received 12-15-10

10-134

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) 698-4020
1-800-592-5482

December 13, 2010

Mr. Jim McKenna
Radford Army Ammunition Plant
Route 114, P.O. Box 1
Radford, Virginia 24143-0100

Re: Final Proposed Plan- NRU- Radford Army Ammunition Plant

Dear Mr. McKenna:

The Virginia Department of Environmental Quality (VDEQ) has reviewed the Final Proposed Plan dated September 2010 for the New River Unit (RAAP-044) at Radford Army Ammunition Plant and approves the plan as revised.

Please contact me at (804) 698-4498 if you have any questions or comments regarding the above site.

James L. Cutler, Jr., CPG
Federal Facilities Project Manager

cc: Paige Holt, ATK
Aziz Farahmand, VDEQ-BRRO

The Roanoke Times
Roanoke, Virginia
Affidavit of Publication

New River Current

ARCADIS U.S., INC.
1114 BENFIELD BLVD, SUITE A
MILLERSVILLE MD 21108

REFERENCE: 80176000
12381667 PUBLIC NOTICE

State of Virginia
City of Roanoke

I, (the undersigned) an authorized representative of the Times-World Corporation, which corporation is publisher of the Roanoke Times, a daily newspaper published in Roanoke, in the State of Virginia, do certify that the annexed notice was published in said newspapers on the following dates:

City/County of Roanoke, Commonwealth/State of Virginia. Sworn and subscribed before me this 22nd day of OCT 2010. Witness my hand and official seal.

Judith F. Bennett Notary Public

JUDITH F. BENNETT NOTARY PUBLIC REG. #228622 MY COMMISSION EXPIRES 10-2011 COMMONWEALTH OF VIRGINIA

PUBLISHED ON: 10/17 10/19

TOTAL COST: 243.36
FILED ON: 10/20/10

PUBLIC NOTICE OF AVAILABILITY
CERCLA PROPOSED PLAN FOR THE NEW RIVER UNIT AT THE RADFORD ARMY AMMUNITION PLANT

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TO REVIEW THE PROPOSED PLAN: The public may view the document at the Christiansburg Branch of the Montgomery-Floyd Regional Library System during normal library hours.
PUBLIC COMMENT PERIOD: Public comments will be received for 30 days beginning September 26, 2010 ending October 26, 2010.
HOW TO COMMENT: Radford Army Ammunition Plant will accept comments by e-mail, fax, or postal mail. All comments must include the name, address, and telephone number of the person commenting and be received by the Army within the designated comment period. All comments must be directed to Joy Case, Public Affairs Officer, Radford Army Ammunition Plant, Route 114, Peppers Ferry Road, Building 220, Radford, VA 24141-0099; phone (540) 731-5762; fax (540) 639-7789; e-mail joy.case@us.army.mil.
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(12381667)

Authorized Signature: [signature] Billing Services Representative

The Roanoke Times
Roanoke, Virginia
Affidavit of Publication

The Roanoke Times

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JUDITH F. BENNETT NOTARY PUBLIC REG. #228622 MY COMMISSION EXPIRES 10-2011 COMMONWEALTH OF VIRGINIA

PUBLISHED ON: 10/17 10/18 10/19

TOTAL COST: 1,160.64
FILED ON: 10/20/10

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(12381667)

Authorized
Signature: [signature], Billing Services Representative

From: McKenna, Jim J Mr CIV USA AMC [jim.mckenna@us.army.mil]
Sent: Tuesday, October 12, 2010 7:12 AM
To: mystic_daves_tarot@yahoo.com; Joe Parrish ATC; Steve cole; Cutler,Jim; Robert Davie
Cc: paige.holt@atk.com; jeremy.flint@atk.com; jerome.redder@atk.com; Wisbeck, Diane; Kalinowski, Chris; Meyer, Tom NAB02; Mendoza, Rich; Ryan, Susan M CIV USA IMCOM; Timothy.Leahy@shawgrp.com; Case, Joy L Ms CIV USA AMC; Munera, Antonio V LTC MIL USA AMC; Robert Davie
Subject: New River Unit Proposed Plan (UNCLASSIFIED)
Attachments: Proposed Plan Fact Sheet 12 Oct 2010.pdf

Importance: High

Classification: UNCLASSIFIED
Caveats: FOUO

Joe, David, Steve and Jim,

I have attached a Fact Sheet as a follow up to the email below that transmitted the NRU Proposed Plan and as a reminder of our public meeting next week. The Fact sheet summarizes the Proposed Plan.

Tim Leahy, Please post this on our website.

Thanks,
Jim

-----Original Message-----
From: McKenna, Jim J Mr CIV USA AMC
Sent: Friday, September 24, 2010 9:32 AM
To: David Allbee (mystic_daves_tarot@yahoo.com); Joe Parrish ATC; Steve cole
Cc: Cutler,Jim; Robert Davie; Paige Holt (paige.holt@atk.com); Jeremy Flint (jeremy.flint@atk.com); jerome.redder@atk.com; diane.wisbeck@arcadis-us.com; Kalinowski, Chris; Meyer, Tom NAB02; Mendoza, Rich; Ryan, Susan M CIV USA IMCOM; Tina_MacGillivray@URSCorp.com; Timothy.Leahy@shawgrp.com; Mary Lou Rochotte; Case, Joy L Ms CIV USA AMC; Munera, Antonio V LTC MIL USA AMC
Subject: New River Unit Proposed Plan (UNCLASSIFIED)
Importance: High

Classification: UNCLASSIFIED
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Highlights are that a public meeting is to be held October 19, 2010 (meeting details are in the plan on page 1) and a hard copy of this plan will be placed in the Christiansburg Library today.

Note we had a draft NRU Proposed Plan to share at our Thursday September 16, 2010 RAB meeting/poster session as well as other presentations for the rest of the sites at our Main Manufacturing Area.

Jim Cutler, please note that the attached draft was revised to address your comments of Wednesday, September 22, 2010.

Thank you all for your support of the Radford Army Ammunition Plant Installation Restoration Program.

Jim McKenna

Classification: UNCLASSIFIED
Caveats: FOUO

Classification: UNCLASSIFIED
Caveats: FOUO

Proposed Plan Fact Sheet

New River Unit (RAAP-044)

October 2010

The Army wants to share with the public the proposed cleanup plan for the New River Unit (NRU) of the Radford Army Ammunition Plant. The Army has recommended response actions (including No Action) for groundwater and six separate study areas at the NRU where historical use of the site was evaluated. A Proposed Plan that has been available for public review since September 26th, 2010 summarizes the recommended cleanup plan for each of the study areas, as well as the other response action alternatives that were considered. These response actions and Proposed Plan have been coordinated with the Virginia Department of Environmental Quality (VDEQ). Public comments may be submitted as outlined below under "How to Participate". The final response action alternative for each study area will be selected in conjunction with the VDEQ and identified in a Decision Document. The Decision Document also will contain a Responsiveness Summary addressing all comments received during the public comment period.

Description and Background

The Radford Army Ammunition Plant is located in the mountains of southwestern Virginia and consists of two noncontiguous units: the New River Unit and the Main Manufacturing Area. The New River Unit encompasses approximately 3,000 acres and is located near the town of Dublin, about six miles southwest of the Main Manufacturing Area (Figure 1). Both the Main Manufacturing Area and New River Unit are owned by the Army and they are currently operated and maintained by Alliant Techsystems, Inc. (ATK) under contract to the Army.

The New River Unit facility was constructed in 1940 and was operated as a powder bag loading plant for artillery, cannon, and mortar projectiles during World War II. All active manufacturing operations at the New River Unit ceased in 1945 at the end of the war, and since that time, it has served primarily as a storage facility for on-going propellant and explosives manufacturing operations conducted at the Main Manufacturing Area.

The six study areas evaluated within the New River Unit are identified as the Bag Loading Area (BLA), the Igniter Assembly Area (IAA), Building Debris Disposal Trench (BDDT), the Western Burning Ground (WBG), the Northern Burning Ground (NBG), and the Rail Yard (RY) (Figure 2). In addition, groundwater beneath the New River Unit was evaluated as a single unit.

Recommended Response Actions

Igniter Assembly and Bag Loading Areas

Former buildings at the IAA and BLA contained a metallic conductive flooring material to prevent buildup of static charges during historical manufacturing operations. This flooring material was exposed to weathering when wooden roofs and walls were removed from the buildings. The flooring material has degraded due to weathering and has leached metals and asbestos to the soils surrounding the buildings.

- IAA Recommended Response Action: Removal of conductive flooring and the excavation and off-site disposal of soil containing metals and asbestos to achieve residential clean up levels. Land Use Controls will be required to restrict access due to the presence of the building remnants.

- BLA Recommended Response Action: Removal of conductive flooring and the excavation and off-site disposal of soil containing metals and asbestos to attain industrial/commercial clean up levels. Land Use Controls will be required to prevent future residential land use and to restrict access to the building remnants.

Building Debris Disposal Trench

The BDDT is located in the southern portion of the NRU and was originally a natural surface water drainage channel. The BDDT was formerly used as a disposal site for construction debris from the NRU buildings. The construction debris and visibly stained soil was removed from the trench in 1998. The excavated soils were replaced with clean fill and the base of the trench was lined with a geotextile material. The trench was then filled with rip-rap to prevent erosion.

- Recommended Response Action: Land Use Controls to prevent future residential land use and mitigate erosion of soil to the adjacent stream

Western Burning Ground

The Western Burning Ground was used to decontaminate explosives contaminated materials and to dispose of off-spec energetics. A test pitting investigation was completed at the WBG in 1999 that effectively removed soils above residential screening levels in the source area. However, lead and chromium were found at elevated levels in sediment within a small area of a pond located near the former burning ground.

- Recommended Response Action: Excavation and off-site disposal of sediment at the edge of the pond containing lead and chromium to achieve residential clean up levels

Northern Burning Ground

The Northern Burning Ground was used to decontaminate explosives contaminated materials and to dispose of off-spec energetic materials. Lead and chromium were identified in surface soil at concentrations that would have precluded industrial or residential use of the site if not removed.

- Recommended Response Action: No Action based on unrestricted land use (i.e., residential). A Removal Action was completed at the NBG in December 2009 during which 384 tons of soil containing elevated levels of lead and chromium were excavated and transported to an off-site disposal facility. The Removal Action was designed, executed and achieved unrestricted future land use, and thus, was identified as the final remedy for the Site.

Rail Yard

The Rail Yard was used as a former loading/unloading area for rail cars (3 tracks and 3 open transfer platforms). The environmental investigations found isolated detections of PAHs and Aroclor-1254 in surface soil, below industrial screening levels. In addition, metals detections were within background limits. There were no exceedances of industrial screening levels in sediment.

- Recommended Response Action: No Action based on unrestricted land use (i.e., residential)

Groundwater

The geology at the NRU is typical of the surrounding limestone/dolomite karst environment. Groundwater typically occurs within the open fractures in the bedrock. The sampling program included 11 groundwater monitoring wells and several springs located throughout the NRU. Several metals (arsenic, iron, lead, manganese) were detected at concentrations above Federal Maximum Contaminant Levels (MCLs) in samples collected from a few of the monitoring wells; however, metals levels in the dissolved phase (soluble) samples were below MCLs as were the spring water samples. Detections of metals above MCLs only occurred in samples with high levels of suspended solids indicating that the well installation and development techniques may be a contributing factor. In addition, the detected metals appear to be naturally occurring as they are the same metals that are present in background soils.

- Recommended Response Action: No Action based on unrestricted land use (i.e., residential)

Where to Find the Proposed Plan and other Project Information

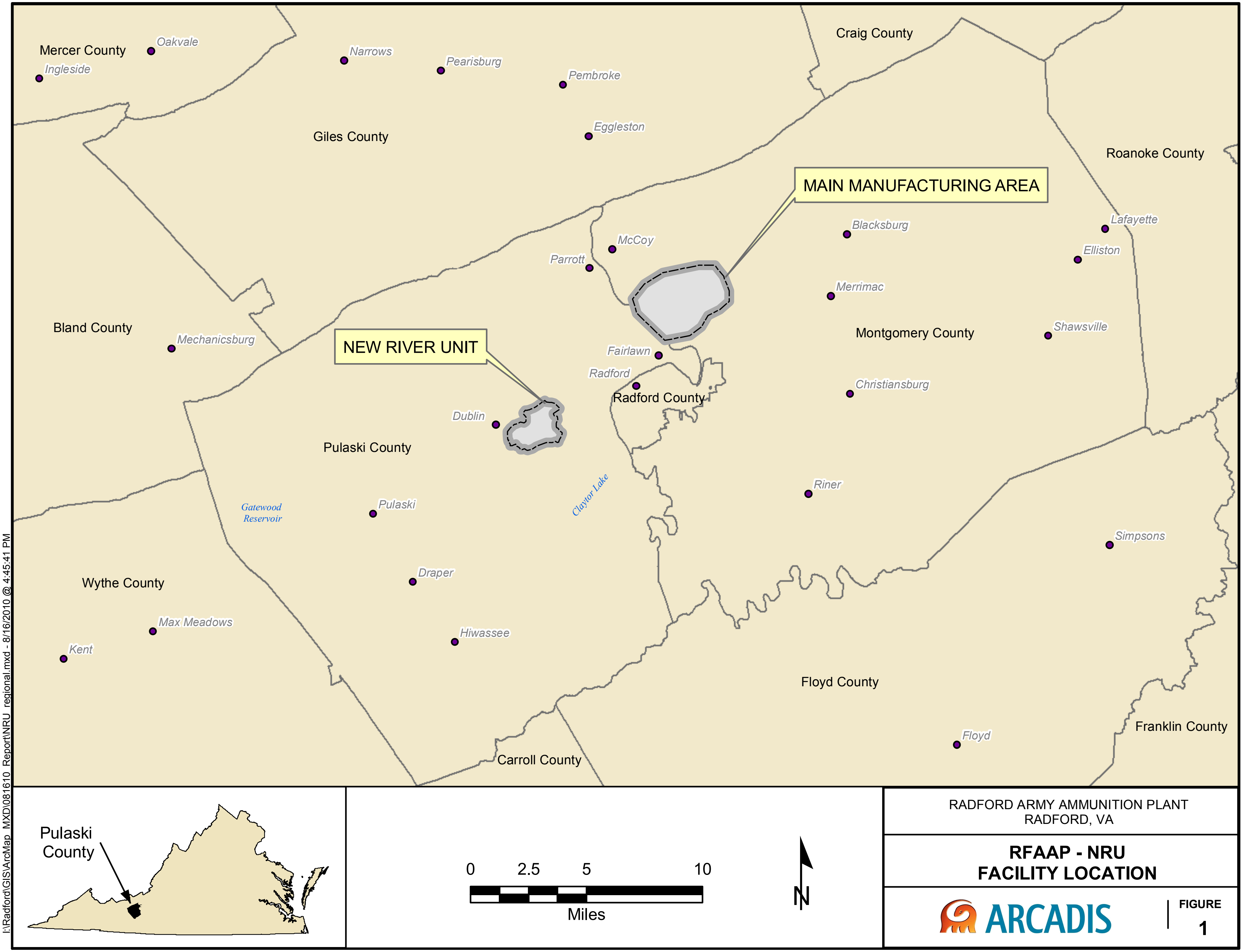
Project Reports can be found on line at http://radfordaapirp.org/inforepo/online-index.htm, or in the Information Repositories listed below:

Montgomery-Floyd Regional Library – Christiansburg Branch
125 Sheltman Street
Christiansburg, VA 24073
Ph #: 540-382-6965

How to Participate

The Army is currently soliciting input from the community on the recommended response actions that are presented in the Proposed Plan. Comments can be submitted during the 30-day public comment period ending October 26th, 2010. In addition, the Army will be hosting a public meeting on October 19th, 2010 at 7:00 PM. The meeting will be held at the New River Valley Competitiveness Center located at 6580 Valley Center Drive in Radford, Virginia. During the public meeting, information about the Response Actions recommended in the Proposed Plan will be provided and the project documents will be available for viewing. The public may submit comments on the Proposed Plan, or other relevant activities, in writing or in person at the public meeting. Written comments can also be submitted by e-mail, fax, or postal mail. All comments must include the name, address, and telephone number of the person commenting and be received within the designated comment period. Written comments can be submitted to Radford Army Ammunition Plant (see contact information below).

Ms. Joy Case, Public Affairs Officer
Radford Army Ammunition Plant
Route 114, Peppers Ferry Road, Bldg 220
Radford, Virginia 24141-0099
Phone: (540) 731-5762; Fax: (540) 639-7789
e-mail: joy.case@us.army.mil



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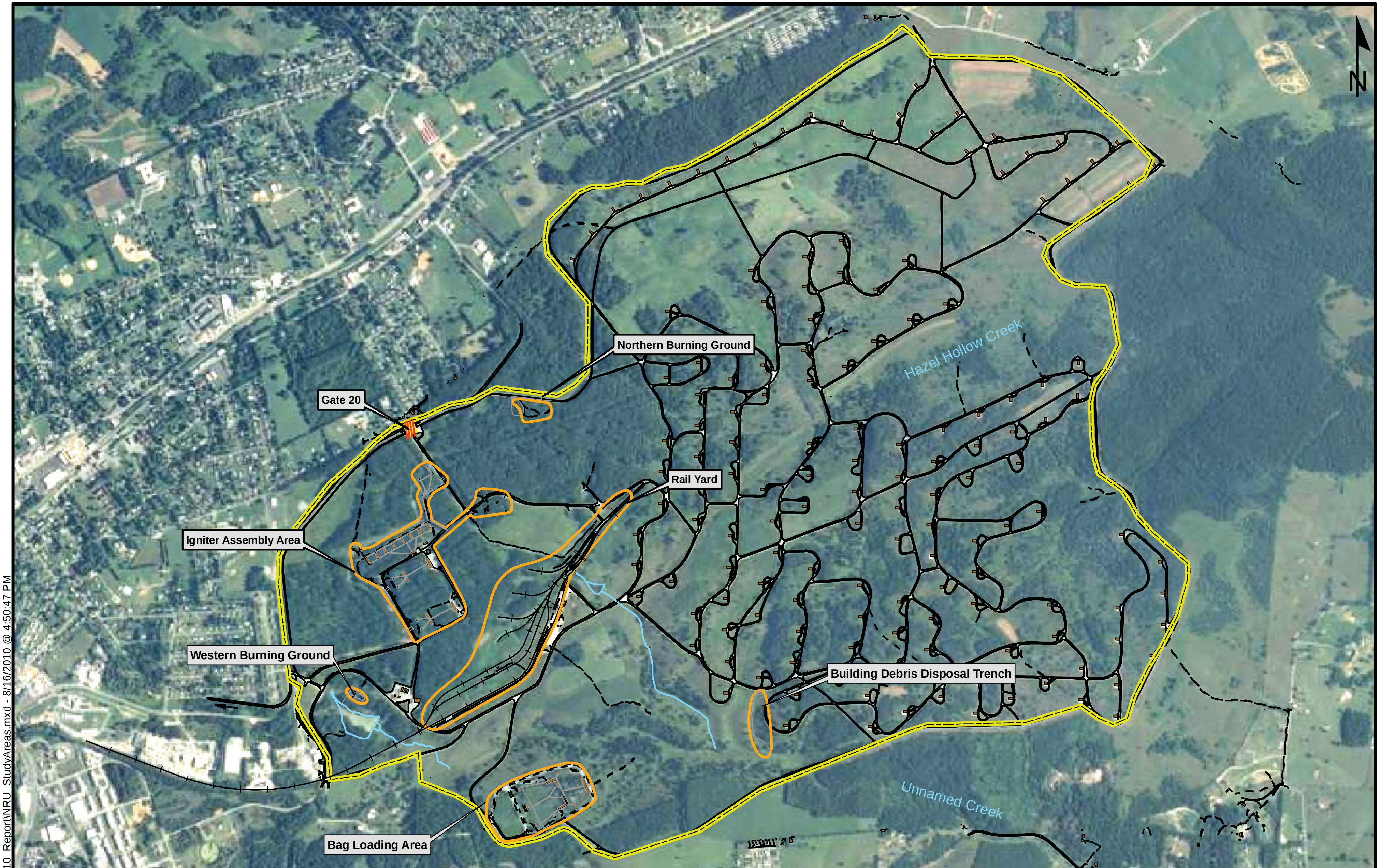

LEGEND

- 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

I:\Radford\GIS\ArcMap_MXD\081610_ReportNRU_StudyAreas.mxd - 8/16/2010 @ 4:50:47 PM

ATK Armament Systems
Energetic Systems
Radford Army Ammunition Plant
Route 114, P.O. Box 1
Radford, VA 24143-0100

www.atk.com

September 28, 2010

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

Subject: Transmittal Acknowledgement,
Final Proposed Plan for New River Unit (RAAP-044) September 2010

Dear Mr. Cutler:

This letter is to acknowledge transmittal of the subject document that was sent to you and the Restoration Advisory Board on September 24, 2010. Enclosed is a copy of the 24 September 2010 transmittal email.

Please coordinate with and provide any questions or comments to myself at (540) 639-8658, Jerry Redder ATK staff (540) 639-7536 or Jim McKenna, ACO Staff (540) 731-5782.

Sincerely,

P.W. Holt, Environmental Manager
Alliant Techsystems Inc.

c: Karen Sismour
Virginia Department of Environmental Quality
P. O. Box 1105
Richmond, VA 23218

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

10-815-137
JMcKenna

Rich Mendoza
1 Rock Island Arsenal
Attn: IMAE-CDN
Bldg 350, 3rd Fl, NW Wing, Rm 319
Rock Island, Illinois, 61299

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

bc: Administrative File
J. McKenna, ACO Staff
Rob Davie-ACO Staff
P.W. Holt
J. J. Redder
Env. File

Coordination: J. McKenna

10-815-137
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Judith F. Bennett Notary Public

JUDITH F. BENNETT NOTARY PUBLIC REG. #228622 MY COMMISSION EXPIRES 10-2011 COMMONWEALTH OF VIRGINIA

PUBLISHED ON: 09/26

TOTAL COST: 131.04
FILED ON: 09/30/10

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(12355356)

Authorized Signature: Tina A McEnheimer, Billing Services Representative

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NOTARY PUBLIC
REG. #228622
MY COMMISSION EXPIRES 10-2011
COMMONWEALTH OF VIRGINIA

PUBLISHED ON: 09/26

TOTAL COST: 430.56
FILED ON: 09/30/10

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Greene, Anne

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Sent: Friday, September 24, 2010 9:32 AM
To: mystic_daves_tarot@yahoo.com; Joe Parrish ATC; Steve cole
Cc: Cutler,Jim; Davie, Robert; Holt, Paige; Flint, Jeremy; Redder, Jerome; diane.wisbeck@arcadis-us.com; Kalinowski, Chris; Meyer, Tom NAB02; Mendoza, Rich; Ryan, Susan M CIV USA IMCOM; Tina_MacGillivray@URSCorp.com; Timothy.Leahy@shawgrp.com; Mary Lou Rochotte; Case, Joy; Munera, Antonio LTC MIL USA
Subject: New River Unit Proposed Plan (UNCLASSIFIED)
Attachments: 2010 09 23. Proposed Plan_Final.pdf

Importance: High

Classification: UNCLASSIFIED
Caveats: FOUO

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Classification: UNCLASSIFIED
Caveats: FOUO

NRU PRAP comments

From: Cutler, Jim (DEQ) [James.Cutler@deq.virginia.gov]
Sent: Wednesday, September 22, 2010 4:22 PM
To: McKenna, Jim J Mr CIV USA AMC
Subject: NRU PRAP comments
Attachments: 2010 09 09 Proposed Plan_Draft Final-JLC.doc

Jim,

The PRAP is good but could probably be edited down even more. I made some deletion suggestions in my comments but I didn't have time to do any detailed editing. The idea is to present the main conclusions to the public as succinct as possible. Section 2 could also be edited to eliminate most of the bulleted items (summarizing that certain constituents were detected in surface soils, etc.). In any event I would like to see a fact sheet of 1-2 pages that summarize all the findings that could also be handed out at the public meeting. We can discuss details later.

I will be out of the office until next Weds. and will be available to discuss my comments at that time.

Thanks,

Jim

James L. Cutler Jr.

Federal Facilities Project Manager

Office of Remediation Programs

Virginia Dept. of Environmental Quality

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PROPOSED PLAN FOR
NEW RIVER UNIT
RADFORD ARMY AMMUNITION PLANT, RADFORD, VIRGINIA
SEPTEMBER 2010

1. INTRODUCTION AND PURPOSE

The United States Department of the Army (Army) is conducting environmental investigation and cleanup activities at the New River Unit of Radford Army Ammunition Plant (RFAAP-NRU) as part of the Army's Installation Restoration Program (IRP). The IRP is a component of the ***Defense Environmental Restoration Program*** which provides for the cleanup of active/operating Department of Defense sites. The IRP activities at RFAAP-NRU are being managed and performed in accordance with the requirements outlined in the ***Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)***, as amended by the ***Superfund Amendments and Reauthorization Act (SARA)*** and the ***National Oil and Hazardous Substances Pollution Contingency Plan (NCP)***. 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.

Six study areas were identified within the New River Unit, which are identified as the Bag Loading Area (BLA), the Igniter Assembly Area (IAA), Building Debris Disposal Trench (BDDT), the Western Burning Ground (WBG), the Northern Burning Ground (NBG), and the Rail Yard (RY). In addition, groundwater beneath the New River Unit was evaluated holistically. Based on the findings of the comprehensive environmental investigations completed at RFAAP-NRU, the BLA, IAA, BDDT, and WBG study areas were identified as requiring a clean-up action or restrictions on land use to ensure protection of human-health and the environment. In addition, an interim removal action was performed at the NBG in December 2009.This Proposed Plan has been prepared by the Army to inform the public of the Response Action (RA) Alternatives that have been developed for addressing the surface soils and pond sediments that are driving the need for response actions (RAs) at the BLA, IAA, BDDT, and WBG study areas. This Proposed Plan also summarizes the RA Alternatives that are available for addressing conductive flooring materials that have been identified as a potential on-going source of asbestos, lead and copper to soil at the facility. Lastly, the Proposed Plan is intended to document the recommendation of No Action for the RY study area and site-wide groundwater, as well as the NBG study area (where action has already been completed). The risk assessments for the RY, NBG and groundwater have indicated that risks are within USEPA's generally acceptable risk range. Therefore, monitoring wells will be removed in accordance with VDEQ guidance.

The main focus of this Proposed Plan is to provide background information on the BLA, IAA, BDDT, and WBG Study Areas, and to summarize the rationale for the Army's selection of the preferred RA alternatives. However, the public is encouraged to review and comment on all of the potential alternatives presented in this Proposed Plan. The Army will select the final remedies for each of the study areas after reviewing and considering all information submitted during the 30-day public comment period, and may modify the preferred RA alternatives or select another RA presented in this Plan based on new information or public comments. The Army will document the final remedy selection in a ***Decision Document***. Information on how the public can submit comments may be found in the "Community Participation" section of this Proposed Plan (see Page 22).

IMPORTANT DATES AND LOCATIONS

Public Comment Period: September 26 – October 26, 2010
The Army will accept written comments on the Proposed Plan during the public comment period.

Public Meeting: October 19, 2010
The Army will hold a public meeting to explain the Proposed Plan and all response actions presented in the Feasibility Study. Oral and written comments will also be accepted at the meeting. The meeting will be held at the New River Valley Competitiveness Center located at 6580 Valley Center Drive in Radford, Virginia at 7:00 PM.

The Administrative Record, containing information used in selecting the Preferred Response Action, is available for public review at the following location:

Montgomery-Floyd Regional Library – Christiansburg Branch
125 Sheltman Street
Christiansburg, VA 24073
Ph #: 540-382-6965

The Army is issuing this Proposed Plan as part of its public participation responsibilities under Section 300.430(f)(2) of the NCP. The Proposed Plan summarizes information that can be found in greater detail in the ***Remedial Investigation (RI)*** and ***Feasibility Study (FS)*** reports that have been prepared for RFAAP-NRU. These reports, and other documents relating to the IRP activities at the facility, can be found in the ***Administrative Record*** file for RFAAP. The Army and VDEQ encourage the public to review all of the documents relevant to the investigation and cleanup activities at RFAAP-NRU in order to comment on the proposed response actions. The titles of relevant documents are listed in the "References" section at the end of this Proposed Plan.

A list of acronyms and abbreviations used in this Proposed Plan is provided at the end of this document. Additionally, a glossary of select terms, which are written in italic, bold type throughout this Proposed Plan, is also provided at the end of this document to define the terminology used.

2. RFAAP-NRU BACKGROUND

The Radford Army Ammunition Plant is located in the mountains of southwestern Virginia and consists of two noncontiguous units: RFAAP-NRU and the Main Manufacturing Area (RFAAP-MMA). RFAAP-NRU is located in Pulaski County, near the town of Dublin, while RFAAP-MMA is located in Montgomery County, near the city of Radford (Figure 1). Although both units are owned by the Army, they are currently operated and maintained by Alliant Techsystems, Inc. (ATK) under contract to the Army. 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.

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 storage operations, the only other current land uses within the secured boundaries include a few agricultural tracts located in the eastern portion of the facility. There are no residences located within the RFAAP-NRU boundaries and the only recreational activities at the facility consist of controlled game hunting. There are no plans to change ownership or land use at RFAAP-NRU, other than an 80-acre tract on the western boundary of the facility that has been parceled out to the Commonwealth of Virginia for use as the Southwest Virginia Veterans Cemetery.

In 1997, the Army initiated environmental investigation activities at RFAAP-NRU to identify potential impacts associated with historical activities at the facility. These investigations focused on six separate study areas, including: two former manufacturing areas known as the Bag Loading Area (BLA) and the Igniter Assembly Area (IAA); a Rail Yard (RY) area; 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). The location of each of the study areas is depicted in Figure 2. A facility-wide groundwater investigation was also conducted at RFAAP-NRU.

The environmental investigations at each of the RFAAP-NRU study areas were conducted in multiple phases, with the final investigations completed in 2010. To ensure that the investigations provided a comprehensive evaluation of potential contaminants, a wide range of analytical groups were sampled for at each study area during the course of investigation, including: volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), explosives, pesticides, herbicides, dioxins/furans, metals. The investigations at the BLA and IAA study areas also included asbestos and lead-based paint sampling. A detailed summary of the findings from all phases of investigation for each of the study areas is summarized in the RI Report for RFAAP-NRU. The environmental investigations completed at the NBG study area were presented in a separate ***Engineering Evaluation/Cost Analysis (EE/CA)*** Report.

The contaminant evaluation and risk assessment results presented in the RI Report concluded that there were no adverse impacts to groundwater at the RFAAP-NRU facility, and that the constituents detected in soil and other media at the RY study area do not present any unacceptable risks or hazards to current or hypothetical future human or environmental receptors. Therefore, the RI Report recommended that No Action be taken for groundwater or for the RY area. However, the risk assessments for the BLA, IAA, BDDT, and WBG study areas did conclude that there are contaminants or source materials present at those study areas that pose elevated risk and/or hazard potentials under certain hypothetical industrial or residential land use scenarios. As such, response actions are required to mitigate the risks associated with these study areas.

The EE/CA for the NBG study area also concluded that lead and chromium detected in surface soil at that study area presented unacceptable risks under industrial and residential land use scenarios. Therefore, the EE/CA recommended a removal action for the NBG that included the excavation and off-site disposal of the lead and chromium impacted soils to reduce risks to levels appropriate for residential development. The selection of this removal action as the final remedy for the NBG is summarized in the 2009 ***Action Memorandum*** prepared by Radford Army Ammunition Plant. The removal action was completed at the NBG in December 2009 and rendered the study area acceptable for unrestricted and unlimited land use because the study area no longer poses an unacceptable risk to human health and the environment. The removal action is documented in the April 2010 Response Action Completion and Closure Report for the Northern Burning Ground.

The following sections of this Proposed Plan present a brief discussion of the site characteristics, affected media, and the ***constituents of concern (COC)*** at the BLA, IAA, BDDT, and WBG study areas. Later sections of this proposed plan then review the available RA alternatives, as well as the Army's preferred alternatives for each study area.

2.1 BAG LOADING AREA

The BLA was one of the two historical manufacturing areas located at 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 the BLA operations. The BLA buildings were all connected by a perimeter road and a series of elevated walkway platforms that ran across the site. The locations of the buildings, roads and walkways are depicted in Figure 3.

After the manufacturing operations were discontinued at RFAAP-NRU, the ten buildings at the BLA were dismantled. All of the wooden components of the ten 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. The seven buildings utilized for the historical loading operations and materials handling also have a conductive flooring material that covers the remains of the concrete floors. This flooring material had been in place to prevent the buildup of electrical charges during the historical operations at the site. In most cases, this conductive flooring material is now in a degraded state as a result of exposure to weather and is washing off the concrete floors onto the surrounding soils. Figure 3 illustrates the seven buildings where the flooring material is present.

Much of the BLA study area is now covered with a thick grass and shrub groundcover, and several large trees have grown adjacent to the remains of the buildings. There are no surface water bodies at or near the BLA study area, with the exception of a small unnamed creek that flows through RFAAP-NRU several hundred feet to the north of the BLA. There are no activities on-going at the BLA study area other than occasional grass mowing, and there are no current plans for utilizing this site in the future.

The sampling efforts conducted during the course of environmental investigation at the BLA study area included surface soils, subsurface soils, building materials, surface water and sediments. Groundwater samples were also collected from two monitoring wells at the BLA during the facility-wide groundwater investigation. The findings of the environmental investigations and risk assessment activities concluded that lead, copper, asbestos, Aroclor 1254 and benzo(a)pyrene [B(a)P] were the primary COCs at the BLA study area.

- Lead and copper were detected at concentrations higher than the USEPA's Screening Levels (SL) in surface soils located immediately adjacent to the buildings with conductive flooring. The concentrations of these constituents decreased to levels below their SLs within a few feet of the buildings, and the elevated concentrations generally did not extend beyond a depth of 1 foot (ft) below ground surface (bgs).

- Asbestos was also detected in surface soils located adjacent to the buildings with the conductive flooring. Extensive soil sampling confirmed that the release of asbestos was limited to the surface soils, to within a few feet of the buildings, and generally co-located with the elevated lead and copper concentrations.

- The PAH compound benzo(a)pyrene was detected in surface soil samples collected from several areas of the site, including adjacent to the buildings, former elevated walkway platforms, and roadways.

- The PCB compound Aroclor 1254 was detected at concentrations above its SL 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.

- The primary source of the lead, copper, and asbestos in soil has been identified as the degrading conductive flooring material. The flooring material is known to contain all three constituents and there is abundant visual evidence of where the flooring has washed off of the concrete building pads onto the surrounding soils.

- Although not considered to be the primary source of the COCs detected in soil, it is also possible that lead-based paints and miscellaneous asbestos containing materials (ACM) that have been identified in the site buildings may have also contributed to the lead and asbestos detections at the site.

- The releases at the site are confined to surface soils. No COCs were identified for surface water, sediments, or groundwater at the site.

2.2 IGNITER ASSEMBLY AREA

The IAA is the second of the two historical manufacturing areas located at RFAAP-NRU. The IAA study area, which is located in the western portion of RFAAP-NRU (Figure 2), 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 buildings at the IAA were connected by concrete sidewalks and several roads are located throughout the area. The layout of the IAA, including the locations of the buildings with conductive flooring is presented in Figure 4.

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 (i.e. roofs and walls) of the site buildings were taken down and removed from the site. The electrical transformers, utility lines, and process equipment were also removed from the site. All that remains of the former IAA buildings are concrete floors and concrete walls. Much like at the BLA, the conductive flooring present in the IAA buildings has degraded due to exposure to weather and is washing off of the concrete onto the soils surrounding the buildings.

The area surrounding the former assembly buildings and is generally flat and vegetated with grass, shrubs, and pine trees. Previously maintained grassy areas have been allowed to revert to more natural conditions. An engineered drainage system around the main portion of the IAA consists of a series of culverts to divert water to ditches which eventually drain into the unnamed creek that provides drainage for much of the RFAAP-NRU. However, the length and slope of the unlined ditches suggests that runoff from normal rain events would infiltrate prior to arriving at the creek. The soil at the IAA varies from fill material to native soil.

The comprehensive environmental investigations completed at the IAA between 1997 and 2010 focused on identifying potential adverse impacts to soil and drainage ditch sediments resulting from historical operations, degrading conductive flooring material, and former electrical transformers at the site. The results of the investigations and subsequent risk assessments concluded that the primary constituents of concern at the IAA were asbestos, lead, copper, and Aroclor 1254.

- Lead and copper were detected at concentrations above their SLs in surface soils located immediately adjacent to the buildings with conductive flooring. The concentrations of these constituents decreased to levels below their SLs within a few feet of the buildings, and the elevated concentrations generally did not extend beyond a depth of 1 ft below ground surface (bgs).

- Asbestos was also detected in surface soils located adjacent to the buildings with the conductive flooring. Extensive soil sampling confirmed that the impacts were confined to the surface soils within a few feet of the buildings and generally co-located with the elevated lead and copper concentrations.

- Aroclor 1254 was detected at concentrations above its SL in a surface soil sample collected near two of the former IAA buildings and one former electrical transformer location. Delineation/ confirmation sampling indicated that the presence of Aroclor 1254 is isolated to and confined to surface soils.

- The primary source of the lead, copper, and asbestos in soil has been identified as the degrading conductive flooring material. The flooring material is known to contain all three constituents and there is visual evidence of where the flooring has washed off of the concrete building pads onto the surrounding soils.

- Although not considered to be primary source materials, it is also possible that lead-based paints and miscellaneous asbestos containing materials (ACM) that have been identified in the site buildings may have also contributed to the lead and asbestos detections at the site.

- The releases at the study area are confined to surface soils. No COCs were identified for surface water, sediments, or groundwater.

2.3 BUILDING DEBRIS DISPOSAL TRENCH

The BDDT study area was formerly a natural drainage channel that had eroded into the clay soils between two hills in the southern portion of RFAAP-NRU. This drainage channel directs surface water runoff from the surrounding area towards a small unnamed creek 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 previously 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 study area 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 minimize the potential for erosion. 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 may have washed out of the debris area prior to the site restoration activities. The features of the BDDT study area are presented in Figure 5.

The environmental investigations completed at the BDDT study area focused on identifying potential adverse impacts to surface soil and subsurface soil within the former debris area of the trench and the downgradient depositional area. The investigations also evaluated potential impacts to surface water and sediments in the stream located downgradient of the BDDT. Based on the findings of the investigation and risk assessments, benzo(a)pyrene was identified as a COC for the study area.

- Benzo(a)pyrene was detected at concentrations higher than applicable SLs in soil samples collected from the trench area that is now covered by the geotextile fabric and rip rap. The geotextile material and rip rap are in good condition and have prevented additional erosion of impacted soils from the trench.

- Benzo(a)pyrene was also detected at concentrations above applicable screening levels in surface soil within the depositional area downgradient of the trench. This area is now covered with a thick grass and shrub ground cover that has, in combination with the relatively gentle slope of the area, minimized erosion of impacted soils to the downgradient stream.

2.4 WESTERN BURNING GROUND

The WBG is a former burning ground located in the southwestern portion of the RFAAP-NRU, south of the IAA (Figure 2). 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. No buildings have ever been located at the WBG study area.

A shallow, unnamed pond is located to the south of the former burning area at the WBG. This 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. The location of the pond and the other features of the WBG study area are presented in Figure 6.

During a 1999 investigation at the WBG study area all of the soils and ashy material from the former burn area were excavated and removed from the site as part of a test pitting program. Samples collected from the base of the excavation confirmed that the impacted soils were removed from the former burn area, which was backfilled with clean material from off-site. While additional ashy material was found in the subsurface beneath the access road leading to the pond, sampling indicated that contaminant concentrations in the ash were generally below applicable screening levels for soil.

Environmental investigations were conducted at the WBG study area between 1997 and 2010 to investigate potential impacts to soil in the former burn area and downgradient areas, including sediments and surface water in the pond. While several constituents were detected at concentrations above applicable screening levels in isolated soil samples, the findings of the risk assessment concluded that the risks and hazards associated with soil at the site were within acceptable ranges. However, chromium and lead were determined to be COCs for sediment in the pond.

- Chromium and lead were detected at concentrations above screening levels in sediment samples collected within a small area near the bank of the pond.

- No COCs were identified for surface water.

- Fish tissue sampling indicated that fish within the pond were not adversely affected by constituents detected in sediment or surface water.

3. SUMMARY OF SITE RISKS

3.1 HUMAN-HEALTH RISK ASSESSMENT

As part of the RI/FS process for the RFAAP-NRU, a site-specific baseline human-health risk assessment (HHRA) was performed for each of the study areas at the facility. The HHRA process is intended to determine if a person, or population, is any more likely to experience health problems (i.e. cancer or non-cancer effects) due to exposure to the constituents detected in soil, sediments, surface water, and/or groundwater at a site. A summary of how health risks are defined and calculated is provided in the section entitled "**What is Risk and How is it Calculated**? on Page 8 of this Proposed Plan. Health risks associated with lead and asbestos are not evaluated using the same strategy as the other constituents; therefore, following USEPA guidance lead blood modeling and asbestos risk determinations (based on activity-based sampling results) were also performed for the study areas where lead and/or asbestos were identified as contaminants of concern.

The current and anticipated future use of the RFAAP-NRU property is industrial/commercial. In order to evaluate potential health risks associated with industrial/commercial land uses, the HHRAs included an evaluation of potential risks and hazards to current and hypothetical future site workers and construction workers as a result of exposure to contaminants through direct contact, inhalation, and ingestion of contaminants that were identified in site media (i.e., soil, sediment, surface water, and groundwater). Although the RFAAP-NRU is not anticipated to be used for residential purposes, the HHRAs also included an evaluation of potential risks and hazards to hypothetical future adult and child residents. The Army utilized the findings of the residential exposure scenarios to determine if it would be necessary to place restrictions on the development of the sites in the unanticipated event that property use changes in the future. Determining the residential level risks also enabled the Army to evaluate the costs and feasibility of remediating the study areas to levels that would be suitable for residential/unrestricted development.

The findings of the HHRAs for the BLA, IAA, BDDT, and WBG study areas are summarized below. A more detailed discussion of the risk assessments conducted for these sites can be found in the RI Report.

3.1.1 BLA Risk Assessment Summary

For the current and reasonably anticipated future industrial/commercial land use scenario:

- The excess lifetime cancer risk (ELCR) was equal to $1x10^{-4}$ for the site worker and $7x10^{-6}$ for the construction worker, both of which are within the USEPA's generally acceptable range of $1x10^{-6}$ to $1x10^{-4}$.

- The non-carcinogenic hazard index (HI) was equal to 0.8 for the site worker and 3 for the construction worker. The USEPA uses a threshold HI of 1 to predict potential adverse health effects. The elevated HI for the construction worker was primarily due to copper in soil at levels greater than background.

- Lead in soil was determined to contribute to potential unacceptable health risks due to predicted fetal blood lead levels above the threshold of 10 µg/dL for the site worker and construction worker.

- 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 exposure scenario. The detected asbestos concentrations in air were lower than the AAL for the construction worker scenario.

For the residential land use scenario:

- The ELCR for the site resident was equal to $1x10^{-3}$, which is above the USEPA's acceptable range. Benzo(a)pyrene in soil was the reason for the elevated ELCR for the site resident.
- The HI for the adult resident was equal to the threshold value of 1; while the HI for the child resident was equal to 12. The elevated HI for the child resident was due to Aroclor 1254 and copper detected in soil
- Lead was determined to contribute blood lead levels above the threshold value of10 µg/dL for the child resident.
- The results of the activity based sampling performed at the BLA indicated that the detected asbestos concentrations in air were higher than the AAL for the residential land use scenario.

3.1.2 IAA Risk Assessment Summary

For the current and reasonably anticipated future industrial/commercial land use scenario:

- The ELCR for the site worker ($1x10^{-4}$) and construction worker ($6x10^{-6}$) were within the USEPA's acceptable range.
- 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, when the constituents were evaluated for target organ/critical effects the HI did not exceed 1; therefore no constituents were identified as risk drivers.
- 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 exposure scenario. The detected asbestos concentrations in air were lower than the AAL for the construction worker scenario.

For the residential land use scenario:

- The HI for the adult resident was equal to the threshold value of 1; while the HI for the child resident was equal to 13. Aroclor 1254 was the primary COC contributing to potential adverse effects.
- The predicted fetal blood levels for an adult resident were higher than the benchmark of 10 µg/dL.
- The results of the activity based sampling performed at the IAA indicated that the asbestos concentrations that could be generated in air were higher than the AAL for the residential land use scenario.

3.1.3 BDDT Risk Assessment Summary

For the current and reasonably anticipated future industrial land use scenario:

- The ELCR for the site worker ($7x10^{-5}$) and construction worker ($2x10^{-6}$) were within the USEPA's generally acceptable range.
- The HI for the site worker and construction worker were less than or equal to 1.

For the residential land use scenario

- The ELCR for the hypothetical future resident was equal to $4x10^{-4}$, which is above the USEPA's generally acceptable risk range. The driver for the increased risks was benzo(a)pyrene in surface soil in the rip rap area and downgradient depositional area.

3.1.4 WBG Risks

For the current and reasonably anticipated future industrial land use scenario:

- The ELCR for the site worker ($1x10^{-5}$) and construction worker ($5x10^{-7}$) were within the USEPA's acceptable range.
- The HI for the site worker (0.4) and construction worker (0.5) were less than 1.

WHAT IS RISK AND HOW IS IT CALCULATED?

A Superfund human health risk assessment estimates the "baseline risk." This is an estimate of the likelihood of health problems occurring if no cleanup action were taken at the site. To estimate the baseline risk at a Superfund site, a four-step process is undertaken.

Step 1: Analyze Contamination
Step 2: Estimate Exposure
Step 3: Assess Potential Health Dangers
Step 4: Characterize Site Risk

In Step 1, the Army looked at the concentrations of contaminants found at the study area as well as past scientific studies on the effects these contaminants have had on people (or animals, when human studies are unavailable). Comparisons between site-specific concentrations and concentrations reported in past studies help determine which contaminants are most likely to pose the greatest threat to human health.

In Step 2, the Army considered the different ways that people might be exposed to the contaminants identified in Step 1, the concentrations that people might be exposed to, and the potential frequency and duration of exposure. Using this information, the Army calculated a "reasonable maximum exposure" scenario, which portrays the highest level of human exposure that could reasonably be expected to occur.

In Step 3, the Army used the information from Step 2 combined with information on the toxicity of each chemical to assess potential health risks. The Army considered two types of risk: cancer risk and non-cancer risk. The likelihood of any kind of cancer resulting from a Superfund site is generally expressed as an upper bound probability (e.g., a "1 in 10,000 chance.") In other words, for every 10,000 people that could be exposed, one extra cancer may occur as a result of exposure to site contaminants. An extra cancer case means that one more person could get cancer than would normally be expected to from all other causes. For non-cancer health effects, the Army calculated a "hazard index." The key concept here is that a "threshold level" (measured usually as a hazard index of less than one) exists below which non-cancer health effects are no longer predicted.

In Step 4, the Army determined whether site risks are great enough to cause health problems for people at or near the Superfund site. The results of the three previous steps are combined, evaluated, and summarized. The Army added up the risk from each of the constituents of potential concern for the site and provided an estimate of excess risk.

The approach used to calculate human health risk at RFAAP-NRU was conducted in accordance with USEPA's Risk Assessment Guidance for Superfund.

For the residential land use scenario at the WBG:

- The ELCR for the site resident ($5x10^{-5}$) was within the USEPA's acceptable range.
- The HI was equal to 0.8 for the adult resident and 6 for the child resident. The elevated HI for the child resident was due to chromiumin the pond sediments.
- Lead in the pond sediments was also found to contribute to elevated fetal blood lead levels for the site resident.

Similar to the original risk assessment findings, the ELCR and HI for the site worker and construction worker scenarios remained within acceptable ranges in the event that the pond was drained and sediments in the pond were reclassified as soil. The ELCR for the residential land use scenario was also within acceptable ranges; however, the HI for the child resident was above the benchmark of 1 for the child resident due to chromium.

3.2 ECOLOGICAL RISK ASSESSMENT

In addition to the HHRA, a site-specific ecological risk assessment (ERA) was performed for each of the Study Areas as part of the risk assessment process. The ERA was intended to evaluate the potential current and future risks and hazards to ecological receptors associated with the constituents detected at the site. Although the ERAs did identify some potential risks to individual receptors, based on the relatively small size of the impacted areas in comparison to the home ranges of the target ecological receptors, there is little potential for population level effects.

4. SCOPE AND ROLE

As discussed in Sections 2 and 3, COCs are present at the BLA, IAA, and BDDT, and WBG study areas that could present potential health risks under certain land use scenarios. The conductive flooring found in the BLA and IAA buildings also serves as a continuing source of the COCs found at those sites. The RA alternatives presented in this Proposed Plan are intended to reduce the risks presented by the COCs through the use of active remediation techniques and/or land-use controls that would minimize potential exposure pathways. In accordance with CERCLA guidance, the RAs are required to ensure that risk and hazard levels associated with the sites are within acceptable ranges for the current and anticipated future use of the site. At the RFAAP-NRU the current and anticipated future use is industrial/commercial; therefore, the RAs will, at a minimum, need to ensure that the properties are suitable for industrial/commercial use. However, it should be noted that if the approach for a study area doesn't allow for unrestricted use of the property, land use controls must be put in place to prevent unauthorized use. Some of the RA alternatives presented in this plan will only allow for industrial/commercial use, while others will allow for unrestricted use. The selected RAs will be the final actions taken at these study areas.

5. RESPONSE ACTION OBJECTIVES

Based on the findings of the environmental investigations and risk assessments completed for the BLA, IAA, BDDT, and WBG study areas, it is the Army's current judgment that the Preferred Alternatives identified in this Proposed Plan, or one of the other RAs considered in this Proposed Plan, are necessary to protect public health or welfare from actual or threatened releases of hazardous substances into the environment. The following Remedial Action Objectives (RAOs) have been established for each of the Study Areas to describe what the RAs are intended to accomplish in order to provide the necessary protection.

5.1 BLA AND IAA

The BLA and IAA sites are very similar to each other in that the presence of degrading conductive flooring material and related surface soil impacts are the primary drivers for remedial action at both study areas. The risk assessments indicated that unacceptable risks and/or hazards are present at both sites under a hypothetical future residential land use scenario and under the industrial/commercial excavation scenarios at the BLA. At the IAA, potential risks under the industrial/commercial scenario and the excavation scenario were within USEPA's generally acceptable risk range, with the exception of asbestos. As such, the same RAOs were developed for both study areas. The 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 could 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.

Preliminary Remediation Goals (PRGs) have been established to guide the RAs for soil at the BLA and IAA. The PRGs establish target clean-up levels (i.e., acceptable levels) for each of the COCs that contribute to unacceptable risk levels for a given land use. The PRGs were based on the target concentrations that would reduce the cancer risks below a 1×10^{-6} threshold and non-cancer risks below a HI of 1. The PRGs for lead and asbestos were based on USEPA guidance and activity based sampling results, respectively. The PRGs listed in the tables below will be utilized to guide the RAs for soil at the BLA and IAA study areas.

PRGs for Bag Loading Area		
COC	Industrial Level PRG	Residential Level PRG
Aroclor 1254	-	0.23 mg/kg
Benzo(a)pyrene	-	0.025 mg/kg
Copper	11,533 mg/kg	3,044 mg/kg
Lead	624 mg/kg	400 mg/kg
Asbestos	0.1%	0.1%

PRGs for Igniter Assembly Area		
COC	Industrial Level PRG	Residential Level PRG
Aroclor 1254	-	0.23 mg/kg
Copper	-	3,044 mg/kg
Lead	-	400 mg/kg
Asbestos	0.1 %	0.1%

5.2 BDDT

The remedial investigation and risk assessment activities for the BDDT concluded that risks and hazards are within acceptable ranges for the current and anticipated future industrial/commercial use of the site. However, unacceptable risks are present under a hypothetical future residential land use scenario due to benzo(a)pyrene in surface soil. The Remedial Action Objectives for the BDDT are to:

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

Because benzo(a)pyrene was only determined to present a risk under the hypothetical future residential land use scenario, it was not necessary to calculate a PRG for the industrial/commercial land use scenario. The PRG for the residential land use scenario at the BDDT is presented in the table below.

PRGs for Building Debris Disposal Trench		
COC	Industrial Level PRG	Residential Level PRG
Benzo(a)pyrene	-	0.025 mg/kg

5.3 WBG

Similar to the BDDT, the risk assessment for the WBG study area concluded that the risks and hazards associated with the site are within acceptable ranges for the current industrial/commercial use. However, chromium and lead in pond sediments were determined to drive elevated risk and hazards under a hypothetical residential land use scenario. The 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.

PRGs Western Burning Ground		
COC	**Industrial Level PRG**	**Residential Level PRG**
Chromium	-	1,358 mg/kg
Lead	-	1,100 mg/kg

6. SUMMARY OF RESPONSE ACTION ALTERNATIVES

In accordance with CERCLA guidance, a thorough evaluation of available remedial technologies and process options for the impacted media at each of the RFAAP-NRU study areas was conducted as part of the FS process. The viable technologies and process options were consolidated to form two to three comprehensive RA alternatives for each impacted media. For the purposes of this Proposed Plan, the RA alternatives are presented in the following general discussion groups:

- No Action Alternatives
- BLA and IAA Soil Alternatives
- BLA and IAA Conductive Flooring Alternatives
- BDDT Soil Alternatives
- WBG Sediment Alternatives

The various RA alternatives are described in the Sections 6.1 through 6.5. The estimated capital cost, cost of operation and maintenance (O&M) activities, and an estimate of the total ***present worth cost*** associated with each alternative is also presented. The alternatives are numbered to correspond with the numbering used within the Feasibility Study report.

6.1 NO ACTION ALTERNATIVES

CERCLA and the NCP require that a No Action RA be evaluated for each study area and affected media to establish a baseline for comparison of the other RAs. Therefore, the No Action Alternative was considered for soil and conductive flooring at the BLA and IAA study areas; soil at the BDDT study area; and sediment at the WBG study area. Under the No Action alternatives, all administrative controls would cease, no further site monitoring or oversight would be performed, and no remedial action would take place at any of the study areas. There is no cost associated with the No Action Alternative because no activity would be performed.

No Action Alternatives (BLA/IAA SL-1, BLA/IAA CF-1, BDDT-SL1, and WBG-SD1)	Cost Estimate
Estimated Capital Cost	$0
Estimated O&M Cost*	$0
Estimated Present Worth Cost	$0

**Operations and Maintenance (O&M) cost over a 30 year period.*

6.2 BLA AND IAA SOILS

The three RA alternatives discussed in this section were designed to meet the RAOs that have been established for soil at the BLA and IAA. Alternative SL-4, which includes excavation and off-site disposal of soils containing COCs is the preferred alternative for both the BLA and IAA soils.

6.2.1 Response Action BLA/IAA SL-2: Institutional Controls

Under Alternative SL-2, 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.

BLA/IAA SL-2	Cost Estimate	
	BLA	IAA
Estimated Capital Cost	$84,000	$118,000
Estimated O&M Cost*	$251,000	$251,000
Total Estimated Present Worth Cost	$188,000	$223,000

**Operations and Maintenance (O&M) cost over a 30 year period*

SUMMARY OF RESPONSE ACTION ALTERNATIVES For RFAAP-NRU		
Medium	**FS Designation**	**Description**
BLA and IAA Soil	BLA/IAA SL-1	No action
	BLA/IAA SL-2	Institutional controls
	BLA/IAA SL-3	Vegetative soil cover and institutional controls
	BLA/IAA SL-4	Excavation, transportation, off-site disposal and institutional controls (institutional controls not necessary if excavation performed to residential clean-up levels)
BLA and IAA Conductive Flooring	BLA/IAA CF-1	No action
	BLA/IAA CF-2	Institutional controls
	BLA/IAA CF-3	Removal of flooring material and off-site disposal
	BLA CF-4	Removal of degraded flooring, capping of intact flooring, and off-site disposal
BDDT Soil	BDDT SL-1	No action
	BDDT SL-2	Institutional controls
	BDDT SL-3	Partial excavation, transportation, off-site disposal, and institutional controls
	BDDT SL-4	Excavation, transportation, and off-site disposal
WBG Sediment	WBG SD-1	No action
	WBG SD-2	Institutional controls
	WBG SD-3	Excavate, transportation, and off-site disposal of sediments

6.2.2 Response Action BLA/IAA SL-3: Vegetative Soil Cover

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 and the vegetative cap would preclude unrestricted/residential development of the property.

BLA/IAA SL-3	Cost Estimate	
	BLA	**IAA**
Estimated Capital Cost	$209,000	$233,000
Estimated O&M Cost*	$252,000	$260,000
Total Estimated Present Worth Cost	$314,000	$341,000

**Operations and Maintenance (O&M) cost over a 30 year period*

6.2.3 Response Action BLA/IAA SL-4: Excavation, Transportation and Off-Site Disposal – Preferred Alternative

Alternative SL-4, which is the preferred 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. If the excavation is only 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 sites. If the excavations were expanded to meet the residential levels, the sites 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. The lead based paint and non-flooring ACM are not included within the scope of actions presented in this Proposed Plan.

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.

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. 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.

BLA/IAA SL-4	**Cost Estimate**	
	BLA	**IAA**
Estimated Capital Cost	Ind: $251,000 Res: $601,000	Ind: $323,000 Res: $335,000
Estimated O&M Cost*	Ind[1]:$148,000 Res[2]: $0	Ind[1]: $147,000 Res[2]: $0
Total Estimated Present Worth Cost	Ind: $312,000 Res: $601,000	Ind: $384,000 Res: $335,000

**Operations and Maintenance (O&M) cost over a 30 year period*
1. Industrial level clean-up scenario includes O&M for ICs.
2. Residential level clean-up scenario does not require ICs or O&M.

6.3 BLA AND IAA CONDUCTIVE FLOORING

The three RA alternatives discussed in this section were designed to meet the RAOs that have been established for conductive flooring at the BLA and IAA. Alternative CF-3, which includes removal and off-site disposal of the conductive flooring material, is the preferred alternative for both the BLA and IAA.

6.3.1 Response Action BLA/IAA CF-2: Institutional Controls

Under Alternative SL-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.

CF-2	**Cost Estimate**	
	BLA	**IAA**
Estimated Capital Cost	$54,000	$61,000
Estimated O&M Cost*	$182,000	$182,000
Total Estimated Present Worth Cost	$129,000	$136,000

**Operations and Maintenance (O&M) cost over a 30 year period*

6.3.2 Response Action BLA/IAA CF-3: *Removal of Flooring Material and Off-Site Disposal* – Preferred Alternative

Under Alternative CF-3, the preferred alternative, the conductive flooring material within the BLA and 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 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.

CF-3	Cost Estimate	
	BLA	IAA
Estimated Capital Cost	$521,000	$787,000
Estimated O&M Cost*	$0	$0
Total Estimated Present Worth Cost	$521,000	$787,000

*No long-term ICs are required for this alternative.

6.3.3 Response Action 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 for a minimum of 30 years 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.

BLA CF-4	Cost Estimate
Estimated Capital Cost	$795,000
Estimated O&M Cost*	$251,000
Total Estimated Present Worth Cost	$899,000

Operations and Maintenance (O&M) cost over a 30 year period.

6.4 BDDT SOIL

The three RA alternatives discussed in this section were designed to meet the RAOs that have been established for soil at the BDDT. Alternative BDDT SL-2, which includes the use of ICs to protect the rip-rap and downgradient vegetation and prevent future residential land use, is the preferred alternative.

6.4.1 Response Action BDDT SL-2: Institutional Controls – Preferred Alternative

Alternative BDDT SL-2, the preferred alternative for the BDDT, utilizes ICs (e.g., administrative and engineering controls) to: 1) to ensure that the rip-rap area and downgradient vegetation are maintained to prevent erosion and transport of PAHs in soils; 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.

BDDT SL-2	Cost Estimate
Estimated Capital Cost	$42,000
Estimated O&M Cost*	$251,000
Total Estimated Present Worth Cost	$146,000

Operations and Maintenance (O&M) cost over a 30 year period.

6.4.2 Response Action BDDT SL-3: Partial Excavation, Transportation, Off-Site Disposal, and Institutional Controls

Alternative 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 rip-rap covered portion of the site would be left in place.

The risk assessment confirmed that these soils would pose unacceptable risks underneath 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 and documented in annual reports and 5-year CERCLA reviews.

BDDT SL-3	Cost Estimate
Estimated Capital Cost	$432,000
Estimated O&M Cost*	$251,000
Total Estimated Present Worth Cost	$537,000

**Operations and Maintenance (O&M) cost over a 30 year period.*

6.4.3 Response Action BDDT SL-4: Excavation, Transportation, and Off-Site Disposal

Alternative BDDT SL-4 is the most aggressive of the RA alternatives 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 RA 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.

BDDT SL-4	Cost Estimate
Estimated Capital Cost	$856,000
Estimated O&M Cost*	$0
Total Estimated Present Worth Cost	$856,000

**No long term ICs or inspections are required for this alternative.*

6.5 WBG SEDIMENT

The two RA alternatives discussed in this section were designed to meet the RAOs that have been established for sediment at the BDDT. Alternative WBG SD-2, which includes the use of ICs to maintain the current land use and prevent unacceptable exposure to COCs at the site, is the preferred alternative.

6.5.1 Response Action WBG SD-2: Institutional Controls

The risk assessment for the WBG area concluded that risks at the site are within acceptable range 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 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.

WBG SD-2	Cost Estimate
Estimated Capital Cost	$44,000
Estimated O&M Cost*	$182,000
Total Estimated Present Worth Cost	$119,000

**Operations and Maintenance (O&M) cost over a 30 year period.*

6.5.2 Response Action WBG SD-3: Excavation, Transportation, and Off-Site Disposal – Preferred Alternative

Alternative WBG SD-3, the preferred alternative for the WBG, 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.

WBG SD-3	Cost Estimate
Estimated Capital Cost	$282,000
Estimated O&M Cost*	$0
Total Estimated Present Worth Cost	$282,000

**No long term ICs or inspections are required for this alternative*

7. EVALUATION OF RESPONSE ACTION ALTERNATIVES

Nine standard criteria are used to evaluate the available RAs individually and against each other in order to select a remedy. These evaluation criteria described below:

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

1. Overall Protectiveness of Human Health and the Environment – Determines whether a RA eliminates, reduces, or controls threats to public health and the environment through ICs or treatment.
2. Compliance with ***Applicable or Relevant and Appropriate Requirements (ARARs)*** – Evaluates whether the RA meets Federal and State environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.

Primary Balancing Criteria - Primary Balancing Criteria are used to weigh major trade-offs among RAs, they are as follows:

3. Long-term Effectiveness and Permanence – Considers the ability of an RA to maintain protection of human health and the environment over time.
4. Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment – Evaluates a RA's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
5. Short-term Effectiveness – Considers the length of time needed to implement a RA and the risks the RA poses to workers, residents, and the environment during implementation.
6. Implementability – Considers the technical and administrative feasibility of implementing the RA, including factors such as the relative availability of goods and services.
7. Cost – Includes estimated capital and annual O&M costs, as well as present worth cost. Present worth cost is the total cost of a RA over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of –30 to +50 percent.

Modifying Criteria – May be considered to the extent that information is available during the FS, but can be fully considered only after public comment on this Proposed Plan.

8. State/Support Agency Acceptance – Considers whether the State agrees with the Army's analysis and recommendations, as described in the RI/FS and Proposed Plan.
9. Community Acceptance – Considers whether the local community agrees with the Army's analysis and Preferred RA. Comments received on the Proposed Plan are an important indicator of community acceptance.

The following sections of the Proposed Plan profile the relative performance of each alternative against the nine criteria and how the alternatives perform relative to each other. A more detailed analysis of the RA alternatives for the BLA, IAA, BDDT, and WBG sites can be found in the FS.

7.1 OVERALL PROTECTIVENESS OF HUMAN HEALTH AND THE ENVIRONMENT

7.1.1 BLA and IAA Soil Alternatives

There are no unacceptable ecological risks present at the BLA or IAA study areas, thus only the protection to human health will be evaluated. The No Action Alternative (BLA/IAA SL-1) would not provide any protection of human-health. 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. Alternatives

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. 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 RA 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.

7.1.2 BLA and IAA Conductive Flooring Alternatives

Alternative BLA/IAA CF-1 does not provide protection of human health or the environment. 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. 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 very similar to BLA CF-3 in that all degraded flooring would be removed and any intact flooring would be contained on-site to prevent the potential for future releases or human exposure.

7.1.3 BDDT Soil Alternatives

There are no unacceptable ecological risks present at the BDDT study area, thus only protection to human health will be evaluated. As with the other study areas, the No-Action Alternative (BDDT SL-1) would not provide any protection of human-health. BDDT SL-2, which uses ICs to control the exposure pathways, affords protection of human health by limiting access and activities at the sites, reducing the potential for contact with COCs. Alternative BDDT SL-2 also provides for the maintenance of the rip-rap and downgradient vegetation, which helps further reduce the potential for human exposure to COCs. Alternatives BDDT SL-3 and SL-4 would provide protection to human-health by physically removing soils that contain COCs that lead to the unacceptable risks/hazards at the site.

7.1.4 WBG Sediment Alternatives

There are no unacceptable ecological risks present at the WBG study area, thus only the protection to human health will be evaluated. Alternative WBG SD-1 does not provide any protection of human health. 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. Alternative 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.

7.2 COMPLIANCE WITH ARARS

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

7.3 LONG TERM EFFECTIVENESS AND PERMANENCE

7.3.1 BLA and IAA Soil Alternatives

Alternative BLA/IAA SL-4 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 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 provid 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 inspection program.

Alternative BLA/IAA SL-2, which only relies on ICs, 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.

7.3.2 BLA and IAA Conductive Flooring Alternatives

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 of 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 Alternative CF-1 is poor because it provides no means to mitigate risk at the site.

7.3.3 BDDT Soil Alternatives

Alternative BDDT SL-4 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 were removed/damaged. Alternatives BDDT SL-2 and BDDT SL-3 are both moderately effective as they both utilize ICs which provide good long-term reliability and effectiveness by maintaining current land use under which risks are acceptable, managing exposure pathways, and thereby ensuring land use does not change in the future resulting in unacceptable risks. The long-term reliability of Alternative BDDT SL-1 is poor because it provides no means to mitigate risk at the site.

7.3.4 WBG Sediment Alternatives

Alternative WBG SD-3 provides excellent long-term reliability and effectiveness because it removes sediment containing the high concentrations of lead and chromium from the site. There are no source materials 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, managing exposure pathways, and thereby ensuring land use does not change in the future resulting in unacceptable risks. The long-term reliability of Alternative SD-1 is poor because it provides no means to mitigate risk at the site.

7.4 REDUCTION OF TOXICITY, MOBILITY, AND VOLUME THROUGH TREATMENT

7.4.1 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. 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.

7.4.2 Conductive Flooring Alternatives

Alternatives BLA/IAA CF-1 and BLA/IAA CF-2 would not result in any reduction in the toxicity, mobility, or volume of wastes present at the BLA and IAA. Alternatives BLA/IAA CF-3 and BLA CF-4 would both eliminate the mobility of the flooring material by removing it from the sites and disposing of the material in an approved off-site landfill. 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.

7.4.3 BDDT Soil Alternatives

Alternatives BDDT SL-1 would not result in any reduction in the toxicity, mobility, or volume of wastes present at the BDDT study area. Alternative BDD 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.

7.4.4 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 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.

7.5 SHORT TERM EFFECTIVENESS

7.5.1 BLA and IAA Soil Alternatives

Alternatives BLA/IAA SL-3 and BLA/IAA SL-4 provide less short-term effectiveness (adequate to good) compared to Alternatives 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. Alternative BLA/IAA SL-1 includes no controls and therefore is not effective in the short term.

7.5.2 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 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. 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.

7.5.3 BDDT Soil Alternatives

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 Alternative BDDT SL-3 and BDDT SL-4 because these options include material handling and generation of waste that could result in site workers being exposed to COCs during implementation. Alternatives 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.

7.5.4 WBG Sediment Alternatives

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. Alternatives 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.

7.6 IMPLEMENTABILITY

7.6.1 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.

Alternatives BLA/IAA SL-3 and BLA/IAA 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. Although, 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.

7.6.2 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. Alternatives BLA/IAA CF-3 and 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.

7.6.3 BDDT Soil Alternatives

Alternatives BDDT SL-1 and BDDT SL-2 are the most readily implementable alternatives for BDDT soil because 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.

7.6.4 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. Alternative WBG SD-3 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.

7.7 COST

7.7.1 BLA and IAA Soil Alternatives

There is no cost associated with BLA/IAA SL-1 at the BLA or IAA because no RAs 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 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.

7.7.2 BLA and IAA Conductive Flooring Alternatives

There is no cost associated with BLA/IAA CF-1 because no RAs 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 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.

7.7.3 BDDT Soil Alternatives

There is no cost associated with BDDT SL-1 because no RAs 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 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 still remain in place.

7.7.4 WBG Sediment Alternatives

There is no cost associated with WBG SD-1 because no RAs 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 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.

7.8 STATE ACCEPTANCE

VADEQ approval of the Preferred RA is anticipated, and will be further evaluated in the Decision Document following the public comment period.

7.9 COMMUNITY ACCEPTANCE

Community acceptance of the preferred RA alternatives for the BLA, IAA, BDDT and WBG study areas will be evaluated at the conclusion of the public comment period. Community acceptance will be addressed in the ***Responsiveness Summary*** prepared for the ROD.

Summary of Present Worth Costs for Response Action Alternatives				
Response Action	**BLA**	**IAA**	**BDDT**	**WBG**
BAG LOADING AREA AND IGNITER ASSEMBLY AREA SOILS				
BLA/IAA SL-1	$0	$0	-	-
BLA/IAA SL-2	$188,000	$223,000	-	-
BLA/IAA SL-3	$314,000	$341,000	-	-
BLA/IAA SL-4 (Industrial)	$312,000	$381,000	-	-
BLA/IAA SL-4 (Residential)	$601,000	$335,000	-	-
BAG LOADING AREA AND IGNITER ASSEMBLY AREA CONDUCTIVE FLOORING				
BLA/IAA CF-1	$0	$0	-	-
BLA/IAA CF-2	$129,000	$136,000	-	-
BLA/IAA CF-3	$521,000	$787,000	-	-
BLA/IAA CF-4	$899,000	-	-	-
BUILDING DEBRIS DISPOSAL TRENCH SOILS				
BDDT SL-1	-	-	$0	-
BDDT SL-2	-	-	$146,000	-
BDDT SL-3	-	-	$537,000	-
BDDT SL-4	-	-	$856,000	-
WESTERN BURNING GROUND SEDIMENTS				
WBG SD-1	-	-	-	$0
WBG SD-2	-	-	-	$119,000
WBG SD-3	-	-	-	$282,000

8. PREFERRED RESPONSE ACTION ALTERNATIVES

The Army's preferred RA alternatives for the BLA, IAA, BDDT, and WBG study areas are outlined in this section. The preferred alternatives are believed to provide the best balance between the evaluation criteria discussed in Section 7.

8.1 BAG LOADING AREA

Alternative SL-4: Excavation, Transportation, Off-Site Disposal and Institutional Controls is the preferred RA for soil at the BLA. Under this alternative, soils located adjacent to the buildings with conductive flooring will be excavated to meet the industrial level PRGs for asbestos, lead, and copper. At a minimum the excavation will include surface soils located within 2-ft of the buildings with conductive flooring. The excavated area will be backfilled with clean material and revegetated at the completion of the removal action. The net outcome of the removal action is that the site soils will no longer present unacceptable risks for the current and anticipated future industrial/commercial land use scenario or under the construction worker scenario. Because COCs will be left in place that could present unacceptable risks under a residential land use scenario, ICs will be implemented for the BLA study area to prevent future residential land use. Allowable uses of the area will include general industrial/commercial use of the property and there will be no health-based requirement to restrict or monitor intrusive activities. The final boundaries of the residential land use ICs will be determined as part of the Decision Document.

Alternative CF-3 Removal and Disposal of Asbestos Containing Flooring Materials is the preferred RA for the BLA conductive flooring. This action will include removal of all of the conductive flooring material located within the BLA buildings and disposing of the material at an approved off-site facility. The work will be performed by a licensed asbestos abatement contractor. Upon completion, this RA will eliminate the potential for human exposure to the flooring material at the site and will prevent the material from re-impacting the soils. However, the buildings will still contain some residual lead-based paint and non-flooring asbestos containing materials that will require the Army to maintain restricted access to the area. Therefore, the buildings will be included in the IC for the area.

8.2 IGNITER ASSEMBLY AREA

Alternative SL-4: Excavation, Transportation, Off-Site Disposal and Institutional Controls is the preferred RA for soil at the IAA. Under this alternative, soils located adjacent to the buildings with conductive flooring will be excavated to meet the residential level PRGs for asbestos, lead, copper, and Aroclor 1254. At a minimum the excavation will include surface soils located within 2-ft of the open sides of buildings with conductive flooring. The excavation will be expanded in areas where the COCs are located further from the buildings. The excavated areas will be backfilled with clean material and revegetated at the completion of the removal action. The net outcome of the removal action is that the site soils will no longer present unacceptable risks under an industrial or residential land use scenario. There would be no need to limit exposure to soils at the IAA upon completion of the removal action; therefore, ICs will not be required for soil.

Alternative CF-3 Removal and Disposal of Asbestos Containing Flooring Materials is the preferred RA for the IAA conductive flooring. This action will include removal of all of the conductive flooring material located within the IAA buildings and disposing of the material at an approved off-site facility. The work will be performed by a licensed asbestos abatement contractor. Upon completion, this RA will eliminate the potential for human exposure to the material at the site and will prevent the material from re-impacting the soils. However, the buildings will still contain some residual lead-based paint and non-flooring asbestos containing materials that will require the Army to maintain restricted access to the area. Therefore, the buildings will be included in the IC for the area.

8.3 BUILDING DEBRIS DISPOSAL TRENCH

Alternative BDDT SL-2, Institutional Controls, is the Army's preferred RA for the soils at the BDDT. Under this alternative, ICs will be implemented at the BDDT study area to prevent future residential land use and prevent migration of soils at the site to the adjacent stream. Allowable uses of the area will include general industrial/commercial use of the property and there will be no health-based requirement to restrict or monitor intrusive activities. The final boundaries of the residential land use ICs will be determined as part of the Decision Document.

8.4 WESTERN BURNING GROUND

Alternative WBG SD-3: Excavation, Transportation, and Off-Site Disposal is the recommended alternative for the WBG sediments. The risk assessment concluded that the potential risks and hazards under the industrial site worker and construction worker scenarios are within generally acceptable levels, and as such, the WBG is suitable for the current industrial/commercial and recreational use. However, lead and chromium in a confined area of pond sediments present an unacceptable risk to hypothetical residents. Although the anticipated future use of the WBG is industrial/commercial; removal of the lead and chromium bearing sediment was selected because the life-cycle costs were only moderately more and it will allow for clean closure and unrestricted future use of the area.

Summary of Preferred Response Action Alternatives		
Media of Concern	**Preferred Response Action**	**Final Clean-Up Level**
Bag Loading Area		
Soil	BLA SL-4	Industrial/Commercial
Conductive Flooring	BLA CF-3	N/A – Complete Removal
Igniter Assembly Area		
Soil	IAA SL-4	Residential
Conductive Flooring	IAA CF-3	N/A – Complete Removal
Building Debris Disposal Trench		
Soil	BDDT SL-2	Industrial/Commercial
Western Burning Ground		
Sediment	WBG SD-3	Residential

9. COMMUNITY PARTICIPATION

Public participation is an important component of the IRP process at RFAAP. The Army provides information regarding the environmental investigation and cleanup activities at the facility to the public through public meetings, the Administrative Record file for the facility, and announcements published in the Roanoke Times newspaper. The Army and VDEQ encourage the public to gain a more comprehensive understanding of the on-going IRP activities at RFAAP through review of the available materials.

The Army is currently soliciting input from the community on the Preferred RAs for the BLA, IAA, BDDT and WBG study areas at RFAAP-NRU that are presented in this Proposed Plan. The dates for the public comment period; the date, location, and time of the public meeting; and the location of the Administrative Record files, are provided on the front page of this Proposed Plan. The public may submit comments on the Proposed Plan, or other relevant activities, in writing or in person at the public meeting. Written comments can also be submitted by e-mail, fax, or postal mail. All comments must include the name, address, and telephone number of the person commenting and be received within the designated comment period. Written comments should be addressed to Ms. Joy Case at Radford Army Ammunition Plant (see contact information below).

For further information on the RFAAP-NRU site, please contact:

Ms. Joy Case
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e-mail: joy.case@us.army.mil

ACRONYMS AND ABBREVIATIONS

AAL .... Air Action Levels
ACM .... Asbestos Containing Materials
ARARs .... Applicable or Relevant and Appropriate Requirements
ATK............................... Alliant Techsystems, Inc.
BDDT .... Building Debris Disposal Trench
BLA .... Bag Loading Area
CERCLA .... Comprehensive Environmental Response, Compensation, and Liability Act of 1980
COC.............................. Constituent of Concern
DD................................. Decision Document
EE/CA .... Engineering Evaluation / Cost Analysis
ELCR .... Excess Lifetime Cancer Risk
ERA............................... Ecological Risk Assessment
ft.................................... feet
FS .... Feasibility Study
IAA .... Igniter Assembly Area
HHRA............................ Human Health Risk Assessment
HI .... Hazard Index
IC .... Institutional Control
IRP .... Installation Restoration Program
MMA.............................. Main Manufacturing Area
NBG .... Northern Burning Ground
NCP .... National Contingency Plan
NROW .... New River Ordnance Works
NRU .... New River Unit
PAH............................... Polycyclic Aromatic Hydrocarbon
PCB............................... Polychlorinated Biphenyl
RA................................. Response Action
RAO .... Remedial Action Objectives
RFAAP.......................... Radford Army Ammunition Plant
RI .... Remedial Investigation
RY................................. Rail Yard
SARA .... Superfund Amendments and Reauthorization Act of 1986
SL.................................. Screening Level
SVOC............................ Semi-Volatile Organic Compound
USEPA.......................... United States Environmental Protection Agency
VOC .... Volatile Organic Compound
VDEQ............................ Virginia Department of Environmental Quality
WBG .... Western Burning Ground

GLOSSARY OF TERMS

Action Memorandum: Under the Non-Time Critical Removal Action process, it provides a concise record of the decision to select a removal action. It is considered the primary decision document under this process.

Administrative Record: This is a collection of documents (including plans, correspondence and reports) generated during site investigation and remedial activities. Information in the Administrative Record is used to select the Preferred Response Actions and is available for public review.

Applicable or Relevant and Appropriate Requirements (ARARs): The Federal and State requirements that a selected remedy will attain. These requirements may vary among sites and response actions.

Capital Costs: This includes costs associated with construction, treatment equipment, site preparation, services, transportation, disposal, health and safety, installation and start-up, administration, legal support, engineering, and design associated with response actions.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): This federal law was passed in 1980 and is commonly referred to as the Superfund Program. It provides for liability, compensation, cleanup, and emergency response in connection with the cleanup of inactive hazardous waste disposal sites that endanger public health and safety or the environment.

Constituent of Concern (COC): A constituent detected during the course of the environmental investigation process that presents unacceptable human-health or ecological risks at the site.

Decision Document: This legal record is signed by the Army and VDEQ. It provides the cleanup action or remedy selected for a site, the basis for selecting that remedy, public comments, responses to comments, and the estimated cost of the remedy.

Defense Environmental Restoration Program (DERP): This purpose of this program is to identify, assess, and cleanup or control hazardous waste contamination that originated from past Department of Defense activities.

Engineering Evaluation/Cost Analysis (EE/CA): This CERCLA document is used to document non-time critical removal actions. It serves an analogous function to, but is more streamlined than, the remedial investigation/feasibility study process.

Feasibility Study (FS): This CERCLA document reviews the contaminants of concern at a site, and evaluates multiple remedial technologies for use at the site. It identifies the most feasible response actions.

National Contingency Plan (NCP): The National Oil and Hazardous Substances Pollution Contingency Plan. These CERCLA regulations provide the federal government the authority to respond to the problems of abandoned or uncontrolled hazardous waste disposal sites as well as to certain incidents involving hazardous wastes (e.g., spills).

Operation and Maintenance (O&M): Annual post-construction cost necessary to ensure the continued effectiveness of a remedial action.

Present Worth Costs: Used to evaluate expenditures that occur over different time periods by discounting all future costs to a common base year. This allows the cost of the response actions to be compared on the basis of a single figure representing the amount of money that would be sufficient to cover capital and O&M costs associated with each remedial action over its planned life.

Remedial Investigation (RI): An investigation under CERCLA that involves sampling environmental media such as air, soil, and water to determine the nature and extent of contamination and human health and environmental risks that result from the contamination.

Responsiveness Summary: A part of the Decision Document in which the Army documents and responds to written and oral comments received from the public and the State about the Proposed Plan.

Superfund Amendments and Reauthorization Act (SARA): A congressional act that modified CERCLA. SARA was enacted in 1986 and again in 1990 to authorize additional funding for the Superfund Program.

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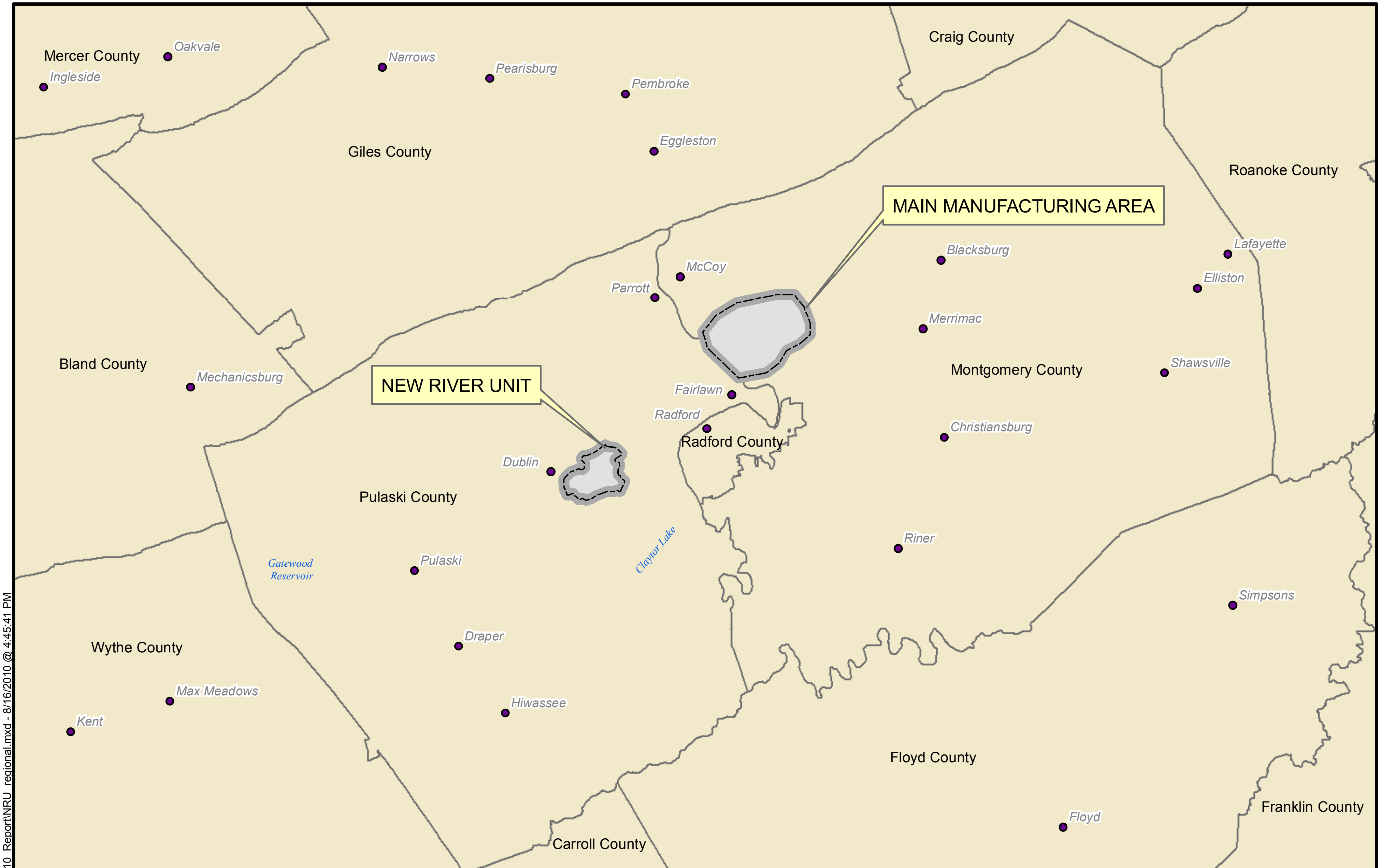

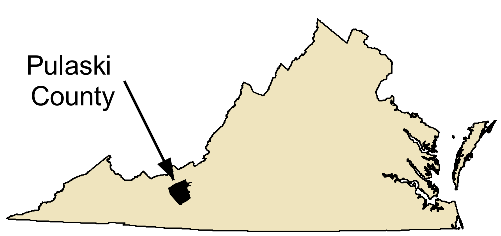

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RADFORD ARMY AMMUNITION PLANT
RADFORD, VA

RFAAP - NRU
FACILITY LOCATION

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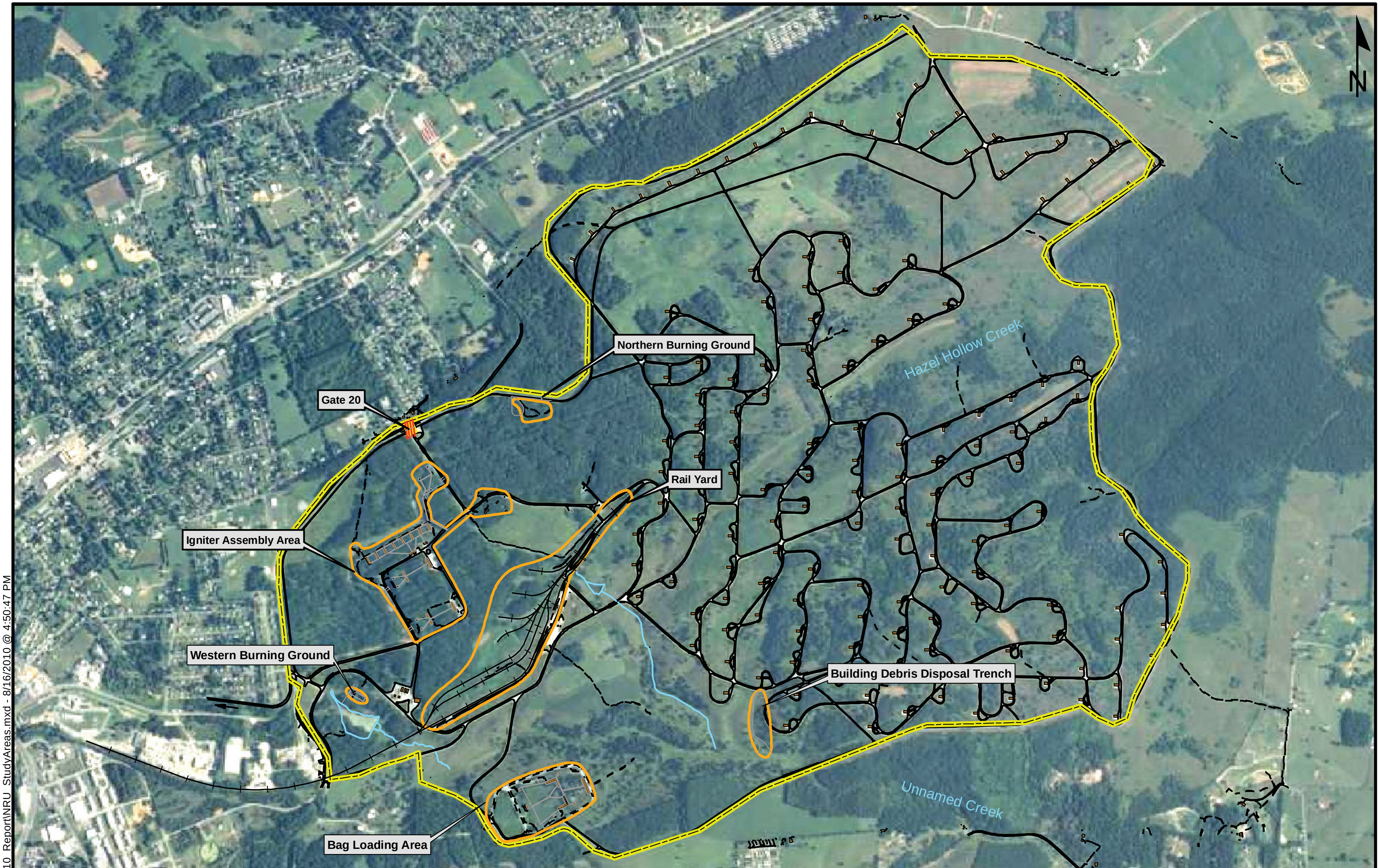

LEGEND

- 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

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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 ARE TWO STORY BUILDINGS

0 200 400 Feet
GRAPHIC SCALE

RADFORD ARMY AMMUNITION PLANT
RADFORD, VA

BAG LOADING AREA SITE LAYOUT

ARCADIS

FIGURE 3

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

SEWER LINE	SURFACE WATER	DIRT ROADS
SITE FEATURES	CULVERT	STUDY AREA
RAIL SPUR	PAVED ROADS	INSTALLATION BOUNDARY

FORMER BUILDINGS

- NO CONDUCTIVE FLOORING
- YES CONDUCTIVE FLOORING

0 340 680 Feet

GRAPHIC SCALE

RADFORD ARMY AMMUNITION PLANT
RADFORD, VA

IGNITER ASSEMBLY AREA SITE LAYOUT

ARCADIS

FIGURE
4

NYC: SER 4/AIT: DB: TBR LD: TBR PIC: TL
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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
5

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

- 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

ARCADIS

FIGURE
6

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