPROXIMATE AND SHALL BE FIELD LOCATED AND MODIFIED ACCORDINGLY.
4. EXISTING BUILDINGS, UTILITIES, AND OTHER FEATURES SHALL BE PROTECTED THROUGHOUT CONSTRUCTION ACTIVITIES. A THREE POINT UTILITY CLEARANCE WILL BE PERFORMED PRIOR TO INITIATING ANY INTRUSIVE WORK AT THE SITE. THE THREE POINT UTILITY CLEARANCE WILL CONSIST OF THE FOLLOWING ACTIVITIES: (1) ARCADIS WILL COORDINATE WITH RADFORD ARMY AMMUNITION PLANT TO REVIEW THE SCOPE OF WORK AND IDENTIFY ANY UTILITY LINES THAT MAY BE LOCATED IN THE WORK AREAS, (2) A RECORDS REVIEW WILL BE CONDUCTED TO REVIEW ALL AVAILABLE DRAWINGS/INFORMATION THAT CAN AIDE IN IDENTIFYING AND LOCATING ADJACENT UNDERGROUND UTILITIES/STRUCTURES, (3) A PRIVATE UTILITY LOCATOR WILL BE RETAINED TO LOCATE UNDERGROUND LINES/STRUCTURES BY APPLYING GEOPHYSICAL METHODS SURROUNDING THE AREAS WHERE INTRUSIVE WORK WILL BE CONDUCTED.
5. INGRESS/EGRESS ROUTES ARE ANTICIPATED TO REQUIRE LIMITED OVERHEAD CLEARING OF LIMBS AND BRANCHES. THE CLEARING OF VEGETATION FOR SITE ACCESS SHALL BE KEPT TO A MINIMUM. CLEARED VEGETATION SHALL BE CHIPPED AND DISPOSED OF ON-SITE WITHIN WOODED OR VEGETATED AREAS.
6. DEBRIS LOCATED ALONG THE SHORELINE, INCLUDING LARGE TO MEDIUM SIZE ROCKS, WILL BE MECHANICALLY REMOVED AND PLACED UPLAND DURING REMOVAL ACTIVITIES. LARGE ROCK AND BOULDERS REMOVED DURING CONSTRUCTION ACTIVITIES WILL BE REPLACED ALONG THE SHORELINE OF THE UNNAMED POND FOLLOWING THE COMPLETION OF SEDIMENT REMOVAL ACTIVITIES.
7. STABILIZED CONSTRUCTION ENTRANCES AND TEMPORARY ACCESS ROADS SHALL BE CONSTRUCTED AS DEPICTED ON DRAWING 2. THE LOCATION OF STABILIZED CONSTRUCTION ENTRANCES AND TEMPORARY ACCESS ROADS SHALL BE FIELD DETERMINED BY THE ENGINEER.
8. EROSION AND SEDIMENT CONTROLS, IF REQUIRED, ARE TO BE PLACED DOWN GRADIENT OF DISTURBED AREAS, AS NECESSARY. ALL EROSION AND SEDIMENT CONTROLS ARE TO REMAIN IN PLACE UNTIL THE SITE IS STABILIZED WITH VEGETATION AND APPROVED FOR REMOVAL BY THE ENGINEER. EROSION AND SEDIMENT CONTROLS SHALL BE CONSTRUCTED AS DEPICTED ON DRAWING 2.
9. A PRE-FABRICATED DECONTAMINATION PAD WILL BE INSTALLED AND UTILIZED AS NECESSARY FOR DRY DECONTAMINATION OF TRUCKS AND EQUIPMENT TO REMOVE ANY EXCESS MATERIALS PRIOR TO SITE DEPARTURE.
10. SEDIMENT REMOVAL WILL BE CONDUCTED FROM THE TOP OF BANK VIA MECHANICAL TECHNIQUES UTILIZING GENERAL CONSTRUCTION EQUIPMENT, SUCH AS A LONG REACH EXCAVATOR. REMOVAL LIMITS, AS IDENTIFIED BY THE FOLLOWING CONTROL POINTS DEPTH WILL BE VERIFIED USING A GPS:

CONTROL POINT	NORTHING	EASTING
CP-1	3,565,563.3	10,849,262.4
CP-2	3,565,547.4	10,849,278.3
CP-3	3,565,538.9	10,849,302.7
CP-4	3,565,536.9	10,849,324.0
CP-5	3,565,542.9	10,849,338.8

11. APPROXIMATELY 75 CUBIC YARDS (CY) OF SEDIMENT WILL BE REMOVED FROM THE NORTHEAST SIDE OF THE UNNAMED POND. IMPACTED SEDIMENTS ARE CONFINED TO AN ESTIMATED 1,000 SQUARE FOOT AREA. THE PLANNED DEPTH OF THE SEDIMENT REMOVAL ACTIVITIES IS 2 FEET BELOW SEDIMENT SURFACE.
12. CONSTRUCTION CONTROLS, SUCH AS FALL HEIGHT OF BUCKET AND BUCKET CYCLE TIMES, SHALL BE IMPLEMENTED AS NECESSARY TO LIMIT RESUSPENSION OF SEDIMENTS WITHIN THE UNNAMED POND DURING REMOVAL ACTIVITIES. STRUCTURAL RESUSPENSION CONTROLS ARE NOT ANTICIPATED.
13. A SEDIMENT DEWATERING AND STAGING AREA APPROXIMATELY 40 FT. BY 75 FT. WILL BE CONSTRUCTED. THE 2 FT. BERMINED AREA WILL BE LINED WITH A TRIPLE LAYER OF POLYETHYLENE GEOMEMBRANE AND A LAYER OF SAND. DREDGED SEDIMENTS WILL BE PLACED IN THE DEWATERING AREA WHERE SEDIMENTS WILL GRAVITY DEWATER. FREE LIQUIDS FROM DEWATERING ACTIVITIES WILL BE CONTAINERIZED AND DISPOSED OF OFF SITE. AGENTS MAY BE ADDED IF ADDITIONAL DEWATERING IS REQUIRED PRIOR TO OFF-SITE TRANSPORTATION AND DISPOSAL.
14. DEWATERED SEDIMENT WILL BE TRANSPORTED OFFSITE BY CAPITOL ENVIRONMENTAL, INC. AND DISPOSED OF AS NON-HAZARDOUS AT A SUBTITLE C DISPOSAL FACILITY LOCATED IN BELLEVILLE, MICHIGAN.
15. ANY DISTURBED AREAS AFFECTED AS A RESULT OF CONSTRUCTION ACTIVITIES WILL BE REPLACED TO PRE-CONSTRUCTION CONDITIONS. RESTORATION AT THE SITE WILL CONSIST OF REMOVAL OF TEMPORARY PARKING AREAS, STAGING AREAS, AND TEMPORARY CONTROLS.

RADFORD ARMY AMMUNITION PLANT
RADFORD, VA

WESTERN BURNING GROUND SEDIMENT REMOVAL PLANS

ARCADIS

FIGURE 14