



US Army Corps
of Engineers
Baltimore District

FINAL

Feasibility Study Report

New River Unit (RAAP-044)

**Bag Loading Area, Igniter
Assembly Area, Building Debris
Disposal Trench, and Western
Burning Ground**

**Radford Army Ammunition Plant
Radford, Virginia**

**Prepared for:
Radford Army Ammunition Plant**

September 2010



received
10-28-10
10-12!

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

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Douglas W. Domenech
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4020
1-800-592-5482

October 22, 2010

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

Re: Feasibility Study Report- NRU- Radford Army Ammunition Plant

Dear Mr. McKenna:

The Virginia Department of Environmental Quality (VDEQ) has reviewed the Final Feasibility Study Report dated September 2010 for the New River Unit (RAAP-044) at Radford Army Ammunition Plant and approves the report 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



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

www.atk.com

September 17, 2010

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

Subject: Transmittal Acknowledgement, Final Feasibility Study Report,
New River Unit (RAAP-044) Bag Loading Area,
Igniter Assembly Area, Building Debris Disposal Trench, and Western Burning Ground
September 2010

Dear Mr. Cutler:

This letter is to acknowledge transmittal of the subject document that was sent to you on September 14, 2010. Enclosed is a copy of the 14 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

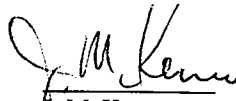
E. A. Lohman
Virginia Department of Environmental Quality
Blue Ridge Regional Office
3019 Peters Creek Road
Roanoke, VA 24019

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

Comments and Responses on the
Draft FS Report
New River Unit RFAAP 044
Radford Army Ammunition Plant
October 2009

Item No.	Report Reference	COMMENT	RESPONSE
Commenter: Ahmet Bulbulkaya (VDEQ)			
1		ARCADIS presents separate PRGs for an adult resident and a child resident. This is unnecessary. There should be only one lifetime resident. When carcinogenic effects are driving the PRG, the Resident PRG incorporates child and the adult exposure into one value. For non-cancer effects, the child resident is always lower than the adult and thus will serve as the "resident" PRG.	Agree. The FS was revised to present a single PRG for the hypothetical future resident as recommended.
2		It doesn't appear that PAH mutagenic effects were incorporated into the B(a)P PRGs. I would think that they are planning on doing this with the revision.	Agree. The PRG for benzo(a)pyrene was revised to incorporate the process for evaluating mutagenic effects.
3		The lead PRG for the WBG for sediment exposure to a Hypothetical Future Residential Child uses a weighted average approach that I need to spend some time with but the proposed PRG doesn't seem to out of whack at 1100ppm. We use 400 ppm as the VRP sediment screening value.	Noted. Both comment and response will be revised upon receipt of the final comments.
Commenter: Jim Cutler (VDEQ) – email comments from July 20, 2010			
4		As discussed in our latest site visit and presented in the revised RI the FS should be revised to include recommended remedial action for the BDDT area.	The BDDT has been incorporated into the FS based on the findings of RI Report. The RI Report concluded that risks are present at the BDDT under the hypothetical future residential land use scenario due to the presence of benzo(a)pyrene in soil.

Comments and Responses on the
Draft FS Report
New River Unit RFAAP 044
Radford Army Ammunition Plant
October 2009

Item No.	Report Reference	COMMENT	RESPONSE
5		The FS should clarify that the recommended remedial action at the BLA and the IAA is the removal of soils at a minimum of 2 feet from the open ends of the selected buildings (the text states "up to 2 feet").	<i>The discussion of the Remedial Action Alternatives for the BLA and IAA has been clarified to state that surface soils will be removed to a minimum distance of 2-ft from the open sides of the buildings containing conductive flooring material</i>
6		The RAOs for human health exposure on page 4-1 and 4-2 should be more strongly worded by substituting "prevent" for "minimize the potential for"	<i>The RAOs have been revised accordingly.</i>
Commenter: VDEQ ARARs Coordinator per Jim Cutler's July 20, 2010 email			
7	Pages ES-2 and 1-2	The Executive summary on page ES-2 and the Introduction on page 1-2; States that eleven (11) groundwater monitoring wells located at the RFAAP-NRU site will be abandoned during the response actions for the Bag Loading Area, Igniter Assembly Area and the Western Burning Ground. Well abandonment is governed jointly by the Virginia Department of Health and the Department of Environmental Quality. See <i>Private Well Regulations</i> : 12 VAC 5-630-60, and 360 to 420, 450 and 480.	<i>Agree. The text on pages ES-2 and 1-2 were revised to state that the monitoring well abandonment activities will be performed in accordance with applicable VDEQ and Virginia Department of Health regulations.</i>
8	Table 4-1	Add the following sections to the Virginia Water Quality Standards: 9 VAC 25-260-140; Sections: 10 to 50, 155, 187, 280, 300, 310, 360 to 380, and 540.	<i>Only Sections 30 and 50 of this regulation are considered substantive and were added to Table 4-1. None of the other sections apply to the actions being considered for RFAAP-NRU.</i>

Comments and Responses on the
Draft FS Report
New River Unit RFAAP 044
Radford Army Ammunition Plant
October 2009

Item No.	Report Reference	COMMENT	RESPONSE
9	Table 4-1	Add the following: Pollutant Discharge Elimination System (VPDES) Permit Regulation: 9 VAC 25-31-10 to 940	<i>This regulation was added to Table 4-1; however, only substantive provisions of the permit requirements will be met; no administrative sections, including obtaining permits and permit fees, will be complied with per the CERCLA permit exception..</i>
10	Table 4-1	Add the following: Waterworks Regulations: 12 VAC 5-590-10 to 1280	<i>This ARAR was not added to Table 4-1. The Waterworks Regulations are found in Title 12, Health and not Title 9 or 4 and cannot be considered an ARAR because ARARs are only federal or more stringent state environmental or federal facility siting laws.</i>
11	Table 4-1	Add the following: Standards of Performance for Visible Emissions and Fugitive Dust/Emissions (Rule 5-1): 9 VAC 5-50-60 to 120	<i>This regulation was added to Table 4-3, which covers action-specific ARARs. However, only the substantive provisions of this regulation apply. None of the administrative provisions, including permit fees, are considered applicable because this is a CERCLA action.</i>
12	Table 4-1	Add the following: Emission Standards for Toxic Pollutants from New and Modified Sources (Rule 6-5): 9 VAC 5-60-300 to 370	<i>This regulation was added to Table 4-3, which covers action-specific ARARs. However, only the substantive provisions of this regulation apply. None of the administrative provisions, including permit fees, are considered applicable because this is a CERCLA action.</i>
13	Table 4-1	Add the following: Ground Water Standards: 9 VAC 25-280-10 to 30, and 50 to 90	<i>Groundwater was not identified as a medium of concern, thus the recommended alternatives do not address groundwater. Therefore, no ARARs for groundwater have been included in Table 4-1.</i>

Comments and Responses on the
Draft FS Report
New River Unit RFAAP 044
Radford Army Ammunition Plant
October 2009

Item No.	Report Reference	COMMENT	RESPONSE
14	Table 4-1	Add the following: Virginia Hazardous Waste Management Regulations: 9 VAC 20-60-12 to 1505	The only substantive provisions of this chapter are 9 VAC 20-60-420, 440, 460-500. These were all added to Table 4-1. All other provisions have either been repealed, incorporate federal law by reference, or are solely administrative in nature.
15	Table 4-2	Add the following: Endangered Species, Definitions and Miscellaneous in General: 4 VAC 15-20-130 to 140.	These sections merely provide lists of endangered and threatened species and a list of definitions. They include no substantive provisions and were not added to Table 4-2. The only substantive section of the state endangered species act is 4 VAC 15-20-70, which covers violations of these regulations. This section was added to Table 4-2.
16	Table 4-2	Add the following: Rules and Regulations for the Enforcement of the Endangered Plant and Insect Species Act: 2 VAC 5-320-10.	This section is a list of endangered and threatened plant and insect species; it has no substantive provisions and is not an ARAR; therefore, it was not added to Table 4-2.
17	Table 4-2	Add the following: Water Quality Management Planning Regulation: 9 VAC 25-720-20 and 130	Neither of these sections contains a substantive provision that can be complied with. The first is the purpose of the chapter which is only to list TMDLs for specific areas and the second is the list for the New River Basin. Neither section contains an enforcement provision or some other substantive portion; therefore this regulation was not added to Table 4-2.
18	Table 4-3	Does the facility have or intending to obtain a General Permit for Stormwater Discharges Associated with Industrial Activity: 9 VAC 25-151 (VAR 05) listed on Table 4-3?	Permits are not required for on-site CERCLA actions. The only portion of this regulation which is applicable (and listed in Table 4-3) is 9 VAC 25-151-70.

**Comments and Responses on the
Draft FS Report
New River Unit RFAAP 044
Radford Army Ammunition Plant
October 2009**

Item No.	Report Reference	COMMENT	RESPONSE
19	Table 4-3	The Virginia Water Quality Standards: 9 VAC 25-260-140 is listed on Table 4-1. Please see the previous comments.	<i>This regulation was removed from Table 4-3 because it is already listed under Table 4-1. See response to Comment #8..</i>
20	Table 4-3	Add the following: Virginia Stormwater Management Program (VSMP) Permit Regulations: 4 VAC 50-60-10 to 1240	<i>This regulation was added as an ARAR to Table 4-3. However, only the substantive provisions of this regulation apply. None of the administrative provisions, including permit fees, are considered applicable because this is a CERCLA action.</i>
21	Table 4-3	Add the following: Virginia Pollution Abatement (VPA) Regulation: 9 VAC 25-32-10 to 300	<i>This regulation was added as an ARAR to Table 4-3. However, only the substantive provisions of this regulation apply. None of the administrative provisions, including permit fees, are considered applicable because this is a CERCLA action.</i>
22	Table 4-3	Add the following: Virginia Water Protection Permit Program Regulation: 9 VAC 25-210-10 to 260	<i>This regulation was added as an ARAR to Table 4-3. However, only the substantive provisions of this regulation apply. None of the administrative provisions, including permit fees, are considered applicable because this is a CERCLA action.</i>
23	Table 4-3	Add the following: Virginia Water Protection General Permit for Impacts from Development Activities Regulation: 9 VAC 25-690-10 to 100	<i>This regulation was not added as an ARAR to Table 4-3. This regulation is only applicable in the event that the preferred alternative requires permanent development or the mining of sand, gravel or crushed stone. The alternatives considered for RFAAP-NRU do not require permanent development.</i>

Comments and Responses on the
Draft FS Report
New River Unit RFAAP 044
Radford Army Ammunition Plant
October 2009

Item No.	Report Reference	COMMENT	RESPONSE
24	Table 4-3	Add the following: Regulations Governing the Transportation of Hazardous Materials: 9 VAC 20-110-10 to 130	Only Section 9 VAC 20-110-60 is applicable to the alternatives being considered for RFAAP-NRU. This section states that "Nothing contained in these regulations shall apply to regular military or naval forces of the United States.."
25	Table 4-3	Add the following: Solid Waste Management Regulations: 9 VAC 20-80-10 to 790	This regulation was added as a "to be considered" ARAR to Table 4-3. Only the substantive provisions of this regulation apply, and only if the remedial alternative includes the construction of a landfill.
26	Table 4-3	Add the following: Erosion and Sediment Control Regulations: 4 VAC 50-30-10 to 110	This regulation was added as an applicable ARAR to Table 4-3.

Greene, Anne

From: McKenna, Jim
Sent: Tuesday, September 14, 2010 1:48 PM
To: Greene, Anne; Cutler, Jim; dennis.druck@us.army.mil; diane.wisbeck@arcadis-us.com; durwood willis2; Geiger.William@epamail.epa.gov; Redder, Jerome; jim spencer; Llewellyn, Tim; Lohman, Elizabeth; Mendoza, Rich; Meyer, Tom NAB02; Parks, Jeffrey N; Sismour, Karen; Timothy.Leahy@shawgrp.com; Tina_MacGillivray@URSCorp.com
Subject: Fed Ex Tracking Numbers for Radford NRU - Final FS Report (UNCLASSIFIED)
Attachments: RTC VDEQ Comments on Draft FS Report.pdf
Importance: High

Classification: UNCLASSIFIED
Caveats: FOUO

All,

Below are the tracking nos for the RAAP-044 Final Feasibility Study that will be sent out tonight. Attached is the Response to Comments on the draft report.

Recipient	Copies	Fed Ex Tracking Number
James McKenna	1 additional Hard copy + Updated Cover Page + 2 CDs	
7939 0980 3937		
Richard Mendoza	1 Hard Copy + 1 CD	7962 4177 0187
Tom Meyer	1 Hard Copy + 1 CD	7962 4177 3587
Dennis Druck	1 Hard Copy	7939 0981 3066
Elizabeth Lohman	1 CD	7939 0979 1984
James Cutler	1 Hard Copy	7962 4178 1725
Karen Sismour	1 Hard Copy	7962 4178 6587
Susan Ryan	1 CD	7962 4179 0568
Mark Bowen	1 CD	7939 0983 4752

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

Jim McKenna
Classification: UNCLASSIFIED
Caveats: FOUO

3 - NRU FS- ARARs comments

From: Cutler, Jim (DEQ) [James.Cutler@deq.virginia.gov]
Sent: Thursday, August 12, 2010 2:55 PM
To: jim.mckenna@us.army.mil
Cc: Wisbeck, Diane; Kalinowski, Chris; Jerome.Redder@ATK.COM;
Mendoza, Richard R Mr CIV USA IMCOM; Mendoza, Richard R Mr CIV
USA IMCOM; Bulbulkaya, Ahmet (DEQ); Hollis, Michelle (DEQ)
Subject: NRU FS- ARARs comments

Jim,

We have reviewed the Army's responses to ARARs comments at the NRU. Except for the following

items the VDEQ accepts the RTCs without further comment.

10. Since groundwater was not identified as a medium of concern this comment would not apply for

this site. However this regulation is considered a potential ARAR by VDEQ in support of selection of MCLs as cleanup goals.

14. Virginia has authorization from EPA to operate the Commonwealth hazardous waste program in

lieu of the federal program. While they do incorporate the federal regulations, Virginia has made some changes. Additional sections may be included in the ARAR depending on the final remedy selection.

15 and 16. The intent of this comment was to recognize that Virginia's list of Endangered Species

contains additional species not on the Federal list and would be covered as an ARAR.

However, the

anticipated removal actions do not appear to impact any potential habitat at the site so this ARAR does

not appear to be relevant to the proposed remedies.

17. The proper consideration of TMDLs as ARARs or TBCs has not been fully resolved at VDEQ.

Since no discharges or other impacts to the referenced drainage basins are anticipated as part of the

final remedy we have no additional comments at this time.

In summary, the ARAR tables as revised are acceptable for the FS.

Based on the consensus noted in the July 21, 2010 meeting notes and VDEQ's acceptance of the lead

PRG values (Ahmet's 8/10/10 email) it appears that there are no outstanding issues and the revised FS

can be submitted to VDEQ.

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

Thanks,

Jim

James L. Cutler Jr.

Federal Facilities Project Manager

Office of Remediation Programs

Virginia Dept. of Environmental Quality

804-698-4498

4 - 2010 07 21 NRU Meeting Notes (UNCLASSIFIED)
From: McKenna, Jim J Mr CIV USA AMC [jim.mckenna@us.army.mil]
Sent: Thursday, July 22, 2010 2:52 PM
To: Wisbeck, Diane; Mendoza, Rich; Ryan, Susan M CIV USA IMCOM
Cc: jerome.redder@atk.com; Kalinowski, Chris; Meyer, Tom NAB02; Cutler, Jim;
paige.holt@atk.com; Robert Davie
Subject: RE: 2010 07 21 NRU Meeting Notes (UNCLASSIFIED)
Attachments: 2010 07 21 VDEQ Mtg Notes.docx

Importance: High

Classification: UNCLASSIFIED
Caveats: FOUO

Classification: UNCLASSIFIED
Caveats: FOUO

All,

Attached are the 07/21/2010 meeting notes that ARCADIS prepared. I'm ok with them. I think everyone has Jim Cutler's/DEQ's preliminary FS comments that Diane referenced in these notes.

In addition my understanding from this meeting is that DEQ will provide formal correspondence concurring with the NRU RI Report by July 30, 2010.

BTW I'll be out of the office until Tuesday, July 27, 2010.

Thanks,
Jim McKenna

-----Original Message-----

From: Wisbeck, Diane [mailto:Diane.Wisbeck@arcadis-us.com]
Sent: Thursday, July 22, 2010 2:23 PM
To: McKenna, Jim J Mr CIV USA AMC
Cc: jerome.redder@atk.com; Kalinowski, Chris
Subject: 2010 07 21 NRU Meeting Notes

Jim,

Attached are my notes from yesterday's meeting. Although we may not have addressed the comments in the order in which they were received (or are presented here) I do think we touched on everything briefly.

If these are acceptable to you, please feel free to pass them on to the VDEQ.

Diane Wisbeck Project Manager | diane.wisbeck@arcadis-us.com
<blockedmailto:diane.wisbeck@arcadis-us.com>

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Classification: UNCLASSIFIED
Caveats: FOUO

Classification: UNCLASSIFIED
Caveats: FOUO

**Meeting with Virginia DEQ
for the New River Unit, Radford AAP
July 21, 2010, Edgewood, MD
Draft Meeting Notes**

Attendees

Jim McKenna	Radford Army Ammunition Plant (RFAAP)
Jim Cutler	Virginia Department of Environmental Quality (VDEQ)
Jerome Redder	ATK
Diane Wisbeck	ARCADIS

Purpose

This purpose of the meeting was to review status on the VDEQ review of the Feasibility Study

Summary

The participants met at the office of The Shaw Group in Edgewood, MD. Jim Cutler (VDEQ) provided preliminary comments on the Feasibility Study for discussion and indicated that final comments would be provided by 30 July 2010. The preliminary comments addressed three general areas: 1) Recommended alternatives; 2) Remedial Action Objectives (including Preliminary Remediation Goals); and Applicable or Relevant and Appropriate Requirements (ARARs). The preliminary comments along with discussion on the comments are summarized below.

1. As discussed in our latest site visit and presented in the revised RI the FS should be revised to include recommended remedial action for the BDDT area.

It was discussed that in general VDEQ is in agreement with the recommended alternatives for the IAA, BLA, and Western Burning Ground. It was agreed that the FS would be revised to recommend a remedial action for the BDDT area.

2. The FS should clarify that the recommended remedial action at the BLA and the IAA is the removal of soils at a minimum of 2 feet from the open ends of the selected buildings (the text states "up to 2 feet").

It was agreed that the FS would be revised to indicate that a minimum of 2 feet from the open ends of the selected buildings will be excavated.

3. The RAOs for human health exposure on page 4-1 and 4-2 should be more strongly worded by substituting "prevent" for "minimize the potential for"

This comment was discussed and will be further reviewed by Army.

4. VDEQ ARARs coordinator comments: The Executive summary on page ES-2 and the Introduction on page 1-2; States that eleven (11) groundwater monitoring wells located at the RFAAP-NRU site will be abandoned during the response actions for the Bag Loading Area, Igniter Assembly Area and the Western Burning Ground. Well abandonment is governed jointly by the Virginia Department of Health and the Department of

Environmental Quality. See Private Well Regulations: 12 VAC 5-630-60, and 360 to 420, 450 and 480.

It was agreed that the FS would be revised to include the ARAR as it pertains to the well abandonment activities.

5. ARCADIS Presents separate PRGs for an Adult ARCADIS presents separate PRGs for an adult resident and a child resident. This is unnecessary. There should be only one lifetime resident. When carcinogenic effects are driving the PRG, the Resident PRG incorporates child and the adult exposure into one value. For non-cancer effects, the child resident is always lower than the adult and thus will serve as the "resident" PRG.

It was agreed that the FS would be revised to present a PRG based on a lifetime exposure.

6. It doesn't appear that PAH mutagenic effects were incorporated into the B(a)P PRGs. I would think that they are planning on doing this with the revision.

It was agreed that the FS would be revised to include a PRG for B(a)P that incorporates the USEPA Guidance for Early Childhood Exposures.

7. The lead PRG for the WBG for sediment exposure to a Hypothetical Future Residential Child uses a weighted average approach that needs to be verified.

VDEQ indicated that this comment would be finalized by 30 July 2010.

8. Preliminary Comments on ARARs (email dated 20 July 2010).

Suggested ARARs will be reviewed by ARCADIS and AEC.

Action Items

Action	Responsible Individual(s)	Due Date
Review Virginia ARARs and determine the applicability to the recommended alternatives for NRU	AEC, ARCADIS	30 July 2010
Submit Final FS Report in Red-line Strike Out, BDDT figures, revised ARAR tables to Army for review.	ARCADIS	23 July 2010
Review Final FS Report: BDDT, ARARs, RAOs	Army	30 July 2010
Provide final comments on Feasibility Study	VDEQ	30 July 2010
Remove erosion control devices from NRG	ARCADIS	Concurrent with BLA/IAA mobilization.

6 - Cutler_NRU FS comments 2010 07 20

NRU FS commentsFrom: Cutler, Jim (DEQ)
[James.Cutler@deq.virginia.gov]
Sent: Tuesday, July 20, 2010 9:26 AM
To: Wisbeck, Diane
Subject: NRU FS comments

Follow Up Flag: Follow up
Flag Status: Flagged

The VDEQ has reviewed the FS report for the New River Unit (RAAP-044) and offer the following comments:

1. As discussed in our latest site visit and presented in the revised RI the FS should be revised to include recommended remedial action for the BDDT area.
2. The FS should clarify that the recommended remedial action at the BLA and the IAA is the removal of soils at a minimum of 2 feet from the open ends of the selected buildings (the text states "up to 2 feet").
3. The RAOs for human health exposure on page 4-1 and 4-2 should be more strongly worded by substituting "prevent" for "minimize the potential for"
4. VDEQ ARARs coordinator comments:

The Executive summary on page ES-2 and the Introduction on page 1-2; States that eleven (11) groundwater monitoring wells located at the RFAAP-NRU site will be abandoned during the response actions for the Bag Loading Area, Igniter Assembly Area and the Western Burning Ground. Well abandonment is governed jointly by the Virginia Department of Health and the Department of Environmental Quality. See Private Well Regulations: 12 VAC 5-630-60, and 360 to 420, 450 and 480.

Table 4-1 Chemical-Specific ARARs and TBC guidance

Add the following sections to the Virginia Water Quality Standards: 9 VAC 25-260-140;

Sections: 10 to 50, 155, 187, 280, 300, 310, 360 to 380, and 540.

Add the following:

Pollutant Discharge Elimination System (VPDES) Permit Regulation: 9 VAC 25-31-10 to 940

Waterworks Regulations: 12 VAC 5-590-10 to 1280

Standards of Performance for Visible Emissions and Fugitive Dust/Emissions (Rule 5-1): 9 VAC 5-50-60 to 120

Emission Standards for Toxic Pollutants from New and Modified Sources (Rule 6-5): 9 VAC 5-60-300 to 370

Ground Water Standards: 9 VAC 25-280-10 to 30, and 50 to 90

Virginia Hazardous Waste Management Regulations: 9 VAC 20-60-12 to 1505

Table 4-2 Location-Specific ARARs and TBC guidance

Add the following:

Endangered Species, Definitions and Miscellaneous in General: 4 VAC 15-20-130 to 140.

Rules and Regulations for the Enforcement of the Endangered Plant and Insect Species Act: 2 VAC 5-320-10.

Water Quality Management Planning Regulation: 9 VAC 25-720-20 and 130

Table 4-3 Action-Specific ARARs and TBC guidance

Does the facility have or intending to obtain a General Permit for Stormwater Discharges Associated with Industrial Activity: 9 VAC 25-151 (VAR 05) listed on Table 4-3?

The Virginia Water Quality Standards: 9 VAC 25-260-140 is listed on Table 4-1.

Please see the previous comments.

Add the following:

Virginia Stormwater Management Program (VSMP) Permit Regulations: 4 VAC 50-60-10 to 1240

Virginia Pollution Abatement (VPA) Regulation: 9 VAC 25-32-10 to 300.

Virginia Water Protection Permit Program Regulation: 9 VAC 25-210-10 to 260.

Virginia Water Protection General Permit for Impacts from Development Activities Regulation:

9 VAC 25-690-10 to 100.

Regulations Governing the Transportation of Hazardous Materials: 9 VAC 20-110-10 to 130

Solid Waste Management Regulations: 9 VAC 20-80-10 to 790

6 - Cutler_NRU FS comments 2010 07 20
Erosion and Sediment Control Regulations: 4 VAC 50-30-10 to 110
James L. Cutler Jr.
Federal Facilities Project Manager
Office of Remediation Programs
Virginia Dept. of Environmental Quality
804-698-4498



DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-REH

10 NOV 2009

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

SUBJECT: Revised Internal Draft Feasibility Study Report for the New River Unit (RAAP-044), Radford Army Ammunition Plant, Virginia, September 2009

1. The US Army Center for Health Promotion and Preventive Medicine reviewed the subject document on behalf of the Office of The Surgeon General pursuant to Army Regulation 200-1 (Environmental Protection and Enhancement). We appreciate the opportunity to review this report.
2. Our previous comments have been addressed and we concur with the recommended response actions as being protective of human health and the environment.
3. The document was reviewed by Mr. Dennis Druck, Environmental Health Risk Assessment Program. He can be reached at DSN 584-2953, commercial (410) 436-2953 or electronic mail, dennis.druck@us.army.mil.

FOR THE COMMANDER:

JEFFREY S. KIRKPATRICK
Director, Health Risk Management

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



ATK Armament Systems
Energetic Systems
Radford Army Ammunition Plant
Route 114, P.O. Box 1
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November 16, 2009

Mr. James L. Cutler, Jr.
Virginia Department of Environmental Quality
629 East Main Street
Richmond, VA 24143-0100

Subject: Transmittal Acknowledgement, Draft Remedial Investigation Report, New River Unit (RAAP-044)
BDDT, BLA, IAA, RY, WBG, and Groundwater, Volumes I and II, October 2009
Draft Feasibility Study Report, New River Unit (RAAP-044), Bag Loading Area, Igniter Assembly
Area, and Western Burning Ground, New River Unit, October 2009

Dear Mr. Cutler:

This letter is to acknowledge transmittal of the subject document that was sent to you on November 9, 2009. Enclosed is a copy of the 9 November 2009 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,


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Mr. James Cutler

Transmittal Acknowledgement, Draft Remedial Investigation Report, New River Unit (RAAP-044) BDDT, BLA, IAA,
RY, WBG, and Groundwater, Volumes I and II, October 2009

November 17, 2009

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Tom Meyer

Corps of Engineers, Baltimore District

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Mr. James Cutler

Transmittal Acknowledgement, Draft Remedial Investigation Report, New River Unit (RAAP-044) BDDT, BLA, IAA,
RY, WBG, and Groundwater, Volumes I and II, October 2009

November 17, 2009

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

Coordination:


J. McKenna

Greene, Anne

From: McKenna, Jim
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Subject: FW: Fed Ex Tracking Numbers for Radford NRU RI and FS Report (UNCLASSIFIED)
Importance: High

Classification: UNCLASSIFIED
Caveats: FOUO

All,

The following two reports for the NRU will be sent out today:

- 1) DRAFT Remedial Investigation Report, New River Unit (RAAP-044), 8DDT, BLA, IAA, RY, WBG, and Groundwater; and
- 2) DRAFT Feasibility Study Report, New River Unit (RAAP-044), Bag Loading Area, Igniter Assembly Area, and Western Burning Ground

The two documents will be sent out together in one package to the POCs and tracking numbers below:

James McKenna (2 Copies and 2 CDs of each report)	793000981440
Dennis Druck (1 Copy of each report)	793001010975
Tom Meyer (1 Copy and 1 CD of each report)	793001006300
Susan Ryan (1 CD of each report)	793001000632
Richard Mendoza (1 Copy and 1 CD of each report)	798121509560
Karen Sismour (1 Copy of each report)	793001299060
James Cutler (1 Copy of each report)	798121821683
Elizabeth Lohman (1 CD of each report)	798121829206

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

Jim McKenna

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Caveats: FOUO

FINAL

**Feasibility Study Report
Bag Loading Area; Igniter
Assembly Area; Building Debris
Disposal Trench; Western
Burning Ground
New River Unit (RAAP-044)**

Radford Army Ammunition Plant
Radford, Virginia

September 2010



Christopher Kalinowski
Site Manager



Diane Wisbeck
Project Manager

**FINAL
Feasibility Study Report
BLA, IAA, BDDT, and WBG
New River Unit (RAAP-044)**

Radford Army Ammunition Plant

Prepared for:
U.S. Army

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Our Ref.:
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Date:
September 2010

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Acronyms and Abbreviations

AEC	Army Environmental Command
ALM	Adult Lead Model
ARAR	Applicable or Relevant and Appropriate Requirements
BDDT	Building Debris Disposal Trench
BLA	Bag Loading Area
BERA	Baseline Ecological Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Constituent of Concern
COPEC	Constituent of Potential Environmental Concern
DD	Decision Document
EPC	Exposure Point Concentration
ERA	Ecological Risk Assessment
EU	Exposure Unit
FS	Feasibility Study
ft	Feet
ft bgs	Feet Below Ground Surface
ft ²	Square Feet
GRA	General Response Action
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
IAA	Igniter Assembly Area
IC	Institutional Control
IEUBK	Integrated Exposure Uptake Biokinetic Model
IRP	Installation Restoration Program
LOAEL	Lowest-Observed Adverse Effect Level
LUC	Land Use Control
mg/kg	Milligram per Kilogram
MMA	Main Manufacturing Area
NBG	Northern Burning Ground
NCP	National Contingency Plan
NOAEL	No-Observed Adverse Effect Level

Acronyms and Abbreviations

NRU	New River Unit
O&M	Operations and Maintenance
OSWER	Office of Solid Waste and Emergency Response
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyls
PRG	Preliminary Remediation Goal
RA	Response Action
RAL	Remediation Action Level
RAO	Remedial Action Objective
RFAAP	Radford Army Ammunition Plant
RY	Rail Yard
ROD	Record of Decision
SOP	Standard Operating Procedure
SVOC	Semi-Volatile Organic Compound
SLERA	Screening-Level Ecological Risk Assessment
TCLP	Toxicity Characterization Leaching Procedure
USEPA	United States Environmental Protection Agency
UCL	Upper Concentration Limit
VOC	Volatile Organic Compound
VDEQ	Virginia Department of Environmental Quality
WBG	Western Burning Ground
XRF	X-Ray Fluorescence
yd ³	Cubic Yard
µg/L	Microgram per Liter

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ARCADIS U.S, Inc. (ARCADIS) has been retained by the United States Army Environmental Command (AEC) to perform Installation Restoration Program (IRP) activities at the Radford Army Ammunition Plant (RFAAP). IRP activities for both the Main Manufacturing Area (RFAAP-MMA) and the New River Unit (RFAAP-NRU) of the RFAAP facility are being conducted as part of a Performance Based Contract (PBC) awarded to ARCADIS under contract W91ZLK-05-D-0015: Task 0002. The RFAAP-NRU is managed under the Comprehensive Environmental Response and Compensation Liability Act (CERCLA).

During the Remedial Investigation (RI) process for the facility, comprehensive environmental investigations were completed for six separate Study Areas identified at the RFAAP-NRU. A facility-wide groundwater investigation was also completed at the RFAAP-NRU during the RI. The Study Areas identified at the RFAAP-NRU are as follows:

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

ARCADIS has prepared this Feasibility Study (FS) Report to present the response action alternatives that are available to address constituents and media of concern that were identified for the BLA, IAA, BDDT, and WBG during the RI phase of the RFAAP-NRU project. The remedial alternatives identified within this FS were developed through completion of the following tasks:

- Development of remedial action objectives (RAOs) for the specific constituents, affected media, and exposure pathways; including calculation of preliminary remediation goals (PRGs);
- Identification of remedial technologies that, alone or in combination, can treat, contain, or dispose of contaminated media;

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- Screening of the remedial technologies to eliminate those that are not able to be technically implemented, either based on attainment of chemical-specific, location specific, and action specific Applicable or Relevant and Appropriate Requirements (ARARs) or the volume of media that must be treated;
- Assembly of the remedial technologies and process options into response action (RA) alternatives which, to the maximum extent practicable, utilize permanent solutions and alternative technologies; and
- Performance of a detailed analysis of the remedial alternatives using the nine threshold, balancing, and modifying evaluation criteria listed in the National Oil and Hazardous Substances Contingency Plan (NCP).

This FS report does not address the RY, and NBG Study Areas or facility-wide groundwater. Based on the human-health and ecological risk assessments presented in the 2010 RI Report for the RFAAP-NRU (ARCADIS 2010), there are no unacceptable risks to human health or the environment under current or potential future exposure scenarios, including hypothetical residential scenarios, at the RY or in site groundwater. Therefore, No Action (unrestricted use) was recommended for the RY Study Area and for groundwater. As such, the network of 11 groundwater monitoring wells at the RFAAP-NRU will be abandoned in accordance with Virginia Department of Environmental Quality (VDEQ) and Virginia Department of Health regulations during the response actions for the BLA, IAA, BDDT, and WBG.

The NBG is not included in this FS because a Non-Time Critical Removal Action has already been completed for that site. The response action for the NBG site included the excavation of lead and chromium impacted surface soils as recommended in an Engineering Evaluation/Cost Analysis (EE/CA) Report (ARCADIS 2009) prepared specifically for that site. The corrective action (removal action) at the NBG resulted in a site closure that will not require any restrictions on the future development of the site (i.e., the site will not be restricted from residential development).

This FS report has been prepared pursuant to the United States Environmental Protection Agency's (USEPA's) *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (USEPA 1988) and guidance set forth in the NCP [40 Code of Federal Regulations (CFR) 300]. In accordance with USEPA protocols, this document provides sufficient information for the decision-makers "to adequately compare alternatives, select appropriate remedies for the site, and demonstrate satisfaction of the CERCLA remedy selection requirements in the Proposed Plan and

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the Record of Decision (ROD)." Final remedy selection for the RFAAP-NRU Study Areas will be determined following the public comment period of the Proposed Plan process and will become legally binding in the Decision Document (DD).

The risk assessment activities presented in the 2010 Remedial Investigation Report for the RFAAP-NRU concluded that media and constituents of concern (COCs) are present at the BLA, IAA, BDDT, and WBG. The identified COCs resulted in potential risks/hazards to human health under current and/or hypothetical future land use scenarios at levels greater than the USEPA target risk and/or hazard ranges. The programmatic goal of CERCLA is to mitigate the risks associated with a site to levels that are protective of the current and reasonably anticipated future use of the property. The current and anticipated future use of the RFAAP-NRU is industrial/commercial; therefore, the remedial alternatives will at a minimum need to mitigate risks associated with the industrial site worker and construction worker exposure scenarios. However, remediation to residential levels will also be evaluated and considered for each study area by the Army as it would eliminate the need for the implementation and maintenance of land use restrictions and provide maximum flexibility to the Army for future use. The constituents and media contributing to the unacceptable risks and/or hazards identified for the various exposure scenarios at the BLA, IAA, BDDT, and WBG are summarized in the table below.

Media of Concern	Exposure Scenario Risk Drivers		
	Industrial Site Worker	Construction Worker	Resident
Bag Loading Area			
Surface Soil	Lead Asbestos	Lead Copper	Lead Copper Benzo(a)pyrene Aroclor 1254 Asbestos
Igniter Assembly Area			
Surface Soil	Asbestos	NR	Copper Lead Aroclor 1254 Asbestos

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Media of Concern	Exposure Scenario Risk Drivers		
	Industrial Site Worker	Construction Worker	Resident
Building Debris Disposal Trench			
Surface Soil	NR	NR	Benzo(a)pyrene
Western Burning Ground			
Pond Sediment	NR	NR	Lead Chromium

NR: No Unacceptable Risk

In addition to surface soil, conductive flooring material in BLA and IAA buildings has also been identified as a source material containing potential constituents of concern. The flooring material, which has deteriorated in many locations due to weathering, is believed to be the primary source of the asbestos and elevated concentrations of lead, and copper that have been identified in surface soil at the BLA and IAA sites. The conductive flooring material is known to contain asbestos, which in a deteriorated/friable state could present unacceptable risks to human receptors under current and future industrial land use scenarios, as well as hypothetical future residential scenarios. As a source material, the conductive flooring will need to be addressed by a response action, regardless of the exposure scenario.

Lead-based paint and residual (non-flooring) asbestos containing materials are present at the BLA and IAA. Visual inspection of the buildings at the BLA and IAA has indicated that the concrete remains of the buildings are generally bare with no paint present; however, there are some areas where some flaking paint is present. Historical sampling has indicated that the paint at the BLA and IAA does contain lead. Suspect asbestos containing materials at the sites include pipe insulation, mastic, and joint compounds; however, these materials are only present in small quantities. Removal actions for lead based paint and non-flooring asbestos will not be presented in this FS as they are not considered to represent a continuing source to the environment. Nevertheless, the Army will as needed control access and minimize current and hypothetical future receptor exposure to these materials.

Based on the media and constituents of concern that are present at the facility the following remedial action objectives (RAOs) were developed:

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RAOs for BLA and IAA

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

RAOs for the BDDT

- Prevent human exposure to COCs in soil that would lead to an unacceptable risk or hazard for the designated use.
- Minimize the potential for COCs present in surface soils to migrate to other areas.

RAOs for WBG Sediment

- Minimize the potential for human exposure to COCs in sediment that would lead to unacceptable risk or hazard for the designated use.
- Minimize the potential for COCs present in sediment to migrate to other areas.

Upon completion of an initial screening process to identify viable technologies and process options, a series of response action alternatives were developed for surface soil at the BLA and IAA; conductive flooring at the BLA and IAA; and sediment at the WBG. These response action alternatives included:

Response Action Alternatives for BLA and IAA Surface Soils

- Alternatives SL-1: No Action.
- Alternatives SL-2: Institutional Controls.
- Alternatives SL-3: Vegetative Soil Cover and Institutional Controls.
- Alternatives SL-4: Excavation, Transportation, Off-Site Disposal and Institutional Controls.

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Response Action Alternatives for BLA and IAA Conductive Flooring

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

Response Action Alternatives for BDDT Soil

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

Response Action Alternatives for WBG Sediment

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

To determine the alternatives that will best meet the RAOs, each of the response action alternatives developed for surface soil, conductive flooring, and pond sediments are evaluated against the nine evaluation criteria specified in 40 CFR 300.430(e) of the NCP. The response action evaluation included an individual analysis of each alternative against the criteria as well as a comparative analysis between the available alternatives. The preferred alternatives are those which best satisfied the combined criteria, while also providing the most cost effective option for the Army. The evaluation criteria, which are classified as either threshold, balancing, or modifying criteria, are summarized as follows:

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- **Threshold Criteria**
 - Protection of human health and the environment;
 - Compliance with ARARs
- **Balancing Criteria;**
 - Long-term effectiveness and permanence;
 - Reduction of toxicity, mobility, or volume through treatment;
 - Short-term effectiveness;
 - Implementability; and,
 - Cost.
- **Modifying Criteria**
 - State Acceptance
 - Community Acceptance

The modifying criteria listed in the NCP will be evaluated/considered following comments on the Proposed Plan and will be discussed in the DD; as such the modifying criteria are not discussed in this FS.

While the final section of the response actions for the BLA, IAA, BDDT and WBG will be presented in the proposed plan and finalized in the DD, the following response actions are recommended for these sites. The recommended response actions provide the optimum balance among considered alternatives with respect to the evaluation criteria and represent the most cost-effective means of addressing the risk at the sites. These RAs are implementable, effective in meeting the RAOs, and are cost effective.

- At the BLA, Response Action SL-4: Excavation, Transportation, Off-Site Disposal and Institutional Controls is recommended for soil. Response Action CF-3: Removal and Off-Site Disposal of Conductive Flooring is recommended for the

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flooring material. These response actions will be implemented to achieve the RAOs under the current and intended future industrial/commercial use of the site.

- At the IAA, Response Action SL-4: Excavation, Transportation, Off-Site Disposal and Institutional Controls is recommended for soil. Response Action CF-3: Removal and Off-Site Disposal of Conductive Flooring is recommended for the flooring material. The soil response action will be implemented to achieve the residential RAOs for the soil within IAA; however, the site will still require institutional controls (ICs) for the buildings. This recommended action is more extensive than the requirements of the current and intended future industrial/commercial use of the site. However, this alternative provides the greatest lifecycle cost benefit to the Army. Note that ICs will still be required to mitigate exposure to lead and asbestos containing material within the building and therefore these actions will still result in an overall industrial level closure for the site.
- Response Action BDDT SL-2: Institutional Controls is recommended for the BDDT. This response action will be implemented to maintain the current and intended future industrial/commercial utilization of the property and will prevent residential/unrestricted development of the site. ICs will be implemented to ensure the continued protection of the rip-rap lined trench and the vegetation in the downgradient depositional area to prevent exposure and transport of COCs.
- At the WBG, Response Action SD-3: Excavation, Transportation, and Off-Site Disposal is recommended for the pond sediment. This alternative will achieve the RAOs for a residential land use scenario. While this action would go beyond the cleanup requirements for the current and intended future industrial/commercial use of the site, this option provides the greatest level of protection to human-health and the environment and would eliminate the need for restrictions on site use. Furthermore, the life-cycle costs for this alternative are only moderately more expensive than the ICs proposed under alternative SD-2.

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1. Introduction

ARCADIS U.S, Inc. (ARCADIS) has been retained by the United States Army Environmental Command (AEC) to perform Installation Restoration Program (IRP) activities at the Radford Army Ammunition Plant (RFAAP). The RFAAP facility is located in Montgomery and Pulaski Counties in southwestern Virginia and consists of two noncontiguous units: the New River Unit (NRU) and the Main Manufacturing Area (MMA). The RFAAP-MMA is located approximately 5 miles northeast of the City of Radford, Virginia. The RFAAP-NRU is located about six miles southwest of the RFAAP-MMA, near the town of Dublin, Virginia (Figure 1-1). IRP activities for both the RFAAP-MMA and the RFAAP-NRU are being conducted as part of a Performance Based Contract (PBC) awarded to ARCADIS under contract W91ZLK-05-D-0015: Task 0002. The RFAAP-NRU is managed under the Comprehensive Environmental Response and Compensation Liability Act (CERCLA).

During the initial phases of the environmental investigation process at the RFAAP-NRU a total of six Study Areas were identified at the RFAAP-NRU facility that required additional characterization. The names/abbreviations for these sites are as follows:

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

Comprehensive environmental investigation activities for the various RFAAP-NRU Study Areas were completed between 1997 and 2008. A facility-wide groundwater investigation was also conducted at the RFAAP-NRU in 2007 and 2008. The details and findings of each phase of investigation at the BDDT, BLA, IAA, RY, and WBG Study Areas and site-wide groundwater are summarized in the 2010 Remedial Investigation (RI) Report (ARCADIS 2010) prepared for the facility. The findings of the environmental investigations at the NBG were not presented in the 2010 RI Report, as they were instead presented within a separate Engineering Evaluation/Cost Analysis (EE/CA) Report (ARCADIS 2009) prepared specifically for the NBG. Based on the findings of the EE/CA for the NBG, a CERCLA Non-Time Critical Removal action was performed at that site in 2009 that will be the final corrective action for the site.

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In addition to presenting the findings of the comprehensive environmental investigations conducted at the RFAAP-NRU, the Final RI Report contained detailed human-health risk assessments (HHRA) and ecological risk assessments (ERA) for each of the five study areas and for groundwater. The HHRA and ERA activities for the RY and groundwater concluded that there were no unacceptable risks to human or ecological receptors under current industrial/commercial land use scenarios or hypothetical future residential land use scenarios. Therefore, the RI Report recommended No-Action (unrestricted land use) for the RY and groundwater. As such, the network of 11 groundwater monitoring wells at the RFAAP-NRU will be abandoned in accordance with Virginia Department of Environmental Quality (VDEQ) and Virginia Department of Health regulations during the response actions for the BLA, IAA, BDDT, and WBG.

The HHRA for the BLA, IAA, BDDT, and WBG identified unacceptable risks for either current or hypothetical future uses. The HHRA for the BLA and IAA indicated an unacceptable risk for hypothetical future industrial and/or residential receptors due to potential exposure to constituents of concern (COCs) in surface soil surrounding site buildings. The HHRA for the BDDT indicated unacceptable an risk to hypothetical future residents at the site based on the presence of COCs in surface soil within, and downgradient of, the former disposal trench. At the WBG, the risk assessment activities indicated elevated risk levels for hypothetical future residents at the site based on potential exposure to COCs in pond sediments. Therefore, the Final RI Report recommended that a feasibility study be conducted for each of these sites to evaluate potential remedial alternatives.

1.1 Purpose of Report

ARCADIS has prepared this Feasibility Study (FS) Report to present the response action alternatives that are feasible to address the constituents and media of concern that were identified for the BLA, IAA, BDDT, and WBG at the RFAAP-NRU during the remedial investigation phase of the project. The remedial alternatives identified within this FS were developed through completion of the following tasks:

- Development of remedial action objectives (RAOs) for the specific constituents, affected media, and exposure pathways;
- Identification of remedial technologies that, alone or in combination, can treat, contain, or dispose of contaminated media;

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- Screening of the remedial technologies to eliminate those that are not able to be technically implemented, either based on attainment of chemical, location, and action specific Applicable or Relevant and Appropriate Requirements (ARARs) or the volume of media that must be treated;
- Assembly of the remedial technologies and process options into response action (RA) alternatives which, to the maximum extent practicable, utilize permanent solutions and alternative technologies; and
- Performance of a detailed analysis of the remedial alternatives using the nine evaluation criteria listed in the National Oil and Hazardous Substances Contingency Plan (NCP).

This FS Report has been prepared pursuant to the United States Environmental Protection Agency's (USEPA's) *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (USEPA 1988) and guidance set forth in the NCP [40 Code of Federal Regulations (CFR) 300]. In accordance with USEPA protocols, this document provides sufficient information for the decision-makers "to adequately compare alternatives, select an appropriate remedy for the site, and demonstrate satisfaction of the CERCLA remedy selection requirements." Final remedy selection for the RFAAP-NRU Study Areas will be presented in the proposed plan and finalized in the Decision Document (DD).

1.2 Report Organization

This Feasibility Study Report is divided into the following sections:

- **Section 1 – Introduction.** This section presents the purpose and layout of the report.
- **Section 2 – RFAAP-NRU Facility Background.** This section presents a brief discussion of the location, history, and site features present at the RFAAP-NRU.
- **Section 3 – Site Summaries.** This section summarizes the environmental setting, nature and extent of contamination, and findings of the baseline risk assessments for the BLA, IAA, BDDT, and WBG.
- **Section 4 – Objectives and Requirements of Remediation.** This section identifies the constituents and media of concern for each Study Area; defines the

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remedial action objectives (RAOs); discusses the applicable or relevant and appropriate requirements (ARARs) for potential remedial actions; and presents the preliminary remediation goals (PRGs) and a discussion of the general response actions for each Study Area.

- **Section 5 – Identification and Preliminary Screening of Remedial Technologies.** This section identifies available remedial action technologies and process options for the constituents and media of concern. These remedial technologies are then screened with respect to the general categories of effectiveness, implementability, and cost.
- **Section 6 – Development of Response Action Alternatives.** This section presents various alternatives for completing the required remediation activities at each of the Study Areas. The alternatives were formulated based on the process options discussed in Section 5.
- **Section 7 – Detailed Analysis of Response Action Alternatives.** This section presents a detailed evaluation of each of the remedial alternatives developed in Section 7. This evaluation includes seven of the nine evaluation criteria specified in the NCP. The remaining two evaluation criteria specified in the NCP, State Acceptance and Community Acceptance will be addressed after completion of the FS process.
- **Section 8 – Comparative Analysis of Response Action Alternatives.** This section presents a comparative analysis for each group of alternatives relative to the various screening criteria to assist in the selection of a final remedy for each Study Area.
- **Section 9 - Recommended Response Action Alternatives.** This section presents a recommended remedial action for each of the Study Areas discussed in this report, based on the comparative analysis of the available alternatives for each media. However, the final selection of the remedial actions for each Study Area will not be made until the DD stage of the CERCLA process.
- **Section 10 – References.** This section provides citations for all documents used in the preparation of this FS Report.

2. RFAAP-NRU Facility Background

2.1 Site Location and History

The RFAAP-NRU facility is located in the mountains of southwestern Virginia in the Great Valley subprovince of the Valley and Ridge Physiographic Province. The RFAAP-NRU encompasses approximately 2,813 acres of Pulaski County, Virginia, near the town of Dublin (Figure 1-1). Access to the facility is controlled by perimeter fencing and permanently stationed security guards.

The RFAAP-NRU facility was constructed in 1940 and was originally known as the New River Ordinance 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. The RFAAP-NRU currently serves as a storage facility for operations at the MMA. The storage facilities consist of magazine type buildings that are primarily located throughout the eastern portion of the RFAAP-NRU. Paved surface roads run throughout the facility to provide access to the storage magazines and areas utilized during historical operations at the site. Rail road tracks and spurs are also located in the area of the site identified as the RY.

Despite the historical manufacturing operations that took place at the RFAAP-NRU, and its current use as a storage facility for the MMA, the majority of the land area consists of undeveloped grasslands, heavily forested areas, and agricultural tracts. A portion of the property has recently been converted for use as a military cemetery. The two areas utilized during the historical manufacturing operations, now identified as the BLA and the IAA, are reverting back to more natural conditions as trees, shrubs, and grasses have grown in the open areas of these sites. The BLA, IAA, BDDT, and WBG; along with the other Study Areas identified during the remedial investigation process (i.e., NRG and RY) are all located in the western half of the RFAAP-NRU facility and encompass a small percentage of the total land area at the RFAAP-NRU. An aerial photograph illustrating the layout of the facility and the locations of the various Study Areas is presented in Figure 2-1.

With the exception of the storage magazines and a few maintenance/support buildings, very few active structures remain at the RFAAP-NRU. The buildings at the BLA and the IAA that were utilized during the historical manufacturing operations at the site have been largely dismantled. The wooden roofs and walls that were a part of the BLA

and IAA buildings have all been removed. The remains consist of concrete foundations and walls and are referenced later in this report with their former building numbers. Several open transfer platforms also remain in the RY area.

2.2 Physiography, Geology, and Hydrogeology

A detailed discussion of the physiographic, geologic, and hydrogeologic characteristics of the RFAAP-NRU are presented within the Final RI Report for the facility (ARCADIS 2010). A conceptual representation of many of the relevant site features discussed in the RI Report is presented in the Hydrogeologic Conceptual Model contained herein as Figure 2-2.

2.3 Surface Water Hydrology

Surface water run-off at the RFAAP-NRU is largely controlled by drainage ditches that parallel the site roads. These drainage ditches, which remain dry except during heavy rainfall events, generally direct run-off toward two small stream networks, or tributaries thereof, located within the RFAAP-NRU. The two stream networks, shown in Figures 2-1 and 2-2, include the following.

- A small, unnamed, stream that flows through the southwestern portion of the facility drains the western portion of the RFAAP-NRU where the Study Areas discussed in this report are located. This stream, referred to as the unnamed creek throughout this report, is largely sourced from two small springs located within the facility. Wiggins Spring is the larger of the two springs and is located at the head waters of a pond at the WBG. The second spring is located at the headwaters of a pond at the RY. A component of flow in the unnamed creek originates from tributaries flowing from offsite to the west. After exiting the RFAAP-NRU, the creek flows to the south and enters Claytor Lake.
- Hazel Hollow Creek emerges in the eastern portion of the RFAAP-NRU from two unnamed springs and a wetland complex. This creek exits the RFAAP-NRU along the eastern boundary of the installation and continues to flow east to the New River, below the Claytor Lake dam.

Three small ponds are located within the boundaries of the RFAAP-NRU. The ponds are all located immediately downgradient of the springs discussed above, and were man-made by damming tributaries of the unnamed creek and Hazel Hollow Creek.

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The largest of these ponds is located at the WBG and is fed by Wiggins Spring. This pond was constructed in the early 1990's.

3. Site Summaries

3.1 Site Characterization Process

The Final RI Report for the RFAAP-NRU (ARCADIS 2010) presents a detailed discussion of the site history, various phases of environmental investigation, and methods and procedures that were utilized to evaluate the environmental site conditions at each of the facility Study Areas. During the site characterization process the nature and extent of contamination present at each Study Area was first evaluated by comparing the combined data sets from the various phases of investigation to human health based screening levels derived from those presented in the USEPA's Regional Screening Levels (RSLs) table (USEPA 2008a). Screening levels for soil and sediment were based on industrial and residential soil RSLs while screening levels for groundwater and surface water were based on tap water RSLs. Because the RFAAP-NRU Study Areas were potentially contaminated with multiple constituents, and because non-carcinogenic effects can sometimes be cumulative, the RSLs based on non-carcinogenic effects were adjusted to reflect a target HQ of 0.1, where applicable (i.e., the published RSLs for non-carcinogens were divided by 10). For screening levels based on cancer effects where the non-cancer screening level was less than 10 times (10x) the cancer level (tagged with c** in RSL table), the non-cancer level was used after adjustment. This adjustment was not conducted for the lead RSLs as they were based on blood lead levels rather than cancer or non-cancer endpoints. Where appropriate, surrogate RSLs were used for constituents that lack screening levels. The adjusted RSLs are referred to as industrial and residential screening levels in this report. In addition to the RSLs, inorganic constituents (i.e. metals) detected in soil and sediment were compared to the background inorganics concentrations presented in the Facility-Wide Background Study Report (IT 2001). Tables 3-1 and 3-2 present a summary of the RSLs and background inorganics concentrations, respectively, utilized during the data comparison process.

Once the nature and extent of contamination and constituents of potential concern were identified, a site specific HHRA and ERA was conducted for each RFAAP-NRU Study Area. The purpose of the risk assessments was to evaluate the potential current and future excess lifetime cancer risks (ELCR) and potential hazards to both human and ecological receptors at the site from exposure to constituents detected in soil, groundwater, surface water, and sediment at the RFAAP-NRU. The risk assessments were conducted in a manner consistent with the approach outlined in the Master Work Plan (URS 2003) in compliance with Comprehensive Environmental Response,

Compensation, and Liability Act/ Superfund Amendments and Reauthorization Act (CERCLA/SARA).

Following the risk assessment process, the BLA, IAA, BDDT, and WBG were the only RFAAP-NRU Study Areas identified in the 2010 RI Report with potentially unacceptable hazards. As such, the RI Report recommended that a FS be conducted for these areas.

The risk assessment results for the RY and facility-wide groundwater indicated that there were no unacceptable risks to current or hypothetical future receptors; therefore, No Action was recommended for those sites. Risks at the NRG were managed through a removal action as discussed in the 2009 EE/CA for the NRG (ARCADIS 2009). The following sections present a summary of the environmental setting, and nature and extent of contamination for the BLA, IAA, BDDT and WBG sites. A more detailed discussion of the site conditions, investigation and risk assessment activities for the BLA, IAA, BDDT and WBG can be found in the 2010 RI Report.

3.2 Bag Loading Area

3.2.1 Site History and Environmental Setting

The BLA is located along the southwestern boundary of the RFAAP-NRU, to the south of the RY (Figure 2-1). The BLA ran two powder bag loading production lines from 1941-1943. Ten buildings were once located onsite; however, all process equipment, wooden roofs, and wooden walls have been removed from the buildings, leaving only concrete slabs and cinder block walls. The concrete slab floors in seven of the buildings (including the second story floors of Buildings 404 and 407) were covered in a conductive flooring material that contained various metals and asbestos. The BLA site layout depicting locations of buildings and conductive flooring is presented as Figure 3-1. Removal of the walls and roofs of the buildings has exposed the conductive flooring to weathering, causing it to degrade and break away from the underlying concrete. In some cases, the flooring has degraded into a red powder-like material that has washed onto the surrounding surface soils.

Topography in the vicinity of the BLA buildings is generally flat. Vegetation is mostly limited to grass and small shrubs, although several trees have also grown adjacent to several of the buildings. Surface water is drained through a series of drainage ditches and culverts. Surface soil at the BLA consists of tan to dark brown silty-clay and clay. The BLA is located on a hilltop and the soil is typical of the Lowell Silt Loam which

forms from the weathering of limestone and interbedded shale. The Lowell Silt Loam is found on the hills and ridges throughout the NRU.

3.2.2 Nature and Extent of Contamination

The Final RI Report for the RFAAP-NRU details the site investigation/characterization activities completed at the BLA between 1997 and 2009 and provides a complete discussion on the nature and extent of contamination present at the site. Areas investigated at the BLA included: soil around buildings with conductive flooring; soil from former transformer and former elevated walkway locations; sediment from area drainage ditches; ponded water and sediments from utility vaults; and surface water and sediment from a downgradient stream. The site investigation activities also included the collection of samples of the conductive flooring and residual paint present in site buildings. A site map depicting historical sample locations at the BLA is included as Figure 3-2. Tables highlighting the number of samples; frequency of detection; and minimum and maximum concentrations for each detected constituent in soil, sediment, and surface water samples at the BLA are presented in Tables 3-3 through 3-5. Laboratory analytical data tables from each phase of investigation at the BLA, including the 2009 asbestos investigation, are presented in Appendix A.

While the analytical results compiled during the various phases of investigation at the BLA identified several constituents at concentrations above applicable screening criteria, the results of the HHRA concluded that only a few of the detected constituents would pose an unacceptable risk to current or hypothetical future receptors. A summary of the calculated human health risks and hazards for the BLA is included herein as Table 3-6. Following is a summary of the COCs (i.e., risk drivers) that were identified for the various exposure scenarios evaluated in the HHRA.

- **Current and Hypothetical Future Site Worker.** The total cumulative ELCR and HI for the site worker exposure scenario are within acceptable ranges. However, under the current and hypothetical future industrial land use scenario, exposure to lead in surface soil was determined to present an unacceptable risk. Although the predicted blood levels for the site worker were below the benchmark of 10 µg/dL, the fetal blood levels were above the benchmark. Asbestos in surface soil was also found to present an unacceptable risk to the site worker due to the potential for airborne asbestos to be generated at concentrations above the site-specific Air Action Level (AAL) developed in the HHRA. The AALs are based on a 1×10^{-4} risk level for the various exposure scenarios.

- **Hypothetical Future Construction Worker.** Lead was also found to present an unacceptable risk under the construction worker scenario due to fetal blood lead levels above the benchmark. In addition to lead, the non-cancer hazards were greater than the benchmark hazard index (HI) of 1 in the skin for the hypothetical future construction worker. Copper was the primary driver in this exposure scenario. Asbestos in soil was not found to present a risk under the construction worker scenario because the concentrations of asbestos observed in air during the 2009 activity based sampling event were below the site specific AAL for the construction worker.
- **Hypothetical Future Residents.** The ELCR values associated with hypothetical future residential exposure to soil was above the USEPA target risk range of 1×10^{-6} to 1×10^{-4} . Benzo(a)pyrene in soil was the driver for the elevated risk ranges. The non-cancer hazards for the residential land use scenario were below the benchmark HI of 1, with the exception of the hypothetical resident exposure to combined surface and subsurface soil. The drivers for the elevated HI for the resident were cobalt, copper, and Aroclor 1254. In addition, the lead evaluation indicated that predicted blood levels for the hypothetical future child resident were greater than the benchmark levels. Asbestos in surface soil was also found to present an unacceptable risk due to the potential for airborne asbestos to be generated at concentrations above AALs for adult and child residents.

The methods and procedures, risk calculations, and findings of the HHRA for the BLA are presented in detail within the Final RI Report. No unacceptable risks were identified for exposure to site surface water or sediments. While cobalt in soil was identified as a potential risk driver for the residential scenario, it was only detected slightly outside of the established background range in two samples. Because of the isolated detections, and the likelihood that they are naturally occurring, cobalt is not considered a driver for remediation at the site.

A site map depicting the historical detections of copper, lead, benzo(a)pyrene, and Aroclor 1254 in soil is presented as Figure 3-3 and a map depicting the results of XRF screening for lead is presented as Figure 3-4. A map depicting asbestos concentrations in soil is also presented as Figure 3-5. As these figures illustrate the majority of the COC concentrations above applicable screening levels were detected in surface soil immediately adjacent to the open sides of the buildings with conductive flooring. The open sides of the buildings provided a route for the degraded conductive flooring material (believed to be the primary source of the asbestos, lead, and copper detections in surface soil) to wash onto the surrounding soils. Visual observation of

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these areas confirmed that pieces of the degraded flooring are visible on ground surface and are generally located within 1-ft of the buildings, which is generally where the highest concentrations of constituents (especially asbestos) are located. Electrical transformers formerly located at the site are believed to be the source of the isolated Aroclor 1254 detections. Benzo(a)pyrene was detected in many areas of the site, including next to buildings, roads, and former elevated walkway corridors,.

A screening level ecological risk assessment (SLERA) and baseline ecological risk assessment (BERA) were completed for the BLA, to evaluate surface soil, sediment, and surface water for ecological receptors. A summary of the calculated ecological risks for terrestrial and aquatic habitats at the BLA are presented in Tables 3-7 and 3-8, respectively. Although the ecological risk assessment (ERA) identified a few constituents with hazard quotients (HQs) above the benchmark value of 1 in soil, the limited spatial distribution of the constituents led to the overall conclusion that effects are not expected for wildlife at the BLA. The methods and procedures, risk calculations, and findings of the SLERA and BERA for the BLA are presented in detail within the 2010 RI Report.

Based on the nature and distribution of the majority of the detected constituents, the primary source appears to be the degrading conductive flooring material and other building materials. Seven of the ten buildings at the BLA contained the conductive flooring material (see Figure 3-1). The results of a conductive flooring survey at the site determined that there is approximately 16,000 square feet (ft²) of conductive flooring present on building pads at the BLA. The condition of the flooring during a 2008 site investigation ranged from highly deteriorated (due to weathering) to mostly intact (e.g., sheltered locations in Buildings 404 and 405). Based on the flooring characterization sampling events conducted at the RFAAP-NRU the conductive flooring is known to contain copper and lead, inorganics that have been identified as COCs in soils at the BLA. The flooring material is also known to contain asbestos, which could present potential human health hazards in a degraded, friable state.

While conductive flooring material is believed to be the primary source of the COCs at the BLA, other building materials may have also contributed to the detections in soil. Lead based paint was identified in historic paint chip samples collected from BLA buildings that may have contributed to the lead detected in surface soils at the site. The lead based paint is not considered to represent a significant continuing source to the environment because very little paint remained on the concrete building remains during the 2008 site investigation. Suspected asbestos containing materials including pipe insulation, joint compounds, mastic, and other materials may have also released

asbestos to the soil during the building demolition activities. Small quantities of suspected asbestos containing materials still exist in some buildings; however, the remaining quantities are minimal and not believed to represent a significant threat of release to the environment. Nevertheless, the Army will, as needed, control future access to these sites to minimize potential exposure pathways.

3.3 Igniter Assembly Area

3.3.1 Site History and Environmental Setting

The IAA is located in the western portion of the RFAAP-NRU (Figure 2-1). Buildings at the site were used for igniter assembly, as well as the shipping and receiving of materials related to the IAA. The main igniter assembly buildings (Buildings 8102-1 through 8102-8) and multiple outparcel buildings at the IAA had a conductive flooring material similar to the BLA (Figure 3-6). Locations of the conductive flooring on specified buildings are depicted on this figure. The buildings were constructed with conductive flooring to prevent build up of static electrical charges which could have potentially ignited explosive materials during assembly operations. This flooring material contains various heavy inorganics and asbestos and was exposed to the weather when the wooden roof and walls were removed from the buildings. As a result, the conductive flooring has degraded into a red powder-like substance very similar to what has been observed at the BLA. In many areas, the degraded conductive flooring material has washed off the concrete pads onto surrounding surface soils.

The areas surrounding the main assembly buildings and multiple outparcel buildings are generally flat and vegetated with tall grass, shrubs, and pine trees. Previously maintained grassy areas have been allowed to revert to more natural conditions. An engineered drainage system around 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 of the unlined ditches suggests that runoff from normal rain events would infiltrate prior to arriving at the creek.

The soil at the site varies from fill material to native soil. Generally, native soil at the IAA belongs to the Groseclose Urban Land Complex soil grouping. Stratigraphic characterization indicates that the soil consists of yellowish-red to dark yellowish-brown to strong brown silt and silty clay. Below this lies a layer of mottled, moderately hard to soft clay with intermixed quartz gravel and weathered bedrock (saprolite). This

material grades downward to a tight, saprolitic clay at approximately 25 ft bgs (IT 2001).

3.3.2 Nature and Extent of Contamination

The 2010 RI Report for the RFAAP-NRU detailed the site characterization activities completed at the IAA between 1997 and 2009 and provides a complete discussion on the nature and extent of contamination present at the site. Areas investigated at the IAA include: soil surrounding all buildings that contain conductive flooring; soil surrounding the locations of former transformers; sediment from area drainage ditches; ponded water from within a subsurface concrete vault adjacent to Building 522; and building materials, including conductive flooring and paint samples. Site maps depicting historical sample locations at the IAA are included as Figure 3-7. Tables highlighting the number of samples; frequency of detection; and minimum and maximum concentrations for each detected constituent in soil and sediment samples at the IAA are presented in Tables 3-9 through 3-10. Laboratory analytical data tables from each phase of investigation at the IAA, including the 2009 asbestos investigation activities, are presented in Appendix B.

While the analytical results compiled during the various phases of investigation at the IAA identified several constituents at concentrations above applicable screening criteria, the results of the HHRA concluded that only a few of the detected constituents would pose an unacceptable risk to current or hypothetical future receptors. A summary of the calculated human health risks and hazards for the IAA is included herein as Table 3-11. Following is a summary of the COCs (i.e., risk drivers) that were identified for the various exposure scenarios evaluated in the HHRA.

- **Current and Hypothetical Future Site Worker.** Under the current and hypothetical future industrial land use scenario, exposure to organic and inorganic constituents, including lead, were within acceptable levels and benchmarks. However, asbestos in surface soil was found to present an unacceptable potential risk due to the potential for airborne asbestos to be generated at concentrations above AALs for site workers.
- **Hypothetical Future Construction Worker.** The potential risks and hazards for hypothetical future construction workers at the site, including exposure to lead, were within acceptable levels and benchmarks. Asbestos in soil was not found to present a risk under the construction worker scenario because the concentrations

of asbestos observed in air during the activity based sampling event were below the site specific AAL for the construction worker.

- **Hypothetical Future Residents.** The ELCR values associated with hypothetical future residential exposure to soil were greater than the USEPA target risk range of 1×10^{-6} to 1×10^{-4} . 2,4-Dinitrotoluene was the primary driver for the elevated risk. The non-cancer hazard for the adult residential exposure were below the benchmark HI of 1. Hazards were greater than the benchmark of 1 for the hypothetical future child resident for a number of target sites and critical effects. The risk drivers for the child resident were Aroclor 1254, copper, cobalt, and 2,4-dinitrotoluene. In addition, the lead evaluation indicated that while average predicted blood levels for the hypothetical future child resident were below benchmark levels, 17 percent of residents would have blood lead levels greater than the benchmark levels. Asbestos in surface soil was also found to present an unacceptable risk due to the potential for airborne asbestos to be generated at concentrations above AALs for adult and child residents.

The methods and procedures, risk calculations, and findings of the HHRA for the IAA are presented in detail within the Final RI Report. While 2,4-dinitrotoluene was identified as a potential risk driver in soil for the residential scenario, it should be noted that this compound was detected in only two samples from the same location during the initial sampling event at the site, and no other detections occurred in subsequent events. Similarly, cobalt was only detected outside of the background range in one sample. As such, cobalt and 2,4-dinitrotoluene are not considered drivers for remediation at the site. Potential risks associated with exposure to sediment were within the generally acceptable risk range. There are no surface water bodies within the IAA.

A site map depicting the historical detections of cobalt, lead, copper, 2,4-dinitrotoluene, and Aroclor 1254 in soil is presented as Figure 3-8 and a map depicting the results of XRF screening for lead is presented as Figure 3-9. A map depicting asbestos concentrations in soil is also presented as Figure 3-10. As these figures illustrate the majority of the COC detections with concentrations above applicable screening levels occurred in surface soil immediately adjacent to the open sides of the buildings with conductive flooring. The open sides of the buildings provided a route for the degraded conductive flooring material (believed to be the primary source of the COCs detected in soil) to wash on to the surrounding soils. Visual observation of these areas confirmed that pieces of the degraded flooring are visible on ground surface and are generally located within 1-ft of the buildings, which is generally where the highest concentrations of constituents (especially asbestos) are located.

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A SLERA and BERA were completed for the IAA to evaluate surface soil and sediment for ecological receptors. A summary of the calculated ecological risks for terrestrial habitats at the IAA are presented in Table 3-12. Although the ERA identified a few constituents with HQs above the benchmark value of 1 in soil, the limited spatial distribution of the constituents led to the overall conclusion that effects are not expected for wildlife at the IAA. The methods and procedures, risk calculations, and findings of the SLERA and BERA for the IAA are presented in detail within the 2010 RI Report.

Based on the nature and distribution of the detected constituents, the majority of the COCs appear to be the result of degrading conductive flooring material and other building materials. Twenty-nine of the 35 buildings at the IAA contained the conductive flooring material (see Figure 3-6). The results of a conductive flooring survey at the site determined that there is approximately 25,000 ft² of conductive flooring present on building pads at the IAA. The condition of the flooring during a 2008 site investigation ranged from highly deteriorated to partially deteriorated, due to weathering. Based on the flooring characterization sampling events conducted at the RFAAP-NRU the conductive flooring is known to contain lead, identified as a COC in soils at the IAA. The flooring material is also known to contain asbestos which could present potential human health hazards in a deteriorated, friable state.

While conductive flooring material is believed to be the primary source of the COCs at the IAA, other building materials may have also contributed to the detections in soil. Lead based paint was identified in historic paint chip samples collected from BLA buildings that may have contributed to the lead detected in surface soils at the site. The lead based paint is not considered to represent a continuing source to the environment because very little paint remained on the concrete building remains during the 2008 site investigation. Suspected asbestos containing materials, including pipe insulation, joint compounds, mastic, and other materials, may have also released asbestos to the soil during the building demolition activities. Small quantities of suspected asbestos containing materials still exist in some buildings; however, the remaining quantities are minimal and not believed to represent a significant threat of release to the environment. Nevertheless, the Army will impose institutional controls (ICs), as needed, at the site to control future access.

3.4 Building Debris Disposal Trench

3.4.1 Site History and Environmental Setting

The BDDT is located in the southern portion of the RFAAP-NRU (Figure 2-1). The trench was formerly an ephemeral unlined natural drainage channel that had eroded into the clay surficial soil. The trench channels surface water runoff from the surrounding area down the length of the trench towards an unnamed creek which passes through the area at the base of the BDDT. An approximately 600 ft long portion of the natural depression formed by the trench was previously utilized for the disposal of miscellaneous building debris derived from the dismantling of various structures at the RFAAP-NRU. The building debris consisted of concrete, wood, and rusted and broken drums of a black, tarry substance believed to be roofing tar. The building debris and any visibly stained soil were removed from the trench during a 1998 site investigation. The excavated material was replaced with clean fill and the trench was lined with a geotextile fabric and filled with riprap to minimize the potential for erosion. The open area downgradient of the trench did not contain any debris and was not addressed during the 1998 site restoration activities. The area downgradient of the trench is covered with a thick grass groundcover and is a natural depositional area for any soils that would have washed out of the disposal trench prior to the site restoration. An aerial photograph of the BDDT area is included as Figure 3-11 that depicts the layout of the site.

Rolling, grass-covered hills with incised drainage channels provide the setting for the BDDT. The trench runs from north to south between two hills and is approximately 650ft long by 15 ft wide. The head of the trench begins at a culvert under one of the area roadways, at an approximate elevation of 2,000 ft above mean sea level (amsl) and slopes downward to the south ending an elevation of approximately 1970 ft amsl. The area downgradient of the trench widens into an open area between the two hills before ending at a small unnamed creek that runs through the southern portion of the RFAAP-NRU. The elevation of the creek bed downgradient of the BDDT is approximately 1960 ft amsl.

The surface soils in the BDDT area generally consist of an organic-rich silty-clay approximately 1 ft deep, which is typical of topsoil throughout the vegetated areas of the RFAAP-NRU. A silty-clay layer with a lower organic content, typical of the Carbo Unit, underlies the surface soils. This unit ranges from strong brown to brownish yellow in color and extends to approximately 4 ft bgs. Bedrock is generally encountered around 5.5 ft bgs, with a saprolitic weathering zone extending from 4 ft

bgs to refusal at the bedrock surface. The reported depths are approximate, since the bedrock surface is variable and consists of weathered shale interbedded with layers of limestone and dolomite. Bedrock outcrops are visible along the length of the trench.

3.4.2 Nature and Extent of Contamination

The 2010 RI Report for the RFAAP-NRU detailed the site characterization activities completed at the BDDT between 1997 and 2008 and provides a complete discussion on the nature and extent of contamination present at the site.

Areas investigated at the BDDT include: soil underneath the former debris covered sections of the trench (currently beneath the liner and rip-rap), soil from the depositional area downgradient/south of the trench, and both surface water and sediment from the unnamed stream located downgradient of the trench (up and down gradient of the location where the trench discharged to the stream). Site maps depicting historical sample locations at the BDDT are included as Figure 3-12.

Tables highlighting the number of samples; frequency of detection; and minimum and maximum concentrations for each detected constituent in soil, sediment, and surface water samples at the BDDT are presented in Tables 3-13 through 3-15. Laboratory analytical data tables from each phase of investigation at the BDDT are presented in Appendix C.

The HHRA for the BDDT considered data collected from the entire site, as well as a second scenario that only included data collected from under the rip-rap lined portion of the site. The rip-rap only scenario was performed to evaluate if the risks differed in this portion of the site and to help determine the need to maintain the rip-rap as a long-term control at the site. The results of the HHRA concluded that the risks for the rip-rap lined portion of the site were very similar to those for the site as a whole. While the analytical results compiled during the various phases of investigation at the BDDT identified several constituents at concentrations above applicable screening criteria, the results of the HHRA for the entire site and BDDT area concluded that only a few of the detected constituents would pose unacceptable risks under a hypothetical future residential land use scenario. A summary of the calculated human health risks and hazards for the BDDT is included herein as Tables 3-16. Following is a summary of the COCs (i.e., risk drivers) that were identified for the various exposure scenarios evaluated in the HHRA.

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- **Current and Hypothetical Future Site Worker.** The total cumulative ELCR for site workers exposed to surface soil, sediment, surface water, and air at the entire BDDT is 7×10^{-5} and 2×10^{-5} for the rip rap portion only; both of which are within the USEPA target risk range of 1×10^{-6} to 1×10^{-4} . The total cumulative HI for site workers is 0.6 for the entire BDDT and 0.3 for the rip rap portion only, both of which are less than the benchmark of 1.
- **Hypothetical Future Construction Worker.** The total cumulative ELCR for hypothetical future construction workers exposed to combined surface and subsurface soil at the entire BDDT or for the rip rap portion only was 2×10^{-6} , which is within the USEPA target risk range of 1×10^{-6} to 1×10^{-4} . The total cumulative HI for hypothetical future construction workers is 1 for the entire BDDT which is equivalent to the benchmark of 1. When the HI is segregated into target site and critical effects, all hazards are less than the benchmark. For the rip rap portion only, the HI for hypothetical future construction workers is 0.4, which is less than the benchmark.
- **Hypothetical Future Residents.** The total cumulative ELCR for hypothetical future residents exposed to combined surface and subsurface soil, sediment, surface water, and air for the entire BDDT is 4×10^{-4} , which is above the USEPA target risk range of 1×10^{-6} to 1×10^{-4} . For the rip rap portion only, the ELCR for hypothetical future residents was 3×10^{-4} , which is also above the target risk range. The driver for the elevated ELCRs in both cases was benzo(a)pyrene. The total cumulative HI for hypothetical future adult residents is 0.6 for the entire BDDT and 0.4 for the rip rap portion only, which are both less than the benchmark of 1.

The total cumulative HI for hypothetical future child residents is 5 for the entire BDDT and 2 for the rip rap portion only, both of which are greater than the benchmark of 1. When the HI for the entire BDDT is segregated into target site and critical effects, hazards were only greater than the benchmark of 1 in the skin due to the presence of the maximum detected concentration of cobalt. In the rip rap area, hazards segregated by target organ are all less than 1.

The methods and procedures, risk calculations, and finding of the HHRA for the BDDT are presented in detail within the Final RI Report. Although the HHRA identified cobalt in soil as contributing to unacceptable non-cancer hazards under the residential exposure scenario, cobalt is not considered to be a true risk driver, or driver for remediation at the BDDT site. The elevated HI due to cobalt was attributed to a single sample (maximum detection) that had a concentration above the RSL and reported

background levels. Moreover, the exceedance of the background and RSL for cobalt was located downgradient of the trench and is not likely to be associated with previous site activities within the formal disposal trench.

A site map depicting the historical detections of benzo(a)pyrene in soil is presented as Figure 3-12. The horizontal extent of benzo(a)pyrene detections above the residential and industrial RSLs have been well delineated within the rip-rap lined sections of trench, as well as within the downgradient depositional area. The topography of the site also provides a good indication of where the impacts exist (i.e., upgradient/uphill sample locations were generally clean). The vertical extent of the benzo(a)pyrene impacts have also been defined by sampling efforts conducted during the remedial investigations. Within the downgradient area the higher concentrations are generally confined to surface soils (i.e. 0-1 ft bgs), with the exception of the area immediately downgradient of the rip rap that had detections above the RSLs in the interval from 1-3 ft bgs. The depth of impacts varies within the rip-rap lined area, ranging from surface soils immediately under the liner, up to 4 ft bgs in some areas. Bedrock is generally located at 5.5 ft bgs, which limits the potential for deeper impacts.

The installation of the rip-rap liner and the heavy vegetation that has become established in the depositional area have prevented erosion from transporting impacted soils downgradient areas of the stream. This has been demonstrated by the low concentrations of PAHs in the stream sediments during the 2008 sampling event. Provided that the rip-rap liner and vegetation are not damaged any additional migration of impacted soils is expected to be minimal.

A screening level ERA and BERA was completed for the BDDT, to evaluate surface soil, sediment, and surface water for ecological receptors. A summary of the calculated ecological risks for terrestrial and aquatic habitats at the BDDT are presented in Tables 3-16, 3-17, and 3-18; respectively. Although the ERA identified a few constituents with HQs above the benchmark value of 1 in soil, the results of the direct contact and food chain models indicate that adverse effects are not expected for wildlife at the BDDT.

3.5 Western Burning Ground

3.5.1 Site History and Environmental Setting

The WBG is a former burning ground located in the southwestern portion of the RFAAP-NRU, south of the IAA (Figure 2-1). The WBG was used as a burning ground

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to decontaminate explosives contaminated material and to dispose of excess and off-specification explosives/energetics. 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. A dirt road runs parallel to the open side of the former burn area, leading north to Alger Road, and south to the top of a steep slope above an unnamed pond. The dirt road was reportedly constructed on top of an ashy layer of material extending from the burning ground at the time of the pond construction. The site is surrounded with wooded areas, and is no longer active. A site map depicting the relevant features of the WBG site is presented as Figure 3-11.

Surface water runoff from the former burn area is expected to flow to the southwest. A small, unlined drainage ditch captures some runoff, channeling flow to the northwest before intersecting a second ditch that drains into the pond. The unnamed pond, which is approximately 3.6 acres in size, was constructed south of the WBG 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.

Stratigraphic characterization within the area generally indicates that the subsurface consists of a layer of brownish-yellow, hard to very hard, clay that is variably mixed with gray gravel, to a depth of approximately 6 ft. An approximately 3.5 ft thick brownish-yellow soft clay seam underlies the hard clay. Below this layer, the soil grades to a gray, hard saprolitic clay (weathered bedrock product). Within the bermed burn area, the depth to bedrock was slightly shallower, ranging from 1 ft at the northern end to 4 ft at the southern end. Soils at the site have been characterized as Lodi loam, a member of the Wurno-Newbern-Faywodd Silt Loam complex and characterized by a moderate permeability and typical depth to bedrock of 4 to 6 ft.

3.5.2 Nature and Extent of Contamination

The 2010 RI Report for the RFAAP-NRU detailed the site characterization activities completed at the WBG between 1997 and 2008 and provides a complete discussion on the nature and extent of contamination present at the site. Areas that were investigated included the former burning area; the access road on the northwest side of the burn area; surface and subsurface soils located downgradient from the burn area; the berms surrounding the burn area; sediments and surface water in the unnamed pond; sediments and surface water in the unnamed creek downgradient of

the pond; and a former transformer location. A test pitting program completed in 1999 effectively removed all of the soils containing elevated constituent concentrations from the former burn area and replaced them with clean fill, thus removing the source areas from the site. Site maps depicting historical sample locations at the WBG are included as Figures 3-12 and 3-13. Laboratory analytical data tables from each phase of investigation at the WBG are presented in Appendix C. Tables highlighting the number of samples, frequency of detection, and minimum and maximum concentrations for each detected constituent in soil, sediment, and surface water samples at the WBG are presented in Tables 3-13 through 3-15.

While the analytical results compiled during the various phases of investigation at the WBG identified several constituents at concentrations above applicable screening criteria, the results of the HHRA concluded that none of the detected constituents in soil would pose an unacceptable risk to current or hypothetical future receptors. However, chromium and lead within the pond sediments, were found to drive risks under a hypothetical future residential land use scenario. A summary of the calculated human health risks and hazards for the WBG is included herein as Table 3-16. Following is a summary of the various exposure scenarios evaluated in the HHRA.

- **Current and Hypothetical Future Site Worker.** Under the current and hypothetical future industrial land use scenario, the potential risks and hazards for current and hypothetical future industrial site workers, including exposure to lead, were within acceptable levels and benchmarks.
- **Hypothetical Future Construction Worker.** The potential risks and hazards for hypothetical future construction workers at the site, including exposure to lead, were within acceptable levels and benchmarks.
- **Hypothetical Future Residents.** Under a hypothetical future residential land use scenario, potential hazards associated with chromium in the pond sediment for the child resident had a HI of 6, which is above the benchmark of 1. Elevated blood lead levels within adult and child residents were also driven by the concentration of lead in the pond sediments. No other scenarios evaluated resulted in an unacceptable risk level.

While not evaluated specifically in the HHRA, the Army has considered the potential risks posed to children who might participate in a semi-annual fishing rodeo held at the WBG pond. The fishing rodeo would occur two days per year. Individuals who catch fish would be allowed to retain them. However, as the pond would be stocked with fish

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just before the rodeo begins, it is not likely that they would accumulate any COPCs during that time. Thus, the only potential risk to children who participate in the rodeo would be through direct contact with sediments.

The HHRA included an evaluation of potential exposures of hypothetical future residential children to pond sediment and demonstrated that the noncancer HI would be two (2), under the conditions assumed. This HI was derived using an exposure frequency of 48 days/year. Given that the rodeo would occur 2 days/year, the maximum exposure frequency for a young child would be 2 days per year. This is lower than the frequency assumed in the residential scenario by a factor of 24. Since the calculated HI is directly proportional to the exposure frequency, the HI of 2 calculated for the hypothetical child resident would be reduced to 0.07 for the child participating in the fishing rodeo and thus would be well below any level of concern.

The Army has also considered hypothetical risks to site workers if the pond is drained in the future. The original risk assessment considered worker exposures to pond sediments using an exposure frequency of 26 days/year, resulting in an estimated cancer risk of $2\text{E-}06$ and noncancer hazard index of 0.1. If the pond were to be drained, however, the sediments would be available for more frequent direct contact by site workers, so that the potential risks and hazards could increase. Thus an analysis was conducted to estimate potential risks and hazards to future site workers who might contact dry pond sediments on a regular basis.

Under this hypothetical scenario, the potential cancer risk for the industrial worker is $8\text{E-}06$ and the resulting HI is 1. Thus, if the pond were to be drained so that site workers had more frequent contact with the dried sediments, the resulting cancer risks and noncancer hazards would be higher but would still be within the acceptable risk range.

Finally, the Army has also considered potential risks to hypothetical future adult and child residents in the event that the pond is drained so that sediments are exposed and accessible for contact. In the original risk assessment, estimated cancer risks and noncancer hazards for future residents fell within the acceptable risk range. If the exposure point concentrations for sediments were used as exposure point concentrations for the soil contact pathways, risks would increase, due to higher EPCs for some constituents, but would still be in the acceptable risk range. However, the hazard index for children would exceed the benchmark of 1 due to higher concentrations of inorganic constituents. In addition, the EPC for lead in sediment

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(3,610 mg/kg) substantially exceeds the PRG of 400 mg/kg that was developed for the residential exposure scenario. Thus risks due to lead would not be acceptable.

The methods and procedures, risk calculations, and findings of the HHRA for the WBG are presented in detail within the Final RI Report. A site map depicting the historical concentrations of chromium and lead in pond sediment is presented as Figure 3-14. Elevated concentrations of chromium and lead in pond sediment appear to be limited to a small area directly south of the former burn area. No unacceptable risks were identified with exposure to site surface water or soil.

A SLERA and BERA were completed for the WBG to evaluate surface soil, sediment, and surface water for ecological receptors. Tables summarizing the calculated ecological risks for terrestrial and aquatic habitats at the WBG are presented in Tables 3-17 and 3-18, respectively. Although the ERA identified a few constituents with HQs above the benchmark value of 1 in surface soils, sediment, and surface water, the limited spatial distribution of the constituents led to the overall conclusion that effects are not expected for wildlife at the WBG. The methods and procedures, risk calculations, and findings of the SLERA and BERA for the WBG are presented in detail within the 2010 RI Report.

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4. Remedial Action Objectives

This section identifies and evaluates the objectives and requirements of remediation as a preparatory step to developing and screening remedial alternatives for the RFAAP-NRU Study Areas.

4.1 Remedial Action Objectives

Remedial Action Objective (RAOs) are site-specific clean-up objectives established for protecting human health and the environment. RAOs specify contaminants and media of concern, potential exposure pathways and receptors, and preliminary remediation goals (PRGs) [40 CFR 300.430 (e)(2)(i)]. RAOs indicate a contaminant level and an exposure route, rather than a contaminant level alone, because protection of human and ecological receptors may be achieved by reducing or eliminating exposure pathways as well as by reducing contaminant concentrations (USEPA, 1988a). The RAOs for the RFAAP-NRU were developed based on the results of the human-health and ecological risk assessments for the BLA, IAA, BDDT, and WBG presented in Section 3.

The following subsections discuss qualitative RAOs for each targeted area at the RFAAP-NRU. Quantitative RAOs for each area are presented in Section 4.4. RAOs are specified for surface soil and conductive flooring at the BLA and IAA; and pond sediments at the WBG.

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

Based on the findings of the site investigations and risk assessment activities completed at the BLA and the IAA, constituents of concern are present in surface soil that contribute to unacceptable risks under current and/or hypothetical future exposure scenarios. The primary source of the identified COCs in surface soil at both the BLA and IAA is conductive flooring material in site buildings, although there were also other contributing sources such as transformers and other building materials. Because of the similarities of these sites, the general RAOs for the BLA and the IAA will be identical.

- Minimize the potential for future releases of COCs from the conductive flooring to the surrounding environment.

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- Prevent human exposure to COCs in soil and the flooring material that would lead to an unacceptable risk or hazard for the designated use.
- Minimize the potential for COCs present in surface soils to migrate to other areas.

4.1.2 Building Debris Disposal Trench Soils

Based on the findings of the site investigations and risk assessment activities completed at the BDDT, constituents of concern are present in surface soil that contribute to unacceptable risks under current and/or hypothetical future exposure scenarios. Therefore the RAOs for the BDDT are:

- Prevent human exposure to COCs in soil that would lead to an unacceptable risk or hazard for the designated use.
- Minimize the potential for COCs present in surface soils to migrate to other areas.

4.1.3 Western Burning Ground Sediments

Based on the findings of the site investigations and risk assessment activities, there are no unacceptable risks at the site under a current or future industrial land use scenario. However, lead and chromium detected in sediment at the WBG pond do contribute to an elevated risk level under a hypothetical future residential child exposure scenario. Therefore, the RAOs for the WBG include:

- Prevent human exposure to COCs in sediment that would lead to unacceptable risk or hazard for the designated use.
- Minimize the potential for COCs present in sediment to migrate to other areas.

4.2 Applicable or Relevant and Appropriate Requirements

This section describes the ARARs and to-be-considered (TBC) guidance that may be applied to actions at the RFAAP-NRU. The ARARs are divided into three categories: chemical-specific, action-specific, and location-specific requirements. ARARs are defined as cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law or regulations that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a site. The

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ARARs are used to develop quantitative RAOs, determine the appropriate extent of site cleanup, and govern the implementation and operation of the selected action. The TBC information is comprised of non-promulgated advisories or guidance issued by federal or state governments that are not legally binding but may be necessary to ensure protection of public health and the environment (USEPA, 1988b).

4.2.1 Definition of Applicable or Relevant and Appropriate Requirements

The National Contingency Plan [(NCP, 40 CFR 300.400(g)], discusses two ARAR components: (1) applicable requirements, and (2) relevant and appropriate requirements. Requirements under federal or state law may be either applicable or relevant and appropriate to CERCLA clean-up actions, but not both. However, requirements must be both relevant and appropriate for compliance to be necessary. The definitions of these types of requirements are as follows:

- Applicable Requirements - “cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental, state environmental, or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, removal action, location, or other circumstance found at a CERCLA site” (40 CFR 300.5).
- Relevant and Appropriate Requirements - “cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental, state environmental, or facility siting laws that, while not ‘applicable’ to a hazardous substance, pollutant, contaminant, removal action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site” (40 CFR 300.5).

Once a federal or state law has been identified as an ARAR, the specific requirements must be distinguished as either substantive or administrative. Substantive requirements pertain directly to the actions or conditions at a site, while administrative requirements facilitate their implementation. USEPA recognizes that certain administrative requirements, such as consultation with state agencies and reporting, are accomplished through the state involvement and public participation requirements of the NCP. The CERCLA program has its own set of administrative procedures that ensure proper implementation of CERCLA. The application of additional or conflicting administrative requirements could result in delay or confusion in the implementation of

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a remedial action. To ensure that CERCLA response actions proceed as rapidly as possible, USEPA has reaffirmed this position in the NCP (USEPA, 1988b).

CERCLA on-site remedial response actions must only comply with the substantive requirements of an ARAR and not the administrative requirements to obtain federal, state, or local permits [CERCLA §121(e)]. The NCP defines on-site as “the areal extent of contamination and all areas in very close proximity to the contamination necessary for implementation of the response action.” Off-site actions need only comply with applicable requirements, not relevant and appropriate requirements. However, off-site actions must comply fully with both substantive and administrative requirements (USEPA, 1988b).

In the absence of federal- or state-promulgated regulations, there are many criteria, advisories, and guidance values that are not legally binding, but may serve as useful guidance for remedial actions. These are not potential ARARs, but are TBC guidance. These guidelines or advisory criteria should be identified if used to develop clean-up goals or if they provide important information needed to properly design or perform a remedial action. Two categories of TBC information are (1) technical information on how to perform or evaluate remedial or response actions; and (2) regulatory policy or proposed regulations (USEPA, 1988b).

4.2.2 Identification of ARARs

Because of their site-specific nature, identification of ARARs requires evaluation of federal, state, and local environmental and health regulations regarding chemicals of concern, site characteristics, and proposed remedial alternatives. The USEPA provides guidance on three categories of ARARs specific to the contaminant, location, or action as discussed below (USEPA, 1988b):

- Chemical-specific requirements set health- or risk-based concentration limits or ranges for specific substances in various environmental media.
- Location-specific requirements set restrictions on activities according to characteristics of the site or its immediate environs (e.g., regulations pertaining to development in a 100-year floodplain). These requirements may apply if the CERCLA site is located in such a restricted area.
- Action-specific requirements set controls or restrictions on specific activities related to the management of hazardous substances (e.g., RCRA standards for design

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and operation of hazardous waste management facilities). These requirements are not chemical-specific, but are specific to specific actions.

The following subsections provide an overview of these three ARAR categories as they apply to the remedial actions at the RFAAP-NRU.

4.2.2.1 Chemical-Specific ARARS

Chemical-specific requirements establish health or risk-based concentration (RBC) limits or ranges for specific hazardous substances in various environmental media. These standards provide media cleanup levels or a basis for calculating cleanup levels for chemicals of concern. Chemical-specific standards are also used to indicate an acceptable level of discharge, to determine treatment and disposal requirements for a particular remedial activity, and to assess the effectiveness of a RA.

There are no chemical-specific ARARs identified for the COCs identified in soils, sediments, or conductive flooring at the BLA, IAA, BDDT, and WBG at RFAAP-NRU. Neither the federal government nor the State of Virginia has promulgated chemical-specific standards, requirements, criteria, and/or limitations that are applicable or relevant and appropriate for remediation of soils, sediments, or flooring materials. However, federal and state risk-based guidance protocols will be used for the calculation of remediation goals. The potential chemical-specific TBC guidance identified for remedial actions at the RFAAP-NRU are presented in Table 4-1.

4.2.2.2 Location-Specific ARARS

Location-specific ARARs may affect site activities and represent restrictions placed on the concentration of hazardous substances or the conduct of activities because of the location or characteristics of a site. These ARARs set restrictions relative to the presence of specific natural or manmade features or potentially affected resources at a disposal or clean-up site. The location-specific ARARs that have been identified for the RFAAP-NRU are summarized in Table 4-2.

4.2.2.3 Action-Specific ARARS

Action-specific ARARs set controls or restrictions on particular kinds of activities related to the management of hazardous waste and are triggered by the type of remedial action being considered. Action-specific ARARs involve design, implementation, and performance requirements that are generally technology- or

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activity-based. Selection of a particular remedial action may invoke appropriate action-specific ARARs that may specify particular performance standards or technologies, as well as specific environmental levels for discharged or residual chemicals. Action-specific ARARs may be established under CERCLA, the Clean Air Act (CAA), the Clean Water Act (CWA), the SDWA, the Toxic Substances Control Act (TSCA), or other laws. The action-specific ARARs that have been identified for the RFAAP-NRU are summarized in Table 4-3.

4.3 Development of Numerical Preliminary Remediation Goals

Numerical remediation goals are a subset of the RAOs and they provide the measurable goals that drive remedial actions for each medium. In the preamble to the NCP, the USEPA explains that remediation goals should be based on ARARs unless they are unavailable. In the cases where remediation goals are not based on ARARs, numerical preliminary remediation goals (PRGs) were developed following the USEPA guidance document entitled *Risk Assessment Guidance for Superfund: Volume I – Human Health Evaluation Manual (Part B, Development of Risk Based Preliminary Remediation Goals)*, Interim, December 1991 (USEPA 1991a) and USEPA's Office of Solid Waste and Emergency Response (OSWER) Directive 9355.0-30, *Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions* (USEPA 1991b).

The first step in developing numerical PRGs was to identify those environmental media that, in the baseline human health risk assessment, present either a cumulative current or future potential cancer risk greater than 1×10^{-4} or a cumulative noncarcinogenic target-organ based hazard index (HI) greater than 1. The next step was to identify COCs within each medium of concern that contribute substantially to the cancer risks or hazard quotients. Following identification of media of concern and risk/hazard drivers, PRGs were developed and refined by considering ARARs, site-specific exposures, uncertainties and other technical factors (e.g., method detection limits).

4.3.1 Constituents and Media of Concern

The environmental investigations completed at the BLA, IAA, BDDT and WBG have successfully defined and delineated the nature and extent of effects that historical operations and/or degrading building materials have had on the environmental media at those site. The HHRAs and ERAs for each study area, discussed in Section 3, identified the risk/hazard drivers by media that contributed to unacceptable risk and hazard levels under various exposure scenarios. The following subsections summarize the constituents and media of concern for the various exposure scenarios

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at the BLA, IAA, BDDT, and WBG. The risk/hazard drivers for each area and exposure scenario are also summarized in Table 4-4.

4.3.1.1 Bag Loading Area

The HHRA for the BLA identified the following risk/hazard drivers:

- **Industrial Site Worker Scenario** – Lead in surface soil was the primary risk driver identified at the BLA under the industrial site worker scenario. While the predicted blood lead levels for the site worker were below the benchmark, the fetal blood levels were above the benchmark. The predicted ELCR associated with industrial level exposure to the other constituents present in soil, sediments, and surface water at the BLA were within or below the generally accepted target risk range of 1×10^{-6} to 1×10^{-4} . The total non cancer hazards for the BLA were also well below the benchmark HI of 1 for soil, sediment, and surface water under the industrial exposure scenario.
- **Construction Worker Scenario** – Copper in surface soil was identified as the risk driver at the BLA under the construction worker scenario. This constituent resulted in a HI above the benchmark of 1. The predicted ELCR associated with exposure to surface and subsurface soil under the construction worker scenario was within the USEPA target risk range. However, concentrations of lead in soil resulted in a 95th percentile fetal blood lead level that exceeded USEPA's benchmark of 10 µg/dL.
- **Resident Exposure Scenario** – Copper, lead, Aroclor 1254 and benzo(a)pyrene were determined to be risk drivers under the residential land use scenario. Exposure to copper and Aroclor 1254 in surface soil resulted in a HI above 1 for the child resident. Exposure to lead in surface soil resulted in predicted blood levels above the benchmark in the child resident. Benzo(a)pyrene in soil contributed to an ELCR above the USEPA target risk range for the adult and child resident.

In addition to the above listed constituents, chrysotile asbestos fibers were identified in surface soil around the BLA buildings where degraded conductive flooring material is present. The asbestos concentrations in soil drop off rapidly within a short distance from the buildings and are generally at or below 0.1% by weight. For example, a surface soil sample collected 1-ft from Building 406 where visible amounts of flooring were present at ground surface indicated a concentration of 9.4% asbestos by weight

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while the soil sample collected 5-ft from Building 406, where no degraded flooring was visible on the ground surface, had an asbestos concentration of <0.1% by weight, confirming that the high concentrations are generally confined to the area immediately adjacent to the building where visible amounts of degraded flooring are present in soil. Activity based air sampling conducted at two of the BLA buildings demonstrated that intensive soil disturbance activities immediately adjacent to the site buildings have the potential to generate airborne asbestos at concentrations that are above site specific AALs developed for the site worker, hypothetical adult resident, and hypothetical future child resident exposure scenarios. This indicates that asbestos in soil presents an unacceptable risk to these receptors. The asbestos concentrations in air did not exceed the AAL for the construction worker scenario. No asbestos fibers were generated in air during the activity based sampling in areas where asbestos concentrations in soil were below 0.1% by weight.

The ERA activities for the BLA indicated the potential for risk to individual ecological receptors (i.e., short-tailed shrew and the American robin) due to Hazard Quotients (HQs) greater than 1 for Aroclor 1254, cadmium, copper, lead, and zinc in surface soil. However, the ERA concluded that adverse population-level effects from these constituents would not be expected based on the limited areal distribution of the constituents in soil. Therefore, the constituents identified in the ecological risk assessment will not be drivers for remediation at the site. However, it should be noted that the constituents identified during the ERA are generally co-located with constituents that are drivers for potential remediation under the human-health scenarios.

In addition to surface soil, conductive flooring material in BLA buildings has also been identified as a medium of concern. This material, which is present in 7 of the 10 buildings at the BLA, has deteriorated in many locations and is believed to be the primary source of the COCs that have been identified in surface soil. This material is also known to contain asbestos, which in a deteriorated/friable state could present unacceptable risks to human receptors. As a source material, the conductive flooring will need to be addressed as part of the selected response action for the BLA.

Building materials other than conductive flooring (e.g. lead based paint, sealing compounds, roofing shingles, pipe insulation, etc.) may have also contributed to the constituent detections that have been observed in soil at the site. Lead-based paint and asbestos are present at the BLA, although visual inspections of the structures at the BLA indicate that very little paint or asbestos materials remains in/on the buildings. Due to the limited quantity of the potential lead-based paint and suspect asbestos

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containing building materials at the site, these materials will not be addressed in this FS. However, the Army may control access to the BLA buildings as necessary to minimize the potential for exposure to lead based paint and asbestos.

All electrical transformers, which are believed to be the primary source of the isolated PCB detections, have also been removed from the site.

Summary of Risk/Hazard Drivers for Potential Exposure Scenarios at the BLA

Driver ¹	Industrial Site Worker Scenario	Construction Worker Scenario	Hypothetical Future Residential Scenario ²
Copper		X	X
Lead	X	X	X
Aroclor 1254			X
Benzo(a)pyrene			X
Asbestos	X		X
1. The risk drivers were identified in the HHRA. No constituents were identified as drivers by the ERA. 2. Hypothetical future residential scenario includes both adult and child exposure			

4.3.1.2 Igniter Assembly Area

The HHRA for the IAA identified the following risk/hazard drivers:

- **Industrial Site Worker Scenario** – No risk and/or hazard drivers were identified at the IAA under the industrial site worker scenario. The predicted ELCRs, HIs, and blood lead levels were all within or below the USEPA target risk ranges.
- **Construction Worker Scenario** – No risk and/or hazard drivers were identified under the construction worker scenario. The total cumulative ELCR for exposure to soil and sediment were within the USEPA target risk range. Although the cumulative HI for the hypothetical future construction worker was above 1, the HIs

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were all below the benchmark of 1 when segregated into target site and critical effects. The predicted blood level estimates for the construction worker were below the benchmark of 10 µg/dL, and the fetal blood level estimates were equivalent to the benchmark of 10 µg/dL.

- **Resident Exposure Scenario** – Aroclor 1254 and lead were determined to be the risk/hazard drivers under the hypothetical residential exposure scenario. While the cumulative non-cancer HI for adult residents was equal to the benchmark of 1, the cumulative HI for child residents was above the benchmark due to Aroclor 1254 detections in soil. Lead in soil was determined to pose a potential risk to residents due to predicted fetal blood levels above the benchmark. The child receptor model also predicted that 21% of the child population would have blood lead levels above the benchmark when exposure was evaluated over a 7 year period. It should be noted that in addition to Aroclor 1254 and Lead, 2,4-dinitrotoluene and cobalt were also identified as potential risk drivers for soil under the residential scenario. However, 2,4-dinitrotoluene and cobalt were eliminated as potential drivers for remediation at the site because of the extremely limited extent of the detections. 2,4-dinitrotoluene was detected in only two samples from the same location during the initial sampling event at the site, and no other detections occurred in subsequent events. Similarly, cobalt was only detected outside of the background range in one sample.

In addition to the above listed constituents, chrysotile asbestos fibers were identified in surface soil around the IAA buildings where degraded conductive flooring material has washed off the building pads. The asbestos levels are highest immediately adjacent to the building and drop off very quickly with distance. Asbestos concentration in soil are generally at or below 0.1% by weight at distances of 5-ft and greater from the building pads. Three surface soil samples collected 1-ft from IAA buildings during the 2009 investigation had asbestos concentration above 1% by weight (IAA-SS045A [2.2%], IAA-SS046A [2.6%], and IAA8102-SS001A [17.2%]). Degraded conductive flooring was visible on the ground surface at these three locations. Soil samples collected 5-ft from these buildings, where no degraded flooring was visible, all had asbestos concentrations equal to or below 0.1% by weight, confirming that the high concentrations are confined to the areas immediately adjacent to the building. Activity based air sampling conducted at one of the IAA buildings demonstrated that intensive soil disturbance activities immediately adjacent to the site building, where asbestos concentrations are highest, has the potential to generate airborne asbestos at concentrations that are above site specific AALs developed for the site worker, hypothetical adult resident, and hypothetical future child resident exposure scenarios.

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The detected concentrations did not exceed the AAL for the construction worker scenario. Activity based sampling indicated that no asbestos fibers were generated in air in areas where asbestos concentrations in soil were below 0.1% by weight.

The ERA activities for the IAA indicated the potential for risk to individual ecological receptors (i.e., short-tailed shrew and the American robin) due to Hazard Quotients (HQs) greater than 1 for Aroclor 1254, Aroclor 1260, cadmium, copper, lead, and zinc in surface soil. However, the ERA concluded that adverse population-level effects from these constituents would not be expected based on the limited areal distribution of the constituents in soil. Therefore, the constituents identified in the ecological risk assessment will not be drivers for remediation at the site. However, it should be noted that the constituents identified during the ERA are generally co-located with constituents that are drivers for potential remediation under the human-health scenarios.

As with the BLA, conductive flooring material in IAA buildings has also been identified as a media of concern. This material, which is present in 29 of the 36 buildings at the IAA, has deteriorated and is believed to be the primary source of the COCs that have been identified in soil. The flooring material is also known to contain asbestos, which in a deteriorated/friable state could present unacceptable risks to human receptors. As a source material, the conductive flooring will need to be managed as part of the selected response action for the IAA.

Building materials other than conductive flooring (e.g. lead based paint, sealing compounds, roofing shingles, pipe insulation, etc.) may have also contributed to the constituent detections that have been observed in soil at the site. Lead-based paint and asbestos are present at the IAA, although visual inspections of the structures at the IAA indicate that very little paint or suspect asbestos materials remains in/on the buildings. Due to the limited quantity of the lead-based paint and asbestos containing materials at the site, these materials will not be addressed in this FS. However, the Army may control access to the IAA buildings as necessary to minimize the potential for exposure to lead based paint and asbestos.

The electrical transformers that are believed to have been the source of the isolated PCB detections in soil have also been removed from the site; with the exception of one transformer located adjacent to Building 8106. This transformer appears to be in good condition with no evidence of leaking.

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Summary of Risk/Hazard Drivers for Potential Exposure Scenarios at the IAA

Driver ¹	Industrial Site Worker Scenario	Construction Worker Scenario	Hypothetical Future Residential Scenario ²
Lead			X
Copper			X
Aroclor 1254			X
Asbestos	X		X
1. The risk drivers were identified in the HHRA. No constituents were identified as drivers by the ERA. 2. Hypothetical future residential scenario includes both adult and child exposure			

4.3.1.3 Building Debris Disposal Trench

The HHRA for the BDDT identified the following risk/hazard drivers:

- **Industrial Site Worker Scenario** – No risk and/or hazard drivers were identified at the BDDT (when evaluated for both the entire site and the rip-rap only portions) for the industrial site worker scenario. The predicted ELCRs, HIs, and blood lead levels were all within or below the USEPA target risk ranges.
- **Construction Worker Scenario** – No risk and/or hazard drivers were identified at the BDDT (when evaluated for both the entire site and the rip-rap only portions) for the future construction worker scenario. The total cumulative ELCR for exposure to combined surface and subsurface soil at the entire BDDT and the rip-rap only portion was within the USEPA target risk range. The total cumulative HI for hypothetical future construction workers is 1 for the entire BDDT, which is equivalent to the benchmark of 1. When the HI is segregated into target site and critical effects, all hazards are less than the benchmark.
- **Resident Exposure Scenario** – Benzo(a)pyrene was determined to be the risk/hazard driver under the hypothetical residential exposure scenario. The total cumulative ELCR for hypothetical future residents exposed to combined surface

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and subsurface soil, sediment, surface water, and air for the entire BDDT is 4×10^{-4} , which is above the USEPA target risk range of 1×10^{-6} to 1×10^{-4} . For the rip rap portion only, the ELCR for hypothetical future residents was 3×10^{-4} , which is also above the target risk range.

The total cumulative HI for hypothetical future adult residents is 0.6 for the entire BDDT and 0.4 for the rip rap portion only, which are both less than the benchmark of 1. The total cumulative HI for hypothetical future child residents is 5 for the entire BDDT and 2 for the rip rap portion only, both of which are greater than the benchmark of 1.

When the HI for the entire BDDT is segregated into target site and critical effects, hazards were only greater than the benchmark of 1 in the skin due to the presence of cobalt. In the rip rap area, hazards segregated by target organ are all less than 1. Although cobalt was identified as a potential risk drivers for soil under the residential scenario. Cobalt was eliminated as a potential driver for remediation at the site because of the extremely limited extent of the detections.

A SLERA and BERA were completed for the BDDT, to evaluate surface soil, sediment, and surface water for ecological receptors, and food chain modeling was evaluated for all those constituents identified as bioaccumulative. The BERA indicated that all constituents evaluated in the terrestrial and/or aquatic food chain models had HQs less than or equal to 1; and as such the SLERA and BERA for direct contact and the constituents evaluated in the terrestrial and aquatic food chain models indicate that adverse effects are not expected for wildlife at the BDDT.

Summary of Risk/Hazard Drivers for Potential Exposure Scenarios at the BDDT

Driver ¹	Industrial Site Worker Scenario	Construction Worker Scenario	Hypothetical Future Residential Scenario ²
Benzo(a)pyrene			X
1. The risk drivers were identified in the HHRA. No constituents were identified as drivers by the ERA. 2. Hypothetical future residential scenario includes both adult and child exposure			

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4.3.1.4 Western Burning Ground

The HHRA for the WBG identified the following COCs:

- **Industrial Site Worker Scenario** – No risk and/or hazard drivers were identified at the WBG under the industrial site worker scenario. The predicted ELCRs, HIs, and blood lead levels were all within or below the USEPA target risk ranges.
- **Construction Worker Scenario** – No risk and/or hazard drivers were identified under the hypothetical construction worker scenario. The predicted ELCRs, HIs, and blood lead levels were all within or below the USEPA target risk ranges.
- **Resident Exposure Scenario** – Chromium and lead in the WBG pond sediments were determined to be risk drivers/COCs under the hypothetical future resident scenario. Chromium in sediment was determined to result in an HI slightly greater than the benchmark of 1 for the child resident. The elevated lead concentrations in the pond sediments resulted in predicted blood lead levels above the benchmark for adult and child residents.

The ERA activities for the WBG indicated the potential for risk to individual ecological receptors (i.e., short-tailed shrew, American robin, mink, and Great Blue Heron) due to Hazard Quotients (HQs) greater than 1 for lead and zinc in soil, and dioxins, dibenzo(a)anthracene, lead and zinc in sediments/surface water. However, the ERA concluded that adverse population-level effects from these constituents would not be expected based on the limited areal distribution of the constituents. Therefore, the constituents identified in the ecological risk assessment will not be drivers for remediation at the site. However, it should be noted that the constituents identified during the ERA are generally co-located with constituents that are drivers for potential remediation under the human-health scenarios.

A test pitting program completed at the WBG in 1999 removed the surface soils and ashy materials from the former burning ground area. The remaining chromium and lead levels in soil at the WBG are generally within background ranges and/or below applicable risk ranges; therefore, the source of the elevated chromium and lead in the pond sediments appears to have been eliminated.

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Summary of Risk/Hazard Drivers for Potential Exposure Scenarios at the WBG

Drivers ¹	Industrial Site Worker Scenario	Construction Worker Scenario	Hypothetical Future Residential Scenario ²
Chromium			X
Lead			X
1. The risk drivers were identified in the HHRA. No constituents were identified as drivers by the ERA. 2. Hypothetical future residential scenario includes both adult and child exposure			

4.3.2 Calculation of Preliminary Remediation Goals

Promulgated clean-up values (i.e., ARARs) for the protection of human health have not been established for the risk/hazard drivers in soil or sediment; therefore, risk-based PRGs were calculated for the non-asbestos risk/hazard drivers in these media at the BLA, IAA, BDDT and WBG. The driver for calculating PRGs at the RFAAP-NRU is the RAO of preventing human exposure to risk/hazard drivers in soil or sediment that would lead to unacceptable risk or hazard for the designated use. In order to achieve this RAO, the PRGs establish clean up values for soil and/or sediment that will 1) achieve a cumulative potential cancer risk no greater than 10^{-4} to 10^{-6} and an HI less than 1; and 2) achieve a predicted blood level less than 10 µg/dL with a 95% probability. PRGs were not calculated for the conductive flooring material because it is classified as a source material that will need to be managed regardless of concentration.

PRGs for the asbestos impacts in soil cannot be calculated because there is not an established method for calculating the concentration of asbestos in air that can be generated by a given level of asbestos in soil. Considering the main route of asbestos toxicity is through the inhalation of fibers, there is no way to assign a risk level based on the concentration of asbestos in soil. Based on this information, USEPA recommends that the results of activity-based air sampling be utilized to determine whether disturbance of soils in areas known to contain asbestos can result in the mobilization of asbestos into air at levels that could be potentially hazardous levels to individuals engaged in activities there. Therefore, the results of the activity based

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sampling performed at the BLA and IAA in 2009 will be used to develop the remedial goals for asbestos, as discussed in Section 4.3.2.3 below.

4.3.2.1 Risk-Based, Pathway-Specific PRGs

Risk-based pathway-specific PRGs for risk drivers (except lead and asbestos) in soils and sediments, based on potential cancer risks, were derived by considering potential exposures through incidental ingestion (PRG_o), dermal contact (PRG_d), and inhalation (PRG_i), using the following equations and parameters:

$$PRG_o = \frac{TR * BW * AT}{CSF * EF * ED * IR * FI * CF_1}$$

Where:

PRG_o	=	Preliminary remediation goal for the oral pathway (mg/kg)
TR	=	Target risk of 1×10^{-6}
BW	=	Body weight (kg)
AT	=	Averaging time (day)
CSF	=	COC-specific cancer slope factor (mg/kg-day) ⁻¹
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
IR	=	Soil or sediment ingestion rate (mg/day)
FI	=	Fraction soil or sediment ingested from the Site (unitless)
CF_1	=	Unit conversion factor (kg/mg)

$$PRG_d = \frac{TR * BW * AT}{CSF * SA * AF * ABS * EF * ED * CF_1}$$

Where:

PRG_d	=	Preliminary remediation goal for the dermal pathway (mg/kg)
SA	=	Skin surface area (cm ² /day)
AF	=	Soil-to-skin adherence factor (mg/cm ²)
ABS	=	COC-specific dermal absorption factor (unitless)

$$PRG_i = \frac{TR * AT}{IUR * EF * ED * CF_2 * \frac{1}{PEF}}$$

Where:

IUR	=	COC-specific inhalation unit risk (μg/m ³) ⁻¹
CF_2	=	Unit conversion factor (1000 μg/mg)

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PEF = Particulate emission factor (1.36E09 kg/m³)

While PRGs for the inhalation pathway often include consideration of a volatilization factor, none of the risk drivers at the RFAAP-NRU are considered volatile compounds. As a result, this pathway was not included in the calculation.

PRGs based on potential noncancer hazards were derived for the oral and dermal pathways using the following equations:

$$PRG_o = \frac{THQ * BW * AT * RfD}{EF * ED * IR * FI * CF_1}$$

$$PRG_d = \frac{THQ * BW * AT * RfD}{SA * AF * ABS * EF * ED * CF_1}$$

Where:

THQ = Target hazard quotient
RfD = COC-specific reference dose (mg/kg-day)

Noncancer PRGs for the inhalation pathway were not calculated because none of the identified hazard drivers have reference concentrations. In addition, as demonstrated in the HHRA, particulate inhalation did not contribute substantially to overall risks for any of the hazard drivers. Lastly, non-cancer PRGs were calculated for a child resident as these would also be protective of adult residential exposure.

Exposure assumptions used for each exposure scenario were the same as those used in the HHRA submitted for the RFAAP-NRU (ARCADIS 2010). They are summarized in Table 4-5. In addition, the cancer slope factors and reference doses were the same as those used in the HHRA. The dermal absorption factors for the organic compounds were those recommended in USEPA's dermal guidance (USEPA 2004a). The 2004 USEPA dermal guidance does not provide dermal absorption values for individual metals, due to the fact that the speciation of metals is critical to the amount of the compound absorbed through the skin. To be conservative, however, a dermal absorption factor of 1 percent was used to derive dermal PRGs for copper and chromium.

Following the NCP, a 1×10^{-6} TR level and a THQ of 1 were used as the points of departure for determining remediation goals for the carcinogenic and noncarcinogenic drivers, respectively. Generally, if the target organ/critical effect for the noncancer

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hazard is the same for two hazard drivers, it is necessary to divide the THQ by the number of constituents so that the total hazard for that target organ/critical effect will not exceed 1. Specifically, two noncarcinogenic drivers were identified in soil at the BLA (Aroclor 1254 and copper); however, the target organs/critical effects for those COCs are different. Thus the THQ was established at 1 for each.

Specific calculations of each pathway-specific PRG for each driver in the areas of interest are presented in Appendix E, Tables E1 through E8.

4.3.2.2 Development of Final Risk-Based PRGs

Once the pathway-specific PRGs were calculated, the final risk-based PRGs for the cancer and noncancer endpoints were each calculated by combining the PRGs for the individual pathways, using the following equation. The calculated PRGs for each area are presented in Tables E7 through E9 of Appendix E.

$$PRG = 1 / \left(\left(\frac{1}{PRG_o} \right) + \left(\frac{1}{PRG_d} \right) + \left(\frac{1}{PRG_i} \right) \right)$$

To determine PRGs for lead, the Adult Lead Methodology (ALM) or Integrated Exposure Uptake Biokinetic (IEUBK) models were used. For the ALM model (industrial site worker, construction worker, or hypothetical future residential adult), input parameters were modified to reflect site-specific exposure parameters, as outlined in Table 4-6.

On its web page for the IEUBK model, USEPA notes that the estimates of dietary lead-intake are based on food residue data from the U.S. Food and Drug Administration Total Diet Study available prior to 1994. Using more recent data reported in 2007 (USEPA 2007c), USEPA derived updated dietary lead intake estimates. The following table summarizes the previous default values and the updated values.

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Dietary Lead-Intake Values for the IEUBK Model¹

Age Category (months)	Default Dietary Lead-Intake Value (µg/day)	Updated Dietary Lead-Intake Value (µg/day) ²
0-11	5.53	3.16
12-23	5.78	2.60
24-35	6.49	2.87
36-47	6.24	2.74
48-59	6.01	2.61
60-71	6.34	2.74
72-84	7.00	2.99
1. http://www.epa.gov/superfund/health/contaminants/lead/ieubkfaq.htm#fda 2. Lead Residues reported as non-detects were included as half the reporting limit		

Using the updated dietary intakes and default values for all other model inputs, the target blood lead level of 10 µg/dL is exceeded for 5 percent of the population when the soil lead concentration exceeds approximately 415 mg/kg. Thus, 400 mg/kg has been conservatively selected as the residential PRG. This value (400 mg/kg) corresponds with the USEPA's residential soil screening value for lead.

For the residential child exposed to sediment at WBG, it was necessary to determine what concentration of lead in sediment would yield a weighted average exposure concentration of approximately 400 mg/kg, given assumptions regarding exposure frequency and background concentration of lead in soil, as discussed in USEPA guidance (USEPA 2003i). According to the HHRA for the WBG, the soil lead concentration to which hypothetical future residential children would be exposed is approximately 150 mg/kg. If the soil concentration is 150 mg/kg and the exposure frequency for contact with sediment is 48 days/year, a sediment concentration of 1,100 mg/kg would yield a weighted average concentration of 400 mg/kg. Thus, a residential level PRG of 1,100 mg/kg was selected for lead in sediment at the WBG.

4.3.2.3 Asbestos Remediation Goals

USEPA (2008f) has developed a recommended framework for evaluating asbestos-contaminated sites. That framework states that the measurement of asbestos in soils may not be a good indicator of potential for exposure, due to the fact that the main

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route of asbestos toxicity is through inhalation of fibers. Thus, the important metric is the measurement of asbestos fibers in air within a breathable zone. Based on this information, USEPA recommends that activity-based air sampling be conducted in addition to soil sampling, to determine whether disturbance of soils in areas known to contain asbestos can result in the mobilization of asbestos into air where it may be inhaled by the individuals engaged in activities there. Thus the goal of activity-based sampling is to disturb the soil, through an intensive activity such as raking, and then measuring the amount of asbestos that is found in air during that activity.

The 2010 RI Report for RFAAP-NRU (ARCADIS 2010) details the findings of an asbestos delineation and activity based sampling investigation completed at the BLA and IAA in 2009. In order to evaluate the results of the air sampling that was conducted, ARCADIS developed risk-based air action levels (AALs) for relevant, site-specific exposure scenarios, including the current and future site worker, the hypothetical future construction worker, the hypothetical future child resident, and the hypothetical future adult resident. The details on how these calculations were performed are outlined in Appendix A of the RI Report. AALs were calculated for each potential receptor group at the 1×10^{-6} and 1×10^{-4} risk levels, representing the lower and upper ends of USEPA's acceptable risk range. The calculated AALs are presented in the following table.

Receptor Group	Calculated AAL (s/cc) at Indicated Target Risk Level	
	Target Risk = 1×10^{-6}	Target Risk = 1×10^{-4}
Current/Future Site Worker	0.00007	0.007
Hypothetical Future Construction Worker	0.002	0.2
Hypothetical Future Child Resident	0.00002	0.002
Hypothetical Future Adult Resident	0.00001	0.001

s/cc = structures per milliliter

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As the goals of the remediation program are to reduce potential risks below the 1×10^{-4} risk level, the AALs listed for this risk range in the table above can be used as remedial goals for air at the BLA and IAA. Activity based sampling events at the BLA and IAA confirmed that no asbestos fibers were detected in air samples collected in areas where asbestos concentrations in soil were at or below 0.1% by weight, which would meet the remedial goals for all the receptor scenarios. Therefore, 0.1% asbestos by weight will be utilized as the default remedial goal for all of the receptor scenarios.

4.3.3 Area-Specific PRGs

Area-, media-, and chemical specific PRGs were developed for each of the four areas identified as having risks or hazards that exceeded either USEPA's acceptable risk range, or target hazard index, respectively. These values are presented below:

4.3.3.1 BLA

PRGs were calculated for lead, copper, Aroclor 1254, and benzo(a)pyrene in soil at the BLA. The results of the risk assessment for the existing conditions indicated that lead in surface soil presented risk and/or hazards under the industrial site worker, construction, and hypothetical future resident scenario. Copper in surface soil was determined to present unacceptable hazards under the construction worker and hypothetical future resident scenario. Aroclor 1254 and benzo(a)pyrene in surface soil were determined to present risks and/or hazards under the hypothetical future residential scenario.

Using the approach outlined above, PRGs were calculated for the noncancer endpoints for the construction worker and site worker exposure scenarios, and for both the cancer and noncancer endpoints for the hypothetical future residential scenario. The calculated PRGs for the individual drivers under each exposure scenario are summarized in the table below.

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Scenario-Specific Risk-Based PRGs for Soil at the BLA

Driver	Hypothetical Future Resident	Site Worker	Construction Worker
Aroclor 1254	0.23 mg/kg	--	--
Benzo(a)pyrene	0.025mg/kg	--	--
Copper	3,044 mg/kg (a)	--	11,533 mg/kg
Lead	400 mg/kg (a)	1,486 mg/kg	624 mg/kg
Asbestos	0.1%	0.1%	--

(a) PRGs for hypothetical future child resident used as overall residential PRG.

4.3.3.2 IAA

PRGs were calculated for lead, copper, and Aroclor 1254 in soil at the IAA. While the risk assessment concluded that existing risks and hazards at the site were within acceptable limits for the industrial site worker and construction worker, remediation would be necessary for residential use of the property. Risks exceeded EPA's acceptable risk range for the hypothetical future residential scenario, due to concentrations of Aroclor 1254 in soil. Hazards to the hypothetical future residential child also exceeded EPA's benchmark of 1 due to Aroclor 1254. In addition, concentrations of lead resulted in predicted blood concentrations that exceeded EPA's benchmark of 10 µg/dL or less in 95% of the population.

Using the approach outlined above, PRGs were calculated for both the cancer and noncancer endpoints for the hypothetical future residential scenario. The calculated PRGs for the individual drivers under the residential exposure scenario are summarized in the table below.

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Scenario-Specific Risk-Based PRGs for Soil at the IAA

Driver	Site Worker	Hypothetical Future Resident
Aroclor 1254	--	0.23mg/kg
Copper	--	3,044 mg/kg
Lead	--	400 mg/kg
Asbestos	0.1%	0.1 %

4.3.3.3 BDDT

PRGs were calculated for benzo(a)pyrene in soil at the BDDT. While the risk assessment concluded that existing risks and hazards at the site were within acceptable limits for the industrial site worker and construction worker, remediation would be necessary for residential use of the property. Risks exceeded EPA's acceptable risk range for the hypothetical future residential scenario with an ELCR of 4E-04 due to concentrations of benzo(a)pyrene in soil.

Using the approach outlined above, PRGs were calculated for both the cancer and noncancer endpoints for the hypothetical future residential scenario. The calculated PRG for benzo(a)pyrene under the residential exposure scenario is summarized in the table below.

Scenario-Specific Risk-Based PRGs for Soil in the BDDT

Driver	Hypothetical Future Resident
Benzo(a)pyrene	0.025 mg/kg

4.3.3.4 WBG

PRGs were calculated for lead and chromium in sediment at the WBG. While the risk assessment concluded that risks and hazards were within acceptable limits for the

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industrial site worker, construction worker, and adult resident; exposure of the hypothetical future residential child to chromium in sediment resulted in a hazard index greater than 1. In addition, concentrations of lead in sediment resulted in predicted blood concentrations that exceeded EPA's benchmark of 10 µg/dL or less in 95% of the child resident population.

Using the approach outlined above, PRGs were calculated for the noncancer endpoint for the hypothetical future residential child. The calculated PRGs for the chromium and lead under the child resident exposure scenario are summarized in the table below. The time-weighting factors for calculating the PRG for lead in soil are presented on Figure 4-1.

Scenario-Specific Risk-Based PRGs for Sediment in the WBG

Driver	Hypothetical Future Resident
Chromium	1,358 mg/kg
Lead	1,100 mg/kg

4.4 Determination and Attainment of Cleanup Levels

As there are no chemical specific ARARs for the sites at the RFAAP-NRU, the Cleanup Levels for the BLA, IAA, BDDT, and WBG will be based upon the risk-based PRGs presented in Section 4-3. The Cleanup Levels are the chemical-specific concentrations for each risk/hazard driver that are appropriate for the intended future use of the site (i.e., industrial or residential). The Cleanup Levels will be documented in the Record of Decision (ROD) once Response Actions have been selected for each of the sites.

Due to the risk-based nature of the PRGs and the spatial distribution of the risk/hazard drivers at the BLA, IAA, BDDT, and WBG it would be inappropriate for the Cleanup Levels to be utilized as "not-to-exceed" concentrations. Rather, the Cleanup Levels will be utilized as "area average" concentrations for given exposure units (EU) in accordance with USEPA guidance (USEPA 1989b and 2005c). An EU is a geographic area within which a receptor would be expected to come in contact with during a given exposure duration. The USEPA's Soil Screening Guidance (USEPA 1996) recommends a 0.5-acre source area for residential exposures. Industrial site workers

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and other receptors would be expected to be exposed to contaminants across a larger area than a resident; therefore, a much larger EU would be utilized for those scenarios.

To facilitate evaluation of the attainment of the Cleanup Levels, Remediation Action Levels (RALs) will be developed for the risk/hazard drivers at the BLA, IAA, BDDT, and WBG following the statistical approaches defined in the USEPA's *Guidance on Surface Soil Cleanup at Hazardous Waste Sites* (USEPA 2005c). As defined by USEPA (2005c), an RAL is the maximum concentration that may be left in place within an exposure unit such that the predicted average concentration (i.e., Exposure Point Concentration [EPC]), or the 95% upper concentration limit (UCL) of the average, is at or below the Cleanup Level. The area average approach involves remediating soils within the exposure unit with the highest risk/hazard driver concentrations until the post-remediation EPC is at or below the Cleanup Level. The RALs are the maximum concentrations, or not-to-exceed levels, for the purposes of site remediation. Remediation of soil with risk/hazard driver concentrations greater than the RALs will ensure that the estimated post-remediation EPCs achieve the Cleanup Levels (i.e., PRGs).

The RALs for each of the risk/hazard drivers at the BLA, IAA, BDDT, and WBG will be calculated and presented within the remedial action work plan for the RFAAP-NRU that will follow this FS.

4.5 Response Action Areas

Consistent with CERCLA guidance, response actions are required for areas where risks and/or hazards have been identified at levels that are outside of the acceptable range for the current and/or reasonably anticipated future use of a site. The current and anticipated future use of the RFAAP-NRU facility, including the BLA, IAA, BDDT, and WBG, is industrial/commercial. Therefore, at a minimum, the risks and hazards at the BLA, IAA, BDDT and WBG must be managed/remediated in a manner to allow for industrial/commercial exposure scenarios. However, remediation to residential levels will also be considered within this FS so that project life-cycle costs can be fully evaluated. Should remediation to residential levels (i.e., clean closure) prove to be financially advantageous to the Army in the long term, then clean closure may be recommended on a case-by-case basis.

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4.5.1 Bag Loading Area

As discussed in Section 3.2 and illustrated in Figures 3-3, through 3-5, the bulk of the risk/hazard driver impacted surface soils at the BLA are located immediately adjacent to the seven buildings with conductive flooring. More specifically, the risk/hazard drivers (especially lead, copper, and asbestos) are primarily located on the sides of the buildings that have pathways for the conductive flooring to have washed off of the building pads onto the adjacent soil. The distance to which the impacts extend from the building varies somewhat, but review of the surface soil data and visual observations of the extent of the flooring material in the soil indicates that the majority of the elevated constituent concentrations are confined to surface soil within 1 to 5 ft of the building edges. Furthermore, the highest asbestos concentrations appear to be confined to the areas where degraded conductive flooring is visible in surface soil which is generally within 1 to 2 ft of the buildings.

In addition to the areas beside the buildings, benzo(a)pyrene, which is a potential risk driver under the residential land use scenario, is also present at levels greater than screening levels next to roads and the former walkway platforms in the central portion of the site. Aroclor 1254 was also detected at concentrations above applicable screening levels in two surface soil samples at former transformer locations; however, the Aroclor 1254 detections appear to be isolated because adjacent samples were non-detect or below screening levels.

Under the reasonably anticipated current and future industrial/commercial land use scenario, the risk assessment for the site concluded that the only risk drivers are copper, lead, and asbestos. Because the copper, lead, and asbestos containing soils are collocated and/or confined to the areas adjacent to the site buildings, a single response action will achieve the RAOs for all three constituents. At a minimum the response action for the industrial/commercial land use scenario would include remediation of surface soils (0-1 ft bgs) located at distances ranging from 0-2 ft from the building edges that have pathways for the degraded flooring to have washed onto the adjacent soil. This area will remediate the majority of the soils that contain asbestos at a concentration above 0.1% by weight and ensure that the average remaining concentration is below 0.1%. Surface soils with obvious visual staining or residue from the flooring material would also be included in the action because sampling indicates that the presence of visible amounts of flooring can be an indicator of high concentrations of asbestos. However, the final extent of the remediation area will depend on the development of the RALs for lead and copper which may require that the target area is expanded. Soils on the closed sides of the buildings, where no

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degraded flooring material is present and where risk/hazard driver levels were less than the RALs will not be included in the response action.

Under the hypothetical future residential land use scenario, benzo(a)pyrene and Aroclor 1254, were found to be risk drivers in addition to copper, lead, and asbestos. Therefore, any response action for the site would need to be expanded to include all five constituents in order to achieve clean closure under an unrestricted residential land use scenario. While the extent of the response action area would be determined after the RALs have been developed, the response action area would include surface soil adjacent to the conductive flooring buildings, two former transformers and former elevated walkway platforms. As with the industrial/commercial option, the response action next to the buildings will at a minimum include surface soil within 0-2 ft of the buildings and visibly stained soil to remove the bulk of the soils containing asbestos at concentrations above 0.1%.

In addition to surface soils, a response action will be required for the conductive flooring material at the BLA. The conductive flooring material is the primary source of the constituents that have been detected in surface soil adjacent to the buildings at the site. If a response action was not implemented for the conductive flooring it could continue to leach contaminants could continue to wash into soil surrounding the buildings. The conductive flooring also contains constituents (i.e., metals and asbestos) that could pose a risk to human receptors. Conductive flooring has been identified in a total of seven buildings at the BLA and covers an area of approximately 16,000 ft².

4.5.2 Igniter Assembly Area

The IAA is very similar to the BLA in that the majority of the risk/hazard driver containing surface soils are located immediately adjacent to the open sides of the buildings where degraded conductive flooring has washed off of the building pads (see Figures 3-8 through 3-10). The distance to which the risk/hazard drivers extend from the building varies somewhat, but review of the surface soil data and visual observations of the extent of the flooring material in the soil indicates that the majority of the elevated constituent concentrations are confined to surface soil within a two feet of the building edges.

Aroclor 1254, which is only a driver under the residential exposure scenario, was also detected at a concentration above applicable screening levels at a former transformer

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location near Building 8101; however, the detection appears to be isolated because adjacent samples were non-detect.

Under the current and reasonably anticipated future land use scenario of industrial/commercial, the risk assessment for the site concluded that the only risk driver is asbestos. The response action for the industrial/commercial land use scenario will include remediation of surface soils (0-1 ft bgs) located at distances of 0-2 ft from the building edges that have pathways for the degraded flooring to have washed onto the adjacent soil. This area will remediate the majority of the soils that contain asbestos at a concentration above 0.1% by weight and ensure that the average remaining concentration is below 0.1%. Surface soils with obvious visual staining or residue from the flooring material would also be included in the action because sampling indicates that the presence of visible amounts of flooring can be an indicator of high concentrations of asbestos. Soils on the closed sides of the buildings, where no degraded flooring material is present and where asbestos levels are less than 0.1% by weight would not be included in the response action.

Under the hypothetical future residential land use scenario, lead, copper, and Aroclor 1254, were also found to be risk drivers in addition to asbestos. Therefore, any response action for the site would need to be expanded to include all four constituents in order to achieve clean closure under an unrestricted land use scenario. While the final response action area would be determined after the RALs have been developed for the non-asbestos risk/hazard drivers, the response action area for the residential option would likely be very similar in scope to the industrial option because the lead, copper, and Aroclor 1254 impacts are generally collocated with the asbestos in soil. However, the response area may extend slightly farther from the building edges at Buildings 502 and 504 due to the elevated lead concentrations in this area.

In addition to surface soils, a response action will be required for the conductive flooring material at the IAA. The conductive flooring material is the primary source of the constituents that have been detected in surface soil adjacent to the buildings at the site. If a response action was not implemented for the conductive flooring, contaminants could continue to wash into soil surrounding the buildings, which could potentially migrate to other areas over time. The conductive flooring also contains constituents (i.e., metals and asbestos) that could pose a risk to human receptors. Conductive flooring has been identified in a total of 29 buildings at the IAA and covers an area of approximately 25,000 ft².

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4.5.3 Building Debris Disposal Trench

As discussed in Section 3.4 and illustrated in Figures 3-11 through 3-13, the benzo(a)pyrene impacted surface soils at the BDDT are located underneath the rip-rap covered portion of the site and in the depositional area between the downgradient extent of the rip-rap and the unnamed stream. The horizontal and vertical extents of the affected soils have been well delineated by extensive soil sampling performed within the trench and downgradient areas. The horizontal extent of the impacted soils is closely tied to topography of the site as the detections of benzo(a)pyrene were confined to the low-lying depositional area between the two hills. The vertical profiling samples that were conducted in the depositional area indicated that the impacts are generally confined to surface soils (i.e., 0-1 ft bgs) with the exception of a small area downgradient of the rip-rap where elevated detections extended to 3-4 ft bgs.

The liner and rip-rap that were placed in the former disposal area of the site have proven to be an effective means of preventing disturbance of the impacted soils in this area and also have prevented erosion from transporting impacted soils to downgradient areas. This feature is important because the slope of the land in this area could potentially lead to erosion during rainfall events if the rip-rap was not in place. The depositional area downgradient of the trench has become heavily vegetated with grasses and shrubs since the installation of the rip rap. This vegetation, and the gentle slope of the land in the depositional area, also appears to have effectively prevented/minimized erosion of the soils in this area, thus preventing migration of impacted soils to the unnamed stream. This was demonstrated by the low-levels and/or lack of PAH detections in the creek sediments during the 2002 and 2008 sampling events. The creek sediments and surface water were not found to present a risk or hazard under the evaluated exposure scenarios.

Risks and hazards for the BDDT were found to be within acceptable ranges for the current and future industrial utilization; therefore, no active measure would need to be taken to maintain the industrial/commercial land use scenario that currently exists and is planned for the site. However, based on the results of the HHRA for the BDDT, benzo(a)pyrene in soil was found to present an unacceptable ELCR under a hypothetical future residential land-use scenario. In order to remediate the site to levels that would allow for unrestricted/residential use, the selected response action would be required to address soils in the depositional area of the site as well as underneath the rip-rap covered portion of the trench. It would not be appropriate to plan an action that only included the depositional area because the risk assessment activities confirmed that the soils under the rip rap would still present unacceptable

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risks unless restrictions were put in place to prevent its removal; which would preclude a unrestricted/residential closure of the site. Based on the delineation samples collected during the course of the remedial investigation activities, the benzo(a)pyrene detections with concentrations above the PRG of 0.031 mg/kg are confined to surface soils within an approximately 10,200 ft² area underneath the rip-rap covered portion of the site and a 15,300 ft² area in the depositional area downgradient of the trench. As presented in the Cleanup Level discussion in Section 4.4, RALs would be calculated for benzo(a)pyrene in the BDDT soils to help determine the final extents requiring a response action.

4.5.4 Western Burning Ground

Based on the findings of the risk assessment, the risk and hazards levels for the WBG are currently within acceptable limits for the industrial site worker, construction worker, and adult resident exposure scenarios. Therefore, a remedial action would not be required under the industrial/commercial land use scenario that currently exists and is planned for the site.

Under a hypothetical future residential land use scenario, lead and chromium in pond sediments were determined to present risks/hazards for child residents. As presented in the Cleanup Level discussion in Section 4.4, RALs will be calculated for lead and chromium in the WBG pond sediment. The RALs would establish the sediment concentrations that need to be managed by the response action such that the residual average concentration of lead, and the 95th UCL of chromium, would be below the established PRGs. The residential PRG for lead and chromium at the WBG are 1,100 mg/kg and 1,358 mg/kg, respectively. Based on the results of the sediment investigation activities discussed in the 2010 RI Report for the RFAAP-NRU, the sediments containing lead and chromium above the PRGs are confined to an approximately 1,250 ft² area on the northeast side of the WBG pond. Considering that the pond sediments are generally less than 2-ft thick, this would require management of approximately 70 cubic yards (yd³) of sediment.

5. Identification and Preliminary Screening of Remedial Technologies and Process Options

This section identifies and evaluates potentially applicable remedial technologies and process options for addressing the soil, building materials, and sediments that are contributing to elevated risk levels at the BLA, IAA, BDDT and WBG. Remedial technologies are defined as general categories of remedies under a general response action (e.g. capping is a remedial technology under the general response action of containment). Process options are defined as specific categories of remedies within a remedial technology that are used to implement the remedial technology (e.g. vegetative cover is a process option under the remedial technology of capping) (USEPA, 1988b).

5.1 General Response Actions

General response actions (GRAs) are categories of remedial technologies that may be used to satisfy the RAOs by either reducing the contaminant concentration in each medium to a level that is below the RAL or by preventing receptor exposure to the contaminated medium. General response actions provide the basis for identifying the specific remedial technologies and process options that are applicable for the sites. General response actions are developed for each medium of interest defining remedial actions that may, singly or in combination, be taken to satisfy the RAOs for the site. General response actions that were considered during the preliminary technology screening process for each targeted area within the RFAAP-NRU include.

- No Action;
- Institutional Controls;
- Containment and capping;
- Removal/Excavation;
- In-Situ Treatment;
- Ex-Situ Treatment; and
- Disposal.

The following sections provide a brief discussion of the general components of these GRA categories.

5.1.1 No Action

The NCP and USEPA's current guidance for conducting FS investigations requires that the "no-action" option be developed and examined as a potential remedial action for all sites. The no-action alternative will be evaluated to establish a baseline for the comparison of the remaining alternatives. No response action of any kind would be employed at the sites under this category and all media/COCs would be left in place.

5.1.2 Institutional Controls

Institutional Controls (ICs) may consist of both administrative (Land Use Controls [LUCs]) and physical (engineering) means to restrict access and/or control activities at the site to minimize exposure to COCs. ICs do not physically or chemically alter conditions at the site and do not, or are not intended to, reduce the mobility, toxicity, or volume of contamination at the site as part of a remedial option. The use of ICs is generally effective because they limit potential for exposure to site contamination.

ICs include any restrictions on the current and future use of the property in order to maintain an appropriate level of protection. These restrictions will be a necessary component of the remedy if media that results in an unacceptable risk under an unrestricted land use scenario will remain at the RFAAP-NRU. Therefore, ICs will be a necessary component of any RAs for surface soil, building material, and sediment that do not include removal of affected media to residential risk levels, even though the current and anticipated future use of RFAAP-NRU is industrial.

Property access restrictions as a component of ICs, such as site security and restrictions on future site activities, are already in place at RFAAP-NRU. Some restrictions are already in place at the facility by virtue of it being an active military installation. Continued enforcement of these restrictions will ensure the protection of human health. However, in the event that RFAAP-NRU would be closed and declared excess property, the land use restrictions would be legally recorded (e.g., in zoning ordinances, property deeds, etc.) and incorporated into the provisions for the new land use. A change of land use would result in the re-evaluation of clean-up requirements.

Because contamination may remain in place as part of this GRA, engineering controls, such as placement of signage, fencing, and/or additional security may also be a component of ICs.

5.1.3 Containment

Containment would involve the placement of an engineered cover over the contaminated soil, sediment, or waste materials (i.e., building materials) so as to prevent direct contact with the contaminated media and minimize contaminant migration through air, precipitation, percolation, wind, or run-off pathways. Engineered covers can be installed relatively quickly using readily available materials and standard construction equipment. A cover can provide a functional solution for impacted material at the site with satisfactory long term annual maintenance to minimize erosion or other damage.

5.1.4 Removal/Excavation

Under the removal category of the GRAs, contaminated media or source materials are removed from the site. This category could include the removal of a portion of the affected media and source materials or removal of the entire area of contamination. Soil and sediment removal actions are typically conducted using standard excavation and construction equipment. In the case of the asbestos flooring at the RFAAP-NRU, asbestos abatement protocols would necessarily be followed to conduct the removal action. Removal activities also would include clearing utilities, establishing staging areas for equipment, and establishing a stockpile area. In addition, any removal action for soil would require that the excavation be subsequently backfilled with soil or otherwise regraded to prevent the accumulation of surface water and assure positive drainage, and revegetated. Similarly, any removal action for sediment would require the excavation to be subsequently restored with aquatic vegetation if any was removed. A complete removal would yield a site that was free of any potential risks or hazards. Focused removals may also be effective in meeting the RAOs. This technology is only viable in combination with either treatment or disposal.

5.1.5 In-Situ/Ex-Situ Treatment

Treatment technologies utilize the physical and/or chemical properties of the COCs and contaminated medium to separate, immobilize, or destroy the contamination. Treatment of the contaminated medium can either be implemented with the medium in place (i.e., in-situ) or after excavation/removal (i.e., ex-situ). General categories of

physical/chemical treatment include solidification/stabilization, chemical oxidation/reduction, soil washing, and soil vapor extraction. Biological treatment technologies (bioventing, phytoremediation, monitored natural attenuation) and thermal treatment technologies (electrical resistance heating, steam injection, conductive heating, etc.) also exist. Due to the nature and extent of the COCs present at the RFAAP-NRU, stabilization/solidification would be the most applicable of the available treatment technologies.

Stabilization and solidification is a process by which contaminated soil is mixed with a solidifying agent such as cement, lime, thermoplastics, or organic polymers to render the contaminated soil as an inert solid form. In-situ stabilization/solidification processes rely upon the application of a reagent to produce desirable chemical and physical reactions that improve the physical properties of the soil, and reduce the solubility, toxicity, and/or mobility of contaminants within the soil. The goal of ex-situ/in-situ solidification is to produce a waste that is easier to handle and to reduce the leaching of contaminants from the soil that is either to be left in place or excavated and disposed of offsite.

Several solidifying agents are available; the most common agents used are cement-based. Most cement processes use Portland cement and proprietary agents to aid in solidifying the waste of concern to an inert solid form such as a block or friable, clay-like unit. Wastes can be mixed in-situ, in conventional cement-mixing equipment, prior to landfilling, or in drums which are subsequently landfilled. The advantages of using cement are a high-pH end product, which limits metal leaching from wastes, and the relatively low cost of cement.

5.1.6 Disposal

Disposal is a GRA that is used in concert with other technologies (e.g., removal/excavation). Following a removal action, contaminated media must be transported to either a permitted/approved on-site disposal area or to an approved off-site disposal facility. Prior to disposal the impacted media would need to be fully characterized to ensure that the material is transported and disposed of in accordance with applicable guidelines. Soils and sediments containing COCs at concentrations above TCLP standards may require treatment prior to disposal. Sediments may also require dewatering prior to disposal with appropriate management of water generated during the dewatering process. Asbestos containing materials will also need to be handled/disposed of in accordance with applicable guidelines.

5.2 Preliminary Screening of General Response Actions

Tables 5-1 through 5-3 present a preliminary technical implementability screening of the GRAs for each targeted media that have been identified at the RFAAP-NRU, including surface soil (BLA, IAA, and BDDT), flooring materials (BLA and IAA), and sediment (WBG), respectively. These tables briefly describe potentially applicable technologies and process options associated with the GRAs and provide basic screening information. This screening information accounts for technical implementability; ability to meet the site-specific RAOs and ARARs; compatibility with site-specific conditions, such as the geologic setting and contaminant distribution; and, contaminant characteristics. Technologies and process options that were eliminated from further consideration on the basis of technical implementability are shaded for clarity.

5.3 Evaluation of Available Process Options

Following the preliminary technical implementability screening of the remedial technologies identified in the GRAs, a more detailed evaluation of the available process options within the retained technologies was conducted. This screening was based on three criteria: effectiveness, implementability, and relative cost. The components of these criteria are as follows:

- **Implementability** – This criterion refers primarily to the administrative aspects of using a process option, such as the ability to obtain necessary permits; the availability and capacity of treatment, storage, and disposal services; and the availability of necessary equipment and workers to implement the technology. However, it also includes the consideration of the reliability, maturity, prior application, and operational difficulties of a technology as well as logistical, climate, and terrain limitations.
- **Effectiveness** – This criterion addresses the ability of a technology to meet the RAOs, including overall protection of human health and the environment, compliance with regulations, long-term effectiveness and permanence, short-term effectiveness, and reduction of toxicity, mobility, or volume by treatment.
- **Cost** – Cost plays a limited role in the evaluation of process options at this step. Relative capital and operations and maintenance (O&M) costs are used rather than detailed estimates. Each process option is evaluated on the basis of

engineering judgment as to whether costs are high, moderate, or low relative to the other process options of the same remedial technology type.

Tables 5-4 through 5-6 present the evaluation of available process options for surface soil (BLA, IAA, and BDDT), flooring materials (BLA and IAA), and sediment (WBG), respectively. For each media, these tables provide a comprehensive list of general response actions, remedial technologies, and specific process options, along with a description of each process option and the basis for either retaining the technology or eliminating the technology from further consideration. The various process options within a technology category were considered independently through the screening process. Technologies and process options that were screened out (i.e., not retained) on the bases of effectiveness, implementability, and/or cost are shaded in the tables. Technologies and process options that were retained are discussed in greater detail in Section 5-3.

5.4 Selection of Applicable Process Options

Based on the screening of the available technologies and process options presented in Tables 5-4 through 5-6, potentially applicable technologies/process options were selected for each of the effected media at the RFAAP-NRU. These process options are presented in the following sections along with a discussion of the implementability, effectiveness, and cost evaluation.

5.4.1 Process Options for BLA, IAA, and BDDT Soils

This section presents the remedial process options that could potentially be implemented to attain the RAOs for surface soils:

- No Action;
- Institutional Controls;
- Containment/Capping - Vegetative Soil Cover;
- Removal - Excavation;
- Ex-Situ Chemical Treatment - Stabilization and Solidification; and,
- Disposal - Off-Site Landfill.

5.4.1.1 No Action

The no-action approach will not reduce the source of waste material, presence of COCs in soil, minimize exposure pathways, or prevent the migration of COCs to unaffected areas at the BLA IAA, and BDDT. In addition, there is no way to verify that this option is effective, or to ensure land use remains consistent with the assumption of the risk assessments. The following summarizes the evaluation of this remedial technology with respect to the initial evaluation criteria.

Implementability

- Readily implementable.
- Unacceptable to regulatory agencies and public.

Effectiveness

- Not effective, nor is there any means to demonstrate effectiveness.
- Does not provide controls to limit site use and subsequent exposure to contaminants.

Cost

- There are no costs associated with this option.

Conclusion

Under the no action option, there exist unacceptable risks to human health or the environment at the sites. This option is eliminated from further consideration as a remedial technology because it does not meet the RAOs. However, it was retained as a baseline for comparison with other soil technologies at the BLA, IAA, and BDDT.

5.4.1.2 Institutional Controls

The USEPA requires ICs when site contaminant levels do not allow unrestricted use of a site and/or unlimited exposure to site media. ICs also can serve to notify current and future users of a site about the environmental conditions of the property. Due to the nature and extent of the affected media and risks at the BLA, IAA, and BDDT; ICs may

be a stand-alone remedy or a necessary component of the selected remedial alternative. ICs could consist of both physical means and LUCs to restrict access and/or activities at the BLA, IAA, and BDDT sites to minimize exposure to COCs in soil. ICs that could be employed at the RFAAP-NRU could include:

- Engineering controls, such as placement of signage or fencing at the sites to limit access to the portions of the sites where COCs are present at concentrations above allowable risk levels. Signage and other literature could also be utilized to alert site visitors to the hazards present at the site. As an active military facility, access to the RFAAP-NRU is already restricted by a perimeter fence and site security personnel; therefore, this could be easily implemented.
- Standard Operating Procedures (SOPs) could be developed for use with other ICs to ensure that development and activities within the areas of concern are limited to those that are consistent with the defined risk range for the site (i.e., industrial or residential).
- The health and safety plans for the site could also be updated as necessary to ensure proper long term management of the site and to ensure the health and safety of site workers during remedial implementation.
- Deed notifications would become necessary if the property were transferred out of federal ownership. CERCLA requires deed notifications for any transfer of federal property on which any hazardous substance was known to have been disposed or released, or stored for one year or more (40 CFR 373). The deed notification would, in perpetuity, notify any potential purchaser that the property has been used for the management and disposal of hazardous materials as part of site operations.
- Deed restrictions are provisions built into a property deed prohibiting certain uses of the property. Deed restrictions could preclude residential use of the property should a removal action only reduce the presence of COCs to industrial clean up levels.

The following summarizes the evaluation of this remedial technology with respect to the evaluation criteria.

Implementability

- Readily implementable.

Effectiveness

- Generally effective in managing future exposure.
- Does not reduce the volume or toxicity of contaminants at the site. However, this alternative could reduce the mobility of the contaminants. Historical sampling has indicated that the contaminants are generally localized to the source areas (i.e., buildings with conductive flooring) and are not mobile. ICs could be used to minimize disturbance of the soils and maintain the current vegetation which would minimize the potential for future migration.

Cost

- Low capital and low O&M costs.

Conclusion

This option was retained for further consideration as a stand-alone remedial technology for soils at the BLA, IAA, and BDDT because it could meet the RAO of minimizing exposure pathways suitable for industrial use of the property. ICs were also retained for further consideration as potentially applicable in conjunction with other remedial technologies for soil at the BLA, IAA, and BDDT.

5.4.1.3 Capping – Vegetative Soil Cover

Capping is a prescriptive remedy for contaminated soils which involves the placement of an engineered cover over the contaminated soil preventing direct contact with contaminated soil and minimizing contaminant migration due to precipitation, percolation, wind, or run-off pathways. Vegetative soil covers can be installed relatively quickly using readily available materials and standard construction equipment and methods. The disadvantage of vegetative soil covers is the need for long-term maintenance; however, with satisfactory annual maintenance to minimize soil erosion and sediment transport, a cover could provide a functional solution for affected soil at the BLA, IAA, and BDDT sites.

A vegetative soil cover commonly consists of two layers designed to form a low permeability barrier. The top cover layer promotes vegetative growth, which reduces erosion, and the bottom layer reduces surface water infiltration. Soil covers have specific materials and design requirements. A vegetative soil cover would typically consist of the following layers:

- Protective layer - consisting of top soil that is capable of supporting vegetation.
- Low permeability layer - consisting of compacted soil with a maximum permeability of 1×10^{-5} cm/s.

The soil cover would be utilized to cover existing soils where COCs have been detected at concentrations above applicable remediation goals. The soil cover would be graded such that it promotes positive drainage and then sloped so that the soil cover gradually tapers to the existing surface grade. The following summarizes the evaluation of this remedial technology with respect to the evaluation criteria.

Implementability

- A vegetative soil cover is readily implementable and utilizes standard construction methods and materials.
- Would require clearing and disposal of existing vegetation to access work areas and install cap.

Effectiveness

- Meets the RAOs by eliminating the exposure pathway and mitigating the risk to human health and the environment.
- Will potentially create exposure to contaminants during construction, though this could be minimized with appropriate engineering controls such as dust suppression and decontamination of personnel and equipment.
- Does not reduce the volume or toxicity of contaminants on site, but does reduce mobility of contaminants.

Cost

- Moderate capital and low to moderate O&M costs for soil cover.

Conclusion

The vegetative soil cover option was retained for further consideration as a potential remedial technology for soil and the BLA, IAA, and BDDT. However, this alternative would have to be used in conjunction with ICs because constituents would be left in place and the soil cover would need to be protected.

5.4.1.4 Removal – Excavation

Excavation of the affected soils at the BLA, IAA, and BDDT can be achieved by employing standard excavation and construction equipment to remove the contaminated soils. Removal activities also would include clearing utilities, establishing staging areas for equipment, and establishing a stockpile area. In addition, any removal action for soil would require that the excavation be subsequently backfilled with soil or otherwise regraded to prevent the accumulation of surface water and assure positive drainage. The scope and extent of the excavation activities at the BLA, IAA, and BDDT could be tailored to achieve industrial or residential remedial action levels. This technology is only viable in combination with either treatment and/or disposal. The following summarizes the evaluation of this remedial technology with respect to the evaluation criteria.

Implementability

- Readily implementable and utilizes standard construction methods and materials.
- Requires treatment and/or disposal in conjunction with excavation.
- Requires clearing and disposal of vegetation to access work areas.
- Technology is limited in practicality by depth and size of excavation required.
- Excavation will require management to reduce spreading contamination via fugitive dust emissions and spillage of contaminated soils.

Effectiveness

- Proven technology.
- Will potentially create exposure to contaminants during construction, though this could be minimized with appropriate engineering controls such as dust suppression and decontamination of personnel and equipment.
- Will achieve the RAOs.
- Reduces the volume, mobility and toxicity of waste on site; but does not reduce the toxicity of the waste material unless treated.
- Reduces the volume of waste on-site but does not reduce the volume of water material requiring off-site disposal.
- Potentially applicable as a component of other remedial actions.

Cost

- Moderate to high capital and low O&M costs.

Conclusion

The technology is carried through for evaluation in conjunction with other technologies such as treatment, disposal, and ICs.

5.4.1.5 Ex-Situ Chemical Treatment – Stabilization/Solidification

Stabilization and solidification is a treatment process by which contaminated soil is mixed with a solidifying agent such as cement, lime, thermoplastics, or organic polymers to render the contaminated soil as an inert solid form. Ex-situ stabilization/solidification processes rely upon the application of a reagent to produce a waste that is easier to handle and to reduce the leaching of contaminants from the soil. Stabilization may be required should waste characterization samples indicate that excavated soils contain constituents above TCLP disposal standards. Though it should be noted that historical TCLP samples from the BLA and IAA have not contained inorganic constituents at concentrations above applicable standards.

Several solidifying agents are available; the most common agents used are cement-based. Most cement processes use Portland cement and proprietary agents to aid in solidifying the waste of concern to an inert solid form such as a block or friable, clay-like unit. Wastes can be mixed on-site in conventional cement-mixing equipment, off-site prior to landfilling, or in drums which are subsequently landfilled. The advantages of using cement are a high-pH end product, which limits metal leaching from wastes, and the relatively low cost of cement. The following summarizes the evaluation of this remedial technology with respect to the evaluation criteria.

Implementability

- This technology is readily implementable and utilizes conventional design, construction methods, and materials.
- Can be implemented on-site or at an off-site disposal facility.
- Requires substantial material handling and documentation of effectiveness.

Effectiveness

- Effective in meeting the RAOs in conjunction with excavation and disposal.
- Reduces the toxicity and mobility of the contamination, but not the volume.

Cost

- Moderate capital cost and no O&M if treated soil is disposed off-site.

Conclusion

The “treatment” option was retained for further consideration for soils at the BLA, IAA, and BDDT in conjunction with containment and disposal. Treatment would only be conducted in the event that it is required by the disposal facility.

5.4.1.6 Disposal – Offsite Landfill

The primary disposal technology available is an off-site approved/permitted landfill. Off-site landfilling utilizes standard construction equipment and methods. Landfilling of impacted soil requires excavation, characterization, and transportation to a facility that

is permitted to accept the specific waste. The off-site transportation of wastes resulting from excavation must meet Federal and State shipping and manifesting regulations.

This technology is only viable in combination with either treatment or removal of soil. The following summarizes the evaluation of this remedial technology with respect to the evaluation criteria.

Implementability:

- Readily implementable.
- The excavated soils may need to be treated/stabilized prior to disposal.
- Requires documentation and material handling.

Effectiveness:

- Effective at meeting the RAOs but may create additional short term exposure and risks.
- Does not require long term O&M.
- Effective at reducing the mobility and volume of contaminants on site.

Cost:

- Moderate capital cost and no O&M cost.

Conclusion:

The “disposal” option was retained for further consideration for soils at the BLA, IAA, and BDDT in conjunction with excavation and/or treatment.

5.4.2 Process Options for BLA and IAA Conductive Flooring

The following section presents the remedial process options that would potentially be implemented to attain the RAOs for conductive flooring materials:

- No Action;

- Institutional Controls;
- Capping of Flooring Materials;
- Removal of Flooring Materials;
- Disposal - Off-Site Landfill.

5.4.2.1 No Action

The no action approach will not reduce the source of waste material or chemical constituents or prevent the release or threat of release of contaminants to soil, surface water, or sediment at the BLA or IAA. In addition, there is no way to verify that this option is effective, or to ensure land use remains consistent with the assumption of the risk assessments. The following summarizes the evaluation of this remedial technology with respect to the evaluation criteria.

Implementability

- Readily implementable.
- Unacceptable to regulatory agencies and public.

Effectiveness

- Not effective, nor is there any means to demonstrate effectiveness.
- Does not provide controls to limit site use and subsequent exposure to contaminants.

Cost

- There are no costs associated with this option.

Conclusion

Under the no action option, there exist unacceptable risks to human health at the BLA and IAA sites under current or hypothetical future land uses. The potential for future releases would also remain. This option is eliminated from further consideration as a

remedial technology for the BLA and IAA flooring because it does not meet the RAOs. However, it was retained as a baseline for comparison with other technologies.

5.4.2.2 Institutional Controls

The USEPA requires ICs when site contaminant levels do not allow unrestricted use of a site and/or unlimited exposure to site media. ICs also can serve to notify current and future users of a site about the environmental conditions of the property. Due to the nature and extent of the conductive flooring at the BLA and IAA, ICs may be a necessary component of the selected remedial alternative. ICs could consist of both physical means and LUCs to restrict access and/or activities at the BLA and IAA sites to minimize exposure to the flooring material and site buildings. ICs that could be employed at the RFAAP-NRU may include:

- Engineering controls, such as placement of signage or fencing at the sites to limit access to the buildings where the conductive flooring material is present. Signage and/or other literature could also be utilized to alert site visitors to the hazards present at the site. As an active military facility, access to the RFAAP-NRU is already restricted by a perimeter fence and site security personnel; therefore, this could be easily implemented.
- SOPs could be developed for use with other ICs to ensure that development and activities within the areas of concern are limited to those that are consistent with the defined risk range for the site (i.e., industrial or residential).
- The health and safety plans for the site could also be updated as necessary to ensure proper long term management of the site and to ensure the health and safety of site workers during remedial implementation.
- Deed notifications could become necessary if the property were transferred out of federal ownership. CERCLA requires deed notifications for any transfer of federal property on which any hazardous substance was known to have been disposed or released, or stored for one year or more (40 CFR 373). The deed notification would, in perpetuity, notify any potential purchaser that the property has been used for the management and disposal of hazardous materials as part of site operations.
- Deed restrictions are provisions built into a property deed prohibiting certain uses of the property. Deed restrictions would preclude residential use of the property

should a removal action only reduce the presence of COCs to industrial clean up levels.

The following summarizes the evaluation of this remedial technology with respect to the evaluation criteria.

Implementability

- Readily implementable.

Effectiveness

- Generally effective in managing future exposure; and,
- Does not reduce the volume, toxicity, or mobility of contaminants at the BLA and IAA.

Cost:

- Low capital and low O&M costs.

Conclusion

This option was retained for further consideration as a stand-alone remedial technology because it would meet the RAO of minimizing exposure to COCs. ICs were also retained for further consideration as potentially applicable in conjunction with other remedial technologies at the BLA and IAA.

5.4.2.3 Capping of Conductive Flooring Material

Capping of flooring material will provide protection to human health via the in-situ containment of COCs and asbestos containing materials. Capping of flooring materials may involve the installation of an engineered concrete cover or an epoxy coating to protect intact sections of conductive flooring from degrading and releasing COCs or asbestos. The cap would also prevent exposure to the COCs that are bound in the flooring material. Capping would not be an option for sections of flooring that have already degraded because the capping materials would be unlikely to bond to the materials sufficiently to form a competent cap. Capping of intact flooring materials can be conducted relatively quickly utilizing standard construction methods and materials.

However, capping may require annual inspections and maintenance to ensure that the cap retains its effectiveness. The following summarizes the evaluation of this remedial technology with respect to the evaluation criteria.

Implementability:

- Readily Implementable for intact flooring.
- Not applicable for degraded/friable flooring.

Effectiveness:

- Effective in meeting the RAO for intact flooring materials.
- Would not be effective for the compromised/degraded flooring that makes up the bulk of the material at the site.
- Will prevent direct contact or suspension of asbestos particles and other COCs.
- Long term effectiveness minimized by the need to maintain and monitor the cap.

Cost

- Low capital cost, and moderate to high maintenance cost.

Conclusions:

Eliminated from further consideration as a stand-alone remedial technology because it would not meet the RAOs in the absence of other actions; however, the capping of intact flooring material was retained for further consideration as potentially applicable in conjunction with other actions.

5.4.2.4 Removal of Flooring Material

Removal of flooring material would involve the physical removal of the conductive flooring material from the buildings and the site. The flooring material would be separated from the concrete floors, curbs, and stairs of the buildings through scraping or other mechanical means. Due to the presence of asbestos in the conductive flooring material, proper asbestos abatement methods would need to be utilized in

conformance with federal, state, and local regulations. Once separated from the concrete structure, the flooring materials would be collected and transported to a permitted off-site disposal facility. The disposal facility would necessarily be permitted to handle asbestos wastes, as well as the other constituents that have been identified in the flooring.

This technology could be applied to both intact and degraded sections of the flooring material. A complete removal of the flooring materials would yield a site that was free of the source material that contributed to the COCs in soil, and would not require long term maintenance. A focused removal of only the degraded sections of flooring may also be effective in meeting the RAOs in conjunction with other technologies. This technology is only viable in combination with disposal. The following summarizes the evaluation of this remedial technology with respect to the evaluation criteria.

Implementability:

- This technology is implementable and utilizes standard practices of asbestos abatement.
- Requires significant site preparation, permitting, and material handling procedures to ensure worker safety and to prevent further contamination of soils.

Effectiveness

- Effective in meeting the RAOs.
- Will prevent direct contact or suspension of asbestos particles and other COCs.
- Eliminates the potential for future releases from the conductive flooring.
- Is a permanent solution that does not require inspections, maintenance or monitoring, therefore improving long term effectiveness.

Cost

- High capital cost, and no maintenance cost if all flooring removed.

Conclusions

The removal option was retained for further consideration provided that it is used in conjunction with an off-site disposal option.

5.4.2.5 Disposal – Offsite Landfill

The primary disposal technology available is an off-site approved/permited landfill. Off-site landfilling utilizes standard construction equipment and methods. Due to the presence of the COCs, asbestos, and other constituents in the conductive flooring material, characterization samples of the flooring will be required prior to disposal to ensure the waste is disposed of in accordance with applicable regulations. Due to the presence of friable asbestos in the degraded sections of flooring, at a minimum the flooring would need to be disposed of at a facility permitted to accept friable asbestos. The off-site transportation of wastes resulting from removal must meet Federal and State shipping and manifesting regulations. The following summarizes the evaluation of this remedial technology with respect to the evaluation criteria.

Implementability

- Readily implementable.
- Disposal must be combined with removal.
- Requires documentation and material handling.

Effectiveness

- Effective at meeting the RAOs but may create additional short term exposure and risks.
- Does not require long term O&M.
- Effective in reducing the mobility and volume of contaminants on site.

Cost

- Moderate capital cost and no O&M cost.

Conclusion

The “disposal” option was retained for further consideration in conjunction with removal for both the BLA and IAA.

5.4.3 Process Options for WBG Sediment

The following section presents the remedial process options that would potentially be implemented to attain the RAOs for sediments at the WBG:

- No Action;
- Institutional Controls;
- Removal - Excavation;
- Ex-Situ Chemical Treatment - Stabilization and Solidification; and,
- Disposal - Off-Site Landfill.

5.4.3.1 *No Action*

The no action approach will not reduce the presence of COCs in sediment or mitigate exposure pathways. In addition, there is no way to verify that this option is effective, or to ensure land use remains consistent with the assumption of the risk assessments. The following summarizes the evaluation of this remedial technology with respect to the evaluation criteria.

Implementability

- Readily implementable.
- Unacceptable to regulatory agencies and public.

Effectiveness

- Not effective, nor is there any means to demonstrate effectiveness.
- Does not provide controls to limit site use and subsequent exposure to contaminants.

Cost

- There are no costs associated with this option.

Conclusion

Under the no action option, there exist unacceptable risks to human health under hypothetical future residential land uses at the site. This option is eliminated from further consideration as a remedial technology because it does not meet the RAOs for the WBG. It was retained as a baseline for comparison with other technologies.

5.4.3.2 Institutional Controls

The USEPA requires ICs when site contaminant levels do not allow unrestricted use of a site and/or unlimited exposure to site media. ICs can also serve to notify current and future users of a site about the environmental conditions of the property. Due to the nature and extent of the COCs in the affected sediment at the WBG, ICs may be a component of the selected remedial alternative. ICs could consist of both physical means and LUCs to restrict access and/or activities at the WBG to minimize exposure to the pond sediments. ICs that could be employed at the RFAAP-NRU could include:

- Engineering controls, such as placement of signage or fencing at the sites to limit access to the pond where the affected sediment is present. Signage and/or other literature could also be utilized to alert site visitors to the hazards present at the site. As an active military facility, access to the RFAAP-NRU is already restricted by a perimeter fence and site security personnel; therefore, this could be easily implemented.
- SOPs could be developed for use with other ICs to ensure that development and activities within the area of concern is limited to those that are consistent with the defined risk range for the site (i.e., industrial or residential).

- The health and safety plans for the site could also be updated as necessary to ensure proper long term management of the site and to ensure the health and safety of site workers during remedial implementation.
- Deed notifications could become necessary if the property were transferred out of federal ownership. CERCLA requires deed notifications for any transfer of federal property on which any hazardous substance was known to have been disposed or released, or stored for one year or more (40 CFR 373). The deed notification would, in perpetuity, notify any potential purchaser that the property has been used for the management and disposal of hazardous materials as part of site operations.
- Deed restrictions are provisions built into a property deed prohibiting certain uses of the property. Deed restrictions would preclude residential use of the property should a removal action only reduce the presence of COCs to industrial clean up levels.

The following summarizes the evaluation of this remedial technology with respect to the evaluation criteria.

Implementability

- Readily implementable.

Effectiveness

- Generally effective in managing future exposure.
- Does not reduce the volume or toxicity of contaminants at the site. However, this alternative could reduce the mobility of the contaminants. Historical sampling has indicated that the contaminants are generally localized to a small area and have not migrated as a result of the still waters in the pond. ICs could be used to minimize disturbance of the sediments which would minimize the potential for future migration.

Cost

- Low capital and low O&M costs.

Conclusion

This option was retained for further consideration as a stand-alone remedial technology because it would meet the RAOs in the absence of other actions. Also, ICs were retained for further consideration as potentially applicable in conjunction with other remedial technologies.

5.4.3.3 Removal – Excavation

Excavation methods would apply to sediment removal from the shallow, near-shore areas of the WBG ponds. Excavation can be achieved by employing standard excavation and construction equipment to remove the contaminated sediments. Removal activities also would include clearing utilities, establishing staging areas for equipment, dewatering of sediments, and establishing a stockpile area. A removal action for sediment would require the excavation to be subsequently restored with aquatic vegetation if any was removed. The extent of the sediment removal action can be adjusted to only remove sediments from a target area where the highest concentrations were detected, or can be scaled to remove sufficient sediments so as to achieve residential clean-up levels. This technology is only viable in combination with either treatment or disposal. The following summarizes the evaluation of this remedial technology with respect to the evaluation criteria.

Implementability

- Readily implementable and utilizes standard construction methods and materials.
- Would require treatment or disposal in conjunction with excavation.
- Would require restoration of aquatic vegetation upon completion of excavation activities.
- Technology is limited in practicality by depth and size of excavation required.
 - Excavation would require management to reduce spreading contamination via spillage or handling of contaminated sediments.

Effectiveness

- Proven technology.

- Would potentially create exposure to contaminants during excavation, though this could be minimized with appropriate engineering controls such as decontamination of personnel and equipment.
- Would achieve the RAOs.
- Reduces the volume, mobility and toxicity of contaminated sediment on site; but does not reduce the toxicity of the waste material unless treated, nor the volume of contaminated material disposed off site.
- Potentially applicable in conjunction with other remedial actions.

Cost

- Moderate to high capital and low O&M costs.

5.4.3.4 Ex-Situ Chemical Treatment – Stabilization/Solidification

Stabilization and solidification is a process by which contaminated sediment is mixed with a solidifying agent such as cement, lime, thermoplastics, or organic polymers to render the contaminated sediment as an inert solid form. Ex-situ stabilization/solidification processes rely upon the application of a reagent to produce desirable chemical and physical reactions that improve the physical properties of the sediment, to produce a waste that is easier to handle and to reduce the leaching of contaminants from the sediment. The stabilization agents can be added on-site following excavation using conventional equipment or at the off-site disposal facility. The excavated material would likely need to be dewatered prior to stabilization for the stabilization agents to be most effective. The advantages of using cement in the stabilization process are that it produces a high-pH end product, which limits metal leaching from wastes, and the relatively low cost of cement. The following summarizes the evaluation of this remedial technology with respect to the evaluation criteria.

Implementability

- This technology is readily implementable and utilizes conventional design, construction methods, and materials; and,
- Requires substantial material handling and documentation of effectiveness.

Effectiveness

- Effective in meeting the RAOs in conjunction with excavation and disposal; and,
- Reduces the toxicity and mobility of the contamination, but not the volume.

Cost:

- Moderate capital cost and no O&M if treated soil is disposed off-site.

Conclusion

The “treatment” option was retained for further consideration in conjunction with containment and disposal.

5.4.3.5 Disposal – Offsite Landfill

The primary disposal technology available is an approved/permitted off-site landfill. Off-site landfilling utilizes standard construction equipment and methods. Landfilling of contaminated sediment requires excavation, characterization, and transportation to a facility that is permitted to accept the specific waste. The off-site transportation of wastes resulting from excavation must meet Federal and State shipping and manifesting regulations. This technology is only viable in combination with either treatment or removal of sediment. The following summarizes the evaluation of this remedial technology with respect to the evaluation criteria.

Implementability

- Readily implementable.
- Disposal may be combined with treatment.
- Requires documentation and material handling.

Effectiveness

- Effective at meeting the RAOs but may create additional short term exposure and risks.

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- Does not require long term O&M.
- Effective of reducing the mobility and volume of contaminants on site.

Cost

- Moderate capital cost and no O&M cost.

Conclusion

The “disposal” option was retained for further consideration in conjunction with excavation and treatment.

6. Development of Response Action Alternatives

Response Action (RA) Alternatives were developed from the technologies retained in the initial screening of process options discussed in Section 5. This section provides a brief description of the RAs that could potentially be employed to achieve the RAOs for each of the individual media. An evaluation of these RAs will be conducted in accordance with the nine criteria set forth by Section 300.430(e) of the NCP in Sections 7 and 8.

In accordance with CERCLA guidance, RAs are required at the BLA, IAA, BDDT, and WBG sites to ensure that risk/hazard levels are within accepted ranges for the current and anticipated future use of the site. At the RFAAP-NRU, the current and anticipated future use of the site is industrial/commercial, and as such this will be the stated target of the RAs. However, remediation to residential levels will also be considered within this FS so that project life-cycle costs can be fully evaluated. Should remediation to residential levels (i.e., clean closure) prove to be financially advantageous to the Army in the long term, then clean closure may be recommended on a case-by-case basis.

6.1 Bag Loading Area and Igniter Assembly Area Soils

Four RAs were developed to achieve the RAOs for surficial soil at the BLA and IAA:

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

Each of these alternatives is discussed in the following subsections.

6.1.1 Alternative SL-1: No Action

Under Alternative SL-1, no corrective action of any kind would be employed for soil at the BLA or IAA. The no-action RA was created to establish a baseline for comparing the future performance and risk reduction capabilities of the remaining alternatives, even though no-action could not be employed as a viable alternative itself. The no-

action alternative will not prevent exposure to constituents in surface soil. There is no cost associated with this alternative.

6.1.2 Alternative SL-2: Institutional Controls

Within the BLA and IAA, unacceptable risks currently exist under the both the industrial land use scenario (i.e., site worker and/or construction worker exposure) and hypothetical residential land use scenario (adult and child exposure). For Alternative SL-2 to be effective for the current and anticipated future industrial land use, the existing ICs at the facility would be continued, and/or potentially expanded, to minimize the potential for human exposure to COCs in soil at concentrations above the proposed site worker and construction worker PRGs.

Under Alternative SL-2, ICs, which could consist of administrative and/or engineering controls, would be implemented at locations where COCs are present in soil at concentrations greater than both the industrial and residential PRGs. Examples of administrative controls that could be implemented for the BLA and IAA sites include actions such as: 1) formalizing the facility's land use restriction/avoidance policy for the sites; 2) developing site-specific SOPs for the areas to establish site access notification requirements and restrictions on site activities; and 3) developing site-specific health and safety protocols in the event that work must be performed at the site. In the event that the RFAAP-NRU facility is transferred out of federal ownership, the administrative controls would dictate that deed restrictions be placed on the BLA and IAA sites. Examples of engineering controls that could be implemented to help support the administrative controls could include actions such as installation of fencing or signage around the areas where site access needs to be controlled. It should be noted that the perimeter security fencing around the RFAAP-NRU facility already serves as an effective engineering control that restricts site access.

Any administrative and engineering controls implemented for the ICs will be maintained and documented during the CERCLA 5-year reviews.

6.1.3 Alternative SL-3: Vegetative Soil Cover and Institutional Controls

Alternative SL-3 includes the installation of a vegetative soil cover in targeted areas of the BLA and IAA. This action will mitigate the exposure pathway for areas where the COCs that contribute to the majority of the risk are present in surface soils. At the BLA this includes areas where copper, lead and asbestos are present at concentrations above the RALs for the site worker and construction worker. At the IAA, the soil cover

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would be utilized to mitigate the hazards presented by asbestos in surface soil as no other COCs were identified for the industrial exposure pathways. This alternative requires that ICs be implemented to ensure that the vegetative cap is maintained and that land use is restricted to industrial/commercial. Clean closure could not be achieved by this alternative because COCs would be left in place and the vegetative cap would preclude residential development of the property. Therefore, the vegetative cover would not be expanded to areas where COCs are only present at concentrations above the residential RALs. Additional details for this response action alternative are included in the following list.

- While the final extent of the vegetative soil cover at the BLA will be dependent on the development of the RALs, it is assumed that the soil cover will be installed on the open sides of the seven BLA buildings with conductive flooring. The full soil cover would likely extend to a distance of at least 2 ft from the buildings and then taper down to a distance of 6 ft. The soil cover would not be installed on the closed sides of the buildings that have not been impacted by the degraded conductive flooring. It is estimated that the total extent of the soil cover at the BLA would be approximately 10,000 ft².
- The extent of the vegetative soil cover option would be very similar to the BLA, in that it would be installed on all of the open sides of the IAA buildings that have been impacted by the conductive flooring. The full soil cover would extend to a distance of at least 2 ft from the buildings and then taper down to a distance of 6 ft. It is estimated that the total extent of the soil cover at the IAA would be approximately 16,000 ft².
- Any existing vegetation within the proposed work areas at the BLA and IAA would need to be cleared and grubbed prior to installation of the vegetative cap. The bulk of the vegetation within the work areas consists of grasses, shrubs, and small trees. However, some larger trees may also require removal to allow access to the work areas. The cleared vegetation would be disposed of at an approved off-site disposal facility.
- 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. Soil testing (e.g., geotechnical, agronomic, chemical, and in-situ compaction testing) would be conducted to verify the soil material and placement specifications. Engineering controls would be utilized during site work activities to minimize fugitive dust emissions.

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- Confirmation sampling will be conducted prior to the placement of the cap. The confirmation sampling program will include the collection of samples for field screening and laboratory analysis to ensure that soils with concentrations above the RALs are covered. The field screened samples will be analyzed for copper and lead using XRF. If necessary, the excavation footprint will be expanded based on the results of the confirmation sampling program.
- Storm water, erosion and sediment controls, such as silt fence, would be installed around the perimeter of the areas of disturbance to minimize erosion and sediment transport. These controls would be maintained until the vegetation for the new cover is established.
- It is assumed that construction activities would be conducted in Level D personal protective equipment (PPE); however, due to the presence of asbestos in the surficial soil, the level of PPE may be elevated to level C during construction activities. Real time dust and asbestos monitoring will be employed to assure worker and community protection.
- ICs would be implemented to restrict future land use because soils that exceed both the industrial and residential PRGs will be left in place; although the industrial PRG areas would only be a potential threat should site activities compromise the integrity of the vegetative soil cover. The ICs would be similar to those discussed for Alternative SL-2.
- Long-term inspection and maintenance of the soil cover would be conducted for a period of 30 years after implementation. Long-term maintenance would include performing and documenting annual inspections, conducting 5 year reviews, and maintenance of the vegetative cover to ensure the integrity and effectiveness of the cover. Maintenance would include mowing of the vegetation, erosion/subsidence repairs as deemed necessary, and inspection of ICs.

6.1.4 Alternative SL-4: Excavation, Transportation, Off-Site Disposal and Institutional Controls

Alternative SL-4 includes the excavation and off-site disposal of surface soils that contain constituents which contribute to the majority of the risk at the site (i.e., COCs greater than the industrial or residential RAL). Within the BLA and IAA, risks currently exist under the site worker, construction worker and hypothetical future residential adult and child scenarios. As such, the extent of the excavation activities can be designed to only target the areas that contain COCs at concentrations above the industrial RALs;

or the programs can be expanded to also cover the areas that contain COCs at concentrations above the residential RALs. If the excavation is only conducted to meet the industrial levels, ICs and an inspection program would still be required for the sites. If the excavation is expanded to meet the residential levels, the sites could achieve clean closure for soil and land use would be unrestricted. Following is a list of the activities that would be included for this alternative.

- **BLA Excavation Area under the Industrial Scenario:** The only risk drivers at the BLA under the industrial/construction worker exposure scenarios are lead, copper, and asbestos. The presence of these constituents above screening levels are generally confined to the surface soils located immediately adjacent to the open sides of the buildings with conductive flooring. While the final area requiring excavation will be dependent on the RALs developed for the industrial pathways, it is assumed that this action will include removal of surface soils at distances of at least 0-2 ft from the open sides of the buildings. Soils on the closed ends of the buildings that have not been impacted by the degraded flooring would not be included in this alternative. However, any additional areas containing visible surface staining or degraded conductive flooring would be included. It is estimated that the total footprint of the excavation area at the BLA would be approximately 3,300 ft².
- **BLA Excavation Area under the Residential Scenario:** Lead, copper, Aroclor 1254, benzo(a)pyrene, and asbestos were all found to be risk drivers in surface soil at the BLA under the residential scenario. While the final extent of the excavation area will be dependent on the RALs developed for the residential scenario, the 3,300 ft² excavation footprint for the industrial scenario would likely encompass the required action for the lead, copper, and asbestos impacted soil under the residential scenario. However, the excavation footprint would have to be expanded for the Aroclor 1254 and benzo(a)pyrene containing soils. For Aroclor 1254, the expanded area would include surface soils (0-1 ft bgs) near a former transformer location on the northwest corner of Building 405 and possibly near a former transformer location east of Building 416. The expansion for benzo(a)pyrene would likely include soil along the former elevated walkway corridors in the central portion of the site. In total, the excavation area would encompass approximately 27,000 ft².
- **IAA Excavation Area for the Industrial Scenario:** The only risk driver at the IAA under the industrial exposure scenario is asbestos. The highest concentrations of asbestos in soil are generally confined to the surface soils located immediately

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adjacent to the open sides of the buildings with conductive flooring. This action will include removal of surface soils at distances of at least 0-2 ft from the open sides of the buildings. Soils on the closed ends of the buildings that have not been impacted by the degraded flooring would not be included in this alternative. However, any additional areas containing visible surface staining or degraded conductive flooring would be included. It is estimated that the total footprint of the excavation area would be approximately 5,300 ft².

- IAA Excavation Area for the Residential Scenario: Under the residential scenario, lead, copper, and Aroclor 1254 were found to be risk drivers in addition to asbestos. While the final extent of the excavation area will be dependent on the RALs developed for the residential scenario, it appears that the bulk of the lead and copper impacts are collocated with the asbestos and are generally confined to the area within 0-2 ft of the open sides of the buildings. The only area of the site which may require that the excavation footprint be expanded is in the vicinity of Buildings 502 and 504 in the southern portion of the site. This “hot spot” area may require that the excavation area be expanded to 5 ft or more from the buildings to include lead, copper, and Aroclor 1254 in this area. The excavation activities would also likely include a small (approximately 10 ft by 10 ft area) near a former transformer at Building 8101. It is estimated that the total footprint of the excavation area for this alternative would be approximately 7,300 ft².
- The excavation activities would be performed utilizing conventional excavation equipment. In most areas, the depth of the excavation would extend to a depth of 1 ft bgs. The excavated material would be placed directly into roll-off containers or dump trucks and transported to a pre-approved disposal facility under manifest. Although, historical sampling indicates that soil at the site is not hazardous, waste characterization samples will be collected from the excavated waste to confirm the disposal requirements. If necessary, the soil may be mixed with a stabilization media at the disposal facility to reduce the potential for leachable constituents.
- Confirmation sampling will be conducted during the removal activity. The confirmation sampling program will include the collection of samples for field screening and laboratory analysis to ensure that soils with concentrations above the RALs are not left in place. The field screened samples will be analyzed for copper and lead using XRF. The laboratory samples will include all of the constituents for which RALs have been developed. No additional samples would be analyzed for asbestos because historical sampling has already confirmed that the highest concentrations in soil are located within the area that will be excavated.

If necessary, the excavation footprint will be expanded based on the results of the confirmation sampling program.

- Any existing vegetation within the proposed work areas at the BLA would need to be cleared and grubbed prior to the excavation activities. The bulk of the vegetation within the work areas consists of grasses, shrubs, and small trees. However, some larger trees may also require removal to allow access to the work areas. The cleared vegetation would be disposed of on-site or at an approved off-site disposal facility.
- Upon completion of the excavation activities, the excavated areas will be backfilled with clean soil imported from off site, unless an approved on-site source is identified. Samples of the backfill material will be submitted for laboratory analysis to ensure that contaminants are not imported to the site. The backfilled areas will be graded to promote positive drainage and seeded with grass to minimize the potential for erosion.
- Storm water, erosion and sediment controls, such as silt fence, would be installed around the perimeter of the areas of disturbance to minimize erosion and sediment transport. These controls would be maintained until the vegetation is established..
- It is assumed that construction activities would be conducted in Level D personal protective equipment (PPE); however, due to the presence of asbestos in the surficial soil, the level of PPE may be elevated to level C during construction activities. Real time dust and asbestos monitoring will be employed to assure worker and community protection.
- Should the excavation activities only be performed to target industrial levels, ICs would be implemented to restrict future land use because soils that exceed residential PRGs would be left in place. The ICs would be similar to those discussed in Alternative SL-2. This alternative would require that the industrial/commercial land use of the site remain in effect. ICs would not be required if the excavation activities were performed to residential levels.

6.2 Bag Loading Area and Igniter Assembly Area Conductive Flooring

Four RAs were developed to achieve the RAO for building materials within the BLA and IAA:

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

Each of these alternatives is discussed in the following subsections.

6.2.1.1 *Alternative CF-1: No Action*

Under Alternative CF -1, no corrective action of any kind would be employed at the BLA or IAA. The no-action RA was evaluated to establish a baseline for comparing the future performance and risk management capabilities of the remaining alternatives, even though no-action could not be employed as a viable alternative itself. The no-action alternative will not prevent exposure to constituents in flooring materials. There is no cost associated with this alternative.

6.2.1.2 *Alternative CF-2: Institutional Controls*

Under Alternative CF-2, ICs, which could consist of administrative and/or engineering controls, would be implemented for the buildings that contain conductive flooring. Examples of administrative controls that could be implemented for the BLA and IAA sites include actions such as: 1) formalizing the facility's land use restriction/avoidance policy for the sites; 2) developing site-specific SOPs for the areas to establish site access notification requirements and restrictions on site activities; and 3) developing site-specific health and safety protocols in the event that work must be performed at the site. In the event that the RFAAP-NRU facility is transferred out of federal ownership, the administrative controls would dictate that deed restrictions be placed on the BLA and IAA sites. Examples of engineering controls that could be implemented to help support the administrative controls could include actions such as installation of fencing or signage around the areas where site access needs to be controlled. It should be noted that the perimeter security fencing around the RFAAP-NRU facility already serves as an effective engineering control that restricts site access.

Any administrative and engineering controls implemented for the ICs will be maintained and documented during the CERCLA 5-year reviews.

6.2.1.3 Alternative CF-3: Removal and Disposal of Asbestos Containing Flooring Materials

Under Alternative CF-3, all conductive flooring material within the BLA and IAA 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 is hazardous or non-hazardous.

Removal would likely occur by scraping the surface of the flooring material to dislodge and collect the asbestos containing material. Asbestos removal would be conducted under the supervision of a certified asbestos abatement supervisor to ensure appropriate health and safety protocols, as they relate to asbestos, are employed. Work zones, wetting of the flooring material during removal, and other steps may be required during the removal action.

Buildings 404 and 407 of the BLA are two story structures that will require an evaluation of their structural integrity before workers are permitted to enter the buildings. The evaluation shall determine if there are overhead hazards (i.e. risks associated with falling objects striking workers on the first floor) or elevated worker hazards (i.e., workers on the second floor), and if these hazards can be mitigated.

Removed materials would be transported by truck to the receiving landfill after pre-acceptance of the material. It is assumed that removal activities would be conducted in Level C PPE; however, PPE may be downgraded to Level D if site conditions warrant. Erosion and sediment controls would be incorporated into this alternative.

6.2.1.4 Alternative BLA CF-4: Removal of Degraded Flooring, Capping (Epoxy) of 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 asbestos and metal containing 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 likely hood of future exposure and/or release to the environment. All waste characterization, erosion and sediment controls, health and safety protocol, 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 maintained to restrict future land use. The ICs would likely be similar to those presented under Alternative CF-2.

Long-term maintenance of the protective cap would be conducted for a period of 30 years after implementation. Long-term maintenance activities would be documented in CERCLA 5 year reviews, and may require maintenance of the epoxy cap to ensure the integrity and effectiveness of the cover. Maintenance may also include reapplication of the epoxy coating as deemed necessary.

6.3 Building Disposal Debris Trench

Four RAs were developed to achieve the RAOs for surficial soil at the BDDT:

- Alternative BDDT SL-1: No Action;
- Alternative BDDT SL-2: Institutional Controls;
- Alternative BDDT SL-3: Partial Excavation, Transportation, Off-Site Disposal, and institutional controls;
- Alternative BDDT SL-4: Excavation, Transportation, and Off-Site Disposal.

Each of these alternatives is discussed in the following subsections.

6.3.1 Alternative BDDT SL-1: No Action

Under Alternative BDDT SL-1, no corrective action of any kind would be employed for soil at the BDDT. The no-action RA was created to establish a baseline for comparing the future performance and risk reduction capabilities of the remaining alternatives, even though no-action could not be employed as a viable alternative itself. While the risk assessments indicated that there are no unacceptable risks for the current and anticipated future industrial use of the property, the no-action alternative would not include any provisions for preventing residential use of the property, for which

unacceptable risks are present. The no-action alternative will not prevent exposure to constituents in surface soil. There is no cost associated with this alternative.

6.3.2 Alternative BDDT SL-2: Institutional Controls

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

Under Alternative BDDT SL-2, ICs, which could consist of administrative and/or engineering controls, would be implemented for the BDDT site soils. Examples of administrative controls that could be implemented for the BDDT include actions such as: 1) formalizing the facility's land use restriction/avoidance policy for the site; 2) developing site-specific SOPs for the site to establish site access notification requirements and restrictions on site activities; and 3) developing site-specific health and safety protocols in the event that work must be performed at the site. In the event that the RFAAP-NRU facility is transferred out of federal ownership, the administrative controls would dictate that deed restrictions be placed on the BDDT site. Examples of engineering controls that could be implemented to help support the administrative controls could include actions such as installation of fencing or signage around the areas where site access needs to be controlled. It should be noted that the perimeter security fencing around the RFAAP-NRU facility already serves as an effective engineering control that restricts site access.

In addition, to prevent erosion and transport of the impacted soils within the trench, the following actions would be conducted. The rip-rap liner and downgradient vegetation would be maintained to protect the underlying soils from storm water erosion. Maintenance on both areas would be performed as necessary. In the event that the vegetation is compromised or damaged by fire or other causes, silt fencing will be erected to minimize soil transport and vegetation will be reestablished as quickly as possible.

Any administrative and engineering controls implemented for the ICs will be maintained and documented during the CERCLA 5-year reviews.

6.3.3 Alternative BDDT SL-3: Partial Excavation, Transportation, Off-Site Disposal, and Institutional Controls

Alternative BDDT SL-3 includes the excavation and off-site disposal of surface soils that contain COCs at concentrations greater than the residential RAL from the depositional area downgradient of the rip-rap. Because this excavation only targets the depositional area downgradient of the trench, and leaves impacted soils beneath the trench liner and rip-rap, institutional controls must be in place in a similar manner to alternative BDDT SL-2 to maintain the rip rap and preclude residential development of the site. However, the depositional area would no longer require maintenance or long-term controls. Following is a list of the activities that would be included for this alternative.

- Excavation of the depositional area downgradient of the trench: Benzo(a)pyrene was found to be a risk driver in surface soil at the BDDT under the residential scenario. In order to mitigate these risks, impacted surface soils would be excavated and transported to an off-site disposal facility. While the final extent of the excavation area would be dependent on the RALs developed for the residential scenario, it is assumed that the excavation would encompass the majority of the delta-shaped depositional area, or approximately 15,300 ft². The depth of the excavation would be approximately 1-ft bgs.
- The excavation activities would be performed utilizing conventional excavation equipment. In most areas, the depth of the excavation would extend to a depth of 1-ft bgs. The excavated material would be placed directly into roll-off containers or dump trucks and transported to a pre-approved disposal facility under manifest. Although, historical sampling indicates that soil at the site is not hazardous, waste characterization samples will be collected from the excavated waste to confirm the disposal requirements. If necessary, the soil may be mixed with a stabilization media at the disposal facility to reduce the potential for leachable constituents.
- Confirmation sampling will be conducted during the removal activity. The confirmation sampling program will consist of the collection of samples for laboratory analysis of PAHs to ensure that soils with concentrations above the RALs are not left in place. Because the horizontal extent of the required excavation has been adequately delineated, the confirmation sampling would be

limited to the base of the excavation. If necessary, the excavation depth will be increased based on the results of the confirmation sampling program.

- Any existing vegetation within the proposed work areas at the BDDT would need to be cleared and grubbed prior to the excavation activities. The bulk of the vegetation within the work areas consists of grasses, shrubs, and small trees. However, some larger trees may also require removal to allow access to the work areas. The cleared vegetation would be disposed of on-site or at an approved off-site disposal facility.
- Upon completion of the excavation activities, the excavated areas will be backfilled with clean soil imported from off site, unless an approved on-site source is identified. Samples of the backfill material will be submitted for laboratory analysis to ensure that contaminants are not imported to the site. The backfilled areas will be graded to promote positive drainage and seeded with grass to minimize the potential for erosion.
- Storm water, erosion and sediment controls, such as silt fence, would be installed around the perimeter of the areas of disturbance to minimize erosion and sediment transport. These controls would be maintained until the vegetation is established.
- It is assumed that construction activities would be conducted in Level D personal protective equipment (PPE).
- Administrative and engineering controls, similar to those presentd in Alternative BDDT SL-2, would be put in place to ensure the rip-rap area is properly maintained.

6.3.4 Alternative BDDT SL-4: Excavation, Transportation, and Off-Site Disposal

Alternative BDDT SL-4 is similar to Alternative BDDT SL-3 in that it includes the excavation and off-site disposal of surface soils that contain constituents which contribute to the majority of the risk at the site (i.e., COCs greater than the residential RAL). However, the notable difference is that this option includes the excavation of impacted soils beneath the synthetic liner/rip-rap, in addition to the depositional area downgradient of the trench. As this option would only be conducted to achieve a residential/unrestricted development level closure for the site, the extent of the excavation activities would be designed to target the areas that contain benzo(a)pyrene at concentrations above the residential RALs. After the excavation,

the remaining soils on site would not present unacceptable risks under residential land use scenarios, and as such, the BDDT would not require any ICs.

The following is a list of the activities that would be included for this alternative:

- Excavation of the depositional area downgradient of the trench: Benzo(a)pyrene was found to be a risk drivers in surface soil at the BDDT under the residential scenario. In order to mitigate these risks, impacted surface soils from the depositional area would be excavated and transported to an off-site disposal facility. While the final extent of the excavation area would be dependent on the RALs developed for the residential scenario, it is assumed that the excavation would encompass the majority of the delta-shaped depositional area, or approximately 15,300 ft². The depth of the excavation would be approximately 1-ft bgs.
- Excavation of the rip-rap lined area of the trench: Benzo(a)pyrene in soil underneath the rip-rap lined portion of the site was also found to present potential unacceptable risks in the event that it is removed under a hypothetical future residential land use scenario. Therefore, to achieve a residential level closure for the site, the impacted soils from the trench would be excavated and transported to an off-site disposal facility. To access the impacted soils the rip-rap and synthetic liner would first be removed from the trench and temporarily stockpiled on-site. The impacted soils would then be removed. The approximate areal extent of the excavation in the rip rap area is 10,200 ft². The depth of the excavation is assumed to be approximately 1-ft bgs; however, the final depth would be based on the results of confirmation samples collected from the base of the excavation.
- The excavation activities would be performed utilizing conventional excavation equipment. In most areas, the depth of the excavation would extend to a depth of 1 ft bgs. The excavated material would be placed directly into roll-off containers or dump trucks and transported to a pre-approved disposal facility under manifest. Although, historical sampling indicates that soil at the site is not hazardous, waste characterization samples will be collected from the excavated waste to confirm the disposal requirements. If necessary, the soil may be mixed with a stabilization media at the disposal facility to reduce the potential for leachable constituents.
- Confirmation sampling will be conducted during the removal activity. The confirmation sampling program will consist of the collection of samples for laboratory analysis of PAHs to ensure that soils with concentrations above the

RAIs are not left in place. Because the horizontal extent of the required excavation has been adequately delineated, the confirmation sampling would be limited to the base of the excavation. If necessary, the excavation depth will be increased based on the results of the confirmation sampling program.

- Any existing vegetation within the proposed work areas at the BDDT would need to be cleared and grubbed prior to the excavation activities. The bulk of the vegetation within the work areas consists of grasses, shrubs, and small trees. However, some larger trees may also require removal to allow access to the work areas. The cleared vegetation would be disposed of on-site or at an approved off-site disposal facility.
- Upon completion of the excavation activities, the excavated areas will be backfilled with clean soil imported from off site, unless an approved on-site source is identified. Samples of the backfill material will be submitted for laboratory analysis to ensure that contaminants are not imported to the site. The backfilled areas will be graded to promote positive drainage and seeded with grass to minimize the potential for erosion. The synthetic liner and rip-rap would also be placed back in the trench to prevent stormwater erosion.
- Storm water, erosion and sediment controls, such as silt fence, would be installed around the perimeter of the areas of disturbance to minimize erosion and sediment transport. These controls would be maintained until the rip-rap is back in place and vegetation is established.
- It is assumed that construction activities would be conducted in Level D personal protective equipment (PPE).

6.4 Western Burning Ground Sediment

Three RAs were developed to achieve the RAO for sediments within the unnamed pond at the Western Burning Ground:

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

Each of these alternatives is discussed in the following subsections.

6.4.1 Alternative SD-1: No Action

Under Alternative SD-1, no corrective action of any kind would be employed for sediment. The no-action RA was evaluated to establish a baseline for comparing the performance and risk management capabilities of the remaining alternatives, even though no-action could not be employed as a viable alternative itself. The no-action alternative will not prevent exposure to constituents in sediment. There is no cost associated with this alternative.

6.4.2 Alternative SD-2: Institutional Controls

Alternative SD-2 includes the establishment and maintenance of ICs at the site to control exposure pathways. The risk assessment for the site concluded that provided the current industrial/commercial use of the site is maintained, risks and hazards to human receptors at the site are within acceptable ranges.

Under Alternative SD-2, ICs, which could consist of administrative and/or engineering controls, would be implemented for the WBG pond. Examples of administrative controls that could be implemented for the WBG include actions such as: 1) formalizing the facility's land use restriction/avoidance policy for the site; 2) developing site-specific SOPs for the site to establish site access notification requirements and restrictions on site activities; and 3) developing site-specific health and safety protocols in the event that activities must be performed at the site. In the event that the RFAAP-NRU facility is transferred out of federal ownership, the administrative controls would dictate that deed restrictions be placed on the WBG site. Examples of engineering controls that could be implemented to help support the administrative controls could include actions such as installation of fencing or signage around the areas where site access needs to be controlled. It should be noted that the perimeter security fencing around the RFAAP-NRU facility already serves as an effective engineering control that restricts site access.

Any administrative and engineering controls implemented for the ICs will be maintained and documented during the CERCLA 5-year reviews.

6.4.3 Alternative SD-3: Excavation, Transportation, and Disposal of Sediments

Alternative SD-3 includes the excavation and off-site disposal of pond sediments that contain COCs at concentrations above the residential RALs. This alternative would allow for the clean closure of the site because risks would be within acceptable ranges for residential use of the site. There would be no restrictions to land use at the site; therefore, ICs would not be a necessary component of this alternative.

Lead and chromium were identified as the COCs in sediment that presented a risk under the hypothetical future residential land use scenario. In order to reduce the risks to levels acceptable for residential use of the property, sediment containing lead at concentrations above the residential RALs for lead and chromium would have to be removed from the pond. Based on historical delineation sampling conducted in the pond, lead and chromium above these levels are co-located in a small area near the northern bank of the pond. The target excavation area is confined to an approximately 50 ft by 25 ft area (i.e., 1250 ft²). Considering that the sediment depth is approximately 1.5 to 2 ft deep, approximately 70 yd³ of sediment would be removed.

Given the shallow depth of the unnamed pond located at the WBG, and the proximity of the target removal area to shore, it is expected that sediment removal will be conducted mechanically from shore using conventional excavation equipment (e.g., long-reach excavators). Prior to removal, an aqua barrier will be installed to isolate the excavation area, and the surface water will be pumped from the shore side of the aqua barrier to the lake side of the unnamed pond. In order to minimize the transport of contaminated sediment from the work area to the pond, the water will be filtered during pumping. As necessary, a bulkhead may be constructed along the shore of the unnamed pond to facilitate removal of sediment beyond the typical reach of the equipment used for excavation.

A material stabilization pad consisting of jersey barriers, aggregate, and geotextile will be constructed to allow for sediment dewatering and stabilization. Within this area it is anticipated that dredged/excavated material will be allowed to gravity dewater, and if necessary be mixed with appropriate stabilization materials (e.g., Portland cement, Cement Kiln Dust, Lime Kiln Dust) to reduce the water content before being loaded for transport and disposal. Waste characterization samples will be collected prior to excavation to evaluate whether the material can be disposed of as a non-hazardous or hazardous waste.

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The excavated sediment would be transported off site to an appropriate landfill permitted to accept the material. Based on the nature of the waste, this material may be disposed at a permitted Resource Conservation and Recovery Act (RCRA) Subtitle D (municipal waste) landfill. However, alternative facilities may be considered as part of the remedial design. Excavated materials would be transported by truck to the receiving landfill after pre-acceptance of the material. It is assumed that excavation activities would be conducted in Level D PPE.

Following completion of sediment dredging, the area impacted by remedial activities (i.e., the removal area, the stabilization pad) will be restored to pre-construction conditions to the extent practicable, including re-establishment of aquatic vegetation, as necessary.

7. Detailed Analysis of Response Action Alternatives

This section presents a detailed analysis of each RA developed in Section 6. These analyses are intended to aid in the selection of an RA that best satisfies the criteria identified in the NCP (USEPA 1990), and the specific RAOs, ARARs, and cleanup goals.

7.1 Evaluation Criteria

Section 300.430(e) of the NCP lists nine criteria against which each RA must be assessed. The first two criteria are threshold criteria that must be met by each alternative. The next five criteria are the primary balancing criteria upon which the analysis is based. The final two criteria are referred to as modifying criteria and are applied after the subsequent public comment period to evaluate state and community acceptance. The acceptability or performance of each RA against the criteria is evaluated individually so that relative strengths and weaknesses may be identified.

The two threshold criteria are:

- Protection of human health and the environment; and,
- Compliance with ARARs.

The five primary balancing criteria upon which the analysis is based on are:

- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume through treatment;
- Short-term effectiveness;
- Implementability; and,
- Cost.

The two modifying criteria will be evaluated following comments on the Proposed Plan and will be described in the DD. The modifying criteria are not addressed in this FS. These criteria are:

- State acceptance; and,
- Community acceptance.

The preferred RA for each of the target media will be the RA which satisfies the first two criteria and achieves the best combination of the remaining seven.

7.1.1 Overall Protection of Human Health and the Environment

This criterion addresses the extent and manner in which the RA achieves protection of human health and the environment over time. Protection of human health and the environment is met if each human health and ecological exposure pathway identified in the risk assessment as potentially resulting in adverse effects is eliminated, reduced to an acceptable level, or controlled through treatment or ICs. Site use restrictions after remediation are also considered under this criterion.

7.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

Alternatives are assessed to determine whether they attain federal and state ARARs as discussed in Section 4.3.

7.1.3 Long-Term Effectiveness and Permanence

The long-term reliability and effectiveness criterion addresses the extent and manner in which the RA continues to protect human health and the environment in terms of residual risk remaining at the site after the corrective action objectives have been met. This criterion considers the residuals following completion of the actions, expected duration of the remedy, and the degree of controls required to ensure protectiveness of the remedy.

7.1.4 Reduction of Toxicity, Mobility, or Volume of Wastes

This criterion relates to the extent to which RAs permanently reduce the toxicity, mobility, and volume of contaminants present at the site. Factors for this criterion

include the degree of permanence of the remedial action, the amount of hazardous materials destroyed, and the type and quantity of residuals remaining after treatment.

7.1.5 Short-Term Effectiveness

Short-term effectiveness addresses the effects of the RA during construction and implementation until the corrective action objectives are met. This criterion considers the protection of the community and workers, including the air-quality effects and hazards from excavation, transportation, and on-site treatment. In addition, the expected length of time for completion of the remedial action is considered.

7.1.6 Implementability

The technical and administrative feasibility of implementing each RA and the availability of services and materials are addressed by this criterion. This criterion also considers the degree of coordination required by the regulatory agencies, successful implementation of the remedial action at similar sites, and research to realistically predict field implementability.

7.1.7 Cost

This criterion addresses the capital costs, the operation and maintenance costs, and the present worth analysis of costs anticipated for the implementation of the remedy. Capital costs are divided into direct costs (construction) and indirect costs (non-construction and overhead). Direct capital costs include construction, equipment, land and site development, relocation, and disposal costs. Indirect capital costs include engineering expenses, legal fees, license or permit costs, start-up costs, and contingency allowances. Operation and maintenance costs consist of costs associated with post construction activities necessary to properly operate, maintain, and monitor a given remedy.

A detailed present-worth cost was developed for each RA. The opinions of probable cost presented in this FS were developed in accordance with USEPA guidance (USEPA, 2000b), vendor quotes, and previous project costs. The opinions of probable cost presented in this report were prepared with an anticipated accuracy range of +50 to -30 percent.

Cost as a criterion may also be used to screen RAs where each RA is found to equally meet or exceed the RAOs. Life-cycle costs will also be an important factor in

considering whether it is to the Army's advantage to remediate to industrial or residential levels. The cost analyses were developed applying the criteria detailed in the following sections.

7.1.7.1 Direct Capital Cost

Direct capital costs are comprised of the following components:

- Construction Costs - Costs for materials, labor, and equipment necessary to implement the RA;
- Equipment Costs - Cost of the equipment and/or services necessary to implement the response action; these are permanent equipment costs that continue for the duration of the operational period;
- Land and Site Development Costs - Costs associated with site or building preparation;
- Building and Service Costs - Costs for process and non-process buildings, utility connections, and purchased services; and,
- Disposal Costs - Costs for the off-site disposal of wastes generated during any supplemental investigation (if necessary), remediation, and monitoring activities.

7.1.7.2 Indirect Capital Cost

Indirect capital costs are comprised of the following components:

- Engineering Expenses - Costs for project administrative, design, drafting, and construction supervision;
- Legal Fees and License or Permit Costs - Administrative, legal, and technical support costs to obtain licenses and permits for installation and operation of the remedy;
- Startup and Shakedown Costs - Costs incurred during startup and testing of permanent systems;

- Contingency Allowances - Funds allocated and budgeted to cover unforeseen circumstances or scope modifications; and,
- Shutdown Costs - Costs necessary for the termination of operations after the acceptance of the response action.

7.1.7.3 Operation and Maintenance Cost

Operation and maintenance costs are comprised of the following components:

- Operating Labor Costs - Wages, salaries, overhead, fringe benefits, and profit associated with the labor force required to implement post-construction operations;
- Maintenance Materials and Labor Costs - Costs for labor, equipment, materials, parts and other resources required for routine maintenance of facilities and equipment;
- Auxiliary Materials and Energy - Cost of items such as expendable chemicals and electricity for treatment plant operations, water, sewer service, and fuel;
- Purchased Services - Sampling costs, laboratory fees, and professional fees for monitoring purposes;
- Disposal and Treatment Costs - Costs for the treatment and disposal of wastes generated in on-site treatment processes;
- Administrative Costs - Costs associated with administration of the response action operations, including financing, accounting and general overhead and management;
- Insurance, Taxes, and Licensing Costs - Costs such as liability and sudden accident insurance, licensing fees, or permit renewal and reporting costs;
- Maintenance Reserve and Contingency Funds - Costs for the anticipated replacement or rebuilding of equipment or unanticipated operations and maintenance costs; and,
- Other Costs - Items not otherwise assignable to the above categories.

7.2 Bag Loading Area and Igniter Assembly Area Surface Soils

This section presents an analysis of the RA alternatives that have been developed for surface soils at the BLA and IAA relative to the NCP evaluation criteria. A summary of this evaluation is also presented in Table 7-1 for the BLA and IAA.

7.2.1 Alternative SL-1: No Action

According to the NCP, the level of protectiveness achieved must be compared to the required expenditure of time and materials as an integral portion of the remedy selection process. The No Action alternative is intended to serve as a baseline by which to compare the risk reduction effectiveness of other potential alternatives. In this alternative, no remedial actions would be performed. No efforts would be undertaken to contain, remove, or monitor any contaminated areas at the site. The sites would remain without any additional actions.

7.2.1.1 Overall Protection of Human-Health and the Environment

The No Action alternative fails to control exposure to the contaminated soil and does not provide a reduction in risk to human health or the environment (i.e. industrial and residential risks/hazards remain). The no-action alternative will not reduce the source of waste material or chemical constituents. With the absence of monitoring under this alternative, there is no way to verify whether no-action provides protection or ensure land use remains consistent with the assumptions of the risk assessments.

7.2.1.2 Compliance with ARARs

The No-Action alternative does not meet any of the established ARARs or TBC guidance for the BLA or IAA.

7.2.1.3 Long-Term Effectiveness and Permanence

The No Action alternative does not provide any controls or provisions for monitoring reduction of concentrations over time, reduction of exposure or long-term management measures. All current and potential future risks would remain the same under this alternative.

7.2.1.4 Reduction of Toxicity, Mobility, or Volume

This alternative does not employ any treatment that would reduce the toxicity, mobility, or volume of COCs; therefore, it does not perform well by this criterion.

7.2.1.5 Short-Term Effectiveness

Implementation of this alternative does not pose any additional risks to the community, the workers, or the environment since there are no remedial activities associated with it, however, it does not mitigate any existing risks.

7.2.1.6 Implementability

There are no implementability concerns posed by this option because no actions would be undertaken.

7.2.1.7 Cost

There are no present worth costs or capital costs for the No Action alternative at the BLA or IAA.

7.2.2 Alternative SL-2: Institutional Controls

Alternative SL-2 utilizes ICs as the sole means of managing risks at the BLA and IAA. At a minimum, ICs would be implemented to mitigate risks within the areas that present unacceptable risks and hazards for the industrial site worker and construction worker so as to comply with the current and anticipated future industrial/commercial property use. ICs would also maintain the current industrial/commercial land use of the whole site, thereby ensuring no unacceptable risks to residents in the future; including areas where COCs are present at concentrations above residential PRGs. Elements of the ICs at the RFAAP-NRU, including specific implementation descriptions, will be included as part of the remedial design. The IC objectives are the following:

- Maintain current industrial/commercial use of the property;
- Control access to the area with COCs at concentrations above industrial PRGs to minimize exposure pathways/duration; and

- Prior to disturbance of soils at sites where risks remain, require implementation of special handling procedures, health and safety procedures, and permitting.

7.2.2.1 Overall Protection of Human-Health and the Environment

Alternative SL-2 will protect human health by restricting land use and thus reducing the exposure. Fencing or other engineering controls would protect areas where COCs are present in soil at concentrations above the PRGs, and health and safety protocols would be established for any work in those areas. The risk assessment concluded that there is minimal risk to the environment due to the limited extent of COC in soil.

7.2.2.2 Compliance with ARARs

There are no promulgated standards for soils. Therefore, there are no chemical-specific ARARs for evaluation. Exposure to COCs will be addressed through ICs, which will control changes in the current land use (industrial/commercial). Action-specific and location-specific ARARs will be met by this alternative.

7.2.2.3 Long-Term Effectiveness and Permanence

The long-term effectiveness and permanence of this alternative is dependent on the ability to maintain the ICs. Maintenance of the ICs would be achieved through an annual inspection program and regular maintenance of engineering controls. The overall long term effectiveness of this RA is tempered because COCs will remain on site; thus the potential for release of COCs is a continued threat.

7.2.2.4 Reduction of Toxicity, Mobility, or Volume

This alternative does not employ any treatment that would reduce the toxicity, mobility, or volume of COCs. All COCs would remain in place as they currently exist on-site. Although the nature of the COCs in soil at the site renders them relatively immobile, which is supported by historical data from the BLA, the potential would continue to exist for some limited migration of COCs from the affected areas.

7.2.2.5 Short-Term Effectiveness

Implementation of this alternative does not pose risks to the community or to the environment, and only poses negligible risk to site workers as part of the fence and

sign installation. The short duration required to implement ICs yields these alternatives as effective in the short term.

7.2.2.6 Implementability

Because of the minimal cost, short construction duration, standard procedures for instituting land use controls, and lack of permitting required for this alternative, it is readily implementable.

7.2.2.7 Cost

The costs associated with the implementation of ICs at the BLA and IAA are summarized in Tables 7-2 and 7-3, respectively. The detailed assumptions are presented in Appendix E. The cost associated with the implementation of Alternative SL-2 is based on the best available information regarding the anticipated scope of the RA at each site. The projected present-worth cost of this alternative for the BLA and IAA are \$188,000 and \$223,000, respectively.

7.2.3 Alternative SL-3: Vegetative Soil Cover and Institutional Controls

Alternative SL-3 protects human health via the placement of a vegetative soil cover over surface soils that exceed the industrial RALs for the identified COCs. ICs would also be implemented with this alternative to ensure that soil cover continues to be effective.

7.2.3.1 Overall Protection of Human-Health and the Environment

The soil cover alternative is protective of human health and the environment as it mitigates surface soil exposure for the industrial exposure pathways. However, COCs will be left in place with this option and areas with COCs present at concentrations above the residential PRGs would not be covered. This alternative requires that ICs are put in place to ensure that the soil cover remains intact and that land use does not change.

7.2.3.2 Compliance with ARARs

There are no promulgated standards for soils. Therefore, there are no chemical-specific ARARs for evaluation. Exposure to COCs will be addressed through placement of a vegetative cap and the use of ICs, which will control changes in the

current land use (industrial/commercial). Action-specific and location-specific ARARs will be met by this alternative.

7.2.3.3 Long-Term Effectiveness and Permanence

The soil cover associated with this alternative is designed to reduce risk to human health associated with exposure to contaminants in surface soil. As such, the soil cover will require periodic maintenance to ensure the soil cover integrity. Typical maintenance activities would include mowing of the vegetation and repairs to the cap resulting from erosion. ICs will also be implemented at the sites as described in the previous sections.

7.2.3.4 Reduction of Toxicity, Mobility, or Volume

Alternative SL-3 provides a reduction of mobility of the COCs by preventing their transport via erosion or by the migration of contaminants into deeper soils by minimizing percolation of precipitation through the soil. The vegetative cap would also prevent the COCs in surface soils from becoming airborne via wind or disturbance (i.e., dust generation). The toxicity and volume of the contaminants at the site would remain unchanged.

7.2.3.5 Short-Term Effectiveness

Soil disturbance activities during construction of the soil cover could result in material handling and dust generation resulting in minimal short-term risks. However, the potential for exposure would be reduced through the use of suitable protective clothing and equipment, good construction practices, and standard dust suppression techniques. Short term effectiveness may be minimally impacted by the necessity for an engineering design of the soil cover and permitting requirements.

7.2.3.6 Implementability

The vegetative cover alternative is readily implementable at both the BLA and IAA, involving standard construction techniques and equipment. However, the clearing activities that would be required to perform the site work, along with the number of target areas at both sites, may add some level of difficulty to this alternative. Minimal permitting effort may also be required for these remedial alternatives.

7.2.3.7 Cost

The costs associated with implementation of Alternative SL-3 at the BLA and the IAA are summarized in Table 7-4 and 7-5, respectively. In addition to the capital costs involved in construction of the vegetative cover, there will be annual inspection and maintenance costs with this option to ensure the vegetative cap and the LUCs are properly maintained. The detailed assumptions for the cost analysis are presented in Appendix E. The cost associated with the implementation of Alternative SL-3 is based on the best available information regarding the anticipated scope of the RA per site. The projected present-worth cost of this alternative for the BLA and IAA are as follows:

- BLA - \$314,000.
- IAA - \$341,000.

7.2.4 Alternative SL-4: Excavation, Transportation, Off-Site Disposal and Institutional Controls

Alternative SL-4 provides protection to human health and the environment by removing soils that contain the site specific COCs (see Sections 4.3.1.1 and 4.3.1.2) that exceed the industrial and/or residential PRGs for soil. Excavation of impacted soil will be combined with disposal at an approved permitted landfill. ICs would also be implemented in the event that the excavation was conducted to remove soils to the industrial clean up levels. ICs would not be required if all soils containing COCs at concentrations above the residential PRGs were removed.

7.2.4.1 Overall Protection of Human-Health and the Environment

The soil excavation alternative is protective of human health and the environment as it removes the source and exposure pathway for human health risk drivers from the site. However, the degree of protection to human health is contingent upon whether the excavation will extend only over those soils that exceed the industrial PRGs; or if the soil excavation will include soils that exceed both the industrial and residential PRGs. If the extent of the excavation is only to the industrial PRG, then ICs must also be maintained to ensure protectiveness of human health due to the potential residential risks at the site.

7.2.4.2 Compliance with ARARs

There are no promulgated standards for soils. Therefore, there are no chemical-specific ARARs for evaluation. Exposure to COCs will be addressed through excavation of soils with COC concentrations above the PRGs. Action-specific and location-specific ARARs will be met by this alternative.

7.2.4.3 Long-Term Effectiveness and Permanence

Alternative SL-4 is most effective in the long term if soils exceeding both the industrial and residential RALs are excavated, as the removal of COCs in soil that exceeds the residential RALs will remove the source of contamination and allow for an unrestricted use of the sites. The excavation to residential levels will not require sampling, inspections, maintenance or ICs. However, if excavation is only performed in the areas required to achieve industrial level closure, then ICs must be in place to prevent the potential for residential level exposures.

7.2.4.4 Reduction of Toxicity, Mobility, or Volume

This alternative is very effective at reducing the mobility and volume of the media affected by COCs present at the site. The degree of this reduction is dependent on whether the excavation is performed to meet the industrial or residential clean up goals. While, the excavation activities would not inherently reduce the total volume or toxicity of the COCs, the COCs and media would be transferred to a disposal facility and not longer present a risk to on-site receptors.

7.2.4.5 Short-Term Effectiveness

Excavation and transportation activities would result in material handling and dust generation resulting in short-term exposure risks. However, the potential for exposure would be reduced through the use of suitable protective clothing and equipment, good construction practices, and standard dust suppression techniques.

7.2.4.6 Implementability

This RA is readily implementable, involving standard construction techniques and equipment. However, the expansion of the target areas from industrial to residential levels would add some level of difficulty due to the larger scale of the area and volume of material that would need to be handled.

7.2.4.7 Cost

The costs associated with the implementation of excavation and disposal are contingent upon whether excavation shall cover the areas that are above the industrial PRGs or if the areas is expanded to include soils with COCs above the residential PRGs. The costs for implementing this alternative for the BLA are summarized in Tables 7-6A (industrial level) and 7-6B (residential level). The costs for implementing this alternative for the IAA are summarized in Tables 7-7A (industrial level) and 7-7B (residential level). The detailed assumptions are presented in Appendix E. The costs associated with the implementation of Alternative SL-4 are based on the best available information regarding the anticipated scope of the RA at the BLA and IAA. The projected present-worth cost of this RA for the various options are as follows:

- BLA Excavation and Disposal of Surface Soils for Industrial Level Closure: \$312,000.
- BLA Excavation and Disposal of Surface Soils for Residential Level Closure: \$601,000.
- IAA Excavation and Disposal of Surface Soils for Industrial Level Closure: \$384,000.
- IAA Excavation and Disposal of Surface Soils for Residential Level Closure: \$335,000.

7.3 Bag Loading Area and Igniter Assembly Area Conductive Flooring

This section presents an analysis of each RA alternative that has been developed for conductive flooring at the BLA and IAA relative to the NCP evaluation criteria. A summary of this evaluation is also presented in Table 7-8.

7.3.1 Alternative CF-1: No Action

According to the NCP, the level of protectiveness achieved must be compared to the required expenditure of time and materials as an integral portion of the remedy selection process. The No Action alternative is intended to serve as a baseline by which to compare the risk reduction effectiveness of other potential alternatives. In this alternative, no remedial actions would be performed. No efforts would be undertaken to

contain, remove, or monitor any contaminated areas at the site. The sites would remain without any additional actions.

7.3.1.1 Overall Protection of Human-Health and the Environment

The No Action alternative fails to control exposure to the contaminated media and does not provide a reduction in risk to human health or the environment. The no-action alternatives will not reduce the source of waste material or chemical constituents. In the absence of monitoring, under this alternative there is no way to verify whether no-action provides protection or ensure land use remains consistent with the assumptions of the risk assessments.

7.3.1.2 Compliance with ARARs

The no action alternative would fail to comply with the ARARs and TBC guidance for the BLA and IAA, as material would be left in place that pose unacceptable risks to human receptors.

7.3.1.3 Long-Term Effectiveness and Permanence

The No Action alternatives do not provide any controls for monitoring any reduction of concentrations over time, reduction of exposure or long-term management measures. All current and potential future risks would remain the same under this alternative.

7.3.1.4 Reduction of Toxicity, Mobility, or Volume

This alternative does not employ any treatment that would reduce the toxicity, mobility, or volume of COCs; therefore, they do not meet this criterion.

7.3.1.5 Short-Term Effectiveness

Implementation of these alternatives do not pose any additional risks to the community, the workers, or the environment since there are no remedial activities associated with it, however, they do not mitigate any existing risks.

7.3.1.6 Implementability

There are no implementability concerns posed by these alternatives.

7.3.1.7 Cost

There are no present worth costs and capital costs for the No Action alternatives.

7.3.2 Alternative CF-2: Institutional Controls

It is expected that implementation of ICs would control/minimize exposure so that risks to human receptors would remain within acceptable levels.

7.3.2.1 Overall Protection of Human-Health and the Environment

Alternative CF-2 will protect human health by restricting land use and controlling access to areas that contain conductive flooring, thus mitigating the exposure pathways. Maintenance of existing ICs as described will not reduce the risk to the environment; although, the ecological risk assessments for the BLA and IAA concluded that population level ecological effects were unlikely due to the limited distribution of COCs at the sites. In addition, CF-2 does not achieve the RAO because it fails to prevent future weathering of conductive flooring material or continued release to surrounding soils.

7.3.2.2 Compliance with ARARs

There are no chemical-specific ARARs for evaluation. Exposure to COCs will be addressed through the use of ICs, which will control exposure to the flooring materials. Action-specific and location-specific ARARs will be met by this alternative.

7.3.2.3 Long-Term Effectiveness and Permanence

Alternative CF-2 is moderately effective in the long term as long as ICs are properly implemented. These alternatives will require minimal maintenance to the fence and signs to ensure their effectiveness.

7.3.2.4 Reduction of Toxicity, Mobility, or Volume

This alternative does not employ any treatment that would reduce the toxicity, mobility, or volume of COCs. As such, the potential for release of COCs to surrounding areas will remain.

7.3.2.5 Short-Term Effectiveness

Implementation of this alternative does not pose risks to the community or to the environment, and only poses negligible risk to site workers as part of the fence and sign installation. The short duration required to implement ICs yields these alternatives as effective in the short term.

7.3.2.6 Implementability

Because of the minimal cost, short construction duration, and lack of permitting required for these alternatives, these alternatives are readily implementable.

7.3.2.7 Cost

The costs associated with the implementation of ICs for conductive flooring at the BLA and IAA are summarized in Tables 7-9 and 7-10, respectively. The detailed assumptions are presented in Appendix E. The cost associated with the implementation of Alternative CF-2 is based on the best available information regarding the anticipated scope of the RA at each site. The projected present-worth cost of implementing Alternative CF-2 at the BLA and IAA are \$129,000 and \$136,000, respectively.

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

Alternative CF-3 provide protection to human health and the environment by removing the building materials that drive unacceptable risk to human health and combines removal with disposal at an approved permitted landfill.

7.3.3.1 Overall Protection of Human-Health and the Environment

The removal of degraded flooring material combined with disposal is protective of human health and the environment as it removes the source material from the site, therefore mitigating the exposure pathways.

7.3.3.2 Compliance with ARARs

There are no chemical-specific ARARs for evaluation. The flooring will be removed from the site and disposed of in accordance with applicable guidelines. Action-specific and location-specific ARARs will be met by this alternative.

7.3.3.3 Long-Term Effectiveness and Permanence

Alternative CF-3 is very effective in the long term, as the removal of contaminated building materials that pose risks to human health or the environment will remove the source of contamination. As such, this alternative will not require inspections, maintenance, or ICs. This alternative also ensures that there will be no potential for future releases to soils surrounding the buildings.

7.3.3.4 Reduction of Toxicity, Mobility, or Volume

This RA provides the greatest reduction of mobility of the COCs. The toxicity and volume of the contaminants would be removed from these sites; however, both toxicity and volume would be transferred to the disposal facility rather than being eliminated.

7.3.3.5 Short-Term Effectiveness

Removal and transportation activities would result in material handling and potential exposure to asbestos dust. Safeguards would be employed to mitigate the potential for construction worker exposure to asbestos dust. These would include wetting of asbestos material, secondary containment and working in level C PPE. Because of the necessary health and safety protocols involved with asbestos abatement, this RA does pose some risk in the short term.

7.3.3.6 Implementability

This RA is implementable. This alternative utilizes standard abatement techniques and equipment.

7.3.3.7 Cost

The costs associated with the implementation of Removal, Transportation and Disposal at the BLA and IAA are summarized in Tables 7-11 and 7-12, respectively. The detailed assumptions are presented in Appendix E. The costs associated with the implementation of Alternative CF-3 are based on the best available information regarding the anticipated scope of the RA per site. The projected present-worth costs of implementing this alternative at the BLA and IAA are as follows \$521,000 and \$787,000, respectively.

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

Alternative BLA CF-4 provides protection to human health and the environment by removing the conductive flooring that contributes to unacceptable risk to human health and combines removal of degraded flooring, sealing/capping of intact flooring (Buildings 404 and 407), with disposal at an approved permitted landfill.

7.3.4.1 Overall Protection of Human-Health and the Environment

The removal of degraded flooring material and sealing/capping of intact flooring material, combined with disposal is protective of human health and the environment as it removes the source material from the site and/or caps the potential source of exposure, therefore mitigating the exposure pathways.

7.3.4.2 Compliance with ARARs

There are no chemical-specific ARARs for evaluation. The flooring will be removed from the site and disposed of in accordance with applicable guidelines. Action-specific and location-specific ARARs will be met by this alternative.

7.3.4.3 Long-Term Effectiveness and Permanence

Alternative BLA CM-4 is effective in the long term, as the removal of conductive flooring materials that pose risks to human health and serve as a continuing source of COCs to surrounding soils will either be removed from the site or capped to prevent exposure and future degradation. While effective in the long term, this alternative will require periodic inspection and/or maintenance of the cap placed over the intact flooring materials (at Buildings 404 and 407) and ICs to ensure the protectiveness of the cap is maintained.

7.3.4.4 Reduction of Toxicity, Mobility, or Volume

This RA provides the excellent reduction of mobility of the COCs. The toxicity and volume of the contaminants would be removed from these sites; however, both toxicity and volume would be transferred to the disposal facility rather than being eliminated.

7.3.4.5 Short-Term Effectiveness

Removal and transportation activities would result in material handling and potential worker exposure to asbestos dust. Safeguards would be employed to mitigate the potential for construction worker exposure to asbestos dust. These would include wetting of asbestos material, possible secondary containment and working in level C PPE. Because of the necessary health and safety protocols involved with asbestos abatement, this RA could pose some exposure risk in the short term.

7.3.4.6 Implementability

The necessary health and safety protocols and permitting involved with asbestos abatement prevent these alternatives from being easily implementable. However, these alternatives utilize standard construction techniques and equipment.

7.3.4.7 Cost

The costs associated with the implementation of Removal, Capping, Transportation and Disposal of the conductive flooring at the BLA are summarized in Table 7-13. The detailed assumptions are presented in Appendix E. The cost associated with the implementation of Alternatives BLA CF-4 is based on the best available information regarding the anticipated scope of the RA per site. The projected present-worth cost of this RA is \$899,000.

7.4 Building Disposal Debris Trench Soils

This section presents an analysis of the RA alternatives that have been developed for soils within the BDDT trench relative to the NCP evaluation criteria. A summary of this evaluation is also presented in Table 7-14 for the BDDT.

7.4.1 Alternative BDDT SL-1: No Action

According to the NCP, the level of protectiveness achieved must be compared to the required expenditure of time and materials as an integral portion of the remedy selection process. The No Action alternative is intended to serve as a baseline by which to compare the risk reduction effectiveness of other potential alternatives. In this alternative, no remedial actions would be performed. No efforts would be undertaken to contain, remove, or monitor any contaminated areas at the site. The sites would remain without any additional actions.

7.4.1.1 Overall Protection of Human-Health and the Environment

The No Action alternative fails to control exposure to the contaminated soil and does not provide a reduction in risk to human health or the environment (i.e. residential risks/hazards remain). The no-action alternative will not reduce the source of waste material or chemical constituents. With the absence of monitoring under this alternative, there is no way to verify whether no-action provides protection or ensure land use remains consistent with the assumptions of the risk assessments.

7.4.1.2 Compliance with ARARs

The No-Action alternative does not meet any of the established ARARs or TBC guidance for the BDDT.

7.4.1.3 Long-Term Effectiveness and Permanence

The No Action alternative does not provide any controls or provisions for monitoring reduction of concentrations over time, reduction of exposure or long-term management measures. All current and potential future risks would remain the same under this alternative.

7.4.1.4 Reduction of Toxicity, Mobility, or Volume

This alternative does not employ any treatment that would reduce the toxicity, mobility, or volume of COCs; therefore, it does not perform well by this criterion.

7.4.1.5 Short-Term Effectiveness

Implementation of this alternative does not pose any additional risks to the community, the workers, or the environment since there are no remedial activities associated with it, however, it does not mitigate any existing risks.

7.4.1.6 Implementability

There are no implementability concerns posed by this option because no actions would be undertaken.

7.4.1.7 Cost

There are no present worth costs or capital costs for the No Action alternative at the BLA or IAA.

7.4.2 Alternative BDDT SL-2: Institutional Controls

Alternative BDDT SL-2 utilizes ICs to manage the risks originating from soils within the BDDT trench. At a minimum, ICs would be implemented to maintain the current industrial/commercial land use of the whole site. This would help ensure that the site is not developed for residential purposes, which could lead to potentially unacceptable exposure to COCs. Elements of the ICs at the RFAAP-NRU, including specific IC implementation descriptions, will be included as part of the remedial design. The IC objectives are the following:

- Maintain current industrial/commercial use of the property;
- Control access to the area with COCs at concentrations above residential PRGs to minimize exposure pathways/duration;
- Maintain the rip-rap and the vegetation in the downgradient depositional area to minimize the potential for erosion to transport impacted soils.

7.4.2.1 Overall Protection of Human-Health and the Environment

Alternative BDDT SL-2 will protect human health by restricting land use and thus reducing the potential for unauthorized exposure. Signage would inform persons that might work at, or visit, the site of the hazards present at the site and the restrictions to land use. Health and safety protocols would be established for any work that might be conducted at the site. Provided that the rip-rap and vegetation are properly maintained as required by this alternative, there is minimal risk that impacted soils would be transported to areas that could lead to unacceptable exposures to humans or the environment.

7.4.2.2 Compliance with ARARs

There are no promulgated standards for soils. Therefore, there are no chemical-specific ARARs for evaluation. Exposure to COCs will be addressed through ICs,

which will control changes in the current land use (industrial/commercial). Action-specific and location-specific ARARs will be met by this alternative.

7.4.2.3 Long-Term Effectiveness and Permanence

The long-term effectiveness and permanence of this alternative is dependent on the ability to maintain the ICs. Maintenance of the ICs would be achieved through an annual inspection program and regular maintenance of engineering controls.

7.4.2.4 Reduction of Toxicity, Mobility, or Volume

This alternative does not employ any treatment that would reduce the toxicity, or volume of COCs. All COCs would remain in place as they currently exist on-site. However, maintenance of the rip-rap and downgradient vegetation will minimize the potential for transport of the COCs by preventing erosion.

7.4.2.5 Short-Term Effectiveness

Implementation of this alternative does not pose risks to the community or to the environment, or to site workers as part of the sign installation. The short duration required to implement ICs yields this alternative effective in the short term.

7.4.2.6 Implementability

Because of the minimal cost, short construction duration, standard procedures for instituting land use controls, and lack of permitting required for this alternative, it is readily implementable.

7.4.2.7 Cost

The costs associated with the implementation of Alternative BDDT SL2 are summarized in Table 7-15. The detailed assumptions are presented in Appendix E. The cost associated with the implementation of Alternative BDDT SL-2 is based on the best available information regarding the anticipated scope of the RA at the site. The projected present-worth cost of this alternative for the BDDT is \$146,000.

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

Alternative BDDT SL-3 provides protection to human health and the environment by removing soils that contain the site specific COCs (see Section 4.3.1.3) that exceed the residential PRGs for soil. Excavation of those soil located within the depositional area down gradient of the trench will be combined with disposal at an approved permitted landfill. ICs would also be required because COC impacted soils will be left in place beneath the rip-rap liner. ICs would be required to maintain the rip-rap and prevent the residential/unrestricted development of the site.

7.4.3.1 Overall Protection of Human-Health and the Environment

The soil excavation alternative is protective of human health and the environment as it removes COC impacted soil within the downgradient deposition area, and employs ICs to protect against the residential risk drivers remaining from COC impacted soil within the trench.

7.4.3.2 Compliance with ARARs

There are no promulgated standards for soils. Therefore, there are no chemical-specific ARARs for evaluation. Exposure to COCs will be addressed through excavation of soils with COC concentrations above the PRGs. Action-specific and location-specific ARARs will be met by this alternative.

7.4.3.3 Long-Term Effectiveness and Permanence

Because Alternative BDDT SL-3 only targets those soil located within the depositional area downgradient of the trench, and leaves the impacted soils within the trench, ICs must be in place to prevent the potential for residential exposures.

7.4.3.4 Reduction of Toxicity, Mobility, or Volume

This alternative is partially effective at reducing the mobility and volume of media affected by COCs present at the site. This alternative has been deemed only partially effective because those soils within the trench will remain on site. While, the excavation activities would not inherently reduce the total volume or toxicity of the COCs, the COCs and impacted media would be transferred to a disposal facility and no longer present a risk to on-site receptors. The potential mobility of the COCs would

be severely limited because the only area where COCw would remain is under the protective rip-rap cover.

7.4.3.5 Short-Term Effectiveness

Excavation and transportation activities would result in material handling and potential dust generation resulting in short-term exposure risks. However, the potential for exposure would be reduced through the use of suitable protective clothing and equipment, hygienic construction practices, and standard dust suppression techniques.

7.4.3.6 Implementability

This RA is readily implementable, involving standard construction techniques and equipment. In addition, a short duration to conduct this removal would be expected because of the minimal volume of soil proposed for removal.

7.4.3.7 Cost

The costs associated with the implementation of partial excavation and disposal are presented in Table 7-16. The detailed assumptions are presented in Appendix E. The costs associated with the implementation of Alternative SL-4 are based on the best available information regarding the anticipated scope of the RA at the BDDT. The projected present-worth cost of this RA is \$537,000.

7.4.4 Alternative BDDT SL-4: Excavation, Transportation, and Off-Site Disposal

Alternative BDDT SL-4 provides protection to human health and the environment by removing impacted soils so that the residual COC concentrations are below the residential PRGs. No ICs would be required under this alternative.

7.4.4.1 Overall Protection of Human-Health and the Environment

The removal alternative is protective of human health and the environment as it mitigates the exposure pathway of contaminated soils from the site. Because this alternative will remove soils that exceed the residential PRG, there will be no residual risk associated with this site; the BDDT will be able to have unrestricted use.

7.4.4.2 Compliance with ARARs

There are no promulgated standards for soils. Therefore, there are no chemical-specific ARARs for evaluation. Exposure to COCs will be addressed through excavation of soils with COC concentrations above the PRGs. Action-specific and location-specific ARARs will be met by this alternative.

7.4.4.3 Long-Term Effectiveness and Permanence

Alternative BDDT SL-4 is highly effective in the long term, as the removal of COCs that exceed the residential PRGs will remove the risks to residential levels; thus allowing a clean closure for the site. As such, this alternative will not require long term inspections, maintenance or ICs.

7.4.4.4 Reduction of Toxicity, Mobility, or Volume

This RA provides the greatest reduction of mobility of the COCs. The toxicity and volume of the contaminants would be removed from the site; however, both toxicity and volume would be transferred to the disposal facility rather than being eliminated.

7.4.4.5 Short-Term Effectiveness

Excavation and transportation activities would result in material handling resulting in the potential for short-term risks. However, the potential for worker exposure would be reduced through the use of protective equipment and hygienic construction practices.

7.4.4.6 Implementability

This RA is implementable, involving conventional soil excavation techniques and equipment. A construction design package would be required as part of the remedial action work plan.

7.4.4.7 Cost

The cost associated with the implementation of Alternative BDDT SL-4 is summarized in Table 7-17. The detailed assumptions are presented in Appendix E. The cost associated with the implementation of Alternative BDDT SL-4 is based on the best available information regarding the anticipated scope of the RA per site. The projected present-worth cost of the RA is \$856,000.

7.5 Western Burning Ground Sediments

This section presents an analysis of each RA alternative that has been developed for sediment at the WBG relative to the NCP evaluation criteria. A summary of this evaluation is also presented in Table 7-14.

7.5.1 Alternative SD-1: No Action

According to the NCP, the level of protectiveness achieved must be compared to the required expenditure of time and materials as an integral portion of the remedy selection process. The No Action alternative is intended to serve as a baseline by which to compare the risk reduction effectiveness of other potential alternatives. In this alternative, no remedial actions would be performed. No efforts would be undertaken to contain, remove, or monitor any contaminated areas at the site. The sites would remain without any additional actions.

7.5.1.1 Overall Protection of Human-Health and the Environment

The No Action alternative fails to control exposure to the contaminated media and does not provide a reduction in risk to human health or the environment. The no-action alternative will not reduce the source of waste material or chemical constituents. In the absence of monitoring, under this alternative there is no way to verify whether no-action provides protection or ensure land use remains consistent with the assumptions of the risk assessments.

7.5.1.2 Compliance with ARARs

The No Action alternative does not comply with any of the ARARs or TBC guidance.

7.5.1.3 Long-Term Effectiveness and Permanence

The No Action alternative does not provide any controls for monitoring any reduction of concentrations over time, reduction of exposure or long-term management measures. All current and potential future risks would remain the same under this alternative.

7.5.1.4 Reduction of Toxicity, Mobility, or Volume

This alternative does not employ any treatment that would reduce the toxicity, mobility, or volume of COCs; therefore, it does not meet this criterion.

7.5.1.5 Short-Term Effectiveness

Implementation of this alternative does not pose any additional risks to the community, the workers, or the environment since there are no remedial activities associated with it, however, it does not mitigate any existing risks.

7.5.1.6 Implementability

There are no implementability concerns posed by this option.

7.5.1.7 Cost

There are no costs associated with this alternative.

7.5.2 Alternative SD-2: Institutional Controls

Alternative SD-2 maintains the current and reasonably anticipated future land use (industrial/commercial) and will include land use restrictions. ICs will maintain the current land use thereby minimizing the potential for unacceptable risks to humans in the future. Elements of the ICs at Radford including specific implementation descriptions will be included as part of the remedial design. The IC objectives are the following:

- Maintain current industrial use of the property.
- Minimize or restrict access to the area containing COCs at concentrations above the PRGs thus removing or mitigating exposure pathways.
- Prior to disturbance of sediment at sites where risks remain, require implementation of special handling procedures, health and safety procedures, and permitting.

7.5.2.1 Overall Protection of Human-Health and the Environment

Alternative SD-2 will protect human health by restricting land use and by managing exposure to the industrial site worker and construction excavation worker. Maintenance of existing ICs as described will not reduce the risk to the environment; although the ecological risk assessment concluded that there was minimal risk to ecological receptors due to the limited distribution of the COCs.

7.5.2.2 Compliance with ARARs

There are no promulgated standards for sediments. Therefore, there are no chemical-specific ARARs for evaluation. Exposure to COCs will be addressed through ICs, which will control changes in the current land use (industrial/commercial). Action-specific and location-specific ARARs will be met by this alternative.

7.5.2.3 Long-Term Effectiveness and Permanence

Alternative SD-2 is effective in the long term as long as the site use remains unchanged and ICs continue to be implemented. This alternative will require minimal maintenance to signs or other engineering controls to ensure their effectiveness.

7.5.2.4 Reduction of Toxicity, Mobility, or Volume

This alternative does not employ any treatment that would reduce the toxicity, mobility, or volume of COCs.

7.5.2.5 Short-Term Effectiveness

Implementation of this alternative does not pose risks to the community or to the environment, and only poses negligible risk to site workers as part of the installation of engineering controls. The short duration required to implement ICs yields this option as effective in the short term.

7.5.2.6 Implementability

Because of the minimal cost, short construction duration, and lack of permitting required for this alternative, this option is readily implementable.

7.5.2.7 Cost

The costs associated with the implementation of ICs at the WBG are summarized in Tables 7-15. The detailed assumptions are presented in Appendix E. The cost associated with the implementation of Alternative SD-2 is based on the best available information regarding the anticipated scope of the RA at the WBG. The projected present-worth cost of the RA is \$119,000. The bulk of the costs for this alternative are associated with the long term inspections, maintenance, and reporting for the ICs.

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

Alternative SD-3 provides protection to human health and the environment by removing the sediments that contain COCs which exceed the residential PRGs and combining removal with disposal at an approved permitted landfill.

7.5.3.1 Overall Protection of Human-Health and the Environment

The removal alternative is protective of human health and the environment as it mitigates the exposure pathway of contaminated sediments from the site. Because this alternative will remove sediments that exceed the residential PRG, there will be no risk associated with this site, the WBG will be able to have unrestricted use.

7.5.3.2 Compliance with ARARs

This alternative complies with the ARARs and TBC guidance.

7.5.3.3 Long-Term Effectiveness and Permanence

Alternative SD-3 is highly effective in the long term, as the removal of COCs that exceed the residential PRGs will remove the risks to residential levels; thus allowing a clean closure for the site. As such, this alternative will not require long term inspections, maintenance or ICs.

7.5.3.4 Reduction of Toxicity, Mobility, or Volume

This RA provides the greatest reduction of mobility of the COCs. The toxicity and volume of the contaminants would be removed from the site; however, both toxicity and volume would be transferred to the disposal facility rather than being eliminated.

7.5.3.5 Short-Term Effectiveness

Excavation and transportation activities would result in material handling resulting in the potential for short-term risks. However, the potential for worker exposure would be reduced through the use of protective equipment and good construction practices.

7.5.3.6 Implementability

This RA is readily implementable, involving conventional sediment excavation techniques and equipment. However, the topography of the WBG area may provide some limitations on how the work would be performed.

7.5.3.7 Cost

The costs associated with the implementation of Alternative SD-3 are summarized in Table 7-16. The detailed assumptions are presented in Appendix E. The cost associated with the implementation of Alternative SD-3 is based on the best available information regarding the anticipated scope of the RA per site. The projected present-worth cost of the RA is \$282,000.

8. Comparative Analysis of Response Action Alternatives

In Section 7 the available response action alternative for the BLA, IAA, BDDT, and WBG were evaluated on an individual basis. This section (Section 8) provides a comparative analysis of the expected performance of each alternative relative to the other alternatives to identify their respective advantages and disadvantages.

In order to compare the response action alternatives, ratings of poor, acceptable, good or excellent were assigned to each of the evaluation criteria used in the analysis of the alternatives. Ratings were assigned based on a subjective appraisal of the degree to which each alternative met the criteria. The ratings for each group of alternative as they apply to the BLA, IAA, BDDT, and WBG are presented in Tables 8-1 through 8-3, respectively.

8.1 Bag Loading Area and Igniter Assembly Area Surface Soils

The response action alternatives available for the BLA and IAA soils are:

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

The comparative analysis of each of these alternatives is presented in the following subsections and in Table 8-1.

8.1.1 Overall Protection of Human Health and the Environment

Alternative SL-1 does not provide protection of human health or the environment. Alternative SL-2 which uses ICs to manage the exposure pathways, affords protection of human health by minimizing the potential for contact with COCs. Alternatives SL-3 and SL-4 are more protective of human health because they reduce risk by mitigating potential exposure pathways. However, for Alternative SL-4 there is the option to expand the response action to achieve the residential PRGs, as opposed to only

achieving the industrial PRGs. Naturally, the option to remediate to the residential PRG would be most protective within a respective alternative.

8.1.2 Compliance with ARARs

There are no chemical-specific ARARs for the chemicals that contribute to the majority of the risks to human health at the BLA or IAA. Location-specific and action-specific ARARs will be met by all alternatives with the exception of the no-action alternative (SL-1).

8.1.3 Long-Term Reliability and Effectiveness

Alternative SL-4 would rank slightly more reliable and effective than Alternative SL-3 because the contaminants are permanently removed from the site rather than being controlled in place. However, alternatives SL-3 and SL-4 both provide (good) long-term reliability and effectiveness because they mitigate exposure pathways to contaminated surface soil. 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 (SL-4) was expanded to excavate to residential levels.

For SL-4, the option to remediate to the residential PRG will provided the greatest (excellent) long-term reliability and effectiveness, because it removes the source of the risk, and will not require long term maintenance or inspection program.

Alternative SL-2 provides good long-term reliability and effectiveness for the BLA and IAA 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 the No Action Alternative is poor because it provides no means to mitigate risk at the site.

8.1.4 Reduction of Toxicity, Mobility, or Volume of Wastes

The No Action Alternative (SL-1) does not contribute to the reduction in the toxicity, mobility, or volume of wastes present at the site. Alternative 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 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 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.

8.1.5 Short-Term Effectiveness

Alternatives SL-3 and SL-4 provide less short-term effectiveness (adequate to good) compared to Alternatives SL-2 (excellent). The short-term effectiveness is less for Alternatives SL-3 and SL-4 because material handling and dust generation could occur with these remedies. Alternative 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. Alternatives SL-1 is not effective in the short term and thus received a rating of poor.

8.1.6 Implementability

The most readily implementable Alternatives are Alternatives SL-1 and SL-2 which receive excellent ratings due to the minimal effort necessary to complete them. Alternative SL-2 requires minimal engineering effort and permitting is not expected. Alternative SL-3 will require an engineering design prior to implementation, thus resulting in a score of good. Alternative SL-4 will require minimal design and should not require permitting as part of the excavation, transportation, and disposal of contaminated soils. The extent of the excavation for the industrial level closure scenario is relatively minimal; thus the implementability of SL-4 is rated as good. However, if the extent of the excavation is expanded to residential levels, SL-4 will become more difficult to implement due to the larger areas and waste volumes that will have to be handled.

8.1.7 Cost

There is no cost associated with SL-1 at the BLA or IAA because no response actions of any kind would be implemented. The cost of implementing the institutional controls for Alternative 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, SL-3 (Vegetative Soil Cover) and SL-4 (Excavation and Disposal) are much higher than the Alternative SL-2. At the BLA, the cost of SL-3 is approximately \$314,000, while the cost of 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 SL-3 is approximately \$341,000, while the cost of 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 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.

8.2 Bag Loading Area and Igniter Assembly Area Conductive Flooring

The response action alternatives available for the BLA and IAA conductive flooring are:

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

The comparative analysis of each of these alternatives is presented in the following subsections and in Table 8-2.

8.2.1 Overall Protection of Human Health and the Environment

Alternative CF-1 does not provide protection of human health or the environment. Alternative 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 CF-3 is protective of human health and the environment because it reduces risk by mitigating potential exposure pathways by a complete removal, or containment (Alternative BLA CF-4 Buildings 404 and 407) of the source.

8.2.2 Compliance with ARARs

There are no chemical-specific ARARs for the flooring material at the BLA and IAA. Location-specific and action-specific ARARs will be met by all alternatives with the exception of the no-action alternative.

8.2.3 Long-Term Reliability and Effectiveness

Alternative CF-3 provides excellent long-term reliability and effectiveness because it mitigates exposure pathways by a complete removal of the source. As a result, annual inspections and maintenance of the flooring are unnecessary with this alternative. 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 the cap is intact for Buildings 404 and 407.

Alternative CF-2 provides adequate long-term reliability and effectiveness for all sites 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. However, CF-2 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.

8.2.4 Reduction of Toxicity, Mobility, or Volume of Wastes

Alternatives CF-1 and CF-2 do not contribute to the reduction in the toxicity, mobility, or volume of wastes present at the site. Alternative BLA CF-4 reduces the mobility of contaminants present at the site at Buildings 404 and 407 of the BLA. The toxicity and volume of the contaminants would be removed from the sites under Alternatives CF-3 and BLA CF-4.

8.2.5 Short-Term Effectiveness

Alternative CF-3 and BLA CF-4 provides less short-term effectiveness (adequate to good) compared to Alternative CF-2 (excellent). The short-term effectiveness is less for Alternatives CF-3 and BLA CF-4 because material handling and dust generation has the potential to occur with these remedies. Alternative 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 and thus received a rating of poor.

8.2.6 Implementability

The most readily implementable Alternatives are Alternatives CF-1 and CF-2, which receives excellent ratings due to the minimal effort associated with them. Alternative CF-2 requires minimal engineering effort and permitting is not expected. Alternatives CF-3 and CF-4 are adequately implementable. Although both of these alternatives utilize standard construction materials and methods for asbestos abatement, they will require engineering safeguards, manual labor, and health and safety protocols to implement the removal of degraded flooring.

8.2.7 Cost

There is no cost associated with CF-1 because no response actions of any kind would be implemented. The cost of implementing the institutional controls for Alternative CF-2 at the BLA and IAA are \$129,000 and \$136,000, respectively. The cost of the removal action alternative, CF-3, is considerably more than CF-2 at \$521,000 for the BLA and \$787,000 for the IAA. The cost of the last alternative, CF-4, which only applies to the BLA is \$899,000. The cost of CF-4 is greater than CF-3 due to the ICs and O&M that are required for this alternative.

8.3 Building Disposal Debris Trench Soils

The response action alternatives available for the BDDT soils are:

- Alternative BDDT SL-1: No Action;
- Alternative BDDT SL-2: Institutional Controls;
- Alternative BDDT SL-3: Partial Excavation, Transportation, Off-Site Disposal, and institutional controls;
- Alternative BDDT SL-4: Excavation, Transportation, and Off-Site Disposal

The comparative analysis of each of these alternatives is presented in the following subsections and in Table 8-3.

8.3.1 Overall Protection of Human Health and the Environment

There are no ecological risks present at this site, thus only the protection to human health will be evaluated. Alternative BDDT SL-1 does not provide protection of human health. Alternative BDDT SL-2, which uses ICs to maintain current land use and manage the exposure pathways, affords protection of human health for industrial/commercial land use. Alternative BDDT SL-3 is protective of human health because it reduces risk to levels acceptable for residential use by removing the soils located downgradient of the trench that are the driver for risk at the site. Alternative BDDT SL-4 is most effective as it removes soils beneath the rip-rap lining of the trench and those soils downgradient of the site to residential PRGs.

8.3.2 Compliance with ARARs

There are no chemical-specific ARARs for soils at the BDDT. Location-specific and action-specific ARARs will be met by all alternatives with the exception of the no-action alternative.

8.3.3 Long-Term Reliability and Effectiveness

Alternative BDDT SL-4 provides excellent long-term reliability and effectiveness because it mitigates exposure pathways to contaminated soils both beneath the rip-rap lining of the trench and those soils down gradient of the trench, and eliminates the potential for future migration of contaminants. Alternatives BDDT SL-2 and BDDT SL-3 are both moderately effective as they both require IC/ECs 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.

8.3.4 Reduction of Toxicity, Mobility, or Volume of Wastes

The No Action Alternative (BDDT SL-1) does not contribute to the reduction in the toxicity, mobility, or volume of wastes present at the site. Alternative BDDT SL-2 would not reduce the toxicity or volume of waste at the site, but it would reduce the mobility of the contaminants present in soils by implementing ICs that would prevent disturbance

of the impacted soils and provide for the maintenance of rip-rap and vegetation that prevent erosion of impacted soils. Alternative BDDT SL-3 would provide a reduction in the mobility of contaminants via the implementation of ICs. However, this alternative only provides a partial reduction of volume and toxicity of the contaminants because PAH impacted soils beneath the rip-rap lining of the trench will remain on site. Alternative BDDT-SL4 provides the greatest reduction in the toxicity, mobility, and volume of waste as this alternative will remove all soils from the site that exceed the residential PRG.

8.3.5 Short-Term Effectiveness

Alternative BDDT SL-2 provides the best short term effectiveness due to the minimal logistical coordination to implement. BDDT SL-2 also prevents the need to handle materials thus minimizes the potential for short term exposure to constituents. The short-term effectiveness is less for Alternative BDDT SL-3 because material handling and generation of waste will occur for portions of this site with this alternative. Alternative BDDT SL-4 is the least effective in the short term due to the quantity of material being removed from the site and the logistical coordination and engineering design required to remove all soils above the residential PRG. 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.

8.3.6 Implementability

The most readily implementable Alternatives are Alternatives BDDT SL-1 and BDDT SL-2 which receive excellent ratings. Alternative BDDT SL-2 requires minimal engineering effort and permitting is not expected. 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.

8.3.7 Cost

There is no cost associated with BDDT SL-1 because no response actions 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 SL-3 would still require ICs to maintain the rip rap area because COCs would still remain in place.

8.4 Western Burning Ground Sediment

The response action alternatives available for the WBG sediments are:

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

The comparative analysis of each of these alternatives is presented in the following subsections and in Table 8-3.

8.4.1 Overall Protection of Human Health and the Environment

There are no ecological risks present at this site, thus only the protection to human health will be evaluated. Alternative SD-1 does not provide protection of human health. Alternative SD-2, which uses ICs to maintain current land use and manage the exposure pathways, affords protection of human health for industrial/commercial land use. 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.

8.4.2 Compliance with ARARs

There are no chemical-specific ARARs for sediment at the WBG. Location-specific and action-specific ARARs will be met by all alternatives with the exception of the no-action alternative.

8.4.3 Long-Term Reliability and Effectiveness

Alternative SD-3 provides excellent long-term reliability and effectiveness because it mitigates exposure pathways to contaminated sediment and eliminates the source of the contamination. Alternative SD-2 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.

8.4.4 Reduction of Toxicity, Mobility, or Volume of Wastes

The No Action Alternative (SD-1) does not contribute to the reduction in the toxicity, mobility, or volume of wastes present at the site. Alternative 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 SD-3; however, the excavation activities included in Alternative SD-3 will result in the disturbance of the sediments which could result in the contaminants being spread to other areas of the pond.

8.4.5 Short-Term Effectiveness

Alternative SD-3 provides less short-term effectiveness (adequate to good) compared to Alternative SD-2 (excellent). The short-term effectiveness is less for Alternative SD-3 because material handling and generation of waste will occur with this remedy. Alternatives 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 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.

8.4.6 Implementability

The most readily implementable Alternatives are Alternatives SD-1 and SD-2 which receive excellent ratings. Alternative SD-2 requires minimal engineering effort and permitting is not expected. Alternative SD-3 will require an engineering design prior to implementation and permitting as part of the excavation, transportation, and disposal of contaminated sediments. However, the extent of the excavation is minimal and does not require significant design, thus the implementability of this alternative is rated as good.

8.4.7 Cost

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

9. Recommended Response Action Alternatives

The final selection of the CERCLA response actions for the BLA, IAA, BDDT, and WBG discussed in this FS will not be made until the DD. However, this section presents recommendations on the preferred response actions for each site. The recommended response actions provide the optimum balance among considered alternatives with respect to the evaluation criteria specified in the NCP and represent cost-effective means of addressing the risk at the sites. These RAs are implementable, effective in meeting the RAOs, and are cost effective.

9.1.1 Bag Loading Area

Alternative SL-4: Excavation, Transportation, Off-Site Disposal and Institutional Controls is the recommended alternative for soil at the BLA. Under this alternative, soil containing asbestos, lead, and copper at concentrations above the industrial RALs will be excavated and removed from the site, so that the site will be suitable for the current and anticipated future industrial/commercial land use scenario. Institutional controls will be required over the long term because the site will not be remediated to levels suitable for residential land use. While this alternative could have been expanded to remediate to residential levels, the costs associated with the additional excavation activities are substantial. It should also be noted that ICs would be required for the site regardless of the recommended soil action because the buildings at the site are going to be left in place with lead based paint and asbestos containing materials. Alternative SL-4 is preferable to SL-3 (Vegetative Soil Cover and Institutional Controls) because it is more effective and has less long term O&M requirements.

Alternative CF-3 Removal and Disposal of Asbestos Containing Flooring Materials is the recommended alternative for the BLA conductive flooring. The degrading conductive flooring serves as a continuing source of contaminants to surface soil surrounding the BLA buildings. In its degraded state, the conductive flooring also presents an exposure risk to receptors that may come into contact with it. While the ICs presented in Alternative CF-2 could help meet the RAOs of minimizing migration potential and human exposure, the most effective way to meet the RAOs is to remove the flooring from the site. Alternative CF-4 is not recommended for the BLA because it has the same effectiveness as Alternative CF-3, but is much more expensive to implement due to the need to implement ICs and maintain the epoxy coating for the flooring.

9.1.2 Igniter Assembly Area

Alternative SL-4: Excavation, Transportation, and Off-Site Disposal is the recommended alternative for soil at the IAA. Under this alternative, soil containing asbestos, lead, and Aroclor 1254 at concentrations above the residential RALs will be excavated and removed from the site. Institutional controls would not be required for soil under this alternative because the site will be remediated to levels suitable for residential land use. While Alternative SL-4 could have been reduced slightly to remediate only to industrial levels, the costs associated with the additional excavation activities are less than those for long term inspections and reporting associated with an industrial level closure. It should also be noted that land use controls will still be required for the site because the buildings at the site are going to be left in place with lead based paint and asbestos containing materials. Alternative SL-4 is preferable to SL-3 (Vegetative Soil Cover and Institutional Controls) because it is more effective and has less long term O&M requirements.

Similar to the BLA, Alternative CF-3 Removal and Disposal of Asbestos Containing Flooring Materials is the recommended alternative for the IAA conductive flooring. The degrading conductive flooring serves as a potential continuing source of contaminants to surface soil surrounding the IAA buildings. In its degraded state, the conductive flooring also presents an exposure risk to receptors that may come into contact with it. While the ICs presented in Alternative CF-2 could help meet the RAOs of minimizing migration potential and human exposure, the most effective way to meet the RAOs is to remove the flooring from the site.

9.1.3 Building Debris Disposal Trench

Alternative BDDT SL-2: Institutional Controls is the recommended alternative for the BDDT soils. The risk assessment for the site has concluded that the risks and hazards under the industrial site worker and construction worker scenarios are within generally acceptable levels, and as such the BDDT is suitable for the current industrial/commercial use. The anticipated future use of the BDDT is also industrial/commercial. Therefore, the use of institutional controls and land use restrictions will be sufficiently protective and an active removal option will not be required for the site.

Alternative BDDT SL-2 was recommended over Alternative BDDT SL-3 (Partial Excavation, Transportation, Off-Site Disposal, and Institutional Controls) and BDDT SL-4 (Excavation, Transportation, and Disposal). While both of these alternatives

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would have been slightly more protective for the long term management of the site, the life cycle costs for both alternatives were significantly higher than BDDT SL-2. Furthermore, Alternative BDDT SL-3 would not have removed the requirement for ICs for the rip-rap area because COCs would remain in that area at concentrations that would prohibit residential development of the site.

9.1.4 Western Burning Ground

Alternative SD-3: Excavation, Transportation, and Off-Site Disposal is the recommended alternative for the WBG pond sediments. Although the risk assessment for the WBG concluded that the risks and hazards associated with the site are within acceptable levels for the current and reasonably anticipated future industrial/commercial land use, the recommended alternative would increase the level of protection to human-health and the environment by reducing the levels of lead and chromium in pond sediments to levels that would be suitable for residential development. Alternative SD-3 is recommended over Alternative SD-2 (Institutional Controls) because of the additional level of protection that it affords and because it eliminates the need to place long term restrictions on land use/development at the site. Furthermore, the life-cycle costs associated with Alternative SD-3 (\$282,000) are only slightly more expensive than SD-2 (\$119,000). This alternative would still allow the pond located at the site to be utilized for a semi-annual fishing rodeo.

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Tables

Table 3-1
Screening Levels for the Protection of Human Health
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent	CASN	Adjusted Soil Risk Screening Level [a,b]			Adjusted Tap Water Regional Screening Level (RSL) [a,c]	
		Residential Scenario	Industrial Scenario	Surrogate	Level (RSL) [a,c]	
		(mg/kg)	(mg/kg)		(mg/L)	Surrogate
Volatile Organic Compounds						
1,2,3-Trichloropropane	96-18-4	9.10E-02 c	4.10E-01 c		9.60E-06 c	
1,2,4-Trimethylbenzene	95-63-6	6.70E+00 n	2.80E+01 ns		1.50E-03 n	
2-Butanone	78-93-3	2.80E+03 ns	1.90E+04 nms		7.10E-01 n	
3-Octanone	106-68-3	NA	NA		NA	
4-Methyl-2-pentanone	108-10-1	5.30E+02 ns	5.20E+03 ns		2.00E-01 n	
Acetone	67-64-1	6.10E+03 n	6.10E+04 nms		2.20E+00 n	
Bromodichloromethane	75-27-4	1.00E+01 c	4.60E+01 c		1.10E-03 c	
Carbon Disulfide	75-15-0	6.70E+01 ns	3.00E+02 ns		1.00E-01 n	
Chloroform	67-66-3	3.00E-01 c	1.50E+00 c		1.90E-04 c	
cis-1,2-Dichloroethene	156-59-2	7.80E+01 n	1.00E+03 ns		3.70E-02 n	
d-Limonene	5989-27-5	NA	NA		NA	
Ethanol	64-17-5	NA	NA		NA	
m,p-Xylene	136777612	6.00E+01 ns	2.60E+02 ns	p-Xylene	2.00E-02 n	p-Xylene
Methylene Chloride	75-09-2	1.10E+01 c	5.40E+01 c		4.80E-03 c	
p-Isopropyltoluene	99-87-6	2.20E+02 ns	1.10E+03 ns	Isopropylbenzene	6.80E-02 n	Isopropylbenzene
Tetrachloroethene	127-18-4	5.70E-01 c	2.70E+00 c		1.10E-04 c	
Toluene	108-88-3	5.00E+02 ns	4.60E+03 ns		2.30E-01 n	
Trichloroethene	79-01-6	2.80E+00 c	1.40E+01 c		1.70E-03 c	
Xylenes (total)	1330-20-7	6.00E+01 ns	2.60E+02 ns		2.00E-02 n	
Semi-Volatile Organic Compounds						
1,2,4-Trichlorobenzene	120-82-1	8.70E+00 n	4.00E+01 ns		8.20E-04 n	
1,2-Dichlorobenzene	95-50-1	2.00E+02 ns	1.00E+03 ns	1,2-Dichlorobenzene	3.70E-02 n	1,2-Dichlorobenzene
1,3-Dichlorobenzene	541-73-1	2.00E+02 ns	1.00E+03 ns		3.70E-02 n	
1,4-Dichlorobenzene	106-46-7	2.60E+00 c	1.30E+01 c		4.30E-04 c	
2,4-Dinitrotoluene	121-14-2	1.20E+01 n	1.20E+02 n		7.30E-03 n	
2,6-Dinitrotoluene	606-20-2	6.10E+00 n	6.20E+01 n		3.70E-03 n	
3,3'-Dichlorobenzidine	91-94-1	1.10E+00 c	3.80E+00 c		1.50E-04 c	
4-Methylphenol	106-44-5	3.10E+01 n	3.10E+02 n		1.80E-02 n	
Benzoic Acid	65-85-0	2.40E+04 nm	2.50E+05 nm		1.50E+01 n	
bis(2-Ethylhexyl)phthalate	117-81-7	3.50E+01 c*	1.20E+02 c*		4.80E-03 c	
Butylbenzylphthalate	85-68-7	2.60E+02 c*	9.10E+02 c		3.50E-02 c	
Carbazole	86-74-8	NA	NA		NA	
Dibenzofuran	132-64-9	7.80E+00 n	1.00E+02 n	Furan	3.70E-03 n	Furan
Diethylphthalate	84-66-2	4.90E+03 n	4.90E+04 nm		2.90E+00 n	
Di-n-Butylphthalate	84-74-2	6.10E+02 n	6.20E+03 n		3.70E-01 n	
Di-n-Octylphthalate	117-84-0	6.10E+02 n	6.20E+03 n	di-n-Butylphthalate	3.70E-01 n	di-n-Butylphthalate
N-Nitrosodiphenylamine	86-30-6	9.90E+01 c	3.50E+02 c		1.40E-02 c	
Pentachlorophenol	87-86-5	3.00E+00 c	9.00E+00 c		5.60E-04 c	
Phenol	108-95-2	1.80E+03 n	1.80E+04 nm		1.10E+00 n	
Dioxin/Furan Compounds						
1,2,3,4,6,7,8-HpCDD	35822-46-9	4.50E-04 c	1.80E-03 c	Total HpCDD	5.20E-08 c	Total HpCDD
1,2,3,4,6,7,8-HpCDF	67562-39-4	3.70E-04 c	1.30E-03 c	Total HpCDF	5.20E-08 c	Total HpCDF
1,2,3,4,7,8-HxCDF	55673-89-7	3.70E-04 c	1.30E-03 c	Total HpCDF	5.20E-08 c	Total HpCDF
1,2,3,4,7,8-HxCDD	39227-28-6	4.50E-05 c	1.80E-04 c	Total HxCDD	5.20E-09 c	Total HxCDD
1,2,3,4,7,8-HxCDF	70648-26-9	3.70E-05 c	1.30E-04 c	Total HxCDF	5.20E-09 c	Total HxCDF
1,2,3,6,7,8-HxCDD	57653-85-7	4.50E-05 c	1.80E-04 c	Total HxCDD	5.20E-09 c	Total HxCDD
1,2,3,6,7,8-HxCDF	57117-44-9	3.70E-05 c	1.30E-04 c	Total HxCDF	5.20E-09 c	Total HxCDF
1,2,3,7,8,9-HxCDD	19408-74-3	4.50E-05 c	1.80E-04 c	Total HxCDD	5.20E-09 c	Total HxCDD
1,2,3,7,8,9-HxCDF	72918-21-9	3.70E-05 c	1.30E-04 c	Total HxCDF	5.20E-09 c	Total HxCDF
1,2,3,7,8-PeCDD	40321-76-4	4.50E-06 c	1.80E-05 c	Total PeCDD	5.20E-10 c	Total PeCDD
1,2,3,7,8-PeCDF	57117-41-6	1.20E-04 c	4.40E-04 c		1.70E-08 c	
2,3,4,6,7,8-HxCDF	60851-34-5	3.70E-05 c	1.30E-04 c	Total HxCDF	5.20E-09 c	Total HxCDF
2,3,4,7,8-PeCDF	57117-31-4	1.20E-05 c	4.40E-05 c		1.70E-09 c	
2,3,7,8-TCDD	1746-01-6	4.50E-06 c*	1.80E-05 c*		5.20E-10 c*	
2,3,7,8-TCDF	51207-31-9	3.70E-05 c	1.30E-04 c		5.20E-09 c	
OCDD	3268-87-9	1.50E-02 c	6.10E-02 c		1.70E-06 c	
OCDF	39001-02-0	1.20E-02 c	4.40E-02 c		1.70E-06 c	
Explosives						
1,3,5-Trinitrobenzene	99-35-4	2.20E+02 n	2.70E+03 n		1.10E-01 n	
1,3-Dinitrobenzene	99-65-0	6.10E-01 n	6.20E+00 n		3.70E-04 n	
2,4,6-Trinitrotoluene	118-96-7	3.60E+00 c**	4.20E+01 c**		1.80E-03 c**	
4-Amino-2,6-Dinitrotoluene	19406-51-0	1.50E+01 n	1.90E+02 n		7.30E-03 n	
m-Nitrotoluene	99-08-1	1.20E+02 n	1.20E+03 n		7.30E-02 n	
Nitrobenzene	98-95-3	3.10E+00 n	2.80E+01 n		3.40E-04 n	
Nitroglycerine	55-63-0	6.10E-01 n	6.20E+00 n		3.70E-04 n	
Pentaerythritol Tetranitrate	78-11-5	NA	NA		NA	
Perchlorate	14797-73-0	5.50E+00 n	7.20E+01 n		2.60E-03 n	

Table 3-1
Screening Levels for the Protection of Human Health
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent	CASN	Adjusted Soil Risk Screening Level [a,b]			Adjusted Tap Water Regional Screening Level (RSL) [a,c]	
		Residential Scenario	Industrial Scenario	Surrogate	(mg/L)	Surrogate
		(mg/kg)	(mg/kg)			
Herbicides						
2,4,5-T	93-76-5	6.10E+01 n	6.20E+02 n		3.70E-02 n	
2,4,5-TP	93-72-1	4.90E+01 n	4.90E+02 n		2.90E-02 n	
2,4-D	94-75-7	6.90E+01 n	7.70E+02 n		3.70E-02 n	
2,4-DB	94-82-6	4.90E+01 n	4.90E+02 n		2.90E-02 n	
Dalapon	75-99-0	1.80E+02 n	1.80E+03 n		1.10E-01 n	
Dicamba	1918-00-9	1.80E+02 n	1.80E+03 n		1.10E-01 n	
Dichlorprop	120-36-5	NA	NA		NA	
MCPA	94-74-6	3.10E+00 n	3.10E+01 n		1.80E-03 n	
MCPP	93-65-2	6.10E+00 n	6.20E+01 n		3.70E-03 n	
Pesticides						
4,4'-DDD	72-54-8	2.00E+00 c	7.20E+00 c		2.80E-04 c	
4,4'-DDE	72-55-9	1.40E+00 c	5.10E+00 c		2.00E-04 c	
4,4'-DDT	50-29-3	1.70E+00 c*	7.00E+00 c*		2.00E-04 c*	
Alpha-BHC	319-84-6	7.70E-02 c	2.70E-01 c		1.10E-05 c	
Alpha-Chlordane	5103-71-9	1.60E+00 c*	6.50E+00 c*	Chlordane	1.90E-04 c*	Chlordane
Beta-BHC	319-85-7	2.70E-01 c	9.60E-01 c		3.70E-05 c	
Delta-BHC	319-86-8	5.20E-01 c*	2.10E+00 c	gamma-BHC	6.10E-05 c	gamma-BHC
Dieldrin	60-57-1	3.00E-02 c	1.10E-01 c		4.20E-06 c	
Endosulfan I	115-29-7	3.70E+01 n	3.70E+02 n		2.20E-02 n	
Endosulfan II	33213-65-9	3.70E+01 n	3.70E+02 n	Endosulfan	2.20E-02 n	Endosulfan
Endosulfan Sulfate	1031-07-8	3.70E+01 n	3.70E+02 n	Endosulfan	2.20E-02 n	Endosulfan
Endrin	72-20-8	1.80E+00 n	1.80E+01 n		1.10E-03 n	
Endrin Aldehyde	7421-93-4	1.80E+00 n	1.80E+01 n	Endrin	1.10E-03 n	Endrin
Endrin Ketone	53494-70-5	1.80E+00 n	1.80E+01 n	Endrin	1.10E-03 n	Endrin
Gamma-BHC (Lindane)	58-89-9	5.20E-01 c*	2.10E+00 c		6.10E-05 c	
Gamma-Chlordane	5566-34-7	1.60E+00 c*	6.50E+00 c*	Chlordane	1.90E-04 c*	Chlordane
Heptachlor	76-44-8	1.10E-01 c	3.80E-01 c		1.50E-05 c	
Heptachlor Epoxide	1024-57-3	5.30E-02 c*	1.90E-01 c*		7.40E-06 c*	
Methoxychlor	72-43-5	3.10E+01 n	3.10E+02 n		1.80E-02 n	
Polycyclic Aromatic Hydrocarbons						
2-Methylnaphthalene	91-57-6	3.10E+01 n	4.10E+02 ns		1.50E-02 n	
Acenaphthene	83-32-9	3.40E+02 n	3.30E+03 n		2.20E-01 n	
Acenaphthylene	208-96-8	3.40E+02 n	3.30E+03 n	Acenaphthene	2.20E-01 n	Acenaphthene
Anthracene	120-12-7	1.70E+03 n	1.70E+04 nm		1.10E+00 n	
Benzo(a)anthracene	56-55-3	1.50E-01 c	2.10E+00 c		2.90E-05 c	
Benzo(a)pyrene	50-32-8	1.50E-02 c	2.10E-01 c		2.90E-06 c	
Benzo(b)fluoranthene	205-99-2	1.50E-01 c	2.10E+00 c		2.90E-05 c	
Benzo(g,h,i)perylene	191-24-2	1.70E+02 n	1.70E+03 n	Pyrene	1.10E-01 n	Pyrene
Benzo(k)fluoranthene	207-08-9	1.50E+00 c	2.10E+01 c		2.90E-04 c	
Chrysene	218-01-9	1.50E+01 c	2.10E+02 c		2.90E-03 c	
Dibenzo(a,h)anthracene	53-70-3	1.50E-02 c	2.10E-01 c		2.90E-06 c	
Fluoranthene	206-44-0	2.30E+02 n	2.20E+03 n		1.50E-01 n	
Fluorene	86-73-7	2.30E+02 n	2.20E+03 n		1.50E-01 n	
Indeno(1,2,3-cd)pyrene	193-39-5	1.50E-01 c	2.10E+00 c		2.90E-05 c	
Naphthalene	91-20-3	3.90E+00 c*	2.00E+01 c*		1.40E-04 c*	
Phenanthrene	85-01-8	1.70E+03 n	1.70E+04 nm	Anthracene	1.10E+00 n	Anthracene
Pyrene	129-00-0	1.70E+02 n	1.70E+03 n		1.10E-01 n	
Polychlorinated Biphenyls						
Aroclor 1254	11097-69-1	1.10E-01 c**	7.40E-01 c*		3.40E-05 c*	
Aroclor 1260	11096-82-5	2.20E-01 c	7.40E-01 c		3.40E-05 c	
Inorganics						
Aluminum	7429-90-5	7.70E+03 n	9.90E+04 nm		3.70E+00 n	
Antimony	7440-36-0	3.10E+00 n	4.10E+01 n		1.50E-03 n	
Arsenic	7440-38-2	3.90E-01 c*	1.60E+00 c		4.50E-05 c	
Barium	7440-39-3	1.50E+03 n	1.90E+04 nm		7.30E-01 n	
Beryllium	7440-41-7	1.60E+01 n	2.00E+02 n		7.30E-03 n	
Cadmium	7440-43-9	7.00E+00 n	8.10E+01 n		1.80E-03 n	
Calcium	7440-70-2	NA	NA		NA	
Chromium	7440-47-3	2.80E+02 c	1.40E+03 c		5.50E+00 n	
Cobalt	7440-48-4	2.30E+00 n	3.00E+01 n		1.10E-03 n	
Copper	7440-50-8	3.10E+02 n	4.10E+03 n		1.50E-01 n	
Iron	7439-89-6	5.50E+03 n	7.20E+04 nm		2.60E+00 n	
Lead	7439-92-1	4.00E+02 n<	8.00E+02 n<		1.50E-02 n<	
Magnesium	7439-95-4	NA	NA		NA	
Manganese	7439-96-5	1.80E+02 n	2.30E+03 n		8.80E-02 n	
Mercury	7439-97-6	6.70E-01 ns	2.80E+00 ns		6.30E-05 n	
Nickel	7440-02-0	1.60E+02 n	2.00E+03 n		7.30E-02 n	

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Constituent	CASN	Adjusted Soil Risk Screening Level [a,b]			Adjusted Tap Water Regional Screening Level (RSL) [a,c]	
		Residential Scenario	Industrial Scenario	Surrogate		
		(mg/kg)	(mg/kg)		(mg/L)	Surrogate
Potassium	7440-09-7	NA	NA		NA	
Selenium	7782-49-2	3.90E+01 n	5.10E+02 n		1.80E-02 n	
Silver	7440-22-4	3.90E+01 n	5.10E+02 n		1.80E-02 n	
Sodium	7440-23-5	NA	NA		NA	
Thallium	7440-28-0	5.10E-01 n	6.60E+00 n		2.40E-04 n	
Vanadium	7440-62-2	5.50E+01 n	7.20E+02 n		2.60E-02 n	
Zinc	7440-66-6	2.30E+03 n	3.10E+04 nm		1.10E+00 n	

Notes:

COPC = Constituent of Potential Concern

mg/kg = Milligrams per kilogram.

mg/L = Milligrams per liter.

[a] Regional screening levels were from USPEA (2008a).

The screening levels used were risk screening levels for the residential scenario from USEPA (2008a). Screening levels based on non-cancer effects were adjusted by a factor of 10. For chemicals whose screening levels were based on cancer effects but the noncancer screening level was less than 10x the cancer level (tagged with c**), the non-cancer level was used after adjustment.

c = cancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; n = noncancer; m = Concentration may exceed ceiling limit;

s = Concentration may exceed saturation concentration (C_{sat}).

< The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.

[b] Adjusted soil screening levels were used to assess soil and sediment at the NRU.

[c] Adjusted tap-water screening levels were used to assess surface water and groundwater at the NRU.

Table 3-2.
Facility-Wide Background Inorganics Concentrations
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent	Range of Detects (mg/kg)		95% UTL
	Min	Max	
Aluminum	3,620	47,900	40,041
Antimony	–	–	–
Arsenic	1.2	35.9	15.8
Barium	23.4	174	209
Beryllium	0.61	5.4	1.02
Cadmium	0.62	2.5	0.69
Calcium	–	–	–
Chromium	6.3	75.8	65.3
Cobalt	5.9	130	72.3
Copper	1.6	38.7	53.5
Iron	7,250	67,700	50,962
Lead	2.1	256	26.8
Magnesium	–	–	–
Manganese	16.7	2,040	2,543
Mercury	0.038	1.2	0.13
Nickel	4.6	94.2	62.8
Potassium	–	–	–
Selenium	–	–	–
Silver	–	–	–
Sodium	–	–	–
Thallium	1.3	5	2.11
Vanadium	12.2	114	108
Zinc	4.7	598	202

Notes:

mg/kg = Milligrams per kilogram.

Background levels for inorganics are facility-wide soil background point estimates taken from Facility-Wide Background Study Report (IT Corporation 2001).

Table 3-3
Summary of Constituent Detections in Soil
Combined Surface and Subsurface Soil
BAG LOADING AREA
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent [a]	CASN	Frequency of Detection (FOD) [b]		Detects		Detection Limits		Maximum Location	Exposure Point				
		number of detects / number of samples	FOD %	Min - Max		Min - Max			Concentration [c]				
				(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)				
Volatile Organic Compounds													
2-Butanone	78-93-3	1	-	18	6	0.011	-	0.011	0.0055	-	0.0088	BLA-SPSD01	0.011 m
3-Octanone	106-68-3	1	-	1	100	0.011	-	0.011	—	-	—	BLASS07	0.011 m
4-Methyl-2-pentanone	108-10-1	1	-	18	6	0.0016	-	0.0016	0.0055	-	0.0088	BLA-SPSD01	0.0016 m
Acetone	67-64-1	2	-	18	11	0.023	-	0.043	0.0055	-	0.0088	BLA-SPSD01	0.043 m
Carbon Disulfide	75-15-0	3	-	18	17	0.00043	-	0.0031	0.0055	-	0.0088	BLA-SPSD01	0.0031 m
d-Limonene	5989-27-5	1	-	1	100	0.057	-	0.057	—	-	—	BLASS07	0.057 m
Methylene Chloride	75-09-2	3	-	20	15	0.001	-	0.0028	0.0055	-	0.0088	BLA-SPSD01	0.0028 m
Tetrachloroethene	127-18-4	2	-	18	11	0.0009	-	0.00092	0.0055	-	0.0094	BLASS07	0.00092 m
Toluene	108-88-3	5	-	18	28	0.00071	-	0.007	0.0055	-	0.0094	BLASS07	0.000455
Semi-Volatile Organic Compounds													
2,4-Dinitrotoluene	121-14-2	9	-	20	45	0.04	-	3	0.2	-	0.2	BLASS03	0.549
2,6-Dinitrotoluene	606-20-2	3	-	20	15	0.07	-	1.9	0.2	-	0.4	SS-09	1.9 m
Benzoic Acid	65-85-0	4	-	15	27	0.14	-	0.3	0.86	-	3.8	TR-03E	0.3 m
bis(2-Ethylhexyl)phthalate	117-81-7	13	-	16	81	0.03	-	0.57	0.2	-	0.21	SS-09	0.222
Carbazole	86-74-8	10	-	14	71	0.045	-	13	0.2	-	0.26	BLASB02	10.37
Dibenzofuran	132-64-9	9	-	14	64	0.016	-	2.8	0.2	-	0.26	BLASB02	2.256
Di-n-Butylphthalate	84-74-2	6	-	14	43	0.061	-	120	0.2	-	0.39	BLASS03	25.07
N-Nitrosodiphenylamine	86-30-6	2	-	13	15	0.1	-	8.3	0.2	-	0.78	BLASS03	8.3 m
Phenol	108-95-2	1	-	14	7	0.08	-	0.08	0.2	-	0.78	SS-14	0.08 m
Explosives													
1,3,5-Trinitrobenzene	99-35-4	1	-	19	5	0.07	-	0.07	0.1	-	0.2	BLASS06	0.07 m
1,3-Dinitrobenzene	99-65-0	1	-	19	5	0.05	-	0.05	0.1	-	0.2	BLASS02	0.05 m
2,4,6-Trinitrotoluene	118-96-7	1	-	19	5	0.06	-	0.06	0.2	-	0.4	BLASS03	0.06 m
4-Amino-2,6-Dinitrotoluene	19406-51-0	3	-	19	16	0.04	-	0.07	0.2	-	0.4	BLASS03	0.07 m
m-Nitrotoluene	99-08-1	1	-	19	5	2.86	-	2.86	0.4	-	0.8	BLASS04	2.86 m
Nitroglycerine	55-63-0	1	-	19	5	0.21	-	0.21	0.31	-	0.72	BLASS11	0.21 m
Pentaerythritol Tetranitrate	78-11-5	1	-	19	5	0.16	-	0.16	0.31	-	0.72	BLASD01	0.16 m
Pesticides													
4,4'-DDD	72-54-8	4	-	5	80	0.00064	-	0.043	0.00798	-	0.00798	SS-09	0.043 m
4,4'-DDE	72-55-9	2	-	4	50	0.00058	-	0.00086	0.00798	-	0.00809	BLASD01	0.00086 m
Beta-BHC	319-85-7	1	-	4	25	0.00028	-	0.00028	0.00082	-	0.00809	BLASD01	0.00028 m
Alpha-Chlordane	5103-71-9	1	-	5	20	0.089	-	0.089	0.00079	-	0.00809	SS-09	0.089 m
Gamma-Chlordane	5566-34-7	1	-	5	20	0.01	-	0.01	0.00079	-	0.00809	SS-09	0.01 m
Endosulfan I	115-29-7	1	-	5	20	0.022	-	0.022	0.00079	-	0.00809	SS-09	0.022 m
Endrin	72-20-8	1	-	4	25	0.00035	-	0.00035	0.00079	-	0.00809	BLASD02	0.00035 m
Heptachlor Epoxide	1024-57-3	2	-	5	40	0.00094	-	0.015	0.00082	-	0.00809	SS-09	0.015 m
Methoxychlor	72-43-5	2	-	4	50	0.00442	-	0.0674	0.00082	-	0.00809	BLASB02	0.0674 m

Table 3-3
Summary of Constituent Detections in Soil
Combined Surface and Subsurface Soil
BAG LOADING AREA
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent [a]	CASN	Frequency of Detection (FOD) [b]		Detects		Detection Limits		Maximum Location	Exposure Point				
		number of detects / number of samples	FOD %	Min - Max		Min - Max			Concentration [c]				
				(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)				
Polycyclic Aromatic Hydrocarbons													
1-Methylnaphthalene	90-12-0	15	-	24	62	0.0056	-	0.4	0.0054	-	0.027	BLA-SS005	0.174
2-Methylnaphthalene	91-57-6	26	-	42	62	0.0013	-	0.58	0.0054	-	0.39	BLA-SS005	0.123
Acenaphthene	83-32-9	32	-	42	76	0.0015	-	12	0.0018	-	0.26	BLA-SS005	4.438
Acenaphthylene	208-96-8	26	-	42	62	0.00076	-	0.31	0.0022	-	0.39	BLA-SS007	0.0698
Anthracene	120-12-7	36	-	42	86	0.00099	-	22	0.0022	-	0.26	BLA-SS005	8.391
Benzo(a)anthracene	56-55-3	42	-	44	95	0.0054	-	46	0.0022	-	0.0022	BLA-SS005	18.65
Benzo(a)pyrene	50-32-8	39	-	44	89	0.0049	-	39	0.0022	-	0.26	BLA-SS005	16.14
Benzo(b)fluoranthene	205-99-2	41	-	44	93	0.0098	-	68	0.0022	-	0.26	BLASB02	26.42
Benzo(g,h,i)perylene	191-24-2	39	-	42	93	0.0068	-	21	0.0022	-	0.26	BLA-SS005	9.511
Benzo(k)fluoranthene	207-08-9	41	-	44	93	0.0028	-	31	0.0022	-	0.26	BLA-SS005	10.59
Chrysene	218-01-9	41	-	44	93	0.0065	-	54	0.0022	-	0.26	BLA-SS005	22.13
Dibenzo(a,h)anthracene	53-70-3	30	-	42	71	0.0019	-	6.9	0.0022	-	0.26	BLA-SS005	3.081
Fluoranthene	206-44-0	41	-	44	93	0.0089	-	160	0.0022	-	0.26	BLA-SS005	61.55
Fluorene	86-73-7	31	-	42	74	0.00085	-	12	0.0054	-	0.26	BLA-SS005	4.364
Indeno(1,2,3-cd)pyrene	193-39-5	38	-	42	90	0.0052	-	25	0.0022	-	0.26	BLA-SS005	11.02
Naphthalene	91-20-3	25	-	42	60	0.0019	-	1.4	0.0054	-	0.26	BLA-SS005	0.183
Phenanthrene	85-01-8	41	-	44	93	0.0058	-	100	0.0022	-	0.26	BLA-SS005	40.34
Pyrene	129-00-0	41	-	44	93	0.0071	-	88	0.0022	-	0.26	BLA-SS005	37.59
Polychlorinated Biphenyls													
Aroclor 1254	11097-69-1	9	-	20	45	0.0066	-	8.3	0.02	-	0.04	SS-09	1.869
Inorganics													
Aluminum	7429-90-5	47	-	47	100	5530	-	43700	—	-	—	BLASB01	26269
Antimony	7440-36-0	20	-	45	44	0.2	-	8.1	0.59	-	5.6	BLA-SS014	1.18
Arsenic	7440-38-2	46	-	47	98	1.29	-	58.4	0.51	-	0.51	BLA-SS014	11.6
Barium	7440-39-3	47	-	47	100	37.2	-	11100	—	-	—	BLA-SS008	5627
Beryllium	7440-41-7	47	-	47	100	0.36	-	2.97	—	-	—	BLASB02	1.402
Cadmium	7440-43-9	30	-	38	79	0.09	-	44.8	0.12	-	1.5	BLA-SS013	13.39
Calcium	7440-70-2	47	-	47	100	483	-	191000	—	-	—	BLA-SS007	118268
Chromium	7440-47-3	47	-	47	100	11.2	-	106	—	-	—	BLA-SS016	53.25
Cobalt	7440-48-4	44	-	47	94	3.9	-	149	40.6	-	47	BLASS11	37.99
Copper	7440-50-8	47	-	47	100	21	-	72000	—	-	—	BLA-SS013	19489
Iron	7439-89-6	47	-	47	100	8500	-	61500	—	-	—	BLA-SS012	39751
Lead	7439-92-1	47	-	47	100	9.82	-	58000	—	-	—	BLA-SS013	2020 avg
Magnesium	7439-95-4	47	-	47	100	3470	-	105000	—	-	—	BLA-SS003	66609
Manganese	7439-96-5	47	-	47	100	71	-	3080	—	-	—	BLASS11	545.8
Mercury	7439-97-6	36	-	38	95	0.02	-	16.8	0.047	-	0.05	BLA-SS009	6.724
Nickel	7440-02-0	47	-	47	100	5.99	-	148	—	-	—	BLA-SS013	44.45
Potassium	7440-09-7	47	-	47	100	752	-	9590	—	-	—	BLASB02	3771

Table 3-3
Summary of Constituent Detections in Soil
Combined Surface and Subsurface Soil
BAG LOADING AREA
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent [a]	CASN	Frequency of Detection (FOD) [b]		Detects		Detection Limits		Maximum Location	Exposure Point Concentration [c]				
		number of detects / number of samples	FOD %	Min - Max		Min - Max			(mg/kg)				
				(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)						
Selenium	7782-49-2	12	-	46	26	0.39	-	1.9	1.03	-	1.9	BLA-SS013	0.89
Silver	7440-22-4	12	-	38	32	0.39	-	2.3	1.03	-	3.7	BLA-SS013	0.944
Sodium	7440-23-5	25	-	45	56	23.8	-	118	1190	-	2330	BLASS03	51.18
Thallium	7440-28-0	20	-	45	44	0.04	-	0.78	2.4	-	4.7	407712	0.333
Vanadium	7440-62-2	47	-	47	100	14.4	-	102	—	-	—	BLA-SS002	64.55
Zinc	7440-66-6	47	-	47	100	30.4	-	12500	—	-	—	BLA-SS013	4942
Asbestos													
Asbestos (Y/N)	-	19		19	100	NA		NA	NA		NA	NA	NA
Asbestos weight percent (%)	-	10		29	34	0.1		9.4	-		-	BLA-SS026A	NA
Chrysotile (structures)	-	22		22	100	1		95	-		-	BLA-SS020B	NA
Crocidolite (structures)	-	1		29	3	1		1	-		-	BLA-S023C	NA

Notes:

- = Not detected/ not analyzed/ not applicable.

CASN = Chemical abstracts registry number.

mg/kg = Milligrams per kilograms.

PAH = Polycyclic Aromatic Hydrocarbon.

USEPA = United States Environmental Protection Agency.

VOC = Volatile Organic Compound.

[a] Only chemicals detected at least once in all five areas are presented.
For duplicate samples, the highest detected value or the lowest detection limit were used.
For constituents analyzed in two methods, the result of the more precise method was used i.e., USEPA method 8260 over 8270 for VOCs, method 8270-SIM over method 8270 for PAHs, and method 8330 over method 8260 or 8270 for explosives.

[b] Frequency of detection (FOD) = number of detects / total number of samples analyzed.

[c] The exposure point concentration (EPC) was the upper confidence level on the mean (UCL) or the maximum concentration where the UCL was incalculable.
EPCs marked with "m" are based on the maximum detected concentration.
Exposure to lead is evaluated by predicting resultant blood lead levels using the arithmetic average (avg).
The UCLs were calculated using ProUCL 4.0. The UCL used is the one recommended by ProUCL 4.0.

Table 3-4
Summary of Constituent Detections in Sediment
BAG LOADING AREA
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent [a]	CASN	Frequency of Detection (FOD) [b]			Detects		Detection Limits			Maximum Location	Exposure Point Concentration [c]		
		number of detects / number of samples	FOD %	Min - Max		Min - Max			(mg/kg)				
				(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)						
Volatile Organic Compounds													
Acetone	67-64-1	1	-	2	50	0.028	-	0.028	0.008	-	0.008	BLASD05	0.028 m
Toluene	108-88-3	1	-	2	50	0.00096	-	0.00096	0.008	-	0.008	BLASD05	0.00096 m
Semi-Volatile Organic Compounds													
bis(2-Ethylhexyl)phthalate	117-81-7	1	-	2	50	0.058	-	0.058	0.25	-	0.25	BLASD04	0.058 m
Pesticides													
4,4'-DDD	72-54-8	2	-	2	100	0.00059	-	0.00073	—	-	—	BLASD04	0.00073 m
4,4'-DDE	72-55-9	2	-	2	100	0.00102	-	0.00182	—	-	—	BLASD04	0.00182 m
4,4'-DDT	50-29-3	2	-	2	100	0.00062	-	0.00077	—	-	—	BLASD04	0.00077 m
Beta-BHC	319-85-7	1	-	2	50	0.00029	-	0.00029	0.00099	-	0.00099	BLASD04	0.00029 m
Alpha-Chlordane	5103-71-9	2	-	2	100	0.00025	-	0.00038	—	-	—	BLASD04	0.00038 m
Gamma-Chlordane	5566-34-7	1	-	2	50	0.00041	-	0.00041	0.00099	-	0.00099	BLASD04	0.00041 m
Dieldrin	60-57-1	1	-	2	50	0.00094	-	0.00094	0.00099	-	0.00099	BLASD04	0.00094 m
Polycyclic Aromatic Hydrocarbons													
2-Methylnaphthalene	91-57-6	2	-	2	100	0.0013	-	0.0018	—	-	—	BLASD04	0.0018 m
Anthracene	120-12-7	1	-	2	50	0.0017	-	0.0017	0.0025	-	0.0025	BLASD04	0.0017 m
Benzo(a)anthracene	56-55-3	2	-	2	100	0.0059	-	0.013	—	-	—	BLASD04	0.013 m
Benzo(a)pyrene	50-32-8	2	-	2	100	0.005	-	0.012	—	-	—	BLASD04	0.012 m
Benzo(b)fluoranthene	205-99-2	2	-	2	100	0.013	-	0.019	—	-	—	BLASD04	0.019 m
Benzo(g,h,i)perylene	191-24-2	2	-	2	100	0.0031	-	0.0071	—	-	—	BLASD04	0.0071 m
Benzo(k)fluoranthene	207-08-9	2	-	2	100	0.0033	-	0.0071	—	-	—	BLASD04	0.0071 m
Chrysene	218-01-9	2	-	2	100	0.0073	-	0.013	—	-	—	BLASD04	0.013 m
Dibenzo(a,h)anthracene	53-70-3	2	-	2	100	0.0013	-	0.0021	—	-	—	BLASD04	0.0021 m
Fluoranthene	206-44-0	2	-	2	100	0.0078	-	0.019	—	-	—	BLASD04	0.019 m
Fluorene	86-73-7	1	-	2	50	0.0012	-	0.0012	0.0025	-	0.0025	BLASD04	0.0012 m
Indeno(1,2,3-cd)pyrene	193-39-5	2	-	2	100	0.0039	-	0.0081	—	-	—	BLASD04	0.0081 m
Naphthalene	91-20-3	2	-	2	100	0.002	-	0.0021	—	-	—	BLASD04	0.0021 m
Phenanthrene	85-01-8	2	-	2	100	0.0037	-	0.009	—	-	—	BLASD04	0.009 m
Pyrene	129-00-0	2	-	2	100	0.0091	-	0.019	—	-	—	BLASD04	0.019 m
Inorganics													
Aluminum	7429-90-5	2	-	2	100	7900	-	13300	—	-	—	BLASD04	13300 m
Antimony	7440-36-0	2	-	2	100	0.28	-	0.37	—	-	—	BLASD05	0.37 m
Arsenic	7440-38-2	2	-	2	100	2.1	-	4.6	—	-	—	BLASD05	4.6 m
Barium	7440-39-3	2	-	2	100	74.8	-	77.2	—	-	—	BLASD04	77.2 m
Beryllium	7440-41-7	2	-	2	100	0.89	-	0.92	—	-	—	BLASD05	0.92 m
Calcium	7440-70-2	2	-	2	100	61200	-	102000	—	-	—	BLASD05	102000 m
Chromium	7440-47-3	2	-	2	100	26.8	-	28.5	—	-	—	BLASD05	28.5 m

Table 3-4
Summary of Constituent Detections in Sediment
BAG LOADING AREA
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent [a]	CASN	Frequency of Detection (FOD) [b]		Detects	Detection Limits		Maximum Location	Exposure Point Concentration [c]
		number of detects / number of samples	FOD %	Min - Max	Min - Max			(mg/kg)
				(mg/kg)	(mg/kg)	(mg/kg)		
Cobalt	7440-48-4	2 - 2	100	7.3 - 10.5	- - -		BLASD05	10.5 m
Copper	7440-50-8	2 - 2	100	6.06 - 8.89	- - -		BLASD04	8.89 m
Iron	7439-89-6	2 - 2	100	17600 - 23300	- - -		BLASD05	23300 m
Lead	7439-92-1	2 - 2	100	14.6 - 19.3	- - -		BLASD05	17 avg
Magnesium	7439-95-4	2 - 2	100	3200 - 9810	- - -		BLASD05	9810 m
Manganese	7439-96-5	2 - 2	100	649 - 681	- - -		BLASD04	681 m
Nickel	7440-02-0	2 - 2	100	10.9 - 11.5	- - -		BLASD04	11.5 m
Potassium	7440-09-7	2 - 2	100	1240 - 1310	- - -		BLASD05	1310 m
Sodium	7440-23-5	2 - 2	100	81.9 - 83.6	- - -		BLASD05	83.6 m
Thallium	7440-28-0	2 - 2	100	0.18 - 0.29	- - -		BLASD05	0.29 m
Vanadium	7440-62-2	2 - 2	100	31.7 - 37.8	- - -		BLASD05	37.8 m
Zinc	7440-66-6	2 - 2	100	25.8 - 36	- - -		BLASD04	36 m

Notes:

- = Not detected/ not analyzed/ not applicable.

CASN = Chemical abstracts registry number.

mg/kg = Milligrams per kilograms.

PAH = Polycyclic Aromatic Hydrocarbon.

USEPA = United States Environmental Protection Agency.

VOC = Volatile Organic Compound.

[a] Only chemicals detected at least once in all five areas are presented.

For duplicate samples, the highest detected value or the lowest detection limit were used.

For constituents analyzed in two methods, the result of the more precise method was used i.e., USEPA method 8260 over 8270 for VOCs, method 8270-SIM over method 8270 for PAHs, and method 8330 over method 8260 or 8270 for explosives.

[b] Frequency of detection (FOD) = number of detects / total number of samples analyzed.

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

EPCs marked with "m" are based on the maximum detected concentration.

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

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

Table 3-5
Summary of Constituent Detections in Surface Water
BAG LOADING AREA
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent [a]	CASN	Frequency of Detection (FOD) [b]		Detects	Detection Limits	Maximum Location	Exposure Point Concentration [c]
		number of detects / number of samples	FOD %	Min - Max	Min - Max		(mg/L)
				(mg/L)	(mg/L)		
Volatile Organic Compounds							
Carbon Disulfide	75-15-0	2	- 3	67	0.00007 - 0.00012	0.001 - 0.001	BLASW/SD04 0.00012 m
Chloroform	67-66-3	2	- 3	67	0.00013 - 0.00018	0.001 - 0.001	BLASW/SD04 0.00018 m
Semi-Volatile Organic Compounds							
Butylbenzylphthalate	85-68-7	1	- 2	50	0.00044 - 0.00044	0.005 - 0.005	BLASW/SD04 0.00044 m
Di-n-Butylphthalate	84-74-2	1	- 2	50	0.0009 - 0.0009	0.005 - 0.005	BLASW/SD04 0.0009 m
Explosives							
m-Nitrotoluene	99-08-1	2	- 2	100	0.00042 - 0.00043	– - –	BLASW/SD04 0.00043 m
Herbicides							
2,4-D	94-75-7	1	- 2	50	0.00326 - 0.00326	0.0005 - 0.0005	BLASW/SD04 0.00326 m
Pesticides							
Dieldrin	60-57-1	2	- 2	100	0.0000041 - 5.82E-06	– - –	BLASW/SD05 0.00000582 m
Polycyclic Aromatic Hydrocarbons							
Benzo(a)anthracene	56-55-3	1	- 4	25	0.000024 - 0.000024	0.00005 - 0.00047	BLA-VLTW01 0.000024 m
Benzo(b)fluoranthene	205-99-2	1	- 4	25	0.000025 - 0.000025	0.00005 - 0.00047	BLA-VLTW01 0.000025 m
Chrysene	218-01-9	1	- 4	25	0.00003 - 0.00003	0.00005 - 0.00047	BLA-VLTW01 0.00003 m
Fluoranthene	206-44-0	1	- 4	25	0.000066 - 0.000066	0.000047 - 0.00005	BLA-VLTW01 0.000066 m
Phenanthrene	85-01-8	1	- 4	25	0.000036 - 0.000036	0.000047 - 0.00005	BLA-VLTW01 0.000036 m
Pyrene	129-00-0	1	- 4	25	0.000041 - 0.000041	0.00005 - 0.00047	BLA-VLTW01 0.000041 m
Inorganics							
Aluminum	7429-90-5	4	- 4	100	0.14 - 0.549	– - –	BLA-SPSW01 0.549 m
Antimony	7440-36-0	1	- 4	25	0.00077 - 0.00077	0.005 - 0.015	BLASW/SD05 0.00077 m
Arsenic	7440-38-2	2	- 4	50	0.0034 - 0.01	0.003 - 0.003	BLA-SPSW01 0.01 m
Barium	7440-39-3	4	- 4	100	0.0588 - 0.0981	– - –	BLA-VLTW01 0.0981 m
Calcium	7440-70-2	4	- 4	100	25.6 - 86.5	– - –	BLA-SPSW01 86.5 m
Chromium	7440-47-3	1	- 4	25	0.0027 - 0.0027	0.01 - 0.01	BLA-VLTW01 0.0027 m
Copper	7440-50-8	2	- 4	50	0.646 - 0.828	0.02 - 0.02	BLA-SPSW01 0.828 m
Iron	7439-89-6	4	- 4	100	0.274 - 0.742	– - –	BLA-VLTW01 0.742 m
Lead	7439-92-1	4	- 4	100	0.00034 - 0.247	– - –	BLA-VLTW01 0.0625 avg
Magnesium	7439-95-4	4	- 4	100	16.4 - 496	– - –	BLA-SPSW01 496 m
Manganese	7439-96-5	4	- 4	100	0.0184 - 0.377	– - –	BLA-SPSW01 0.377 m
Mercury	7439-97-6	1	- 4	25	0.0002 - 0.0002	0.0001 - 0.0002	BLA-VLTW01 0.0002 m

Table 3-5
Summary of Constituent Detections in Surface Water
BAG LOADING AREA
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent [a]	CASN	Frequency of Detection (FOD) [b]		Detects		Detection Limits		Maximum Location	Exposure Point Concentration [c]
		number of detects / number of samples	FOD %	Min - Max		Min - Max			(mg/L)
				(mg/L)	(mg/L)	(mg/L)	(mg/L)		
Potassium	7440-09-7	4 - 4	100	3.3	- 146	-	- -	BLA-SPSW01	146 m
Selenium	7782-49-2	1 - 4	25	0.00051	- 0.00051	0.005	- 0.005	BLASW/SD04	0.00051 m
Sodium	7440-23-5	4 - 4	100	22.1	- 107	-	- -	BLA-SPSW01	107 m
Zinc	7440-66-6	2 - 4	50	0.0263	- 0.116	0.02	- 0.02	BLA-VLTW01	0.116 m

Notes:

- = Not detected/ not analyzed/ not applicable.

CASN = Chemical abstracts registry number.

mg/L = Milligrams per liter.

PAH = Polycyclic Aromatic Hydrocarbon.

USEPA = United States Environmental Protection Agency.

VOC = Volatile Organic Compound.

[a] Only chemicals detected at least once in all five areas are presented.

For duplicate samples, the highest detected value or the lowest detection limit were used.

For constituents analyzed in two methods, the result of the more precise method was used i.e., USEPA method 8260 over 8270 for VOCs, method 8270-SIM over method 8270 for PAHs, and method 8330 over method 8260 or 8270 for explosives.

[b] Frequency of detection (FOD) = number of detects / total number of samples analyzed.

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

EPCs marked with "m" are based on the maximum detected concentration.

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

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

Table 3-6
Summary of Calculated Human Health Risks and Hazards
BAG LOADING AREA
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

<u>RECEPTOR</u>	Total Excess Lifetime Cancer Risk	Total Non-Cancer Hazard
Exposure Medium - Scenario		
<u>Site Worker</u>		
Surface Soil - Direct Contact	1E-04	0.7
Sediment - Wading	4E-07	0.007
Surface Water - Wading	2E-06	0.05
TOTAL SITE RISKS (Site Worker):	1E-04	0.8
<u>Hypothetical Future Construction Worker</u>		
Combined Surface and Subsurface Soil - Direct Contact	7E-06	3
TOTAL SITE RISKS (Construction Worker):	7E-06	3
<u>Hypothetical Future Adult Resident</u>		
Combined Surface and Subsurface Soil - Direct Contact	2E-04	1
Sediment - Wading	6E-07	0.01
Surface Water - Wading	6E-07	0.01
TOTAL SITE RISKS (Adult Resident):	2E-04	1
<u>Hypothetical Future Child Resident</u>		
Combined Surface and Subsurface Soil - Direct Contact	8E-04	12
Sediment - Wading	6E-07	0.09
Surface Water - Wading	6E-07	0.04
TOTAL SITE RISKS (Child Resident):	8E-04	12
<u>Hypothetical Future Aggregate Resident (Adult + Child)</u>		
Combined Surface and Subsurface Soil - Direct Contact	1E-03	--
Sediment - Wading	1E-06	--
Surface Water - Wading	1E-06	--
TOTAL SITE RISKS (Aggregate Resident):	1E-03	--

Table 3-7
Summary of Ecological Risk Characterization Results - Terrestrial Habitat
BAG LOADING AREA
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent	Baseline Level Assessment										Bioaccumulative ? (YES/no)	Results of Refined Food Chain Models [c]			
	Soil				EPC (mg/kg)	Hazard Quotient [a]	Ecological		Results of Refined Food Chain Models [c]						
	Frequency of Detection		%	Screening Level [b]			Source	Basis	Short-tailed Shrew			American Robin			
	# detects / n samples								LOAEL HQ	NOAEL HQ		LOAEL HQ	NOAEL HQ		
Volatile Organic Compounds															
3-Octanone	1	-	1	100%	0.011	m	NA			no	—	—	—	—	
d-Limonene	1	-	1	100%	0.057	m	NA			no	—	—	—	—	
Semi-Volatile Organic Compounds															
2,6-Dinitrotoluene	3	-	20	15%	1.9	m	60	R5		no	—	—	—	—	
Benzoic Acid	4	-	15	27%	0.3	m	NA			no	—	—	—	—	
Carbazole	10	-	14	71%	11.99		NA			no	—	—	—	—	
Dibenzofuran	9	-	14	64%	2.604		NA			no	—	—	—	—	
Di-n-Butylphthalate	6	-	14	43%	29.36		200	R5		no	—	—	—	—	
N-Nitrosodiphenylamine	2	-	13	15%	8.3	m	20	R5		no	—	—	—	—	
Explosives															
2,4,6-Trinitrotoluene	1	-	19	5%	0.06	m	NA			no	—	—	—	—	
m-Nitrotoluene	1	-	19	5%	2.86	m	NA			no	—	—	—	—	
Nitroglycerine	1	-	19	5%	0.21	m	NA			no	—	—	—	—	
Pentaerythritol Tetranitrate	1	-	19	5%	0.16	m	NA			no	—	—	—	—	
Pesticides															
4,4'-DDD	4	-	5	80%	0.043	m	2	EcoSSL	mam	YES	0.001	0.006	0.1	1	
4,4'-DDE	2	-	4	50%	0.0009	m	0.04	EcoSSL	mam	YES	0.00002	0.0001	0.003	0.03	
BHC, beta-	1	-	4	25%	0.0003	m	0.07	R5		YES	0.00001	0.00006	0.000009	0.00004	
Chlordane, alpha-	1	-	5	20%	0.089	m	0.4	R5		YES	0.0003	0.003	0.0003	0.003	
Endosulfan	1	-	5	20%	0.022	m	NA			YES	0.001	0.01	0.00002	0.0002	
Endrin	1	-	4	25%	0.0004	m	0.03	R5		YES	0.00006	0.0006	0.000008	0.00008	
Heptachlor Epoxide	2	-	5	40%	0.015	m	0.1	R5		YES	0.0009	0.009	—	—	
Methoxychlor	2	-	4	50%	0.0674	m	3	R5		YES	0.003	0.006	—	—	
Polycyclic Aromatic Hydrocarbons															
Acenaphthene	32	-	42	76%	4.763		0.007	R5		YES	0.02	0.2	0.002	0.02	
Acenaphthylene	26	-	42	62%	0.0728		0.0001	R5		YES	0.00004	0.000004	0.00003	0.0003	
Anthracene	36	-	42	86%	9.003		0.006	R5		YES	0.00001	0.0001	0.001	0.01	
Benzo(a)anthracene	42	-	44	95%	24.65		5	R5		YES	0.08	0.8	0.004	0.04	
Benzo(a)pyrene	39	-	44	89%	17.26		10	R5		YES	0.03	0.3	0.003	0.03	
Benzo(b)fluoranthene	41	-	44	93%	33.31		0.6	R5		YES	0.02	0.5	0.005	0.05	
Benzo(g,h,i)perylene	39	-	42	93%	13.05		0.1	R5		YES	0.4	4	0.002	0.02	
Benzo(k)fluoranthene	41	-	44	93%	14.82		0.1	R5		YES	0.009	0.2	0.002	0.02	
Chrysene	41	-	44	93%	29.95		6	R5		YES	0.002	0.02	0.004	0.04	
Dibenzo(a,h)anthracene	30	-	42	71%	3.297		0.2	R5		YES	6	60	0.0005	0.005	
Fluoranthene	41	-	44	93%	92.29		0.8	R5		YES	0.07	0.7	0.03	0.3	
Fluorene	31	-	42	74%	4.686		0.04	R5		YES	0.0009	0.003	0.002	0.02	
Indeno(1,2,3-cd)pyrene	38	-	42	90%	11.79		0.1	R5		YES	1	10	0.002	0.02	
Naphthalene	25	-	42	60%	0.194		2	R5		no	—	—	—	—	
Phenanthrene	41	-	44	93%	53.49		1	R5		YES	0.02	0.2	0.008	0.08	
Pyrene	41	-	44	93%	56.42		0.7	R5		YES	0.04	0.4	0.008	0.08	

Table 3-7
Summary of Ecological Risk Characterization Results - Terrestrial Habitat
BAG LOADING AREA
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent						Baseline Level Assessment				Bioaccumulative ? (YES/no)	Results of Refined Food Chain Models [c]			
						Soil		Hazard	Ecological		Short-tailed Shrew		American Robin	
	Frequency of Detection		EPC	Quotient [a]	Screening Level [b]		Short-tailed Shrew		American Robin					
	# detects / n samples	%	(mg/kg)		Source	Basis	LOAEL HQ	NOAEL HQ	LOAEL HQ		NOAEL HQ			
Polychlorinated Biphenyls														
Aroclor 1254	9	-	20	45%	2.155	NA			YES	0.5	5	0.09	0.9	
Inorganics														
Antimony	20	-	45	44%	1.236	5	EcoSSL	mam	no	—	—	—	—	
Arsenic	46	-	47	98%	12.33	0.7	EcoSSL	veg	YES	0.06	0.6	0.03	0.07	
Barium	47	-	47	100%	6,101	20	EcoSSL	inv	no	—	—	—	—	
Cadmium	30	-	38	79%	14.42	40	EcoSSL	mam	YES	2	20	0.1	1	
Chromium	47	-	47	100%	53.69	2	EcoSSL	avi	no	—	—	—	—	
Cobalt	44	-	47	94%	34.68	3	EcoSSL	veg	no	—	—	—	—	
Copper	47	-	47	100%	21,230	800	EcoSSL	avi	YES	10	10	8	10	
Iron	47	-	47	100%	39,125	NA			no	—	—	—	—	
Lead	47	-	47	100%	15,706	1,000	EcoSSL	avi	YES	2	20	6	60	
Manganese	47	-	47	100%	545.9	2	EcoSSL	veg	no	—	—	—	—	
Mercury	36	-	38	95%	7.271	70	R5		no	—	—	—	—	
Nickel	47	-	47	100%	45.55	1	EcoSSL	veg	YES	0.004	0.04	0.006	0.009	
Selenium	12	-	46	26%	0.857	2	EcoSSL	veg	YES	0.07	0.1	0.02	0.05	
Silver	12	-	38	32%	0.971	0.2	EcoSSL	avi	YES	0.0001	0.001	0.03	0.07	
Zinc	47	-	47	100%	5,351	100	EcoSSL	avi	YES	7	70	2	20	

Notes:

- = Not applicable.

COPEC = Constituent of Potential Ecological Concern.

EPC = Exposure point concentrations - the minimum of the upper confidence limit (UCL) on the mean and the maximum concentration.

EPCs marked with "m" are the maximum concentration.

LOAEL HQ = Lowest observed adverse effect level hazard quotient.

mg/kg = Milligrams per kilogram.

NA = Not available.

NOAEL HQ = No observed adverse effect level hazard quotient.

[a] Hazard quotients (HQs) greater than one are presented in bold font. HQs are rounded to one significant figure (unitless).

[b] See Table A.2-18 for sources of ecological screening levels (ESLs); ESLs marked with 's' are based on a surrogate.

R5: Region 5 Ecological Screening Levels (USEPA 2003e; R5).

EcoSSL: USEPA Ecological Soil Screening Levels (USEPA 2005b, EcoSSL).

Where readily available (i.e., EcoSSLs), the basis of the ESL is presented.

[c] Foodchain modeling was conducted for bioaccumulative COPECs.

Table 3-8
Summary of Ecological Risk Characterization Results - Aquatic Habitat
BAG LOADING AREA
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent											Baseline Level Assessment		Bioaccumulative ? (YES/no)	Results of Refined Food Chain Models [b]					
	Sediment					Surface Water					Sediment	Surface Water		Mink		Great Blue Heron			
	Frequency of Detection				EPC	Frequency of Detection				EPC	Hazard Quotient	Hazard Quotient							
	# detects / n samples	%			(mg/kg)	# detects / n samples	%			(mg/L)	[a]	[a]		LOAEL HQ	NOAEL HQ	LOAEL HQ	NOAEL HQ		
Volatile Organic Compounds																			
Acetone	1	-	2	50%	0.028	m	0	-	3	0%	—	3	NA	no	—	—	—	—	
Pesticides																			
4,4'-DDD	2	-	2	100%	0.00073	m	0	-	2	0%	—	0.1	NA	YES	0.00002	0.00009	0.002	0.02	
4,4'-DDE	2	-	2	100%	0.00182	m	0	-	2	0%	—	0.6	NA	YES	0.0006	0.003	0.07	0.7	
4,4'-DDT	2	-	2	100%	0.00077	m	0	-	2	0%	—	0.0001	NA	YES	0.00002	0.00009	0.002	0.02	
BHC, beta-	1	-	2	50%	0.00029	m	0	-	2	0%	—	0.06	NA	YES	—	—	—	—	
Chlordane, alpha-	2	-	2	100%	0.00038	m	0	-	2	0%	—	0.1	NA	YES	0.000002	0.00002	0.000001	0.00001	
Dieldrin	1	-	2	50%	0.00094	m	2	-	2	100%	0.00000582	m	0.5	0.1	YES	0.001	0.01	0.0003	0.003
Polycyclic Aromatic Hydrocarbons																			
Anthracene	1	-	2	50%	0.0017	m	0	-	4	0%	—	0.03	NA	YES	1E-10	0.000000001	0.000000003	0.00000003	
Benzo(a)anthracene	2	-	2	100%	0.013	m	1	-	4	25%	0.000024	m	0.1	1	YES	0.000006	0.00006	0.00000006	0.0000006
Benzo(a)pyrene	2	-	2	100%	0.012	m	0	-	4	0%	—	0.08	NA	YES	0.000001	0.00001	0.00000005	0.0000005	
Benzo(b)fluoranthene	2	-	2	100%	0.019	m	1	-	4	25%	0.000025	m	0.002	0.003	YES	0.0000007	0.00002	0.00000009	0.0000009
Benzo(g,h,i)perylene	2	-	2	100%	0.0071	m	0	-	4	0%	—	0.04	NA	YES	0.000007	0.00007	0.00000003	0.0000003	
Benzo(k)fluoranthene	2	-	2	100%	0.0071	m	0	-	4	0%	—	0.03	NA	YES	0.0000002	0.000005	0.00000003	0.0000003	
Chrysene	2	-	2	100%	0.013	m	1	-	4	25%	0.00003	m	0.08	1	YES	0.0000001	0.000001	0.00000006	0.0000006
Dibenzo(a,h)anthracene	2	-	2	100%	0.0021	m	0	-	4	0%	—	0.06	NA	YES	0.0002	0.002	0.00000009	0.0000009	
Fluoranthene	2	-	2	100%	0.019	m	1	-	4	25%	0.000066	m	0.04	2	YES	0.0000006	0.000006	0.00000001	0.000001
Fluorene	1	-	2	50%	0.0012	m	0	-	4	0%	—	0.02	NA	YES	0.000000002	0.000000005	0.000000002	0.00000002	
Indeno(1,2,3-cd)pyrene	2	-	2	100%	0.0081	m	0	-	4	0%	—	0.5	NA	YES	0.000009	0.00009	0.00000003	0.0000003	
Phenanthrene	2	-	2	100%	0.009	m	1	-	4	25%	0.000036	m	0.04	0.09	YES	0.0000005	0.000005	0.00000002	0.0000002
Pyrene	2	-	2	100%	0.019	m	1	-	4	25%	0.000041	m	0.1	2	YES	0.000001	0.00001	0.00000009	0.0000009
Inorganics																			
Aluminum	2	-	2	100%	—		4	-	4	100%	0.549	m	NA	6	no	—	—	—	—
Arsenic	2	-	2	100%	4.6	m	2	-	4	50%	0.01	m	0.5	2	YES	0.07	0.7	0.02	0.06
Barium	2	-	2	100%	77.2	m	4	-	4	100%	0.0981	m	NA	20	no	—	—	—	—
Beryllium	2	-	2	100%	0.92	m	0	-	4	0%	—	NA	NA	no	—	—	—	—	
Copper	2	-	2	100%	8.89	m	2	-	4	50%	0.828	m	0.3	90	YES	0.03	0.04	0.008	0.01
Iron	2	-	2	100%	—		4	-	4	100%	0.742	m	NA	2	no	—	—	—	—
Lead	2	-	2	100%	17	avg	4	-	4	100%	0.247	m	0.5	100	YES	0.02	0.2	0.03	0.3
Manganese	2	-	2	100%	—		4	-	4	100%	0.377	m	NA	3	no	—	—	—	—
Mercury	0	-	2	0%	—		1	-	4	25%	0.0002	m	NA	8	no	—	—	—	—
Nickel	2	-	2	100%	11.5	m	0	-	4	0%	—	0.5	NA	YES	0.01	0.02	0.007	0.009	
Selenium	0	-	2	0%	—		1	-	4	25%	0.00051	m	NA	0.5	YES	—	—	—	—
Thallium	2	-	2	100%	0.29	m	0	-	4	0%	—	NA	NA	no	—	—	—	—	
Vanadium	2	-	2	100%	37.8	m	0	-	4	0%	—	NA	NA	no	—	—	—	—	
Zinc	2	-	2	100%	36	m	2	-	4	50%	0.116	m	0.3	1	YES	0.08	0.8	0.02	0.1

Notes:

- = Not applicable.
EPC = Exposure point concentrations - the minimum of the upper confidence limit (UCL) on the mean and the maximum concentration.
EPCs marked with "m" are the maximum concentration.
LOAEL HQ = Lowest observed adverse effect level hazard quotient.
mg/kg = Milligrams per kilogram.
mg/L = Milligrams per liter.
NOAEL HQ = No observed adverse effect level hazard quotient.
[a] Hazard quotients (HQs) greater than one are presented in bold font. HQs are rounded to one significant figure (unitless).
[b] Foodchain modeling was conducted for bioaccumulative COPECs.

Table 3-9
Summary of Constituent Detections in Soil
Combined Surface and Subsurface Soil
IGNITER ASSEMBLY AREA
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent [a]	CASN	Frequency of Detection (FOD) [b]		Detects		Detection Limits		Maximum Location	Exposure Point	
		number of detects / number of samples	FOD %	Min - Max		Min - Max			Concentration [c]	
				(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)	
Volatile Organic Compounds										
3-Octanone	106-68-3	4	-	4	100	0.006	-	0.015	IASD12	0.015 m
Acetone	67-64-1	8	-	18	44	0.009	-	0.16	IASD12	0.0432
d-Limonene	5989-27-5	3	-	3	100	0.031	-	0.084	IASD08	0.084 m
Methylene Chloride	75-09-2	2	-	18	11	0.002	-	0.004	SS-11	0.004 m
Toluene	108-88-3	3	-	16	19	0.00066	-	0.00083	IASB12	0.00083 m
Semi-Volatile Organic Compounds										
2,4-Dinitrotoluene	121-14-2	2	-	36	6	48	-	210	504360	210 m
Benzoic Acid	65-85-0	7	-	27	26	0.1	-	0.3	TR-01A	0.233
bis(2-Ethylhexyl)phthalate	117-81-7	28	-	47	60	0.03	-	750	504312	244
Butylbenzylphthalate	85-68-7	1	-	27	4	0.13	-	0.13	SS-11	0.13 m
Carbazole	86-74-8	5	-	27	19	0.016	-	2.4	IASD09	0.336
Dibenzofuran	132-64-9	4	-	25	16	0.018	-	0.74	IASD09	0.74 m
Diethylphthalate	84-66-2	4	-	34	12	0.07	-	250	504360	250 m
Di-n-Butylphthalate	84-74-2	4	-	27	15	0.07	-	0.31	IASS05	0.31 m
Di-n-Octylphthalate	117-84-0	1	-	25	4	0	-	0	IATP2A/C	0 m
Explosives										
1,3,5-Trinitrobenzene	99-35-4	1	-	19	5	0.07	-	0.07	IASD11	0.07 m
4-Amino-2,6-Dinitrotoluene	19406-51-0	2	-	19	11	0.04	-	0.05	IASS05	0.05 m
Nitroglycerine	55-63-0	1	-	19	5	0.57	-	0.57	IASS05	0.57 m
Pesticides										
4,4'-DDD	72-54-8	6	-	9	67	0.00068	-	0.00248	IASD08	0.00189
4,4'-DDE	72-55-9	5	-	9	56	0.00066	-	0.00301	IASD05	0.00155
4,4'-DDT	50-29-3	14	-	21	67	0.00042	-	0.0067	IASD08	0.00443
Beta-BHC	319-85-7	1	-	9	11	0.00017	-	0.00017	IASD07	0.00017 m
Delta-BHC	319-86-8	1	-	9	11	0.00104	-	0.00104	IASD10	0.00104 m
Alpha-Chlordane	5103-71-9	3	-	9	33	0.00038	-	0.00301	IASD05	0.00301 m
Gamma-Chlordane	5566-34-7	4	-	9	44	0.00062	-	0.00408	IASD05	0.00408 m
Dieldrin	60-57-1	7	-	9	78	0.00061	-	0.00909	IASD10	0.00655
Endosulfan II	33213-65-9	8	-	20	40	0.0003	-	0.00378	IASD08	0.0019
Endrin	72-20-8	8	-	22	36	0.00024	-	0.02	TR-01A	0.00522
Endrin Ketone	53494-70-5	3	-	9	33	0.00148	-	0.00424	IASD05	0.00424 m
Heptachlor Epoxide	1024-57-3	1	-	9	11	0.00101	-	0.00101	IASD08	0.00101 m
Methoxychlor	72-43-5	7	-	10	70	0.00107	-	0.0122	IASD10	0.00729
Polycyclic Aromatic Hydrocarbons										
1-Methylnaphthalene	90-12-0	1	-	3	33	0.037	-	0.037	IAA-SS002	0.037 m
2-Methylnaphthalene	91-57-6	13	-	38	34	0.00092	-	0.36	IASD11	0.0674
Acenaphthene	83-32-9	6	-	38	16	0.0014	-	1	IASD09	0.0889

Table 3-9
Summary of Constituent Detections in Soil
Combined Surface and Subsurface Soil
IGNITER ASSEMBLY AREA
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent [a]	CASN	Frequency of Detection (FOD) [b]			Detects		Detection Limits		Maximum Location	Exposure Point			
		number of detects / number of samples	FOD %	Min - Max		Min - Max		Concentration [c]					
				(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)					
Acenaphthylene	208-96-8	6	-	40	15	0.0012	-	0.3	0.0019	-	0.49	TR-01A	0.0437
Anthracene	120-12-7	9	-	40	22	0.0011	-	2.1	0.0019	-	0.49	IASD09	0.197
Benzo(a)anthracene	56-55-3	18	-	42	43	0.0018	-	6.9	0.0019	-	0.49	IASD09	2.174
Benzo(a)pyrene	50-32-8	17	-	42	40	0.002	-	5.9	0.0019	-	0.49	IASD09	2.218
Benzo(b)fluoranthene	205-99-2	17	-	42	40	0.0049	-	13	0.0019	-	0.49	TR-01A	4.783
Benzo(g,h,i)perylene	191-24-2	15	-	47	32	0.0023	-	41	0.0019	-	0.49	504360	11.58
Benzo(k)fluoranthene	207-08-9	18	-	42	43	0.0014	-	6.5	0.0019	-	0.49	TR-01A	1.957
Chrysene	218-01-9	20	-	49	41	0.0026	-	44	0.0019	-	0.49	504360	11.96
Dibenzo(a,h)anthracene	53-70-3	7	-	40	18	0.0024	-	0.97	0.0019	-	0.49	IASD09	0.117
Fluoranthene	206-44-0	22	-	49	45	0.0047	-	59	0.0019	-	0.49	504360	17.05
Fluorene	86-73-7	8	-	38	21	0.00097	-	1.3	0.0019	-	0.49	IASD09	0.412
Indeno(1,2,3-cd)pyrene	193-39-5	13	-	40	32	0.0017	-	6.1	0.0019	-	0.49	TR-01A	2.203
Naphthalene	91-20-3	14	-	40	35	0.00088	-	0.75	0.0019	-	0.49	IASD09	0.26
Phenanthrene	85-01-8	23	-	42	55	0.00084	-	16	0.0022	-	0.49	IASD09	4.371
Pyrene	129-00-0	22	-	49	45	0.0033	-	48	0.0019	-	0.49	504360	13.74
Polychlorinated Biphenyls													
Aroclor 1254	11097-69-1	18	-	61	30	0.0049	-	12	0.022	-	0.04	IASS05	3.697
Aroclor 1260	11096-82-5	3	-	38	8	0.37	-	1	0.02	-	0.04	SS-11	1 m
Inorganics													
Aluminum	7429-90-5	139	-	139	100	881	-	46900	-	-	-	81027160	20453
Antimony	7440-36-0	39	-	136	29	0.21	-	16.9	0.54	-	5.6	IAA-SS028	1.066
Arsenic	7440-38-2	138	-	139	99	0.55	-	164	-	-	-	SS-12	19.37
Barium	7440-39-3	139	-	139	100	8.5	-	11800	-	-	-	SS-11a	1256
Beryllium	7440-41-7	118	-	139	85	0.28	-	4.3	0.11	-	1.2	IASB4	0.883
Cadmium	7440-43-9	55	-	118	47	0.06	-	15.2	0.11	-	6.2	IAA-SS015	1.813
Calcium	7440-70-2	139	-	139	100	33.7	-	197000	-	-	-	IAA-SS006	37571
Chromium	7440-47-3	139	-	139	100	10.1	-	1920	-	-	-	504360	163.8
Cobalt	7440-48-4	137	-	139	99	0.26	-	422	4.6	-	27.8	IASB07	30.81
Copper	7440-50-8	139	-	139	100	5.13	-	56500	-	-	-	SS-12	9523
Iron	7439-89-6	139	-	139	100	9450	-	328000	-	-	-	IAA-SS028	40300
Lead	7439-92-1	139	-	139	100	6.4	-	16200	-	-	-	504360	642 avg
Magnesium	7439-95-4	139	-	139	100	120	-	86100	-	-	-	IAA-SS033	21215
Manganese	7439-96-5	139	-	139	100	8.6	-	2510	-	-	-	IASB07	323.4
Mercury	7439-97-6	92	-	130	71	0.015	-	79.5	0.05	-	0.15	IAA-SS022	4.138
Nickel	7440-02-0	138	-	139	99	0.47	-	213	0.12	-	0.12	IAA-SS028	26.15
Potassium	7440-09-7	138	-	139	99	173	-	5570	1250	-	1250	IATP2B/D	1077
Selenium	7782-49-2	45	-	136	33	0.41	-	1.9	0.55	-	6.2	50240,81022636	0.795
Silver	7440-22-4	17	-	111	15	0.18	-	22.5	0.22	-	3.7	SS-12	1.434
Sodium	7440-23-5	94	-	137	69	6.28	-	1350	972	-	1850	IATP2B/D	75.6

Table 3-9
Summary of Constituent Detections in Soil
Combined Surface and Subsurface Soil
IGNITER ASSEMBLY AREA
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent [a]	CASN	Frequency of Detection (FOD) [b]		Detects		Detection Limits		Maximum Location	Exposure Point Concentration [c]
		number of detects / number of samples	FOD %	Min - Max		Min - Max			(mg/kg)
				(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)		
Thallium	7440-28-0	59 - 139	42	0.11 - 1	0.22 - 12.5	SS-03,SS-11	0.387		
Vanadium	7440-62-2	137 - 139	99	10.8 - 98.4	- - -	50240	59.23		
Zinc	7440-66-6	137 - 139	99	6 - 21800	- - -	SS-11	2171		
Asbestos									
Asbestos (Y/N)	-	20 41	49	NA NA	NA NA	NA	NA		
Asbestos weight percent (%)	-	7 22	32	0.1 17.2	- -	IAA8102-SS001A	NA		
Chrysotile (structures)	-	22 22	100	1 96	- -	IAA-SS044A	NA		

Notes:

- = Not detected/ not analyzed/ not applicable.

CASN = Chemical abstracts registry number.

mg/kg = Milligrams per kilograms.

PAH = Polycyclic Aromatic Hydrocarbon.

USEPA = United States Environmental Protection Agency.

VOC = Volatile Organic Compound.

[a] Only chemicals detected at least once in all five areas are presented.

For duplicate samples, the highest detected value or the lowest detection limit were used.

For constituents analyzed in two methods, the result of the more precise method was used i.e., USEPA method 8260 over 8270 for VOCs, method 8270-SIM over method 8270 for PAHs, and method 8330 over method 8260 or 8270 for explosives.

[b] Frequency of detection (FOD) = number of detects / total number of samples analyzed.

[c] The exposure point concentration (EPC) was the upper confidence level on the mean (UCL) or the maximum concentration where the UCL was incalculable. EPCs marked with "m" are based on the maximum detected concentration.

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

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

Table 3-10
Summary of Constituent Detections in Sediment
IGNITER ASSEMBLY AREA
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent [a]	CASN	Frequency of Detection (FOD) [b]		Detects	Detection Limits		Maximum Location	Exposure Point Concentration [c]
		number of detects / number of samples	FOD %	Min - Max	Min - Max			(mg/kg)
				(mg/kg)	(mg/kg)	(mg/kg)		
Inorganics						-		
Aluminum	7429-90-5	4 - 4	100	16600 - 21200	- - -		IAA-SE003	21200 m
Arsenic	7440-38-2	4 - 4	100	8.4 - 10.3	- - -		IAA-SE001	10.3 m
Barium	7440-39-3	4 - 4	100	36.8 - 48.9	- - -		IAA-SE004	48.9 m
Beryllium	7440-41-7	4 - 4	100	0.61 - 1.2	- - -		IAA-SE003	1.2 m
Cadmium	7440-43-9	2 - 4	50	0.42 - 0.47	1.3 - 1.4		IAA-SE004	0.47 m
Calcium	7440-70-2	4 - 4	100	1350 - 8650	- - -		IAA-SE001	8650 m
Chromium	7440-47-3	4 - 4	100	25.1 - 32.7	- - -		IAA-SE001	32.7 m
Cobalt	7440-48-4	4 - 4	100	4 - 13	- - -		IAA-SE003	13 m
Copper	7440-50-8	4 - 4	100	19 - 24.8	- - -		IAA-SE003	24.8 m
Iron	7439-89-6	4 - 4	100	27900 - 32300	- - -		IAA-SE001	32300 m
Lead	7439-92-1	4 - 4	100	31.8 - 44.4	- - -		IAA-SE003	35.8 avg
Magnesium	7439-95-4	4 - 4	100	1800 - 4580	- - -		IAA-SE001	4580 m
Manganese	7439-96-5	4 - 4	100	186 - 369	- - -		IAA-SE003	369 m
Mercury	7439-97-6	4 - 4	100	0.054 - 0.093	- - -		IAA-SE002	0.093 m
Nickel	7440-02-0	4 - 4	100	7.7 - 15.2	- - -		IAA-SE003	15.2 m
Potassium	7440-09-7	4 - 4	100	643 - 880	- - -		IAA-SE003	880 m
Vanadium	7440-62-2	4 - 4	100	50.7 - 62.6	- - -		IAA-SE001	62.6 m
Zinc	7440-66-6	4 - 4	100	54.5 - 107	- - -		IAA-SE003	107 m

Notes:

- = Not detected/ not analyzed/ not applicable.
CASN = Chemical abstracts registry number.
mg/kg = Milligrams per kilograms.

PAH = Polycyclic Aromatic Hydrocarbon.
USEPA = United States Environmental Protection Agency.
VOC = Volatile Organic Compound.

[a] Only chemicals detected at least once in all five areas are presented.

For duplicate samples, the highest detected value or the lowest detection limit were used.

For constituents analyzed in two methods, the result of the more precise method was used i.e., USEPA method 8260 over 8270 for VOCs, method 8270-SIM over method 8270 for PAHs, and method 8330 over method 8260 or 8270 for explosives.

[b] Frequency of detection (FOD) = number of detects / total number of samples analyzed.

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

EPCs marked with "m" are based on the maximum detected concentration.

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

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

Table 3-11
Summary of Calculated Human Health Risks and Hazards
IGNITER ASSEMBLY AREA
REASONABLE MAXIMUM EXPOSURE
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

<u>RECEPTOR</u>	Total Excess Lifetime Cancer Risk	Total Non-Cancer Hazard
Exposure Medium - Scenario		
<u>Site Worker</u>		
Surface Soil - Direct Contact	1E-04	1
Sediment - Wading	8E-07	0.01
TOTAL SITE RISKS (Site Worker):	1E-04	1
<u>Hypothetical Future Construction Worker</u>		
Combined Surface and Subsurface Soil - Direct Contact	6E-06	3
TOTAL SITE RISKS (Construction Worker):	6E-06	3
<u>Hypothetical Future Adult Resident</u>		
Combined Surface and Subsurface Soil - Direct Contact	1E-04	1
Sediment - Wading	1E-06	0.02
TOTAL SITE RISKS (Adult Resident):	1E-04	1
<u>Hypothetical Future Child Resident</u>		
Combined Surface and Subsurface Soil - Direct Contact	4E-04	13
Sediment - Wading	1E-06	0.1
TOTAL SITE RISKS (Child Resident):	4E-04	13
<u>Hypothetical Future Aggregate Resident (Adult + Child)</u>		
Combined Surface and Subsurface Soil - Direct Contact	5E-04	--
Sediment - Wading	3E-06	--
TOTAL SITE RISKS (Aggregate Resident):	5E-04	--

Table 3-12
Summary of Ecological Risk Characterization Results - Terrestrial Habitat
IGNITER ASSEMBLY AREA
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent	Soil						Baseline Level Assessment			Bioaccumulative ? (YES/no)	Results of Refined Food Chain Models [c]			
							Hazard Quotient [a]	Ecological Screening Level [b]			Short-tailed Shrew		American Robin	
	Frequency of Detection		EPC (mg/kg)	Source	Basis	LOAEL HQ		NOAEL HQ	LOAEL HQ		NOAEL HQ			
	# detects / n samples	%												
Volatile Organic Compounds														
3-Octanone	4	-	4	100%	0.015	m	NA			no	—	—	—	—
d-Limonene	3	-	3	100%	0.084	m	NA			no	—	—	—	—
Semi-Volatile Organic Compounds														
2,4-Dinitrotoluene	2	-	36	6%	48	m	40	R5		no	—	—	—	—
Benzoic Acid	7	-	27	26%	0.233		NA			no	—	—	—	—
bis(2-Ethylhexyl)phthalate	28	-	47	60%	303.3		300	R5		no	—	—	—	—
Carbazole	5	-	27	19%	0.402		NA			no	—	—	—	—
Dibenzofuran	4	-	25	16%	0.74	m	NA			no	—	—	—	—
Diethylphthalate	4	-	34	12%	250	m	10	R5		no	—	—	—	—
Di-n-Butylphthalate	4	-	27	15%	0.31	m	2	R5		no	—	—	—	—
Explosives														
Nitroglycerine	1	-	19	5%	0.57	m	NA			no	—	—	—	—
Pesticides														
4,4'-DDD	6	-	9	67%	0.0019		0.09	EcoSSL	mam	YES	0.00005	0.0003	0.006	0.06
4,4'-DDE	5	-	9	56%	0.0016		0.07	EcoSSL	mam	YES	0.00004	0.0002	0.005	0.05
4,4'-DDT	14	-	21	67%	0.0037		0.2	EcoSSL	mam	YES	0.0001	0.0005	0.01	0.1
BHC, beta-	1	-	9	11%	0.0002	m	0.04	R5		YES	0.000007	0.00003	0.000006	0.00002
BHC, delta-	1	-	9	11%	0.001	m	0.0001	R5		YES	0.00003	0.00005	0.00004	0.0002
Chlordane, alpha-	3	-	9	33%	0.003	m	0.01	R5		YES	0.00001	0.0001	0.00001	0.0001
Dieldrin	7	-	9	78%	0.0066		1	EcoSSL	mam	YES	0.003	0.03	0.0006	0.006
Endosulfan II	8	-	20	40%	0.0021		0.02	R5		YES	0.0001	0.001	0.000002	0.00002
Endrin	8	-	22	36%	0.0064		0.6	R5		YES	0.001	0.01	0.0002	0.002
Heptachlor Epoxide	1	-	9	11%	0.001	m	0.007	R5		YES	0.00006	0.0006	—	—
Methoxychlor	7	-	10	70%	0.0073		0.4	R5		YES	0.0003	0.0007	—	—
Polycyclic Aromatic Hydrocarbons														
Acenaphthene	6	-	38	16%	0.129		0.0002	R5		YES	0.0004	0.004	0.00005	0.0005
Acenaphthylene	6	-	40	15%	0.0607		0.00009	R5		YES	0.00003	0.000003	0.00002	0.0002
Anthracene	9	-	40	23%	0.277		0.0002	R5		YES	0.0000004	0.000004	0.00004	0.0004
Benzo(a)anthracene	18	-	42	43%	2.939		0.6	R5		YES	0.009	0.09	0.0004	0.004
Benzo(a)pyrene	17	-	42	40%	2.998		2	R5		YES	0.005	0.05	0.0005	0.005
Benzo(b)fluoranthene	17	-	42	40%	6.47		0.1	R5		YES	0.004	0.09	0.001	0.01
Benzo(g,h,i)perylene	15	-	47	32%	1.434		0.01	R5		YES	0.05	0.5	0.0002	0.002
Benzo(k)fluoranthene	18	-	42	43%	2.654		0.02	R5		YES	0.002	0.04	0.0004	0.004
Chrysene	20	-	49	41%	4.008		0.8	R5		YES	0.0003	0.003	0.0006	0.006
Dibenzo(a,h)anthracene	7	-	40	18%	0.162		0.009	R5		YES	0.3	3	0.00003	0.0003
Fluoranthene	22	-	49	45%	8.402		0.07	R5		YES	0.006	0.06	0.003	0.03
Fluorene	8	-	38	21%	0.154		0.001	R5		YES	0.00003	0.00009	0.00005	0.0005
Indeno(1,2,3-cd)pyrene	13	-	40	33%	3.035		0.03	R5		YES	0.3	3	0.0005	0.005
Naphthalene	14	-	40	35%	0.357		4	R5		no	—	—	—	—
Phenanthrene	23	-	42	55%	5.962		0.1	R5		YES	0.003	0.03	0.0009	0.009
Pyrene	22	-	49	45%	6.298		0.08	R5		YES	0.004	0.04	0.0009	0.009

Table 3-12
Summary of Ecological Risk Characterization Results - Terrestrial Habitat
IGNITER ASSEMBLY AREA
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent						Baseline Level Assessment				Bioaccumulative ? (YES/no)	Results of Refined Food Chain Models [c]			
	Soil				EPC (mg/kg)	Hazard Quotient [a]	Ecological		LOAEL HQ		NOAEL HQ	LOAEL HQ	NOAEL HQ	
	Frequency of Detection		m	Source			Basis							
	# detects / n samples	%						Screening Level [b]						
Polychlorinated Biphenyls														
Aroclor 1254	18	-	61	30%	2.857		NA			YES	0.7	7	0.1	1
Aroclor 1260	3	-	38	8%	1	m	NA			YES	0.2	2	0.04	0.4
Inorganics														
Antimony	39	-	136	29%	1.221		5	EcoSSL	mam	no	—	—	—	—
Arsenic	138	-	139	99%	23.99		1	EcoSSL	veg	YES	0.1	1	0.05	0.1
Barium	139	-	139	100%	1,724		5	EcoSSL	inv	no	—	—	—	—
Cadmium	55	-	118	47%	2.198		6	EcoSSL	mam	YES	0.2	2	0.02	0.2
Chromium	139	-	139	100%	157.4		6	EcoSSL	avi	no	—	—	—	—
Cobalt	137	-	139	99%	38.29		3	EcoSSL	veg	no	—	—	—	—
Copper	139	-	139	100%	13,224		500	EcoSSL	avi	YES	6	8	5	6
Iron	139	-	139	100%	40,291		NA			no	—	—	—	—
Lead	139	-	139	100%	2,016		200	EcoSSL	avi	YES	0.2	2	0.8	8
Mercury	92	-	130	71%	5.234		50	R5		no	—	—	—	—
Nickel	138	-	139	99%	29.05		0.8	EcoSSL	veg	YES	0.003	0.03	0.004	0.006
Selenium	45	-	136	33%	0.701		1	EcoSSL	veg	YES	0.06	0.1	0.02	0.04
Silver	17	-	111	15%	1.815		0.4	EcoSSL	avi	YES	0.0003	0.003	0.06	0.1
Zinc	137	-	139	99%	2,929		60	EcoSSL	avi	YES	4	40	1	10

Notes:

- = Not applicable.

COPEC = Constituent of Potential Ecological Concern.

EPC = Exposure point concentrations - the minimum of the upper confidence limit (UCL) on the mean and the maximum concentration.

EPCs marked with "m" are the maximum concentration.

LOAEL HQ = Lowest observed adverse effect level hazard quotient.

mg/kg = Milligrams per kilogram.

NA = Not available.

NOAEL HQ = No observed adverse effect level hazard quotient.

[a] Hazard quotients (HQs) greater than one are presented in bold font. HQs are rounded to one significant figure (unitless).

[b] See Table A.2-18 for sources of ecological screening levels (ESLs); ESLs marked with 's' are based on a surrogate.

R5: Region 5 Ecological Screening Levels (USEPA 2003e; R5).

EcoSSL: USEPA Ecological Soil Screening Levels (USEPA 2005b, EcoSSL).

Where readily available (i.e., EcoSSLs), the basis of the ESL is presented.

[c] Foodchain modeling was conducted for bioaccumulative COPECs.

Table 3-13
Soil Risk Assessment Dataset
Combined Surface and Subsurface Soil
BUILDING DEBRIS DISPOSAL TRENCH
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent [a]	CASN	Frequency of Detection (FOD) [b]		Detects		Detection Limits		Maximum Location					
		number of detects / number of samples	FOD %	Min - Max		Min - Max							
				(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)						
Volatile Organic Compounds													
1,2,4-Trimethylbenzene	95-63-6	2	-	4	50	0.003	-	0.004	0.002	-	0.002	DTSS1	*
m,p-Xylene	136777612	1	-	7	14	0.003	-	0.003	0.003	-	0.014	DTSS1	*
Xylenes (total)	1330-20-7	1	-	7	14	0.003	-	0.003	0.003	-	0.014	DTSS1	*
Semi-Volatile Organic Compounds													
Carbazole	86-74-8	4	-	4	100	0.17	-	3.5	—	-	—	DTSB35	*
Dibenzofuran	132-64-9	3	-	4	75	0.28	-	0.8	0.4	-	0.4	DTSB35	*
Herbicides													
2,4-D	94-75-7	1	-	1	100	0.171	-	0.171	—	-	—	DTSB46	*
Dalapon	75-99-0	1	-	1	100	0.099	-	0.099	—	-	—	DTSB46	*
Dicamba	1918-00-9	1	-	1	100	0.00849	-	0.00849	—	-	—	DTSB46	*
MCP	93-65-2	1	-	1	100	13.5	-	13.5	—	-	—	DTSB46	*
Pesticides													
4,4'-DDD	72-54-8	1	-	1	100	0.0034	-	0.0034	—	-	—	DTSB46	*
Methoxychlor	72-43-5	1	-	1	100	0.0291	-	0.0291	—	-	—	DTSB46	*
Polycyclic Aromatic Hydrocarbons													
1-Methylnaphthalene	90-12-0	3	-	12	25	0.002	-	0.0036	0.0039	-	0.0045	BDDT-SS001	*
2-Methylnaphthalene	91-57-6	16	-	63	25	0.00095	-	5.1	0.0039	-	0.43	DTSB46	*
Acenaphthene	83-32-9	35	-	63	56	0.002	-	27	0.0039	-	0.011	DTSB46	*
Acenaphthylene	208-96-8	20	-	63	32	0.00087	-	0.31	0.0039	-	0.85	DTSB55	*
Anthracene	120-12-7	40	-	63	63	0.0036	-	37	0.0039	-	0.011	DTSB46	*
Benzo(a)anthracene	56-55-3	45	-	63	71	0.0093	-	66	0.0039	-	0.011	DTSB46	*
Benzo(a)pyrene	50-32-8	45	-	63	71	0.0089	-	57	0.0039	-	0.011	DTSB46	*
Benzo(b)fluoranthene	205-99-2	50	-	63	79	0.0038	-	81	0.0041	-	0.011	DTSB46	*
Benzo(g,h,i)perylene	191-24-2	44	-	63	70	0.0063	-	38	0.0039	-	0.011	DTSB46	*
Benzo(k)fluoranthene	207-08-9	46	-	63	73	0.0017	-	26	0.0041	-	0.011	DTSB46	*
Chrysene	218-01-9	45	-	63	71	0.0089	-	61	0.0039	-	0.011	DTSB46	*
Dibenzo(a,h)anthracene	53-70-3	28	-	63	44	0.0027	-	9.9	0.0039	-	3.4	DTSB46	*
Fluoranthene	206-44-0	53	-	63	84	0.0052	-	180	0.0041	-	0.0088	DTSB46	*
Fluorene	86-73-7	34	-	63	54	0.002	-	28	0.0039	-	0.08	DTSB46	*
Indeno(1,2,3-cd)pyrene	193-39-5	42	-	63	67	0.013	-	47	0.0039	-	0.011	DTSB46	*
Naphthalene	91-20-3	21	-	63	33	0.0011	-	29	0.0039	-	0.43	DTSB46	*
Phenanthrene	85-01-8	49	-	63	78	0.0047	-	160	0.0041	-	0.011	DTSB46	*
Pyrene	129-00-0	51	-	63	81	0.0054	-	130	0.0041	-	0.011	DTSB46	*
Inorganics													
Aluminum	7429-90-5	8	-	8	100	14600	-	20100	—	-	—	DTSS3	*
Antimony	7440-36-0	2	-	8	25	0.22	-	0.33	0.59	-	0.66	DTSB47	*
Arsenic	7440-38-2	8	-	8	100	2.11	-	11.6	—	-	—	DTSS3	*
Barium	7440-39-3	8	-	8	100	56	-	78.7	—	-	—	DTSB47	*
Beryllium	7440-41-7	8	-	8	100	0.76	-	1.5	—	-	—	DTSS3	*

Table 3-13
Soil Risk Assessment Dataset
Combined Surface and Subsurface Soil
BUILDING DEBRIS DISPOSAL TRENCH
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent [a]	CASN	Frequency of Detection (FOD) [b]		Detects		Detection Limits		Maximum Location
		number of detects / number of samples	FOD %	Min - Max		Min - Max		
				(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	
Cadmium	7440-43-9	2 - 8	25	0.05	- 0.1	0.12	- 0.13	DTSB46 *
Calcium	7440-70-2	8 - 8	100	850	- 2560	—	- —	DTSS3 *
Chromium	7440-47-3	8 - 8	100	23.2	- 60.8	—	- —	DTSS3 *
Cobalt	7440-48-4	8 - 8	100	10.7	- 446	—	- —	DTSS2 *
Copper	7440-50-8	8 - 8	100	19.3	- 138	—	- —	DTSS2 *
Iron	7439-89-6	8 - 8	100	21100	- 58100	—	- —	DTSS3 *
Lead	7439-92-1	8 - 8	100	14.1	- 336	—	- —	DTSS2 *
Magnesium	7439-95-4	8 - 8	100	4040	- 13500	—	- —	DTSS3 *
Manganese	7439-96-5	8 - 8	100	484	- 3430	—	- —	DTSS2 *
Mercury	7439-97-6	4 - 8	50	0.02	- 0.03	0.12	- 0.13	DTSB46,DTSB46,DTSS *
Nickel	7440-02-0	8 - 8	100	15.1	- 41.3	—	- —	DTSS2 *
Potassium	7440-09-7	8 - 8	100	1370	- 3980	—	- —	DTSS3 *
Selenium	7782-49-2	1 - 8	12	0.43	- 0.43	0.59	- 1.24	DTSB46 *
Sodium	7440-23-5	8 - 8	100	18	- 173	—	- —	DTSB35 *
Thallium	7440-28-0	5 - 8	62	0.2	- 0.51	0.24	- 0.26	DTSB35 *
Vanadium	7440-62-2	8 - 8	100	38.4	- 108	—	- —	DTSS3 *
Zinc	7440-66-6	8 - 8	100	39.5	- 178	—	- —	DTSS1 *

Notes:

- = Not detected/ not analyzed/ not applicable.

CASN = Chemical abstracts registry number.

mg/kg = Milligrams per kilograms.

PAH = Polycyclic Aromatic Hydrocarbon.

USEPA = United States Environmental Protection Agency.

VOC = Volatile Organic Compound.

* = Surface soil

r = Rip-rap area

[a] Only chemicals detected at least once in all five areas are presented.

For duplicate samples, the highest detected value or the lowest detection limit were used.

For constituents analyzed in two methods, the result of the more precise method was used i.e., USEPA method 8260 over 8270 for VOCs, method 8270-SIM over method 8270 for PAHs, and method 8330 over method 8260 or 8270 for explosives.

[b] Frequency of detection (FOD) = number of detects / total number of samples analyzed.

Table 3-14
Sediment Risk Assessment Dataset
BUILDING DEBRIS DISPOSAL TRENCH
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent [a]	CASN	Frequency of Detection (FOD) [b]			Detects		Detection Limits		Maximum Location			
		number of detects / number of samples	FOD %	Min - Max		Min - Max						
				(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)					
Volatile Organic Compounds												
Acetone	67-64-1	5	-	13	38	0.022	-	0.037	0.007	-	0.012	DTSW/SD07
Carbon Disulfide	75-15-0	6	-	13	46	0.00099	-	0.0015	0.007	-	0.009	DTSW/SD07
Methylene Chloride	75-09-2	1	-	13	8	0.005	-	0.005	0.001	-	0.012	DTSD03
p-Isopropyltoluene	99-87-6	1	-	7	14	0.004	-	0.004	0.001	-	0.002	DTSD01
Toluene	108-88-3	3	-	13	23	0.00094	-	0.0027	0.002	-	0.012	DTSW/SD10
Trichloroethene	79-01-6	1	-	13	8	0.003	-	0.003	0.004	-	0.012	DTSD02
Semi-Volatile Organic Compounds												
4-Methylphenol	106-44-5	1	-	7	14	0.06	-	0.06	0.46	-	0.58	DTSD03
Di-n-Butylphthalate	84-74-2	2	-	7	29	0.08	-	0.09	0.46	-	0.59	DTSD04
Pesticides												
4,4'-DDD	72-54-8	2	-	2	100	0.0011	-	0.00115	-	-	-	DTSW/SD05
4,4'-DDE	72-55-9	2	-	2	100	0.00141	-	0.00212	-	-	-	DTSW/SD05
4,4'-DDT	50-29-3	2	-	2	100	0.00067	-	0.00123	-	-	-	DTSW/SD05
Delta-BHC	319-86-8	1	-	2	50	0.00354	-	0.0065	0.00134	-	0.00134	DTSW/SD07
Alpha-Chlordane	5103-71-9	2	-	2	100	0.00033	-	0.00039	-	-	-	DTSW/SD07
Dieldrin	60-57-1	2	-	2	100	0.00121	-	0.00159	-	-	-	DTSW/SD05
Polycyclic Aromatic Hydrocarbons												
1-Methylnaphthalene	90-12-0	1	-	4	25	0.0048	-	0.0048	0.0044	-	0.0048	BDDT-SE004
2-Methylnaphthalene	91-57-6	7	-	17	41	0.0042	-	0.074	0.0044	-	0.59	DTSW/SD10
Acenaphthene	83-32-9	7	-	17	41	0.0018	-	0.24	0.0044	-	0.6	DTSW/SD10
Acenaphthylene	208-96-8	1	-	17	6	0.0017	-	0.0017	0.0032	-	1.2	DTSW/SD06
Anthracene	120-12-7	8	-	17	47	0.0023	-	0.41	0.0026	-	0.06	DTSW/SD10
Benzo(a)anthracene	56-55-3	10	-	17	59	0.0026	-	0.88	0.0026	-	0.04	DTSW/SD10
Benzo(a)pyrene	50-32-8	9	-	17	53	0.012	-	0.71	0.0026	-	0.04	DTSW/SD10
Benzo(b)fluoranthene	205-99-2	8	-	17	47	0.0041	-	1.2	0.0044	-	0.12	DTSW/SD10
Benzo(g,h,i)perylene	191-24-2	8	-	17	47	0.0064	-	0.28	0.0044	-	0.12	DTSW/SD10
Benzo(k)fluoranthene	207-08-9	9	-	17	53	0.0017	-	0.37	0.0026	-	0.06	DTSW/SD10
Chrysene	218-01-9	11	-	17	65	0.004	-	0.8	0.0028	-	0.04	DTSW/SD10
Dibenzo(a,h)anthracene	53-70-3	4	-	17	24	0.0029	-	0.076	0.0032	-	0.12	DTSW/SD10
Fluoranthene	206-44-0	14	-	17	82	0.0082	-	2	0.0044	-	0.09	DTSW/SD10
Fluorene	86-73-7	7	-	17	41	0.0024	-	0.24	0.0044	-	0.12	DTSW/SD10
Indeno(1,2,3-cd)pyrene	193-39-5	8	-	17	47	0.0075	-	0.36	0.0026	-	0.06	DTSW/SD10
Naphthalene	91-20-3	7	-	17	41	0.014	-	0.091	0.0044	-	0.6	DTSW/SD10
Phenanthrene	85-01-8	14	-	17	82	0.0042	-	1.9	0.0044	-	0.04	DTSW/SD10
Pyrene	129-00-0	13	-	17	76	0.006	-	1.7	0.0044	-	0.04	DTSW/SD10
Inorganics												

Table 3-14
Sediment Risk Assessment Dataset
BUILDING DEBRIS DISPOSAL TRENCH
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent [a]	CASN	Frequency of Detection (FOD) [b]		Detects	Detection Limits		Maximum Location
		number of detects / number of samples	FOD %	Min - Max	Min - Max		
				(mg/kg)	(mg/kg)	(mg/kg)	
Aluminum	7429-90-5	13 - 13	100	8690 - 20200	- - -	DTSW/SD09	
Antimony	7440-36-0	3 - 13	23	0.37 - 0.89	0.69 - 1.19	DTSW/SD05	
Arsenic	7440-38-2	13 - 13	100	1.96 - 13.2	- - -	DTSD03	
Barium	7440-39-3	13 - 13	100	72.5 - 358	- - -	DTSD03	
Beryllium	7440-41-7	13 - 13	100	0.7 - 1.3	- - -	DTSD03	
Calcium	7440-70-2	13 - 13	100	46100 - 98600	- - -	DTSD04	
Chromium	7440-47-3	13 - 13	100	22.3 - 73	- - -	DTSD03	
Cobalt	7440-48-4	13 - 13	100	8.8 - 27.6	- - -	DTSD02	
Copper	7440-50-8	13 - 13	100	4.4 - 15	- - -	DTSD01	
Iron	7439-89-6	13 - 13	100	16400 - 56200	- - -	DTSD03	
Lead	7439-92-1	13 - 13	100	10.7 - 28.6	- - -	DTSD03	
Magnesium	7439-95-4	13 - 13	100	3070 - 7720	- - -	DTSD02	
Manganese	7439-96-5	13 - 13	100	387 - 3340	- - -	DTSD03	
Mercury	7439-97-6	2 - 13	15	0.03 - 0.04	0.08 - 0.18	DTSW/SD05	
Nickel	7440-02-0	13 - 13	100	7.9 - 20.8	- - -	DTSD03	
Potassium	7440-09-7	13 - 13	100	776 - 2200	- - -	DTSW/SD10	
Silver	7440-22-4	1 - 13	8	0.86 - 0.86	0.28 - 2.39	DTSD01	
Sodium	7440-23-5	13 - 13	100	87.4 - 510	- - -	DTSD01	
Thallium	7440-28-0	9 - 13	69	0.09 - 1.1	0.28 - 0.35	DTSD01	
Vanadium	7440-62-2	13 - 13	100	31.6 - 75.7	- - -	DTSD03	
Zinc	7440-66-6	13 - 13	100	32.6 - 51.9	- - -	DTSD02	

Notes:

- = Not detected/ not analyzed/ not applicable.

CASN = Chemical abstracts registry number.

mg/kg = Milligrams per kilograms.

PAH = Polycyclic Aromatic Hydrocarbon.

USEPA = United States Environmental Protection Agency.

VOC = Volatile Organic Compound.

[a] Only chemicals detected at least once in all five areas are presented.

For duplicate samples, the highest detected value or the lowest detection limit were used.

For constituents analyzed in two methods, the result of the more precise method was used i.e., USEPA method 8260 over 8270 for VOCs, method 8270-SIM over method 8270 for PAHs, and method 8330 over method 8260 or 8270 for explosives.

[b] Frequency of detection (FOD) = number of detects / total number of samples analyzed.

Table 3-15
Surface Water Risk Assessment Dataset
BUILDING DEBRIS DISPOSAL TRENCH
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent [a]	CASN	Frequency of Detection (FOD) [b]			Detects		Detection Limits			Maximum Location		
		number of detects / number of samples		FOD %	Min - Max		Min - Max					
					(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)				
Volatile Organic Compounds												
Bromodichloromethane	75-27-4	1	-	13	8	0.023	-	0.023	0.0006	-	0.001	DTSW3
Carbon Disulfide	75-15-0	5	-	13	38	0.00022	-	0.00034	0.001	-	0.005	DTSW/SD08
Chloroform	67-66-3	6	-	13	46	0.00007	-	0.004	0.0008	-	0.001	DTSW3
Semi-Volatile Organic Compounds												
Di-n-Butylphthalate	84-74-2	2	-	7	29	0.002	-	0.003	0.01	-	0.01	DTSW2
Pesticides												
4,4'-DDT	50-29-3	1	-	2	50	5.16E-06	-	5.16E-06	0.00002	-	0.00002	DTSW/SD05
Dieldrin	60-57-1	2	-	2	100	5.48E-06	-	5.91E-06	—	-	—	DTSW/SD07
Endrin Ketone	53494-70-5	2	-	2	100	4.37E-06	-	5.99E-06	—	-	—	DTSW/SD07
Polycyclic Aromatic Hydrocarbons												
2-Methylnaphthalene	91-57-6	4	-	17	24	0.00003	-	0.00013	0.000046	-	0.01	DTSW/SD10
Acenaphthene	83-32-9	1	-	17	6	0.00005	-	0.00005	0.000046	-	0.01	DTSW/SD10
Acenaphthylene	208-96-8	1	-	17	6	0.00004	-	0.00004	0.000046	-	0.01	DTSW/SD10
Fluorene	86-73-7	1	-	17	6	0.00003	-	0.00003	0.000046	-	0.01	DTSW/SD10
Naphthalene	91-20-3	6	-	17	35	0.00003	-	0.00013	0.000046	-	0.01	DTSW/SD10
Inorganics												
Aluminum	7429-90-5	13	-	13	100	0.0498	-	0.603	—	-	—	DTSW/SD09
Antimony	7440-36-0	2	-	13	15	0.00038	-	0.00074	0.005	-	0.005	DTSW/SD06
Barium	7440-39-3	13	-	13	100	0.06	-	0.0825	—	-	—	DTSW/SD08
Calcium	7440-70-2	13	-	13	100	47	-	65	—	-	—	DTSW2
Copper	7440-50-8	7	-	13	54	0.012	-	0.0348	0.02	-	0.02	DTSW1
Iron	7439-89-6	13	-	13	100	0.0763	-	0.507	—	-	—	DTSW/SD09
Lead	7439-92-1	8	-	13	62	0.00015	-	0.0046	0.002	-	0.002	DTSW1
Magnesium	7439-95-4	13	-	13	100	12.7	-	17.4	—	-	—	DTSW/SD08
Manganese	7439-96-5	13	-	13	100	0.0034	-	0.0198	—	-	—	DTSW/SD09
Nickel	7440-02-0	7	-	13	54	0.0027	-	0.0055	0.04	-	0.04	DTSW1
Potassium	7440-09-7	13	-	13	100	1.93	-	3.67	—	-	—	DTSW/SD08
Silver	7440-22-4	1	-	13	8	0.0021	-	0.0021	0.002	-	0.01	DTSW1
Sodium	7440-23-5	13	-	13	100	22.4	-	35.3	—	-	—	DTSW/SD08
Thallium	7440-28-0	4	-	13	31	0.0023	-	0.0072	0.002	-	0.002	DTSW4
Zinc	7440-66-6	7	-	13	54	0.0202	-	0.0462	0.02	-	0.02	DTSW1

Notes:

- = Not detected/ not analyzed/ not applicable.

CASN = Chemical abstracts registry number.

mg/L = Milligrams per liter.

PAH = Polycyclic Aromatic Hydrocarbon.

USEPA = United States Environmental Protection Agency.

VOC = Volatile Organic Compound.

[a] Only chemicals detected at least once in all five areas are presented.

For duplicate samples, the highest detected value or the lowest detection limit were used.

For constituents analyzed in two methods, the result of the more precise method was used i.e., USEPA method 8260 over 8270 for VOCs, method 8270-SIM over method 8270 for PAHs, and method 8330 over method 8260 or 8270 for explosives.

[b] Frequency of detection (FOD) = number of detects / total number of samples analyzed.

Table 3-16
Summary of Calculated Human Health Risks and Hazards
BUILDING DEBRIS DISPOSAL TRENCH
REASONABLE MAXIMUM EXPOSURE
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

<u>RECEPTOR</u>	Total Excess Lifetime Cancer Risk	Total Non-Cancer Hazard
Exposure Medium - Scenario		
<u>Site Worker</u>		
Surface Soil - Direct Contact	5E-05	0.5
Combined Surface and Subsurface Soil - Vapor Migration to Indoor Air	NA	0.04
Sediment - Wading	1E-05	0.02
Surface Water - Wading	4E-07	0.04
TOTAL SITE RISKS (Site Worker):	7E-05	0.6
<u>Hypothetical Future Construction Worker</u>		
Combined Surface and Subsurface Soil - Direct Contact	2E-06	1
TOTAL SITE RISKS (Construction Worker):	2E-06	1
<u>Hypothetical Future Adult Resident</u>		
Combined Surface and Subsurface Soil - Direct Contact	8E-05	0.5
Combined Surface and Subsurface Soil - Vapor Migration to Indoor Air	NA	0.06
Sediment - Wading	3E-05	0.04
Surface Water - Wading	1E-07	0.01
TOTAL SITE RISKS (Adult Resident):	1E-04	0.6
<u>Hypothetical Future Child Resident</u>		
Combined Surface and Subsurface Soil - Direct Contact	3E-04	4
Combined Surface and Subsurface Soil - Vapor Migration to Indoor Air	NA	0.06
Sediment - Wading	2E-05	0.3
Surface Water - Wading	1E-07	0.04
TOTAL SITE RISKS (Child Resident):	3E-04	5
<u>Hypothetical Future Aggregate Resident (Adult + Child)</u>		
Combined Surface and Subsurface Soil - Direct Contact	4E-04	--
Combined Surface and Subsurface Soil - Vapor Migration to Indoor Air	NA	--
Sediment - Wading	5E-05	--
Surface Water - Wading	2E-07	--
TOTAL SITE RISKS (Aggregate Resident):	4E-04	--

Table 3-17
Summary of Ecological Risk Characterization Results - Terrestrial Habitat
BUILDING DEBRIS DISPOSAL TRENCH
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent	Soil						Baseline Level Assessment				Bioaccumulative ? (YES/no)	Results of Refined Food Chain Models [c]			
							Hazard Quotient [a]	Ecological Screening Level [b]		LOAEL HQ		NOAEL HQ	Short-tailed Shrew		American Robin
	Frequency of Detection # detects / n samples	EPC (mg/kg)	Source	Basis	LOAEL HQ	NOAEL HQ		LOAEL HQ	NOAEL HQ						
Semi-Volatile Organic Compounds															
Carbazole	4	-	4	100%	3.5	m	NA			no	-	-	-	-	
Dibenzofuran	3	-	4	75%	0.8	m	NA			no	-	-	-	-	
Herbicides															
Dalapon	1	-	1	100%	0.099	m	NA			no	-	-	-	-	
Dicamba	1	-	1	100%	0.0085	m	NA			no	-	-	-	-	
MCPP	1	-	1	100%	13.5	m	NA			no	-	-	-	-	
Pesticides															
4,4'-DDD	1	-	1	100%	0.0034	m	0.2	EcoSSL	mam	YES	0.00009	0.0004	0.01	0.1	
Methoxychlor	1	-	1	100%	0.0291	m	1	R5		YES	0.001	0.003	-	-	
Polycyclic Aromatic Hydrocarbons															
Acenaphthene	35	-	63	56%	7.14		0.01	R5		YES	0.02	0.2	0.003	0.03	
Acenaphthylene	20	-	63	32%	0.0469		0.00007	R5		YES	0.00003	0.000003	0.00002	0.0002	
Anthracene	40	-	63	63%	10.67		0.007	R5		YES	0.00002	0.0002	0.002	0.02	
Benzo(a)anthracene	45	-	63	71%	19.04		4	R5		YES	0.06	0.6	0.003	0.03	
Benzo(a)pyrene	45	-	63	71%	15.79		10	R5		YES	0.03	0.3	0.002	0.02	
Benzo(b)fluoranthene	50	-	63	79%	23.81		0.4	R5		YES	0.01	0.3	0.004	0.04	
Benzo(g,h,i)perylene	44	-	63	70%	9.622		0.08	R5		YES	0.3	3	0.001	0.01	
Benzo(k)fluoranthene	46	-	63	73%	7.473		0.05	R5		YES	0.004	0.1	0.001	0.01	
Chrysene	45	-	63	71%	18.1		4	R5		YES	0.001	0.01	0.003	0.03	
Dibenzo(a,h)anthracene	28	-	63	44%	1.235		0.07	R5		YES	2	20	0.0002	0.002	
Fluoranthene	53	-	63	84%	53.96		0.4	R5		YES	0.04	0.4	0.02	0.2	
Fluorene	34	-	63	54%	7.328		0.06	R5		YES	0.002	0.005	0.003	0.03	
Indeno(1,2,3-cd)pyrene	42	-	63	67%	7.795		0.07	R5		YES	0.7	7	0.001	0.01	
Naphthalene	21	-	63	33%	6.839		70	R5		no	-	-	-	-	
Phenanthrene	49	-	63	78%	47.5		1	R5		YES	0.02	0.2	0.007	0.07	
Pyrene	51	-	63	81%	39.71		0.5	R5		YES	0.03	0.3	0.006	0.06	
Inorganics															
Cobalt	8	-	8	100%	446	m	30	EcoSSL	veg	no	-	-	-	-	
Copper	8	-	8	100%	138	m	5	EcoSSL	avi	YES	0.06	0.08	0.05	0.07	
Iron	8	-	8	100%	58,100	m	NA			no	-	-	-	-	
Lead	8	-	8	100%	336	m	30	EcoSSL	avi	YES	0.03	0.3	0.1	1	
Manganese	8	-	8	100%	3,430	m	20	EcoSSL	veg	no	-	-	-	-	
Selenium	1	-	8	13%	0.43	m	0.8	EcoSSL	veg	YES	0.04	0.06	0.01	0.02	

Table 3-17
Summary of Ecological Risk Characterization Results - Terrestrial Habitat
BUILDING DEBRIS DISPOSAL TRENCH
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Notes:

- = Not applicable.
- COPEC = Constituent of Potential Ecological Concern.
- EPC = Exposure point concentrations - the minimum of the upper confidence limit (UCL) on the mean and the maximum concentration.
EPCs marked with "m" are the maximum concentration.
- LOAEL HQ = Lowest observed adverse effect level hazard quotient.
- mg/kg = Milligrams per kilogram.
- NA = Not available.
- NOAEL HQ = No observed adverse effect level hazard quotient.
- [a] Hazard quotients (HQs) greater than one are presented in bold font. HQs are rounded to one significant figure (unitless).
- [b] See Table A.2-18 for sources of ecological screening levels (ESLs); ESLs marked with 's' are based on a surrogate.
R5: Region 5 Ecological Screening Levels (USEPA 2003e; R5).
EcoSSL: USEPA Ecological Soil Screening Levels (USEPA 2005b; EcoSSL).
Where readily available (i.e., EcoSSLs), the basis of the ESL is presented.
- [c] Foodchain modeling was conducted for bioaccumulative COPECs.

Table 3-18
Summary of Ecological Risk Characterization Results - Aquatic Habitat
BUILDING DEBRIS DISPOSAL TRENCH
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent												Baseline Level Assessment		Bioaccumulative ? (YES/no)	Results of Refined Food Chain Models [b]				
	Sediment					Surface Water					Sediment	Surface Water							
	Frequency of Detection				EPC	Frequency of Detection				EPC	Hazard	Hazard	Mink				Great Blue Heron		
	# detects / n samples		%		(mg/kg)	# detects / n samples		%		(mg/L)	Quotient	Quotient	LOAEL HQ		NOAEL HQ	LOAEL HQ	NOAEL HQ		
												[a]	[a]						
Volatile Organic Compounds																			
Acetone	5	-	13	38%	3.7E-02	m	0	-	13	0%	—	4	NA	no	—	—	—	—	
Bromodichloromethane	0	-	13	0%	—		1	-	13	8%	2.3E-02	m	NA	NA	no	—	—	—	—
Carbon Disulfide	6	-	13	46%	1.4E-03		5	-	13	38%	—	2	NA	no	—	—	—	—	
Pesticides																			
4,4'-DDD	2	-	2	100%	1.2E-03	m	0	-	2	0%	—	0.2	NA	YES	0.00003	0.0002	0.003	0.03	
4,4'-DDE	2	-	2	100%	2.1E-03	m	0	-	2	0%	—	0.7	NA	YES	0.0006	0.003	0.07	0.7	
4,4'-DDT	2	-	2	100%	1.2E-03	m	1	-	2	50%	5.2E-06	m	0.0002	10	YES	0.00003	0.0001	0.003	0.03
BHC, delta-	1	-	2	50%	6.5E-03	m	0	-	2	0%	—	0.001	NA	YES	—	—	—	—	
Chlordane, alpha-	2	-	2	100%	3.9E-04	m	0	-	2	0%	—	0.1	NA	YES	0.000002	0.00002	0.000001	0.00001	
Dieldrin	2	-	2	100%	1.6E-03	m	2	-	2	100%	5.9E-06	m	0.8	0.1	YES	0.003	0.03	0.0004	0.004
Polycyclic Aromatic Hydrocarbons																			
2-Methylnaphthalene	7	-	17	41%	3.0E-02		4	-	17	24%	—	2	NA	no	—	—	—	—	
Acenaphthene	7	-	17	41%	7.1E-02		1	-	17	6%	5.0E-05	m	10	0.009	YES	0.000003	0.00003	0.0000001	0.000001
Acenaphthylene	1	-	17	6%	1.7E-03	m	1	-	17	6%	4.0E-05	m	0.3	0.000008	YES	0.0000001	1E-08	0.0000001	1E-07
Anthracene	8	-	17	47%	9.1E-02		0	-	17	0%	—	2	NA	YES	0.000000008	8E-08	0.0000002	0.000002	
Benzo(a)anthracene	10	-	17	59%	6.5E-01		0	-	17	0%	—	6	NA	YES	0.0002	0.002	0.000003	0.00003	
Benzo(a)pyrene	9	-	17	53%	5.4E-01		0	-	17	0%	—	4	NA	YES	0.00005	0.0005	0.000002	0.00002	
Benzo(b)fluoranthene	8	-	17	47%	2.7E-01		0	-	17	0%	—	0.03	NA	YES	0.000007	0.0002	0.000001	0.00001	
Benzo(g,h,i)perylene	8	-	17	47%	7.5E-02		0	-	17	0%	—	0.4	NA	YES	0.00007	0.0007	0.0000003	0.000003	
Benzo(k)fluoranthene	9	-	17	53%	2.8E-01		0	-	17	0%	—	1	NA	YES	0.000007	0.0002	0.000001	0.00001	
Chrysene	11	-	17	65%	6.1E-01		0	-	17	0%	—	4	NA	YES	0.000004	0.00004	0.000003	0.00003	
Dibenzo(a,h)anthracene	4	-	17	24%	7.6E-02	m	0	-	17	0%	—	2	NA	YES	0.006	0.06	0.0000003	0.000003	
Fluoranthene	14	-	17	82%	1.5E+00		0	-	17	0%	—	4	NA	YES	0.00002	0.0002	0.000007	0.00007	
Fluorene	7	-	17	41%	5.8E-02		1	-	17	6%	3.0E-05	m	0.7	0.01	YES	0.00000008	0.0000003	0.0000001	0.000001
Indeno(1,2,3-cd)pyrene	8	-	17	47%	8.9E-02		0	-	17	0%	—	5	NA	YES	0.00009	0.0009	0.0000004	0.000004	
Phenanthrene	14	-	17	82%	1.4E+00		0	-	17	0%	—	7	NA	YES	0.00003	0.0003	0.000002	0.00002	
Pyrene	13	-	17	76%	1.3E+00		0	-	17	0%	—	7	NA	YES	0.00009	0.0009	0.000005	0.00005	
Inorganics																			
Aluminum	13	-	13	100%	—		13	-	13	100%	3.9E-01		NA	4	no	—	—	—	—
Arsenic	13	-	13	100%	7.6E+00		0	-	13	0%	—	0.8	NA	YES	0.09	0.9	0.03	0.08	
Barium	13	-	13	100%	1.5E+02		13	-	13	100%	7.3E-02		NA	20	no	—	—	—	—
Beryllium	13	-	13	100%	1.1E+00		0	-	13	0%	—	NA	NA	no	—	—	—	—	
Copper	13	-	13	100%	1.3E+01		7	-	13	54%	2.4E-02		0.4	3	YES	0.04	0.05	0.01	0.01
Iron	13	-	13	100%	3.3E+04		13	-	13	100%	—	2	NA	no	—	—	—	—	
Lead	13	-	13	100%	1.9E+01	avg	8	-	13	62%	1.2E-03	avg	0.5	0.5	YES	0.02	0.2	0.03	0.3
Manganese	13	-	13	100%	1.9E+03		13	-	13	100%	—	4	NA	no	—	—	—	—	
Nickel	13	-	13	100%	1.5E+01		7	-	13	54%	4.4E-03		0.7	0.08	YES	0.01	0.03	0.007	0.01
Silver	1	-	13	8%	8.6E-01	m	1	-	13	8%	2.1E-03	m	0.9	0.7	YES	0.0004	0.004	0.05	0.1
Thallium	9	-	13	69%	4.5E-01		4	-	13	31%	7.2E-03	m	NA	9	no	—	—	—	—
Vanadium	13	-	13	100%	5.3E+01		0	-	13	0%	—	NA	NA	no	—	—	—	—	
Zinc	13	-	13	100%	4.5E+01		7	-	13	54%	3.0E-02		0.4	0.2	YES	0.1	1	0.02	0.1

Table 3-18
Summary of Ecological Risk Characterization Results - Aquatic Habitat
BUILDING DEBRIS DISPOSAL TRENCH
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Notes:

– = Not applicable.

EPC = Exposure point concentrations - the minimum of the upper confidence limit (UCL) on the mean and the maximum concentration.
 EPCs marked with "m" are the maximum concentration.

LOAEL HQ = Lowest observed adverse effect level hazard quotient.

mg/kg = Milligrams per kilogram.

mg/L = Milligrams per liter.

NOAEL HQ = No observed adverse effect level hazard quotient.

[a] Hazard quotients (HQs) greater than one are presented in bold font. HQs are rounded to one significant figure (unitless).

[b] Foodchain modeling was conducted for bioaccumulative COPECs.

Table 3-19
Summary of Constituent Detections in Soil
Combined Surface and Subsurface Soil
WESTERN BURNING GROUND
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent [a]	CASN	Frequency of Detection (FOD) [b]		Detects		Detection Limits		Maximum Location	Exposure Point				
		number of detects / number of samples	FOD %	Min - Max		Min - Max			Concentration [c]				
				(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)				
Volatile Organic Compounds													
Acetone	67-64-1	3	-	29	10	0.004	-	0.07	WBGSB10	0.07 m			
Carbon Disulfide	75-15-0	3	-	29	10	0.00039	-	0.0008	SS-04	0.0008 m			
d-Limonene	5989-27-5	1	-	1	100	0.17	-	0.17	WBGSB23	0.17 m			
Methylene Chloride	75-09-2	5	-	29	17	0.002	-	0.003	0.001	-	0.0072	S-04a,WBGSB2,V	0.002
p-Isopropyltoluene	99-87-6	1	-	14	7	0.0048	-	0.0048	0.001	-	0.0011	WBGSB8	0.0048 m
Toluene	108-88-3	2	-	26	8	0.00032	-	0.0011	0.001	-	0.0072	WBGSB23	0.0011 m
Semi-Volatile Organic Compounds													
bis(2-Ethylhexyl)phthalate	117-81-7	11	-	81	14	0.04	-	0.83	0.07	-	0.49	WBGSB22	0.121
Butylbenzylphthalate	85-68-7	1	-	78	1	0.16	-	0.16	0.01	-	0.49	WBGSB22	0.16 m
Carbazole	86-74-8	4	-	78	5	0.023	-	0.1	0.05	-	0.49	WBGSB24	0.1 m
Dibenzofuran	132-64-9	3	-	78	4	0.01	-	0.014	0.06	-	0.49	WBGSB25	0.014 m
Di-n-Butylphthalate	84-74-2	15	-	81	19	0.04	-	0.42	0.03	-	0.49	WBGTP2A	0.111
Di-n-Octylphthalate	117-84-0	1	-	76	1	0.016	-	0.016	0.01	-	0.49	WBGSB23	0.016 m
N-Nitrosodiphenylamine	86-30-6	1	-	78	1	0.06	-	0.06	0.01	-	0.49	WBGSB3	0.06 m
Dioxin/Furan Compounds													
1,2,3,4,6,7,8-HpCDD	35822-46-9	22	-	22	100	0.00000124	-	0.000243	-	-	-	WBGTP2B	0.00010074
1,2,3,4,6,7,8-HpCDF	67562-39-4	18	-	22	82	0.00000016	-	3.587E-05	9E-08	-	1.6E-07	WBGSB22	3.0644E-05
1,2,3,4,7,8,9-HpCDF	55673-89-7	8	-	19	42	0.00000011	-	4.05E-06	3E-08	-	2.1E-07	WBGSB22	1.0162E-06
1,2,3,4,7,8-HxCDD	39227-28-6	13	-	19	68	0.00000026	-	7.23E-06	7E-08	-	2.7E-07	WBGTP2B	2.4311E-06
1,2,3,4,7,8-HxCDF	70648-26-9	13	-	22	59	0.00000013	-	0.0000183	3E-08	-	1.2E-07	WBGSB22	7.4885E-06
1,2,3,6,7,8-HxCDD	57653-85-7	15	-	22	68	0.00000037	-	0.000023	5E-08	-	2.1E-07	WBGTP2B	8.5682E-06
1,2,3,6,7,8-HxCDF	57117-44-9	12	-	19	63	0.00000009	-	8.49E-06	3E-08	-	1.2E-07	WBGSB22	2.0053E-06
1,2,3,7,8,9-HxCDD	19408-74-3	16	-	22	73	0.00000031	-	2.096E-05	1.6E-07	-	2.1E-07	WBGSB22	9.9377E-06
1,2,3,7,8,9-HxCDF	72918-21-9	4	-	19	21	0.00000045	-	1.82E-06	3E-08	-	0.0000005	WBGSB22	0.00000182 m
1,2,3,7,8-PeCDD	40321-76-4	11	-	19	58	0.00000002	-	6.85E-06	6E-08	-	1.7E-07	WBGTP2B	1.9837E-06
1,2,3,7,8-PeCDF	57117-41-6	10	-	19	53	0.00000009	-	4.16E-06	4E-08	-	0.0000001	WBGSB22	1.0326E-06
2,3,4,6,7,8-HxCDF	60851-34-5	11	-	19	58	0.00000001	-	5.28E-06	4E-08	-	1.4E-07	WBGSB22	1.4368E-06
2,3,4,7,8-PeCDF	57117-31-4	10	-	19	53	0.00000013	-	6.41E-06	4E-08	-	1.1E-07	WBGSB22	1.5653E-06
2,3,7,8-TCDD	1746-01-6	11	-	19	58	0.00000024	-	4.17E-06	5E-08	-	1.7E-07	WBGTP7A	1.2924E-06
2,3,7,8-TCDF	51207-31-9	9	-	19	47	0.00000008	-	1.035E-05	3E-08	-	2.1E-07	WBGSB22	2.0065E-06
OCDD	3268-87-9	22	-	22	100	0.00005723	-	0.0083	-	-	-	WBGTP12S	0.00423
OCDF	39001-02-0	21	-	22	95	0.00000054	-	5.862E-05	3.9E-07	-	3.9E-07	WBGSB25	3.6049E-05
Explosives													
Pentaerythritol Tetranitrate	78-11-5	1	-	20	5	0.11	-	0.11	0.3	-	1.3	WBGSB24	0.11 m
Herbicides													
2,4,5-TP	93-72-1	1	-	4	25	0.0078	-	0.0078	0.0101	-	0.0102	WBGSB25	0.0078 m
2,4-D	94-75-7	2	-	4	50	0.0107	-	0.0302	0.0201	-	0.0202	WBGSB25	0.0302 m
Dalapon	75-99-0	3	-	4	75	0.0223	-	0.163	1.01	-	1.01	WBGSB24	0.163 m
MCP	93-65-2	1	-	4	25	2.56	-	2.56	10.1	-	101	WBGSB23	2.56 m

Table 3-19
Summary of Constituent Detections in Soil
Combined Surface and Subsurface Soil
WESTERN BURNING GROUND
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent [a]	CASN	Frequency of Detection (FOD) [b]		Detects		Detection Limits		Maximum Location	Exposure Point				
		number of detects / number of samples	FOD %	Min - Max		Min - Max			Concentration [c]				
				(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)				
Pesticides													
4,4'-DDD	72-54-8	1	-	4	25	0.0019	-	0.0019	0.0067	-	0.00681	WBGSB25	0.0019 m
Dieldrin	60-57-1	1	-	4	25	0.00472	-	0.00472	0.0067	-	0.00676	WBGSB24	0.00472 m
Polycyclic Aromatic Hydrocarbons													
2-Methylnaphthalene	91-57-6	10	-	81	12	0.001	-	0.023	0.002	-	0.49	WBGSB25	0.00844
Acenaphthene	83-32-9	7	-	81	9	0.0019	-	0.32	0.0017	-	0.49	WBGSB9	0.0348
Acenaphthylene	208-96-8	5	-	81	6	0.0016	-	0.0039	0.0017	-	0.49	WBGSB25	0.00256
Anthracene	120-12-7	9	-	81	11	0.00037	-	0.1	0.0017	-	0.49	WBGSB25	0.02
Benzo(a)anthracene	56-55-3	12	-	81	15	0.0019	-	0.97	0.002	-	0.49	WBGSB25	0.0792
Benzo(a)pyrene	50-32-8	14	-	81	17	0.0017	-	1.1	0.002	-	0.49	WBGSB25	0.101
Benzo(b)fluoranthene	205-99-2	15	-	81	19	0.0034	-	1.8	0.002	-	0.49	WBGSB25	0.132
Benzo(g,h,i)perylene	191-24-2	16	-	81	20	0.0017	-	0.96	0.002	-	0.49	WBGSB25	0.108
Benzo(k)fluoranthene	207-08-9	15	-	81	19	0.001	-	0.53	0.002	-	0.49	WBGSB25	0.0733
Chrysene	218-01-9	15	-	81	19	0.0018	-	0.99	0.002	-	0.49	WBGSB25	0.0979
Dibenzo(a,h)anthracene	53-70-3	7	-	79	9	0.0013	-	0.22	0.0017	-	0.49	WBGSB25	0.0444
Fluoranthene	206-44-0	15	-	81	19	0.00096	-	1.6	0.002	-	0.49	WBGSB25	0.136
Fluorene	86-73-7	7	-	81	9	0.00094	-	0.028	0.0017	-	0.49	WBGSB24	0.00677
Indeno(1,2,3-cd)pyrene	193-39-5	12	-	81	15	0.0018	-	1.1	0.002	-	0.49	WBGSB25	0.0896
Naphthalene	91-20-3	10	-	81	12	0.00087	-	0.018	0.002	-	0.49	WBGSB25	0.00627
Phenanthrene	85-01-8	14	-	81	17	0.0016	-	0.69	0.002	-	0.49	WBGSB25	0.0692
Pyrene	129-00-0	14	-	81	17	0.0012	-	1.6	0.002	-	0.49	WBGSB25	0.116
Polychlorinated Biphenyls													
Aroclor 1254	11097-69-1	3	-	46	7	0.047	-	0.87	0.03	-	0.05	WBGSB22	0.87 m
Inorganics													
Aluminum	7429-90-5	124	-	124	100	5760	-	53700	—	-	—	WBGSB47	19592
Antimony	7440-36-0	47	-	121	39	0.27	-	5.3	0.3	-	0.71	WBGSB3	0.721
Arsenic	7440-38-2	124	-	124	100	1.7	-	37.9	—	-	—	WBGSB4	9.753
Barium	7440-39-3	124	-	124	100	11.5	-	610	—	-	—	WBGSB3	94.87
Beryllium	7440-41-7	120	-	124	97	0.12	-	3.9	0.11	-	0.59	WBGTP18A	1.096
Cadmium	7440-43-9	38	-	121	31	0.066	-	2.95	0.01	-	0.16	WBGSB22	0.277
Calcium	7440-70-2	124	-	124	100	533	-	97300	—	-	—	WBGSB2	11404
Chromium	7440-47-3	124	-	124	100	12.5	-	256	—	-	—	WBGSB22	51.8
Cobalt	7440-48-4	124	-	124	100	1.4	-	31.4	—	-	—	WBGSB16	12.4
Copper	7440-50-8	124	-	124	100	4.37	-	1340	—	-	—	WBGSB3	98.42
Iron	7439-89-6	124	-	124	100	13400	-	61800	—	-	—	WBGSB22	35118
Lead	7439-92-1	124	-	124	100	7.9	-	3990	—	-	—	WBGSB3	155 avg
Magnesium	7439-95-4	124	-	124	100	319	-	58900	—	-	—	WBGSB2	9720
Manganese	7439-96-5	124	-	124	100	21.3	-	911	—	-	—	WBGTP16A	204
Mercury	7439-97-6	54	-	121	45	0.03	-	0.24	0.05	-	0.16	WBGTP16A	0.086
Nickel	7440-02-0	124	-	124	100	1.3	-	47.5	—	-	—	WBGSB47	17.51
Potassium	7440-09-7	124	-	124	100	335	-	10600	—	-	—	WBGSB2	1693
Selenium	7782-49-2	27	-	121	22	0.5	-	1.4	0.45	-	1.32	WBGSB43	0.604
Silver	7440-22-4	35	-	121	29	0.12	-	2.3	0.11	-	1.4	WBGSB13	0.327
Sodium	7440-23-5	119	-	121	98	9.7	-	384	1	-	33.8	WBGSB3	116.6

Table 3-19
Summary of Constituent Detections in Soil
Combined Surface and Subsurface Soil
WESTERN BURNING GROUND
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent [a]	CASN	Frequency of Detection (FOD) [b]		Detects		Detection Limits		Maximum Location	Exposure Point Concentration [c]
		number of detects / number of samples	FOD %	Min - Max		Min - Max			(mg/kg)
				(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)		
Thallium	7440-28-0	17 - 121	14	0.12 - 1.2	0.23 - 1.1	WBGTP3S	0.27		
Vanadium	7440-62-2	124 - 124	100	28 - 99.8	- - -	WBGSB47	64.77		
Zinc	7440-66-6	124 - 124	100	11.8 - 3250	- - -	WBGSB3	401.1		

Notes:

- = Not detected/ not analyzed/ not applicable.

CASN = Chemical abstracts registry number.

mg/kg = Milligrams per kilograms.

PAH = Polycyclic Aromatic Hydrocarbon.

USEPA = United States Environmental Protection Agency.

VOC = Volatile Organic Compound.

[a] Only chemicals detected at least once in all five areas are presented.

For duplicate samples, the highest detected value or the lowest detection limit were used.

For constituents analyzed in two methods, the result of the more precise method was used i.e., USEPA method 8260 over 8270 for VOCs, method 8270-SIM over method 8270 for PAHs, and method 8330 over method 8260 or 8270 for explosives.

[b] Frequency of detection (FOD) = number of detects / total number of samples analyzed.

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

EPCs marked with "m" are based on the maximum detected concentration.

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

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

Table 3-20
Summary of Constituent Detections in Sediment
WESTERN BURNING GROUND
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent [a]	CASN	Frequency of Detection (FOD) [b]		Detects		Detection Limits		Maximum Location	Exposure Point Concentration [c]				
		number of detects / number of samples	FOD %	Min - Max		Min - Max			(mg/kg)				
				(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)						
Volatile Organic Compounds													
2-Butanone	78-93-3	5	-	14	36	0.015	-	0.18	0.007	-	0.019	WBGSD12	0.0737
Acetone	67-64-1	11	-	14	79	0.003	-	0.23	0.0077	-	0.01	WBGSW/SD07	0.107
Carbon Disulfide	75-15-0	5	-	12	42	0.0012	-	0.0015	0.007	-	0.013	WBGSW/SD14	0.00143
Methylene Chloride	75-09-2	2	-	14	14	0.002	-	0.002	0.001	-	0.019	SD-01,SD-02	0.002 m
Toluene	108-88-3	8	-	14	57	0.00092	-	0.61	0.0077	-	0.019	WBGSD11	0.141
Semi-Volatile Organic Compounds										-			
1,2,4-Trichlorobenzene	120-82-1	2	-	15	13	0.012	-	0.023	0.002	-	1.1	WBGSW/SD14	0.023 m
1,4-Dichlorobenzene	106-46-7	2	-	15	13	0.012	-	0.049	0.002	-	1.1	WBGSW/SD14	0.049 m
4-Methylphenol	106-44-5	4	-	17	24	0.13	-	2.2	0.26	-	1.1	WBGSD2	2.2 m
bis(2-Ethylhexyl)phthalate	117-81-7	9	-	17	53	0.06	-	0.33	0.26	-	0.94	WBGSW/SD14	0.214
Carbazole	86-74-8	2	-	15	13	0.14	-	0.21	0.26	-	1.1	WBGSW/SD07	0.21 m
Dibenzofuran	132-64-9	2	-	15	13	0.039	-	0.1	0.3	-	1.4	WBGSW/SD07	0 m
Phenol	108-95-2	1	-	15	7	0.086	-	0.086	0.26	-	1.1	WBGSW/SD14	0.086 m
Dioxin/Furan Compounds										-			
1,2,3,4,6,7,8-HpCDD	35822-46-9	6	-	6	100	2.11E-06	-	7.199E-05	-	-	-	WBGSD11	0.00007199 m
1,2,3,4,6,7,8-HpCDF	67562-39-4	5	-	6	83	9.4E-07	-	0.0000063	0.00000017	-	0.00000017	WBGSD11	0.0000063 m
1,2,3,4,7,8,9-HpCDF	55673-89-7	2	-	6	33	2.6E-07	-	5.4E-07	0.00000023	-	0.00000033	WBGSW/SD10	0.00000054 m
1,2,3,4,7,8-HxCDD	39227-28-6	2	-	6	33	7.1E-07	-	1.03E-06	0.00000026	-	0.00000034	WBGSD11	0.00000103 m
1,2,3,4,7,8-HxCDF	70648-26-9	2	-	6	33	9.2E-07	-	1.68E-06	0.00000014	-	0.0000002	WBGSW/SD10	0.00000168 m
1,2,3,6,7,8-HxCDD	57653-85-7	3	-	6	50	9.9E-07	-	2.04E-06	0.00000024	-	0.00000027	WBGSD11	0.00000204 m
1,2,3,6,7,8-HxCDF	57117-44-9	1	-	6	17	1.73E-06	-	1.73E-06	0.00000014	-	0.00000019	WBGSW/SD10	0.00000173 m
1,2,3,7,8,9-HxCDD	19408-74-3	4	-	6	67	9.3E-07	-	2.39E-06	0.00000026	-	0.00000026	WBGSD11	0.00000239 m
2,3,4,6,7,8-HxCDF	60851-34-5	1	-	6	17	9.4E-07	-	9.4E-07	0.00000018	-	0.00000023	WBGSW/SD10	0.00000094 m
2,3,4,7,8-PeCDF	57117-31-4	1	-	6	17	1.41E-06	-	1.41E-06	0.00000013	-	0.00000022	WBGSW/SD10	0.00000141 m
2,3,7,8-TCDF	51207-31-9	1	-	6	17	2.83E-06	-	2.83E-06	0.00000014	-	0.00000035	WBGSW/SD10	0.00000283 m
OCDD	3268-87-9	6	-	6	100	0.0001412	-	0.003422	-	-	-	WBGSD11	0.003422 m
OCDF	39001-02-0	5	-	6	83	2.44E-06	-	1.515E-05	0.0000003	-	0.0000003	WBGSD11	0.00001515 m
Explosives										-			
1,3,5-Trinitrobenzene	99-35-4	1	-	8	12	0.41	-	0.41	0.1	-	0.25	WBGSD12	0.41 m
Nitroglycerine	55-63-0	1	-	8	12	0.96	-	0.96	0.46	-	1.41	WBGSD12	0.96 m
Herbicides										-			
2,4,5-T	93-76-5	1	-	5	20	0.00757	-	0.00757	0.0153	-	0.214	WBGSW/SD14	0.00757 m
2,4-D	94-75-7	2	-	5	40	0.385	-	6.83	0.0356	-	0.427	WBGSW/SD14	6.83 m
Dicamba	1918-00-9	1	-	5	20	0.0322	-	0.0322	0.0356	-	0.427	WBGSW/SD08	0.0322 m
MCPP	93-65-2	1	-	5	20	3.56	-	3.56	17.8	-	214	WBGSW/SD08	3.56 m

Table 3-20
Summary of Constituent Detections in Sediment
WESTERN BURNING GROUND
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent [a]	CASN	Frequency of Detection (FOD) [b]		Detects	Detection Limits		Maximum Location	Exposure Point
		number of detects / number of samples	FOD %	Min - Max	Min - Max	Concentration [c]		
				(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)
Pesticides						-		
4,4'-DDD	72-54-8	4 - 5	80	0.00033 - 0.00152	0.00143 - 0.00143		WBGSW/SD13	0.00152 m
4,4'-DDE	72-55-9	4 - 6	67	0.00152 - 0.00308	0.0016 - 0.0016		WBGSW/SD08	0.00308 m
4,4'-DDT	50-29-3	3 - 5	60	0.00142 - 0.0119	0.00102 - 0.00253		WBGSW/SD10	0.0119 m
Delta-BHC	319-86-8	1 - 5	20	0.00095 - 0.00095	0.00119 - 0.00253		WBGSW/SD08	0.00095 m
Alpha-Chlordane	5103-71-9	2 - 5	40	0.00021 - 0.00071	0.00119 - 0.00253		WBGSW/SD15	0.00071 m
Gamma-Chlordane	5566-34-7	1 - 5	20	0.00088 - 0.00088	0.00102 - 0.00253		WBGSW/SD15	0.00088 m
Dieldrin	60-57-1	1 - 5	20	0.00347 - 0.00347	0.00102 - 0.00253		WBGSW/SD10	0.00347 m
Endosulfan II	33213-65-9	2 - 5	40	0.00094 - 0.00161	0.00102 - 0.00253		WBGSW/SD10	0.00161 m
Endrin Aldehyde	7421-93-4	1 - 5	20	0.00169 - 0.00169	0.00102 - 0.00253		WBGSW/SD10	0.00169 m
Endrin Ketone	53494-70-5	2 - 5	40	0.00224 - 0.00288	0.00102 - 0.00253		WBGSW/SD14	0.00288 m
Methoxychlor	72-43-5	1 - 5	20	0.00637 - 0.00637	0.00102 - 0.00253		WBGSW/SD14	0.00637 m
Polycyclic Aromatic Hydrocarbons						-		
1-Methylnaphthalene	90-12-0	1 - 2	50	0.0026 - 0.0026	0.0074 - 0.0074		WBG-SE006	0.0026 m
2-Methylnaphthalene	91-57-6	4 - 18	22	0.0022 - 0.065	0.003 - 1.1		WBGSW/SD14	0.065 m
Acenaphthene	83-32-9	4 - 18	22	0.014 - 0.31	0.003 - 1.1		WBGSW/SD09	0.31 m
Acenaphthylene	208-96-8	1 - 18	6	0.021 - 0.021	0.003 - 1.1		WBGSW/SD09	0.021 m
Anthracene	120-12-7	5 - 18	28	0.0048 - 0.83	0.003 - 1.1		WBGSW/SD09	0.201
Benzo(a)anthracene	56-55-3	10 - 20	50	0.0055 - 4	0.003 - 1.1		WBGSW/SD09	2.322
Benzo(a)pyrene	50-32-8	7 - 20	35	0.0057 - 3.7	0.003 - 1.1		WBGSW/SD09	0.62
Benzo(b)fluoranthene	205-99-2	9 - 20	45	0.0081 - 4.6	0.003 - 1.1		WBGSW/SD09	0.735
Benzo(g,h,i)perylene	191-24-2	5 - 18	28	0.005 - 2.1	0.003 - 1.1		WBGSW/SD09	0.386
Benzo(k)fluoranthene	207-08-9	9 - 20	45	0.0033 - 1.4	0.003 - 1.1		WBGSW/SD09	0.24
Chrysene	218-01-9	10 - 20	50	0.0077 - 4.1	0.003 - 1.1		WBGSW/SD09	2.38
Dibenzo(a,h)anthracene	53-70-3	3 - 18	17	0.0061 - 0.56	0.003 - 1.1		WBGSW/SD09	0.56 m
Fluoranthene	206-44-0	11 - 20	55	0.0026 - 4.9	0.003 - 1.1		WBGSW/SD09	0.891
Fluorene	86-73-7	5 - 18	28	0.0027 - 0.25	0.003 - 1.1		WBGSW/SD09	0.0913
Indeno(1,2,3-cd)pyrene	193-39-5	5 - 18	28	0.0038 - 1.6	0.003 - 1.1		WBGSW/SD09	0.306
Naphthalene	91-20-3	3 - 18	17	0.0017 - 0.085	0.003 - 1.1		WBGSW/SD09	0.085 m
Phenanthrene	85-01-8	10 - 20	50	0.0067 - 2.8	0.003 - 1.1		WBGSW/SD09	0.484
Pyrene	129-00-0	11 - 20	55	0.0017 - 5	0.003 - 1.1		WBGSW/SD09	0.854

Table 3-20
Summary of Constituent Detections in Sediment
WESTERN BURNING GROUND
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent [a]	CASN	Frequency of Detection (FOD) [b]		Detects	Detection Limits		Maximum Location	Exposure Point Concentration [c]
		number of detects / number of samples	FOD %	Min - Max	Min - Max			(mg/kg)
				(mg/kg)	(mg/kg)	(mg/kg)		
Inorganics						-		
Aluminum	7429-90-5	28 - 28	100	5400 - 30900	- - -	- - -	WBGSD17	19156
Antimony	7440-36-0	9 - 26	35	0.51 - 3.1	0.43 - 1.89	- - -	WBGSW/SD10	0.966
Arsenic	7440-38-2	28 - 28	100	1.44 - 30.4	- - -	- - -	WBGSW/SD13	8.685
Barium	7440-39-3	28 - 28	100	32.3 - 179	- - -	- - -	WBGSW/SD10	92.82
Beryllium	7440-41-7	27 - 28	96	0.45 - 2.27	0.33 - 0.33	- - -	WBGSW/SD10	1.164
Cadmium	7440-43-9	14 - 26	54	0.09 - 2.7	0.13 - 0.37	- - -	WBGSW/SD10	0.507
Calcium	7440-70-2	28 - 28	100	1820 - 120000	- - -	- - -	WBGSD20	53728
Chromium	7440-47-3	28 - 28	100	5.17 - 15400	- - -	- - -	WBGSW/SD10	6048
Cobalt	7440-48-4	28 - 28	100	3.2 - 84.1	- - -	- - -	WBGSW/SD10	24.48
Copper	7440-50-8	28 - 28	100	6.36 - 188	- - -	- - -	WBGSW/SD10	54.79
Iron	7439-89-6	28 - 28	100	8530 - 293000	- - -	- - -	WBGSW/SD13	74658
Lead	7439-92-1	32 - 32	100	5.61 - 109000	- - -	- - -	WBGSW/SD10	3610 avg
Magnesium	7439-95-4	28 - 28	100	863 - 10200	- - -	- - -	WBGSW/SD15	4767
Manganese	7439-96-5	28 - 28	100	25.9 - 2310	- - -	- - -	WBGSW/SD13	831.3
Mercury	7439-97-6	17 - 26	65	0.03 - 0.09	0.12 - 0.37	- - -	WBGSW/SD14	0.0589
Nickel	7440-02-0	28 - 28	100	4.4 - 26.8	- - -	- - -	WBGSW/SD08	15.71
Potassium	7440-09-7	28 - 28	100	290 - 2210	- - -	- - -	WBGSD2	1206
Selenium	7782-49-2	4 - 26	15	0.81 - 1.3	0.65 - 3.79	- - -	WBGSD6,WBGSD11	1.3 m
Silver	7440-22-4	4 - 26	15	0.79 - 8.42	0.14 - 3.79	- - -	WBGSW/SD10	8.42 m
Sodium	7440-23-5	28 - 28	100	72 - 577	- - -	- - -	WBGSD5	267
Thallium	7440-28-0	12 - 28	43	0.1 - 1.7	0.43 - 2.5	- - -	WBGSD1	0.389
Vanadium	7440-62-2	28 - 28	100	14 - 106	- - -	- - -	WBGSW/SD10	49.04
Zinc	7440-66-6	28 - 28	100	17.1 - 17300	- - -	- - -	WBGSW/SD10	6810

Notes:

- = Not detected/ not analyzed/ not applicable.

CASN = Chemical abstracts registry number.

mg/kg = Milligrams per kilograms.

PAH = Polycyclic Aromatic Hydrocarbon.

USEPA = United States Environmental Protection Agency.

VOC = Volatile Organic Compound.

[a] Only chemicals detected at least once in all five areas are presented.

For duplicate samples, the highest detected value or the lowest detection limit were used.

For constituents analyzed in two methods, the result of the more precise method was used i.e., USEPA method 8260 over 8270 for VOCs, method 8270-SIM over method 8270 for PAHs, and method 8330 over method 8260 or 8270 for explosives.

[b] Frequency of detection (FOD) = number of detects / total number of samples analyzed.

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

EPCs marked with "m" are based on the maximum detected concentration.

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

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

Table 3-21
Summary of Constituent Detections in Surface Water
WESTERN BURNING GROUND
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent [a]	CASN	Frequency of Detection (FOD) [b]		Detects	Detection Limits	Maximum Location	Exposure Point Concentration [c]		
		number of detects / number of samples	FOD %	Min - Max	Min - Max		(mg/L)		
				(mg/L)	(mg/L)			(mg/L)	
Volatile Organic Compounds									
2-Butanone	78-93-3	1	-	10	10	0.004 - 0.004	0.004 - 0.005	WBGDW2	0.004 m
Acetone	67-64-1	1	-	10	10	0.0028 - 0.0028	0.004 - 0.005	WBGSW/SD07	0.0028 m
Carbon Disulfide	75-15-0	7	-	10	70	0.00007 - 0.00025	0.005 - 0.005	WBGSW/SD10	0.00021543
Chloroform	67-66-3	5	-	10	50	0.00013 - 0.003	0.001 - 0.001	WBGDW2	0.00129
cis-1,2-Dichloroethene	156-59-2	1	-	10	10	0.00012 - 0.00012	0.001 - 0.001	WBGSW/SD14	0.00012 m
Tetrachloroethene	127-18-4	1	-	10	10	0.00016 - 0.00016	0.001 - 0.001	WBGSW/SD14	0.00016 m
Toluene	108-88-3	1	-	10	10	0.00021 - 0.00021	0.001 - 0.001	WBGSW/SD10	0.00021 m
Trichloroethene	79-01-6	1	-	10	10	0.00011 - 0.00011	0.001 - 0.001	WBGSW/SD14	0.00011 m
Semi-Volatile Organic Compounds									
1,2-Dichlorobenzene	95-50-1	1	-	13	8	0.00021 - 0.00021	0.001 - 0.01	WBGSW/SD13	0.00021 m
1,3-Dichlorobenzene	541-73-1	1	-	13	8	0.00021 - 0.00021	0.001 - 0.01	WBGSW/SD13	0.00021 m
1,4-Dichlorobenzene	106-46-7	1	-	13	8	0.00028 - 0.00028	0.001 - 0.01	WBGSW/SD13	0.00028 m
Benzoic Acid	65-85-0	3	-	10	30	0.0052 - 0.0067	0.025 - 0.05	WBGSW/SD14	0.0067 m
bis(2-Ethylhexyl)phthalate	117-81-7	1	-	13	8	0.0026 - 0.0026	0.005 - 0.01	WBGSW/SD14	0.0026 m
Butylbenzylphthalate	85-68-7	1	-	13	8	0.00063 - 0.00063	0.005 - 0.01	WBGSW/SD14	0.00063 m
Diethylphthalate	84-66-2	1	-	13	8	0.001 - 0.001	0.005 - 0.01	WBGDW1	0.001 m
Di-n-Butylphthalate	84-74-2	4	-	13	31	0.00013 - 0.00091	0.005 - 0.01	WBGSW/SD09	0.00091 m
Dioxin/Furan Compounds									
OCDD	3268-87-9	4	-	4	100	1.406E-08 - 3.5E-08	- - -	WBGSW/SD09	3.504E-08 m
Explosives									
m-Nitrotoluene	99-08-1	2	-	7	29	0.00036 - 0.00038	0.0005 - 0.00052	WBGSW/SD09	0.00038 m
Herbicides									
2,4-D	94-75-7	2	-	5	40	0.00356 - 0.00368	0.0005 - 0.0005	WBGSW/SD08	0.00368 m
MCP	93-65-2	1	-	5	20	0.0541 - 0.0541	0.125 - 0.125	WBGSW/SD08	0.0541 m
Pesticides									
Dieldrin	60-57-1	3	-	5	60	3.58E-06 - 9.01E-06	0.00002 - 0.00002	WBGSW/SD14	0.00000901 m
Polycyclic Aromatic Hydrocarbons									
1-Methylnaphthalene	90-12-0	1	-	2	50	0.000026 - 0.000026	0.000047 - 0.000047	WBG-SW005	0.000026 m
2-Methylnaphthalene	91-57-6	3	-	15	20	0.00003 - 0.000033	0.000047 - 0.01	WBG-SW005	0.000033 m
Acenaphthene	83-32-9	2	-	15	13	0.00002 - 0.00004	0.000047 - 0.01	WBG-SW005	0.00004 m
Anthracene	120-12-7	2	-	15	13	0.00002 - 0.00003	0.000047 - 0.01	WBG-SW005	0.00003 m
Fluorene	86-73-7	2	-	15	13	0.00003 - 0.000034	0.000047 - 0.01	WBG-SW005	0.000034 m
Naphthalene	91-20-3	2	-	15	13	0.00002 - 0.00004	0.000047 - 0.01	WBGSW/SD10	0.00004 m
Phenanthrene	85-01-8	3	-	15	20	0.000018 - 0.00005	0.00005 - 0.01	WBG-SW005	0.00005 m
Inorganics									
Aluminum	7429-90-5	13	-	13	100	0.0392 - 0.811	- - -	WBGSW/SD13	0.351
Arsenic	7440-38-2	2	-	13	15	0.0086 - 0.0104	0.003 - 0.007	WBGDW6	0.0104 m

Table 3-21
Summary of Constituent Detections in Surface Water
WESTERN BURNING GROUND
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent [a]	CASN	Frequency of Detection (FOD) [b]		Detects		Detection Limits		Maximum Location	Exposure Point
		number of detects / number of samples	FOD %	Min - Max		Min - Max			Concentration [c]
				(mg/L)	(mg/L)	(mg/L)	(mg/L)		(mg/L)
Barium	7440-39-3	13 - 13	100	0.054	- 0.148	-	- -	WBGSW/SD13	0.0952
Beryllium	7440-41-7	1 - 13	8	0.0011	- 0.0011	0.001	- 0.002	WBGDW4	0.0011 m
Calcium	7440-70-2	15 - 15	100	56.7	- 90.7	-	- -	WBGSW/SD13	74.57
Copper	7440-50-8	6 - 13	46	0.0011	- 0.0235	0.02	- 0.02	WBGDW3	0.0185
Iron	7439-89-6	14 - 15	93	0.0416	- 50.9	-	- -	WBGSW/SD13	39.87
Lead	7439-92-1	11 - 18	61	0.00017	- 0.106	0.002	- 0.002	WBG-SW004	0.0193 avg
Magnesium	7439-95-4	15 - 15	100	12.1	- 21	-	- -	WBGSW/SD13	16.72
Manganese	7439-96-5	14 - 15	93	0.002	- 1.47	-	- -	WBGSW/SD13	1.154
Nickel	7440-02-0	2 - 13	15	0.0014	- 0.0015	0.001	- 0.04	WBGDW2	0.0015 m
Potassium	7440-09-7	15 - 15	100	1.9	- 4.08	-	- -	WBGSW/SD13	3.187
Selenium	7782-49-2	1 - 13	8	0.00044	- 0.00044	0.004	- 0.005	WBGSW/SD14	0.00044 m
Silver	7440-22-4	2 - 13	15	0.001	- 0.0012	0.001	- 0.01	WBGDW4	0.0012 m
Sodium	7440-23-5	15 - 15	100	6.54	- 63.9	-	- -	WBGSW/SD15	36.76
Thallium	7440-28-0	2 - 13	15	0.0023	- 0.0054	0.002	- 0.007	WBGDW1	0.0054 m
Vanadium	7440-62-2	6 - 15	40	0.0011	- 0.079	0.002	- 0.05	SW-01	0.026
Zinc	7440-66-6	8 - 13	62	0.018	- 0.0237	0.02	- 0.02	WBGDW3	0.0208

Notes:

- = Not detected/ not analyzed/ not applicable.

CASN = Chemical abstracts registry number.

mg/L = Milligrams per liter.

PAH = Polycyclic Aromatic Hydrocarbon.

USEPA = United States Environmental Protection Agency.

VOC = Volatile Organic Compound.

[a] Only chemicals detected at least once in all five areas are presented.

For duplicate samples, the highest detected value or the lowest detection limit were used.

For constituents analyzed in two methods, the result of the more precise method was used i.e., USEPA method 8260 over 8270 for VOCs, method 8270-SIM over method 8270 for PAHs, and method 8330 over method 8260 or 8270 for explosives.

[b] Frequency of detection (FOD) = number of detects / total number of samples analyzed.

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

EPCs marked with "m" are based on the maximum detected concentration.

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

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

Table 3-22
Summary of Calculated Human Health Risks and Hazards
WESTERN BURNING GROUND
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

<u>RECEPTOR</u>	Total Excess Lifetime Cancer Risk	Total Non-Cancer Hazard
Exposure Medium - Scenario		
<u>Site Worker</u>		
Surface Soil - Direct Contact	1E-05	0.1
Sediment - Wading	2E-06	0.1
Surface Water - Wading	3E-06	0.2
TOTAL SITE RISKS (Site Worker):	1E-05	0.4
<u>Hypothetical Future Construction Worker</u>		
Combined Surface and Subsurface Soil - Direct Contact	5E-07	0.5
TOTAL SITE RISKS (Construction Worker):	5E-07	0.5
<u>Hypothetical Future Adult Resident</u>		
Combined Surface and Subsurface Soil - Direct Contact	1E-05	0.2
Sediment - Wading	6E-06	0.2
Surface Water - Wading	6E-07	0.04
Fish Consumption	NA	0.3
TOTAL SITE RISKS (Adult Resident):	2E-05	0.8
<u>Hypothetical Future Child Resident</u>		
Combined Surface and Subsurface Soil - Direct Contact	3E-05	2
Sediment - Wading	5E-06	2
Surface Water - Wading	6E-07	0.1
Fish Consumption	NA	1
TOTAL SITE RISKS (Child Resident):	3E-05	6
<u>Hypothetical Future Aggregate Resident (Adult + Child)</u>		
Combined Surface and Subsurface Soil - Direct Contact	4E-05	--
Sediment - Wading	1E-05	--
Surface Water - Wading	1E-06	--
Fish Consumption	NA	--
TOTAL SITE RISKS (Aggregate Resident):	5E-05	--

Table 3-23
Summary of Ecological Risk Characterization Results - Terrestrial Habitat
WESTERN BURNING GROUND
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent	Baseline Level Assessment										Bioaccumulative ? (YES/no)	Results of Refined Food Chain Models [c]			
	Soil				EPC (mg/kg)	Hazard Quotient [a]	Ecological		LOAEL HQ	NOAEL HQ		LOAEL HQ	NOAEL HQ		
	Frequency of Detection		Screening Level [b]	Source			Basis								
	# detects / n samples	%													
Volatile Organic Compounds															
d-Limonene	1	-	1	100%	0.17	m	NA			no	—	—	—	—	
p-Isopropyltoluene	1	-	11	9%	0.0048	m	NA			no	—	—	—	—	
Semi-Volatile Organic Compounds															
Carbazole	3	-	26	12%	0.1	m	NA			no	—	—	—	—	
Dibenzofuran	2	-	26	8%	0.014	m	NA			no	—	—	—	—	
Dioxin/Furan Compounds															
Dioxin Toxicity Equivalents	8	-	8	100%	9.9E-06	m	50	R5s		YES	0.005	0.05	0.0009	0.009	
Explosives															
Pentaerythritol Tetranitrate	1	-	9	11%	0.11	m	NA			no	—	—	—	—	
Herbicides															
Dalapon	3	-	4	75%	0.163	m	NA			no	—	—	—	—	
MCPP	1	-	4	25%	2.56	m	NA			no	—	—	—	—	
Pesticides															
4,4'-DDD	1	-	4	25%	0.0019	m	0.09	EcoSSL	mam	YES	0.00005	0.0003	0.006	0.06	
Dieldrin	1	-	4	25%	0.00472	m	1	EcoSSL	mam	YES	0.002	0.02	0.0004	0.004	
Polycyclic Aromatic Hydrocarbons															
Acenaphthene	3	-	29	10%	0.32	m	0.0005	R5		YES	0.001	0.01	0.0001	0.001	
Acenaphthylene	1	-	29	3%	0.0039	m	0.000006	R5		YES	0.000002	0.0000002	0.000001	0.00001	
Anthracene	6	-	29	21%	0.035		0.00002	R5		YES	6E-08	0.0000006	0.000005	0.00005	
Benzo(a)anthracene	9	-	29	31%	0.132		0.03	R5		YES	0.0004	0.004	0.00002	0.0002	
Benzo(a)pyrene	9	-	29	31%	0.164		0.1	R5		YES	0.0003	0.003	0.00003	0.0003	
Benzo(b)fluoranthene	10	-	29	34%	0.228		0.004	R5		YES	0.0001	0.003	0.00003	0.0003	
Benzo(g,h,i)perylene	9	-	29	31%	0.148		0.001	R5		YES	0.005	0.05	0.00002	0.0002	
Benzo(k)fluoranthene	9	-	29	31%	0.123		0.0008	R5		YES	0.00007	0.002	0.00002	0.0002	
Chrysene	10	-	29	34%	0.164		0.03	R5		YES	0.00001	0.0001	0.00002	0.0002	
Dibenzo(a,h)anthracene	4	-	27	15%	0.22	m	0.01	R5		YES	0.4	4	0.00003	0.0003	
Fluoranthene	9	-	29	31%	0.236		0.002	R5		YES	0.0002	0.002	0.00008	0.0008	
Fluorene	3	-	29	10%	0.028	m	0.0002	R5		YES	0.000006	0.00002	0.000009	0.00009	
Indeno(1,2,3-cd)pyrene	9	-	29	31%	0.145		0.001	R5		YES	0.01	0.1	0.00002	0.0002	
Phenanthrene	9	-	29	31%	0.119		0.003	R5		YES	0.00005	0.0005	0.00002	0.0002	
Pyrene	10	-	29	34%	0.2		0.003	R5		YES	0.0001	0.001	0.00003	0.0003	
Polychlorinated Biphenyls															
Aroclor 1254	2	-	28	7%	0.084	m	NA			YES	0.02	0.2	0.003	0.03	

Table 3-23
Summary of Ecological Risk Characterization Results - Terrestrial Habitat
WESTERN BURNING GROUND
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent						Baseline Level Assessment			Bioaccumulative ? (YES/no)	Results of Refined Food Chain Models [c]				
	Soil				EPC (mg/kg)	Hazard Quotient [a]	Ecological			Short-tailed Shrew		American Robin		
	Frequency of Detection		# detects / n samples	%			Screening Level [b]	Source		Basis	LOAEL HQ	NOAEL HQ	LOAEL HQ	NOAEL HQ
Inorganics														
Antimony	26	-	53	49%	0.836	3	EcoSSL	mam	no	—	—	—	—	
Arsenic	56	-	56	100%	10.72	0.6	EcoSSL	veg	YES	0.05	0.5	0.02	0.06	
Cadmium	25	-	53	47%	0.322	0.9	EcoSSL	mam	YES	0.03	0.3	0.003	0.03	
Chromium	56	-	56	100%	55.92	2	EcoSSL	avi	no	—	—	—	—	
Copper	56	-	56	100%	145.5	5	EcoSSL	avi	YES	0.07	0.08	0.04	0.05	
Iron	56	-	56	100%	35,755	NA			no	—	—	—	—	
Lead	56	-	56	100%	698	60	EcoSSL	avi	YES	0.06	0.6	0.3	3	
Selenium	17	-	53	32%	0.625	1	EcoSSL	veg	YES	0.05	0.09	0.02	0.03	
Silver	16	-	53	30%	0.37	0.09	EcoSSL	avi	YES	0.00006	0.0006	0.01	0.02	
Zinc	56	-	56	100%	593.9	10	EcoSSL	avi	YES	0.8	8	0.1	1	

Notes:

— = Not applicable.

COPEC = Constituent of Potential Ecological Concern.

EPC = Exposure point concentrations - the minimum of the upper confidence limit (UCL) on the mean and the maximum concentration.

EPCs marked with "m" are the maximum concentration.

LOAEL HQ = Lowest observed adverse effect level hazard quotient.

mg/kg = Milligrams per kilogram.

NA = Not available.

NOAEL HQ = No observed adverse effect level hazard quotient.

[a] Hazard quotients (HQs) greater than one are presented in bold font. HQs are rounded to one significant figure (unitless).

[b] See Table A.2-18 for sources of ecological screening levels (ESLs); ESLs marked with 's' are based on a surrogate.

R5: Region 5 Ecological Screening Levels (USEPA 2003e; R5).

EcoSSL: USEPA Ecological Soil Screening Levels (USEPA 2005b, EcoSSL).

Where readily available (i.e., EcoSSLs), the basis of the ESL is presented.

[c] Foodchain modeling was conducted for bioaccumulative COPECs.

Table 3-24
Summary of Ecological Risk Characterization Results - Aquatic Habitat
WESTERN BURNING GROUND
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent											Baseline Level Assessment		Bioaccumulative ? (YES/no)	Results of Refined Food Chain Models [b]					
	Sediment					Surface Water					Sediment	Surface Water		Mink		Great Blue Heron			
	Frequency of Detection			EPC		Frequency of Detection			EPC		Hazard Quotient	Hazard Quotient		LOAEL HQ	NOAEL HQ	LOAEL HQ	NOAEL HQ		
	# detects / n samples	%	(mg/kg)	# detects / n samples		%	(mg/L)	[a]	[a]										
Volatile Organic Compounds																			
2-Butanone	5	-	14	36%	0.0737	1	-	10	10%	0.004	m	2	0.0003	no	—	—	—	—	
Acetone	11	-	14	79%	0.107	1	-	10	10%	0.0028	m	10	0.002	no	—	—	—	—	
Carbon Disulfide	5	-	12	42%	0.00143	7	-	10	70%	0.0002		2	0.2	no	—	—	—	—	
Semi-Volatile Organic Compounds																			
1,2,4-Trichlorobenzene	2	-	15	13%	0.023	m	0	-	13	0%	—	0.01	NA	YES	—	—	—	—	
1,2-Dichlorobenzene	0	-	15	0%	—		1	-	13	8%	0.0002	m	NA	0.3	YES	—	—	—	
1,3-Dichlorobenzene	0	-	15	0%	—		1	-	13	8%	0.0002	m	NA	0.001	YES	—	—	—	
1,4-Dichlorobenzene	2	-	15	13%	0.049	m	1	-	13	8%	0.0003	m	0.08	0.01	YES	—	—	—	
4-Methylphenol	4	-	17	24%	2.2	m	0	-	13	0%	—	3	NA	no	—	—	—	—	
Carbazole	2	-	15	13%	0.21	m	0	-	13	0%	—	NA	NA	no	—	—	—	—	
Dioxin/Furan Compounds																			
Dioxin Toxicity Equivalents	6	-	6	100%	2.8E-06	m	4	-	4	100%	4E-12	m	3	1	YES	0.0000003	0.000003	0.00000001	
Explosives																			
1,3,5-Trinitrobenzene	1	-	8	13%	0.41	m	0	-	7	0%	—	NA	NA	no	—	—	—	—	
Nitroglycerine	1	-	8	13%	0.96	m	0	-	7	0%	—	NA	NA	no	—	—	—	—	
Herbicides																			
2,4-D	2	-	5	40%	6.83	m	2	-	5	40%	0.0037	m	5	0.02	no	—	—	—	
Dicamba	1	-	5	20%	0.0322	m	0	-	5	0%	—	NA	NA	no	—	—	—	—	
MCPP	1	-	5	20%	3.56	m	1	-	5	20%	0.0541	m	NA	NA	no	—	—	—	
Pesticides																			
4,4'-DDD	4	-	5	80%	0.00152	m	0	-	5	0%	—	0.3	NA	YES	0.00003	0.0002	0.004	0.04	
4,4'-DDE	4	-	6	67%	0.00308	m	0	-	5	0%	—	1	NA	YES	0.0009	0.005	0.1	1	
4,4'-DDT	3	-	5	60%	0.0119	m	0	-	5	0%	—	0.002	NA	YES	0.0003	0.001	0.03	0.3	
BHC, delta-	1	-	5	20%	0.00095	m	0	-	5	0%	—	0.0001	NA	YES	—	—	—	—	
Chlordane, alpha-	2	-	5	40%	0.00071	m	0	-	5	0%	—	0.2	NA	YES	0.000003	0.00003	0.000003	0.00003	
Dieldrin	1	-	5	20%	0.00347	m	3	-	5	60%	9E-06	m	2	0.2	YES	0.005	0.05	0.001	0.01
Endosulfan II	2	-	5	40%	0.00161	m	0	-	5	0%	—	0.1	NA	YES	—	—	—	—	
Methoxychlor	1	-	5	20%	0.00637	m	0	-	5	0%	—	0.3	NA	YES	—	—	—	—	
Polycyclic Aromatic Hydrocarbons																			
2-Methylnaphthalene	4	-	18	22%	0.065	m	3	-	15	20%	3E-05	m	3	0.007	no	—	—	—	
Acenaphthene	4	-	18	22%	0.31	m	2	-	15	13%	4E-05	m	50	0.007	YES	0.000008	0.00008	0.0000005	0.000005
Acenaphthylene	1	-	18	6%	0.021	m	0	-	15	0%	—	4	NA	YES	0.00000009	0.000000009	0.00000004	0.0000004	
Anthracene	5	-	18	28%	0.201		2	-	15	13%	3E-05	m	4	3	YES	0.00000002	0.0000002	0.0000003	0.000003
Benzo(a)anthracene	10	-	20	50%	2.322		0	-	15	0%	—	20	NA	YES	0.0006	0.006	0.00001	0.0001	
Benzo(a)pyrene	7	-	20	35%	0.62		0	-	15	0%	—	4	NA	YES	0.00007	0.0007	0.000003	0.00003	
Benzo(b)fluoranthene	9	-	20	45%	0.735		0	-	15	0%	—	0.07	NA	YES	0.00002	0.0005	0.000003	0.00003	
Benzo(g,h,i)perylene	5	-	18	28%	0.386		0	-	15	0%	—	2	NA	YES	0.0005	0.005	0.000002	0.00002	
Benzo(k)fluoranthene	9	-	20	45%	0.24		0	-	15	0%	—	1	NA	YES	0.000007	0.0002	0.000001	0.00001	
Chrysene	10	-	20	50%	2.38		0	-	15	0%	—	10	NA	YES	0.00001	0.0001	0.00001	0.0001	
Dibenzo(a,h)anthracene	3	-	18	17%	0.56	m	0	-	15	0%	—	20	NA	YES	0.04	0.4	0.000002	0.00002	
Fluoranthene	11	-	20	55%	0.891		0	-	15	0%	—	2	NA	YES	0.00001	0.0001	0.000004	0.00004	
Fluorene	5	-	18	28%	0.0913		2	-	15	13%	3E-05	m	1	0.01	YES	0.0000002	0.0000005	0.0000002	0.000002
Indeno(1,2,3-cd)pyrene	5	-	18	28%	0.306		0	-	15	0%	—	20	NA	YES	0.0002	0.002	0.000001	0.00001	
Phenanthrene	10	-	20	50%	0.484		3	-	15	20%	5E-05	m	2	0.1	YES	0.000008	0.00008	0.0000008	0.000008
Pyrene	11	-	20	55%	0.854		0	-	15	0%	—	4	NA	YES	0.00006	0.0006	0.000004	0.00004	

Table 3-24
Summary of Ecological Risk Characterization Results - Aquatic Habitat
WESTERN BURNING GROUND
New River Unit, Radford Army Ammunition Plant, Radford, Virginia

Constituent											Baseline Level Assessment			Results of Refined Food Chain Models [b]			
	Sediment					Surface Water					Sediment	Surface Water	Bioaccumulative ? (YES/no)				
	Frequency of Detection				EPC (mg/kg)	Frequency of Detection				EPC (mg/L)	Hazard Quotient [a]	Hazard Quotient [a]					
	# detects / n samples		%	# detects / n samples		%	LOAEL HQ	NOAEL HQ	LOAEL HQ					NOAEL HQ			
Inorganics																	
Aluminum	28	-	28	100%	19,156	13	-	13	100%	0.351	0.3	4	no	—	—	—	—
Barium	28	-	28	100%	92.82	13	-	13	100%	0.0952	NA	20	no	—	—	—	—
Beryllium	27	-	28	96%	1.164	1	-	13	8%	0.0011 m	NA	2	no	—	—	—	—
Cadmium	14	-	26	54%	0.507	0	-	13	0%	—	0.5	NA	YES	—	—	—	—
Chromium	28	-	28	100%	6,048	0	-	13	0%	—	100	NA	no	—	—	—	—
Copper	28	-	28	100%	54.79	6	-	13	46%	0.0185	2	2	YES	0.003	0.004	0.0006	0.0009
Iron	28	-	28	100%	74,658	14	-	15	93%	39.87	4	100	no	—	—	—	—
Lead	32	-	32	100%	37,445	11	-	18	61%	0.0248	1,000	10	YES	0.00005	0.0005	0.00001	0.0001
Manganese	28	-	28	100%	831.3	14	-	15	93%	1.154	2	10	no	—	—	—	—
Nickel	28	-	28	100%	15.71	2	-	13	15%	0.0015 m	0.7	0.03	YES	0.000003	0.000006	0.0000003	0.0000004
Selenium	4	-	26	15%	1.3 m	1	-	13	8%	0.0004 m	0.7	0.4	YES	0.0002	0.0003	0.000008	0.00002
Silver	4	-	26	15%	8.42 m	2	-	13	15%	0.0012 m	8	0.4	YES	0.0000008	0.000008	0.00002	0.00004
Thallium	12	-	28	43%	0.389	2	-	13	15%	0.0054 m	NA	7	no	—	—	—	—
Vanadium	28	-	28	100%	49.04	6	-	15	40%	0.026	NA	1	no	—	—	—	—
Zinc	28	-	28	100%	6,810	8	-	13	62%	0.0208	60	0.2	YES	0.04	0.4	0.008	0.07

Notes:

- = Not applicable.

EPC = Exposure point concentrations - the minimum of the upper confidence limit (UCL) on the mean and the maximum concentration.
EPCs marked with "m" are the maximum concentration.

FOD Frequency of Detection.

LOAEL HQ = Lowest observed adverse effect level hazard quotient.

mg/kg = Milligrams per kilogram.

mg/L = Milligrams per liter.

NOAEL HQ = No observed adverse effect level hazard quotient.

[a] Hazard quotients (HQs) greater than one are presented in bold font. HQs are rounded to one significant figure (unitless).

[b] Foodchain modeling was conducted for bioaccumulative COPECs.

Table 4-1
Potential Chemical-Specific ARARs and TBC Guidance
New River Unit, Radford Army Ammunition Plant Radford, Virginia

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

Table 4-1
Potential Chemical-Specific ARARs and TBC Guidance
New River Unit, Radford Army Ammunition Plant Radford, Virginia

Media	Authority	Requirement	Status	Requirement Synopsis
Surface Water	State Regulatory Requirement	Virginia Water Quality Standards – Numerical Criteria for dissolved oxygen, pH, and maximum temperature 9 VAC 25-260-50	To Be Considered	Provides numerical ranges for dissolved oxygen, pH, and temperature for surface water bodies that must be maintained..
	State Regulatory Requirement	Pollutant Discharge Elimination System (VPDES) Permit Regulation: 9 VAC 25-31-10 to 940	To Be Considered	Virginia is a delegated state under the federal NPDES permit program. DEQ administers the federal program as the VPDES permit program, which is authorized under the State Water Control Law. The VPDES permit regulation sets forth the policies and procedures that are followed in the administration of the permit program. Only the substantive provisions of this regulation will be applicable. No permits will be obtained.
	Federal Criteria, Advisories, and Guidance	Clean Water Act (33 USC 1314), USEPA Office of Water, Federal Ambient Water Quality Criteria	Applicable	AWQCs are criteria for protection of freshwater and marine aquatic life which have been developed for 95 carcinogenic and noncarcinogenic compounds. These standards also would apply to any stormwater or applied water that flows from a regulated unit to the land surface.

Table 4-2
Potential Location-Specific ARARs and TBC Guidance
New River Unit, Radford Army Ammunition Plant Radford, Virginia

Authority	Requirement	Status	Requirement Synopsis
Federal Regulatory Requirements	Resource Conservation and Recovery Act (RCRA) – Location Standards (40 CFR 264.18)	Applicable	This regulation outlines the requirements for constructing a RCRA facility on a 100-year floodplain. The facility must be designed, constructed, operated, and maintained to avoid washout by a 100-year flood, unless waste may be removed safely before floodwater can reach the facility or no adverse effects on human health and the environment would result if washout occurred. This will be applicable to the disposal facility utilized for the waste.
	Executive Order 11990: Protection of Wetlands (40 CFR 6, Appendix A)	Relevant and appropriate	Federal agencies are required to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands.
	Endangered Species Act (16 USC 1531 et seq., 50 CFR 402)	Applicable	This law requires that action be taken to conserve endangered or threatened species. In addition, actions must not destroy or adversely modify critical habitat.
	Migratory Bird Treaty Act (16 USC 703 et seq)	Applicable	Actions taken or funded which result in the killing, hunting, taking, or capturing or any migratory birds, part, nest, or egg is unlawful.
	RCRA, 40 CFR 268	Applicable	Land disposal restrictions apply to land disposal of listed or characteristic hazardous materials disposed off site, or excavated treated and disposed on site If off-site disposal of contaminated media is necessary, LDR requirements will be met (Subtitle C Disposal)
	Hazardous Waste Operations and Emergency Response 29 CFR 1910.120	Applicable	OSHA requirements for workers engaged in response or other hazardous waste operations Incorporate the OSHA requirements in the Health and Safety Plan for the site
	Occupational Safety and Health Standards 29 CFR Part 1910.	Relevant and Appropriate	Occupational Safety and Health Standards (General Industry Standards) Incorporate OSHA standards in the Health and Safety Plan
	Guidance for Caps	To Be Considered	Evaluating Cover Systems for Solid and Hazardous Waste. (September 1982) EPA OSW-00-00-867 If a cap is part of the remedy this guidance will be followed

Table 4-2
Potential Location-Specific ARARs and TBC Guidance
New River Unit, Radford Army Ammunition Plant Radford, Virginia

Authority	Requirement	Status	Requirement Synopsis
Federal Regulatory Requirements	40 CFR 262.34	Applicable	The exemption for ninety-day accumulation Storage of waste materials at the site for less than 90 days
	National Emission Standards for Hazardous Air Pollutants 40 CFR 61.145 and 150	Relevant and Appropriate	The handling transportation and disposal of asbestos containing material will be managed and disposed in accord with Part 61
Federal Guidance	Storm Water Pollution Prevention Plan for Construction EPA 833-R-06 -008-May 2007	To be Considered	Guidance document for the management of surface water during construction projects. This guidance document will be consulted for relevant and appropriate management practices for preventing pollution as a result of construction activities.
State Regulatory Requirement	Endangered and Threatened Species 4 VAC 15-20-70	To be Considered	This provision provides that any violation of regulation under the Virginia State Endangered species act will be a misdemeanor.

Table 4-3
Potential Action-Specific ARARs and TBC Guidance
New River Unit, Radford Army Ammunition Plant Radford, Virginia

Authority	Requirement	Status	Requirement Synopsis
Federal Regulatory Requirements	National Emission Standards for Hazardous Air Pollutants 40 CFR61.145	Relevant and Appropriate	Notification requirements must be followed and Engineering controls are required to reduce fugitive emissions while performing asbestos demolition work.
	National Primary and Secondary Ambient Air Quality Standards (40 CFR 50.6, 50.7 and 50.13)	Relevant and Appropriate	Appropriate engineering controls are required to reduce particulate emissions associated with excavation and transportation.
	Land Disposal Restrictions (40 CFR 268.34)	Applicable	This regulation prohibits land disposal of metals containing waste, soil, or debris identified as hazardous by TCLP analysis.
	RCRA – Identification and Listing of Hazardous Waste (40 CFR 261)	Applicable	This regulation provides guidance for classifying wastes as hazardous under RCRA.
	U.S. Department of Transportation Rules for Transportation of Hazardous Materials (49 CFR 171.3)	Relevant and Appropriate	This regulation provides requirements for transportation of hazardous waste.
State Regulatory Requirements	Stormwater Discharges: Virginia 9 VAC 25-151-70 (VAR 05)	Relevant and Appropriate	Provides for the use of best management practices to control stormwater, erosion control and sediment transport.
	Fugitive Particulate Emissions: Virginia 9 VAC 5-40-90	Relevant and Appropriate	Restricts persons from conducting activities that generate airborne particulate matter without taking reasonable precautions.
	Standards of Performance for Visible Dust Emissions and Fugitive Dust/ Emissions (Rule 5-1): 9 VAC 5-50-60 to 120	Applicable	Provides standards for the control and abatement of air pollution resulting from site excavation activities. Only the substantive provisions of this regulation could be considered as ARARs.

Table 4-3
Potential Action-Specific ARARs and TBC Guidance
New River Unit, Radford Army Ammunition Plant Radford, Virginia

Authority	Requirement	Status	Requirement Synopsis
State Regulatory Requirements Continued	Emission Standards for Toxic Pollutants from New and Modified Sources (Rule 6-5): 9 VAC 5-60-300 to 370	To Be Considered	Provides regulations for the control and abatement of air pollution. Only the substantive provisions of this regulation could be considered as ARARs.
	Virginia Air Quality Standards: 9 VAC 5-30-60 and 65	Applicable	Provides long-range goals for particulate matter ambient air quality throughout the state of Virginia in order to protect the public health and welfare.
	Virginia Stormwater Management Program Permit Regulations: 4 VAC 50-60-10 to 240	To be Considered	The regulation provides a framework for the administration, implementation and enforcement of the procedures and requirements in conjunction with the issuance of a VSMP permit. Only the substantive provisions of this regulation could be considered as ARARs.
	Virginia Pollution Abatement Regulations: 9 VAC 25-32-10 to 300	To be Considered	This regulation delineates the procedures and requirements to be followed in connection with the VPA permits issued pursuant to the state water control law. Only the substantive provisions of this regulation could be considered as ARARs.
	Virginia Water Protection Permit Program Regulations: 9 VAC 25-210-10 to 260	To be Considered	Regulation governing the standards used for wetland delineation and the application and issuance of a VWP permit. Only the substantive provisions of this regulation could be considered as ARARs.
	Regulations Governing the Transportation of Hazardous Materials: 9 VAC 20-110-60	Applicable	The purpose of this rule is to establish that nothing contained within Virginia's Regulations Governing the Transportation of Hazardous Materials shall apply to regular military or naval forces of the United States. The purpose of these regulations is to regulate the transportation of hazardous materials and to maintain a register of shippers transporting hazardous and radioactive materials.
	Solid Waste Management Regulations: 9 VAC 20-80-10 to 790	To be Considered	The purpose of this regulation is to establish standards and procedures for the management of solid wastes, and creation/operation of solid waste management facilities. This regulation also sets forth the requirements for undertaking corrective actions at solid waste management facilities. Only the substantive provisions of this regulation would apply and in the event that the preferred alternative calls for the construction of a landfill.
	Erosion and Sediment Control: 4 VAC 50-30-10 to 110	Applicable	This regulation is the basis for the administration, implementation, and enforcement of erosion and sediment control certification.

Table 4-4. Summary of Risk-Drivers for BLA, IAA, and WBG, New River Unit, Radford Army Ammunition Plant, Radford, Virginia.

Industrial Site Worker Scenario	Construction Worker Scenario	Hypothetical Future Residential Scenario - Adult	Hypothetical Future Residential Scenario - Child
Bag Loading Area			
Lead Asbestos - - -	Lead Copper - - -	Lead Copper Aroclor 1254 Benzo(a)pyrene Asbestos	Lead Copper Aroclor 1254 Benzo(a)pyrene Asbestos
Igniter Assembly Area			
Asbestos - -	- - -	Lead Aroclor 1254 Asbestos	Lead Aroclor 1254 Asbestos
Building Debris Disposal Trench			
-	-	Benzo(a)pyrene	Benzo(a)pyrene
Western Burning Ground			
- -	- -	- -	Chromium Lead

**Table 4-5. Exposure Parameters Used to Develop Preliminary Remediation Goals for COCs (Except Lead),
New River Unit, Radford Army Ammunition Plant, Radford, Virginia.**

Parameter	Site Worker	Construction Worker	Adult Resident	Child Resident
BW	70 kg	70 kg	70 kg	15 kg
AT - cancer	25550	25550 days	25550 days	25550 days
AT - noncancer	9,125 days	182 days	10,950 days	2,190 days
EF- soil	250 days/year	130 day/year	350 day/year	350 day/year
EF - sediment	-	-	-	48 days/year
ED	25 years	1 year	30 years	6 years
IR	100 mg/day	330 mg/day	100 mg/day	200 mg/day
FI	1	1	1	1
SA	3300 cm ²	3300 cm ²	5700 cm ²	2800 cm ²
AF	0.2 mg/cm ² -d	0.3 mg/cm ² -d	0.07 mg/cm ² -d	0.2 mg/cm ² -d
PEF	1.36x10 ⁹ kg/m ³	1.36x10 ⁹ kg/m ³	1.36x10 ⁹ kg/m ³	1.36x10 ⁹ kg/m ³

Table 4-6. Parameter Values Used in the Adult Lead Model (ALM) for Evaluation of Lead Risks, New River Unit, Radford Army Ammunition Plant, Radford, Virginia.

Exposure Variable	Description	Receptor Scenario				
		Units	Industrial Worker ^[a]	Construction Worker - Soil ^[a]	Adult Resident - Soil ^[b]	Adult Resident - Sediment ^[c]
PRG	Lead concentration in soil and dust	ppm	1,486	624	930	3,380
$R_{\text{fetal/maternal}}$	Fetal/maternal PbB ratio	--	0.9 [d]	0.9 [d]	0.9 [d]	0.9 [d]
BKSF _S	Biokinetic Slope Factor	µg/dL per µg/day	0.4 [d]	0.4 [d]	0.4 [d]	0.4 [d]
GSD _i	Geometric standard deviation PbB	--	2.04 [e]	2.04 [e]	2.04 [e]	2.04 [e]
PbB ₀	Baseline PbB	µg/dL	1.3 [e]	1.3 [e]	1.3 [e]	1.3 [e]
IR _S	Soil ingestion rate	g/day	0.05 [f]	0.10 [g]	0.05 [f]	0.05 [f]
AF _o	Absorption fraction (oral)	--	0.12 [d]	0.12 [d]	0.12 [d]	0.12 [d]
AF _d	Absorption fraction (dermal)	--	NA [h]	NA [h]	NA [h]	NA [h]
EF	Exposure frequency	days/yr	219 [i]	130 [j]	350 [k]	48 [l]
AT	Averaging time	days/yr	365 [i]	182 [j]	365 [k]	182 [l]

Abbreviations:

µg/dL = micrograms per deciliter

µg/day = micrograms per day

g/day = grams per day

NA = not applicable

PbB = blood lead concentration

ppm = parts per million

Notes:

[a] Industrial worker represents female adult (ages 17 - 45 years) exposed to lead in soil from all occupational sources, including soil in indoor dust, resulting from non-contact intensive activities.

[b] Resident represents female adult (ages 17 - 45 years) exposed to lead in soil and dust at their residence.

[c] Resident represents female adult (ages 17 - 45 years) exposed to lead in sediment at a different location.

[d] Default CTE value (USEPA, 2003a).

[e] Default value for non-Hispanic white populations from the South region (USEPA, 2002; Table 3a).

[f] Default CTE value for soil ingestion for adults that are not engaged in contact-intensive activities such as construction work (USEPA, 2003a; 2007).

[g] Recommended CTE value for soil ingestion for adults engaged in contact intensive activities such as excavation (USEPA, 2003a; 2007).

[h] Consistent with USEPA (2003a; 2004; 2007) guidance, dermal exposures to lead in aqueous and non-aqueous media were not quantitatively evaluated with the ALM due to the uncertainty in assigning a dermal absorption fraction that would apply to the numerous inorganic forms of lead that are typically found in environmental settings.

[i] Default CTE value for non-residential exposure scenarios, corresponds to average time spent at work by both full- and part-time workers.

[k] Consistent with USEPA (2003b), a time-weighted approach was used to evaluate potential lead risks. Adult residents are assumed to be at a residence for 350 days per year.

[l] Consistent with USEPA (2003b), a time-weighted approach was used to evaluate potential lead risks. Adult residents are assumed to be exposed to sediment at a location to sediment at a different location for 2 of 7 days per week over six months (182 days), except for four days when it rains (i.e., 52 - 4 = 48 days).

References:

USEPA. 2002. Blood Lead Concentrations of U.S. Adult Females: Summary Statistics From Phases 1 and 2 of the National Health and Nutrition Evaluation Survey (NHANES III). OSWER #9285.7-52. March.

USEPA. 2003a. Recommendations of the Technical Review Workgroup for Lead for an Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil. EPA-540-R-03-001. January.

USEPA. 2003b. Assessing Intermittent or Variable Exposures at Lead Sites. OSWER Directive #9285.7-76. EPA-540-R-03-008. November.

USEPA. 2004. Risk Assessment Guidance for Superfund, Part E, Supplemental Guidance for Dermal Risk Assessment. EPA/540/R/99/005. July.

USEPA. 2007. Frequent Questions from Risk Assessors on the ALM. Accessed on-line 4/23/08 at <http://www.epa.gov/superfund/health/contaminants/lead/almfaq.htm>. Updated August 2.

Table 5-1. Preliminary Screening of Remedial Technologies for Soil, New River Unit, Radford Army Ammunition Plant, Radford, Virginia.

General Response Action	Remedial Technology	Remedial Technology Process Option	Description	Retained: yes or no	Decision Rationale
No Action	No Action	No Action	No remedial or follow on actions are performed.	Yes	Required by NCP and USEPA guidance as a baseline for comparison to other remedial alternatives.
Institutional Controls	Deed Notification	Deed Notification	Property deed is used to convey information about the land to a future buyer.	No	As a federal military facility, RFAAP-NRU does not have a deed.
	Deed Restriction	Deed Restriction	Provisions placed in a deed limiting the use of the property by prohibiting certain activities.	No	As a federal military facility, RFAAP-NRU does not have a deed.
	Revision to Facility SOPs	Revision to Facility SOPs	Standard Operating Procedures would be developed for the facility to limit the use of property by prohibiting certain activities.	Yes	The SOPs would preclude certain site uses (e.g., excavation, residential use, etc.) for the duration of the risk created by residual COCs.
	Access Restrictions	Fencing/Signage	Physical barriers to prevent contact with surface soil or warning signs to inform people of surface soil.	Yes	Conventional technology to inform and prevent contact with COCs in surface soil.
	Education	Informational Pamphlet	Information about the site is presented to the public through mailings or public meetings.	Yes	Effective for informing the public about risks associated with COCs in surface soil.
	Management Plans	Site Management/Health and Safety Plans	Ensure proper management of remedial technology and safety for site workers.	Yes	Provides long-term permanence and protection for site workers.
Monitored Natural Attenuation	Monitored Natural Attenuation	Monitored Natural Attenuation	Perform routine monitoring to assess changes in concentration over time and to ensure protection of receptors.	No	Monitoring of surface soil would not be an effective remedy, as metal concentrations would not be expected to change.
Containment	Capping	Soil and Vegetative Cover	Using a soil and vegetative cover to prevent dermal contact with site constituents.	Yes	A soil and vegetative cover prevents direct contact with surface soil.
		Impermeable (i.e. RCRA) cover	Using an impermeable cover to prevent degradation and infiltration from COCs in surface soil.	Yes	An impermeable cover prevents direct contact with COCs in surface soil and prevents migration.
Removal	Excavation	Excavation of Surface Soils	Removal of surface soil through excavation.	Yes	Conventional technology.
In Situ Treatment	Physical	Soil Flushing	Movement of high quantities of water through impacted soil to desorb COCs.	No	Lead is not very water soluble.
	Chemical	Stabilization/Solidification	Fixation of surficial soil and COCs by mixing various agents.	Yes	Implementable technology for immobilization of lead in soil.
	Biological	Phytoremediation	Use of hyper accumulating plants for the uptake of COCs.	No	Ineffective for reduction of lead concentrations.
Ex Situ Treatment	Physical	Soil Flushing	Movement of high quantities of water through impacted soil to desorb contaminants.	No	COCs are not very water soluble.
	Chemical	Stabilization/Solidification	Fixation of surface soil and COCs by mixing various agents.	Yes	Implementable technology for immobilization of lead in soil.
Disposal	Disposal	Offsite Landfill	Offsite disposal of excavated surface soil in an approved landfill.	Yes	Conventional disposal option in conjunction with removal.
		Offsite Incineration	Offsite incineration of excavated soil or remediation process residuals in an approved incineration facility.	No	Not effective for metals.
		Backfilling Excavation	On-site reuse of treated soil.	No	Would not be acceptable to regulatory authority. Treated site soils should not be transported to other areas of the site.
		Onsite Consolidation	Redistribute impacted soil onsite to control long-term management and exposure.	No	Would not be acceptable to regulatory authority. Site soils should not be transported to other areas of the site.

Notes:

	Technology screened out.
COC	Constituents of Concern
NCP	National Contingency Plan
RCRA	Resource Conservation and Recovery Act
RFAAP-NRU	Radford Army Ammunition Plant - New River Unit.
USEPA	United States Environmental Protection Agency

Table 5-2. Preliminary Screening of Remedial Technologies for Building Materials, New River Unit, Radford Army Ammunition Plant, Radford, Virginia.

General Response Action	Remedial Technology	Remedial Technology Process Option	Description	Retained: yes or no	Decision Rationale
No Action	No Action	No Action	No remedial or follow on actions are performed.	Yes	Required by NCP and USEPA guidance as a baseline for comparison to other remedial alternatives.
Institutional Controls	Deed Notification	Deed Notification	Property deed is used to convey information about the land to a future buyer.	No	As a federal military facility, RFAAP-NRU does not have a deed.
	Deed Restriction	Deed Restriction	Provisions placed in a deed limiting the use of the property by prohibiting certain activities.	No	As a federal military facility, RFAAP-NRU does not have a deed.
	Revision to Facility SOPs	Revision to Facility SOPs	Standard Operating Procedures would be developed for the facility to limit the use of property by prohibiting certain activities.	Yes	The SOPs would preclude certain site uses (e.g., excavation, residential use, etc.) for the duration of the risk created by residual COCs.
	Access Restrictions	Fencing/Signage	Physical barriers to prevent contact with flooring material or warning signs to inform people of flooring material.	Yes	Conventional technology to inform and prevent contact with flooring material.
	Education	Informational Pamphlet	Information about the site is presented to the public through mailings or public meetings.	Yes	Effective for informing the public about risks associated with flooring material.
	Management Plans	Site Management/Health and Safety Plans	Ensure proper management of remedial technology and safety for site workers.	Yes	Provides long-term permanence and protection for site workers.
Monitored Natural Attenuation	Monitored Natural Attenuation	Monitored Natural Attenuation	Perform routine monitoring to assess changes in concentration over time and to ensure protection of receptors.	No	Ineffective for flooring material.
Containment	Capping	Soil and Vegetative Cover	Using a soil and vegetative cover to prevent dermal contact with site COCs.	Yes	A soil and vegetative cover prevents direct contact with flooring material.
		Liner	Using a liner system (e.g. concrete or epoxy) to protect the flooring material and prevent further degradation, release, and exposure.	Yes	An liner system would prevent direct contact with flooring material and prevent further degradation and/or release.
Removal	Physical Removal	Physical Removal	Physically removing the flooring material from the buildings through scraping or other means	Yes	Conventional technology. Completely removes source.
In Situ Treatment	Chemical	Stabilization/Solidification	Fixation of COCs in flooring material by mixing various agents.	No	Ineffective for flooring material.
Ex Situ Treatment	Chemical	Stabilization/Solidification	Fixation of COCs in flooring material by mixing various agents.	No	Ineffective for flooring material.
Disposal	Disposal	Offsite Landfill	Offsite disposal of excavated flooring material in an asbestos licensed landfill.	Yes	Conventional disposal option in conjunction with removal.
		Offsite Incineration	Offsite incineration of flooring material or remediation process residuals in an approved incineration facility.	No	Not effective for metals.

Notes:

	Technology screened out
COC	Constituents of Concern
NCP	National Contingency Plan
RCRA	Resource Conservation and Recovery Act
RFAAP-NRU	Radford Army Ammunition Plant - New River Unit.
USEPA	United States Environmental Protection Agency

Table 5-3. Preliminary Screening of Remedial Technologies for Sediment, New River Unit, Radford Army Ammunition Plant, Radford, Virginia.

General Response Action	Remedial Technology	Remedial Technology Process Option	Description	Retained: yes or no	Decision Rationale
No Action	No Action	No Action	No remedial or follow on actions are performed.	Yes	Required by NCP and USEPA guidance as a baseline for comparison to other remedial alternatives.
Institutional Controls	Deed Notification	Deed Notification	Property deed is used to convey information about the land to a future buyer.	No	As a federal military facility, RFAAP-NRU does not have a deed.
	Deed Restriction	Deed Restriction	Provisions placed in a deed limiting the use of the property by prohibiting certain activities.	No	As a federal military facility, RFAAP-NRU does not have a deed.
	Revision to Facility SOPs	Revision to Facility SOPs	Standard Operating Procedures would be developed for the facility to limit the use of property by prohibiting certain activities.	Yes	The SOPs would preclude certain site uses (e.g., excavation, swimming, fishing, residential use, etc.) for the duration of the risk created by residual COCs.
	Access Restrictions	Fencing/Signage	Physical barriers to prevent contact with sediment or warning signs to inform people of sediment.	Yes	Conventional technology to inform and prevent contact with sediment.
	Education	Informational Pamphlet	Information about the site is presented to the public through mailings or public meetings.	Yes	Effective for informing the public and site workers/visitors about risks associated with COCs in sediment.
	Management Plans	Site Management/Health and Safety Plans	Ensure proper management of remedial technology and safety for site workers.	Yes	Provides long-term permanence and protection for site workers.
Monitored Natural Attenuation	Monitored Natural Attenuation	Monitored Natural Attenuation	Perform routine monitoring to assess changes in concentration over time and to ensure protection of receptors.	No	Monitoring of sediment would not be an effective remedy, as metal concentrations would not be expected to change.
Removal	Excavation	Excavation	Removal of sediment through excavation and dewatering.	Yes	Conventional technology.
In Situ Treatment	Chemical	Stabilization/Solidification	Fixation of sediment and COCs by mixing various agents.	Yes	Implementable technology for immobilization of lead in sediment.
	Physical	Sediment Flushing	Movement of high quantities of water through sediment to desorb COCs.	No	Lead is not very water soluble.
Ex Situ Treatment	Chemical	Stabilization/Solidification	Fixation of sediment and COCs by mixing various agents.	Yes	Implementable technology for immobilization of lead in excavated sediment.
	Physical	Sediment Flushing	Movement of high quantities of water through sediment to desorb COCs.	No	Lead is not very water soluble.
Disposal	Disposal	Offsite Landfill	Offsite disposal of excavated sediment or remediation process residuals in an approved landfill.	Yes	Conventional disposal option in conjunction with removal.
		Offsite Incineration	Offsite incineration of excavated sediment or remediation process residuals in an approved incineration facility.	No	Not effective for metals.
		Backfilling Excavation	On-site reuse of treated sediment.	No	Would not be acceptable to regulatory authority. Site sediment should not be transported to other areas of the site.
		Onsite Consolidation	Redistribute impacted sediment onsite to control long-term management and exposure.	No	Would not be acceptable to regulatory authority. Site sediment should not be transported to other areas of the site.

Notes:

	Technology screened out
COC	Constituents of Concern
NCP	National Contingency Plan
RCRA	Resource Conservation and Recovery Act
RFAAP-NRU	Radford Army Ammunition Plant - New River Unit.
USEPA	United States Environmental Protection Agency

Table 5-4. Screening of Available Process Options for Soil, New River Unit, Radford Army Ammunition Plant, Radford, Virginia.

General Response Action	Remedial Technology	Remedial Technology Process Option	Effectiveness Evaluation	Implementability Evaluation	Relative Cost Evaluation	Retained?
No Action	No Action	No Action	---	---	---	Yes: Required by NCP and USEPA guidance as a baseline for comparison to other process options.
Institutional Controls	Revise SOPs for Facility	Develop New SOPs for Facility	Moderate: Does not reduce environmental impacts but helps ensure long-term permanence of remedy.	High: RFAAP-NRU can specify Site uses.	Low: Negligible cost.	Yes: Considered in conjunction with other technologies and necessary to ensure long-term permanence of remedy.
	Access Restrictions	Fencing/Signage	Moderate: Access to RFAAP-NRU is already restricted. Minimizes exposure pathways, but does not remediate COCs.	High: RFAAP-NRU could easily implement fencing and signage.	Moderate: Moderate capital and O&M costs relative to other institutional control technologies.	Yes: Could be utilized in conjunction with other technologies to limit exposure pathways.
	Education	Informational Pamphlet	Low: Access to RFAAP-NRU is already restricted. Minimizes exposure pathways, but does not remediate COCs.	Moderate: Implementable, although ensuring complete conveyance to the public may be difficult.	Low: Negligible cost.	Yes. May be utilized in conjunction with other technologies to inform site visitors of risks. However, will not be utilized as long term measure.
	Management Plans	Site Management/Health and Safety Plans	Moderate to High: Effective for protection of site workers and management of remedial implementation	High: Easily implementable.	Low: Low capital and long-term costs to create and maintain.	Yes: Necessary for proper site management, long-term implementation, and site health and safety
Containment	Capping	Soil and Vegetative Cover	Moderate: Reduces potential for exposure; does not remediate environmental impacts. Does not prevent infiltration of water. COCs leaching from surface soil not significant contributor to source. Long-term effectiveness depends on future maintenance.	Moderate: Implementable, although may restrict future Site uses. May require regrading to control ponding of surface water.	High: High capital costs; low O&M costs.	Yes: Considered in conjunction with institutional controls.
		Impermeable (i.e. RCRA) cover	High: Reduces potential for exposure; does not remediate environmental impacts. COCs leaching from surface soil not significant contributor to source. Long-term effectiveness depends on future maintenance.	Moderate: Implementable, although may restrict future Site uses. May require regrading to control ponding of surface water.	High: High capital costs; low O&M costs.	Yes: Considered in conjunction with institutional controls.
Excavation	Excavation	Excavation of Surface Soils	High: Permanently removes surface soils.	Low to Moderate: Potential concerns due to asbestos in surface soil.	High: High capital costs; low O&M costs.	Yes: Considered in conjunction with disposal.
Chemical Treatment	In Situ Treatment	In Situ Stabilization/Solidification	High: Effective in reducing mobility of metals, making metals less bioavailable; does not remediate contaminants.	Low to Moderate: Implementable dependant on volumes to be addressed. May restrict future Site uses.	Moderate: Moderate capital costs, low O&M costs.	No: Generally not used for small volumes and limited areal extent found at site.
	Ex Situ Treatment	Ex Situ Stabilization/Solidification	High: Effective in reducing mobility of metals, making metals less bioavailable; does not remediate contaminants.	Low to Moderate: Implementability dependent upon volumes to be excavated. May restrict future Site uses.	Moderate to High: Moderate to High capital costs, low O&M costs.	Yes: Considered in conjunction with disposal and/or ex situ treatment process options. May be required for offsite disposal.
Disposal	Disposal	Offsite Landfill	High: Permanent disposal of surface soil.	Low to Moderate: Excavated soil may require pre-treatment (i.e. stabilization/solidification) prior to acceptance to landfill.	High capital cost; low O&M cost.	Yes: Considered in conjunction with excavation.

Notes:

	Shading indicates that process option will not be retained for further evaluation.
---	Evaluation not required.
COC	Chemicals of Concern
NCP	National Contingency Plan
O&M	Operation and Maintenance
RCRA	Resource Conservation and Recovery Act
RFAAP-NRU	Radford Army Ammunition Plant - New River Unit.
USEPA	United States Environmental Protection Agency

Table 5-5. Screening of Available Process Options for Conductive Flooring, New River Unit, Radford Army Ammunition Plant, Radford, Virginia.

General Response Action	Remedial Technology	Remedial Technology Process Option	Effectiveness Evaluation	Implementability Evaluation	Relative Cost Evaluation	Retained?
No Action	No Action	No Action	---	---	---	Yes: Required by NCP and USEPA guidance as a baseline for comparison to other process options.
Institutional Controls	Revise SOPs for Facility	Develop New SOPs for Facility	Moderate: Does not reduce site COCs but helps ensure long-term permanence of remedy.	High: RFAAP-NRU can specify Site uses.	Low: Negligible cost.	Yes: Considered in conjunction with other technologies and necessary to ensure long-term permanence of remedy.
	Access Restrictions	Fencing/Signage	Low: Access to RFAAP-NRU is already restricted. Minimizes exposure pathways, but does not remediate COCs.	High: RFAAP-NRU could easily implement fencing and signage.	Moderate: Moderate capital and O&M costs relative to other institutional control technologies.	Yes: Considered in conjunction with other technologies and necessary to ensure long-term permanence of remedy.
	Education	Informational Pamphlet	Low: Access to RFAAP-NRU is already restricted. Minimizes exposure pathways, but does not remediate COCs.	Moderate: Implementable, although ensuring complete conveyance to the public may be difficult.	Low: Negligible cost.	Yes. May be utilized in conjunction with other technologies to inform site visitors of risks. However, will not be utilized as long term measure.
	Management Plans	Site Management/Health and Safety Plans	Moderate to High: Effective for protection of site workers and management of remedial implementation	High: Easily implementable.	Low: Low capital and long-term costs to create and maintain.	Yes: Necessary for proper site managment, long-term implementation, and site health and safety
Containment	Capping	Soil and Vegetative Cover	Moderate: Reduces potential for exposure; does not remediate site COCs. Does not prevent infiltration of water. COCs leaching from flooring material contributes to source. Long-term effectiveness depends on future maintenance.	Low: Difficult to place and compact soil cover in tight confines of buildings. Also difficult to establish vegetation in shaded areas. Not applicable to second story of BLA buildings.	High: High capital costs; high O&M costs.	No: Difficulties in installing and maintaining a vegetative cap eliminate this alternative from further consideration.
		Epoxy or Concrete Liner	High: Reduces potential for exposure; does not remediate COCs. Prevents further degradation of flooring material. Prevents COCs leaching from flooring material. Long-term effectiveness depends on future maintenance.	Moderate: Implementable, although may restrict future Site uses. May require regrading to control ponding of surface water.	High: High capital costs; low O&M costs.	Yes: Considered in conjunction with institutional controls.
Removal	Removal	Excavation of Flooring Material	High: Permanently removes flooring material.	Moderate: Potential concerns due to asbestos in flooring material and structural concerns for second story of BLA buildings.	High: High capital costs; low O&M costs.	Yes: Considered in conjunction with disposal.
Disposal	Disposal	Offsite Landfill	High: Permanent disposal of flooring material.	Low to Moderate: Flooring material may require disposal at hazardous waste landfill.	High capital cost; low O&M cost.	Yes: Considered in conjunction with excavation.

Notes:

	Shading indicates that process option will not be retained for further evaluation.
---	Evaluation not required.
COC	Chemicals of Concern
NCP	National Contingency Plan
O&M	Operation and Maintenance
RCRA	Resource Conservation and Recovery Act
RFAAP-NRU	Radford Army Ammunition Plant - New River Unit.
USEPA	United States Environmental Protection Agency

Table 5-6. Screening of Available Procoess Options for Sediment, New River Unit, Radford Army Ammunition Plant, Radford, Virginia.

General Response Action	Remedial Technology	Remedial Technology Process Option	Effectiveness Evaluation	Implementability Evaluation	Relative Cost Evaluation	Retained?
No Action	No Action	No Action	---	---	---	Yes: Required by NCP and USEPA guidance as a baseline for comparison to other process options.
Institutional Controls	Revise SOPs for Facility	Develop New SOPs for Facility	Moderate: Does not reduce environmental impacts but helps ensure long-term permanence of remedy.	High: RFAAP-NRU can specify Site uses.	Low: Negligible cost.	Yes: Considered in conjunction with other technologies and necessary to ensure long-term permanence of remedy.
	Access Restrictions	Fencing/Signage	Moderate: Access to RFAAP-NRU is already restricted. Minimizes exposure pathways, but does not remediate COCs.	High: RFAAP-NRU could easily implement fencing and signage.	Moderate: Moderate capital and O&M costs relative to other institutional control technologies.	Yes: Considered in conjunction with other institutional controls.
	Education	Informational Pamphlet	Low: Access to RFAAP-NRU is already restricted. Minimizes exposure pathways, but does not remediate COCs.	Moderate: Implementable, although ensuring complete conveyance to the public may be difficult.	Low: Negligible cost.	Yes. May be utilized in conjunction with other technologies to inform site visitors of risks. However, will not be utilized as long term measure.
	Management Plans	Site Management/Health and Saftey Plans	Moderate to High: Effective for protection of site workers and management of remedial implementation	High: Easily implementable.	Low: Low capital and long-term costs to create and maintain.	Yes: Necessary for proper site managmenet, long-term implementation, and site health and safety
Chemical Treatment	In Situ Treatment	In Situ Stabilization/Solidification	High: Effective in reducing mobility of metals, making metals less bioavailable; does not remediate contaminants.	Low to Moderate: Implementable dependant on volumes to be addressed. May restrict future Site uses.	Moderate: Moderate capital costs, low O&M costs.	No: Generally not used for small volumes found at site.
	Ex Situ Treatment	Ex Situ Stabilization/Solidification	High: Effective in reducing mobility of metals, making metals less bioavailable; does not remediate contaminants.	Low to Moderate: Implementability dependent upon volumes to be excavated.	Moderate to High: Moderate to High capital costs, low O&M costs.	Yes: Considered in conjunction with disposal and/or ex situ treatment process options. May be required for offsite disposal.
Excavation	Excavation	Excavation	High: Permanently removes sediement.	Moderate: Potential health concerns due to COCs in sediment.	High: High capital costs; low O&M costs.	Yes: Considered in conjunction with disposal.
Disposal	Disposal	Offsite Landfill	High: Permanent disposal of sediment.	Low to Moderate: Excavated sediment may require pre-treatent (i.e. stablization/solidification) prior to acceptance to landfill.	High capital cost; low O&M cost.	Yes: Considered in conjunction with excavation.

COC

NCP

O&M

RCRA

RFAAP-NRU

USEPA

Shading indicates that process option will not be retained for further evaluation.
Evaluation not required.
Chemicals of Concern
National Contingency Plan
Operation and Maintenance
Resource Conservation and Recovery Act
Radford Army Ammunition Plant - New River Unit.
United States Environmental Protection Agency

Table 7-1. Summary of Individual Analysis of Response Action Alternatives for BLA and IAA Soil, New River Unit, Radford Army Ammunition Plant, Radford, Virginia.

Alternative	Threshold Criteria		Balancing Criteria				Modifying Criteria		
	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume through Treatment	Short-Term Effectiveness	Implementability	Cost	State Acceptance	Community Acceptance
SL-1 - No Action	Does not reduce the risk to human health or the environment.	Does not apply.	Uncertain in the absence of monitoring, all current and potential future risks would remain the same.	Does not reduce the toxicity, mobility, or volume of COCs.	Does not pose any additional risks to the community, the workers, or the environment, but does not mitigate existing risks.	No implementability concerns.	\$0	Likely not acceptable	Likely not acceptable
SL-2 - Institutional Controls	Protects human health by restricting land use and reducing exposure pathways. Due to limited extent of COCs in soil, the current and anticipated future risks to the environment are minimal.	Meets chemical-specific, action-specific, and location-specific ARARs.	Effective as long as institutional controls are properly maintained. However, COCs will still remain on-site and have the potential to migrate.	Does not reduce the toxicity or volume of COCs. May help control mobility by minimizing soil disturbance.	Does not pose any additional risks to the community or the environment, but does not mitigate existing risks. Negligible risks to site works as part of fence and sign installation.	Readily implementable.	BLA: \$188,000 IAA: \$223,000	Assessed in the ROD following comment on the RI/FS	Assessed in the ROD following comment on the RI/FS
SL-3 - Vegetative Soil Cover with Institutional Controls	Protective as it mitigates surface soil exposure for the industrial exposure pathways. However, COCs present at concentrations above residential PRGs would not be covered. ICs would restrict land use to further reduce exposure pathways.	Meets chemical-specific, action-specific, and location-specific ARARs.	Effective with periodic maintenance to ensure soil cover integrity. Also requires inspections to ensure maintenance of ICs.	Reduces the mobility, but does not reduce toxicity or volume.	May result in material handling and dust generation, but the potential for exposure would be reduced through the use of suitable protective clothing and equipment, good construction practices, and standard dust suppression techniques.	Readily implementable involving standard construction techniques and equipment. Clearing activities may add some level of difficulty.	BLA: \$314,000 IAA: \$341,000	Assessed in the ROD following comment on the RI/FS	Assessed in the ROD following comment on the RI/FS
SL-4 - Excavation, Transportation, Off-Site Disposal and LUCs	Protective as it removes the source and exposure pathway. Degree of protection dependant upon removal of soils to Industrial or Residential PRGs. LUCs would be required if soil removal only conducted to industrial levels.	Meets chemical-specific, action-specific, and location-specific ARARs.	Reduces the long term risk. Removal to Industrial PRGs would require continued monitoring, maintenance, or LUCs.	Reduces the mobility, transfers the volume and toxicity to a disposal facility. Reduction dependant on removal of soils to Industrial or Residential PRGs.	Would result in material handling and dust generation, but the potential for exposure would be reduced through the use of suitable protective clothing and equipment, good construction practices, and standard dust suppression techniques.	Readily implementable involving standard construction techniques and equipment. Removal of soils to Residential PRGs would require add some level of difficulty.	BLA (Industrial): \$312,000 BLA (Residential): \$601,000 IAA (Industrial): \$384,000 IAA (Residential): \$335,000	Assessed in the ROD following comment on the RI/FS	Assessed in the ROD following comment on the RI/FS

Table 7-2. Projected Costs for Response Action Alternative SL-2 at the BLA, New River Unit, Radford Army Ammunition Plant, Radford Virginia.

ITEM	QUANTITY	UNITS	UNIT COST	CAPITAL COST	ANNUAL O & M COST	PRESENT WORTH COST
I. ADMINISTRATIVE AND ENGINEERING ACTIONS						
1. Land-Use Controls	1.0	LS	\$4,250	\$4,250		
2. Fence Installation	2350.0	LF	\$10	\$23,500		
3. Sign Installation	50.0	Each	\$205	\$10,250		
Subtotal:				\$38,000	\$0	\$0
II. ANNUAL INSPECTION AND FIVE YEAR REVIEW						
1. Annual Inspection and Reporting	30.0	Year	\$2,280		\$68,400	\$28,300
2. Five Year Review	6.0	Each	\$15,000		\$90,000	\$37,200
3. Annual O&M	30.0	Year	\$2,000		\$60,000	\$24,800
Subtotal:				\$0	\$218,400	\$90,300
SUBTOTAL (I and II)				\$38,000	\$218,400	\$90,300
III. IMPLEMENTATION COSTS						
1. Administration and Legal	5% of Capital Costs			\$1,900		
2. CMI Plan	1.0	LS	\$20,000	\$20,000		
3. Completion Report	1.0	LS	\$15,000	\$15,000		
4. Cost Contingency	25% of Capital Costs			\$9,500		
5. O&M Contingency	15% of O&M Costs				\$32,800	\$13,600
Subtotal:				\$46,400	\$32,800	\$13,600
A. TOTAL CAPITAL COSTS				\$84,400		
B. TOTAL ANNUAL COSTS					\$251,200	
C. TOTAL PRESENT WORTH OF ANNUAL COSTS						\$103,900
TOTAL PRESENT WORTH OF CAPITAL AND ANNUAL COSTS (A + C)						\$188,000

LS - Lump Sum

LF - Linear Foot

Present worth cost is calculated using 7.0% interest in 2009 dollars.

Assumptions presented in Appendix F

Table 7-3. Projected Costs for Response Action Alternative SL-2 at the IAA, New River Unit, Radford Army Ammunition Plant, Radford Virginia.

ITEM	QUANTITY	UNITS	UNIT COST	CAPITAL COST	ANNUAL O & M COST	PRESENT WORTH COST
I. ADMINISTRATIVE AND ENGINEERING ACTIONS						
1. Land-Use Controls	1.0	LS	\$4,250	\$4,250		
2. Fence Installation	5000.0	LF	\$10	\$50,000		
3. Sign Installation	50.0	Each	\$205	\$10,250		
Subtotal:				\$64,500	\$0	\$0
II. ANNUAL INSPECTION AND FIVE YEAR REVIEW						
1. Annual Inspection and Reporting	30.0	Year	\$2,280		\$68,400	\$28,300
2. Five Year Review	6.0	Each	\$15,000		\$90,000	\$37,200
3. Annual O&M/Repairs	30.0	Year	\$2,000		\$60,000	\$24,800
Subtotal:				\$0	\$218,400	\$90,300
SUBTOTAL (I and II)				\$64,500	\$218,400	\$90,300
III. IMPLEMENTATION COSTS						
1. Administration and Legal			5% of Capital Costs	\$3,200		
2. CMI Plan	1.0	LS	\$20,000	\$20,000		
3. Completion Report	1.0	LS	\$15,000	\$15,000		
4. Cost Contingency			25% of Capital Costs	\$16,100		
5. O&M Contingency			15% of O&M Costs		\$32,800	\$13,600
Subtotal:				\$54,300	\$32,800	\$13,600
A. TOTAL CAPITAL COSTS				\$118,800		
B. TOTAL ANNUAL COSTS					\$251,200	
C. TOTAL PRESENT WORTH OF ANNUAL COSTS						\$103,900
TOTAL PRESENT WORTH OF CAPITAL AND ANNUAL COSTS (A + C)						\$223,000

LS - Lump Sum

LF - Linear Foot

Present worth cost is calculated using 7.0% interest in 2009 dollars.

Assumptions presented in Appendix F

Table 7-4. Projected Costs for Response Action Alternative SL-3 at the BLA, New River Unit, Radford Army Ammunition Plant, Radford, Virginia.

ITEM	QUANTITY	UNITS	UNIT COST	CAPITAL COST	ANNUAL O & M COST	PRESENT WORTH COST
I. ADMINISTRATIVE ACTIONS						
1. Land-Use Controls	1.0	LS	\$3,250	\$3,250		
2. Sign Installation	50	Each	\$205	\$10,250		
Subtotal:				\$13,500	\$0	\$0
II. GENERAL ACTIONS/SITE PREPARATION						
1. Mobilization/Demobilization	1	LS	\$20,000	\$20,000		
2. Clear and Grub	5	Day	\$3,000	\$15,000		
3. Install, Maintain, and Remove Erosion and Sediment Controls	1900	LF	\$5	\$9,500		
4. Surveying	2	Day	\$1,500	\$3,000		
5. Pre-Activity Confirmation Sampling	45	Sample	\$500	\$22,500		
6. Decontamination Controls	1	LS	\$5,000	\$5,000		
Subtotal:				\$75,000	\$0	\$0
III. SOIL COVER INSTALLATION						
1. Import and Place Common Borrow	300	ton	\$30	\$9,000		
2. Import and Place Top Soil	185	CY	\$35	\$6,475		
3. Site Restoration	1	LS	\$5,000	\$5,000		
Subtotal:				\$20,475	\$0	\$0
IV. O&M, ANNUAL INSPECTION AND FIVE YEAR REVIEW						
1. Annual Inspection and Reporting	30	Each	\$2,800		\$84,000	\$34,700
2. Five Year Review	6	Each	\$15,000		\$90,000	\$37,200
3. Annual Mowing and General O&M	30	Each	\$1,000		\$30,000	\$12,400
4. Cap Repairs O&M (2.5 % of soil cover installation)	30	Each	\$512		\$15,356	\$6,400
Subtotal:				\$0	\$219,356	\$90,700
SUBTOTAL (I, II, III and IV))				\$108,975	\$219,356	\$90,700
V. IMPLEMENTATION COSTS						
1. Administration and Legal	5% of Capital Costs			\$5,400		
2. CMI Plan		1.0	LS	\$20,000	\$20,000	
3. Procurement	18% of Capital Costs			\$19,600		
4. Construction Management	12% of Capital Costs			\$13,100		
5. Completion Report		1.0	LS	\$15,000	\$15,000	
6. Cost Contingency	25% of Capital Costs			\$27,200		
7. O&M Contingency	15% of O&M Costs				\$32,900	\$13,600
Subtotal:				\$100,300	\$32,900	\$13,600
A. TOTAL CAPITAL COSTS				\$209,275		
B. TOTAL ANNUAL COSTS					\$252,256	
C. TOTAL PRESENT WORTH OF ANNUAL COSTS						\$104,300
TOTAL PRESENT WORTH OF CAPITAL AND ANNUAL COSTS (A + C)						\$314,000

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

Present worth cost is calculated using 7.0% interest in 2009 dollars.

Table 7-5. Projected Costs for Response Action Alternative SL-3 at the IAA, New River Unit, Radford Army Ammunition Plant, Radford, Virginia.

ITEM	QUANTITY	UNITS	UNIT COST	CAPITAL COST	ANNUAL O & M COST	PRESENT WORTH COST
I. ADMINISTRATIVE ACTIONS						
1. Land-Use Controls	1.0	LS	\$3,250	\$3,250		
2. Sign Installation	50	Each	\$205	\$10,250		
Subtotal:				\$13,500	\$0	\$0
II. GENERAL ACTIONS/SITE PREPARATION						
1. Mobilization/Demobilization	1	LS	\$20,000	\$20,000		
2. Clear and Grub	5	Day	\$3,000	\$15,000		
3. Install, Maintain, and Remove Erosion and Sediment Controls	2000	LF	\$5	\$10,000		
4. Surveying	2	Day	\$1,500	\$3,000		
5. Pre-Activity Confirmation Sampling	110	Sample	\$250	\$27,500		
6. Decontamination Controls	1	LS	\$5,000	\$5,000		
Subtotal:				\$80,500	\$0	\$0
III. SOIL COVER INSTALLATION						
1. Import and Place Common Borrow	475	ton	\$30	\$14,250		
2. Import and Place Top Soil	300	CY	\$35	\$10,500		
3. Site Restoration	1	LS	\$5,000	\$5,000		
Subtotal:				\$29,750	\$0	\$0
IV. O&M, ANNUAL INSPECTION AND FIVE YEAR REVIEW						
1. Annual Inspection and Reporting	30	Each	\$2,800		\$84,000	\$34,700
2. Five Year Review	6	Each	\$15,000		\$90,000	\$37,200
3. Annual Mowing and General O&M	30	Each	\$1,000		\$30,000	\$12,400
3. Cap Repairs O&M (2.5 % of soil cover installation)	30	Each	\$744		\$22,313	\$9,200
Subtotal:				\$0	\$226,313	\$93,500
SUBTOTAL (I, II, III and IV))				\$123,750	\$226,313	\$93,500
V. IMPLEMENTATION COSTS						
1. Administration and Legal	5% of Capital Costs			\$6,200		
2. CMI Plan		1.0	LS	\$20,000	\$20,000	
3. Procurement	18% of Capital Costs			\$22,300		
4. Construction Management	12% of Capital Costs			\$14,900		
5. Completion Report		1.0	LS	\$15,000	\$15,000	
6. Cost Contingency	25% of Capital Costs			\$30,900		
7. O&M Contingency	15% of O&M Costs				\$33,900	\$14,000
Subtotal:				\$109,300	\$33,900	\$14,000
A. TOTAL CAPITAL COSTS				\$233,050		
B. TOTAL ANNUAL COSTS					\$260,213	
C. TOTAL PRESENT WORTH OF ANNUAL COSTS						\$107,500
TOTAL PRESENT WORTH OF CAPITAL AND ANNUAL COSTS (A + C)						\$341,000

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

Present worth cost is calculated using 7.0% interest in 2009 dollars.

Table 7-6A. Projected Costs for Response Action Alternative SL-4 to Industrial Levels at the BLA, New River Unit, Radford Army Ammunition Plant, Radford, Virginia.

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

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

Present worth cost is calculated using 7.0% interest in 2009 dollars.

Table 7-6B. Projected Costs for Response Action Alternative SL-4 to Residential Levels at the BLA, New River Unit, Radford Army Ammunition Plant, Radford, Virginia.

ITEM		QUANTITY	UNITS	UNIT COST	CAPITAL COST	ANNUAL O & M COST	PRESENT WORTH COST
I. ADMINISTRATIVE ACTIONS							
1. Land-Use Controls		0.0	LS	\$3,250	\$0		
Subtotal:					\$0	\$0	\$0
II. GENERAL ACTIONS/SITE PREPARATION							
1. Mobilization/Demobilization		1.0	LS	\$20,000	\$20,000		
2. Clear and Grub		7.0	Day	\$2,300	\$16,100		
3. Utility Clearance		1.0	Day	\$2,000	\$2,000		
4. Install, Maintain, and Remove Erosion and Sediment Controls		3000	LF	\$5	\$15,000		
5. XRF Rental		3	Week	\$3,500	\$10,500		
6. Surveying		1.0	Day	\$2,500	\$2,500		
7. MEC (UXO)		0.0	Day	\$2,800	\$0		
8. Decontamination Controls		1.0	LS	\$5,000	\$5,000		
Subtotal:					\$71,100	\$0	\$0
III. EXCAVATION, DISPOSAL, AND BACKFILL							
1. Excavation, Transportation and Disposal of Impacted Soil		1200	ton	\$167	\$200,400		
2. Excavation Confirmation Sampling		50.0	Each	\$500	\$25,000		
3. Import and Place Common Borrow		1200	ton	\$20	\$24,000		
4. Import and Place Top Soil		500	CY	\$28	\$14,000		
5. Waste Characterization		15	each	\$770	\$11,550		
6. Site Restoration		1.0	LS	\$7,500	\$7,500		
Subtotal:					\$282,450	\$0	\$0
SUBTOTAL (I, II, and III)					\$353,550	\$0	\$0
IV. IMPLEMENTATION COSTS							
1. Administration and Legal	5% of Capital Costs			\$20,000	\$17,700		
2. CMI Plan		1.0	LS	\$20,000	\$20,000		
3. Procurement	18% of Capital Costs				\$63,600		
4. Construction Management	12% of Capital Costs				\$42,400		
5. Completion Report		1.0	LS	\$15,000	\$15,000		
6. Cost Contingency	25% of Capital Costs				\$88,400		\$0
7. O&M Contingency	15% of O&M Costs					\$0	\$0
Subtotal:					\$247,100	\$0	\$0
A. TOTAL CAPITAL COSTS					\$600,650		
B. TOTAL ANNUAL COSTS						\$0	
C. TOTAL PRESENT WORTH OF ANNUAL COSTS							\$0
TOTAL PRESENT WORTH OF CAPITAL AND ANNUAL COSTS (A + C)							\$601,000

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

Present worth cost is calculated using 7.0% interest in 2009 dollars.

Table 7-7A. Projected Costs for Response Action Alternative SL-4 to Industrial Levels at the IAA, New River Unit, Radford Army Ammunition Plant, Radford, Virginia.

ITEM	QUANTITY	UNITS	UNIT COST	CAPITAL COST	ANNUAL O & M COST	PRESENT WORTH COST
I. ADMINISTRATIVE ACTIONS						
1. Land-Use Controls	1.0	LS	\$3,250	\$3,250		
2. Sign Installation	40.0	Each	\$205	\$8,200		
Subtotal:				\$11,450	\$0	\$0
II. GENERAL ACTIONS/SITE PREPARATION						
1. Mobilization/Demobilization	1.0	LS	\$20,000	\$20,000		
2. Clear and Grub	5.0	Day	\$3,000	\$15,000		
3. Utility Clearance	1.0	Day	\$2,000	\$2,000		
4. Install, Maintain, and Remove Erosion and Sediment Controls	2000	LF	\$5	\$10,000		
5. XRF Rental	2	Week	\$3,500	\$7,000		
6. Surveying	2.0	Day	\$2,500	\$5,000		
7. MEC (UXO)	0.0	Day	\$2,800	\$0		
8. Decontamination Controls	1.0	LS	\$5,000	\$5,000		
Subtotal:				\$64,000	\$0	\$0
III. EXCAVATION, DISPOSAL, AND BACKFILL						
1. Excavation, Transportation and Disposal of Impacted Soil	235	ton	\$167	\$39,245		
2. Excavation Confirmation Sampling	80.0	Each	\$500	\$40,000		
3. Import and Place Common Borrow	235	ton	\$20	\$4,700		
4. Import and Place Top Soil	100	CY	\$28	\$2,800		
5. Waste Characterization	10.0	each	\$770	\$7,700		
6. Site Restoration	1.0	LS	\$10,000	\$10,000		
Subtotal:				\$104,445	\$0	\$0
IV. O&M, ANNUAL INSPECTION AND FIVE YEAR REVIEW						
1. Annual Inspection and Reporting	30.0	Each	\$2,280		\$68,400	\$28,300
2. Five Year Review	6.0	Each	\$10,000		\$60,000	\$24,800
Subtotal:				\$0	\$128,400	\$53,100
SUBTOTAL (I, II, III, and IV)				\$179,895	\$128,400	\$53,100
V. IMPLEMENTATION COSTS						
1. Administration and Legal	5% of Capital Costs		\$20,000	\$9,000		
2. CMI Plan		1.0	LS	\$20,000	\$20,000	
3. Procurement	18% of Capital Costs			\$32,400		
4. Construction Management	12% of Capital Costs			\$21,600		
5. Completion Report		1.0	LS	\$15,000	\$15,000	
6. Cost Contingency	25% of Capital Costs			\$45,000		\$0
7. O&M Contingency	15% of O&M Costs				\$19,300	\$8,000
Subtotal:				\$143,000	\$19,300	\$8,000
A. TOTAL CAPITAL COSTS				\$322,895		
B. TOTAL ANNUAL COSTS					\$147,700	
C. TOTAL PRESENT WORTH OF ANNUAL COSTS						\$61,100
TOTAL PRESENT WORTH OF CAPITAL AND ANNUAL COSTS (A + C)						\$384,000

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

Present worth cost is calculated using 7.0% interest in 2009 dollars.

Table 7-7B. Projected Costs for Response Action Alternative SL-4 to Residential Levels at the IAA, New River Unit, Radford Army Ammunition Plant, Radford, Virginia.

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

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

Present worth cost is calculated using 7.0% interest in 2009 dollars.

Table 7-8. Summary of Individual Analysis of Response Action Alternatives for BLA and IAA Conductive Flooring, New River Unit, Radford Army Ammunition Plant, Radford, Virginia.

Alternative	Threshold Criteria		Balancing Criteria				Modifying Criteria		
	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume through Treatment	Short-Term Effectiveness	Implementability	Cost	State Acceptance	Community Acceptance
CF-1 - No Action	Does not reduce the risk to human health or the environment.	Does not apply.	Uncertain in the absence of monitoring, all current and potential future risks would remain the same.	Does not reduce the toxicity, mobility, or volume of COCs.	Does not pose any additional risks to the community, the workers, or the environment, but does not mitigate existing risks.	No implementability concerns.	\$0	Likely not acceptable	Likely not acceptable
CF-2 - Institutional Controls	Protects human helath by restricting land use and reducing exposure pathways. Will not reduce risk to the environment, but population level ecological effects are unlikely.	Meets chemical-specific, action-specific, and location-specific ARARs.	Moderately effective as long as institutional controls are properly implemented and maintained.	Does not reduce the toxicity, mobility, or volume of COCs.	Does not pose any additional risks to the community or the environment, but does not mitigate existing risks. Negligible risks to site works as part of fence and sign installation.	Readily implementable.	BLA: \$129,000 IAA: \$7136,000	Assessed in the ROD following comment on the RI/FS	Assessed in the ROD following comment on the RI/FS
CF-3 - Removal and Disposal of Asbestos Containing Flooring Materials	Protective of human health and the environment.	Meets chemical-specific, action-specific, and location-specific ARARs.	Highly Effective in the long term.	Reduces the mobility, transfers the volume and toxicity to a disposal facility.	Would result in material handling and potential exposure to asbestos dust. Necessary safeguards would need to be employed.	Readily implementable; although structural integrity two-story buildings at the BLA will have to be verified.	BLA: \$521,000 IAA: \$787,000	Assessed in the ROD following comment on the RI/FS	Assessed in the ROD following comment on the RI/FS
CF-4 - Removal of Degraded Flooring, Capping (Epoxy) of Intact Flooring, and Off-Site Disposal - BLA Only	Protective of human health and the environment.	Meets chemical-specific, action-specific, and location-specific ARARs.	Effective for reducing long term risk. Would require periodic monitoring and/or maintenance of the cap.	Reduces the mobility, relocates the volume and toxicity to a disposal facility.	Would result in material handling and potential exposure to asbestos dust. Necessary safeguards would need to be employed.	Readily implementable; although structural integrity two-story buildings at the BLA will have to be verified.	BLA: \$899,000	Assessed in the ROD following comment on the RI/FS	Assessed in the ROD following comment on the RI/FS

Table 7-9. Projected Costs for Response Action Alternative CF-2 at the BLA, New River Unit, Radford Army Ammunition Plant, Radford Virginia.

ITEM	QUANTITY	UNITS	UNIT COST	CAPITAL COST	ANNUAL O & M COST	PRESENT WORTH COST
I. ADMINISTRATIVE AND ENGINEERING ACTIONS						
1. Land-Use Restrictions/Controls	1.0	LS	\$4,250	\$4,250		
2. Fence Installation	0.0	LF	\$10	\$0		
3. Sign Installation	50.0	Each	\$205	\$10,250		
Subtotal:				\$14,500	\$0	\$0
II. ANNUAL INSPECTION AND FIVE YEAR REVIEW						
1. Annual Inspection and Reporting	30.0	Year	\$2,280		\$68,400	\$28,300
2. Five Year Review	6.0	Each	\$15,000		\$90,000	\$37,200
Subtotal:				\$0	\$158,400	\$65,500
SUBTOTAL (I and II)				\$14,500	\$158,400	\$65,500
III. IMPLEMENTATION COSTS						
1. Administration and Legal	5% of Capital Costs			\$700		
2. CMI Plan	1.0	LS	\$20,000	\$20,000		
3. Completion Report	1.0	LS	\$15,000	\$15,000		
4. Cost Contingency	25% of Capital Costs			\$3,600		
5. O&M Contingency	15% of O&M Costs				\$23,800	\$9,800
Subtotal:				\$39,300	\$23,800	\$9,800
A. TOTAL CAPITAL COSTS				\$53,800		
B. TOTAL ANNUAL COSTS					\$182,200	
C. TOTAL PRESENT WORTH OF ANNUAL COSTS						\$75,300
TOTAL PRESENT WORTH OF CAPITAL AND ANNUAL COSTS (A + C)						\$129,000

LS - Lump Sum

LF - Linear Foot

Present worth cost is calculated using 7.0% interest in 2009 dollars.

Assumptions presented in Appendix F

Table 7-10. Projected Costs for Response Action Alternative CF-2 at the IAA, New River Unit, Radford Army Ammunition Plant, Radford Virginia.

ITEM	QUANTITY	UNITS	UNIT COST	CAPITAL COST	ANNUAL O & M COST	PRESENT WORTH COST
I. ADMINISTRATIVE AND ENGINEERING ACTIONS						
1. Land-Use Restrictions/Controls	1.0	LS	\$4,250	\$4,250		
2. Fence Installation	0.0	LF	\$10	\$0		
3. Sign Installation	75.0	Each	\$205	\$15,375		
Subtotal:				\$19,625	\$0	\$0
II. ANNUAL INSPECTION AND FIVE YEAR REVIEW						
1. Annual Inspection and Reporting	30.0	Year	\$2,280		\$68,400	\$28,300
2. Five Year Review	6.0	Each	\$15,000		\$90,000	\$37,200
Subtotal:				\$0	\$158,400	\$65,500
SUBTOTAL (I and II)				\$19,625	\$158,400	\$65,500
III. IMPLEMENTATION COSTS						
1. Administration and Legal	5% of Capital Costs			\$1,000		
2. CMI Plan	1.0	LS	\$20,000	\$20,000		
3. Completion Report	1.0	LS	\$15,000	\$15,000		
4. Cost Contingency	25% of Capital Costs			\$4,900		
5. O&M Contingency	15% of O&M Costs				\$23,800	\$9,800
Subtotal:				\$40,900	\$23,800	\$9,800
A. TOTAL CAPITAL COSTS				\$60,525		
B. TOTAL ANNUAL COSTS					\$182,200	
C. TOTAL PRESENT WORTH OF ANNUAL COSTS						\$75,300
TOTAL PRESENT WORTH OF CAPITAL AND ANNUAL COSTS (A + C)						\$136,000

LS - Lump Sum

LF - Linear Foot

Present worth cost is calculated using 7.0% interest in 2009 dollars.

Assumptions presented in Appendix F

Table 7-11. Projected Costs for Response Action Alternative CF-3 at the BLA, New River Unit, Radford Army Ammunition Plant, Radford Virginia.

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

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

Present worth cost is calculated using 7.0% interest in 2009 dollars.
 Assumptions presented in Appendix F

Table 7-12. Projected Costs for Response Action Alternative CF-3 at the IAA, New River Unit, Radford Army Ammunition Plant, Radford Virginia.

ITEM	QUANTITY	UNITS	UNIT COST	CAPITAL COST	ANNUAL O & M COST	PRESENT WORTH COST
I. ADMINISTRATIVE ACTIONS						
1. Land-Use Controls	0	LS	\$4,250	\$0		
2. Pre-Work Coordination	1	LS	\$10,000	\$10,000		
Subtotal:				\$10,000	\$0	\$0
II. GENERAL ACTIONS/SITE PREPARATION						
1. Focused Asbestos Survey	0	LS	\$20,000	\$0		
2. Focused Asbestos Survey Report	0	LS	\$5,000	\$0		
3. Structural Evaluation of Bldg 404 and 407	0	LS	\$10,000	\$0		
4. Mobilization/Demobilization	1	LS	\$20,000	\$20,000		
5. Dust Suppression Systems and Air Monitoring	30	day	\$1,500	\$45,000		
6. Decontamination Controls	1	LS	\$5,000	\$5,000		
Subtotal:				\$70,000	\$0	\$0
III. CONDUCTIVE FLOOR ABATEMENT						
1. Remove Conductive Flooring	36000	SF	\$10	\$360,000		
2. Waste Characterization	7	each	\$770	\$5,390		
3. Transportation and Disposal	133	CY	\$100	\$13,333		
4. Site Restoration	1	LS	\$5,000	\$5,000		
Subtotal:				\$383,723	\$0	\$0
SUBTOTAL (I, II, and III)				\$463,723	\$0	\$0
IV. IMPLEMENTATION COSTS						
1. Administration and Legal			5% of Capital Costs	\$23,200		
2. CMI Plan	1	LS	\$25,000	\$25,000		
3. Procurement			18% of Capital Costs	\$83,500		
4. Construction Management			12% of Capital Costs	\$55,600		
5. Completion Report	1	LS	\$20,000	\$20,000		
6. Cost Contingency			25% of Capital Costs	\$115,900		\$0
7. O&M Contingency			15% of O&M Costs		\$0	\$0
Subtotal:				\$323,200	\$0	\$0
A. TOTAL CAPITAL COSTS				\$786,923		
B. TOTAL ANNUAL COSTS					\$0	
C. TOTAL PRESENT WORTH OF ANNUAL COSTS						\$0
TOTAL PRESENT WORTH OF CAPITAL AND ANNUAL COSTS (A + C)						\$787,000

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

Present worth cost is calculated using 7.0% interest in 2009 dollars.
 Assumptions presented in Appendix F

Table 7-13. Projected Costs for Response Action Alternative CF-4 at the BLA, New River Unit, Radford Army Ammunition Plant, Radford Virginia.

ITEM	QUANTITY	UNITS	UNIT COST	CAPITAL COST	ANNUAL O & M COST	PRESENT WORTH COST
I. ADMINISTRATIVE ACTIONS						
1. Land-Use Controls	1.0	LS	\$4,250	\$4,250		
2. Pre-Work Coordination	1.0	LS	\$10,000	\$10,000		
Subtotal:				\$14,250	\$0	\$0
II. GENERAL ACTIONS/SITE PREPARATION						
1. Focused Asbestos Survey	0	LS	\$20,000	\$0		
2. Focused Asbestos Survey Report	0	LS	\$5,000	\$0		
3. Structural Evaluation of Bldg 404 and 407	1	LS	\$10,000	\$10,000		
4. Mobilization/Demobilization	1	LS	\$20,000	\$20,000		
5. Dust Suppression Systems and Air Monitoring	30	day	\$1,500	\$45,000		
6. Decontamination Controls	1	LS	\$5,000	\$5,000		
Subtotal:				\$80,000	\$0	\$0
III. CONDUCTIVE FLOOR ABATEMENT						
1. Remove Degraded Conductive Flooring	15000	SF	\$10	\$150,000		
2. Seal/Paint Intact Conductive Flooring	4000	SF	\$10	\$40,000		
3. Waste Characterization	5	each	\$770	\$3,850		
4. Transportation and Disposal	50	CY	\$100	\$5,000		
5. Site Restoration	1	LS	\$5,000	\$5,000		
Subtotal:				\$203,850	\$0	\$0
IV. O&M, ANNUAL INSPECTION AND FIVE YEAR REVIEW						
1. Annual Inspection and Reporting	30	Each	\$2,280		\$68,400	\$28,300
2. Five Year Review	6	Each	\$15,000		\$90,000	\$37,200
3. O&M (5% of Conductive Flooring Sealing)	30	Each	\$2,000		\$60,000	\$24,800
Subtotal:				0	\$218,400	\$90,300
SUBTOTAL (I, II, III, and IV)				\$298,100	\$218,400	\$90,300
V. IMPLEMENTATION COSTS						
1. Administration and Legal	5% of Capital Costs			\$20,000	\$298,100	
2. CMI Plan	1	LS	\$20,000	\$20,000		
3. Procurement	18% of Capital Costs				\$53,700	
4. Construction Management	12% of Capital Costs				\$35,800	
5. Completion Report	1	LS	\$15,000	\$15,000		
6. Cost Contingency	25% of Capital Costs				\$74,500	\$0
7. O&M Contingency	15% of O&M Costs				\$32,800	\$13,500
Subtotal:				\$497,100	\$32,800	\$13,500
A. TOTAL CAPITAL COSTS				\$795,200		
B. TOTAL ANNUAL COSTS					\$251,200	
C. TOTAL PRESENT WORTH OF ANNUAL COSTS						\$103,800
TOTAL PRESENT WORTH OF CAPITAL AND ANNUAL COSTS (A + C)						\$899,000

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

Present worth cost is calculated using 7.0% interest in 2009 dollars.
 Assumptions presented in Appendix E

Table 7-14. Summary of Individual Analysis of Response Action Alternatives for BDDT Soils, New River Unit, Radford Army Ammunition Plant, Radford, Virginia.

Alternative	Threshold Criteria		Balancing Criteria				Modifying Criteria		
	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume through Treatment	Short-Term Effectiveness	Implementability	Cost	State Acceptance	Community Acceptance
BDDT SL-1 - No Action	Does not reduce the risk to human health or the environment.	Does not apply.	Uncertain in the absence of monitoring, all current and potential future risks would remain the same.	Does not reduce the toxicity, mobility, or volume of COCs.	Does not pose any additional risks to the community, the workers, or the environment, but does not mitigate existing risks.	No implementability concerns.	\$0	Likely not acceptable	Likely not acceptable
BDDT SL-2 - Institutional Controls	Protects human helath by restricting land use and reducing exposure pathways. Due to limited extent of COCs in soil, limited risks to environment exists.	Meets chemical-specific, action-specific, and location-specific ARARs.	Effective in the long term as long as the site remains unchagned and the institutional controls continue to be implemented.	Does not reduce the toxicity and volume of COCs. Will minimize mobility by vegetative cover and rip-rap preventing exposure of soils.	Does not pose any additional risks to the community or the environment. Negligible risks to site works as part of sign installation.	Readily implementable.	\$146,000	Assessed in the ROD following comment on the RI/FS	Assessed in the ROD following comment on the RI/FS
BDDT SL-3 - Partial Excavation, Transportation, Off-Site Disposal, and Institutional Controls	Protects human helath by restricting land use and reducing exposure pathways. Due to limited extent of COCs in soil, limited risks to environment exists.	Meets chemical-specific, action-specific, and location-specific ARARs.	Effective in the long term as long as the site remains unchagned and the institutional controls continue to be implemented.	Partially reduces the toxicity and volume of COCs for portions of the site where excavation occur. Will minimize mobility by vegetative cover and rip-rap preventing exposure of soils.	Would result in potential risks due to material handling, but the potential for exposure would be reduced through the use of suitable protective clothing and equipment and good construction practices.	Readily implementable using convential techniques and equipment. Topography may provide some work limitations.	\$537,000	Assessed in the ROD following comment on the RI/FS	Assessed in the ROD following comment on the RI/FS
BDDT SL-4 - Excavation, Transportation, Off-Site Disposal	Protectective as it removes the source and exposure pathway.	Meets chemical-specific, action-specific, and location-specific ARARs.	Highly effective at reducing long term risk.	Reduces the mobility, transfers the volume and toxicity to a disposal facility.	Would result in potential risks due to material handling, but the potential for exposure would be reduced through the use of suitable protective clothing and equipment and good construction practices.	Readily implementable using convential techniques and equipment. Topography may provide some work limitations.	\$856,000	Assessed in the ROD following comment on the RI/FS	Assessed in the ROD following comment on the RI/FS

Table 7-15. Projected Costs for Response Action Alternative BDDT SL-2 at the BDDT, New River Unit, Radford Army Ammunition Plant, Radford Virginia.

ITEM	QUANTITY	UNITS	UNIT COST	CAPITAL COST	ANNUAL O & M COST	PRESENT WORTH COST
I. ADMINISTRATIVE AND ENGINEERING ACTIONS						
1. Land-Use Controls	1.0	LS	\$4,250	\$4,250		
2. Sign Installation	5.0	Each	\$205	\$1,025		
Subtotal:				\$5,275	\$0	\$0
II. ANNUAL INSPECTION AND FIVE YEAR REVIEW						
1. Annual Inspection and Reporting	30.0	Year	\$2,280		\$68,400	\$28,300
2. Five Year Review	6.0	Each	\$15,000		\$90,000	\$37,200
3. Annual O&M	30.0	Year	\$2,000		\$60,000	\$24,800
Subtotal:				\$0	\$218,400	\$90,300
SUBTOTAL (I and II)				\$5,275	\$218,400	\$90,300
III. IMPLEMENTATION COSTS						
1. Administration and Legal			5% of Capital Costs	\$300		
2. CMI Plan	1.0	LS	\$20,000	\$20,000		
3. Completion Report	1.0	LS	\$15,000	\$15,000		
4. Cost Contingency			25% of Capital Costs	\$1,300		
5. O&M Contingency			15% of O&M Costs		\$32,800	\$13,600
Subtotal:				\$36,600	\$32,800	\$13,600
A. TOTAL CAPITAL COSTS				\$41,875		
B. TOTAL ANNUAL COSTS					\$251,200	
C. TOTAL PRESENT WORTH OF ANNUAL COSTS						\$103,900
TOTAL PRESENT WORTH OF CAPITAL AND ANNUAL COSTS (A + C)						\$146,000

LS - Lump Sum

LF - Linear Foot

Present worth cost is calculated using 7.0% interest in 2009 dollars.

Assumptions presented in Appendix F.

Table 7-16. Projected Costs for Response Action Alternative BDDT SL-3 at the BDDT, New River Unit, Radford Army Ammunition Plant, Radford, Virginia.

ITEM	QUANTITY	UNITS	UNIT COST	CAPITAL COST	ANNUAL O & M COST	PRESENT WORTH COST
I. ADMINISTRATIVE ACTIONS						
1. Land-Use Controls	1.0	LS	\$2,050	\$2,050		
2. Sign Installation	10.0	Each	\$205	\$2,050		
Subtotal:				\$4,100	\$0	\$0
II. GENERAL ACTIONS/SITE PREPARATION						
1. Mobilization/Demobilization	1	LS	\$25,000	\$25,000		
2. Utility Location	1	Day	\$2,000	\$2,000		
3. Install, Maintain, and Remove Erosion and Sediment Controls	500	LF	\$5	\$2,500		
4. Decontamination Pad (includes labor to perform decon)	1	LS	\$5,000	\$5,000		
5. Install, Maintain, and Remove Temporary Access Road	1	LS	\$15,000	\$15,000		
Subtotal:				\$49,500	\$0	\$0
III. SOIL EXCAVATION, TRANSPORTATION AND DISPOSAL						
1. Excavation of Down Gradient Depositional Area	7	Day	\$2,000	\$14,000		
2. Waste Characterization						
A. Decontamination water	2	each	\$1,000	\$2,000		
B. Soil	2	each	\$1,000	\$2,000		
3. Excavation/Confirmation Sampling - Laboratory Samples	40	each	\$215	\$8,600		
4. Transportation and Disposal of Soil	1000	ton	\$140	\$140,000		
5. Import, Place, and Compact Backfill	700	CY	\$20	\$14,000		
6. Site Restoration	1	LS	\$5,000	\$5,000		
Subtotal:				\$185,600	\$0	\$0
SUBTOTAL (I, II, and III)				\$239,200	\$0	\$0
IV. ANNUAL INSPECTION AND FIVE YEAR REVIEW						
1. Annual Inspection and Reporting	30.0	Year	\$2,280		\$68,400	\$28,300
2. Five Year Review	6.0	Each	\$15,000		\$90,000	\$37,200
3. Annual O&M	30.0	Year	\$2,000		\$60,000	\$24,800
Subtotal:				\$0	\$218,400	\$90,300
V. IMPLEMENTATION COSTS						
1. Administration and Legal				5% of Capital Costs	\$12,000	
2. CMI Plan	1	LS	\$30,000		\$30,000	
3. Procurement				18% of Capital Costs	\$43,100	
4. Construction Management				12% of Capital Costs	\$28,700	
5. Completion Report	1	LS	\$20,000		\$20,000	
6. Cost Contingency				25% of Capital Costs	\$59,800	
7. O&M Contingency				15% of O&M Costs	\$32,800	\$13,600
Subtotal:				\$193,600	\$32,800	\$13,600
A. TOTAL CAPITAL COSTS				\$432,800		
B. TOTAL ANNUAL COSTS					\$251,200	
C. TOTAL PRESENT WORTH OF ANNUAL COSTS						\$103,900
TOTAL PRESENT WORTH OF CAPITAL AND ANNUAL COSTS (A + C)						\$537,000
CY - Cubic Yard LF - Linear Foot LS - Lump Sum SY - Square Yard Present worth cost is calculated using 7.0% interest in 2009 dollars. Assumptions presented in Appendix F						

Table 7-17. Projected Costs for Response Action Alternative BDDT SL-4 at the BDDT, New River Unit, Radford Army Ammunition Plant, Radford, Virginia.

ITEM	QUANTITY	UNITS	UNIT COST	CAPITAL COST	ANNUAL O & M COST	PRESENT WORTH COST
I. ADMINISTRATIVE ACTIONS						
1. Land-Use Controls	0.0	LS	\$2,050	\$0		
2. Sign Installation	0.0	Each	\$205	\$0		
Subtotal:				\$0	\$0	\$0
II. GENERAL ACTIONS/SITE PREPARATION						
1. Mobilization/Demobilization	1	LS	\$25,000	\$25,000		
2. Utility Location	1	Day	\$2,000	\$2,000		
3. Install, Maintain, and Remove Erosion and Sediment Controls	1500	LF	\$5	\$7,500		
4. Decontamination Pad (includes labor to perform decon)	1	LS	\$5,000	\$5,000		
5. Install, Maintain, and Remove Temporary Access Road	1	LS	\$10,000	\$10,000		
6. Segregate Clean Rip-Rap from Trench for Reuse	5	Day	\$2,000	\$10,000		
Subtotal:				\$59,500	\$0	\$0
III. SOIL EXCAVATION, TRANSPORTATION AND DISPOSAL						
1. Excavation of Down Gradient Depositional Area and BDDT Trench	14	Day	\$2,000	\$28,000		
2. Waste Characterization						
A. Decontamination water	2	each	\$1,000	\$2,000		
B. Soil	5	each	\$1,000	\$5,000		
3. Excavation/Confirmation Sampling - Laboratory Samples	80	each	\$215	\$17,200		
4. Transportation and Disposal of Soil	2378	ton	\$140	\$332,920		
5. Import, Place, and Compact Backfill	1650	CY	\$20	\$33,000		
6. Import, Place, and Install Geotextile Fabric	10200	SF	\$1	\$11,424		
7. Place Stockpiled Rip-Rap Back into Trench	5	Day	\$2,000	\$10,000		
8. Site Restoration	1	LS	\$5,000	\$5,000		
Subtotal:				\$444,544	\$0	\$0
SUBTOTAL (I, II, and III)				\$504,044	\$0	\$0
IV. IMPLEMENTATION COSTS						
1. Administration and Legal	5% of Capital Costs			\$25,200		
2. CMI Plan		1	LS	\$30,000	\$30,000	
3. Procurement	18% of Capital Costs			\$90,700		
4. Construction Management	12% of Capital Costs			\$60,500		
5. Completion Report		1	LS	\$20,000	\$20,000	
6. Cost Contingency	25% of Capital Costs			\$126,000		
7. O&M Contingency	15% of O&M Costs				\$0	\$0
Subtotal:				\$352,400	\$0	\$0
A. TOTAL CAPITAL COSTS				\$856,444		
B. TOTAL ANNUAL COSTS					\$0	
C. TOTAL PRESENT WORTH OF ANNUAL COSTS						\$0
TOTAL PRESENT WORTH OF CAPITAL AND ANNUAL COSTS (A + C)						\$856,000

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

Present worth cost is calculated using 7.0% interest in 2009 dollars.
Assumptions presented in Appendix F

Table 7-18. Summary of Individual Analysis of Response Action Alternatives for WBG Sediment, New River Unit, Radford Army Ammunition Plant, Radford, Virginia.

Alternative	Threshold Criteria		Balancing Criteria				Modifying Criteria		
	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume through Treatment	Short-Term Effectiveness	Implementability	Cost	State Acceptance	Community Acceptance
SD-1 - No Action	Does not reduce the risk to human health or the environment.	Does not apply.	Uncertain in the absence of monitoring, all current and potential future risks would remain the same.	Does not reduce the toxicity, mobility, or volume of COCs.	Does not pose any additional risks to the community, the workers, or the environment, but does not mitigate existing risks.	No implementability concerns.	\$0	Likely not acceptable	Likely not acceptable
SD-2 - Institutional Controls	Protects human helath by restricting land use and reducing exposure pathways. Due to limited extent of COCs in sediment, limited risks to environment exists.	Meets chemical-specific, action-specific, and location-specific ARARs.	Effective in the long term as long as the site remains unchagned and the institutional controls continue to be implemented.	Does not reduce the toxicity and volume of COCs. May help minimize mobility by minimizing disturbance of sediments. Sampling data indicates COCs are relatively immobile in sediment as a result of the still waters in the pond.	Does not pose any additional risks to the community or the environment. Negligible risks to site works as part of fence and sign installation.	Readily implementable.	\$119,000	Assessed in the ROD following comment on the RI/FS	Assessed in the ROD following comment on the RI/FS
SD-3 - Excavation, Transportation, Off-Site Disposal of Sediments	Protectective as it removes the source and exposure pathway.	Meets chemical-specific, action-specific, and location-specific ARARs.	Highly effective at reducing long term risk.	Reduces the mobility, transfers the volume and toxicity to a disposal facility.	Would result in potential risks due to material handling, but the potential for exposure would be reduced through the use of suitable protective clothing and equipment and good construction practices.	Readily implementable using convential techniques and equipment. Topography may provide some work limitations.	\$282,000	Assessed in the ROD following comment on the RI/FS	Assessed in the ROD following comment on the RI/FS

Table 7-19. Projected Costs for Response Action Alternative SD-2 at the WBG, New River Unit, Radford Army Ammunition Plant, Radford Virginia.

ITEM	QUANTITY	UNITS	UNIT COST	CAPITAL COST	ANNUAL O & M COST	PRESENT WORTH COST
I. ADMINISTRATIVE AND ENGINEERING ACTIONS						
1. Land-Use Controls	1.0	LS	\$7,750	\$7,750		
2. Sign Installation	15.0	Each	\$205	\$3,075		
Subtotal:				\$10,825	\$0	\$0
II. ANNUAL INSPECTION AND FIVE YEAR REVIEW						
1. Annual Inspection and Reporting	30.0	Year	\$2,280		\$68,400	\$28,300
2. Five Year Review	6.0	Each	\$15,000		\$90,000	\$37,200
Subtotal:				\$0	\$158,400	\$65,500
SUBTOTAL (I and II)				\$10,825	\$158,400	\$65,500
III. IMPLEMENTATION COSTS						
1. Administration and Legal			5% of Capital Costs		\$500	
2. CMI Plan	1.0	LS	\$20,000	\$20,000		
3. Completion Report	1.0	LS	\$10,000	\$10,000		
4. Cost Contingency			25% of Capital Costs		\$2,700	
5. O&M Contingency			15% of O&M Costs		\$23,800	\$9,800
Subtotal:				\$33,200	\$23,800	\$9,800
A. TOTAL CAPITAL COSTS				\$44,025		
B. TOTAL ANNUAL COSTS					\$182,200	
C. TOTAL PRESENT WORTH OF ANNUAL COSTS						\$75,300
TOTAL PRESENT WORTH OF CAPITAL AND ANNUAL COSTS (A + C)						\$119,000

LS - Lump Sum

LF - Linear Foot

Present worth cost is calculated using 7.0% interest in 2009 dollars.

Assumptions presented in Appendix f

Table 7-20. Projected Costs for Response Action Alternative SD-3 at the WBG, New River Unit, Radford Army Ammunition Plant, Radford, Virginia.

ITEM	QUANTITY	UNITS	UNIT COST	CAPITAL COST	ANNUAL O & M COST	PRESENT WORTH COST
I. ADMINISTRATIVE ACTIONS						
1. Land-Use Controls	0.0	LS	\$2,050	\$0		
2. Pre-Work Coordination	1.0	LS	\$5,000	\$5,000		
Subtotal:				\$5,000	\$0	\$0
II. GENERAL ACTIONS/SITE PREPARATION						
1. Mobilization/Demobilization	1	LS	\$25,000	\$25,000		
2. Clear and Grub	2	Day	\$3,000	\$6,000		
3. Utility Location	1	Day	\$2,000	\$2,000		
4. Install, Maintain, and Remove Erosion and Sediment Controls	500	LF	\$5	\$2,500		
5. Surveying	2	Day	\$1,500	\$3,000		
6. Decontamination Pad (includes labor to perform decon)	1	LS	\$5,000	\$5,000		
Subtotal:				\$43,500	\$0	\$0
III. SEDIMENT EXCAVATION, DEWATERING, TRANSPORT AND DISPOSAL						
1. Aqua Barrier Installation (includes \$2000 install fee)	250	LF	\$75	\$20,750		
2. Excavation of Sediment via Excavator	2	Day	\$2,000	\$4,000		
3. Stabilize Sediment with Portland Cement	1	LS	\$5,000	\$5,000		
4. Waste Characterization						
A. Decontamination water	2	each	\$1,000	\$2,000		
B. Stabilized Sediment	5	each	\$1,000	\$5,000		
5. Excavation/Confirmation Sampling - Laboratory Samples	12	each	\$215	\$2,580		
6. XRF Rental for Field Sampling	1	Week	\$5,000	\$5,000		
7. Dewatering/Water Treatment Equipment	1	Week	\$5,000	\$5,000		
8. Transportation and Disposal of Stabilized Sediment	160	ton	\$265	\$42,400		
9. Site Restoration	1	LS	\$5,000	\$5,000		
10. Backfill	0	CY	\$35	\$0		
Subtotal:				\$96,730	\$0	\$0
SUBTOTAL (I, II, and III)				\$145,230	\$0	\$0
IV. IMPLEMENTATION COSTS						
1. Administration and Legal				5% of Capital Costs	\$7,300	
2. CMI Plan	1	LS	\$30,000		\$30,000	
3. Procurement				18% of Capital Costs	\$26,100	
4. Construction Management				12% of Capital Costs	\$17,400	
5. Completion Report	1	LS	\$20,000		\$20,000	
6. Cost Contingency				25% of Capital Costs	\$36,300	
7. O&M Contingency				15% of O&M Costs	\$0	\$0
Subtotal:				\$137,100	\$0	\$0
A. TOTAL CAPITAL COSTS				\$282,330		
B. TOTAL ANNUAL COSTS					\$0	
C. TOTAL PRESENT WORTH OF ANNUAL COSTS						\$0
TOTAL PRESENT WORTH OF CAPITAL AND ANNUAL COSTS (A + C)						\$282,000

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

Present worth cost is calculated using 7.0% interest in 2009 dollars.
Assumptions presented in Appendix E

Table 8-1. Comparative Analysis of Response Action Alternatives for BLA and IAA Soil, New River Unit, Radford Army Ammunition Plant, Radford, Virginia.

Evaluation Criteria	Alternative SL-1 No Action	Alternative SL-2 Institutional Controls	Alternative SL-3 Vegetative Soil Cover and Institutional Controls	Alternative SL-4 Excavation, Transportation, and Off-Site Disposal
Threshold Criteria				
1) Overall Protection of Human Health and the Environment	Poor. Does not provide overall protection of human health or the environment. Does not minimize, reduce, or control COC impacts in surface soil or associated exposure risks.	Adequate. Protective of human health and the environment by eliminating potential exposure to COCs in surface soil.	Good. Protective of human health and the environment by mitigating potential exposure pathways.	Excellent. Protective of human health and the environment by mitigating potential exposure pathways. Allows for the option to remediate to residential or industrial standards.
2) Compliance with ARARs	There are no chemical-specific ARARs for COCs in soil. Complies with action-specific and location-specific ARARs.	There are no chemical-specific ARARs for COCs in soil. Complies with action-specific and location-specific ARARs.	There are no chemical-specific ARARs for COCs in soil. Complies with action-specific and location-specific ARARs.	There are no chemical-specific ARARs for COCs in soil. Complies with action-specific and location-specific ARARs.
Balancing Criteria				
3) Long-Term Reliability and Effectiveness	Poor. Not effective, poor long-term reliability. Does not mitigate potential risks at the site.	Good long-term reliability and effectiveness. Maintains current land use with acceptable risks, manages exposure pathways, and ensures land use does not change in the future.	Good long-term reliability and effectiveness at mitigating exposure pathways. Institutional controls necessary because COCs left in place and need to maintain cover.	Excellent long-term reliability and effectiveness at mitigating exposure pathways. Institutional controls necessary unless soil excavated to residential screening levels.
4) Reduction of Toxicity, Mobility, or Volume of Wastes	Does not reduce toxicity, mobility, or volume of wastes in surface soil.	Adequate. Does not reduce toxicity or volume of wastes in surface soil. Could help minimize mobility by controlling soil disturbance that could lead to migration.	Good. Reduces mobility of COCs present in surface soil. Does not reduce toxicity or volume of wastes in surface soil.	Excellent. Reduces toxicity, mobility, and volume of wastes in surface soil at the site. Toxicity and volume transferred to disposal facility.
5) Short-Term Effectiveness	Poor. Not effective in the short-term.	Provides excellent short-term effectiveness. Mitigates risk at site by maintaining current land use and managing exposure pathways.	Provides good short-term effectiveness. Mitigates risk at site by managing exposure pathways. However, material handling slightly reduces short-term effectiveness.	Provides good short-term effectiveness. Mitigates risk at site by managing exposure pathways. However, dust generation and material handling slightly reduces short-term effectiveness.
6) Implementability	Excellent implementability due to lack of technical components.	Excellent implementability. Requires minimal engineering and permitting.	Good implementability. Will require engineering design.	Good. Will require engineering design. May be more difficult to implement if soil excavated to residential levels due to larger areas and volumes of waste to be handled.
7) Cost	No cost.	Present Value Costs BLA: \$188,000 IAA: \$223,000	Present Value Costs BLA: \$314,000 IAA: \$341,000	Present Value Costs BLA (Industrial): \$312,000 BLA (Residential): \$601,000 IAA (Industrial): \$384,000 IAA (Residential): \$335,000
Modifying Criteria				
8) State Acceptance	Likely not acceptable.	Assessed in the ROD following comment of the RI/FS.	Assessed in the ROD following comment of the RI/FS.	Assessed in the ROD following comment of the RI/FS.
9) Community Acceptance	Likely not acceptable.	Assessed in the ROD following comment of the RI/FS.	Assessed in the ROD following comment of the RI/FS.	Assessed in the ROD following comment of the RI/FS.

Notes:

-All costs are estimated to an accuracy of +50 percent to -30 percent (USEPA, 2000)

Abbreviations:

ARAR Applicable or Relevant and Appropriate Requirement.
COC Constituents of Concern.
O&M operation and maintenance
USEPA U.S. Environmental Protection Agency.

**Table 8-2. Comparative Analysis of Response Action Alternatives for BLA and IAA Conductive Flooring,
New River Unit, Radford Army Ammunition Plant, Radford, Virginia.**

Evaluation Criteria	Alternative BLA CF-1/IAA CF-1	Alternative BLA CF-2/IAA CF-2	Alternative BLA CF-3/IAA CF-3	Alternative BLA CF-4
	No Action	Institutional Controls	Removal of Degraded Flooring and Off-Site Disposal	Removal of Degraded Flooring, Capping (Epoxy) Intact Flooring, and Off-Site Disposal
Threshold Criteria				
1) Overall Protection of Human Health and the Environment	Does not provide overall protection of human health or the environment.	Adequate. Protective of human health. Does not prevent release of COCs to the environment.	Excellent. Protective of human health and the environment by mitigating potential exposure pathways through complete removal.	Excellent. Protective of human health and the environment by mitigating potential exposure pathways through complete removal or containment.
2) Compliance with ARARs	There are no chemical-specific ARARs for COCs in flooring. Complies with action-specific and location-specific ARARs.	There are no chemical-specific ARARs for COCs in flooring. Complies with action-specific and location-specific ARARs.	There are no chemical-specific ARARs for COCs in flooring. Complies with action-specific and location-specific ARARs.	There are no chemical-specific ARARs for COCs in flooring. Complies with action-specific and location-specific ARARs.
Balancing Criteria				
3) Long-Term Reliability and Effectiveness	Poor. Not effective, poor long-term reliability. Does not mitigate potential risks at the site.	Adequate long-term reliability and effectiveness. Maintains current land use with acceptable risks, manages exposure pathways, and ensures land use does not change in the future. Does not prevent continued leaching of COCs to surrounding soils.	Excellent long-term reliability and effectiveness at mitigating exposure pathways by completely removing the source material.	Good long-term reliability and effectiveness at mitigating exposure pathways by completely removing or capping the source material. Epoxy cap would require periodic maintenance and inspection.
4) Reduction of Toxicity, Mobility, or Volume of Wastes	Does not reduce toxicity, mobility, or volume of wastes at the site.	Adequate. Does not reduce toxicity or volume of wastes at the site. Will reduce mobility by minimizing disturbance of the flooring material that could contribute to mobility.	Excellent. Reduces toxicity, mobility, and volume of wastes at the site. Toxicity and volume transferred to disposal facility.	Good. Reduces toxicity, mobility, and volume of wastes at the site. Toxicity and volume transferred to disposal facility.
5) Short-Term Effectiveness	Not effective in the short-term.	Provides excellent short-term effectiveness. Mitigates risk at site by maintaining current land use and managing exposure pathways. Does not pose risk to community, workers, or the environment.	Provides good short-term effectiveness. Mitigates risk at site by managing exposure pathways. However, dust generation and material handling slightly reduces short-term effectiveness.	Provides good short-term effectiveness. Mitigates risk at site by managing exposure pathways. However, dust generation and material handling slightly reduces short-term effectiveness.
6) Implementability	Excellent implementability due to lack of technical components.	Excellent implementability. Requires minimal engineering and permitting.	Adequate implementability. Will require engineering safeguards, permitting, and health and safety protocols.	Adequate implementability. Will require engineering safeguards, permitting, and health and safety protocols.
7) Cost	No cost.	Present Value Costs BLA: \$129,000 IAA: \$136,000	Present Value Costs BLA: \$521,000 IAA: \$ 787,000	Present Value Costs BLA: \$899,000
Modifying Criteria				
8) State Acceptance	Likely not acceptable.	Assessed in the ROD following comment of the RI/FS.	Assessed in the ROD following comment of the RI/FS.	Assessed in the ROD following comment of the RI/FS.
9) Community Acceptance	Likely not acceptable.	Assessed in the ROD following comment of the RI/FS.	Assessed in the ROD following comment of the RI/FS.	Assessed in the ROD following comment of the RI/FS.

Notes:

-All costs are estimated to an accuracy of +50 percent to -30 percent (USEPA, 2000)

Abbreviations:

ARAR	Applicable or Relevant and Appropriate Requirement.
COC	Constituents of Concern.
O&M	operation and maintenance
USEPA	U.S. Environmental Protection Agency.

Table 8-3. Comparative Analysis of Response Action Alternatives for BDDT Soil, New River Unit, Radford Army Ammunition Plant, Radford, Virginia.

Evaluation Criteria	<u>Alternative SL-1</u> No Action	<u>Alternative SL-2</u> Institutional Controls	<u>Alternative SL-3</u> Partial Excavation, Transportation, Off-Site Disposal, and Institutional Controls	<u>Alternative SL-4</u> Excavation, Transportation, and Off-Site Disposal
Threshold Criteria				
1) Overall Protection of Human Health and the Environment	Poor. Does not provide overall protection of human health or the environment. Does not minimize, reduce, or control COC impacts in surface soil or associated exposure risks.	Adequate. Protective of human health and the environment by eliminating potential exposure to COCs in surface soil.	Adequate. Protective of human health and the environment by eliminating potential exposure pathways.	Excellent. Protective of human health and the environment by mitigating potential exposure pathways.
2) Compliance with ARARs	There are no chemical-specific ARARs for COCs in soil. Complies with action-specific and location-specific ARARs.	There are no chemical-specific ARARs for COCs in soil. Complies with action-specific and location-specific ARARs.	There are no chemical-specific ARARs for COCs in soil. Complies with action-specific and location-specific ARARs.	There are no chemical-specific ARARs for COCs in soil. Complies with action-specific and location-specific ARARs.
Balancing Criteria				
3) Long-Term Reliability and Effectiveness	Poor. Not effective, poor long-term reliability. Does not mitigate potential risks at the site.	Good long-term reliability and effectiveness. Maintains current land use with acceptable risks, manages exposure pathways, and ensures land use does not change in the future.	Good long-term reliability and effectiveness at mitigating exposure pathways. Institutional controls necessary for soil remaining within the BDDT trench.	Excellent long-term reliability and effectiveness at mitigating exposure pathways. Institutional controls necessary unless soil excavated to residential screening levels.
4) Reduction of Toxicity, Mobility, or Volume of Wastes	Does not reduce toxicity, mobility, or volume of wastes in surface soil.	Adequate. Does not reduce toxicity or volume of wastes in surface soil. Minimize's mobility by controlling soil disturbance that could lead to migration.	Adequate. Reduces toxicity, mobility, and volume of wastes in portions of the site that are excavated. Toxicity and volume transferred to disposal facility.	Excellent. Reduces toxicity, mobility, and volume of wastes in surface soil at the site. Toxicity and volume transferred to disposal facility.
5) Short-Term Effectiveness	Poor. Not effective in the short-term.	Provides excellent short-term effectiveness. Mitigates risk at site by maintaining current land use and managing exposure pathways.	Provides good short-term effectiveness. Mitigates risk at site by managing exposure pathways. However, dust generation and material handling slightly reduces short-term effectiveness.	Provides good short-term effectiveness. Mitigates risk at site by managing exposure pathways. However, dust generation and material handling slightly reduces short-term effectiveness.
6) Implementability	Excellent implementability due to lack of technical components.	Excellent implementability. Requires minimal engineering and permitting.	Good. Will require engineering design.	Good. Will require engineering design.
7) Cost	No cost.	Present Value Costs \$146,000	Present Value Costs \$537,000	Present Value Costs \$856,000
Modifying Criteria				
8) State Acceptance	Likely not acceptable.	Assessed in the ROD following comment of the RI/FS.	Assessed in the ROD following comment of the RI/FS.	Assessed in the ROD following comment of the RI/FS.
9) Community Acceptance	Likely not acceptable.	Assessed in the ROD following comment of the RI/FS.	Assessed in the ROD following comment of the RI/FS.	Assessed in the ROD following comment of the RI/FS.

Notes:

-All costs are estimated to an accuracy of +50 percent to -30 percent (USEPA, 2000)

Abbreviations:

ARAR Applicable or Relevant and Appropriate Requirement.
COC Constituents of Concern.
O&M operation and maintenance
USEPA U.S. Environmental Protection Agency.

Table 8-4. Comparative Analysis of Response Action Alternatives for WBG Sediment, New River Unit, Radford Army Ammunition Plant, Radford, Virginia.

Evaluation Criteria	<u>Alternative SD-1</u>	<u>Alternative SD-2</u>	<u>Alternative SD-3</u>
	No Action	Institutional Controls	Excavation, Transportation, and Off-Site Disposal
Threshold Criteria			
1) Overall Protection of Human Health and the Environment	Does not provide overall protection of human health. No environmental risks are present at the site. Does not minimize, reduce, or control COC impacts in sediment or associated exposure risks.	Good. Protective of human health for military/industrial land uses. No environmental risks are present at the site.	Good. Protective of human health by removal of sediments to residential standards. No environmental risks are present at the site.
2) Compliance with ARARs	There are no chemical-specific ARARs for COCs in sediment. Risk-based limits were developed. Complies with action-specific and location-specific ARARs.	There are no chemical-specific ARARs for COCs in sediment. Risk-based limits were developed. Complies with action-specific and location-specific ARARs.	There are no chemical-specific ARARs for COCs in sediment. Risk-based limits were developed. Complies with action-specific and location-specific ARARs.
Balancing Criteria			
3) Long-Term Reliability and Effectiveness	Not effective, poor long-term reliability. Does not mitigate potential risks at the site.	Good long-term reliability and effectiveness. Maintains current land use with acceptable risks, manages exposure pathways, and ensures land use does not change in the future.	Excellent long-term reliability and effectiveness at mitigating exposure pathways. Eliminates the source of contamination.
4) Reduction of Toxicity, Mobility, or Volume of Wastes	Does not reduce toxicity, mobility, or volume of wastes in sediment.	Good. Does not reduce toxicity or volume of wastes in sediment. Does reduce mobility by controlling activities that could disturb sediment and/or mobilize contaminants. Mobility currently nil due to still waters in pond.	Good. Reduces toxicity, mobility, and volume of wastes in site sediment. Toxicity and volume transferred to disposal facility.
5) Short-Term Effectiveness	Not effective in the short-term.	Provides excellent short-term effectiveness. Mitigates risk at site by maintaining current land use and managing exposure pathways. Does not pose risk to community, workers, or the environment.	Provides good short-term effectiveness. Mitigates risk at site by managing exposure pathways. However, waste generation and material handling slightly reduces short-term effectiveness.
6) Implementability	Excellent implementability due to lack of technical components.	Excellent implementability. Requires minimal engineering effort.	Adequate implementability. Will require engineering design. Will also require site preparation work due to topography and site conditions..
7) Cost	No cost.	Present Value: \$119,000	Present Value: \$282,000
Modifying Criteria			
8) State Acceptance	Likely not acceptable.	Assessed in the ROD following comment of the RI/FS.	Assessed in the ROD following comment of the RI/FS.
9) Community Acceptance	Likely not acceptable.	Assessed in the ROD following comment of the RI/FS.	Assessed in the ROD following comment of the RI/FS.

Notes:

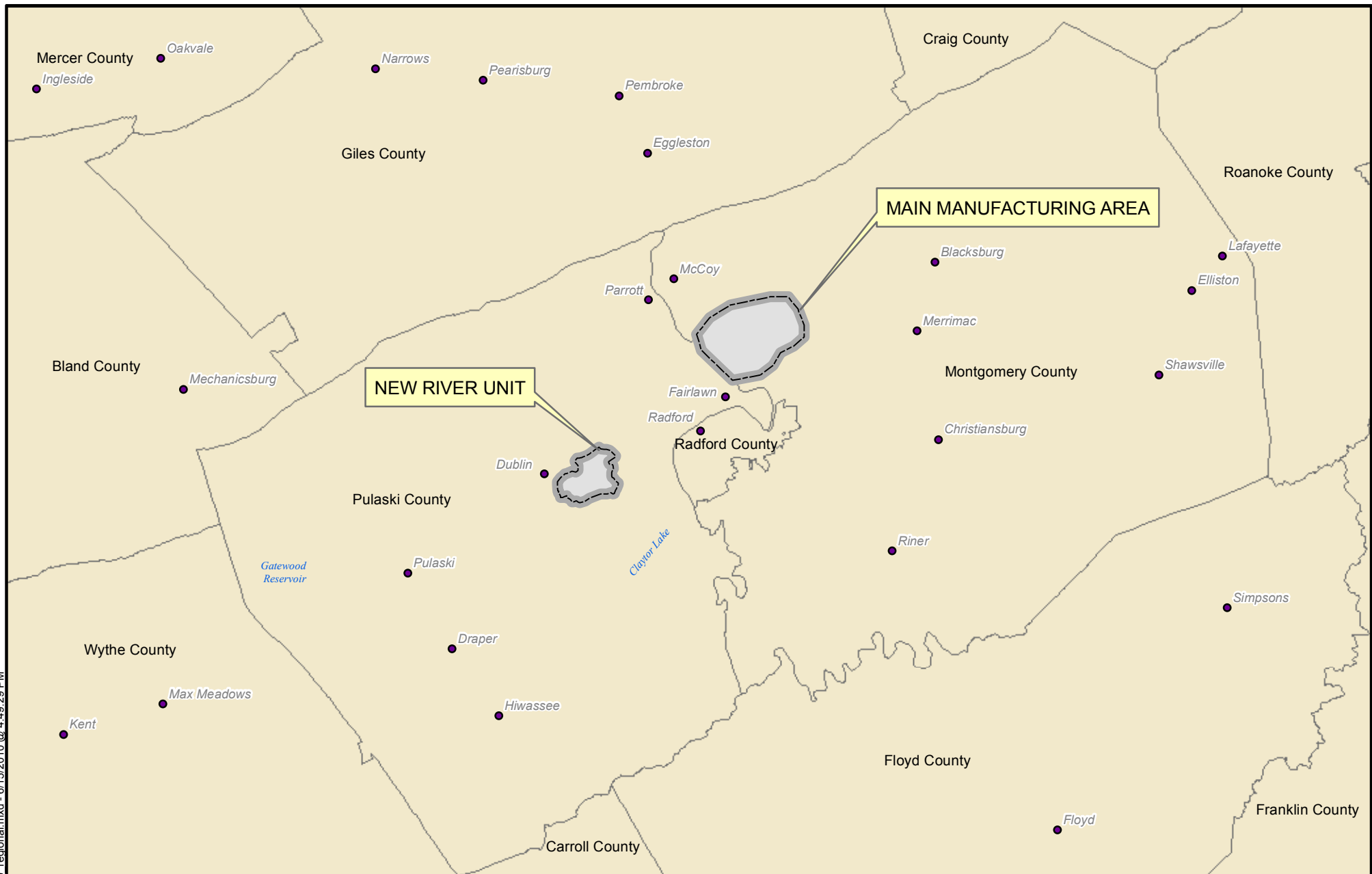
-All costs are estimated to an accuracy of +50 percent to -30 percent (USEPA, 2000)

Abbreviations:

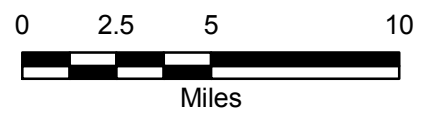
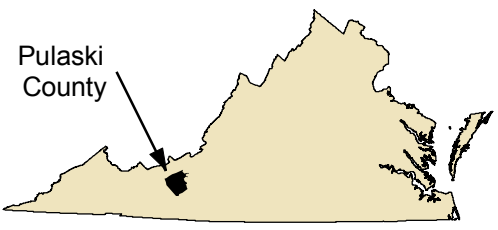
ARAR Applicable or Relevant and Appropriate Requirement.
COC Constituents of Concern.
O&M operation and maintenance
USEPA U.S. Environmental Protection Agency.

Figures

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Pulaski County

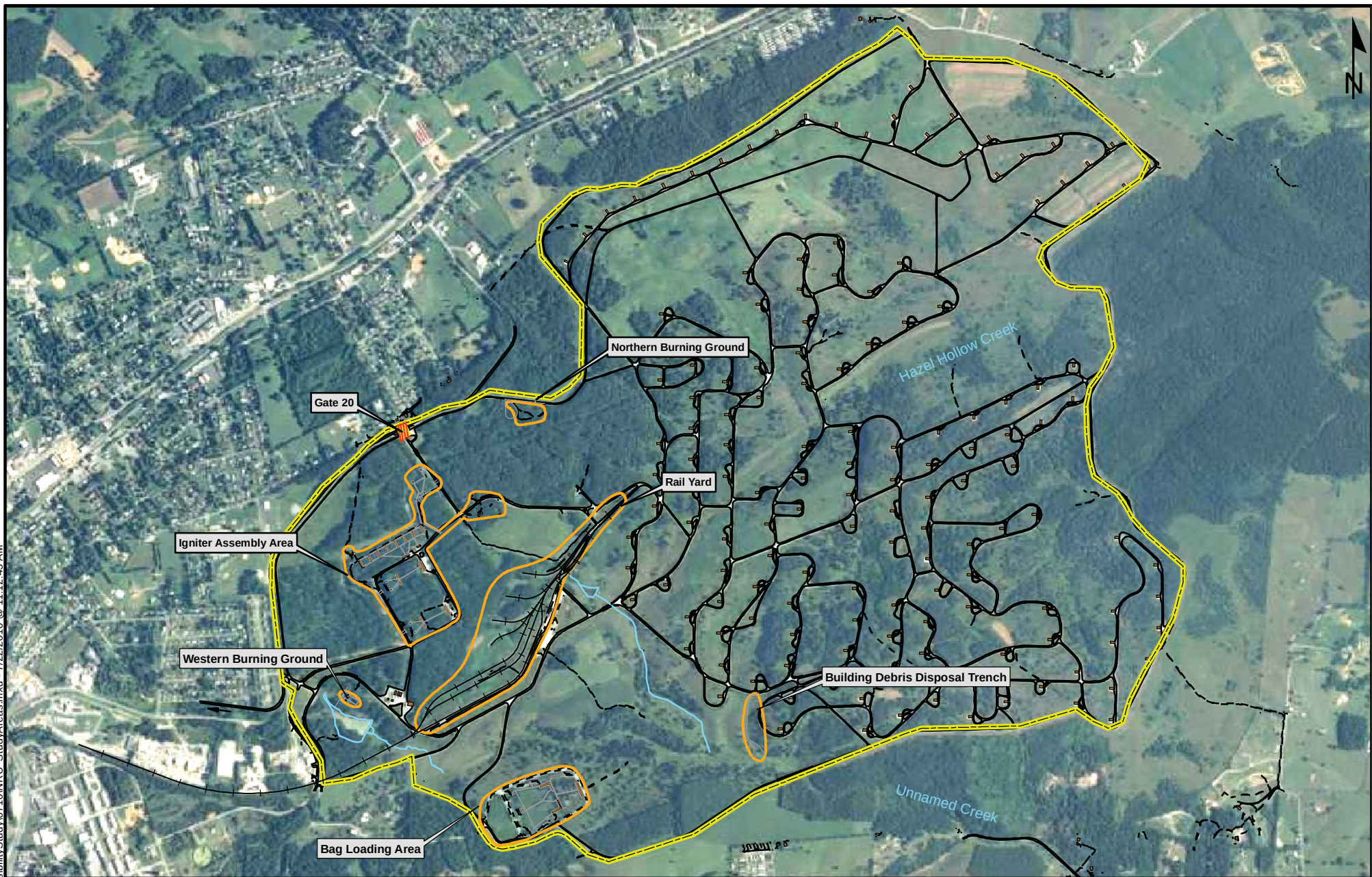


RADFORD ARMY AMMUNITION PLANT
RADFORD, VA

**RFAAP - NRU
FACILITY LOCATION**



FIGURE
1-1

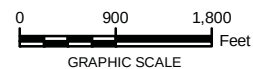


LEGEND

— SITE FEATURES	- - - DIRT ROADS
+ RAIL SPUR	ORANGE STUDY AREA
— SURFACE WATER	YELLOW NRU BOUNDARY
— PAVED ROADS	BROWN BUILDINGS

NOTES:

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



RADFORD ARMY AMMUNITION PLANT
RADFORD, VA

**RFAAP - NRU
STUDY AREAS**



FIGURE
2-1

XREFS:

IMAGES: PROJECTNAME: ----
ARCADIS\linecwf.tif
NRU bloc-2.jpg

- BEDROCK
- CONOCOCHEAQUE FORMATION
 - PRINCIPALLY BLUE-GRAY LIMESTONE AND DOLOMITE W/ THIN BEDS OF SANDSTONE, SILTSTONE AND SHALE
 - FAULTED, STRUCTURALLY COMPLEX, KARST WEATHERED
 - HUNDREDS OF FEET THICK

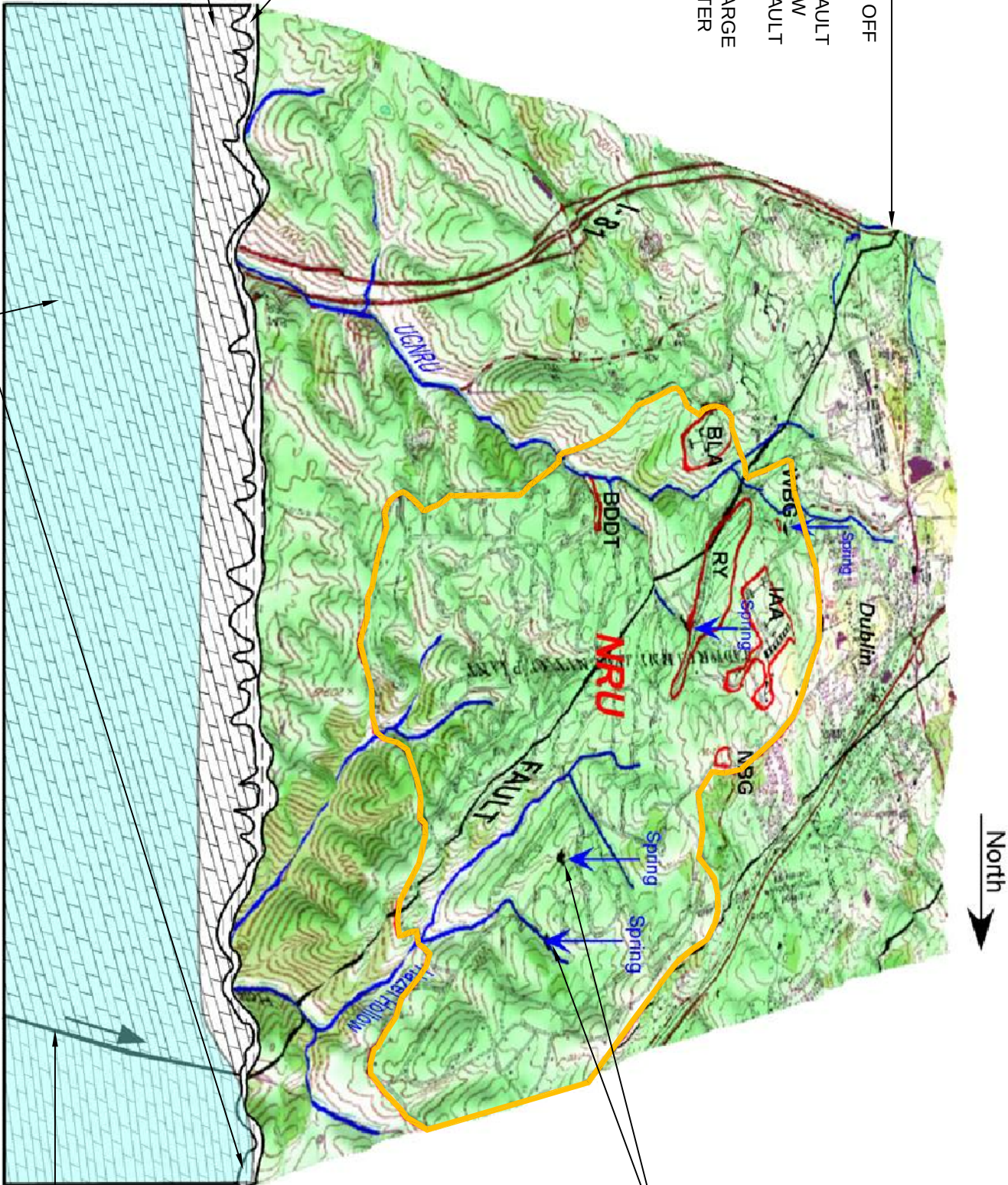
- OVERBURDEN/RESIDUUM
- DOMINANTLY CLAY AND SILT
 - RANGES IN THICKNESS ACROSS FACILITY
 - 0 FT THICK IN MANY PLACES
 - < 5 FT THICK AT THE BDDT
 - > 55 FT THICK AT THE NBG

- FAULT
- GROUNDWATER ELEVATIONS DROP OFF ON SOUTH SIDE OF FAULT
 - FAULT RESTRICTS FLOW ACROSS FAULT SCARP AND CONFINES THE SHALLOW FLOW SYSTEM IN THE NORTHERN FAULT BLOCK
 - EXPLAINS LINE OF SPRINGS/ DISCHARGE POINTS FOR SHALLOW GROUNDWATER SYSTEM

- GROUNDWATER
- SATURATION IN OVERBURDEN LOCALIZED IN BEDROCK DEPRESSIONS
 - KARST SOLUTION POROSITY DOMINATES FACILITY WIDE GW SYSTEM
 - DEPTH TO GROUNDWATER INCREASES ON SOUTH SIDE OF FAULT

- SPRINGS
- DISCHARGE POINTS FOR SHALLOW GROUNDWATER SYSTEM IN BEDROCK
- TOP OF BEDROCK
- PINNACLED AND GROOVED
 - DEPTH VARIES ACROSS SITE
 - UPPER ZONE IS AN EPIKARST

- GENERAL NOTES
- HUMMOCKY TERRAIN
 - LOW PERMEABILITY RESIDUUM INHIBITS DIFFUSE GROUNDWATER RECHARGE
 - GROUNDWATER RECHARGE CONCENTRATED IN SINKHOLES



NYC: SER 4/AIT: DB.TBR LD: TBR P/C: TL
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Legend

— PAVED ROADS
- - - DIRT ROADS
— SITE FEATURES

— SURFACE WATER
— FORMER RAISED WALKWAY PLATFORMS

— STUDY AREA
— INSTALLATION BOUNDARY

BUILDINGS

— NO CONDUCTIVE FLOORING
— YES CONDUCTIVE FLOORING

NOTE:
BUILDINGS 404 AND 405 ARE TWO STORY BUILDINGS

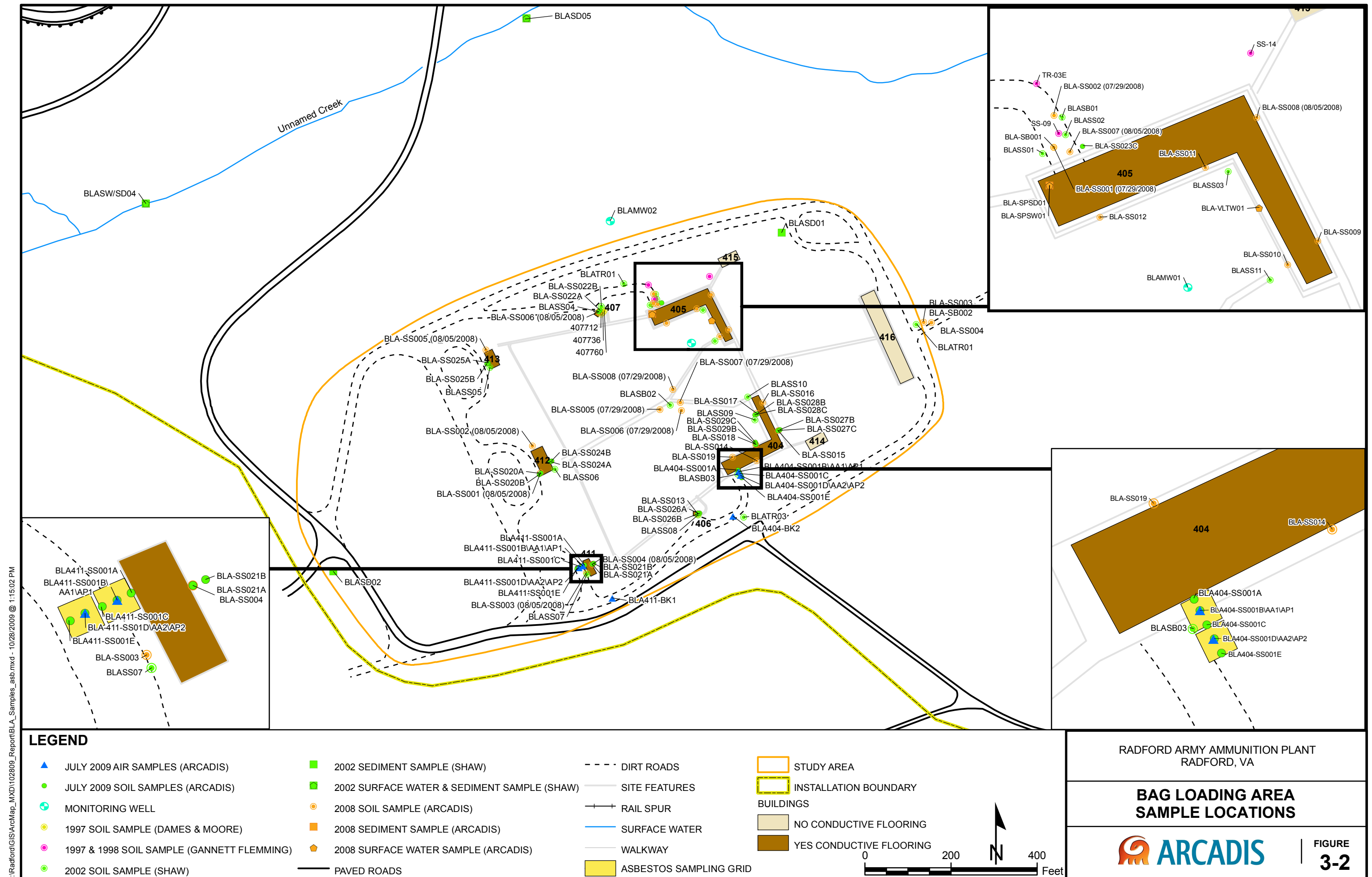
0 200 400
Feet
GRAPHIC SCALE

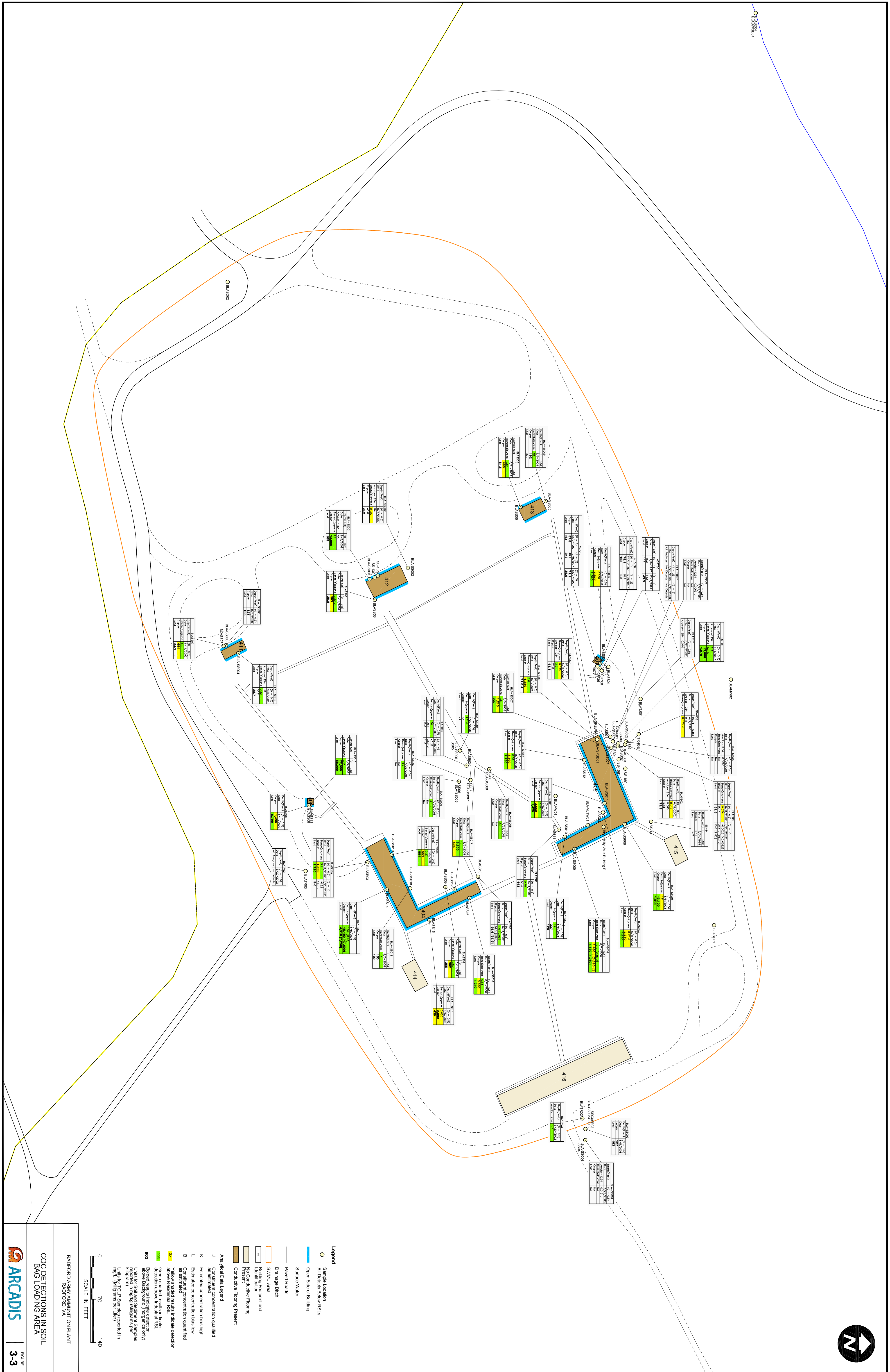
RADFORD ARMY AMMUNITION PLANT
RADFORD, VA

BAG LOADING AREA SITE LAYOUT



FIGURE
3-1







- <400 MG/KG
- 400 - 750 MG/KG
- >750 MG/KG
- ASBESTOS PRESENT IN SAMPLE

— WALKWAY
- - - DIRT ROADS
— PAVED ROADS
□ STUDY AREA

 INSTALLATION BOUNDARY

BUILDINGS

 NO CONDUCTIVE FLOORING

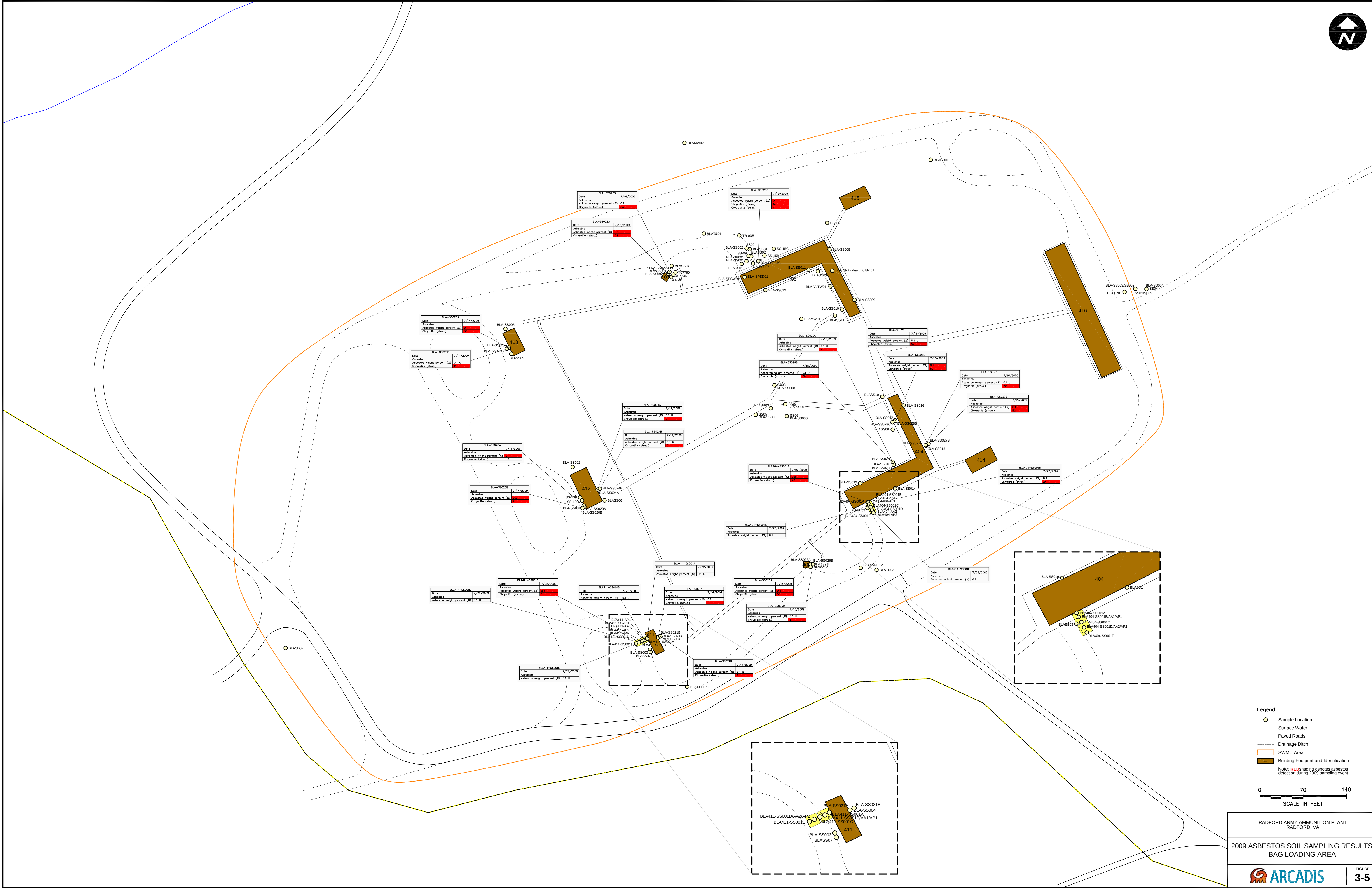
 YES CONDUCTIVE FLOORING

NOTES:
DISTANCE FROM BUILDINGS:
A: 1 FOOT (CLOSEST TO BUILDING)
B: 5 FEET
C: 10 FEET
D: 15 FEET (FARTHEST FROM BUILDING)



XRF SAMPLE LOCATIONS AND RESULTS BAG LOADING AREA





Legend

- Sample Location
- Surface Water
- Paved Roads
- Drainage Ditch
- SWMU Area
- Building Footprint and Identification

Note: **RED** shading denotes asbestos detection during 2009 sampling event

0 70 140

SCALE IN FEET

FIGURE
3-5

NYC: SER 4/AT: DB.TBR LD: TBR P/C: TL
Radford (GP08RAAP.00PM)
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LEGEND

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

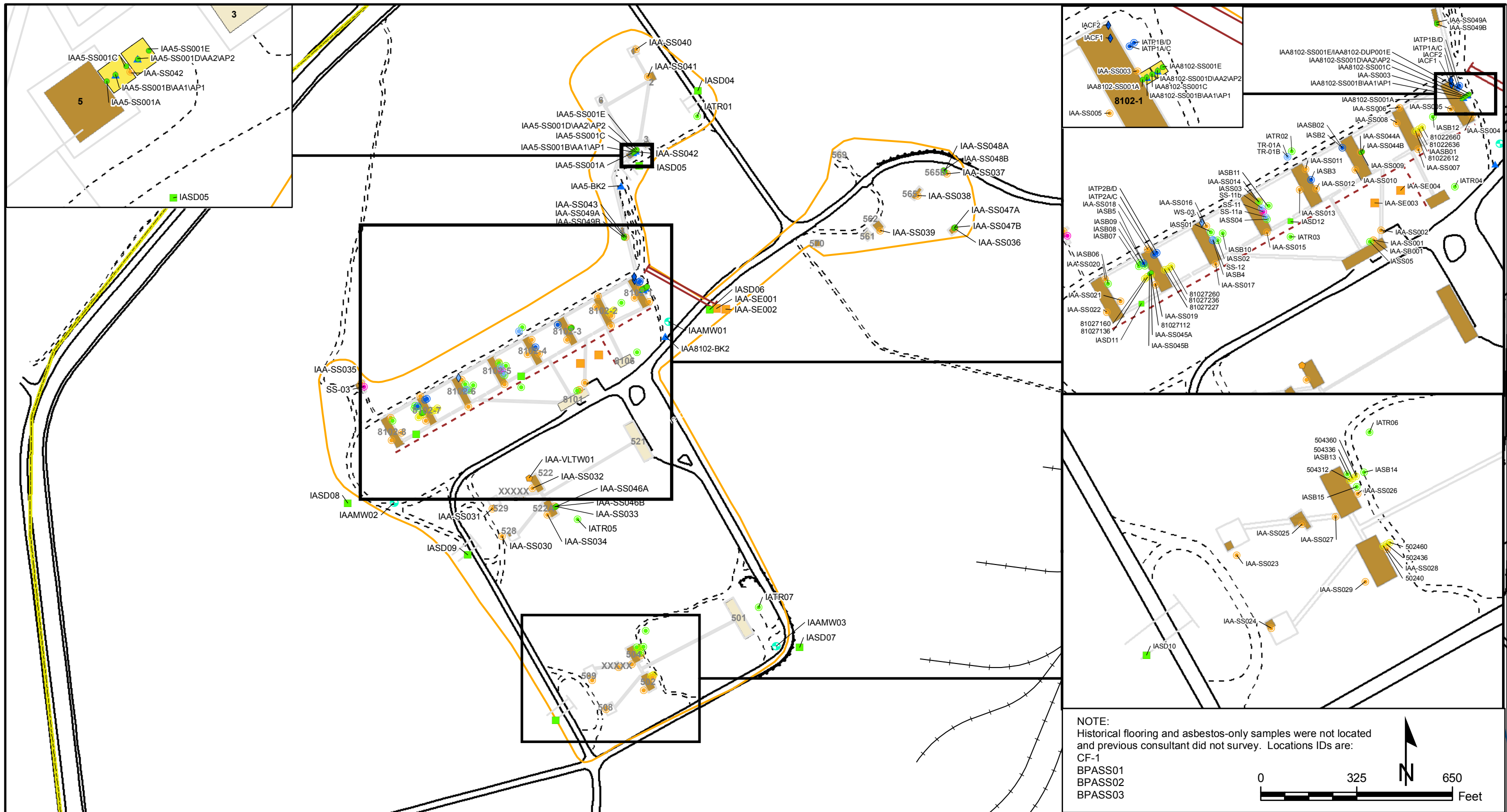


RADFORD ARMY AMMUNITION PLANT
RADFORD, VA

IGNITER ASSEMBLY AREA SITE LAYOUT



FIGURE
3-6



LEGEND

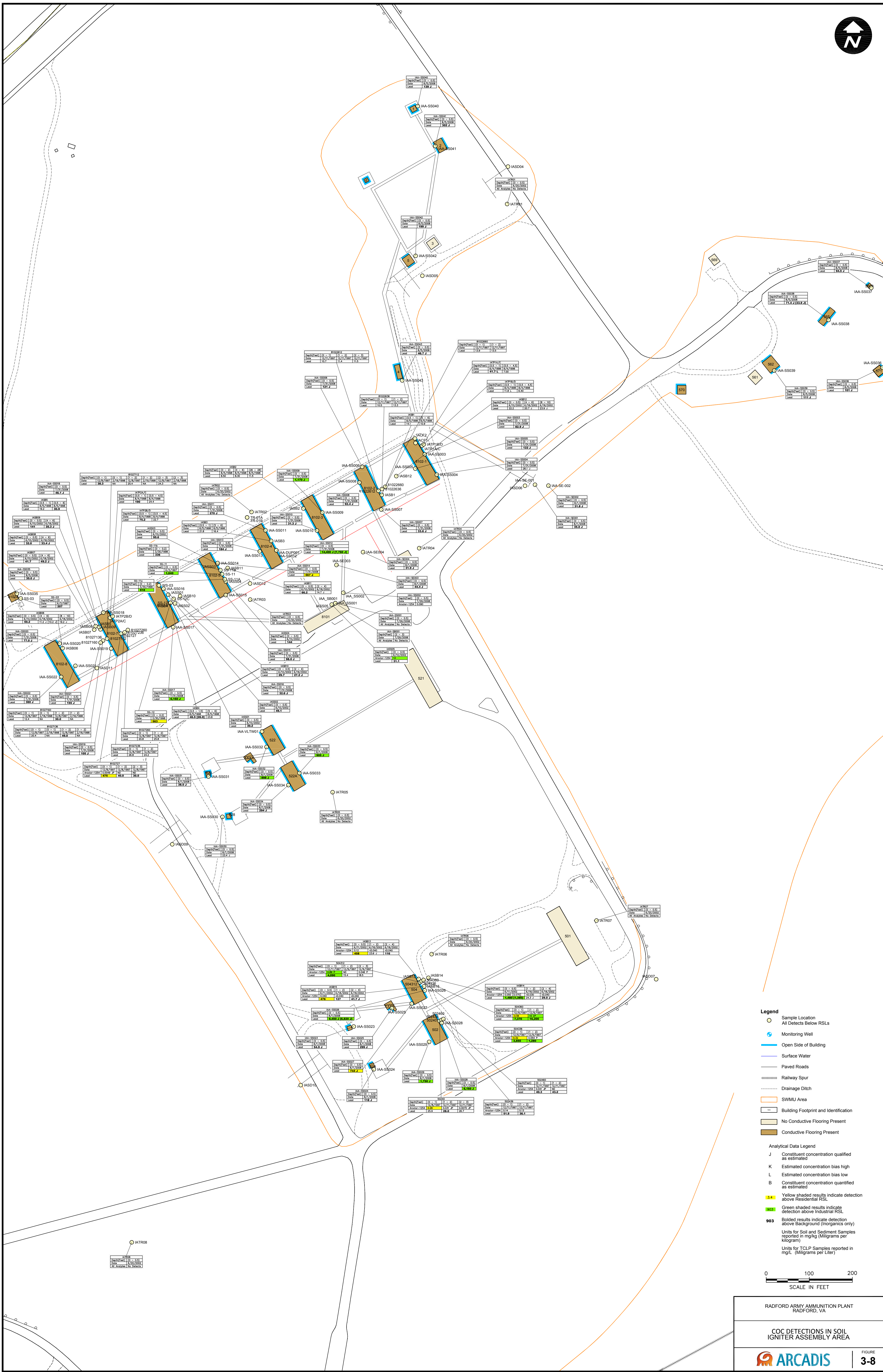
▲ JULY 2009 AIR SAMPLES (ARCADIS)	● 1998 SOIL SAMPLE (GANNETT FLEMING)	● 2002 SOIL SAMPLE (ASBESTOS-ONLY) (SHAW)	— SITE FEATURES	□ STUDY AREA
● JULY 2009 SOIL SAMPLES (ARCADIS)	◆ 1998 FLOORING SAMPLE (GANNETT FLEMING)	● 2008 SOIL SAMPLE (ARCADIS)	— RAIL SPUR	□ INSTALLATION BOUNDARY
● MONITORING WELLS	● 1998 SOIL SAMPLE (ICF KAISER)	■ 2008 SEDIMENT SAMPLE (ARCADIS)	— SURFACE WATER	■ BUILDINGS
● SOIL SAMPLE	◆ 1998 FLOORING SAMPLE (ICF KAISER)	● 2008 SURFACE WATER SAMPLE (ARCADIS)	— CULVERT	■ NO CONDUCTIVE FLOORING
● 1997 SOIL SAMPLE (DAMES & MOORE)	● 2002 SOIL SAMPLE (SHAW)	— SEWER LINE	— PAVED ROADS	■ YES CONDUCTIVE FLOORING
● 1997 SOIL SAMPLE (GANNETT FLEMING)	■ 2002 SEDIMENT SAMPLE (SHAW)	■ ASBESTOS SAMPLING GRID	--- DIRT ROADS	

RADFORD ARMY AMMUNITION PLANT
RADFORD, VA

IGNITER ASSEMBLY AREA SAMPLE LOCATIONS



FIGURE
3-7



- Legend**
- Sample Location
 - All Detects Below RSLs
 - Monitoring Well
 - Open Side of Building
 - Surface Water
 - Paved Roads
 - Railway Spur
 - Drainage Ditch
 - SWMU Area
 - Building Footprint and Identification
 - No Conductive Flooring Present
 - Conductive Flooring Present

Analytical Data Legend

J Constituent concentration qualified as estimated

K Estimated concentration bias high

L Estimated concentration bias low

B Constituent concentration quantified as estimated

Yellow shaded results indicate detection above Residential RSL

Green shaded results indicate detection above Industrial RSL

903 Bolded results indicate detection above Background (inorganics only)

Units for Soil and Sediment Samples reported in mg/kg (Milligrams per kilogram)

Units for TCLP Samples reported in mg/L (Milligrams per Liter)

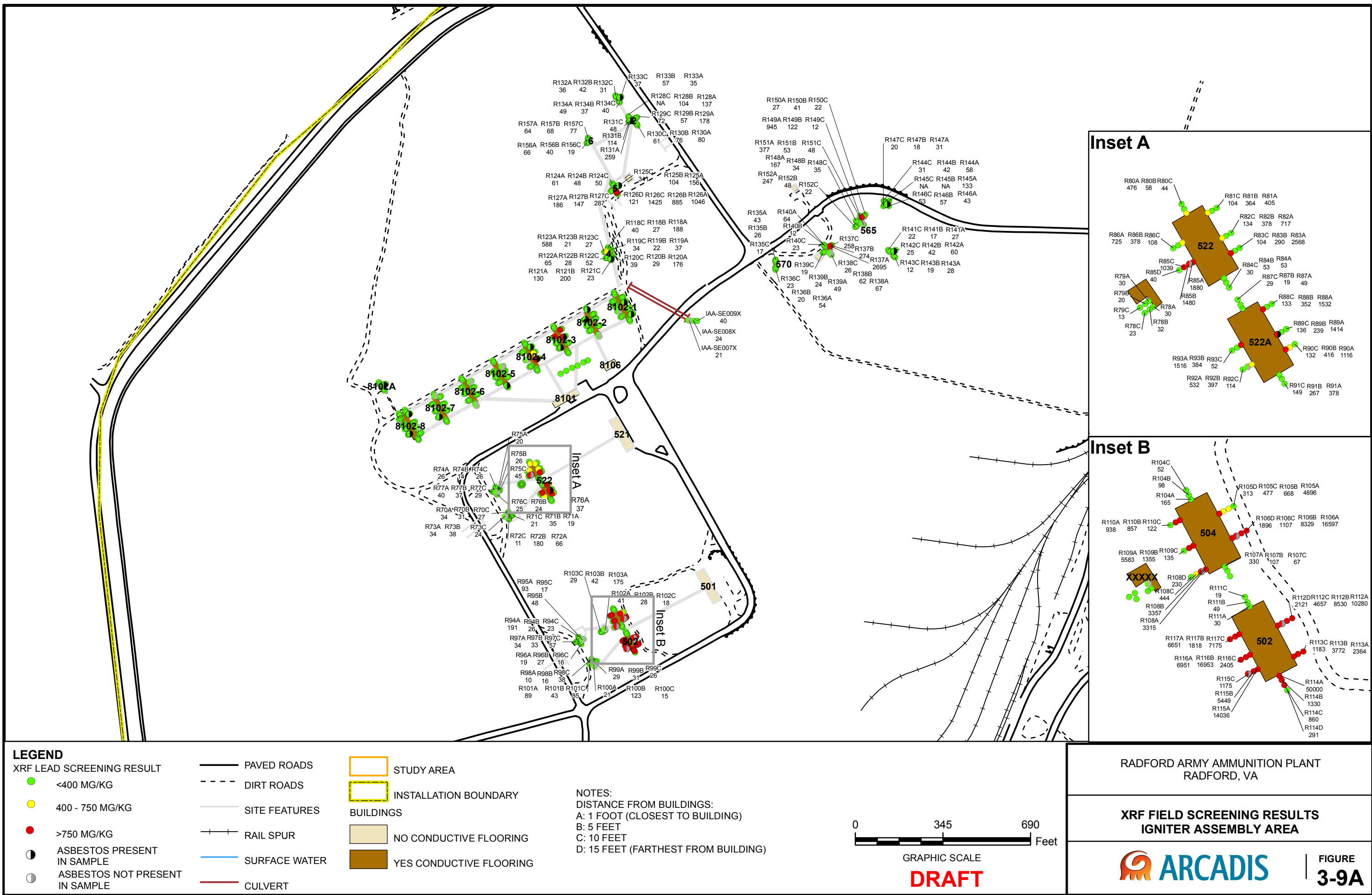
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SCALE IN FEET

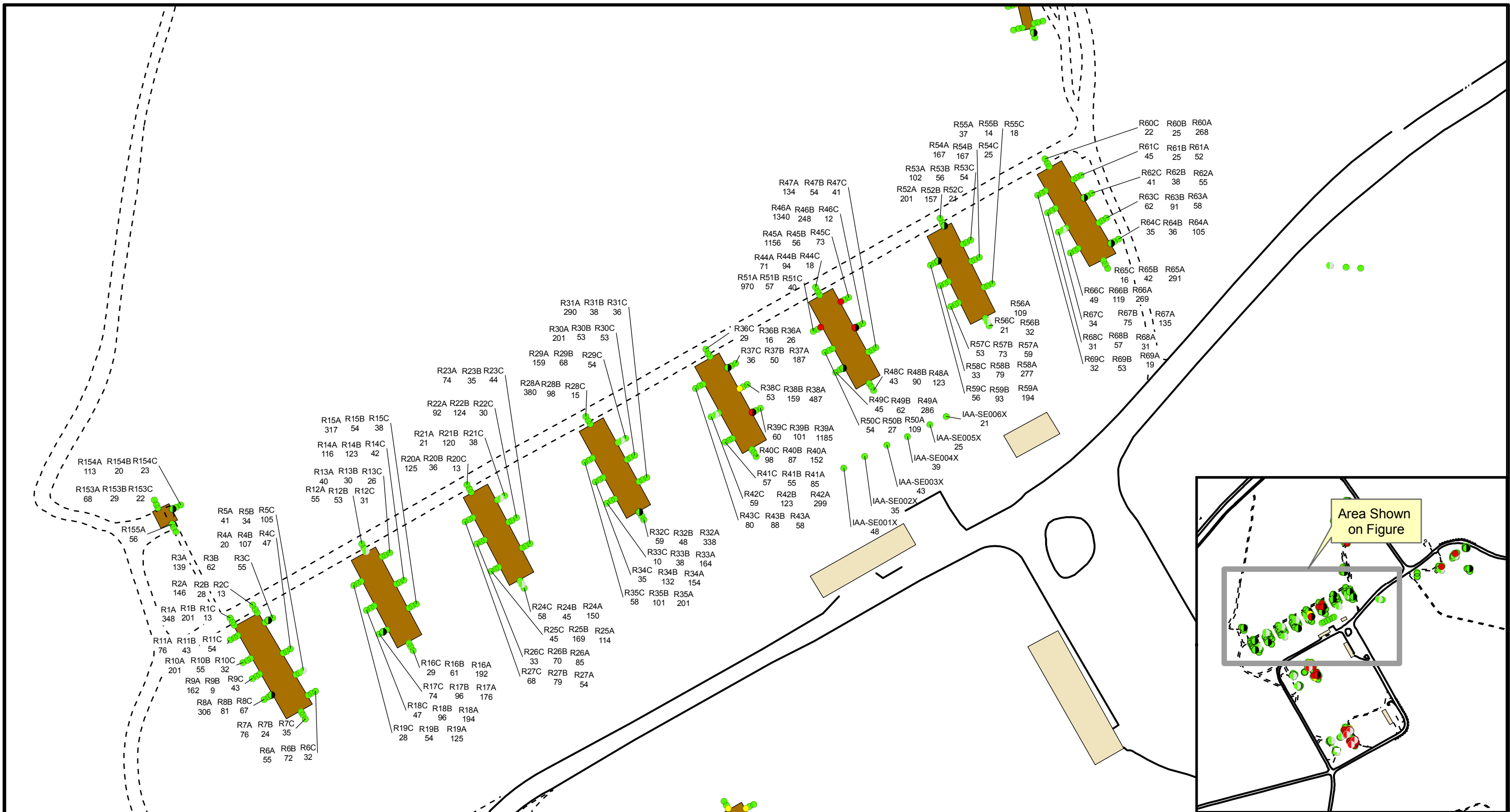
RADFORD ARMY AMMUNITION PLANT
RADFORD, VA

COC DETECTIONS IN SOIL
IGNITER ASSEMBLY AREA



FIGURE
3-8





LEGEND

XRF LEAD SCREENING RESULT

- <400 MG/KG
- 400 - 750 MG/KG
- >750 MG/KG
- ASBESTOS PRESENT IN SAMPLE
- ASBESTOS NOT PRESENT IN SAMPLE

PAVED ROADS

DIRT ROADS

STUDY AREA

INSTALLATION BOUNDARY

BUILDINGS

- NO CONDUCTIVE FLOORING
- YES CONDUCTIVE FLOORING

NOTES:

DISTANCE FROM BUILDINGS:

A: 1 FOOT (CLOSEST TO BUILDING)

B: 5 FEET

C: 10 FEET

D: 15 FEET (FARTHEST FROM BUILDING)

0 100 200 Feet

GRAPHIC SCALE

RADFORD ARMY AMMUNITION PLANT
RADFORD, VA

**XRF FIELD SCREENING RESULTS
IGNITER ASSEMBLY AREA**

ARCADIS

**FIGURE
3-9B**

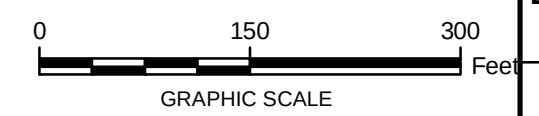


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LEGEND

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

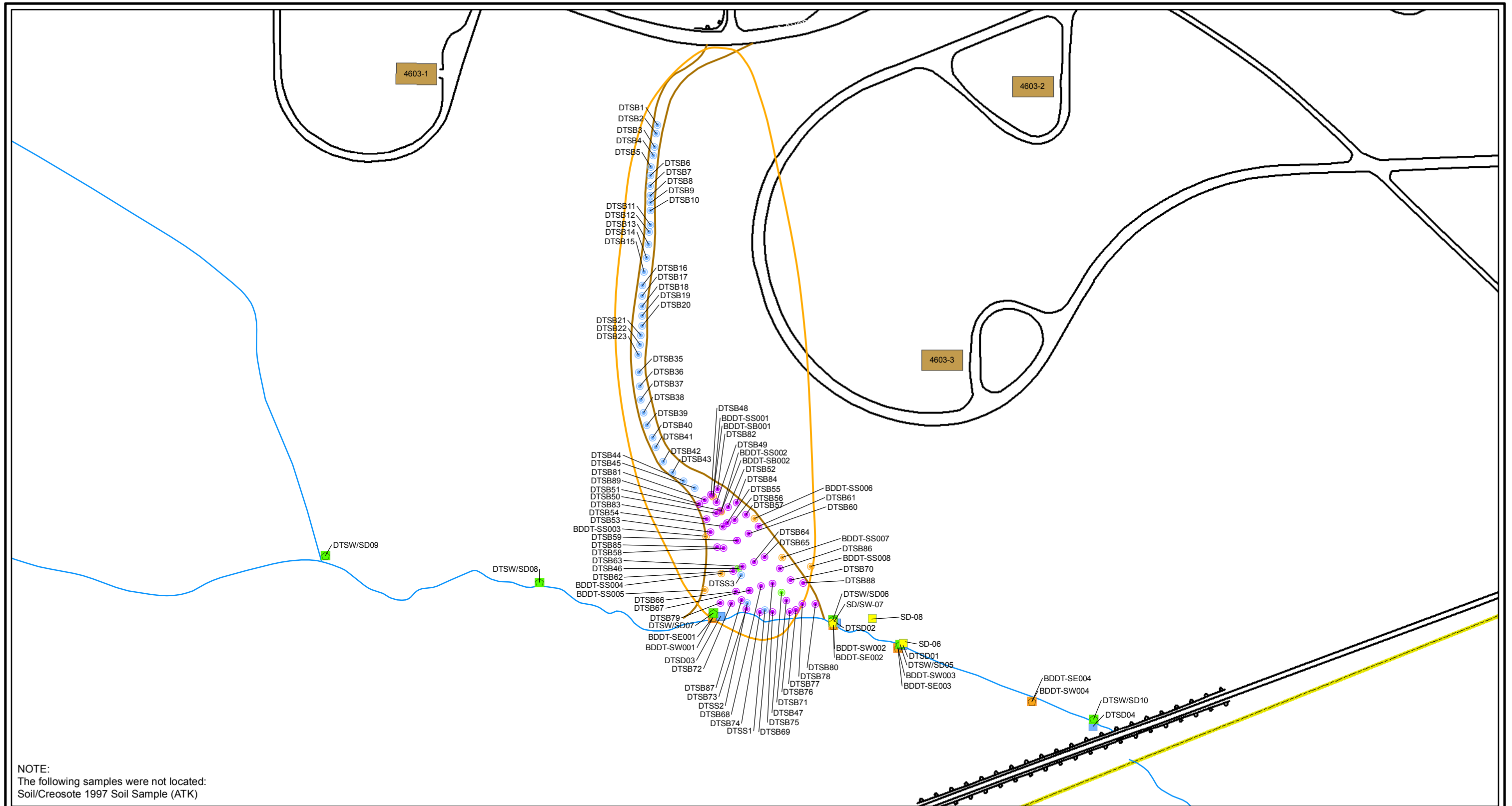


RADFORD ARMY AMMUNITION PLANT
RADFORD, VA

BUILDING DEBRIS DISPOSAL TRENCH SITE LAYOUT



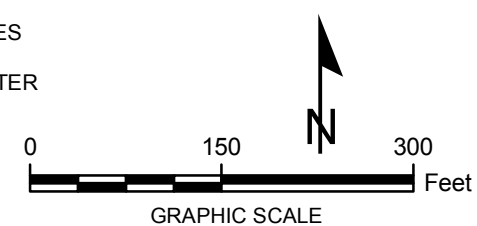
FIGURE
3-11



LEGEND

1998 SEDIMENT SAMPLE (GANNET FLEMING)	2002 SEDIMENT SAMPLE (SHAW)
1998 SURFACE WATER SAMPLE (GANNET FLEMING)	2002 SURFACE WATER SAMPLE (SHAW)
1998 SOIL SAMPLE (ICF KE)	2004 SOIL SAMPLE (SHAW)
1998 SEDIMENT SAMPLE (ICF KE)	2008 SOIL SAMPLE (ARCADIS)
1998 SURFACE WATER SAMPLE (ICF KE)	2008 SEDIMENT SAMPLE (ARCADIS)
2002 SOIL SAMPLE (SHAW)	2008 SURFACE WATER SAMPLE (ARCADIS)

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

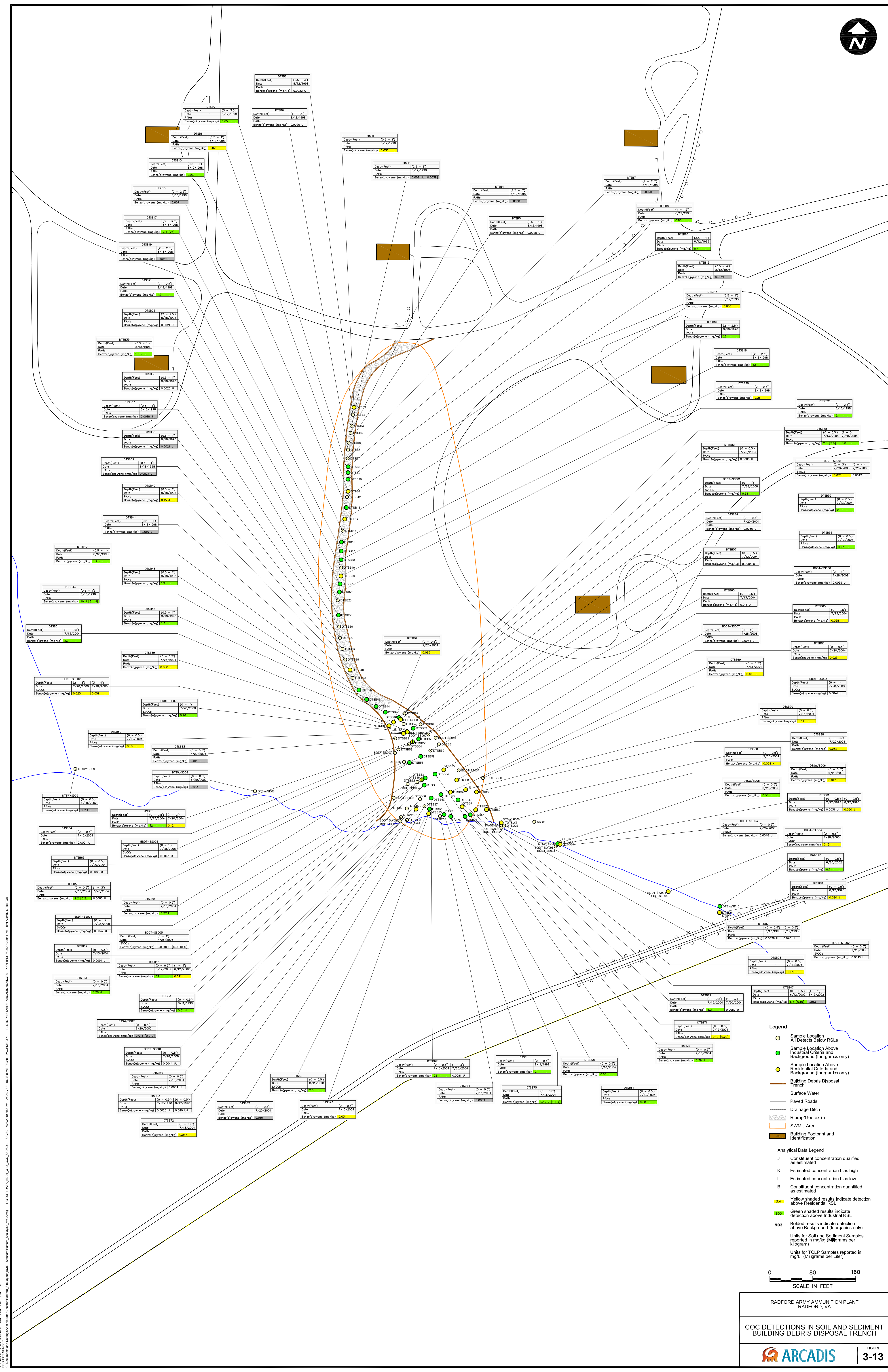


RADFORD ARMY AMMUNITION PLANT
RADFORD, VA

BUILDING DEBRIS DISPOSAL TRENCH SAMPLE LOCATIONS



FIGURE
3-12



NYC: SER 4/11T: DB.TBR LD: TBR P/C: TL
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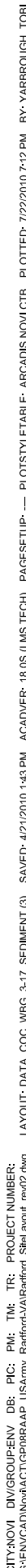
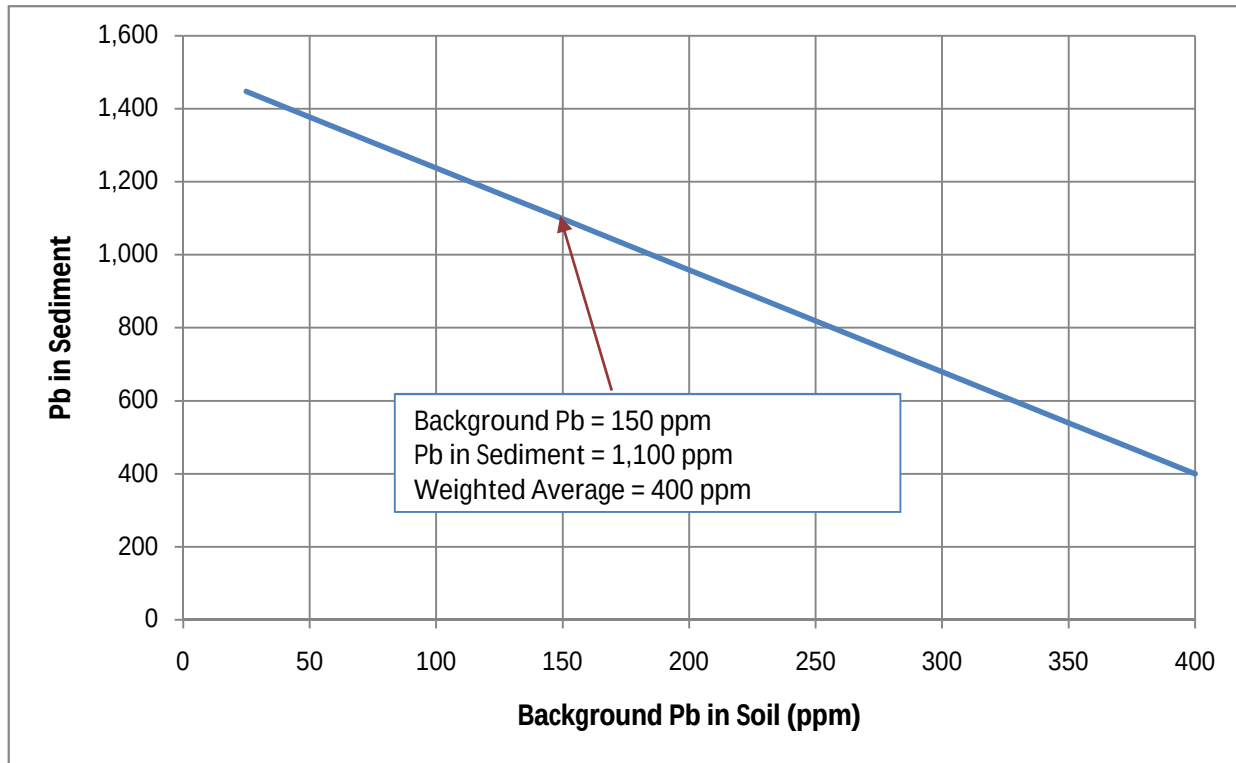


Figure 4-1. PRG for Pb in sediment that yields an average of 400 ppm based on range of background soil Pb.



Variable	Value	Units	Description
PbS_residence	150	ppm	Estimated background concentration of Pb in soil
PbS_sediment	1,098	ppm	Solution that yields PbS_weighted = 400 ppm
EF_residence	134	days/6 months	EF_residence = 182 days (6 months) - EF_sediment
EF_sediment	48	days/6 months	site visit two days per week for 6 months, minus 4 rain days
PbS_weighted	400	ppm	$PbS_{weighted} = PbS_{res} \times EF_{res} = PbS_{sed} \times EF_{sed}$

Source: Equation 1 from USEPA. 2003. Assessing Intermittent or Variable Exposures at Lead Sites. OSWER Directive #9285.7-76. EPA-540-R-03-008. November.

Appendix A

Summary of Laboratory Analytical
Results from BLA Site Investigations

Table A-1. Soil Analytical Results, Bag Loading Area, 1997 Dames and Moore Soil Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	407712 0-1 12/09/97	407712 1-2 12/09/97	407712 2-3 12/09/97	407736 0-1 12/09/97	407736 1-2 12/09/97	407760 0-1 12/09/97	407760 1-2 12/09/97
Inorganics											
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	36,000	32,600	40,700	29,200	32,700	33,600	39,100
Antimony	3.1 {nc}	41 {nc}	- -	mg/kg	0.33 J	ND	0.29 J	ND	ND	ND	ND
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	4.6	5.3	5.4	4.4	3.5	4.9	4.4
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	86.3	71.3	81.6	78.6	54.8	50.4	49.2
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	1.6	1.6	2.0	1.4	1.5	1.5	1.6
Cadmium	7 {nc}	81 {nc}	0.69	mg/kg	NA	NA	NA	NA	NA	NA	NA
Calcium	- -	- -	- -	mg/kg	483 J	3840	661 J	761 J	787 J	1080 J	1360
Chromium	280 {ca}	1,460 {ca}	65.3	mg/kg	42.1	42.4	57.9	39	38.7	43.3	47.2
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	14.8	16.9	119	11.4	14.8	16.6	13.9
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	57.8	40.9	71.1	78.1	40.7	41.2	34.5
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	38,700	41,300	47,600	41,400	36,800	39,000	43,500
Lead	400 {++}	800 {++}	26.8	mg/kg	15.1	20.5	35.9	105	13.8	16.1	43.3
Magnesium	- -	- -	- -	mg/kg	6,220	8,150	7,810	4,850	5,820	5,660	6,630
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	218	286	736	183	216	289	180
Mercury	3.1 {sat}	3.1 {sat}	0.13	mg/kg	NA	NA	NA	NA	NA	NA	NA
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	27.6	25.4	33.9	23.2	25.3	25.6	28.2
Potassium	- -	- -	- -	mg/kg	4,870	4,760	5,740	4,080	4,850	4,880	5,610
Selenium	39 {nc}	510 {nc}	- -	mg/kg	1.4	0.8 J	1.1	1.2	0.63 J	0.96 J	0.85 J
Silver	39 {nc}	510 {nc}	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA
Sodium	- -	- -	- -	mg/kg	54.4 J	54.3 J	58 J	35.6 J	44.8 J	48.1 J	49.9 J
Thallium	0.51 {nc}	6.6 {nc}	2.11	mg/kg	0.78 J	0.47 J	ND	ND	ND	ND	ND
Vanadium	55{nc}	720 {nc}	108	mg/kg	77.4	79.9	93.1	78.3	71.6	76.5	86.6
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	39.8	42.6	57.8	91.4	33.8	38.4	41.2

mg/kg Milligrams per kilogram.

[a] USEPA Regional Screening Levels (USEPA 2008a).

[b] Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.

{ca} Carcinogen.

{nc} Noncarcinogen.

* Noncarcinogen screening level is less than one hundred times the carcinogen screening level.

** Noncarcinogen screening level is less than ten times the carcinogen screening level.

{++} The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.

{max} Concentration may exceed ceiling limit.

{sat} Screening level may exceed saturation concentration.

J Constituent concentration quantified as estimated.

NA Not Analyzed.

[3.3] Bracketed concentration indicates laboratory analytical result for duplicate sample.

24,400 Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).

10.6 J Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).

16 Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Table A-2. Soil Analytical Results, Bag Loading Area, 1997 and 1998 Gannett Fleming Independent Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	SS-09 0 - 0.5 06/04/97	SS-14 0 - 0.16 03/31/98	TR-03E 0.04 - 0.16 04/02/98
Explosives							
1,3,5-Trinitrobenzene	220 (nc)	2,700 (nc)	--	mg/kg	ND	NA	NA
1,3-Dinitrobenzene	0.61 (nc)	6.2 (nc)	--	mg/kg	ND	NA	NA
2,4,6-Trinitrotoluene	3.6 (ca**)	42 (ca**)	--	mg/kg	ND	NA	NA
2,4-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	ND	NA	NA
2,6-Dinitrotoluene	6.1 (nc)	62 (nc)	--	mg/kg	1.9 C,J	NA	NA
2-Amino-4,6-Dinitrotoluene	15 (nc)	190 (nc)	--	mg/kg	ND	NA	NA
4-Amino-2,6-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	ND	NA	NA
Dinitrotoluene Mix	0.71 (ca)	2.5 (ca)	--	mg/kg	1.9 J	NA	NA
HMX	310 (nc)	3,100 (nc)	--	mg/kg	ND	NA	NA
m-Nitrotoluene	--	--	--	mg/kg	ND	NA	NA
Nitrobenzene	3.1 (nc)	28 (nc)	--	mg/kg	ND	NA	NA
Nitroglycerine	0.61 (nc)	6.2 (nc)	--	mg/kg	ND	NA	NA
o-Nitrotoluene	78 (nc)	1,300 (sa)	--	mg/kg	ND	NA	NA
Pentaerythritol Tetranitrate	--	--	--	mg/kg	ND	NA	NA
p-Nitrotoluene	30 (ca**)	110 (ca*)	--	mg/kg	ND	NA	NA
RDX	4.4 (ca*)	16 (ca)	--	mg/kg	ND	NA	NA
Tetryl	24 (nc)	250 (nc)	--	mg/kg	ND	NA	NA
Organochlorine Pesticides							
4,4'-DDD	2 (ca**)	7.2 (ca**)	--	mg/kg	0.043 I	NA	NA
4,4'-DDE	1.4 (ca**)	5.1 (ca**)	--	mg/kg	ND	NA	NA
4,4'-DDT	1.7 (ca*)	7 (ca*)	--	mg/kg	R	NA	NA
Aldrin	0.029 (ca*)	0.1 (ca)	--	mg/kg	I,R,J	NA	NA
Alpha-BHC	0.077 (ca**)	0.27 (ca**)	--	mg/kg	ND	NA	NA
Alpha-Chlordane	1.6 (ca**)	6.5 (ca**)	--	mg/kg	0.089 I	NA	NA
Beta-BHC	0.27 (ca**)	0.96 (ca**)	--	mg/kg	ND	NA	NA
Delta-BHC	0.52 (ca**)	2.1 (ca**)	--	mg/kg	ND	NA	NA
Dieldrin	0.03 (ca)	0.11 (ca)	--	mg/kg	I,R	NA	NA
Endosulfan I	--	--	--	mg/kg	0.022 I	NA	NA
Endosulfan II	37 (nc)	370 (nc)	--	mg/kg	I,R	NA	NA
Endosulfan Sulfate	--	--	--	mg/kg	ND	NA	NA
Endrin	1.8 (nc)	18 (nc)	--	mg/kg	I,R	NA	NA
Endrin Aldehyde	1.8 (nc)	18 (nc)	--	mg/kg	I,R	NA	NA
Endrin Ketone	--	--	--	mg/kg	ND	NA	NA
Gamma-BHC (Lindane)	0.52 (ca*)	2.1 (ca)	--	mg/kg	ND	NA	NA
Gamma-Chlordane	1.6 (ca**)	6.5 (ca**)	--	mg/kg	0.01 I	NA	NA
Heptachlor	0.11 (ca)	0.38 (ca)	--	mg/kg	ND	NA	NA
Heptachlor Epoxide	0.053 (ca*)	0.19 (ca*)	--	mg/kg	0.015 I	NA	NA
Methoxychlor	31 (nc)	310 (nc)	--	mg/kg	ND	NA	NA
Toxaphene	0.44 (ca**)	1.6 (ca**)	--	mg/kg	ND	NA	NA
PCBs							
Aroclor-1016	0.39 (nc)	21 (ca**)	--	mg/kg	ND	ND	ND
Aroclor-1221	0.17 (ca**)	0.62 (ca**)	--	mg/kg	ND	ND	ND
Aroclor-1232	0.17 (ca**)	0.62 (ca**)	--	mg/kg	ND	ND	ND
Aroclor-1242	0.22 (ca**)	0.74 (ca**)	--	mg/kg	ND	ND	ND
Aroclor-1248	0.22 (ca**)	0.74 (ca**)	--	mg/kg	ND	ND	ND
Aroclor-1254	0.22 (ca**)	0.74 (ca*)	--	mg/kg	8.3	ND	0.11
Aroclor-1260	0.22 (ca**)	0.74 (ca**)	--	mg/kg	ND	ND	ND
Volatile Organics							
1,1,1-Trichloroethane	680	680	--	mg/kg	ND	ND	NA
1,1,2,2-Tetrachloroethane	0.59	2.9	--	mg/kg	ND	ND	NA
1,1,2-trichloro-1,2,2-trifluoroethane	940	940	--	mg/kg	ND	ND	NA
1,1,2-Trichloroethane	1.1	5.5	--	mg/kg	ND	ND	NA
1,1-Dichloroethane	3.4	17	--	mg/kg	ND	ND	NA
1,1-Dichloroethene	25	110	--	mg/kg	ND	ND	NA
1,2,3-Trichlorobenzene	--	--	--	mg/kg	ND	ND	NA
1,2,4-Trichlorobenzene	180	220	--	mg/kg	ND	ND	NA
1,2-Dibromo-3-chloropropane	0.0056	0.073	--	mg/kg	ND	ND	NA
1,2-Dibromoethane	0.034	0.17	--	mg/kg	ND	ND	NA
1,2-Dichlorobenzene	220	220	--	mg/kg	ND	ND	NA
1,2-Dichloroethane	0.45	2.2	--	mg/kg	ND	ND	NA
1,2-Dichloropropane	0.93	4.7	--	mg/kg	ND	ND	NA
1,3-Dichlorobenzene	--	--	--	mg/kg	ND	ND	NA
1,4-Dichlorobenzene	2.6	13	--	mg/kg	ND	ND	NA
1,4-Dioxane	44	160	--	mg/kg	ND	ND	NA
2-Butanone	28,000	28,000	--	mg/kg	ND	ND	NA
2-Hexanone	--	--	--	mg/kg	ND	ND	NA
3-Octanone	--	--	--	mg/kg	ND	ND	NA
4-Methyl-2-pentanone	3,200	3,200	--	mg/kg	ND	ND	NA
Acetone	6,100	110,000	--	mg/kg	ND	ND	NA
Benzene	1.1	5.6	--	mg/kg	ND	ND	NA
Bromochloromethane	--	--	--	mg/kg	ND	ND	NA
Bromodichloromethane	10	46	--	mg/kg	ND	ND	NA
Bromoform	61	220	--	mg/kg	ND	ND	NA
Bromomethane	0.79	3.5	--	mg/kg	ND	ND	NA
Carbon Disulfide	260	260	--	mg/kg	ND	ND	NA
Carbon Tetrachloride	0.25	1.3	--	mg/kg	ND	ND	NA
Chlorobenzene	31	860	--	mg/kg	ND	ND	NA
Chloroethane	2,200	2,200	--	mg/kg	ND	ND	NA
Chloroform	0.3	1.5	--	mg/kg	ND	ND	NA
Chloromethane	1.7	8.4	--	mg/kg	ND	ND	NA
cis-1,2-Dichloroethene	78	1,400	--	mg/kg	ND	ND	NA
cis-1,3-Dichloropropene	--	--	--	mg/kg	ND	ND	NA
Cyclohexane	120	120	--	mg/kg	ND	ND	NA
Dibromochloromethane	5.8	21	--	mg/kg	ND	ND	NA
Dichlorodifluoromethane	19	78	--	mg/kg	ND	ND	NA

Notes found at end of table.

Table A-2. Soil Analytical Results, Bag Loading Area, 1997 and 1998 Gannett Fleming Independent Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	SS-09 0 - 0.5 06/04/97	SS-14 0 - 0.16 03/31/98	TR-03E 0.04 - 0.16 04/02/98
Volatile Organics							
d-Limonene	--	--	--	mg/kg	ND	ND	NA
Ethylbenzene	5.7	29	--	mg/kg	ND	ND	NA
Isopropylbenzene	310	310	--	mg/kg	ND	ND	NA
m,p-Xylene	--	--	--	mg/kg	ND	ND	NA
Methyl acetate	29,000	29,000	--	mg/kg	ND	ND	NA
Methyl tert-butyl ether	39	190	--	mg/kg	ND	ND	NA
Methylcyclohexane	71	71	--	mg/kg	ND	ND	NA
Methylene Chloride	11	54	--	mg/kg	0.0010 B	0.0020 B	NA
o-Xylene	300	300	--	mg/kg	ND	ND	NA
Styrene	1,000	1,000	--	mg/kg	ND	ND	NA
Tetrachloroethene	0.57	2.7	--	mg/kg	ND	ND	NA
Toluene	930	930	--	mg/kg	ND	ND	NA
trans-1,2-Dichloroethene	11	50	--	mg/kg	ND	ND	NA
trans-1,3-Dichloropropene	--	--	--	mg/kg	ND	ND	NA
Trichloroethene	2.8	14	--	mg/kg	ND	ND	NA
Trichlorofluoromethane	80	1,300	--	mg/kg	ND	ND	NA
Vinyl Chloride	0.06	1.7	--	mg/kg	ND	ND	NA
Xylenes (total)	300	300	--	mg/kg	ND	ND	NA
Semivolatile Organics							
1,2,4-Trichlorobenzene	180	220	--	mg/kg	ND	ND	ND
1,2-Dichlorobenzene	220	220	--	mg/kg	ND	ND	ND
1,3-Dichlorobenzene	--	--	--	mg/kg	ND	ND	ND
1,4-Dichlorobenzene	2.6	13	--	mg/kg	ND	ND	ND
1-Methylnaphthalene	22	99	--	mg/kg	ND	ND	ND
2,4,5-Trichlorophenol	610	6,200	--	mg/kg	ND	ND	ND
2,4,6-Trichlorophenol	44	160	--	mg/kg	ND	ND	ND
2,4-Dichlorophenol	18	180	--	mg/kg	ND	ND	ND
2,4-Dimethylphenol	120	1,200	--	mg/kg	ND	ND	ND
2,4-Dinitrophenol	12	120	--	mg/kg	ND	ND	ND
2,4-Dinitrotoluene	12	120	--	mg/kg	0.78	ND	ND
2,6-Dinitrotoluene	6.1	62	--	mg/kg	ND	ND	ND
2-Chloronaphthalene	210	210	--	mg/kg	ND	ND	ND
2-Chlorophenol	39	510	--	mg/kg	ND	ND	ND
2-Methylnaphthalene	31	440	--	mg/kg	0.030 J	ND	ND
2-Methylphenol	310	3,100	--	mg/kg	ND	ND	ND
2-Nitroaniline	--	--	--	mg/kg	ND	ND	ND
2-Nitrophenol	--	--	--	mg/kg	ND	ND	ND
3,3'-Dichlorobenzidine	1.1	3.8	--	mg/kg	ND	ND	ND
3-Nitroaniline	--	--	--	mg/kg	ND	ND	ND
4,6-Dinitro-2-methylphenol	--	--	--	mg/kg	ND	ND	ND
4-Bromophenyl-phenylether	--	--	--	mg/kg	ND	ND	ND
4-Chloro-3-Methylphenol	--	--	--	mg/kg	ND	ND	ND
4-Chloroaniline	24	250	--	mg/kg	ND	ND	ND
4-Chlorophenyl-phenylether	--	--	--	mg/kg	ND	ND	ND
4-Methylphenol	31	310	--	mg/kg	ND	ND	ND
4-Nitroaniline	--	--	--	mg/kg	ND	ND	ND
4-Nitrophenol	--	--	--	mg/kg	ND	ND	ND
Acenaphthene	340	3,300	--	mg/kg	0.10 J	ND	ND
Acenaphthylene	340	3,300	--	mg/kg	0.060 J	ND	ND
Anthracene	1,700	170,000	--	mg/kg	0.20 J	ND	ND
Benzo(a)anthracene	0.15	2.1	--	mg/kg	1.1	ND	0.11
Benzo(a)pyrene	0.015	0.21	--	mg/kg	1.3 K	ND	0.070 J
Benzo(b)fluoranthene	0.15	2.1	--	mg/kg	1.9 K	ND	0.12 J
Benzo(g,h,i)perylene	170	1,700	--	mg/kg	0.51 K	ND	ND
Benzo(k)fluoranthene	1.5	21	--	mg/kg	2.0 K	ND	0.080 J
Benzoic Acid	240,000	2,500,000	--	mg/kg	ND	ND	0.30 J
Benzyl Alcohol	3,100	310,000	--	mg/kg	ND	ND	ND
bis(2-Chloroethoxy)methane	18	180	--	mg/kg	ND	ND	ND
bis(2-Chloroethyl)ether	0.19	0.9	--	mg/kg	ND	ND	ND
bis(2-Chloroisopropyl)ether	--	--	--	mg/kg	ND	ND	ND
bis(2-Ethylhexyl)phthalate	35	120	--	mg/kg	0.57	0.050 J	0.10 J
Butylbenzylphthalate	1,200	120,000	--	mg/kg	ND	ND	ND
Carbazole	24	86	--	mg/kg	0.40	ND	ND
Chrysene	15	210	--	mg/kg	1.7	ND	0.11 J
Dibenzo(a,h)anthracene	0.015	0.21	--	mg/kg	0.20 J,K	ND	ND
Dibenzofuran	--	--	--	mg/kg	0.10	ND	ND
Diethylphthalate	4,900	490,000	--	mg/kg	ND	ND	ND
Dimethylphthalate	--	--	--	mg/kg	ND	ND	ND
Di-n-Butylphthalate	610	6,200	--	mg/kg	3.6	ND	ND
Dinitrotoluene Mix	0.71	2.5	--	mg/kg	0.78	ND	ND
Di-n-Octylphthalate	--	--	--	mg/kg	ND	ND	ND
Fluoranthene	230	2,200	--	mg/kg	2.9	ND	0.10 J
Fluorene	230	2,200	--	mg/kg	0.20 J	ND	ND
Hexachlorobenzene	0.3	1.1	--	mg/kg	ND	ND	ND
Hexachlorobutadiene	6.2	22	--	mg/kg	ND	ND	ND
Hexachlorocyclopentadiene	37	370	--	mg/kg	ND	ND	ND
Hexachloroethane	35	120	--	mg/kg	ND	ND	ND
Indeno(1,2,3-cd)pyrene	0.15	2.1	--	mg/kg	0.52 K	ND	ND
Isophorone	510	1,800	--	mg/kg	ND	ND	ND
Naphthalene	3.9 (ca)	20 (ca)	--	mg/kg	0.10 J	ND	ND
Nitrobenzene	3.1	28	--	mg/kg	ND	ND	ND
N-Nitroso-di-n-propylamine	0.069	0.25	--	mg/kg	ND	ND	ND
N-Nitrosodiphenylamine	99	350	--	mg/kg	0.10 J	ND	ND
Pentachlorophenol	3	9	--	mg/kg	ND	ND	ND
Phenanthrene	1,700	170,000	--	mg/kg	2.0	ND	0.10 J
Phenol	1,800	180,000	--	mg/kg	ND	0.080 J	ND
Pyrene	170	1,700	--	mg/kg	2.5 C	ND	0.10 J
Pyridine	7.8	100	--	mg/kg	ND	ND	ND

Notes found at end of table.

Table A-2. Soil Analytical Results, Bag Loading Area, 1997 and 1998 Gannett Fleming Independent Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	SS-09 0 - 0.5 06/04/97	SS-14 0 - 0.16 03/31/98	TR-03E 0.04 - 0.16 04/02/98
Inorganics							
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	12,400	35,600	NA
Antimony	3.1 {nc}	41 {nc}	-	mg/kg	ND	NA	NA
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	7.60	4.70	NA
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	10,200 J	65.8	NA
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	0.700	1.60	NA
Cadmium	7 {nc}	81 {nc}	0.69	mg/kg	ND	NA	NA
Calcium	-	-	-	mg/kg	77,200	1,460	NA
Chromium	280 {ca}	1,460 {ca}	65.3	mg/kg	56.6	44.0	NA
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	17.2	22.5	NA
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	13,600	27.1	NA
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	31,300	40,000	NA
Lead	400 {++}	800 {++}	26.8	mg/kg	1,970	14.7	NA
Magnesium	-	-	-	mg/kg	52,600	6,270	NA
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	327	573	NA
Mercury	3.1 {sat}	3.1 {sat}	0.13	mg/kg	ND	NA	NA
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	57.1	23.8	NA
Potassium	-	-	-	mg/kg	2,700	4,200	NA
Selenium	39 {nc}	510 {nc}	-	mg/kg	0.600	NA	NA
Silver	39 {nc}	510 {nc}	-	mg/kg	ND	NA	NA
Sodium	-	-	-	mg/kg	ND	NA	NA
Thallium	0.51 {nc}	6.6 {nc}	2.11	mg/kg	ND	NA	NA
Vanadium	55{nc}	720 {nc}	108	mg/kg	39.6	78.3	NA
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	5,940	41.4	NA
Miscellaneous							
pH	-	-	-	pH Units	ND	NA	NA
Total Organic Carbon	-	-	-	mg/kg	ND	NA	NA

mg/kg

Milligrams per kilogram.

[a]

USEPA Regional Screening Levels (USEPA 2008a).

[b]

Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.

{ca}

Carcinogen.

{nc}

Noncarcinogen.

*

Noncarcinogen screening level is less than one hundred times the carcinogen screening level.

**

Noncarcinogen screening level is less than ten times the carcinogen screening level.

{++}

The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.

{max}

Concentration may exceed ceiling limit.

{sat}

Screening level may exceed saturation concentration.

B (Inorganics)

Constituent concentration quantified as estimated.

B (Organics)

Constituent was detected in the associated method blank.

J

Constituent concentration quantified as estimated.

K

Estimated concentration bias high.

L

Estimated concentration bias low.

NA

Not Analyzed.

[3.3]

Bracketed concentration indicates laboratory analytical result for duplicate sample.

24,400

Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).

10.6 J

Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).

16

Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Table A-3. Conductive Flooring Analytical Results, Bag Loading Area, 1997 and 1998 Gannett Fleming Independent Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	WS-01 5-JUN-97	WS-04 3-MAR-98	WS-05 3-MAR-98
Organochlorine Pesticides							
4,4'-DDE	1.4 {ca**}	5.1 {ca**}	--	mg/kg	0.51	NA	NA
Alpha-Chlordane	1.6 {ca**}	6.5 {ca**}	--	mg/kg	0.45	NA	NA
Endosulfan I	--	--	--	mg/kg	0.37	NA	NA
Endrin	1.8 {nc}	18 {nc}	--	mg/kg	0.25	NA	NA
Endrin Aldehyde	1.8 {nc}	18 {nc}	--	mg/kg	0.54	NA	NA
Endrin Ketone	--	--	--	mg/kg	0.59	NA	NA
Heptachlor Epoxide	0.053 {ca*}	0.19 {ca*}	--	mg/kg	0.52	NA	NA
Methoxychlor	31 {nc}	310 {nc}	--	mg/kg	4.4	NA	NA
PCBs							
Aroclor-1254	0.22 {ca**}	0.74 {ca*}	--	mg/kg	2.80	NA	NA
Volatile Organics							
Acetone	6,100 {nc}	61,000 {nc}	--	mg/kg	0.02 B	NA	NA
Methylene Chloride	11 {ca}	54 {ca}	--	mg/kg	0.003 B	NA	NA
Semivolatile Organics							
2-Methylnaphthalene	31	440	--	mg/kg	0.4 J	NA	NA
Acenaphthylene	340	3,300	--	mg/kg	4.72	NA	NA
Anthracene	1,700	170,000	--	mg/kg	16.1	NA	NA
Benzo(a)anthracene	0.15	2.1	--	mg/kg	20.8	NA	NA
Benzo(a)pyrene	0.015	0.21	--	mg/kg	22.2	NA	NA
Benzo(b)fluoranthene	0.15	2.1	--	mg/kg	27.3	NA	NA
Benzo(g,h,i)perylene	170	1,700	--	mg/kg	17 J	NA	NA
Benzo(k)fluoranthene	1.5	21	--	mg/kg	18.2	NA	NA
Chrysene	15	210	--	mg/kg	18	NA	NA
Dibenzo(a,h)anthracene	0.015	0.21	--	mg/kg	1 J	NA	NA
Dibenzofuran	--	--	--	mg/kg	3 J	NA	NA
Fluoranthene	230	2,200	--	mg/kg	13.45	NA	NA
Fluorene	230	2,200	--	mg/kg	4.33	NA	NA
Indeno(1,2,3-cd)pyrene	0.15	2.1	--	mg/kg	16 J	NA	NA
Naphthalene	3.9 {ca}	20 {ca}	--	mg/kg	1 J	NA	NA
Phenanthrene	1,700	170,000	--	mg/kg	24.6	NA	NA
Pyrene	170	1,700	--	mg/kg	26	NA	NA
Inorganics							
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	3,270	1,190	683
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	9.5	7.8	4.1
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	4,250 J	172	54.1
Calcium	--	--	--	mg/kg	90,600	110,000	70,700
Chromium	280 {ca}	1,460 {ca}	65.3	mg/kg	72.5	92.3	67.9
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	13.9	12	10.2
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	59,600	86,000	65,500
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	40,200	32,000	24,600
Lead	400 {++}	800 {++}	26.8	mg/kg	492	214	255
Magnesium	--	--	--	mg/kg	71,600	120,000	140,000
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	231	139	111
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	130	213	147
Potassium	--	--	--	mg/kg	482	633	312
Vanadium	55 {nc}	720 {nc}	108	mg/kg	18.8	NA	NA
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	3,730	441	187
Asbestos							
Chrysotile	--	--	--	%	NA	1.6	1.6

mg/kg

Milligrams per kilogram.

[a]

USEPA Regional Screening Levels (USEPA 2008a).

[b]

Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.

{ca}

Carcinogen.

{nc}

Noncarcinogen.

*

Noncarcinogen screening level is less than one hundred times the carcinogen screening level.

**

Noncarcinogen screening level is less than ten times the carcinogen screening level.

{++}

The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.

{max}

Concentration may exceed ceiling limit.

{sat}

Screening level may exceed saturation concentration.

B (Organics)

Constituent was detected in the associated method blank.

J

Constituent concentration quantified as estimated.

NA

Not Analyzed.

24,400

Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).

10.6 J

Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).

16

Bolded inorganics indicates concentration is above facility-wide background value.

Table A-4. Conductive Flooring Analytical Results, Bag Loading Area, 2002 US Army Corp of Engineers Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	RFAAP-405 Flooring	RFAAP-407 Flooring	RFAAP-413 Flooring
Explosives							
1,3,5-Trinitrobenzene	220 {nc}	2,700 {nc}	--	mg/kg	< 0.0032	<0.0028	<0.0028
1,3-Dinitrobenzene	0.61 {nc}	6.2 {nc}	--	mg/kg	< 0.0032	<0.0028	<0.0028
2,4,6-Trinitrotoluene	3.6 {ca**}	42 {ca**}	--	mg/kg	< 0.0032	<0.0028	<0.0028
2,4-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	< 0.0032	<0.0028	<0.0028
2,6-Dinitrotoluene	6.1 {nc}	62 {nc}	--	mg/kg	< 0.0032	<0.0028	<0.0028
2-Amino-4,6-Dinitrotoluene	15 {nc}	190 {nc}	--	mg/kg	< 0.0032	<0.0028	<0.0028
4-Amino-2,6-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	< 0.0032	<0.0028	<0.0028
Dinitrotoluene Mix	0.71 {ca}	2.5 {ca}	--	mg/kg	< 0.0032	<0.0028	<0.0028
HMX	310 {nc}	3,100 {nc}	--	mg/kg	< 0.013	< 0.011	< 0.011
m-Nitrotoluene	--	--	--	mg/kg	< 0.0016	< 0.0014	< 0.0014
Nitrobenzene	3.1 {nc}	28 {nc}	--	mg/kg	< 0.0016	< 0.0014	< 0.0014
Nitroglycerine	0.61 {nc}	6.2 {nc}	--	mg/kg	< 0.0032	<0.0028	<0.0028
o-Nitrotoluene	78 {nc}	1,300 {sat}	--	mg/kg	< 0.0016	< 0.0014	< 0.0014
Pentaerythritol Tetranitrate	--	--	--	mg/kg	< 0.0032	<0.0028	<0.0028
p-Nitrotoluene	30 {ca**}	110 {ca*}	--	mg/kg	< 0.0016	< 0.0014	< 0.0014
RDX	4.4 {ca*}	16 {ca}	--	mg/kg	< 0.0064	< 0.0057	< 0.0057
Tetryl	24 {nc}	250 {nc}	--	mg/kg	< 0.013	< 0.011	< 0.011
Pesticides							
4,4'-DDD	2 {ca**}	7.2 {ca**}	--	mg/kg	< 0.00029	< 0.00026	< 0.00025
4,4'-DDE	1.4 {ca**}	5.1 {ca**}	--	mg/kg	0.00490	< 0.00023	< 0.0014
4,4'-DDT	1.7 {ca*}	7 {ca*}	--	mg/kg	0.01700	0.00410	0.00340
Aldrin	0.029 {ca*}	0.1 {ca}	--	mg/kg	< 0.00037	< 0.00033	< 0.00032
Alpha-BHC	0.077 {ca**}	0.27 {ca**}	--	mg/kg	< 0.00029	< 0.00026	< 0.00025
Alpha-Chlordane	1.6 {ca**}	6.5 {ca**}	--	mg/kg	< 0.0017	< 0.0015	< 0.0015
Beta-BHC	0.27 {ca**}	0.96 {ca**}	--	mg/kg	< 0.00026	< 0.00023	< 0.00022
Delta-BHC	0.52 {ca**}	2.1 {ca**}	--	mg/kg	< 0.0017	< 0.0015	< 0.0015
Chlordane	--	--	--	mg/kg	< 0.00022	< 0.0002	< 0.00019
Dieldrin	0.03 {ca}	0.11 {ca}	--	mg/kg	0.00690	0.00098	0.00120
Endosulfan I	--	--	--	mg/kg	< 0.00036	< 0.00032	< 0.00031
Endosulfan II	37 {nc}	370 {nc}	--	mg/kg	< 0.00026	< 0.00023	< 0.00022
Endosulfan Sulfate	--	--	--	mg/kg	< 0.00022	< 0.0002	< 0.00019
Endrin	1.8 {nc}	18 {nc}	--	mg/kg	0.00230	< 0.00021	< 0.00021
Endrin Aldehyde	1.8 {nc}	18 {nc}	--	mg/kg	< 0.00031	< 0.00027	< 0.00027
Endrin Ketone	--	--	--	mg/kg	< 0.00019	< 0.00017	< 0.00017
Gamma-BHC (Lindane)	0.52 {ca*}	2.1 {ca}	--	mg/kg	< 0.00055	< 0.00049	< 0.00048
Gamma-Chlordane	1.6 {ca**}	6.5 {ca**}	--	mg/kg	< 0.00036	< 0.00032	< 0.00031
Heptachlor	0.11 {ca}	0.38 {ca}	--	mg/kg	< 0.00041	< 0.00036	< 0.00035
Heptachlor Epoxide	0.053 {ca*}	0.19 {ca*}	--	mg/kg	< 0.0012	< 0.001	< 0.001
Methoxychlor	31 {nc}	310 {nc}	--	mg/kg	< 0.00037	< 0.00033	< 0.00032
Toxaphene	0.44 {ca**}	1.6 {ca**}	--	mg/kg	< 0.021	< 0.018	< 0.018
PCBs							
Aroclor-1016	0.39 {nc}	21 {ca**}	--	mg/kg	< 0.0042	< 0.0037	< 0.0036
Aroclor-1221	0.17 {ca**}	0.62 {ca**}	--	mg/kg	< 0.015	< 0.013	< 0.013
Aroclor-1232	0.17 {ca**}	0.62 {ca**}	--	mg/kg	< 0.024	< 0.021	< 0.021
Aroclor-1242	0.22 {ca**}	0.74 {ca**}	--	mg/kg	< 0.031	< 0.027	< 0.026
Aroclor-1248	0.22 {ca**}	0.74 {ca**}	--	mg/kg	< 0.011	< 0.0098	< 0.0096
Aroclor-1254	0.22 {ca**}	0.74 {ca*}	--	mg/kg	0.190	0.030	0.034
Aroclor-1260	0.22 {ca**}	0.74 {ca**}	--	mg/kg	< 0.0061	< 0.0054	< 0.0053
Volatile Organics							
1,1,1-Trichloroethane	680	680	--	mg/kg	< 0.0029	< 0.0026	< 0.0025
1,1,2,2-Tetrachloroethane	0.59	2.9	--	mg/kg	< 0.0032	< 0.0028	< 0.0028
1,1,2-Trichloroethane	1.1	5.5	--	mg/kg	< 0.0031	< 0.0027	< 0.0026
1,1-Dichloroethane	3.4	17	--	mg/kg	< 0.0029	< 0.0026	< 0.0025
1,1-Dichloroethene	25	110	--	mg/kg	< 0.0023	< 0.002	< 0.0019
1,2-Dichloroethane	0.45	2.2	--	mg/kg	< 0.0026	< 0.0023	< 0.0022
1,2-Dichloropropane	0.93	4.7	--	mg/kg	< 0.0029	< 0.0026	< 0.0025
2-Butanone	28,000	28,000	--	mg/kg	< 0.0061	< 0.0054	< 0.0053
2-Hexanone	--	--	--	mg/kg	< 0.0039	< 0.0034	< 0.0033
4-Methyl-2-pentanone	3,200	3,200	--	mg/kg	< 0.0039	< 0.0034	< 0.0033
Acetone	6,100	110,000	--	mg/kg	< 0.0027	< 0.0024	< 0.0024
Benzene	1.1	5.6	--	mg/kg	< 0.0029	< 0.0026	< 0.0025
Bromochloromethane	--	--	--	mg/kg	< 0.0027	< 0.0024	< 0.0024
Bromoform	61	220	--	mg/kg	< 0.0023	< 0.002	< 0.0019
Bromomethane	0.79	3.5	--	mg/kg	< 0.0029	< 0.0026	< 0.0025
Carbon Disulfide	260	260	--	mg/kg	< 0.0023	< 0.002	< 0.0019
Carbon Tetrachloride	0.25	1.3	--	mg/kg	< 0.0031	< 0.0027	< 0.0026

Notes found at end of table.

Table A-4. Conductive Flooring Analytical Results, Bag Loading Area, 2002 US Army Corp of Engineers Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	RFAAP-405 Flooring	RFAAP-407 Flooring	RFAAP-413 Flooring
Volatile Organics							
Chlorobenzene	31	860	--	mg/kg	< 0.0029	< 0.0026	< 0.0025
Chloroethane	2,200	2,200	--	mg/kg	< 0.0032	< 0.0028	< 0.0028
Chloroform	0.3	1.5	--	mg/kg	< 0.0031	< 0.0027	< 0.0026
Chloromethane	1.7	8.4	--	mg/kg	< 0.0031	< 0.0027	< 0.0026
cis-1,2-Dichloroethene	78	1,400	--	mg/kg	< 0.0029	< 0.0026	< 0.0025
cis-1,3-Dichloropropene	--	--	--	mg/kg	< 0.0019	< 0.0017	< 0.0017
Dichlorodifluoromethane	19	78	--	mg/kg	< 0.0024	< 0.0021	< 0.0021
Ethylbenzene	5.7	29	--	mg/kg	< 0.0031	< 0.0027	< 0.0026
m,p-Xylene	--	--	--	mg/kg	< 0.0056	< 0.005	< 0.0048
Methylene Chloride	11	54	--	mg/kg	0.013	0.011	0.012
o-Xylene	300	300	--	mg/kg	< 0.0026	< 0.0023	< 0.0022
Styrene	1,000	1,000	--	mg/kg	< 0.0027	< 0.0024	< 0.0024
Tetrachloroethene	0.57	2.7	--	mg/kg	< 0.0029	< 0.0026	< 0.0025
Toluene	930	930	--	mg/kg	< 0.0026	< 0.0023	< 0.0022
trans-1,2-Dichloroethene	11	50	--	mg/kg	< 0.0023	< 0.002	< 0.0019
trans-1,3-Dichloropropene	--	--	--	mg/kg	< 0.0019	< 0.0017	< 0.0017
Trichloroethene	2.8	14	--	mg/kg	< 0.0018	< 0.0016	< 0.0016
Vinyl Chloride	0.06	1.7	--	mg/kg	< 0.0032	< 0.0028	< 0.0028
Xylenes (total)	300	300	--	mg/kg	ND	ND	ND
Semivolatile Organics							
1,2,4-Trichlorobenzene	180 {ca**}	220 {sat}	--	mg/kg	< 0.053	< 0.047	< 0.046
1,2-Dichlorobenzene	220 {sat}	220 {sat}	--	mg/kg	< 0.056	< 0.05	< 0.048
1,3-Dichlorobenzene	--	--	--	mg/kg	< 0.051	< 0.045	< 0.044
1,4-Dichlorobenzene	2.6 {ca}	13 {ca}	--	mg/kg	< 0.048	< 0.043	< 0.042
2,2-Oxybis(1-Chloropropane)	--	--	--	mg/kg	< 0.055	< 0.048	< 0.047
2,4,5-Trichlorophenol	610 {nc}	6,200 {nc}	--	mg/kg	< 0.10	< 0.092	< 0.09
2,4,6-Trichlorophenol	44 {ca**}	160 {ca**}	--	mg/kg	< 0.10	< 0.091	< 0.089
2,4-Dichlorophenol	18 {nc}	180 {nc}	--	mg/kg	< 0.071	< 0.062	< 0.061
2,4-Dimethylphenol	120 {nc}	1,200 {nc}	--	mg/kg	< 0.22	< 0.2	< 0.19
2,4-Dinitrophenol	12 {nc}	120 {nc}	--	mg/kg	< 0.14	< 0.12	< 0.12
2,4-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	< 0.071	< 0.062	< 0.061
2,6-Dinitrotoluene	6.1 {nc}	62 {nc}	--	mg/kg	< 0.059	< 0.053	< 0.051
2-Chloronaphthalene	210 {sat}	210 {sat}	--	mg/kg	< 0.056	< 0.05	< 0.048
2-Chlorophenol	39 {nc}	510 {nc}	--	mg/kg	< 0.077	< 0.068	< 0.066
2-Methylnaphthalene	31 {nc}	440 {sat}	--	mg/kg	< 0.051	< 0.045	< 0.044
2-Methylphenol	310 {nc}	3,100 {nc}	--	mg/kg	< 0.092	< 0.081	< 0.079
2-Nitroaniline	--	--	--	mg/kg	< 0.063	< 0.055	< 0.054
2-Nitrophenol	--	--	--	mg/kg	< 0.11	< 0.097	< 0.094
3,3'-Dichlorobenzidine	1.1 {ca**}	3.8 {ca**}	--	mg/kg	< 0.071	< 0.062	< 0.061
3-Nitroaniline	--	--	--	mg/kg	< 0.063	< 0.055	< 0.054
4,6-Dinitro-2-methylphenol	--	--	--	mg/kg	< 0.22	< 0.2	< 0.19
4-Bromophenyl-phenylether	--	--	--	mg/kg	< 0.039	< 0.034	< 0.033
4-Chloro-3-Methylphenol	--	--	--	mg/kg	< 0.066	< 0.058	< 0.057
4-Chloroaniline	24 {nc}	250 {nc}	--	mg/kg	< 0.016	< 0.014	< 0.013
4-Chlorophenyl-phenylether	--	--	--	mg/kg	< 0.039	< 0.034	< 0.033
4-Methylphenol	31 {nc}	310 {nc}	--	mg/kg	< 0.11	< 0.098	< 0.096
4-Nitroaniline	--	--	--	mg/kg	< 0.10	< 0.088	< 0.086
4-Nitrophenol	--	--	--	mg/kg	< 0.18	< 0.16	< 0.15
Acenaphthene	340 {nc}	3,300 {nc}	--	mg/kg	< 0.066	< 0.058	< 0.057
Acenaphthylene	340 {nc}	3,300 {nc}	--	mg/kg	< 0.18	< 0.16	< 0.15
Anthracene	1,700 {nc}	170,000 {max}	--	mg/kg	< 0.079	< 0.07	< 0.068
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	< 0.051	< 0.045	< 0.044
Benzo(a)pyrene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	< 0.045	< 0.04	< 0.039
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	< 0.11	< 0.099	< 0.097
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	< 0.11	< 0.099	< 0.097
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	< 0.087	< 0.077	< 0.075
Benzyl Butyl Phthalate	--	--	--	mg/kg	< 0.055	< 0.048	< 0.047
bis(2-Chloroethoxy)methane	18 {nc}	180 {nc}	--	mg/kg	< 0.047	< 0.041	< 0.04
bis(2-Chloroethyl)ether	0.19 {ca**}	0.9 {ca**}	--	mg/kg	< 0.051	< 0.045	< 0.044
bis(2-Ethylhexyl)phthalate	35 {ca*}	120 {ca*}	--	mg/kg	0.08	0.097	0.052
Carbazole	24 {ca**}	86 {ca**}	--	mg/kg	< 0.061	< 0.054	< 0.053
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	< 0.069	< 0.061	< 0.06
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	< 0.09	< 0.08	< 0.078
Dibenzofuran	--	--	--	mg/kg	< 0.059	< 0.053	< 0.051
Diethylphthalate	4,900 {nc}	490,000 {max}	--	mg/kg	< 0.19	< 0.17	< 0.17
Dimethylphthalate	--	--	--	mg/kg	< 0.18	< 0.16	< 0.15
Di-n-Butylphthalate	610 {nc}	6,200 {nc}	--	mg/kg	0.100 J	0.074 J	0.120 J
Di-n-Octylphthalate	--	--	--	mg/kg	< 0.071	< 0.062	< 0.061
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	< 0.12	< 0.1	< 0.1
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	< 0.082	< 0.072	< 0.071
Hexachlorobenzene	0.3 {ca}	1.1 {ca}	--	mg/kg	< 0.048	< 0.043	< 0.042
Hexachlorobutadiene	6.2 {ca**}	22 {ca*}	--	mg/kg	< 0.51	< 0.45	< 0.44

Notes found at end of table.

Table A-4. Conductive Flooring Analytical Results, Bag Loading Area, 2002 US Army Corp of Engineers Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	RFAAP-405 Flooring	RFAAP-407 Flooring	RFAAP-413 Flooring
Semivolatile Organics							
Hexachlorocyclopentadiene	37 {nc}	370 {nc}	--	mg/kg	< 0.15	< 0.13	< 0.13
Hexachloroethane	35 {ca**}	120 {ca**}	--	mg/kg	< 0.061	< 0.054	< 0.053
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	< 0.084	< 0.074	< 0.072
Isophorone	510 {ca*}	1,800 {ca*}	--	mg/kg	< 0.058	< 0.051	< 0.05
Naphthalene	3.9 {ca}	20 {ca}	--	mg/kg	< 0.071	< 0.062	< 0.061
Nitrobenzene	3.1 {nc}	28 {nc}	--	mg/kg	< 0.061	< 0.054	< 0.053
N-Nitroso-di-n-propylamine	0.069 {ca**}	0.25 {ca**}	--	mg/kg	< 0.051	< 0.045	< 0.044
N-Nitrosodiphenylamine	99 {ca**}	350 {ca**}	--	mg/kg	< 0.032	< 0.028	< 0.028
Pentachlorophenol	3 {ca}	9 {ca}	--	mg/kg	< 0.17	< 0.15	< 0.14
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	< 0.066	< 0.058	< 0.057
Phenol	1,800 {nc}	180,000 {max}	--	mg/kg	< 0.043	< 0.038	< 0.037
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	< 0.11	< 0.097	< 0.094
Inorganics							
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	1,270	1,230	8,330
Antimony	3.1 {nc}	41 {nc}	--	mg/kg	< 5.1	< 5.1	< 5.4
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	5.3	5.5	10.2
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	149	36	80
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	0.58	0.31	0.97
Cadmium	7 {nc}	81 {nc}	0.69	mg/kg	6.8	3.5	9.3
Calcium	--	--	--	mg/kg	97,600	88,300	76,400
Chromium	280 {ca}	1,460 {ca}	65.3	mg/kg	95.4	102.0	91.7
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	12.2	12.1	14.6
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	120,000	112,000	80,600
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	32,500	33,600	41,900
Lead	400 {++}	800 {++}	26.8	mg/kg	268	273	289
Magnesium	--	--	--	mg/kg	126,000	111,000	125,000
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	166	150	290
Mercury	3.1 {sat}	3.1 {sat}	0.13	mg/kg	< 0.02	< 0.02	< 0.02
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	188	212	143
Potassium	--	--	--	mg/kg	428	281	1,250
Selenium	39 {nc}	510 {nc}	--	mg/kg	< 1.3	< 1.3	< 1.4
Silver	39 {nc}	510 {nc}	--	mg/kg	4.3	2.6	3.5
Sodium	--	--	--	mg/kg	365	320	ND
Thallium	0.51 {nc}	6.6 {nc}	2.11	mg/kg	< 3.5	< 3.5	< 3.7
Vanadium	55 {nc}	720 {nc}	108	mg/kg	3.2	3.4	30.5
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	460	430	306
Asbestos							
Chrysotile	--	--	--	%	2	2	2

mg/kg

Milligrams per kilogram.

[a] USEPA Regional Screening Levels (USEPA 2008a).

[b] Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.

{ca} Carcinogen.

{nc} Noncarcinogen.

* Noncarcinogen screening level is less than one hundred times the carcinogen screening level.

** Noncarcinogen screening level is less than ten times the carcinogen screening level.

{++} The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.

{max} Concentration may exceed ceiling limit.

{sat} Screening level may exceed saturation concentration.

B (Inorganics) Constituent concentration quantified as estimated.

B (Organics) Constituent was detected in the associated method blank.

J Constituent concentration quantified as estimated.

K Estimated concentration bias high.

L Estimated concentration bias low.

NA Not Analyzed.

{3.3} Bracketed concentration indicates laboratory analytical result for duplicate sample

24,400 Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).

10.6 J Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).

16 Bolded inorganics indicates concentration is above facility-wide background value.

Table A-5. Soil Analytical Results, Bag Loading Area, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	BLASB0 0 - 0.5 06/11/02	BLASB01 2 - 4 06/20/02	BLASB02 0 - 0.5 06/11/02	BLASB02 2 - 4 06/20/02	BLASB03 0 - 0.5 06/11/02	BLASB03 2 - 4 06/20/02	BLASS01 0 - 0.5 06/11/02	BLASS02 0 - 0.5 06/11/02	BLASS03 0 - 0.5 06/11/02	BLASS04 0 - 0.5 06/11/02	BLASS02 0 - 0.5 06/11/02	BLASS05 0 - 0.5 06/11/02	BLASS06 0 - 0.5 06/11/02	BLASS07 0 - 0.5 06/11/02	BLASS08 0 - 0.5 06/11/02	BLASS09 0 - 0.5 06/11/02	BLASS10 0 - 0.5 06/11/02	BLASS11 0 - 0.5 06/11/02	BLATR01 0 - 0.5 06/20/02	BLATR02 0 - 0.5 06/20/02	BLATR03 0 - 0.5 06/20/02	
Explosives																										
1,3,5-Trinitrobenzene	220 (nc)	2,700 (nc)	--	mg/kg	<0.1	<0.1 [<0.1]	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.07 J	<0.1	<0.1	<0.1	<0.1 [<0.1]	<0.1	NA	NA	NA	
1,3-Dinitrobenzene	0.61 (nc)	6.2 (nc)	--	mg/kg	<0.1	<0.1 [<0.1]	<0.1	<0.1	<0.2	<0.1	<0.1	0.05 J	<0.1	<0.1	0.05 J	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1 [<0.1]	<0.1	NA	NA	NA	
2,4,6-Trinitrotoluene	3.6 (ca**)	42 (ca**)	--	mg/kg	<0.2	<0.2 [<0.2]	<0.2	<0.2	<0.4	<0.2	<0.2	<0.2	0.06 J	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2 [<0.2]	<0.2	NA	NA	NA	
2,4-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	<0.2	<0.2 [<0.2]	0.05 J	<0.2	0.43 K	<0.2	<0.2	0.26	2.99	0.08 J	0.26	0.08 J	<0.2	<0.2	0.25	0.04 K	<0.2 [<0.2]	<0.2	NA	NA	NA	
2,6-Dinitrotoluene	6.1 (nc)	62 (nc)	--	mg/kg	<0.2	<0.2 [<0.2]	<0.2	<0.2	<0.4	<0.2	<0.2	<0.2	0.32	<0.2	<0.2	<0.2	0.07 J	<0.2	<0.2	<0.2	<0.2 [<0.2]	<0.2	NA	NA	NA	
2-Amino-4,6-Dinitrotoluene	15 (nc)	190 (nc)	--	mg/kg	<0.2	<0.2 [<0.2]	<0.2	<0.2	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2 [<0.2]	<0.2	NA	NA	NA	
4-Amino-2,6-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	<0.2	<0.2 [<0.2]	<0.2	<0.2	<0.4	<0.2	<0.2	<0.2	0.07 K	<0.2	<0.2	<0.2	0.06 K	0.04 K	<0.2	<0.2 [<0.2]	<0.2	NA	NA	NA		
Dinitrotoluene Mix	0.71 (ca)	2.5 (ca)	--	mg/kg	<0.2	<0.2 [<0.2]	0.05 J	<0.2	0.43	<0.2	<0.2	0.26	3.31	0.08 J	0.26	0.08 J	0.07 J	<0.2	0.25	0.04	<0.2 [<0.2]	<0.2	NA	NA	NA	
HMX	310 (nc)	3,100 (nc)	--	mg/kg	<0.2	<0.2 [<0.2]	<0.2	<0.2	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2 [<0.2]	<0.2	NA	NA	NA	
m-Nitrotoluene	--	--	--	mg/kg	<0.4	<0.4 [<0.4]	<0.4	<0.4	<0.8	<0.4	<0.4	<0.4	<0.4	2.86	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4 [<0.4]	<0.4	NA	NA	NA	
Nitrobenzene	3.1 (nc)	28 (nc)	--	mg/kg	<0.2	<0.2 [<0.2]	<0.2	<0.2	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2 [<0.2]	<0.2	NA	NA	NA	
Nitroglycerine	0.61 (nc)	6.2 (nc)	--	mg/kg	<0.34	<0.41 [<0.38]	<0.35	<0.47	<0.68	<0.39	<0.34	<0.31	<0.72	<0.39	<0.31	<0.31	<0.72	<0.69	<0.7	<0.37	<0.36 [<0.37]	0.21 J	NA	NA	NA	
o-Nitrotoluene	78 (nc)	1,300 (sat)	--	mg/kg	<0.4	<0.4 [<0.4]	<0.4	<0.4	<0.8	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4 [<0.4]	<0.4	NA	NA	NA	
Pentaerythritol Tetranitrate	--	--	--	mg/kg	<0.34	<0.41 [<0.38]	<0.35	<0.47	<0.68	<0.39	<0.34	<0.31	<0.72	<0.39	<0.31	<0.31	<0.72	<0.69	<0.7	<0.37	<0.36 [<0.37]	<0.36	NA	NA	NA	
p-Nitrotoluene	30 (ca**)	110 (ca*)	--	mg/kg	<0.4	<0.4 [<0.4]	<0.4	<0.4	<0.8	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4 [<0.4]	<0.4	NA	NA	NA	
RDX	4.4 (ca*)	16 (ca)	--	mg/kg	<0.2	<0.2 [<0.2]	<0.2	<0.2	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2 [<0.2]	<0.2	NA	NA	NA	
Tetryl	24 (nc)	250 (nc)	--	mg/kg	<0.2	<0.2 [<0.2]	<0.2	<0.2	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2 [<0.2]	<0.2	NA	NA	NA	
Herbicides																										
2,4,5-T	61	620	--	mg/kg	NA	NA	<0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.121 [<0.124]	NA	NA	NA	NA	
2,4,5-TP	49	490	--	mg/kg	NA	NA	<0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.121 [<0.124]	NA	NA	NA	NA	
2,4-D	69	770	--	mg/kg	NA	NA	<0.239	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.243 [<0.249]	NA	NA	NA	NA	
2,4-DB	49	490	--	mg/kg	NA	NA	<1.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.21 [<1.24]	NA	NA	NA	NA	
Dalapon	180	1,800	--	mg/kg	NA	NA	<1.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.21 [<1.24]	NA	NA	NA	NA	
Dicamba	180	1,800	--	mg/kg	NA	NA	<0.239	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.243 [<0.249]	NA	NA	NA	NA	
Dichlorprop	--	--	--	mg/kg	NA	NA	<0.239	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.243 [<0.249]	NA	NA	NA	NA	
Dinoseb	6.1	62	--	mg/kg	NA	NA	<0.239	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.243 [<0.249]	NA	NA	NA	NA	
MCPA	3.1	31	--	mg/kg	NA	NA	<120	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<121 [<124]	NA	NA	NA	NA	
MCPP	6.1	62	--	mg/kg	NA	NA	<120	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<121 [<124]	NA	NA	NA	NA	
Organochlorine Pesticides																										
4,4'-DDD	2 (ca**)	7.2 (ca**)	--	mg/kg	NA	NA	<0.00798	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00574 J [0.00627 J]	NA	NA	NA	NA	
4,4'-DDE	1.4 (ca**)	5.1 (ca**)	--	mg/kg	NA	NA	<0.00798	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00809 [<0.0083]	NA	NA	NA	NA	
4,4'-DDT	1.7 (ca*)	7 (ca*)	--	mg/kg	NA	NA	<0.00798	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00809 [<0.0083]	NA	NA	NA	NA	
Aldrin	0.029 (ca*)	0.1 (ca)	--	mg/kg	NA	NA	<0.00798	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00809 [<0.0083]	NA	NA	NA	NA	
Alpha-BHC	0.077 (ca**)	0.27 (ca**)	--	mg/kg	NA	NA	<0.00798	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00809 [<0.0083]	NA	NA	NA	NA	
Alpha-Chlordane	1.6 (ca**)	6.5 (ca**)	--	mg/kg	NA	NA	<0.00798	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00809 [<0.0083]	NA	NA	NA	NA	
Beta-BHC	0.27 (ca**)	0.96 (ca**)	--	mg/kg	NA	NA	<0.00798	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00809 [<0.0083]	NA	NA	NA	NA	
Delta-BHC	0.52 (ca**)	2.1 (ca**)	--	mg/kg	NA	NA	<0.00798	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00809 [<0.0083]	NA	NA	NA	NA	
Dieldrin	0.03 (ca)	0.11 (ca)	--	mg/kg	NA	NA	<0.00798 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00809 J [<0.0083 J]	NA	NA	NA	NA	
Endosulfan I	--	--	--	mg/kg	NA	NA	<0.00798	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00809 [<0.0083]	NA	NA	NA	NA	
Endosulfan II	37 (nc)	370 (nc)	--	mg/kg	NA	NA	<0.00798	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00809 [<0.0083]	NA	NA	NA	NA	
Endosulfan Sulfate	--	--	--	mg/kg	NA	NA	<0.00798	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA						

Table A-5. Soil Analytical Results, Bag Loading Area, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	BLASB0 0 - 0.5 06/11/02	BLASB01 2 - 4 06/20/02	BLASB02 0 - 0.5 06/11/02	BLASB02 2 - 4 06/20/02	BLASB03 0 - 0.5 06/11/02	BLASB03 2 - 4 06/20/02	BLASS01 0 - 0.5 06/11/02	BLASS02 0 - 0.5 06/11/02	BLASS03 0 - 0.5 06/11/02	BLASS04 0 - 0.5 06/11/02	BLASS02 0 - 0.5 06/11/02	BLASS05 0 - 0.5 06/11/02	BLASS06 0 - 0.5 06/11/02	BLASS07 0 - 0.5 06/11/02	BLASS08 0 - 0.5 06/11/02	BLASS09 0 - 0.5 06/11/02	BLASS10 0 - 0.5 06/11/02	BLASS11 0 - 0.5 06/11/02	BLATR01 0 - 0.5 06/20/02	BLATR02 0 - 0.5 06/20/02	BLATR03 0 - 0.5 06/20/02	
Volatile Organics																										
1,2,3-Trichlorobenzene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1,2,4-Trichlorobenzene	180	220	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1,2-Dibromo-3-chloropropane	0.0056	0.073	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1,2-Dibromoethane	0.034	0.17	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1,2-Dichlorobenzene	220	220	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1,2-Dichloroethane	0.45	2.2	--	mg/kg	<0.0057	<0.0069 [<0.0064]	<0.0066	<0.0079	<0.0074	<0.0059	<0.0058	<0.0067	<0.0066	NA	<0.0067	<0.0088	<0.0066	<0.0070	NA	<0.0055	<0.0061 [<0.0056]	<0.0068	NA	NA	NA	
1,2-Dichloropropane	0.93	4.7	--	mg/kg	<0.0057	<0.0069 [<0.0064]	<0.0066	<0.0079	<0.0074	<0.0059	<0.0058	<0.0067	<0.0066	NA	<0.0067	<0.0088	<0.0066	<0.0070	NA	<0.0055	<0.0061 [<0.0056]	<0.0068	NA	NA	NA	
1,3-Dichlorobenzene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1,4-Dichlorobenzene	2.6	13	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1,4-Dioxane	44	160	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
2-Butanone	28,000	28,000	--	mg/kg	<0.0057 J	<0.0069 [<0.0064]	<0.0066 J	<0.0079	<0.0074 J	<0.0059	<0.0058 J	<0.0067 J	<0.0066 J	NA	<0.0067 J	<0.0088 J	<0.0066 J	<0.0070 J	NA	<0.0055 J	<0.0061 J [<0.0056 J]	<0.0068 J	NA	NA	NA	
2-Hexanone	--	--	--	mg/kg	<0.0057 J	<0.0069 [<0.0064]	<0.0066 J	<0.0079	<0.0074 J	<0.0059	<0.0058 J	<0.0067 J	<0.0066 J	NA	<0.0067 J	<0.0088 J	<0.0066 J	<0.0070 J	NA	<0.0055 J	<0.0061 J [<0.0056 J]	<0.0068 J	NA	NA	NA	
3-Octanone	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.011 J	NA	NA	NA	NA	NA	NA	NA	
4-Methyl-2-pentanone	3,200	3,200	--	mg/kg	<0.0057	<0.0069 [<0.0064]	<0.0066	<0.0079	<0.0074	<0.0059	<0.0058	<0.0067	<0.0066	NA	<0.0067	<0.0088	<0.0066	<0.0070	NA	<0.0055	<0.0061 [<0.0056]	<0.0068	NA	NA	NA	
Acetone	6,100	110,000	--	mg/kg	<0.0057 J	<0.0069 [<0.0064]	<0.0066 J	<0.0079	<0.0074 J	<0.0059	<0.0058 J	<0.0067 J	<0.0066 J	NA	<0.0067 J	<0.0088 J	<0.0066 J	0.023 B	NA	<0.0055 J	<0.0061 J [<0.0056 J]	<0.0068 J	NA	NA	NA	
Benzene	1.1	5.6	--	mg/kg	<0.0057	<0.0069 [<0.0064]	<0.0066	<0.0079	<0.0074	<0.0059	<0.0058	<0.0067	<0.0066	NA	<0.0067	<0.0088	<0.0066	<0.0070	NA	<0.0055	<0.0061 [<0.0056]	<0.0068	NA	NA	NA	
Bromochloromethane	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Bromodichloromethane	10	46	--	mg/kg	<0.0057	<0.0069 [<0.0064]	<0.0066	<0.0079	<0.0074	<0.0059	<0.0058	<0.0067	<0.0066	NA	<0.0067	<0.0088	<0.0066	<0.0070	NA	<0.0055	<0.0061 [<0.0056]	<0.0068	NA	NA	NA	
Bromoform	61	220	--	mg/kg	<0.0057	<0.0069 L [<0.0064 L]	<0.0066	<0.0079 L	<0.0074	<0.0059 L	<0.0058	<0.0067	<0.0066	NA	<0.0067	<0.0088	<0.0066	<0.0070	NA	<0.0055	<0.0061 [<0.0056]	<0.0068	NA	NA	NA	
Bromomethane	0.79	3.5	--	mg/kg	<0.0057	<0.0069 [<0.0064]	<0.0066	<0.0079	<0.0074	<0.0059	<0.0058	<0.0067	<0.0066	NA	<0.0067	<0.0088	<0.0066	<0.0070	NA	<0.0055	<0.0061 [<0.0056]	<0.0068	NA	NA	NA	
Carbon Disulfide	260	260	--	mg/kg	<0.0057	0.0016 B [<0.0064]	<0.0066	<0.0079	<0.0074	0.00043 B	<0.0058	<0.0067	<0.0066	NA	<0.0067	<0.0088	<0.0066	<0.0070	NA	<0.0055	<0.0061 [<0.0056]	<0.0068	NA	NA	NA	
Carbon Tetrachloride	0.25	1.3	--	mg/kg	<0.0057	<0.0069 [<0.0064]	<0.0066	<0.0079	<0.0074	<0.0059	<0.0058	<0.0067	<0.0066	NA	<0.0067	<0.0088	<0.0066	<0.0070	NA	<0.0055	<0.0061 [<0.0056]	<0.0068	NA	NA	NA	
Chlorobenzene	31	860	--	mg/kg	<0.0057	<0.0069 [<0.0064]	<0.0066	<0.0079	<0.0074	<0.0059	<0.0058	<0.0067	<0.0066	NA	<0.0067	<0.0088	<0.0066	<0.0070	NA	<0.0055	<0.0061 [<0.0056]	<0.0068	NA	NA	NA	
Chloroethane	2,200	2,200	--	mg/kg	<0.0057	<0.0069 [<0.0064]	<0.0066	<0.0079	<0.0074	<0.0059	<0.0058	<0.0067	<0.0066	NA	<0.0067	<0.0088	<0.0066	<0.0070	NA	<0.0055	<0.0061 [<0.0056]	<0.0068	NA	NA	NA	
Chloroform	0.3	1.5	--	mg/kg	<0.0057	<0.0069 [<0.0064]	<0.0066	<0.0079	<0.0074	<0.0059	<0.0058	<0.0067	<0.0066	NA	<0.0067	<0.0088	<0.0066	<0.0070	NA	<0.0055	<0.0061 [<0.0056]	<0.0068	NA	NA	NA	
Chloromethane	1.7	8.4	--	mg/kg	<0.0057	<0.0069 [<0.0064]	<0.0066	<0.0079	<0.0074	<0.0059	<0.0058	<0.0067	<0.0066	NA	<0.0067	<0.0088	<0.0066	<0.0070	NA	<0.0055	<0.0061 [<0.0056]	<0.0068	NA	NA	NA	
cis-1,2-Dichloroethene	78	1,400	--	mg/kg	<0.0057	<0.0069 [<0.0064]	<0.0066	<0.0079	<0.0074	<0.0059	<0.0058	<0.0067	<0.0066	NA	<0.0067	<0.0088	<0.0066	<0.0070	NA	<0.0055	<0.0061 [<0.0056]	<0.0068	NA	NA	NA	
cis-1,3-Dichloropropene	--	--	--	mg/kg	<0.0057	<0.0069 [<0.0064]	<0.0066	<0.0079	<0.0074	<0.0059	<0.0058	<0.0067	<0.0066	NA	<0.0067	<0.0088	<0.0066	<0.0070	NA	<0.0055	<0.0061 [<0.0056]	<0.0068	NA	NA	NA	
Cyclohexane	120	120	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Dibromochloromethane	5.8	21	--	mg/kg	<0.0057	<0.0069 [<0.0064]	<0.0066	<0.0079	<0.0074	<0.0059	<0.0058	<0.0067	<0.0066	NA	<0.0067	<0.0088	<0.0066	<0.0070	NA	<0.0055	<0.0061 [<0.0056]	<0.0068	NA	NA	NA	
Dichlorodifluoromethane	19	78	--	mg/kg	NA	NA	NA																			

Table A-5. Soil Analytical Results, Bag Loading Area, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	BLASB01 0 - 0.5 06/11/02	BLASB01 2 - 4 06/20/02	BLASB02 0 - 0.5 06/11/02	BLASB02 2 - 4 06/20/02	BLASB03 0 - 0.5 06/11/02	BLASB03 2 - 4 06/20/02	BLASS01 0 - 0.5 06/11/02	BLASS02 0 - 0.5 06/11/02	BLASS03 0 - 0.5 06/11/02	BLASS04 0 - 0.5 06/11/02	BLASS02 0 - 0.5 06/11/02	BLASS05 0 - 0.5 06/11/02	BLASS06 0 - 0.5 06/11/02	BLASS07 0 - 0.5 06/11/02	BLASS08 0 - 0.5 06/11/02	BLASS09 0 - 0.5 06/11/02	BLASS10 0 - 0.5 06/11/02	BLASS11 0 - 0.5 06/11/02	BLATR01 0 - 0.5 06/20/02	BLATR02 0 - 0.5 06/20/02	BLATR03 0 - 0.5 06/20/02
Semivolatile Organics																									
bis(2-Chloroisopropyl)ether	--	--	--	mg/kg	NA	NA	<0.20	<0.26	<0.78	<0.22	NA	NA	<0.21	NA	NA	R	<0.20 J	<0.39	NA	<0.21	<0.21 [<0.21]	<0.21	NA	NA	NA
bis(2-Ethylhexyl)phthalate	35	120	--	mg/kg	NA	NA	<0.20 J	0.030 B	0.18 B	0.037 B	NA	NA	<0.21	NA	NA	0.21 B	0.17 B	0.30 B	NA	<0.21	0.083 B [<0.21]	0.10 B	NA	NA	NA
Butylbenzylphthalate	1,200	120,000	--	mg/kg	NA	NA	<0.20 J	<0.26	<0.78	<0.22	NA	NA	<0.21	NA	NA	R	<0.20 J	<0.39	NA	<0.21	<0.21 [<0.21]	<0.21	NA	NA	NA
Carbazole	24	86	--	mg/kg	NA	NA	13	<0.26	0.71 J	<0.22	NA	NA	0.045 J	NA	NA	0.13 J	0.057 J	0.35 J	NA	0.14 J	0.25 [0.25]	0.18 J	NA	NA	NA
Chrysene	15	210	--	mg/kg	NA	NA	48	<0.26	4.4	0.015 J	NA	NA	0.21	NA	NA	0.89	0.31 J	1.4	NA	0.88	1.2 [1.1]	0.89	NA	NA	NA
Dibenzo(a,h)anthracene	0.015	0.21	--	mg/kg	NA	NA	5.9 J	<0.26	0.53 J	<0.22	NA	NA	<0.21 J	NA	NA	0.18	0.044 J	0.19 J	NA	0.14 J	0.18 J [0.19 J]	0.13 J	NA	NA	NA
Dibenzofuran	--	--	--	mg/kg	NA	NA	2.8	<0.26	0.24 J	<0.22	NA	NA	<0.21	NA	NA	0.074 J	0.016 J	0.084 J	NA	0.019 J	0.055 J [0.036 J]	0.025 J	NA	NA	NA
Diethylphthalate	4,900	490,000	--	mg/kg	NA	NA	<0.20 L	<0.26	<0.78 L	<0.22	NA	NA	<0.21 L	NA	NA	R	<0.20 J	<0.39 L	NA	<0.21 L	<0.21 L [<0.21 L]	<0.21 L	NA	NA	NA
Dimethylphthalate	--	--	--	mg/kg	NA	NA	<0.20	<0.26	<0.78	<0.22	NA	NA	<0.21	NA	NA	R	<0.20 J	<0.39	NA	<0.21	<0.21 [<0.21]	<0.21	NA	NA	NA
Di-n-Butylphthalate	610	6,200	--	mg/kg	NA	NA	<0.20	<0.26	2.5 B	<0.22	NA	NA	120 B	NA	NA	0.58 B	<0.20 J	<0.39	NA	0.36 B	0.061 B [<0.21]	<0.21	NA	NA	NA
Dinitrotoluene Mix	0.71	2.5	--	mg/kg	NA	NA	<0.20	<0.26	<0.78	<0.22	NA	NA	130 J	NA	NA	R	<0.20	<0.39	NA	<0.21	<0.21 [<0.21]	<0.21	NA	NA	NA
Di-n-Octylphthalate	--	--	--	mg/kg	NA	NA	<0.20 J	<0.26	<0.78	<0.22	NA	NA	<0.21 J	NA	NA	R	<0.20 J	<0.39	NA	<0.21	<0.21 [<0.21]	<0.21	NA	NA	NA
Fluoranthene	230	2,200	--	mg/kg	NA	NA	110	<0.26	9.4	0.033 J	NA	NA	0.37	NA	NA	1.5	0.69 J	3.9	NA	1.7	2.9 [2.5]	2.0	NA	NA	NA
Fluorene	230	2,200	--	mg/kg	NA	NA	5.2 J	<0.26	0.32 J	<0.22	NA	NA	<0.21	NA	NA	0.075 J	0.020 J	0.21 J	NA	0.032 J	0.11 J [0.083 J]	0.069 J	NA	NA	NA
Hexachlorobenzene	0.3	1.1	--	mg/kg	NA	NA	<0.20	<0.26	<0.78	<0.22	NA	NA	<0.21	NA	NA	R	<0.20 J	<0.39	NA	<0.21	<0.21 [<0.21]	<0.21	NA	NA	NA
Hexachlorobutadiene	6.2	22	--	mg/kg	NA	NA	<0.20	<0.26	<0.78	<0.22	NA	NA	<0.21	NA	NA	R	<0.20 J	<0.39	NA	<0.21	<0.21 [<0.21]	<0.21	NA	NA	NA
Hexachlorocyclopentadiene	37	370	--	mg/kg	NA	NA	<0.20	<0.26	<0.78	<0.22	NA	NA	<0.21	NA	NA	<0.18	<0.20 J	<0.39	NA	<0.21	<0.21 [<0.21]	<0.21	NA	NA	NA
Hexachloroethane	35	120	--	mg/kg	NA	NA	<0.20	<0.26	<0.78	<0.22	NA	NA	<0.21	NA	NA	R	<0.20 J	<0.39	NA	<0.21	<0.21 [<0.21]	<0.21	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.15	2.1	--	mg/kg	NA	NA	23	<0.26	2.3	<0.22	NA	NA	0.13 J	NA	NA	0.60	0.22 J	1.1	NA	0.68	0.91 [0.85]	0.63	NA	NA	NA
Isophorone	510	1,800	--	mg/kg	NA	NA	<0.20	<0.26	<0.78	<0.22	NA	NA	<0.21	NA	NA	R	<0.20 J	<0.39	NA	<0.21	<0.21 [<0.21]	<0.21	NA	NA	NA
Naphthalene	3.9 [ca]	20 [ca]	--	mg/kg	NA	NA	0.37	<0.26	0.23 J	<0.22	NA	NA	<0.21	NA	NA	0.072 J	0.013 J	0.019 J	NA	<0.21	0.036 J [<0.21]	<0.21	NA	NA	NA
Nitrobenzene	3.1	28	--	mg/kg	NA	NA	<0.20	<0.26	<0.78	<0.22	NA	NA	<0.21	NA	NA	R	<0.20 J	<0.39	NA	<0.21	<0.21 [<0.21]	<0.21	NA	NA	NA
N-Nitroso-di-n-propylamine	0.069	0.25	--	mg/kg	NA	NA	<0.20	<0.26	<0.78	<0.22	NA	NA	<0.21	NA	NA	<0.18	<0.20 J	<0.39	NA	<0.21	<0.21 [<0.21]	<0.21	NA	NA	NA
N-Nitrosodiphenylamine	99	350	--	mg/kg	NA	NA	<0.20	<0.26	<0.78	<0.22	NA	NA	8.3	NA	NA	R	<0.20 J	<0.39	NA	<0.21	<0.21 [<0.21]	<0.21	NA	NA	NA
Pentachlorophenol	3	9	--	mg/kg	NA	NA	<0.99	<1.3	<3.8	<1.1	NA	NA	<1.0	NA	NA	<0.86	<1.0 J	<1.9	NA	<1.0	<1.0 [<1.0]	<1.0	NA	NA	NA
Phenanthrene	1,700	170,000	--	mg/kg	NA	NA	78	<0.26	5.4	0.017 J	NA	NA	0.19 J	NA	NA	0.62	0.30 J	2.6	NA	0.73	1.7 [1.4]	1.2	NA	NA	NA
Phenol	1,800	180,000	--	mg/kg	NA	NA	<0.20	<0.26	<0.78	<0.22	NA	NA	<0.21	NA	NA	R	<0.20 J	<0.39	NA	<0.21	<0.21 [<0.21]	<0.21	NA	NA	NA
Pyrene	170	1,700	--	mg/kg	NA	NA	85 J	<0.26	7.9 J	0.026 J	NA	NA	0.42	NA	NA	1.6	0.53 J	3.1 J	NA	1.2	2.1 [1.9]	1.5	NA	NA	NA
Pyridine	7.8	100	--	mg/kg	NA	NA	<0.20	<0.26	<0.78	<0.22	NA	NA	<0.21	NA	NA	<0.18	<0.20 J	<0.39	NA	<0.21	<0.21 [<0.21]	<0.21	NA	NA	NA
Inorganics																									
Aluminum	7,700 [nc]	990,000 {max}	40,041	mg/kg	17,400	43,700 J [32,300 J]	26,500	40,900 J	14,000	30,500 J	18,000	5,530	13,500	NA	5,530	26,600	22,200	20,300	21,700	29,700	28,600 [25,400]	24,100	NA	NA	NA
Antimony	3.1 [nc]	41 [nc]	--	mg/kg	0.200 B	0.280 B [0.280 B]	<0.590 L	0.320 B	0.440 L	<0.650 L	0.230 B	0.200 B	0.970 L	NA	0.200 B	0.220 B	0.250 B	0.370 B	1.62 L	0.230 B	0.230 B [0.230 B]	0.230 B	NA	NA	NA
Arsenic	0.39 [ca*]	1.6 [ca]	15.8	mg/kg	6.40 J	5.26 J [3.99 J]	1.29 J	3.67 J	7.16 J	5.66 J	7.48 J	<0.510	7.05 J	NA	<0.510	14.8 J	7.94 J	12.5 J	4.94 J	7.97 J	5.50 J [4.91 J]	5.15 J	NA	NA	NA
Barium	1,500 [nc]	190,000 {max}	209	mg/kg	84.9	37.2 [39.9]	49.9	108	3,980	89.9	155	49.2	3,120	NA	49.2	57.9	48.3	45.4	267	331	69.6 [89.3]	98.6	NA	NA	NA
Beryllium	16 [nc]	200 [nc]	1.02	mg/kg	0.860	1.64 [1.44]	1.32	2.97	0.520 B	1.36	0.950	0.360 B	0.500 B	NA	0.360 B	1.24	1.18	1.37	1.00	0.370 B	1.41 [1.27]	1.49	NA	NA	NA
Cadmium	7 [nc]	81 [nc]	0.69	mg/kg	0.250	<0.130 [<0.120]	<0.120	<0.150	11.8	<0.130	0.350	1.29	12.2	NA	1.29	0.530	0.100 J	0.170	12.1	1.12	0.350 [0.300]	1.50	NA	NA	NA
Calcium	--	--	--	mg/kg	17,100	1,040 J [1,210 J]	1,130	3,360 J	23,500	1,360 J	10,700	64,700	71,400	NA	64,700	6,240	1,800	642	43,600	15,800	1,370 [1,620]	1,890	NA	NA	NA
Chromium	280 [ca]	1,460 [ca]	65.3	mg/kg	33.6 L	48.0 J [45.6 J]	39.9 L	54.9 J	73.9 L	31.1 J	33.5 L	11.2 L	40.2 L	NA	11.2 L	62.6 L	43.4 L	37.3 L	30.2 L	51.4 L	29.3 L [29.0 L]	58.9 L	NA	NA	NA
Cobalt	2.3 [nc]	30 [nc]	72.3	mg/kg	37.8 J	8.52 J [7.67 J]	14.24																		

Table A-6. Sediment Analytical Results, Bag Loading Area, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	BLASD01 0 - 0.5 06/18/02	BLASD02 0 - 0.5 06/18/02	BLASD04 0 - 0.5 06/24/02	BLASD05 0 - 0.5 06/24/02
Explosives								
1,3,5-Trinitrobenzene	220 {nc}	2,700 {nc}	--	mg/kg	<0.1	<0.1	<0.1	<0.1
1,3-Dinitrobenzene	0.61 {nc}	6.2 {nc}	--	mg/kg	<0.1	<0.1	<0.1	<0.1
2,4,6-Trinitrotoluene	3.6 {ca**}	42 {ca**}	--	mg/kg	<0.2	<0.2	<0.2	<0.2
2,4-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	<0.2	<0.2	<0.2	<0.2
2,6-Dinitrotoluene	6.1 {nc}	62 {nc}	--	mg/kg	<0.2	<0.2	<0.2	<0.2
2-Amino-4,6-Dinitrotoluene	15 {nc}	190 {nc}	--	mg/kg	<0.2	<0.2	<0.2	<0.2
4-Amino-2,6-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	<0.2	<0.2	<0.2	<0.2
Dinitrotoluene Mix	0.71 {ca}	2.5 {ca}	--	mg/kg	<0.2	<0.2	<0.2	<0.2
HMX	310 {nc}	3,100 {nc}	--	mg/kg	<0.2	<0.2	<0.2	<0.2
m-Nitrotoluene	--	--	--	mg/kg	<0.4	<0.4	<0.4	<0.4
Nitrobenzene	3.1 {nc}	28 {nc}	--	mg/kg	<0.2	<0.2	<0.2	<0.2
Nitroglycerine	0.61 {nc}	6.2 {nc}	--	mg/kg	<0.35	<0.37	<0.47	<0.44
o-Nitrotoluene	78 {nc}	1,300 {sat}	--	mg/kg	<0.4	<0.4	<0.4	<0.4
Pentaerythritol Tetranitrate	--	--	--	mg/kg	0.16 J	<0.37	<0.47	<0.44
p-Nitrotoluene	30 {ca**}	110 {ca*}	--	mg/kg	<0.4	<0.4	<0.4	<0.4
RDX	4.4 {ca*}	16 {ca}	--	mg/kg	<0.2	<0.2	<0.2	<0.2
Tetryl	24 {nc}	250 {nc}	--	mg/kg	<0.2	<0.2	<0.2	<0.2
Herbicides								
2,4,5-T	61	620	--	mg/kg	<0.119	<0.0124	<0.159	<0.15
2,4,5-TP	49	490	--	mg/kg	<0.119	<0.0124	<0.159	<0.15
2,4-D	69	770	--	mg/kg	<0.239	<0.0248	<0.318	<0.299
2,4-DB	49	490	--	mg/kg	<1.19	<0.124	<1.59	<1.5
Dalapon	180	1,800	--	mg/kg	<1.19	<0.124	<1.59	<1.5
Dicamba	180	1,800	--	mg/kg	<0.239	<0.0248	<0.318 L	<0.299 L
Dichlorprop	--	--	--	mg/kg	<0.239	<0.0248	<0.318	<0.299
Dinoseb	6.1	62	--	mg/kg	<0.239	<0.0248	<0.318	<0.299
MCPA	3.1	31	--	mg/kg	<119	<12.4	<159	<150
MCPP	6.1	62	--	mg/kg	<119	<12.4	<159	<150
Organochlorine Pesticides								
4,4'-DDD	2 {ca**}	7.2 {ca**}	--	mg/kg	0.00092	0.00064 J	0.00073 J	0.00059 J
4,4'-DDE	1.4 {ca**}	5.1 {ca**}	--	mg/kg	0.00086 B	0.00058 B	0.00182 B	0.00102 B
4,4'-DDT	1.7 {ca*}	7 {ca*}	--	mg/kg	<0.00079	<0.00082	0.00077 B	0.00062 B
Aldrin	0.029 {ca*}	0.1 {ca*}	--	mg/kg	<0.00079	<0.00082	<0.00106	<0.00099
Alpha-BHC	0.077 {ca**}	0.27 {ca**}	--	mg/kg	<0.00079	<0.00082	<0.00106	<0.00099
Alpha-Chlordane	1.6 {ca**}	6.5 {ca**}	--	mg/kg	<0.00079	<0.00082	0.00038 J	0.00025 J
Beta-BHC	0.27 {ca**}	0.96 {ca**}	--	mg/kg	0.00028 J	<0.00082	0.00029 J	<0.00099
Delta-BHC	0.52 {ca**}	2.1 {ca**}	--	mg/kg	<0.00079	<0.00082	<0.00106	<0.00099
Dieldrin	0.03 {ca}	0.11 {ca}	--	mg/kg	<0.00079	<0.00082	0.00094 K	<0.00099
Endosulfan I	--	--	--	mg/kg	<0.00079	<0.00082	<0.00106	<0.00099
Endosulfan II	37 {nc}	370 {nc}	--	mg/kg	<0.00079	<0.00082	<0.00106	<0.00099
Endosulfan Sulfate	--	--	--	mg/kg	<0.00079	<0.00082	<0.00106	<0.00099
Endrin	1.8 {nc}	18 {nc}	--	mg/kg	<0.00079	0.00035 J	<0.00106	<0.00099
Endrin Aldehyde	1.8 {nc}	18 {nc}	--	mg/kg	<0.00079	<0.00082	<0.00106	<0.00099
Endrin Ketone	--	--	--	mg/kg	<0.00079	<0.00082	<0.00106	<0.00099
Gamma-BHC (Lindane)	0.52 {ca*}	2.1 {ca}	--	mg/kg	<0.00079	<0.00082	<0.00106	<0.00099
Gamma-Chlordane	1.6 {ca**}	6.5 {ca**}	--	mg/kg	<0.00079	<0.00082	0.00041 J	<0.00099
Heptachlor	0.11 {ca}	0.38 {ca}	--	mg/kg	<0.00079	<0.00082	<0.00106	<0.00099
Heptachlor Epoxide	0.053 {ca*}	0.19 {ca*}	--	mg/kg	0.00094	<0.00082	<0.00106	<0.00099
Methoxychlor	31 {nc}	310 {nc}	--	mg/kg	0.00442	<0.00082	<0.00106	<0.00099
Toxaphene	0.44 {ca**}	1.6 {ca**}	--	mg/kg	<0.0397	<0.0413	<0.053	<0.0499
PAHs								
2-Methylnaphthalene	31 {nc}	440 {sat}	--	mg/kg	0.0044	0.0064	0.0018 B	0.0013 B
Acenaphthene	340 {nc}	3,300 {nc}	--	mg/kg	<0.0024	<0.0026	<0.0027	<0.0025
Acenaphthylene	340 {nc}	3,300 {nc}	--	mg/kg	0.00099 J	<0.0026	<0.0027	<0.0025
Anthracene	1,700 {nc}	170,000 {max}	--	mg/kg	<0.0024	0.00099 J	0.0017 J	<0.0025
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	0.0054	0.0074	0.013	0.0059
Benzo(a)pyrene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	0.0049	0.0098	0.012	0.0050
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	0.0098	0.017	0.019	0.013
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	0.0068	0.0083	0.0071	0.0031
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	0.0028	0.0051	0.0071	0.0033
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	0.0065	0.011	0.013	0.0073
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	0.0019 J	0.0028	0.0021 J	0.0013 J
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	0.0089	0.015	0.019	0.0078
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	0.0015 J	0.00095 J	0.0012 J	<0.0025
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	0.0052	0.0098	0.0081	0.0039
Naphthalene	3.9 {nc}	20 {nc}	--	mg/kg	0.0037 B	0.0040 B	0.0021 B	0.0020 B
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	0.0058	0.010	0.0090	0.0037
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	0.0071	0.012	0.019	0.0091
PCBs								
Aroclor-1016	0.39 {nc}	21 {ca**}	--	mg/kg	<0.030	<0.040	<0.050 J	<0.040 J
Aroclor-1221	0.17 {ca**}	0.62 {ca**}	--	mg/kg	<0.070	<0.080	<0.10 J	<0.090 J
Aroclor-1232	0.17 {ca**}	0.62 {ca**}	--	mg/kg	<0.030	<0.040	<0.050 J	<0.040 J
Aroclor-1242	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.030	<0.040	<0.050 J	<0.040 J
Aroclor-1248	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.030	<0.040	<0.050 J	<0.040 J
Aroclor-1254	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.030	<0.040	<0.050 J	<0.040 J
Aroclor-1260	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.030	<0.040	<0.050 J	<0.040 J

Notes found at end of table.

Table A-6. Sediment Analytical Results, Bag Loading Area, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	BLASD01 0 - 0.5 06/18/02	BLASD02 0 - 0.5 06/18/02	BLASD04 0 - 0.5 06/24/02	BLASD05 0 - 0.5 06/24/02
Volatile Organics								
1,1,1-Trichloroethane	680	680	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
1,1,2,2-Tetrachloroethane	0.59	2.9	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
1,1,2-trichloro-1,2,2-trifluoroethane	940	940	--	mg/kg	NA	NA	NA	NA
1,1,2-Trichloroethane	1.1	5.5	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
1,1-Dichloroethane	3.4	17	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
1,1-Dichloroethene	25	110	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
1,2,3-Trichlorobenzene	--	--	--	mg/kg	NA	NA	NA	NA
1,2,4-Trichlorobenzene	180	220	--	mg/kg	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	0.0056	0.073	--	mg/kg	NA	NA	NA	NA
1,2-Dibromoethane	0.034	0.17	--	mg/kg	NA	NA	NA	NA
1,2-Dichlorobenzene	220	220	--	mg/kg	NA	NA	NA	NA
1,2-Dichloroethane	0.45	2.2	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
1,2-Dichloropropane	0.93	4.7	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
1,3-Dichlorobenzene	--	--	--	mg/kg	NA	NA	NA	NA
1,4-Dichlorobenzene	2.6	13	--	mg/kg	NA	NA	NA	NA
1,4-Dioxane	44	160	--	mg/kg	NA	NA	NA	NA
2-Butanone	28,000	28,000	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
2-Hexanone	--	--	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
3-Octanone	--	--	--	mg/kg	NA	NA	NA	NA
4-Methyl-2-pentanone	3,200	3,200	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
Acetone	6,100	110,000	--	mg/kg	<0.0060	<0.0062	<0.0080 J	0.028 B
Benzene	1.1	5.6	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
Bromochloromethane	--	--	--	mg/kg	NA	NA	NA	NA
Bromodichloromethane	10	46	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
Bromoform	61	220	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
Bromomethane	0.79	3.5	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
Carbon Disulfide	260	260	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
Carbon Tetrachloride	0.25	1.3	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
Chlorobenzene	31	860	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
Chloroethane	2,200	2,200	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
Chloroform	0.3	1.5	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
Chloromethane	1.7	8.4	--	mg/kg	<0.0060	<0.0062	<0.0080 L	<0.0075 L
cis-1,2-Dichloroethene	78	1,400	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
cis-1,3-Dichloropropene	--	--	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
Cyclohexane	120	120	--	mg/kg	NA	NA	NA	NA
Dibromochloromethane	5.8	21	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
Dichlorodifluoromethane	19	78	--	mg/kg	NA	NA	NA	NA
d-Limonene	--	--	--	mg/kg	NA	NA	NA	NA
Ethylbenzene	5.7	29	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
Isopropylbenzene	310	310	--	mg/kg	NA	NA	NA	NA
m,p-Xylene	--	--	--	mg/kg	<0.012	<0.012	<0.016	<0.015
Methyl acetate	29,000	29,000	--	mg/kg	NA	NA	NA	NA
Methyl tert-butyl ether	39	190	--	mg/kg	NA	NA	NA	NA
Methylcyclohexane	71	71	--	mg/kg	NA	NA	NA	NA
Methylene Chloride	11	54	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
o-Xylene	300	300	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
Styrene	1,000	1,000	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
Tetrachloroethene	0.57	2.7	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
Toluene	930	930	--	mg/kg	<0.0060	<0.0062	<0.0080	0.00096 B
trans-1,2-Dichloroethene	11	50	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
trans-1,3-Dichloropropene	--	--	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
Trichloroethene	2.8	14	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
Trichlorofluoromethane	80	1,300	--	mg/kg	NA	NA	NA	NA
Vinyl Chloride	0.06	1.7	--	mg/kg	<0.0060	<0.0062	<0.0080	<0.0075
Xylenes (total)	300	300	--	mg/kg	<0.012	<0.012	<0.016	<0.015
Semivolatile Organics								
1,2,4-Trichlorobenzene	180	220	--	mg/kg	<0.20	<0.21	<0.27	<0.25
1,2-Dichlorobenzene	220	220	--	mg/kg	<0.20	<0.21	<0.27	<0.25
1,3-Dichlorobenzene	--	--	--	mg/kg	<0.20	<0.21	<0.27	<0.25
1,4-Dichlorobenzene	2.6	13	--	mg/kg	<0.20	<0.21	<0.27	<0.25
1-Methylnaphthalene	22	99	--	mg/kg	NA	NA	<0.27	<0.25
2,4,5-Trichlorophenol	610	6,200	--	mg/kg	<0.20	<0.21	<0.27	<0.25
2,4,6-Trichlorophenol	44	160	--	mg/kg	<0.20	<0.21	<0.27	<0.25
2,4-Dichlorophenol	18	180	--	mg/kg	<0.20	<0.21	<0.27	<0.25
2,4-Dimethylphenol	120	1,200	--	mg/kg	<0.20 L	<0.21 L	<0.27 L	<0.25 L
2,4-Dinitrophenol	12	120	--	mg/kg	<0.99	<1.0	<1.3	<1.2
2,4-Dinitrotoluene	12	120	--	mg/kg	<0.20	<0.21	<0.27	<0.25
2,6-Dinitrotoluene	6.1	62	--	mg/kg	<0.20	<0.21	<0.27	<0.25
2-Chloronaphthalene	210	210	--	mg/kg	<0.20	<0.21	<0.27	<0.25
2-Chlorophenol	39	510	--	mg/kg	<0.20	<0.21	<0.27	<0.25
2-Methylnaphthalene	31	440	--	mg/kg	<0.20	<0.21	<0.27	<0.25
2-Methylphenol	310	3,100	--	mg/kg	<0.20	<0.21	<0.27	<0.25
2-Nitroaniline	--	--	--	mg/kg	<0.20	<0.21	<0.27	<0.25
2-Nitrophenol	--	--	--	mg/kg	<0.20	<0.21	<0.27	<0.25
3,3'-Dichlorobenzidine	1.1	3.8	--	mg/kg	<0.20	<0.21	<0.27	<0.25
3-Nitroaniline	--	--	--	mg/kg	<0.20	<0.21	<0.27	<0.25
4,6-Dinitro-2-methylphenol	--	--	--	mg/kg	<0.99	<1.0	<1.3	<1.2
4-Bromophenyl-phenylether	--	--	--	mg/kg	<0.20	<0.21	<0.27	<0.25
4-Chloro-3-Methylphenol	--	--	--	mg/kg	<0.20	<0.21	<0.27	<0.25
4-Chloroaniline	24	250	--	mg/kg	<0.20	<0.21	<0.27	<0.25
4-Chlorophenyl-phenylether	--	--	--	mg/kg	<0.20	<0.21	<0.27	<0.25
4-Methylphenol	31	310	--	mg/kg	<0.20 L	<0.21 L	<0.27	<0.25
4-Nitroaniline	--	--	--	mg/kg	<0.20	<0.21	<0.27 J	<0.25 J
4-Nitrophenol	--	--	--	mg/kg	<0.99	<1.0	<1.3	<1.2

Notes found at end of table.

Semivolatile Organics								

Table A-6. Sediment Analytical Results, Bag Loading Area, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	BLASD01 0 - 0.5 06/18/02	BLASD02 0 - 0.5 06/18/02	BLASD04 0 - 0.5 06/24/02	BLASD05 0 - 0.5 06/24/02
Acenaphthene	340	3,300	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Acenaphthylene	340	3,300	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Anthracene	1,700	170,000	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Benzo(a)anthracene	0.15	2.1	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Benzo(a)pyrene	0.015	0.21	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Benzo(b)fluoranthene	0.15	2.1	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Benzo(g,h,i)perylene	170	1,700	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Benzo(k)fluoranthene	1.5	21	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Benzoic Acid	240,000	2,500,000	--	mg/kg	0.14 B	<1.0	<1.3	<1.2
Benzyl Alcohol	3,100	310,000	--	mg/kg	<0.20	<0.21	<0.27	<0.25
bis(2-Chloroethoxy)methane	18	180	--	mg/kg	<0.20	<0.21	<0.27	<0.25
bis(2-Chloroethyl)ether	0.19	0.9	--	mg/kg	<0.20	<0.21	<0.27	<0.25
bis(2-Chloroisopropyl)ether	--	--	--	mg/kg	<0.20	<0.21	<0.27	<0.25
bis(2-Ethylhexyl)phthalate	35	120	--	mg/kg	0.20 B	0.20 B	0.058 B	<0.25
Butylbenzylphthalate	1,200	120,000	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Carbazole	24	86	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Chrysene	15	210	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Dibenzo(a,h)anthracene	0.015	0.21	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Dibenzofuran	--	--	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Diethylphthalate	4,900	490,000	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Dimethylphthalate	--	--	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Di-n-Butylphthalate	610	6,200	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Dinitrotoluene Mix	0.71	2.5	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Di-n-Octylphthalate	--	--	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Fluoranthene	230	2,200	--	mg/kg	0.0095 J	0.015 J	0.029 J	0.013 J
Fluorene	230	2,200	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Hexachlorobenzene	0.3	1.1	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Hexachlorobutadiene	6.2	22	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Hexachlorocyclopentadiene	37	370	--	mg/kg	<0.20	<0.21	<0.27 J	<0.25 J
Hexachloroethane	35	120	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Indeno(1,2,3-cd)pyrene	0.15	2.1	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Isophorone	510	1,800	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Naphthalene	3.9 {ca}	20 {ca}	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Nitrobenzene	3.1	28	--	mg/kg	<0.20	<0.21	<0.27	<0.25
N-Nitroso-di-n-propylamine	0.069	0.25	--	mg/kg	<0.20	<0.21	<0.27	<0.25
N-Nitrosodiphenylamine	99	350	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Pentachlorophenol	3	9	--	mg/kg	<0.99	<1.0	<1.3	<1.2
Phenanthrene	1,700	170,000	--	mg/kg	<0.20	<0.21	0.018 J	0.012 J
Phenol	1,800	180,000	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Pyrene	170	1,700	--	mg/kg	0.022 J	0.014 J	0.022 J	0.010 J
Pyridine	7.8	100	--	mg/kg	<0.20	<0.21	<0.27	<0.25
Inorganics								
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	24,400	31,500	13,300	7,900
Antimony	3.1 {nc}	41 {nc}	--	mg/kg	0.460 L	0.320 B	0.280 B	0.370 B
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	10.6 J	4.92 J	2.10 L	4.60 L
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	151	54.5	77.2	74.8
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	1.36	2.20	0.890	0.920
Cadmium	7 {nc}	81 {nc}	0.69	mg/kg	0.0900 J	<0.120	<0.150	<0.150
Calcium	--	--	--	mg/kg	5,640 J	1,490 J	61,200 J	102,000 J
Chromium	280 {ca}	1,460 {ca}	65.3	mg/kg	54.5 J	33.7 J	26.8	28.5
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	28.8	19.6	7.30 J	10.5 J
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	23.5 L	23.8 L	8.89	6.06
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	41,100 J	32,000 J	17,600 J	23,300 J
Lead	400 {++}	800 {++}	26.8	mg/kg	24.6	23.6	14.6	19.3
Magnesium	--	--	--	mg/kg	7,550 J	6,370 J	3,200 J	9,810 J
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	1,030 J	180 J	681 J	649 J
Mercury	3.1 {sat}	3.1 {sat}	0.13	mg/kg	0.0500 J	0.0500 J	<0.0700	<0.0700
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	23.4	31.0	11.5 J	10.9 J
Potassium	--	--	--	mg/kg	3,030	4,730	1,240	1,310
Selenium	39 {nc}	510 {nc}	--	mg/kg	0.470 L	<1.24 L	<1.59 L	<1.50 L
Silver	39 {nc}	510 {nc}	--	mg/kg	<1.19	<1.24	<1.59	<1.50
Sodium	--	--	--	mg/kg	28.7 B	34.9	81.9 J	83.6 J
Thallium	0.51 {nc}	6.6 {nc}	2.11	mg/kg	0.240 J	0.310 J	0.180 J	0.290 J
Vanadium	55{nc}	720 {nc}	108	mg/kg	71.5 J	59.5 J	31.7 J	37.8 J
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	50.3 J	45.8 J	36.0 J	25.8 J

mg/kg

Milligrams per kilogram.

[a]

USEPA Regional Screening Levels (USEPA 2008a).

[b]

Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.

{ca}

Carcinogen.

{nc}

Noncarcinogen.

*

Noncarcinogen screening level is less than one hundred times the carcinogen screening level.

**

Noncarcinogen screening level is less than ten times the carcinogen screening level.

{++}

The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.

{max}

Concentration may exceed ceiling limit.

{sat}

Screening level may exceed saturation concentration.

B (Inorganics)

Constituent concentration quantified as estimated.

B (Organics)

Constituent was detected in the associated method blank.

J

Constituent concentration quantified as estimated.

K

Estimated concentration bias high.

L

Estimated concentration bias low.

NA

Not Analyzed.

24,400

Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).

10.6 J

Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).

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Bolded inorganics indicates constituent concentration is above facility-wide background value.

Table A-7. Surface Water Analytical Results, Bag Loading Area, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Date Collected:	Tapwater Screening Values [a]	Units	BLASW04 06/24/02	BLASW05 06/24/02
Explosives				
1,3,5-Trinitrobenzene	1.1	mg/L	<0.00013	<0.00013
1,3-Dinitrobenzene	0.0037	mg/L	<0.00013	<0.00013
2,4,6-Trinitrotoluene	0.0022	mg/L	<0.00026	<0.00026
2,4-Dinitrotoluene	0.073	mg/L	<0.00013	<0.00013
2,6-Dinitrotoluene	0.037	mg/L	<0.00026	<0.00026
2-Amino-4,6-Dinitrotoluene	0.073	mg/L	<0.00026	<0.00026
4-Amino-2,6-Dinitrotoluene	0.073	mg/L	<0.00026	<0.00026
Dinitrotoluene Mix	0.000099	mg/L	<0.00026	<0.00026
HMX	1.8	mg/L	<0.00026	<0.00026
m-Nitrotoluene	--	mg/L	0.00043 J	0.00042 J
Nitrobenzene	0.0034	mg/L	<0.00026	<0.00026
Nitroglycerine	0.0037	mg/L	<0.00097 L	<0.00097 L
o-Nitrotoluene	0.37	mg/L	<0.00052	<0.00052
Pentaerythritol Tetranitrate	--	mg/L	<0.00097 L	<0.00097 L
p-Nitrotoluene	0.0042	mg/L	<0.00052	<0.00052
RDX	0.00061	mg/L	<0.00026	<0.00026
Tetryl	0.15	mg/L	<0.00026	<0.00026
Herbicides				
2,4,5-T	0.37	mg/L	<0.0001	<0.0001
2,4,5-TP	0.29	mg/L	<0.0001	<0.0001
2,4-D	0.37	mg/L	0.00326	<0.0005
2,4-DB	0.29	mg/L	<0.002	<0.002
Dalapon	1.1	mg/L	<0.002	<0.002
Dicamba	1.1	mg/L	<0.0005	<0.0005
Dichlorprop	--	mg/L	<0.0005	<0.0005
Dinoseb	0.037	mg/L	<0.0005	<0.0005
MCPA	0.018	mg/L	<0.125	<0.125
MCPP	0.037	mg/L	<0.125	<0.125
Organochlorine Pesticides				
4,4'-DDD	0.00028	mg/L	<0.00002	<0.00002
4,4'-DDE	0.0002	mg/L	<0.00002	<0.00002
4,4'-DDT	0.0002	mg/L	<0.00002	<0.00002
Aldrin	0.000004	mg/L	<0.00002	<0.00002
Alpha-BHC	0.000011	mg/L	<0.00002	<0.00002
Alpha-Chlordane	--	mg/L	<0.00002	<0.00002
Beta-BHC	0.000037	mg/L	<0.00002	<0.00002
Delta-BHC	--	mg/L	<0.00002	<0.00002
Dieldrin	0.0000042	mg/L	0.0000041 J	0.00000582 J
Endosulfan I	--	mg/L	<0.00002	<0.00002
Endosulfan II	--	mg/L	<0.00002	<0.00002
Endosulfan Sulfate	--	mg/L	<0.00002	<0.00002
Endrin	0.011	mg/L	<0.00002	<0.00002
Endrin Aldehyde	--	mg/L	<0.00002	<0.00002
Endrin Ketone	--	mg/L	<0.00002	<0.00002
Gamma-BHC (Lindane)	0.000061	mg/L	<0.00002	<0.00002
Gamma-Chlordane	--	mg/L	<0.00002	<0.00002
Heptachlor	0.000015	mg/L	<0.00002	<0.00002
Heptachlor Epoxide	0.0000074	mg/L	<0.00002	<0.00002
Methoxychlor	0.18	mg/L	<0.00002	<0.00002
Toxaphene	0.000061	mg/L	<0.001	<0.001
PAHs				
2-Methylnaphthalene	0.15	mg/L	<0.000050	<0.000050
Acenaphthene	2.2	mg/L	<0.000050	<0.000050
Acenaphthylene	--	mg/L	<0.000050	<0.000050
Anthracene	11	mg/L	<0.000050	<0.000050
Benzo(a)anthracene	0.000029	mg/L	<0.000050	<0.000050
Benzo(a)pyrene	0.000029	mg/L	<0.000050	<0.000050
Benzo(b)fluoranthene	0.000029	mg/L	<0.000050	<0.000050
Benzo(g,h,i)perylene	--	mg/L	<0.000050 J	<0.000050 J
Benzo(k)fluoranthene	0.00029	mg/L	<0.000050	<0.000050
Chrysene	0.0029	mg/L	<0.000050	<0.000050
Dibenzo(a,h)anthracene	0.000029	mg/L	<0.000050 J	<0.000050 J
Fluoranthene	1.5	mg/L	<0.000050	<0.000050
Fluorene	1.5	mg/L	<0.000050	<0.000050
Indeno(1,2,3-cd)pyrene	0.000029	mg/L	<0.000050 J	<0.000050 J
Naphthalene	0.0062	mg/L	<0.000050	<0.000050
Phenanthrene	--	mg/L	<0.000050	<0.000050
Pyrene	1.1	mg/L	<0.000050	<0.000050
PCBs				
Aroclor-1016	0.00096	mg/L	<0.00010	<0.00010
Aroclor-1221	0.0000068	mg/L	<0.00020	<0.00020
Aroclor-1232	0.0000068	mg/L	<0.00010	<0.00010
Aroclor-1242	0.000034	mg/L	<0.00010	<0.00010
Aroclor-1248	0.000034	mg/L	<0.00010	<0.00010
Aroclor-1254	0.000034	mg/L	<0.00010	<0.00010
Aroclor-1260	0.000034	mg/L	<0.00010	<0.00010

Notes found at end of table.

Table A-7. Surface Water Analytical Results, Bag Loading Area, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Date Collected:	Tapwater Screening Values [a]	Units	BLASW04 06/24/02	BLASW05 06/24/02
Volatile Organics				
1,1,1-Trichloroethane	9.1	mg/L	<0.0010	<0.0010
1,1,2,2-Tetrachloroethane	0.000067	mg/L	<0.0010	<0.0010
1,1,2-trichloro-1,2,2-trifluoroethane	59	mg/L	NA	NA
1,1,2-Trichloroethane	0.00024	mg/L	<0.0010	<0.0010
1,1-Dichloroethane	0.0024	mg/L	<0.0010	<0.0010
1,1-Dichloroethene	0.34	mg/L	<0.0010	<0.0010
1,2,3-Trichlorobenzene	- -	mg/L	NA	NA
1,2,4-Trichlorobenzene	0.019	mg/L	NA	NA
1,2-Dibromo-3-chloropropane	0.00000032	mg/L	NA	NA
1,2-Dibromoethane	0.0000065	mg/L	NA	NA
1,2-Dichlorobenzene	0.37	mg/L	NA	NA
1,2-Dichloroethane	0.00015	mg/L	<0.0010	<0.0010
1,2-Dichloropropane	0.00039	mg/L	<0.0010	<0.0010
1,3-Dichlorobenzene	- -	mg/L	NA	NA
1,4-Dichlorobenzene	0.00043	mg/L	NA	NA
1,4-Dioxane	0.0061	mg/L	NA	NA
2-Butanone	7.1	mg/L	<0.0040	<0.0040
2-Hexanone	- -	mg/L	<0.0040	<0.0040
4-Methyl-2-pentanone	2	mg/L	<0.0040	<0.0040
Acetone	22	mg/L	<0.0040 J	<0.0040 J
Benzene	0.00041	mg/L	<0.0010	<0.0010
Bromochloromethane	- -	mg/L	NA	NA
Bromodichloromethane	0.0011	mg/L	<0.0010	<0.0010
Bromoform	0.0085	mg/L	<0.0010	<0.0010
Bromomethane	0.0087	mg/L	<0.0010 L	<0.0010 L
Carbon Disulfide	1	mg/L	0.00012 B	0.000070 B
Carbon Tetrachloride	0.0002	mg/L	<0.0010	<0.0010
Chlorobenzene	0.091	mg/L	<0.0010	<0.0010
Chloroethane	21	mg/L	<0.0010	<0.0010
Chloroform	0.00019	mg/L	0.00018 J	0.00013 J
Chloromethane	0.0018	mg/L	<0.0010 L	<0.0010 L
cis-1,2-Dichloroethene	0.37	mg/L	<0.0010	<0.0010
cis-1,3-Dichloropropene	- -	mg/L	<0.0010	<0.0010
Cyclohexane	13	mg/L	NA	NA
Dibromochloromethane	0.0008	mg/L	<0.0010	<0.0010
Dichlorodifluoromethane	0.39	mg/L	NA	NA
Ethylbenzene	0.0015	mg/L	<0.0010	<0.0010
Isopropylbenzene	0.68	mg/L	NA	NA
m,p-Xylene	- -	mg/L	<0.0020	<0.0020
Methyl acetate	37	mg/L	NA	NA
Methyl tert-butyl ether	0.012	mg/L	NA	NA
Methylcyclohexane	6.3	mg/L	NA	NA
Methylene Chloride	0.0048	mg/L	<0.0010	<0.0010
o-Xylene	1.4	mg/L	<0.0010	<0.0010
Styrene	1.6	mg/L	<0.0010	<0.0010
Tetrachloroethene	0.00011	mg/L	<0.0010	<0.0010
Toluene	2.3	mg/L	<0.0010	<0.0010
trans-1,2-Dichloroethene	0.11	mg/L	<0.0010	<0.0010
trans-1,3-Dichloropropene	-	mg/L	<0.0010	<0.0010
Trichloroethene	0.0017	mg/L	<0.0010	<0.0010
Trichlorofluoromethane	1.3	mg/L	NA	NA
Vinyl Chloride	0.000016	mg/L	<0.0010	<0.0010
Xylenes (total)	0.2	mg/L	<0.0020	<0.0020
Semivolatile Organics				
1,2,4-Trichlorobenzene	0.019	mg/L	<0.0050	<0.0050
1,2-Dichlorobenzene	0.37	mg/L	<0.0050	<0.0050
1,3-Dichlorobenzene	- -	mg/L	<0.0050	<0.0050
1,4-Dichlorobenzene	0.00043	mg/L	<0.0050	<0.0050
1-Methylnaphthalene	0.0023	mg/L	NA	NA
2,4,5-Trichlorophenol	3.7	mg/L	<0.0050	<0.0050
2,4,6-Trichlorophenol	0.0061	mg/L	<0.0050	<0.0050
2,4-Dichlorophenol	0.11	mg/L	<0.0050	<0.0050
2,4-Dimethylphenol	0.73	mg/L	<0.0050	<0.0050
2,4-Dinitrophenol	0.073	mg/L	<0.025	<0.025
2,4-Dinitrotoluene	0.073	mg/L	<0.0050	<0.0050
2,6-Dinitrotoluene	0.037	mg/L	<0.0050	<0.0050
2-Chloronaphthalene	2.9	mg/L	<0.0050	<0.0050
2-Chlorophenol	0.18	mg/L	<0.0050	<0.0050
2-Methylnaphthalene	0.15	mg/L	<0.0050	<0.0050
2-Methylphenol	1.8	mg/L	<0.0050	<0.0050
2-Nitroaniline	- -	mg/L	<0.0050	<0.0050
2-Nitrophenol	- -	mg/L	<0.0050	<0.0050
3,3'-Dichlorobenzidine	0.00015	mg/L	<0.0050	<0.0050
3-Nitroaniline	- -	mg/L	<0.0050	<0.0050
4,6-Dinitro-2-methylphenol	- -	mg/L	<0.025	<0.025
4-Bromophenyl-phenylether	- -	mg/L	<0.0050	<0.0050
4-Chloro-3-Methylphenol	- -	mg/L	<0.0050	<0.0050
4-Chloroaniline	0.15	mg/L	<0.0050	<0.0050
4-Chlorophenyl-phenylether	- -	mg/L	<0.0050	<0.0050

Notes found at end of table.

Table A-7. Surface Water Analytical Results, Bag Loading Area, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Date Collected:	Tapwater Screening Values [a]	Units	BLASW04 06/24/02	BLASW05 06/24/02
Semivolatile Organics				
4-Methylphenol	0.18	mg/L	<0.0050	<0.0050
4-Nitroaniline	- -	mg/L	<0.0050 J	<0.0050 J
4-Nitrophenol	- -	mg/L	<0.025	<0.025
Acenaphthene	2.2	mg/L	<0.0050	<0.0050
Acenaphthylene	- -	mg/L	<0.0050	<0.0050
Anthracene	11	mg/L	<0.0050	<0.0050
Benzo(a)anthracene	0.000029	mg/L	<0.0050	<0.0050
Benzo(a)pyrene	0.0000029	mg/L	<0.0050	<0.0050
Benzo(b)fluoranthene	0.000029	mg/L	<0.0050	<0.0050
Benzo(g,h,i)perylene	- -	mg/L	<0.0050	<0.0050
Benzo(k)fluoranthene	0.00029	mg/L	<0.0050	<0.0050
Benzoic Acid	150	mg/L	<0.025	<0.025
Benzyl Alcohol	18	mg/L	<0.0050	<0.0050
bis(2-Chloroethoxy)methane	0.11	mg/L	<0.0050	<0.0050
bis(2-Chloroethyl)ether	0.000012	mg/L	<0.0050	<0.0050
bis(2-Chloroisopropyl)ether	- -	mg/L	<0.0050	<0.0050
bis(2-Ethylhexyl)phthalate	0.0048	mg/L	<0.0050	<0.0050
Butylbenzylphthalate	7.3	mg/L	0.00044 B	<0.0050
Carbazole	0.0034	mg/L	<0.0050	<0.0050
Chrysene	0.0029	mg/L	<0.0050	<0.0050
Dibenzo(a,h)anthracene	0.0000029	mg/L	<0.0050	<0.0050
Dibenzofuran	- -	mg/L	<0.0050	<0.0050
Diethylphthalate	29	mg/L	<0.0050	<0.0050
Dimethylphthalate	- -	mg/L	<0.0050	<0.0050
Di-n-Butylphthalate	3.7	mg/L	0.00090 B	<0.0050
Dinitrotoluene Mix	0.000099	mg/L	<0.0050	<0.0050
Di-n-Octylphthalate	- -	mg/L	<0.0050	<0.0050
Fluoranthene	1.5	mg/L	<0.0050	<0.0050
Fluorene	1.5	mg/L	<0.0050	<0.0050
Hexachlorobenzene	0.000042	mg/L	<0.0050	<0.0050
Hexachlorobutadiene	0.00086	mg/L	<0.0050	<0.0050
Hexachlorocyclopentadiene	0.22	mg/L	<0.0050 J	<0.0050 J
Hexachloroethane	0.0048	mg/L	<0.0050	<0.0050
Indeno(1,2,3-cd)pyrene	0.000029	mg/L	<0.0050	<0.0050
Isophorone	0.071	mg/L	<0.0050	<0.0050
Naphthalene	0.0062	mg/L	<0.0050	<0.0050
Nitrobenzene	0.0034	mg/L	<0.0050	<0.0050
N-Nitroso-di-n-propylamine	0.0000096	mg/L	<0.0050	<0.0050
N-Nitrosodiphenylamine	0.014	mg/L	<0.0050	<0.0050
Pentachlorophenol	0.00056	mg/L	<0.025	<0.025
Phenanthrene	- -	mg/L	<0.0050	<0.0050
Phenol	11	mg/L	<0.0050	<0.0050
Pyrene	1.1	mg/L	<0.0050	<0.0050
Pyridine	0.037	mg/L	<0.0050	<0.0050
Inorganics				
Aluminum	37	mg/L	0.140 J	0.384
Antimony	0.015	mg/L	<0.00500	0.000770 B
Arsenic	0.000045	mg/L	<0.00300	<0.00300
Barium	7.3	mg/L	0.0851	0.0847
Beryllium	0.073	mg/L	<0.00200	<0.00200
Cadmium	0.018	mg/L	<0.00200	<0.00200
Calcium	- -	mg/L	57.2	54.6
Chromium	- -	mg/L	<0.0100	<0.0100
Cobalt	- -	mg/L	<0.0500	<0.0500
Copper	1.5	mg/L	<0.0200	<0.0200
Iron	26	mg/L	0.274	0.297
Lead	- -	mg/L	0.000500 B	0.000340 B
Magnesium	- -	mg/L	16.4	16.4
Manganese	0.88	mg/L	0.0304	0.0184
Mercury	0.00063	mg/L	<0.000100	<0.000100
Nickel	0.73	mg/L	<0.0400	<0.0400
Potassium	- -	mg/L	3.30	3.31
Selenium	0.18	mg/L	0.000510 B	<0.00500
Silver	0.18	mg/L	<0.0100	<0.0100
Sodium	- -	mg/L	34.2	34.7
Thallium	0.0024	mg/L	<0.00200	<0.00200
Vanadium	0.18	mg/L	<0.0500	<0.0500
Zinc	11	mg/L	<0.0200	<0.0200
Perchlorate				
Perchlorate	0.026	mg/L	<0.001	<0.001
Miscellaneous				
Hardness	- -	mg/L	210	204

mg/L

[a]

J

24,400

Milligrams per liter.

USEPA Regional Screening Levels (USEPA 2008a).

Adjusted tap-water screening levels used to assess surface water at the NRU.

Constituent concentration quantified as estimated.

Highlighted value indicates constituent concentration is above tapwater screening value.

Table A-8. Soil, Conductive Flooring, and Building Material Analytical Results, Bag Loading Area, 2005 Shaw Soil Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Sample Name: Sample Matrix: Sample Type/Paint Color: Sample Depth (ft): Distance from Building (in): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]		BLASS12 Soil - 0.0 - 0.5 6 01/26/05	BLASS13 Soil - 0.0 - 0.5 6 01/26/05	BLASS14 Soil - 0.0 - 0.5 30 01/26/05	BLASS15 Soil - 0.0 - 0.5 6 01/26/05	BLASS16 Soil - 0.0 - 0.5 6 01/26/05	BLASS17 Soil - 0.0 - 0.5 30 01/26/05	BLADF01 Flooring Deteriorated - - 01/26/05	BLADF02 Flooring Deteriorated - - 01/26/05	BLAIF01 Flooring Intact - - 01/26/05	BLAIF02 Flooring Intact - - 01/26/05	BLAW01 Wipe - - 01/26/05	BLAW02 Wipe - - 01/26/05	WB01 Wipe - - 01/26/05	BLAPC01 Paint White - - 01/26/05
Sample Components																		
Acid Soluble	--	--	--	%	18.1	17.3	22.3	20.7	7.3	20.5	29.2	29.5	27.4	17.9	NA	NA	NA	NA
Organics	--	--	--	%	8.2	7.2	13.8	22.5	13.1	21.7	14.5	17.8	17.8	22.5	NA	NA	NA	NA
Other	--	--	--	%	66.3	68.0	60.7	42.6	67.6	46.2	45.0	42.2	38.4	38.7	NA	NA	NA	NA
Asbestos																		
Actinolite	--	--	--	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	NA	NA	NA
Amosite	--	--	--	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	NA	NA	NA
Anthophyllite	--	--	--	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	NA	NA	NA
Chrysotile	--	--	--	%	7.4	7.6	3.2	14.2	11.9	11.6	11.3	10.5	16.5	20.8	NA	NA	NA	NA
Crocidolite	--	--	--	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	NA	NA	NA
Tremolite	--	--	--	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	NA	NA	NA
Total Asbestos	--	--	--	%	7.4	7.6	3.2	14.2	11.9	11.6	11.3	10.5	16.5	20.8	NA	NA	NA	NA
Total Asbestos	--	--	--	s/cm ²	NA	NA	NA	NA	NA	NA	0.0	0.0	0.0	0.0	225,000,000	122,000,000	2,820	NA
Inorganics																		
Lead	400 {++}	800 {++}	26.8	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	306

[a]	USEPA Regional Screening Levels (USEPA 2008a).
[b]	Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.
ft	Feet.
in	Inches.
%	Percent.
s/cm ²	Structures per square centimeter.
mg/kg	Milligrams per kilogram.
NA	Not Analyzed.
{++}	The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.
24,400	Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).
10.6 J	Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).

Table A-9. XRF Screening Results for Soil, Bag Loading Area, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID	Sample Depth (ft)	Date Collected	Distance From Building (ft)	Lead (mg/kg)
Adjusted Soil Screening Values-Residential [a]:				400 (++)
Adjusted Soil Screening Values-Industrial [a]:				800 (++)
Facility-Wide Background Values [b]:				26.8
Units:				mg/kg
Building 412				
BLA-R1A	0 - 0.5	08/04/08	1	84
BLA-R1B	0 - 0.5	08/04/08	5	75
BLA-R1C	0 - 0.5	08/04/08	10	73
BLA-R2A	0 - 0.5	08/04/08	1	120
BLA-R2B	0 - 0.5	08/04/08	5	74
BLA-R2C	0 - 0.5	08/04/08	10	136
BLA-R3A	0 - 0.5	08/04/08	1	35
BLA-R3B	0 - 0.5	08/04/08	5	19
BLA-R3C	0 - 0.5	08/04/08	10	23
BLA-R4A	0 - 0.5	08/04/08	1	20
BLA-R4B	0 - 0.5	08/04/08	5	18
BLA-R4C	0 - 0.5	08/04/08	10	19
BLA-R5A	0 - 0.5	08/04/08	1	23
BLA-R5B	0 - 0.5	08/04/08	5	18
BLA-R5C	0 - 0.5	08/04/08	10	20
BLA-R6A	0 - 0.5	08/04/08	1	22
BLA-R6B	0 - 0.5	08/04/08	5	21
BLA-R6C	0 - 0.5	08/04/08	10	12
BLA-R7A	0 - 0.5	08/04/08	1	19
BLA-R7B	0 - 0.5	08/04/08	5	15
BLA-R7C	0 - 0.5	08/04/08	10	13
Building 411				
BLA-R8A	0 - 0.5	08/04/08	1	150
BLA-R8B	0 - 0.5	08/04/08	5	236
BLA-R8C	0 - 0.5	08/04/08	10	34
BLA-R9A	0 - 0.5	08/04/08	1	25
BLA-R9B	0 - 0.5	08/04/08	5	16
BLA-R9C	0 - 0.5	08/04/08	10	18
BLA-R10A	0 - 0.5	08/04/08	1	24
BLA-R10B	0 - 0.5	08/04/08	5	13
BLA-R10C	0 - 0.5	08/04/08	10	14
BLA-R11A	0 - 0.5	08/04/08	1	16
BLA-R11B	0 - 0.5	08/04/08	5	18
BLA-R12A	0 - 0.5	08/04/08	1	22
BLA-R12B	0 - 0.5	08/04/08	5	11
BLA-R12C	0 - 0.5	08/04/08	10	22
BLA-R13A	0 - 0.5	08/04/08	1	16
BLA-R13B	0 - 0.5	08/04/08	5	18
BLA-R13C	0 - 0.5	08/04/08	10	19
Building 413				
BLA-R14A	0 - 0.5	08/04/08	1	49
BLA-R14B	0 - 0.5	08/04/08	5	38
BLA-R14C	0 - 0.5	08/04/08	10	30
BLA-R15A	0 - 0.5	08/04/08	1	43
BLA-R15B	0 - 0.5	08/04/08	5	41
BLA-R15C	0 - 0.5	08/04/08	10	64
BLA-R16A	0 - 0.5	08/04/08	1	25
BLA-R16B	0 - 0.5	08/04/08	5	25
BLA-R16C	0 - 0.5	08/04/08	10	18
BLA-R17A	0 - 0.5	08/04/08	1	18
BLA-R17B	0 - 0.5	08/04/08	5	14
BLA-R17C	0 - 0.5	08/04/08	10	22
BLA-R18A	0 - 0.5	08/04/08	1	25
BLA-R18B	0 - 0.5	08/04/08	5	20
BLA-R18C	0 - 0.5	08/04/08	10	14
BLA-R19A	0 - 0.5	08/04/08	1	22
BLA-R19B	0 - 0.5	08/04/08	5	31
BLA-R19C	0 - 0.5	08/04/08	10	<13

Notes found at end of table.

Table A-9. XRF Screening Results for Soil, Bag Loading Area, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID	Sample Depth (ft)	Date Collected	Distance From Building (ft)	Lead (mg/kg)
Adjusted Soil Screening Values-Residential [a]:				400 (++)
Adjusted Soil Screening Values-Industrial [a]:				800 (++)
Facility-Wide Background Values [b]:				26.8
Units:				mg/kg
Building 407				
BLA-R20A	0 - 0.5	08/05/08	1	12,843
BLA-R20B	0 - 0.5	08/05/08	5	2,055
BLA-R20C	0 - 0.5	08/05/08	10	2,278
BLA-R20D	0 - 0.5	08/05/08	15	273
BLA-R21A	0 - 0.5	08/05/08	1	4,590
BLA-R21B	0 - 0.5	08/05/08	5	5,288
BLA-R21C	0 - 0.5	08/05/08	10	216
Building 405				
BLA-R22A	0 - 0.5	08/05/08	1	1,294
BLA-R22B	0 - 0.5	08/05/08	5	808
BLA-R22C	0 - 0.5	08/05/08	10	902
BLA-R22D	0 - 0.5	08/05/08	15	152
BLA-R23A	0 - 0.5	08/05/08	1	98
BLA-R23B	0 - 0.5	08/05/08	5	332
BLA-R23C	0 - 0.5	08/05/08	10	37
BLA-R24A	0 - 0.5	08/05/08	1	590
BLA-R24B	0 - 0.5	08/05/08	5	297
BLA-R24C	0 - 0.5	08/05/08	10	120
BLA-R25A	0 - 0.5	08/05/08	1	41
BLA-R25B	0 - 0.5	08/05/08	5	179
BLA-R25C	0 - 0.5	08/05/08	10	44
BLA-R26A	0 - 0.5	08/05/08	1	1,036
BLA-R26B	0 - 0.5	08/05/08	5	405
BLA-R26C	0 - 0.5	08/05/08	10	126
BLA-R27A	0 - 0.5	08/05/08	1	1,203
BLA-R27B	0 - 0.5	08/05/08	5	224
BLA-R27C	0 - 0.5	08/05/08	10	310
BLA-R28A	0 - 0.5	08/05/08	1	176
BLA-R28B	0 - 0.5	08/05/08	5	82
BLA-R28C	0 - 0.5	08/05/08	10	43
BLA-R29A	0 - 0.5	08/05/08	1	665
BLA-R29B	0 - 0.5	08/05/08	5	277
BLA-R29C	0 - 0.5	08/05/08	10	128
BLA-R30A	0 - 0.5	08/05/08	1	860
BLA-R30B	0 - 0.5	08/05/08	5	483
BLA-R30C	0 - 0.5	08/05/08	10	34
BLA-R31A	0 - 0.5	08/05/08	1	1263
BLA-R31B	0 - 0.5	08/05/08	5	83
BLA-R31C	0 - 0.5	08/05/08	10	18
BLA-R32A	0 - 0.5	08/05/08	1	607
BLA-R32B	0 - 0.5	08/05/08	5	70
BLA-R32C	0 - 0.5	08/05/08	10	72
BLA-R33A	0 - 0.5	08/05/08	1	55
BLA-R33B	0 - 0.5	08/05/08	5	49
BLA-R33C	0 - 0.5	08/05/08	10	132
BLA-R34A	0 - 0.5	08/05/08	1	164
BLA-R34B	0 - 0.5	08/05/08	5	190
BLA-R34C	0 - 0.5	08/05/08	10	76
BLA-R35A	0 - 0.5	08/05/08	1	302
BLA-R35B	0 - 0.5	08/05/08	5	165
BLA-R35C	0 - 0.5	08/05/08	10	148
BLA-R36A	0 - 0.5	08/05/08	1	456
BLA-R36B	0 - 0.5	08/05/08	5	417
BLA-R36C	0 - 0.5	08/05/08	10	36
BLA-R37A	0 - 0.5	08/05/08	1	206
BLA-R37B	0 - 0.5	08/05/08	5	386
BLA-R37C	0 - 0.5	08/05/08	10	164
BLA-R38A	0 - 0.5	08/05/08	1	299
BLA-R38B	0 - 0.5	08/05/08	5	204
BLA-R38C	0 - 0.5	08/05/08	10	146
BLA-R39A	0 - 0.5	08/05/08	1	240
BLA-R39B	0 - 0.5	08/05/08	5	170
BLA-R39C	0 - 0.5	08/05/08	10	36
BLA-R40A	0 - 0.5	08/05/08	1	316
BLA-R40B	0 - 0.5	08/05/08	5	80
BLA-R40C	0 - 0.5	08/05/08	10	17
Building 406				
BLA-R41A	0 - 0.5	08/05/08	1	12,799
BLA-R41B	0 - 0.5	08/05/08	5	3,284
BLA-R41C	0 - 0.5	08/05/08	10	3,104
BLA-R42A	0 - 0.5	08/05/08	1	6,031
BLA-R42B	0 - 0.5	08/05/08	5	1,940
BLA-R42C	0 - 0.5	08/05/08	10	588

Notes found at end of table.

Table A-9. XRF Screening Results for Soil, Bag Loading Area, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID	Sample Depth (ft)	Date Collected	Distance From Building (ft)	Lead (mg/kg)
Adjusted Soil Screening Values-Residential [a]:				400 (++)
Adjusted Soil Screening Values-Industrial [a]:				800 (++)
Facility-Wide Background Values [b]:				26.8
Units:				mg/kg
Building 404				
BLA-R43A	0 - 0.5	08/05/08	1	2,387
BLA-R43B	0 - 0.5	08/05/08	5	1,546
BLA-R43C	0 - 0.5	08/05/08	10	886
BLA-R43D	0 - 0.5	08/05/08	15	402
BLA-R44A	0 - 0.5	08/05/08	1	1,360
BLA-R44B	0 - 0.5	08/05/08	5	820
BLA-R44C	0 - 0.5	08/05/08	10	147
BLA-R45A	0 - 0.5	08/05/08	1	1,100
BLA-R45B	0 - 0.5	08/05/08	5	816
BLA-R45C	0 - 0.5	08/05/08	10	483
BLA-R45D	0 - 0.5	08/05/08	15	124
BLA-R46A	0 - 0.5	08/05/08	1	1,691
BLA-R46B	0 - 0.5	08/05/08	5	686
BLA-R46C	0 - 0.5	08/05/08	10	82
BLA-R47A	0 - 0.5	08/05/08	1	86
BLA-R47B	0 - 0.5	08/05/08	5	313
BLA-R47C	0 - 0.5	08/05/08	10	339
BLA-R48A	0 - 0.5	08/05/08	1	257
BLA-R48B	0 - 0.5	08/05/08	5	358
BLA-R48C	0 - 0.5	08/05/08	10	74
BLA-R49A	0 - 0.5	08/05/08	1	906
BLA-R49B	0 - 0.5	08/05/08	5	438
BLA-R49C	0 - 0.5	08/05/08	10	75
BLA-R50A	0 - 0.5	08/05/08	1	1,866
BLA-R50B	0 - 0.5	08/05/08	5	515
BLA-R50C	0 - 0.5	08/05/08	10	90
BLA-R51A	0 - 0.5	08/05/08	1	773
BLA-R51B	0 - 0.5	08/05/08	5	242
BLA-R51C	0 - 0.5	08/05/08	10	45
BLA-R52A	0 - 0.5	08/05/08	1	1,289
BLA-R52B	0 - 0.5	08/05/08	5	240
BLA-R52C	0 - 0.5	08/05/08	10	62
BLA-R53A	0 - 0.5	08/05/08	1	602
BLA-R53B	0 - 0.5	08/05/08	5	79
BLA-R53C	0 - 0.5	08/05/08	10	77
BLA-R54A	0 - 0.5	08/05/08	1	179
BLA-R54B	0 - 0.5	08/05/08	5	115
BLA-R54C	0 - 0.5	08/05/08	10	63
BLA-R55A	0 - 0.5	08/05/08	1	4,640
BLA-R55B	0 - 0.5	08/05/08	5	259
BLA-R55C	0 - 0.5	08/05/08	10	107
BLA-R56A	0 - 0.5	08/05/08	1	243
BLA-R56B	0 - 0.5	08/05/08	5	117
BLA-R56C	0 - 0.5	08/05/08	10	90
BLA-R57A	0 - 0.5	08/05/08	1	209
BLA-R57B	0 - 0.5	08/05/08	5	639
BLA-R57C	0 - 0.5	08/05/08	10	507
BLA-R58A	0 - 0.5	08/05/08	1	333
BLA-R58B	0 - 0.5	08/05/08	5	46
BLA-R58C	0 - 0.5	08/05/08	10	131
BLA-R59A	0 - 0.5	08/05/08	1	664
BLA-R59B	0 - 0.5	08/05/08	5	536
BLA-R59C	0 - 0.5	08/05/08	10	308
BLA-R60A	0 - 0.5	08/05/08	1	341
BLA-R60B	0 - 0.5	08/05/08	5	164
BLA-R60C	0 - 0.5	08/05/08	10	104
BLA-R61A	0 - 0.5	08/05/08	1	1,061
BLA-R61B	0 - 0.5	08/05/08	5	89
BLA-R61C	0 - 0.5	08/05/08	10	118
BLA-R62A	0 - 0.5	08/05/08	1	529
BLA-R62B	0 - 0.5	08/05/08	5	315
BLA-R62C	0 - 0.5	08/05/08	10	199
BLA-R63A	0 - 0.5	08/05/08	1	640
BLA-R63B	0 - 0.5	08/05/08	5	156
BLA-R63C	0 - 0.5	08/05/08	10	27

[a] USEPA Regional Screening Levels (USEPA 2008a).

[b] Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.

ft Feet.

mg/kg Milligrams per kilogram.

(++) The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.

24,400 Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).

10.6 J Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).

16 Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Table A-10. Soil Analytical Results, Bag Loading Area, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected: Corresponding XRF Screening Location: Building: Distance from Building (ft):	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	BLA-SB001	BLA-SB001	BLA-SB001	BLA-SS001	BLA-SS002	BLA-SS003	BLA-SS004	BLA-SS005	BLA-SS006	BLA-SS007	BLA-SS008	BLA-SS001	BLA-SS002	BLA-SS003	BLA-SS004	BLA-SS005	BLA-SS006	BLA-SS007	BLA-SS008	BLA-SS001	BLA-SS002	BLA-SS003	BLA-SS004	BLA-SS005	BLA-SS006	BLA-SS007	BLA-SS008	BLA-SS009	BLA-SS010	BLA-SS011	BLA-SS012	BLA-SS013	
					1 - 2	2 - 3	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
					07/29/08	07/29/08	07/29/08	07/29/08	07/29/08	07/29/08	07/29/08	07/29/08	07/29/08	07/29/08	07/29/08	07/29/08	07/29/08	07/29/08	07/29/08	08/05/08	08/05/08	08/05/08	08/05/08	08/05/08	08/05/08	08/05/08	08/05/08	08/05/08	08/05/08	08/05/08	08/05/08	08/05/08	08/05/08	08/05/08	08/05/08	08/05/08	08/05/08
					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	BLA-R1A	BLA-R4C	BLA-R8B	BLA-R11A	BLA-R16B	BLA-R21A	BLA-R22C	BLA-R27A	BLA-R31A	BLA-R33B	BLA-R36A	BLA-R39B	BLA-R42A				
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	412	412	411	411	413	407	405	405	405	405	405	405	405	406								
XRF Metals																																					
Lead	400 (++)	800 (++)	26.8		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	84	19	236	16	25	4590	902	1203	1263	49	456	170	6031									
Inorganics																																					
Aluminum	7,700 (nc)	990,000 (max)	40,041	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	27,200	26,400	8,050	34,200	29,200	27,600	13,300	15,000	13,900 [15,200]	22,900	23,600	13,600	5,750									
Antimony	3.1 (nc)	41 (nc)		mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<4.40 J	<4.20 J	<3.80 J	<4.60 J	<4.40 J	<4.70 J	<5.60 J	<4.70 J	<3.90 J [<4.20]	<4.20 J	<4.10 J	<4.10 J										
Arsenic	0.39 (ca*)	1.6 (ca)	15.9	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.30	12.2	8.20	13.6	14.5	8.90	10.3	12.2	8.40 [14.8]	10.0	10.9	11.0	17.9									
Barium	1,500 (nc)	190,000 (max)	208	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	52.0 J	58.4 J	120 J	78.9 J	55.6 J	781 J	1,730 J	11,100 J	1,550 J [1,610]	115 J	7,770 J	6,500 J	654 J									
Beryllium	16 (nc)	200 (nc)	1.02	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.70	1.90	0.700 J	2.00	2.20	2.10	1.10 J	1.00 J	0.950 J [0.980 J]	1.50	0.880 J	0.620 J	0.790 J									
Cadmium	7 (nc)	81 (nc)	0.69	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.80	<1.40	0.950 J	<1.50	<1.50	2.70	9.40	34.7	3.60 [5.60]	1.00 J	12.7	9.30	44.8									
Calcium	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4,090 J	1,350 J	189,000 J	601 J	1,770 J	2,580 J	191,000 J	126,000 J	35,000 J [113,000]	64,400 J	60,100 J	53,400 J	79,600 J									
Chromium	280 (ca)	1,460 (ca)	65.3	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	48.7	53.9	40.6	46.9	52.5	42.2	35.3	58.9	64.0 [96.4]	39.7	59.3	52.0	95.6									
Cobalt	2.3 (nc)	30 (nc)	72.3	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	16.5	23.9	8.40	39.8	29.4	17.0	13.1	<47.0	12.7 J [20.2]	15.7	<40.6	<41.4	19.3									
Copper	310 (nc)	4,100 (nc)	53.5	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	13,000	43.8	127	30.2	192	2,620	1,210	13,100	1,460 J [3,890 J]	227	3,660	3,590	72,000									
Iron	5,500 (nc)	720,000 (max)	50,962	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	46,000	57,100	13,600	50,200	46,700	43,000	25,200	31,800	33,700 [28,300]	36,900	35,200	61,500	35,500									
Lead	400 (++)	800 (++)	26.8	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	105	23.9	163	28.7	25.9	1,340	927	1,030	1,830 [1,080]	128	1,420	2,230	58,000									
Magnesium	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	12,700	4,500	105,000	4,880	6,890	8,390	100,000	75,800	48,300 [58,000]	34,500	37,400	28,100	64,700									
Manganese	180 (nc)	2,300 (nc)	2,543	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	340 J	897 J	228 J	1,270 J	633 J	331 J	491 J	277 J	395 J [491]	438 J	281 J	530 J	470 J									
Mercury	3.1 (sat)	3.1 (sat)	0.13	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0470	0.0360 J	0.0550	0.0450 J	0.0270 J	0.0390 J	0.210	1.90	0.570 J [16.8 J]	0.410	0.530	0.630	0.0580 J									
Nickel	160 (nc)	2,000 (nc)	62.8	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	48.7	26.0	14.8	26.2	31.2	35.9	21.3	46.2	22.9 [34.1]	22.2	30.0	39.9	148									
Potassium	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3,320 J	3,230 J	1,520 J	3,640 J	5,000 J	3,810 J	3,820 J	3,240 J	2,840 J [2,030]	3,210 J	2,220 J	1,140 J	1,040 J									
Selenium	39 (nc)	510 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.50	<1.40	<1.30	<1.50	<1.50	<1.60	<1.90	<1.60	<1.30 [<1.40]	<1.40	<1.40	<1.40	1.90 J									
Silver	39 (nc)	510 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.440 J	<2.80	<2.50	<3.00	<2.90	<3.10	<3.70	0.650 J	<2.60 [0.570 J]	<2.80	0.500 J	1.10 J	2.30 J									
Sodium	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.460	<1.410	<1.270	<1.520	<1.470	<1.550	<1.850	<1.570	<1.310 [<1.410]	<1.390	<1.350	<1.380	<2.330									
Thallium	0.51 (nc)	6.6 (nc)	2.11	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<2.90	<2.80	<2.50	<3.00	<2.90	<3.10	<3.70	<2.60 [<2.80]	<2.80	<2.70	<4.70											
Vanadium	55(nc)	720 (nc)	108	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	71.7	102	24.1	82.6	82.0	70.2	36.8	35.9	30.5 [40.2]	58.4	57.1	37.6	22.2 J									
Zinc	2,300 (nc)	310,000 (max)	202	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	148	37.2	723	43.0	49.9	982	2,050	7,860	1,250 J [2,600 J]	300	3,340	4,410	12,500									
PAHs																																					
1,2,4-Trichlorobenzene	180 (ca**)	220 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
1,2-Dichlorobenzene	220 (sat)	220 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
1,3-Dichlorobenzene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
1,4-Dichlorobenzene	2.6 (ca)	13 (ca)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
1-Methylnaphthalene	22	99	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.013	0.011	0.025	0.0056 J	0.047	<0.0093	<0.0085	<0.010	0.40	<0.0054	0.028 J	0.0092 J	0.33 J [<0.024 J]	0.048	<0.0094	<0.024	0.0087 J									
2,4-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA								
2,6-Dinitrotoluene	6.1 (nc)	62 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA								
2-Methylnaphthalene	31 (nc)	440 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.016	0.014	0.027	0.0061 J	0.054	<0.0093	<0.0085	<0.010	0.58	<0.0054	0.028 J	0.012	0.48 J [<0.024 J]	0.051	<0.0094	0.016 J	<0.015									
Acenaphthene	340 (nc)	3,300 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.27	0.36	0.83	0.21	0.092	<0.0093	0.0058 J	0.014	12	<0.0054	0.24	0.0084 J	9.0 J [0.13 J]	0.24	0.017	0.098	0.057									
Acenaphthylene	340 (nc)	3,300 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.20	0.11	0.31	<0.0082	0.044	<0.0093	0.012	0.0090 J	0.14	<0.0054	0.078	<0.011	0.051 J [<0.024 J]	0.032	0.030	0.032	<0.015									
Anthracene	1,700 (nc)	170,000 (max)	--	mg/kg	NA	NA	NA	NA	NA																												

Table A-10. Soil Analytical Results, Bag Loading Area, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected: Corresponding XRF Screening Location: Building: Distance from Building (ft):	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	BLA-SS014	BLA-SS015	BLA-SS016	BLA-SS017	BLA-SS018	BLA-SS019
					0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
					08/05/08	08/05/08	08/05/08	08/05/08	08/05/08	08/05/08
					BLA-R45A	BLA-R49B	BLA-R52A	BLA-R55B	BLA-R58B	BLA-R61A
					404	404	404	404	404	404
					1	5	1	5	5	1
XRF Metals										
Lead	400 (++)	800 (++)	26.8		1100	438	1289	259	46	1061
Inorganics										
Aluminum	7,700 (nc)	990,000 (max)	40,041	mg/kg	10,900 [11,100]	11,800	11,900	18,000	25,500	19,800
Antimony	3.1 (nc)	41 (nc)	--	mg/kg	<3.60 J [8.10]	<3.60	<3.70	<4.40	<4.40	<4.70
Arsenic	0.39 (ca*)	1.6 (ca)	15.8	mg/kg	47.2 [58.4]	4.30	14.5	9.70	6.90	10.8
Barium	1,500 (nc)	190,000 (max)	209	mg/kg	9,320 J [10,600]	829	1,450	316	273	1,650
Beryllium	16 (nc)	200 (nc)	1.02	mg/kg	1.10 J [0.930 J]	0.710 J	0.840 J	0.630 J	0.660 J	0.570 J
Cadmium	7 (nc)	81 (nc)	0.69	mg/kg	28.6 [34.2]	4.00	11.2	2.90	1.50 J	4.70
Calcium	--	--	--	mg/kg	119,000 J [97,100]	142,000 J	151,000 J	32,900	72,800	56,000
Chromium	280 (ca)	1,460 (ca)	65.3	mg/kg	73.7 [76.6]	52.8	106	43.9	32.9	37.6
Cobalt	2.3 (nc)	30 (nc)	72.3	mg/kg	20.5 J [21.1 J]	8.30	16.0	8.10	3.90 J	6.50 J
Copper	310 (nc)	4,100 (nc)	53.5	mg/kg	15,100 [17,600]	2,890	3,680	5,200	150	551
Iron	5,500 (nc)	720,000 (max)	50,962	mg/kg	37,000 [36,500]	28,600	35,400	29,200	32,100	28,800
Lead	400 (++)	800 (++)	26.8	mg/kg	4,310 [7,250]	439	1,210	405	109	881
Magnesium	--	--	--	mg/kg	73,700 [82,400]	87,100	65,500	19,200	44,600	20,800
Manganese	180 (nc)	2,300 (nc)	2,543	mg/kg	336 J [331]	319	353	254	201	318
Mercury	3.1 (sat)	3.1 (sat)	0.13	mg/kg	0.600 [0.540]	1.00	12.6	2.30	0.320	0.730
Nickel	160 (nc)	2,000 (nc)	62.8	mg/kg	81.2 [86.6]	21.0	38.2	20.5	14.1	17.5
Potassium	--	--	--	mg/kg	3,300 J [2,680]	4,160	2,200	978 J	1,880	2,330
Selenium	39 (nc)	510 (nc)	--	mg/kg	<1.20 [<1.20]	<1.20	<1.20	<1.50	<1.50	<1.60
Silver	39 (nc)	510 (nc)	--	mg/kg	1.70 J [2.00 J]	<2.40	1.00 J	0.390 J	<2.90	<3.10
Sodium	--	--	--	mg/kg	<1,190 [<6,020]	<1,190	<1,250	<1,460	<1,470	<1,560
Thallium	0.51 (nc)	6.6 (nc)	2.11	mg/kg	<2.40 [<2.40]	<2.40	<2.50	<2.90	<2.90	<3.10
Vanadium	55(nc)	720 (nc)	108	mg/kg	34.7 [30.7]	29.6	28.2	49.1	61.9	47.5
Zinc	2,300 (nc)	310,000 (max)	202	mg/kg	5,810 [7,140]	495	1,120	609	170	1,040
PAHs										
1,2,4-Trichlorobenzene	180 (ca**)	220 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	220 (sat)	220 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	2.6 (ca)	13 (ca)	--	mg/kg	NA	NA	NA	NA	NA	NA
1-Methylnaphthalene	22	99	--	mg/kg	<0.021 [0.017 J]	<0.0084	<0.023	0.034	<0.027	0.0056 J
2,4-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	6.1 (nc)	62 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	31 (nc)	440 (sat)	--	mg/kg	<0.021 [0.018 J]	<0.0084	<0.023	0.038	<0.027	0.0079 J
Acenaphthene	340 (nc)	3,300 (nc)	--	mg/kg	0.022 [0.058]	<0.0084	0.028	0.41	0.055	0.013
Acenaphthylene	340 (nc)	3,300 (nc)	--	mg/kg	0.021 [0.036]	<0.0084	0.073	0.23	0.058	0.047
Anthracene	1,700 (nc)	170,000 (max)	--	mg/kg	0.067 J [0.14 J]	0.019	0.10	1.9	0.31	0.033
Benzo(a)anthracene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	0.49 [0.88]	0.019	0.53	11	1.4	0.22
Benzo(a)pyrene	0.015 (ca**)	0.21 (ca**)	--	mg/kg	0.54 [0.93]	0.020	0.53	10	1.3	0.27
Benzo(b)fluoranthene	0.15 (ca*)	2.1 (ca**)	--	mg/kg	0.87 [1.3]	0.032	0.84	17	2.0	0.42
Benzo(a,h,i)perylene	170 (nc)	1,700 (nc)	--	mg/kg	0.43 [0.65]	0.016	0.46	7.8	0.75	0.18
Benzo(k)fluoranthene	1.5 (ca**)	21 (ca**)	--	mg/kg	0.67 [1.1]	0.018	0.56	7.5	0.68	0.23
Chrysene	15 (ca**)	210 (ca**)	--	mg/kg	0.82 [1.5]	0.027	0.72	13	1.6	0.32
Dibenzo(a,h)anthracene	0.015 (ca**)	0.21 (ca**)	--	mg/kg	0.12 [0.21]	<0.0084	0.15	2.4	0.25	<0.011
Dinitrotoluene Mix	0.71	2.5	--	mg/kg	NA	NA	NA	NA	NA	NA
Fluoranthene	230 (nc)	2,200 (nc)	--	mg/kg	1.5 [2.7]	0.050	1.2	32	3.6	0.80
Fluorene	230 (nc)	2,200 (nc)	--	mg/kg	<0.021 [0.062]	<0.0084	0.031	0.51	0.074	<0.011
Hexachlorobutadiene	6.2	22	--	mg/kg	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	0.51 [0.81]	0.018	0.55	7.8	0.97	0.22
Naphthalene	3.9 (ca)	20 (ca)	--	mg/kg	<0.021 [0.040]	<0.0084	<0.023	0.062	<0.027	<0.011
Nitrobenzene	3.9 (nc)	20 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA
Phenanthrene	1,700 (nc)	170,000 (max)	--	mg/kg	0.55 J [1.4 J]	0.018	0.56	10	1.6	0.24
Pyrene	170 (nc)	1,700 (nc)	--	mg/kg	1.2 J [2.6 J]	0.044	1.1	18	2.9	0.40
Asbestos										
Asbestoso (Y/N)	--	--	--	-	Yes	Yes	Yes	Yes	Yes	Yes
PCBs										
Aroclor-1016	0.39 (nc)	21 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA
Aroclor-1221	0.17 (ca**)	0.62 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA
Aroclor-1232	0.17 (ca**)	0.62 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA
Aroclor-1242	0.22 (ca**)	0.74 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA
Aroclor-1248	0.22 (ca**)	0.74 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA
Aroclor-1254	0.22 (ca**)	0.74 (ca*)	--	mg/kg	NA	NA	NA	NA	NA	NA
Aroclor-1260	0.22 (ca**)	0.74 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA
Inorganics-TCLP	TCLP Standard									
Arsenic	5,000	--	--	µg/L	NA	NA	NA	<100	NA	<100
Barium	10,000	--	--	µg/L	NA	NA	NA	2,050	NA	1,230
Cadmium	1,000	--	--	µg/L	NA	NA	NA	21.6 J	NA	<50
Chromium	5,000	--	--	µg/L	NA	NA	NA	<100	NA	<100
Lead	5,000	--	--	µg/L	NA	NA	NA	342	NA	172
Mercury	200	--	--	µg/L	NA	NA	NA	<2	NA	<2
Selenium	1,000	--	--	µg/L	NA	NA	NA	<50	NA	<50
Silver	5,000	--	--	µg/L	NA	NA	NA	<100	NA	<100

mg/kg	Milligrams per kilogram.
[a]	USEPA Regional Screening Levels (USEPA 2008a).
[b]	Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.
{ca}	Carcinogen.
{nc}	Noncarcinogen.
*	Noncarcinogen screening level is less than one hundred times the carcinogen screening level.
**	Noncarcinogen screening level is less than ten times the carcinogen screening level.
{++}	The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.
{max}	Concentration may exceed ceiling limit.
{sat}	Screening level may exceed saturation concentration.
B (Inorganics)	Constituent concentration quantified as estimated.
B (Organics)	Constituent was detected in the associated method blank.
J	Constituent concentration quantified as estimated.
K	Estimated concentration bias high.
L	Estimated concentration bias low.
NA	Not Analyzed.
[3.3]	Bracketed concentration indicates laboratory analytical result for duplicate sample
24,400	Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).
10.6 J	Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).
16	Bolded inorganics indicates concentration is above facility-wide background value.

Table A-11. Surface Water Analytical Results, Bag Loading Area, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Date Collected:	Tapwater Screening Values [a]	Units	BLA-SPSW01 08/01/08	BLA-VLTW01 08/01/08
Volatile Organics				
1,1,1-Trichloroethane	9.1	mg/L	NA	<0.0010
1,1,2,2-Tetrachloroethane	0.000067	mg/L	NA	<0.0010
1,1,2-trichloro-1,2,2-trifluoroethane	59	mg/L	NA	<0.0010
1,1,2-Trichloroethane	0.00024	mg/L	NA	<0.0010
1,1-Dichloroethane	0.0024	mg/L	NA	<0.0010
1,1-Dichloroethene	0.34	mg/L	NA	<0.0010
1,2,3-Trichlorobenzene	- -	mg/L	NA	<0.0010
1,2,4-Trichlorobenzene	0.019	mg/L	NA	<0.0010
1,2-Dibromo-3-chloropropane	0.0000032	mg/L	NA	<0.0010
1,2-Dibromoethane	0.0000065	mg/L	NA	<0.0010
1,2-Dichlorobenzene	0.37	mg/L	NA	<0.0010
1,2-Dichloroethane	0.00015	mg/L	NA	<0.0010
1,2-Dichloropropane	0.00039	mg/L	NA	<0.0010
1,3-Dichlorobenzene	- -	mg/L	NA	<0.0010
1,4-Dichlorobenzene	0.00043	mg/L	NA	<0.0010
1,4-Dioxane	0.0061	mg/L	NA	<0.0050
2-Butanone	7.1	mg/L	NA	<0.010
2-Hexanone	- -	mg/L	NA	<0.0050
4-Methyl-2-pentanone	2	mg/L	NA	<0.0050
Acetone	22	mg/L	NA	<0.010
Benzene	0.00041	mg/L	NA	<0.0010
Bromochloromethane	- -	mg/L	NA	<0.0010
Bromodichloromethane	0.0011	mg/L	NA	<0.0010
Bromoform	0.0085	mg/L	NA	<0.0010
Bromomethane	0.0087	mg/L	NA	<0.0010
Carbon Disulfide	1	mg/L	NA	<0.0010
Carbon Tetrachloride	0.0002	mg/L	NA	<0.0010
Chlorobenzene	0.091	mg/L	NA	<0.0010
Chloroethane	21	mg/L	NA	<0.0010
Chloroform	0.00019	mg/L	NA	<0.0010
Chloromethane	0.0018	mg/L	NA	<0.0010
cis-1,2-Dichloroethene	0.37	mg/L	NA	<0.0010
cis-1,3-Dichloropropene	- -	mg/L	NA	<0.0010
Cyclohexane	13	mg/L	NA	<0.0010
Dibromochloromethane	0.0008	mg/L	NA	<0.0010
Dichlorodifluoromethane	0.39	mg/L	NA	<0.0010
Ethylbenzene	0.0015	mg/L	NA	<0.0010
Isopropylbenzene	0.68	mg/L	NA	<0.0010
m,p-Xylene	- -	mg/L	NA	NA
Methyl acetate	37	mg/L	NA	<0.0010
Methyl tert-butyl ether	0.012	mg/L	NA	<0.0010
Methylcyclohexane	6.3	mg/L	NA	<0.0010
Methylene Chloride	0.0048	mg/L	NA	<0.0010
o-Xylene	1.4	mg/L	NA	NA
Styrene	1.6	mg/L	NA	<0.0010
Tetrachloroethene	0.00011	mg/L	NA	<0.0010
Toluene	2.3	mg/L	NA	<0.0010
trans-1,2-Dichloroethene	0.11	mg/L	NA	<0.0010
trans-1,3-Dichloropropene	- -	mg/L	NA	<0.0010
Trichloroethene	0.0017	mg/L	NA	<0.0010
Trichlorofluoromethane	1.3	mg/L	NA	<0.0010
Vinyl Chloride	0.000016	mg/L	NA	<0.0010
Xylenes (total)	0.2	mg/L	NA	<0.0010
Semivolatile Organics				
1,2,4-Trichlorobenzene	0.019	mg/L	NA	NA
1,2-Dichlorobenzene	0.37	mg/L	NA	NA
1,3-Dichlorobenzene	- -	mg/L	NA	NA
1,4-Dichlorobenzene	0.00043	mg/L	NA	NA
1-Methylnaphthalene	0.0023	mg/L	<0.000047	<0.000046
2,4,5-Trichlorophenol	3.7	mg/L	NA	NA
2,4,6-Trichlorophenol	0.0061	mg/L	NA	NA
2,4-Dichlorophenol	0.11	mg/L	NA	NA
2,4-Dimethylphenol	0.73	mg/L	NA	NA

Notes found at end of table.

Table A-11. Surface Water Analytical Results, Bag Loading Area, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Date Collected:	Tapwater Screening Values [a]	Units	BLA-SPSW01 08/01/08	BLA-VLTW01 08/01/08
Semivolatile Organics				
2,4-Dinitrophenol	0.073	mg/L	NA	NA
2,4-Dinitrotoluene	0.073	mg/L	NA	NA
2,6-Dinitrotoluene	0.037	mg/L	NA	NA
2-Chloronaphthalene	2.9	mg/L	NA	NA
2-Chlorophenol	0.18	mg/L	NA	NA
2-Methylnaphthalene	0.15	mg/L	<0.000047	<0.000046
2-Methylphenol	1.8	mg/L	NA	NA
2-Nitroaniline	- -	mg/L	NA	NA
2-Nitrophenol	- -	mg/L	NA	NA
3,3'-Dichlorobenzidine	0.00015	mg/L	NA	NA
3-Nitroaniline	- -	mg/L	NA	NA
4,6-Dinitro-2-methylphenol	- -	mg/L	NA	NA
4-Bromophenyl-phenylether	- -	mg/L	NA	NA
4-Chloro-3-Methylphenol	- -	mg/L	NA	NA
4-Chloroaniline	0.15	mg/L	NA	NA
4-Chlorophenyl-phenylether	- -	mg/L	NA	NA
4-Methylphenol	0.18	mg/L	NA	NA
4-Nitroaniline	- -	mg/L	NA	NA
4-Nitrophenol	- -	mg/L	NA	NA
Acenaphthene	2.2	mg/L	<0.000047	<0.000046
Acenaphthylene	- -	mg/L	<0.000047	<0.000046
Anthracene	11	mg/L	<0.000047	<0.000046
Benzo(a)anthracene	0.000029	mg/L	<0.00047	0.000024 J
Benzo(a)pyrene	0.0000029	mg/L	<0.00047	<0.000046
Benzo(b)fluoranthene	0.000029	mg/L	<0.00047	0.000025 J
Benzo(g,h,i)perylene	- -	mg/L	<0.00047	<0.000046
Benzo(k)fluoranthene	0.000029	mg/L	<0.00047	<0.000046
Benzoic Acid	150	mg/L	NA	NA
Benzyl Alcohol	18	mg/L	NA	NA
bis(2-Chloroethoxy)methane	0.11	mg/L	NA	NA
bis(2-Chloroethyl)ether	0.000012	mg/L	NA	NA
bis(2-Chloroisopropyl)ether	- -	mg/L	NA	NA
bis(2-Ethylhexyl)phthalate	0.0048	mg/L	NA	NA
Butylbenzylphthalate	7.3	mg/L	NA	NA
Carbazole	0.0034	mg/L	NA	NA
Chrysene	0.0029	mg/L	<0.00047	0.000030 J
Dibenzo(a,h)anthracene	0.0000029	mg/L	<0.00047	<0.000046
Dibenzofuran	- -	mg/L	NA	NA
Diethylphthalate	29	mg/L	NA	NA
Dimethylphthalate	- -	mg/L	NA	NA
Di-n-Butylphthalate	3.7	mg/L	NA	NA
Dinitrotoluene Mix	0.000099	mg/L	NA	NA
Di-n-Octylphthalate	- -	mg/L	NA	NA
Fluoranthene	1.5	mg/L	<0.000047	0.000066
Fluorene	1.5	mg/L	<0.000047	<0.000046
Hexachlorobenzene	0.000042	mg/L	NA	NA
Hexachlorobutadiene	0.00086	mg/L	NA	NA
Hexachlorocyclopentadiene	0.22	mg/L	NA	NA
Hexachloroethane	0.0048	mg/L	NA	NA
Indeno(1,2,3-cd)pyrene	0.000029	mg/L	<0.00047 J	<0.000046 J
Isophorone	0.071	mg/L	NA	NA
Naphthalene	0.0062	mg/L	<0.000047	<0.000046
Nitrobenzene	0.0034	mg/L	NA	NA
N-Nitroso-di-n-propylamine	0.0000096	mg/L	NA	NA
N-Nitrosodiphenylamine	0.014	mg/L	NA	NA
Pentachlorophenol	0.00056	mg/L	NA	NA
Phenanthrene	- -	mg/L	<0.000047	0.000036 J
Phenol	11	mg/L	NA	NA
Pyrene	1.1	mg/L	<0.00047	0.000041 J
Pyridine	0.037	mg/L	NA	NA

Notes found at end of table.

Table A-11. Surface Water Analytical Results, Bag Loading Area, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Date Collected:	Tapwater Screening Values [a]	Units	BLA-SPSW01 08/01/08	BLA-VLTW01 08/01/08
Inorganics				
Aluminum	37	mg/L	0.549	0.273
Antimony	0.015	mg/L	<0.0150	<0.0150
Arsenic	0.000045	mg/L	0.0100	0.00340 J
Barium	7.3	mg/L	0.0588	0.0981
Beryllium	0.073	mg/L	<0.00500	<0.00500
Cadmium	0.018	mg/L	<0.00500	<0.00500
Calcium	--	mg/L	86.5	25.6
Chromium	--	mg/L	<0.0100	0.00270 J
Cobalt	--	mg/L	<0.0150	<0.0150
Copper	1.5	mg/L	0.828	0.646
Iron	26	mg/L	0.554	0.742
Lead	--	mg/L	0.00220 J	0.247
Magnesium	--	mg/L	496	23.3
Manganese	0.88	mg/L	0.377	0.0443
Mercury	0.00063	mg/L	<0.000200 J	0.000200 J
Nickel	0.73	mg/L	<0.0100	<0.0100
Potassium	--	mg/L	146	43.6
Selenium	0.18	mg/L	<0.00500	<0.00500
Silver	0.18	mg/L	<0.0100	<0.0100
Sodium	--	mg/L	107	22.1
Thallium	0.0024	mg/L	<0.0100	<0.0100
Vanadium	0.18	mg/L	<0.0500	<0.0500
Zinc	11	mg/L	0.0263	0.116

mg/L
[a]

milligram per liter

USEPA Regional Screening Levels (USEPA 2008a).

Adjusted tap-water screening levels used to assess surface water at the NRU.

Constituent concentration quantified as estimated.

J

24,400

Highlighted value indicates constituent concentration is above tapwater screening value.

Table A-12. Sediment Analytical Results, Bag Loading Area, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	BLA-SPSD01 0 - 0.5 08/01/08
Inorganics					
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	31,200
Antimony	3.1 {nc}	41 {nc}	--	mg/kg	<4.10 J
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	9.40
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	1,090
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	1.80
Cadmium	7 {nc}	81 {nc}	0.69	mg/kg	2.60
Calcium	--	--	--	mg/kg	22,000
Chromium	280 {ca}	1,460 {ca}	65.3	mg/kg	40.6
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	18.4
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	1,280
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	47,600
Lead	400 {++}	800 {++}	26.8	mg/kg	71.0 J
Magnesium	--	--	--	mg/kg	18,400
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	284
Mercury	3.1 {sat}	3.1 {sat}	0.13	mg/kg	0.0630 J
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	29.8
Potassium	--	--	--	mg/kg	4,510
Selenium	39 {nc}	510 {nc}	--	mg/kg	<1.40
Silver	39 {nc}	510 {nc}	--	mg/kg	<2.80
Sodium	--	--	--	mg/kg	<1,380
Thallium	0.51 {nc}	6.6 {nc}	2.11	mg/kg	<2.80
Vanadium	55{nc}	720 {nc}	108	mg/kg	69.7
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	721
PAHs					
1,2,4-Trichlorobenzene	8.7 {ca**}	40 {ca**}	--	mg/kg	<0.0094
1,2-Dichlorobenzene	220 {sat}	220 {sat}	--	mg/kg	<0.0094
1,3-Dichlorobenzene	--	--	--	mg/kg	<0.0094
1,4-Dichlorobenzene	2.6 {ca}	13 {ca}	--	mg/kg	<0.0094
1-Methylnaphthalene	22 {ca*}	99 {ca*}	--	mg/kg	0.021 J
2,4-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	NA
2,6-Dinitrotoluene	6.1 {nc}	62 {nc}	--	mg/kg	NA
2-Methylnaphthalene	31 {nc}	440 {sat}	--	mg/kg	0.029 J
Acenaphthene	340 {nc}	3,300 {nc}	--	mg/kg	0.36
Acenaphthylene	340 {nc}	3,300 {nc}	--	mg/kg	<0.050
Anthracene	1,700 {nc}	170,000 {max}	--	mg/kg	0.46
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	1.8
Benzo(a)pyrene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	1.6
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	2.5
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	1.1
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	1.3
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	2.8
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	0.31
Dinitrotoluene Mix	0.71 {ca}	2.5 {ca}	--	mg/kg	NA
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	7.4
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	0.39
Hexachlorobutadiene	6.2 {ca**}	22 {ca*}	--	mg/kg	NA
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	1.4 J
Naphthalene	3.9 {nc}	20 {nc}	--	mg/kg	0.11
Nitrobenzene	3.1 {nc}	28 {nc}	--	mg/kg	NA
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	5.4
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	5.3

mg/kg

Milligrams per kilogram.

[a] USEPA Regional Screening Levels (USEPA 2008a).

[b] Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.

{ca} Carcinogen.

{nc} Noncarcinogen.

J Constituent concentration quantified as estimated.

NA Not Analyzed.

24,400 Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).

10.6 J Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).

16 Bolded inorganics indicates concentration is above facility-wide background value.

Table A-13. Surface Soil Analytical Results, 2009 ARCADIS Supplemental Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth (ft): Date Collected:		BLA404-SS001A 0-0.25 07/22/09	BLA404-SS001B 0-0.25 07/22/09	BLA404-SS001C 0-0.25 07/22/09	BLA404-SS001D 0-0.25 07/22/09	BLA404-SS001E 0-0.25 07/22/09	BLA411-SS001A 0-0.25 07/22/09	BLA411-SS001B 0-0.25 07/22/09	BLA411-SS001C 0-0.25 07/22/09	BLA411-SS001D 0-0.25 07/22/09	BLA411-SS001E 0-0.25 07/22/09	BLA-SS020A 0-0.5 07/14/09	BLA-SS020B 0-0.5 07/14/09	BLA-SS021A 0-0.5 07/14/09	BLA-SS021B 0-0.5 07/14/09	BLA-SS022A 0-0.5 07/15/09
Asbestos																
Asbestos weight percent	%	0.2	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.6	0.1 U	0.1 U	0.1	0.2	0.1 U	0.1 U	0.1
Chrysotile	struc.	26	24	NA	NA	NA	NA	NA	1	NA	NA	63	95	1	1	52
Crocidolite	struc.	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Percent Moisture																
Percent Moisture	%	15	100	23	24	26	16	7.0	2.1	2.3	2.4	NA	NA	NA	NA	NA
Soil Particle Size																
3/4"	%	0	4.2	0	0	1.8	0	0	0	0	0	NA	NA	NA	NA	NA
3/8"	%	14	3.0	16	12	3.3	2.9	15	2.2	0	4.6	NA	NA	NA	NA	NA
d < 75 µm	%	8.0	1.7	30	4.3	6.5	6.3	5.8	9.7	3.8	3.0	NA	NA	NA	NA	NA
No. 10	%	17	14	8.4	23	24	19	13	10	7.9	8.1	NA	NA	NA	NA	NA
No. 200	%	18	31	12	10	18	19	16	30	51	40	NA	NA	NA	NA	NA
No. 4	%	21	15	20	20	5.7	12	18	12	5.8	17	NA	NA	NA	NA	NA
No. 40	%	21	31	14	30	41	42	32	36	31	27	NA	NA	NA	NA	NA

U

NA

ND

The compound was analyzed for but not detected. The associated value is the compound quantitation limit.
Not Analyzed
Not Detected

Table A-13. Surface Soil Analytical Results, 2009 ARCADIS Supplemental Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth (ft): Date Collected:		BLA-SS022B 0-0.5 07/15/09	BLA-SS023C 0-0.5 07/15/09	BLA-SS024A 0-0.5 07/14/09	BLA-SS024B 0-0.5 07/14/09	BLA-SS025A 0-0.5 07/14/09	BLA-SS025B 0-0.5 07/14/09	BLA-SS026A 0-0.5 07/15/09	BLA-SS026B 0-0.5 07/15/09	BLA-SS027B 0-0.5 07/15/09	BLA-SS027C 0-0.5 07/15/09	BLA-SS028B 0-0.5 07/15/09	BLA-SS028C 0-0.5 07/15/09	BLA-SS029B 0-0.5 07/15/09	BLA-SS029C 0-0.5 07/15/09
Asbestos															
Asbestos weight percent	%	0.1 U	0.1	0.1 U	0.1 U	0.1	0.1 U	9.4	0.1 U	0.1	0.1 U	0.1	0.1 U	0.1 U	0.1 U
Chrysotile	struc.	53	52	9	2	39	11	56	6	52	22	50	52	50	4
Crocidolite	struc.	ND	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Percent Moisture															
Percent Moisture	%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Soil Particle Size															
3/4"	%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3/8"	%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
d < 75 µm	%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
No. 10	%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
No. 200	%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
No. 4	%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
No. 40	%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Table A-14. Activity Based Air Sampling Results, 2009 ARCADIS Supplemental Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Date Collected:	Method	Units	BLA404-AA1 07/25/09	BLA404-AP1 07/26/09	BLA404-AA2 07/22/09	BLA404-AP2 07/23/09	BLA404-BK2 07/24/09	BLA411-AA1 07/29/09	BLA411-AP1 07/30/09	BLA411-BK1 07/31/09	BLA411-AA2 07/27/09	BLA411-AP2 07/28/09
Asbestos												
Air Concentration	AHERA	s/cc	0.017	0.069	0	0	0	0.078	0.034	0	NA	0
Loading on Filter	AHERA	s/mm2	53.25	214.3	0	0	0	16.92	1.54	0	NA	0
Number of structures	AHERA	struc.	18	39	0	0	0	11	1	0	0	0
Air Concentration	BCPS	s/cc	0	0.0018	0	0	0	0.0213	0	0	NA	0
Loading on Filter	BCPS	s/mm2	0	5.49	0	0	0	4.62	0	0	NA	0
Number of structures	BCPS	struc.	0	1	0	0	0	3	0	0	0	0
Air Concentration	PCME	s/cc	0.0019	0.0018	0	0	0	0.014	0.034	0	NA	0
Loading on Filter	PCME	s/mm2	5.92	5.49	0	0	0	3.08	1.54	0	NA	0
Number of structures	PCME	struc.	2	1	0	0	0	2	1	0	0	0
Air Concentration	TEM	s/cc	0.0218	0.090	0	0	0	0.0783	0.0345	0	NA	0
Loading on Filter	TEM	s/mm2	68.0	280	0	0	0	16.92	1.54	0	NA	0
Number of structures	TEM	struc.	23	51	0	0	0	11	1	0	0	0

s/cc: structures per cubic centimeter
S/mm2: structures per square millimeter
struc: structures
AHERA - Asbestos hazard emergency response act
BCPS - Berman-Crump Protocol Structures
PCE - Phase contrast microscopy
TEM - Transmission electron microscopy

Appendix B

Summary of Laboratory Analytical
Results from IAA Site Investigations

Table B-1. Soil Analytical Results, Igniter Assembly Area, 1997 Dames and Moore Soil Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	50240 0 - 1 12/08/97	50240 1 - 2 12/11/97	50240 2 - 3 12/11/97	502436 0 - 1 12/11/97	502436 1 - 2 12/11/97	502460 0 - 1 12/11/97	502460 1 - 2 12/11/97	504312 0 - 1 12/11/97	504312 1 - 2 12/09/97	504312 2 - 3 12/09/97	504336 0 - 1 12/09/97	504336 1 - 2 12/09/97	504360 0 - 1 12/09/97	504360 1 - 2 12/09/97	81022612 0 - 1 12/11/97	81022612 1 - 2 12/11/97	81022612 2 - 3 12/11/97	81022636 0 - 1 12/11/97	81022636 1 - 2 12/11/97	81022660 0 - 1 12/11/97	81022660 1 - 2 12/11/97	81027112 0 - 1 12/08/97	81027112 1 - 2 12/08/97
Organochlorine Pesticides																											
4,4'-DDT	1.7 {ca*}	7 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	37 {nc}	370 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	1.8 {nc}	18 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	31	310	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs																											
Aroclor-1254	0.22 {ca**}	0.74 {ca*}	--	mg/kg	0.26	0.031 JP	0.0070 JP	0.14	0.13	0.041 JP	ND	0.89 P	ND	0.046 P	0.32	0.054 P	0.56	10 D*	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organics																											
2,4-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	48 J	210 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	41 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	35 {ca*}	120 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	750	ND	110 J	81 J	ND	110 J	260 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	44 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	4,900 {nc}	490,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	250 J	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinitrotoluene Mix	0.71 {ca}	2.5 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	<0	<0	<0	<0	<0	48 J	210 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	59 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	48 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics																											
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	39,000	18,100	23,000	12,800	22,200	25,100	20,400	20,200	20,300	23,500	14,200	15,700	10,900	7,430	9,790	17,600	19,200	15,900	27,200	24,300	25,600	29,300	20,800
Antimony	3.1 {nc}	41 {nc}	--	mg/kg	0.530 J	ND	ND	ND	ND	ND	ND	0.800 J	ND	ND	1.30 J	0.410 J	3.20 J	7.20 J	ND	ND	0.260 J	0.210 J	0.470 J	ND	0.290 J	ND	ND
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	10.6	2.4	4.8	1.20 J	3.4	7.9	6	7.5	5.4	7.7	4.9	5.7	5.3	11.9	ND	8.2	6	1.40 J	8.2	5.5	5	10.5	2.10 J
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	80.1	20.0 J	12.8 J	61	16.4 J	54.7	29.4 J	961	50.2	40.5	394	133	489	906	20.2 J	8.50 J	22.7 J	12.3 J	14.0 J	14.4 J	12.6 J	29.2 J	29.8 J
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	0.760 J	0.500 J	0.390 J	0.370 J	0.34	0.700 J	0.650 J	0.580 J	0.360 J	0.340 J	0.470 J	0.430 J	0.550 J	0.370 J	ND	ND	ND	ND	ND	0.420 J	0.340 J	1.2	0.860 J
Cadmium	7 {nc}	81 {nc}	0.69	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.640 J	ND	ND	0.420 J	ND	2.1	2	ND	ND	ND	ND	ND	ND	1.8	NA	NA
Calcium	--	--	--	mg/kg	1,690	1,280	1,560	1,640	1,220	1,460	1,460	10,500	876 J	734 J	23,500	7,930	148,000	82,000	1,340	633 J	1,080	1,300	488 J	866 J	275 J	739 J	1,370
Chromium	280 {ca**}	1,400 {ca**}	65.3	mg/kg	60.3	31.4	48.8	25.5	46.1	40.9	36.6	511	42.4	42.8	468	176	884	1,920	25.2	44.3	43.9	33.5	51.1	49.8	50.8	37.2	28.8
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	5.90 J	4.10 J	2.80 J	15.9	2.50 J	5.60 J	4.10 J	10.3	4.40 J	2.60 J	8.70 J	10.5	15.3	16.9	0.260 J	1.00 J	0.980 J	0.830 J	1.50 J	1.90 J	1.40 J	27.1	6.10 J
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	29.7	16.8	20.4	16.8	16.6	26.7	23.5	1,780	19	30.4	653	123	397	812	15.9	14.4	18.1	11.7	17.3	18.8	16.5	42.4	19.6
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	45,500	29,000	37,400	19,100	35,200	40,600	33,900	56,000	35,800	33,500	38,600	33,400	41,800	88,000	18,600	40,900	41,300	31,500	44,800	40,900	44,800	38,500	37,400
Lead	400 {++}	800 {++}	26.8	mg/kg	25.9	28	26.7	51.9	36.1	40.3	43.2	4,090	15.4	18.5	3,850	1,280	7,370	16,200	10.7	11.4	11.5	10.5	13.3	13.9	13.5	38.3	25.4
Magnesium	--	--	--	mg/kg	1,520	569 J	511 J	784 J	464 J	745 J	722 J	6,430	1,070	1,010	15,000	4,650	64,600	52,500	447 J	324 J	509 J	479 J	414 J	497 J	323 J	1,500	1,400
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	104	107	83.7	420	88.8	151	100	312	169	51.9	281	274	349	584	8.60	23.4	25.1	25.8	29.1	48.4	35.4	590	69.3
Mercury	3.1 {sat}	3.1 {sat}	0.13	mg/kg	0.400	ND	ND	0.110	ND	3.30	0.630	0.100	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	ND	ND
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	21.0	12.8	13.7	11.0	11.7	18.2	16.6	30.0	9.20	8.80	20.3	15.8	30.0	57.3	1.40 J	5.20 J	4.80 J	3.90 J	7.80 J	9.20	7.40 J	34.8	14.7
Potassium	--	--	--	mg/kg	1,100 J	521 J	633 J	394 J	561 J	613 J	484 J	697 J	586 J	640 J	1,410	607 J	4,610	2,100	173 J	239 J	306 J	240 J	477 J	440 J	413 J	921 J	642 J
Selenium	39 {nc}	510 {nc}	--	mg/kg	1.90	0.710 J	1.30	ND	1.30	0.570 J	1.00	1.20	1.40	1.20	0.850 J	0.870 J	ND	ND	0.570 J	1.40	1.20	0.760 J	1.90	1.20	1.60	1.20	0.750 J
Silver	39 {nc}	510 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	0.180 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	--	--	--	mg/kg	52.9 J	38.6 J	38.5 J	29.3 J	38.0 J	26.9 J	30.0 J	44.3 J	39.0 J	30.9 J	60.9 J	43.2 J	138 J	127 J	22.0 J	22.3 J	23.2 J	20.8 J	32.7 J	33.4 J	29.5 J	45.1 J	43.5 J
Thallium	0.51 {nc}	6.6 {nc}	2.11	mg/kg	ND	0.580 J	ND	0.460 J	ND	ND	0.410 J	ND	ND	ND	0.370 J	ND	ND	ND	ND	ND	ND	0.630 J	ND	ND	ND	ND	ND
Vanadium	55 {nc}	720 {nc}	108	mg/kg	98.4	64.6	87.3	46.0	82.3	86.5	70.6	66.9	74.8	71.4	39.9	52.6	24.6	23.4	42.5	80.8	84.4	61.5	95.3	76.6	91.8	65.8	ND
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	29.6	16.4	11.5	21.3	9.20	34.0	23.6	1,550	17.0	27.0	1,090	323	1,490	3,170	6.00	10.7	19.4	7.90	14.1	21.4	13.5	61.6	ND

Notes found at end of table.

Table B-1. Soil Analytical Results, Igniter Assembly Area, 1997 Dames and Moore Soil Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential	Adjusted Soil Screening Values-Industrial	Facility-Wide Background Values	Units	81027112 2 - 3 12/08/97	81027136 0 - 1 12/08/97	81027136 1 - 2 12/08/97	81027160 0 - 1 12/08/97	81027160 1 - 2 12/08/97	81027236 0 - 1 12/08/97	81027236 1 - 2 12/08/97	81027260 0 - 1 12/08/97	81027260 1 - 2 12/08/97	8102727 0 - 1 12/08/97	8102727 1 - 2 12/08/97	8102727 2 - 3 12/08/97
Organochlorine Pesticides																
4,4'-DDT	1.7 {ca*}	7 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	0.00042 JP
Endosulfan II	37 {nc}	370 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	0.0003 J
Endrin	1.8 {nc}	18 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	0.00042 JP
Methoxychlor	31	310	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	5 J	ND	ND	ND
PCBs																
Aroclor-1254	0.22 {ca**}	0.74 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	ND	0.0049 JP	ND	ND
Semivolatile Organics																
2,4-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	35 {ca*}	120 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	0.22 J	0.085 J	0.082 J	ND
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	4,900 {nc}	490,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinitrotoluene Mix	0.71 {ca}	2.5 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics																
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	23,800	20,000	35,100	18,500	46,900	18,000	31,500	35,400	38,600	16,100	37,600	33,200
Antimony	3.1 {nc}	41 {nc}	--	mg/kg	ND	ND	ND	ND	0.230 J	ND	ND	0.240 J	ND	ND	ND	ND
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	2.8	2.6	8.2	1.40 J	11.4	4	8.1	11.3	14.6	8.7	11.3	11.1
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	46.4 J	39.0 J	54.4	20.3 J	31.9 J	33.9 J	70	27.2 J	54.8	166	51.5	82.6
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	0.810 J	0.680 J	1.2	0.460 J	1.1	0.890 J	2.8	0.630 J	3.8	0.670 J	2.3	2.9
Cadmium	7 {nc}	81 {nc}	0.69	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	--	--	--	mg/kg	1,790	1,490	1,400	1,250	1,360	2,640	2,720	2,590	2,670	1,060	4,380	3,170
Chromium	280 {ca**}	1,400 {ca**}	65.3	mg/kg	31.9	26.5	40	24.8	44.4	26.8	52.5	41.5	56.7	25.2	48.5	47.1
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	5.90 J	4.80 J	21.1	3.00 J	5.90 J	26	17.5	9.30 J	11.9	12	47.6	18.7
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	207	175	34.5	15.2	34.6	35	29.9	51.5	36.8	274	38.3	61.6
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	38,600	32,200	41,600	29,300	45,300	28,900	37,300	41,100	47,000	21,100	40,800	30,900
Lead	400 {++}	800 {++}	26.8	mg/kg	24.3	20.4	49	12.4	30	26.8	24.2	20.8	25.8	475	40	30
Magnesium	--	--	--	mg/kg	1,600	1,340	1,400	921 J	1,530	2,190	14,600	1,240	3,940	1,910	8,420	22,900
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	56.5	47.1	410	34.1	84.1	188	442	99.4	178	221	341	408
Mercury	3.1 {sat}	3.1 {sat}	0.13	mg/kg	ND	ND	ND	ND	ND	ND	0.100	ND	0.150	ND	ND	ND
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	16.8	14.0	27.4	7.70 J	24.7	15.1	37.9	16.9	38.9	13.9	33.0	32.5
Potassium	--	--	--	mg/kg	734 J	620 J	1,080 J	621 J	1,450	778 J	3,940	855 J	1,830	718 J	2,430	4,620
Selenium	39 {nc}	510 {nc}	--	mg/kg	0.850 J	0.730 J	0.830 J	0.990 J	1.30	0.600 J	ND	1.60	1.40	0.660 J	0.860 J	0.590 J
Silver	39 {nc}	510 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	--	--	--	mg/kg	47.5 J	30.4 J	29.7 J	41.8 J	27.0 J	33.7 J	42.7 J	35.0 J	35.8 J	26.6 J	39.3 J	48.8 J
Thallium	0.51 {nc}	6.6 {nc}	2.11	mg/kg	ND	ND	0.660 J	ND	ND	ND	0.530 J	ND	0.550 J	ND	ND	0.520 J
Vanadium	55 {nc}	720 {nc}	108	mg/kg	ND	59.7	77.9	58.3	84.8	54.6	67.5	79.9	83.1	37.6	76.7	59.2
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	ND	43.3	56.3	22.6	43.3	30.4	35.7	36.3	35.9	293	43.8	86.2

mg/kg	Milligrams per kilogram.
[a]	USEPA Regional Screening Levels (USEPA 2008a).
[b]	Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.
{ca}	Carcinogen.
{nc}	Noncarcinogen.
*	Noncarcinogen screening level is less than one hundred times the carcinogen screening level.
**	Noncarcinogen screening level is less than ten times the carcinogen screening level.
{++}	The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.
{max}	Concentration may exceed ceiling limit.
{sat}	Screening level may exceed saturation concentration.
B (Inorganics)	Constituent concentration quantified as estimated.
B (Organics)	Constituent was detected in the associated method blank.
J	Constituent concentration quantified as estimated.
K	Estimated concentration bias high.
L	Estimated concentration bias low.
NA	Not Analyzed.
[3.3]	Bracketed concentration indicates laboratory analytical result for duplicate sample.
24,400	Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).
10.6 J	Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).
16	Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Table B-2. Soil Analytical Results (Hits Only), Igniter Assembly Area, 1998 Dames and Moore Soil Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values	Units	81027112012 0-1 2/19/1998	810271121224 1-2 2/19/1998	810271122436 2-3 2/18/1998	81027136012 0-1 2/18/1998	810271361224 1-2 2/18/1998	81027160012 0-1 2/18/1998	810271601224 1-2 2/18/1998
SVOCs (ug/kg)											
bis(2-Ethylhexyl)phthalate	35 {ca*}	120 {ca*}	- -	ug/kg	ND	ND	ND	ND	ND	ND	300 J
Organochlorine Pesticides											
4,4'-DDT	1.7 {ca*}	7 {ca*}	- -	mg/kg	3.2 J	ND	ND	0.66 J	0.49 J	0.62 J	1.3 J
Endosulfan II	37 {nc}	370 {nc}	- -	mg/kg	ND	ND	ND	ND	ND	ND	ND
Endrin	1.8 {nc}	18 {nc}	- -	mg/kg	1.8 J	0.24 J	1.3 J	ND	ND	ND	ND
Methoxychlor	31	310	- -	mg/kg	ND	ND	ND	ND	ND	ND	ND
PCBs (mg/kg)											
Aroclor-1254	0.22 {ca**}	0.74 {ca*}	- -	mg/kg	ND	ND	ND	ND	ND	ND	ND

mg/kg	Milligrams per kilogram.
[a]	USEPA Regional Screening Levels (USEPA 2008a).
[b]	Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.
µg/kg	Micrograms per kilogram.
{ca}	Carcinogen.
{nc}	Noncarcinogen.
*	Noncarcinogen screening level is less than one hundred times the carcinogen screening level.
J	Constituent concentration quantified as estimated.
ND	Not Detected.
24,400	Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).
10.6 J	Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).
16	Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Table B-3. Soil Analytical Results, Igniter Assembly Area, 1997 and 1998 Gannett Fleming Independent Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	SS-03 0 - 0.5 06/03/97	SS-11 0 - 0.5 06/03/97	SS-11a 0 - 0.2 03/30/98	SS-11b 0 - 0.2 03/30/98	SS-12 0 - 0.2 03/30/98	TR-01A 0 - 0.2 04/02/98	TR-01B 0 - 0.2 04/02/98	WS-03 Paint Chip 03/30/98
Organochlorine Pesticides												
4,4'-DDT	1.7 {ca*}	7 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	ND	ND	NA
Endrin	1.8 {nc}	18 {nc}	--	mg/kg	NA	NA	NA	NA	NA	0.02	ND	NA
Endrin Aldehyde	1.8 {nc}	18 {nc}	--	mg/kg	ND	NA	NA	NA	NA	ND	ND	NA
Methoxychlor	31 {nc}	310 {nc}	--	mg/kg	NA	NA	NA	NA	NA	ND	ND	NA
PCBs												
Aroclor-1260	0.22 {ca**}	0.74 {ca**}	--	mg/kg	0.37	1.0	NA	NA	NA	NA	NA	NA
Volatile Organics												
Acetone	6,100 {nc}	61,000 {nc}	--	mg/kg	ND	0.0090 B	NA	NA	NA	NA	NA	NA
Methylene Chloride	11 {ca}	54 {ca}	--	mg/kg	0.0020 B	0.0040 B	NA	NA	NA	NA	NA	NA
Naphthalene	3.9 {nc}	20 {nc}	--	mg/kg	ND	0.00090 B	NA	NA	NA	NA	NA	NA
Semivolatile Organics												
Acenaphthylene	340 {nc}	3,300 {nc}	--	mg/kg	NA	NA	NA	NA	NA	0.30 J	ND	NA
Anthracene	1,700 {nc}	170,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	1.0	ND	NA
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	0.11 J	0.070 J	NA	NA	NA	3.5	ND	NA
Benzo(a)pyrene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	ND	0.15 J	NA	NA	NA	5.2	0.040 J	NA
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	ND	0.20 J	NA	NA	NA	13	0.090 J	NA
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	ND	0.11 J	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	ND	0.15 J	NA	NA	NA	6.5	0.050 J	NA
Benzoic Acid	240,000 {max}	2,500,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	0.30 J	0.10 J	NA
bis(2-Ethylhexyl)phthalate	35 {ca*}	120 {ca*}	--	mg/kg	1.3 J	5.7	NA	NA	NA	0.40 J	0.20 J	NA
Butylbenzylphthalate	1,200 {nc}	120,000 {max}	--	mg/kg	ND	0.13 J	NA	NA	NA	NA	NA	NA
Carbazole	24 {ca**}	86 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	0.50 J	ND	NA
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	0.10 J	0.15 J	NA	NA	NA	7.7	0.060 J	NA
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	0.94	ND	NA
Diethylphthalate	4,900 {nc}	490,000 {max}	--	mg/kg	ND	0.070 J	NA	NA	NA	NA	NA	NA
Di-n-Butylphthalate	610 {nc}	6,200 {nc}	--	mg/kg	ND	0.070 J	NA	NA	NA	NA	NA	NA
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	0.30 J	0.20 J	NA	NA	NA	4.4	ND	NA
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	6.1	ND	NA
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	0.10 J	0.13 J	NA	NA	NA	0.30 J	ND	NA
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	0.30 J	0.20 J	NA	NA	NA	4.9	ND	NA

Notes found at end of table.

Table B-3. Soil Analytical Results, Igniter Assembly Area, 1997 and 1998 Gannett Fleming Independent Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	SS-03 0 - 0.5 06/03/97	SS-11 0 - 0.5 06/03/97	SS-11a 0 - 0.2 03/30/98	SS-11b 0 - 0.2 03/30/98	SS-12 0 - 0.2 03/30/98	TR-01A 0 - 0.2 04/02/98	TR-01B 0 - 0.2 04/02/98	WS-03 Paint Chip 03/30/98
Inorganics												
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	15,300	7,920	8,060	3,900	4,860	NA	NA	2,680
Antimony	3.1 {nc}	41 {nc}	--	mg/kg	ND	0.600	NA	NA	NA	NA	NA	NA
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	25.2	85.8	100	56.4	164	NA	NA	204
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	50.2 J	9,360 J	11,800	4,600	3,220	NA	NA	2,080
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	0.500	0.600	0.500	ND	ND	NA	NA	NA
Cadmium	7 {nc}	81 {nc}	0.69	mg/kg	2.30	7.80	5.50	3.20	6.80	NA	NA	2.80
Calcium	--	--	--	mg/kg	28,000	54,000	62,100	101,000	87,700	NA	NA	126,000
Chromium	280 {ca**}	1,400 {ca**}	65.3	mg/kg	54.4	86.8	79.4	79.1	99.2	NA	NA	69.3
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	23.8	76.9	66.5	42.1	85.6	NA	NA	57.8
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	24,600	38,000	43,900	53,400	56,500	NA	NA	54,200
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	35,800	28,700	28,600	27,500	35,100	NA	NA	30,600
Lead	400 {++}	800 {++}	26.8	mg/kg	207	1,040	918	336	563	NA	NA	308
Magnesium	--	--	--	mg/kg	28,800	46,000	52,500	82,200	71,500	NA	NA	100,000
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	225	498	465	300	281	NA	NA	201
Mercury	3.1 {sat}	3.1 {sat}	0.13	mg/kg	NA	NA	0.200	ND	ND	NA	NA	0.100
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	61.0	110	97.2	124	173	NA	NA	147
Potassium	--	--	--	mg/kg	673	664	733	837	814	NA	NA	778
Selenium	39 {nc}	510 {nc}	--	mg/kg	ND	1.20	NA	NA	NA	NA	NA	NA
Silver	39 {nc}	510 {nc}	--	mg/kg	3.60	9.40	11.0	13.0	22.5	NA	NA	15.9
Sodium	--	--	--	mg/kg	NA	NA	ND	ND	101	NA	NA	128
Thallium	0.51 {nc}	6.6 {nc}	2.11	mg/kg	1.00	1.00	0.500	0.300	0.700	NA	NA	0.400
Vanadium	55 {nc}	720 {nc}	108	mg/kg	53.0	60.0	23.8	10.8	16.3	NA	NA	NA
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	626	21,800	18,300	8,280	6,460	NA	NA	18,300
Asbestos												
Chrysotile	--	--	--	% ASB	NA	NA	NA	NA	2.1	NA	NA	NA

mg/kg Milligrams per kilogram

[a] USEPA Regional Screening Levels (USEPA 2008a).

[b] Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.

{ca} Carcinogen.

{nc} Noncarcinogen.

* Noncarcinogen screening level is less than one hundred times the carcinogen screening level.

** Noncarcinogen screening level is less than ten times the carcinogen screening level.

{++} The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.

{max} Concentration may exceed ceiling limit.

{sat} Screening level may exceed saturation concentration.

B (Inorganics) Constituent concentration quantified as estimated.

B (Organics) Constituent was detected in the associated method blank.

J Constituent concentration quantified as estimated.

NA Not Analyzed.

ND Not Detected above laboratory detection limit.

24,400 Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).

10.6 J Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).

16 Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Table B-4. Soil Analytical Results, Igniter Assembly Area, 1998 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

	Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]		Units	IASB1A 0.5 - 1 08/05/98	IASB1B 5 - 6 08/05/98	IASB2A 0 - 2 08/05/98	IASB2B 4 - 6 08/05/98	IASB2C 26 - 28 08/05/98	IASB3A 0.5 - 1 08/05/98	IASB3B 5 - 6 08/05/98	IASB4A 0.5 - 1.5 08/05/98	IASB4B 5 - 6 08/05/98	IASB5A 0.5 - 1 08/05/98	IASB5B 0.5 - 6 08/05/98	IATP1A 0.5 - 1 08/04/98	IATP1C 0.5 - 4.5 08/04/98	IATP1B 0.5 - 1 08/04/98	IATP1D 0.5 - 4.5 08/04/98	IATP2A 0.5 - 1 08/04/98	IATP2C 0.5 - 4.5 08/04/98	IATP2B 0.5 - 1 08/04/98	IATP2D 0.5 - 4.5 08/04/98
Explosives																									
1,3,5-Trinitrobenzene	220 {nc}	2,700 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2	<0.2	<0.3	<0.3	<0.2	<0.3	<0.2	<0.3	<0.3
1,3-Dinitrobenzene	0.61 {nc}	6.2 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2	<0.2	<0.3	<0.3	<0.2	<0.3	<0.2	<0.3	<0.3
2,4,6-Trinitrotoluene	3.6 {ca**}	42 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2	<0.2	<0.3	<0.3	<0.2	<0.3	<0.2	<0.3	<0.3
2,4-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2	<0.2	<0.3	<0.3	<0.2	<0.3	<0.2	<0.3	<0.3
2,6-Dinitrotoluene	6.1 {nc}	62 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2	<0.2	<0.3	<0.3	<0.2	<0.3	<0.2	<0.3	<0.3
2-Amino-4,6-Dinitrotoluene	15 {nc}	190 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2	<0.2	<0.3	<0.3	<0.2	<0.3	<0.2	<0.3	<0.3
4-Amino-2,6-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2	<0.2	<0.3	<0.3	<0.2	<0.3	<0.2	<0.3	<0.3
Dinitrotoluene Mix	0.71 {ca}	2.5 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2	<0.2	<0.3	<0.3	<0.2	<0.3	<0.2	<0.3	<0.3
HMX	310 {nc}	3,100 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<2.4	<2	<3	<3	<2.4	<2.5	<2.4	<2.5	<2.5
m-Nitrotoluene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2	<0.2	<0.3	<0.3	<0.2	<0.3	<0.2	<0.3	<0.3
Nitrobenzene	3.1 {nc}	28 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2	<0.2	<0.3	<0.3	<0.2	<0.3	<0.2	<0.3	<0.3
Nitroglycerine	0.61 {nc}	6.2 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.2	<1.2	<1.3	<1.3	<1.2	<1.3	<1.2	<1.3	<1.3
o-Nitrotoluene	78 {nc}	1,300 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2	<0.2	<0.3	<0.3	<0.2	<0.3	<0.2	<0.3	<0.3
Pentaerythritol Tetranitrate	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.2	<1.2	<1.3	<1.3	<1.2	<1.3	<1.2	<1.3	<1.3
p-Nitrotoluene	30 {ca**}	110 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2	<0.2	<0.3	<0.3	<0.2	<0.3	<0.2	<0.3	<0.3
RDX	4.4 {ca*}	16 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2	<0.2	<0.3	<0.3	<0.2	<0.3	<0.2	<0.3	<0.3
Tetryl	24 {nc}	250 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2	<0.2	<0.3	<0.3	<0.2	<0.3	<0.2	<0.3	<0.3
Semivolatile Organics																									
1,2,4-Trichlorobenzene	180 {ca**}	220 {sat}	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 {<0.38}	<0.49	<0.42	<0.49	<0.38	NA	NA	<0.37	NA	<0.39	NA	<0.38	NA	NA
1,2-Dichlorobenzene	220 {sat}	220 {sat}	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 {<0.38}	<0.49	<0.42	<0.49	<0.38	NA	NA	<0.37	NA	<0.39	NA	<0.38	NA	NA
1,2-Diphenylhydrazine	0.61 {ca**}	2.2 {ca**}	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 {<0.38}	<0.49	<0.42	<0.49	<0.38	NA	NA	<0.37	NA	<0.39	NA	<0.38	NA	NA
1,3-Dichlorobenzene	--	--	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 {<0.38}	<0.49	<0.42	<0.49	<0.38	NA	NA	<0.37	NA	<0.39	NA	<0.38	NA	NA
1,4-Dichlorobenzene	2.6 {ca}	13 {ca}	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 {<0.38}	<0.49	<0.42	<0.49	<0.38	NA	NA	<0.37	NA	<0.39	NA	<0.38	NA	NA
2,4,5-Trichlorophenol	610 {nc}	6,200 {nc}	--	mg/kg	<0.91	<0.98	<0.98	<1.0	<1.0	<1.1	<1.1	<1.1 {<0.91}	<1.2	<1.0	<1.2	<0.93	NA	NA	<0.89	NA	<0.94	NA	<0.91	NA	NA
2,4,6-Trichlorophenol	44 {ca**}	160 {ca**}	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 {<0.38}	<0.49	<0.42	<0.49	<0.38	NA	NA	<0.37	NA	<0.39	NA	<0.38	NA	NA
2,4-Dichlorophenol	18 {nc}	180 {nc}	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 {<0.38}	<0.49	<0.42	<0.49	<0.38	NA	NA	<0.37	NA	<0.39	NA	<0.38	NA	NA
2,4-Dimethylphenol	120 {nc}	1,200 {nc}	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 {<0.38}	<0.49	<0.42	<0.49	<0.38	NA	NA	<0.37	NA	<0.39	NA	<0.38	NA	NA
2,4-Dinitrophenol	12 {nc}	120 {nc}	--	mg/kg	<1.9	<2.0	<2.0	<2.1	<2.1	<2.3	<2.3	<2.2 {<1.9}	<2.4	<2.1	<2.4	<1.9	NA	NA	<1.8	NA	<1.9	NA	<1.9	NA	NA
2,4-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43	<0.49	<0.42	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	6.1 {nc}	62 {nc}	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43	<0.49	<0.42	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	210 {sat}	210 {sat}	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 {<0.38}	<0.49	<0.42	<0.49	<0.38	NA	NA	<0.37	NA	<0.39	NA	<0.38	NA	NA
2-Chlorophenol	39 {nc}	510 {nc}	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 {<0.38}	<0.49	<0.42	<0.49	<0.38	NA	NA	<0.37	NA	<0.39	NA	<0.38	NA	NA
2-Methylnaphthalene	31 {nc}	440 {sat}	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 {<0.38}	<0.49	<0.42	<0.49	<0.38	NA	NA	<0.37	NA	<0.39	NA	<0.38	NA	NA
2-Methylphenol	310 {nc}	3,100 {nc}	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 {<0.38}	<0.49	<0.42	<0.49	<0.38	NA	NA	<0.37	NA	<0.39	NA	<0.38	NA	NA
2-Nitroaniline	--	--	--	mg/kg	<1.9	<2.0	<2.0	<2.1	<2.1	<2.3	<2.3	<2.2 {<1.9}	<2.4	<2.1	<2.4	<1.9	NA	NA	<1.8	NA	<1.9	NA	<1.9	NA	NA
2-Nitrophenol	--	--	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 {<0.38}	<0.49	<0.42	<0.49	<0.38	NA	NA	<0.37	NA	<0.39	NA			

Table B-4. Soil Analytical Results, Igniter Assembly Area, 1998 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	IASB1A 0.5 - 1 08/05/98	IASB1B 5 - 6 08/05/98	IASB2A 0 - 2 08/05/98	IASB2B 4 - 6 08/05/98	IASB2C 26 - 28 08/05/98	IASB3A 0.5 - 1 08/05/98	IASB3B 5 - 6 08/05/98	IASB4A 0.5 - 1.5 08/05/98	IASB4B 5 - 6 08/05/98	IASB5A 0.5 - 1 08/05/98	IASB5B 0.5 - 6 08/05/98	IATP1A 0.5 - 1 08/04/98	IATP1C 0.5 - 4.5 08/04/98	IATP1B 0.5 - 1 08/04/98	IATP1D 0.5 - 4.5 08/04/98	IATP2A 0.5 - 1 08/04/98	IATP2C 0.5 - 4.5 08/04/98	IATP2B 0.5 - 1 08/04/98	IATP2D 0.5 - 4.5 08/04/98
Semivolatile Organics																							
Di-n-Butylphthalate	610 {nc}	6,200 {nc}	--	mg/kg	<0.38	0.11 J	<0.40	0.090 J	<0.41	<0.46	<0.46	<0.43 [<0.38]	<0.49	<0.42	<0.49	<0.38	NA	<0.37	NA	<0.39	NA	<0.38	NA
Dinitrotoluene Mix	0.71 {ca}	2.5 {ca}	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43	<0.49	<0.42	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-Octylphthalate	--	--	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 [<0.38]	<0.49	<0.42 J	<0.49	<0.38	NA	<0.37	NA	0.040 J	NA	<0.38 J	NA
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	<0.38	0.080 J	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 [<0.38]	<0.49	<0.42	<0.49	0.16 J	NA	<0.37	NA	<0.39	NA	<0.38	NA
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 [<0.38]	<0.49	<0.42	<0.49	<0.38	NA	<0.37	NA	<0.39	NA	<0.38	NA
Hexachlorobenzene	0.3 {ca}	1.1 {ca}	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 [<0.38]	<0.49	<0.42	<0.49	<0.38	NA	<0.37	NA	<0.39	NA	<0.38	NA
Hexachlorobutadiene	6.2 {ca**}	22 {ca*}	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 [<0.38]	<0.49	<0.42	<0.49	<0.38	NA	<0.37	NA	<0.39	NA	<0.38	NA
Hexachlorocyclopentadiene	37 {nc}	370 {nc}	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 [<0.38]	<0.49	<0.42	<0.49	<0.38	NA	<0.37	NA	<0.39	NA	<0.38	NA
Hexachloroethane	35 {ca**}	120 {ca**}	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 [<0.38]	<0.49	<0.42	<0.49	<0.38	NA	<0.37	NA	<0.39	NA	<0.38	NA
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 [<0.38]	<0.49	<0.42 J	<0.49	<0.38	NA	<0.37	NA	<0.39 J	NA	<0.38 J	NA
Isophorone	510 {ca*}	1,800 {ca*}	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 [<0.38]	<0.49	<0.42	<0.49	<0.38	NA	<0.37	NA	<0.39	NA	<0.38	NA
Naphthalene	3.9 {ca}	20 {ca}	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 [<0.38]	<0.49	<0.42	<0.49	<0.38	NA	<0.37	NA	<0.39	NA	<0.38	NA
Nitrobenzene	3.1 {nc}	28 {nc}	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43	<0.49	<0.42	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	0.069 {ca**}	0.25 {ca**}	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 [<0.38]	<0.49	<0.42	<0.49	<0.38	NA	<0.37	NA	<0.39	NA	<0.38	NA
N-Nitrosodiphenylamine	99 {ca**}	350 {ca**}	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 [<0.38]	<0.49	<0.42	<0.49	<0.38	NA	<0.37	NA	<0.39	NA	<0.38	NA
Pentachlorophenol	3 {ca}	9 {ca}	--	mg/kg	<1.9	<2.0	<2.0	<2.1	<2.1	<2.3	<2.3	<2.2 [<1.9]	<2.4	<2.1	<2.4	<1.9	NA	<1.8	NA	<1.9	NA	<1.9	NA
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	<0.38	0.060 J	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 [<0.38]	<0.49	<0.42	<0.49	0.070 J	NA	<0.37	NA	<0.39	NA	<0.38	NA
Phenol	1,800 {nc}	180,000 {max}	--	mg/kg	<0.38	<0.40	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 [<0.38]	<0.49	<0.42	<0.49	<0.38	NA	<0.37	NA	<0.39	NA	<0.38	NA
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	<0.38	0.050 J	<0.40	<0.42	<0.41	<0.46	<0.46	<0.43 [<0.38]	<0.49	<0.42	<0.49	0.15 J	NA	<0.37	NA	<0.39	NA	<0.38	NA
Inorganics																							
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	11,100	11,500	12,900	11,500	9,930	29,200	17,900	15,600 [14,200]	15,700	10,000	16,900	7,680	9,160	5,670	9,690	13,900	13,500	9,870	16,700
Antimony	3.1 {nc}	41 {nc}	--	mg/kg	<0.550	<0.610	<0.590	<0.640	<0.600	<0.680	<0.700	<0.640 [<0.550]	<0.710	<0.620	<0.710	<0.560	<0.580	<0.550	<0.600	<0.580	<0.650	<0.560	<0.720
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	6.10	4.30	6.40	7.60	3.60	7.80	3.90	6.60 [5.50]	7.80	2.00	11.9	4.30 K	3.30	1.80 K	4.00	28.8 K	5.90	8.40 K	10.1
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	32.2 K	48.2 K	29.2 K	39.6 K	9.50 B	35.5 K	18.0 B	75.5 K [55.1]	51.4 K	38.7 K	20.3 B	527 K	22.5 B	50.7 K	24.2 B	1,170 K	38.5	270 K	41.7
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	<0.110	<0.120	<0.120	<0.130	<0.120	0.360 J	0.280 J	2.30 [0.410 J]	4.30	0.450 J	0.990	<0.110	<0.120	<0.110	<0.120	0.580 J	2.10	0.520 J	1.70
Cadmium	7 {nc}	81 {nc}	0.69	mg/kg	<0.110 L	<0.120 L	<0.120 L	<0.130 L	<0.120 L	<0.140 L	<0.140 L	2.00 L [<0.110]	<0.140 L	<0.120 L	<0.140	0.250 J	<0.120	<0.110	<0.120	1.00	<0.130	0.140 J	<0.140
Calcium	--	--	--	mg/kg	762 B	89.6 B	702 B	230 B	220 B	943 B	462 B	866 B [715 B]	2,080 B	777 B	1,200	1,680	759 B	1,230	508 B	25,100	2,220 B	4,730 B	4,160 B
Chromium	280 {ca**}	1,400 {ca**}	65.3	mg/kg	54.2	28.6	40.5	40.9	24.0	48.5	35.2	35.5 [22.9]	59.8	22.0	42.1	21.8	15.9	15.6	17.3	36.8	42.2	23.7	36.0
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	1.40 J	0.750 J	1.10 J	1.30 J	2.10 J	4.40 J	3.20 J	39.4 [7.30]	18.3	7.30	59.1	4.20 K	0.950 J	2.10 K	1.10 J	17.6 K	25.6	11.8 K	12.3
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	72.4	28.9	19.2	25.4	6.10 B	29.0	12.1 B	265 [27.2]	20.3	83.6	18.3 B	1,280 K	9.10 B	38.9 K	24.5	7,070	21.1	1,440	23.3
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	40,600	19,600	42,700	36,700	25,600	52,600	31,200	31,200 [35,600]	36,300	23,100	44,500	16,700	17,600	12,600	19,300	32,300	33,200	24,300	30,900
Lead	400 {++}	800 {++}	26.8	mg/kg	14.1	10.9	8.50	8.30	11.5	21.8	16.4	46.5 [28.0]	23.8	19.2	30.9	41.7 L	7.00	11.8 L	6.40	190	24.4	75.2	22.7
Magnesium	--	--	--	mg/kg	523 B	128 B	317 B	153 B	120 B	677 B	261 B	2,370 B [989 B]	1,940 B	1,240 B	813 B	2,370	438 B	739	296 B	18,900	2,660	3,680	9,380
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	44.4	24.1	33.4	27.9	46.4	78.7	60.0	144 [134]	557	49.8	254	57.7 K	38.8	114 K	22.4	308	270	234	269
Mercury	3.1 {sat}	3.1 {sat}	0.13	mg/kg	0.270 K	<0.120	<0.120	<0.130	<0.120	<0.140	<0.150	<0.130 [<0.110]	<0.150	<0.130	<0.130	0.500	<0.120	0.120	<0.120	0.660 K	0.170	0.150 K	0.200
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	1.50 K	0.880 K	<0.120	1.20 K	3.20 K	10.3 K	7.50 K	17.5 K [7.80]	48.7 K	8.40 K	14.5	5.70 K	0.470 B	1.10 K	0.830 B	33.5 K	21.7	13.3 K	19.3
Potassium	--	--	--	mg/kg	304 B	176 B	218 B	199 B	184 B	352 B	276 B	694 B [390 B]	840 K	324 B	561 B	243 K	274 B	197 K	180 B	821 K	1,120 J	418 B	5,570 J
Selenium	39 {nc}	510 {nc}	--	mg/kg	<0.550 J	<0.610 J	<0.590 J	0.660 J	<0.600 J	<0.680 J	0.720 J	<0.640 J [<0.550]	<0.710 J	<0.620 J	<0.710	<0.560	0.580	<0.550	<0.600	<0.580	<0.650	<0.560	<0.720
Silver	39 {nc}	510 {nc}	--	mg/kg	<0.220	<0.250	<0.240	0.270 B	<0.240	<0.270	<0.280	<0.260 [<0.220]	<0.280	<0.250	<0.290	0.630 L	<0.230	<0.220 L	<0.240	1.90 B	<0.260	0.300 B	<0.290
Sodium	--	--	--	mg/kg	47.6 B	41.8 B	35.8 B	36.2 B	44.3 B	57.6 B	37.8 B	48.1 B [90.0 B]	48.5 B	36.5 B	96.0 B	35.8 B	69.4 B	35.1 B	93.2 B	84.7 B	134 B	48.8 B	1,350 B
Thallium	0.51 {nc}	6.6 {nc}	2.11	mg/kg	<0.220	<0.250	<0.240	0.550 B	<0.240	0.560 B	<0.280	0.630 B [0.370 B]	<0.280	<0.250	<0.290	<0.220 L	0.540 B	<0.220 L	0.790 B	0.990 B	<0.260	<0.220 L	<0.290
Vanadium	55 {nc}	720 {nc}	108	mg/kg	69.0 L	63.1	70.0 L	56.0 L	43.0 L	89.8 L	54.5 L	57.1 L [58.1]	58.0 L	40.9 L	64.2	33.1 K	33.1	25.0 K	34.9	43.3 K	49.2	38.7 K	47.2
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	50.5 B	26.8 B	16.7 B	24.7 B	11.3 B	41.1 B	26.6 B	101 B [30.5 B]	34.8 B	82.4 B	33.5 B	467	8.20 B	30.8	13.5 B	1,090	21.4 B	312	33.8 B

mg/kg	Milligrams per kilogram.
[a]	USEPA Regional Screening Levels (USEPA 2008a).
[b]	Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.
{ca}	Carcinogen.
{nc}	Noncarcinogen.
*	Noncarcinogen screening level is less than one hundred times the carcinogen screening level.
**	Noncarcinogen screening level is less than ten times the carcinogen screening level.
{++}	The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.
{max}	Concentration may exceed ceiling limit.
{sat}	Screening level may exceed saturation concentration.
B (Inorganics)	Constituent concentration quantified as estimated.
B (Organics)	Constituent was detected in the associated method blank.
J	Constituent concentration quantified as estimated.
K	Estimated concentration bias high.
L	Estimated concentration bias low.
NA	Not Analyzed.
[3.3]	Bracketed concentration indicates laboratory analytical result for duplicate sample.
24,400	Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).
10.6 J	Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).
16	Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Table B-5. Summary of Analytical Results for Conductive Flooring Samples Collected in 1998 and 1999, Igniter Assembly Area, Gannett Fleming Independent Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	WS-03 03/30/98	IACF2 07/20/98	CF-1 06/24/99
Dioxin/Furan							
1,2,3,4,6,7,8-HpCDD	0.00039 {ca**}	0.0016 {ca**}	--	mg/kg	NA	NA	0.00000593
1,2,3,4,6,7,8-HpCDF	0.00032 {ca**}	0.0011 {ca**}	--	mg/kg	NA	NA	0.00000019
1,2,3,4,7,8,9-HpCDF	0.00032 {ca**}	0.0011 {ca**}	--	mg/kg	NA	NA	<0.00000009
1,2,3,4,7,8-HxCDD	0.000039 {ca**}	0.00016 {ca**}	--	mg/kg	NA	NA	<0.00000012
1,2,3,4,7,8-HxCDF	0.000032 {ca**}	0.00011 {ca**}	--	mg/kg	NA	NA	<0.000000492
1,2,3,6,7,8-HxCDD	0.000039 {ca**}	0.00016 {ca**}	--	mg/kg	NA	NA	<0.00000012
1,2,3,6,7,8-HxCDF	0.000032 {ca**}	0.00011 {ca**}	--	mg/kg	NA	NA	<0.00000005
1,2,3,7,8,9-HxCDD	0.000039 {ca**}	0.00016 {ca**}	--	mg/kg	NA	NA	<0.00000011
1,2,3,7,8,9-HxCDF	0.000032 {ca**}	0.00011 {ca**}	--	mg/kg	NA	NA	<0.00000006
1,2,3,7,8-PeCDD	0.0000039 {ca**}	0.000016 {ca**}	--	mg/kg	NA	NA	<0.00000007
1,2,3,7,8-PeCDF	0.000011 {ca**}	0.00038 {ca**}	--	mg/kg	NA	NA	<0.000000492
2,3,4,6,7,8-HxCDF	0.000032 {ca**}	0.00011 {ca**}	--	mg/kg	NA	NA	<0.00000005
2,3,4,7,8-PeCDF	0.000011 {ca**}	0.00038 {ca**}	--	mg/kg	NA	NA	<0.000000492
2,3,7,8-TCDD	0.000045 {ca*}	0.00018 {ca*}	--	mg/kg	NA	NA	0.0000052 K
2,3,7,8-TCDF	0.000032 {ca**}	0.00011 {ca**}	--	mg/kg	NA	NA	<0.000000492
OCDD	0.013 {ca**}	0.053 {ca**}	--	mg/kg	NA	NA	0.000766
OCDF	0.011 {ca**}	0.038 {ca**}	--	mg/kg	NA	NA	0.00000083
Total HpCDDs	--	--	--	mg/kg	NA	NA	0.0000105
Total HpCDFs	--	--	--	mg/kg	NA	NA	0.0000003
Total HxCDDs	--	--	--	mg/kg	NA	NA	<0.00000011
Total HxCDFs	--	--	--	mg/kg	NA	NA	<0.00000005
Total PeCDDs	--	--	--	mg/kg	NA	NA	<0.00000007
Total PeCDFs	--	--	--	mg/kg	NA	NA	<0.00000005
Total TCDDs	--	--	--	mg/kg	NA	NA	<0.00000005
Total TCDFs	--	--	--	mg/kg	NA	NA	<0.00000005
Semivolatile Organics							
1,2,4-Trichlorobenzene	180 {ca**}	220 {sat}	--	mg/kg	NA	<0.34	<0.0096
1,2-Dichlorobenzene	220 {sat}	220 {sat}	--	mg/kg	NA	<0.34	<0.020
1,2-Diphenylhydrazine	0.61 {ca**}	2.2 {ca**}	--	mg/kg	NA	<0.34	NA
1,3-Dichlorobenzene	--	--	--	mg/kg	NA	<0.34	<0.0056
1,4-Dichlorobenzene	2.6 {ca}	13 {ca}	--	mg/kg	NA	<0.34	<0.010
2,4,5-Trichlorophenol	610 {nc}	6,200 {nc}	--	mg/kg	NA	<0.82	<0.090
2,4,6-Trichlorophenol	44 {ca**}	160 {ca**}	--	mg/kg	NA	<0.34	<0.040
2,4-Dichlorophenol	18 {nc}	180 {nc}	--	mg/kg	NA	<0.34	<0.090
2,4-Dimethylphenol	120 {nc}	1,200 {nc}	--	mg/kg	NA	<0.34	<0.030
2,4-Dinitrophenol	12 {nc}	120 {nc}	--	mg/kg	NA	<1.7	<0.18
2,4-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	NA	<0.34	<0.010
2,6-Dinitrotoluene	6.1 {nc}	62 {nc}	--	mg/kg	NA	<0.34	<0.010
2-Chloronaphthalene	210 {sat}	210 {sat}	--	mg/kg	NA	<0.34	<0.0063
2-Chlorophenol	39 {nc}	510 {nc}	--	mg/kg	NA	<0.34	<0.040
2-Methylnaphthalene	31 {nc}	440 {sat}	--	mg/kg	NA	<0.34	<0.060
2-Methylphenol	310 {nc}	3,100 {nc}	--	mg/kg	NA	<0.34	<0.070
2-Nitroaniline	--	--	--	mg/kg	NA	<1.7	<0.13
2-Nitrophenol	--	--	--	mg/kg	NA	<0.34	<0.12
3,3'-Dichlorobenzidine	1.1 {ca**}	3.8 {ca**}	--	mg/kg	NA	<0.67	<0.15
3-Nitroaniline	--	--	--	mg/kg	NA	<1.7	<0.14
4,6-Dinitro-2-methylphenol	--	--	--	mg/kg	NA	<1.7	<0.23
4-Bromophenyl-phenylether	--	--	--	mg/kg	NA	<0.34	<0.020
4-Chloro-3-Methylphenol	--	--	--	mg/kg	NA	<0.67	<0.070
4-Chloroaniline	24 {nc}	250 {nc}	--	mg/kg	NA	<0.67	<0.070
4-Chlorophenyl-phenylether	--	--	--	mg/kg	NA	<0.34	<0.010
4-Methylphenol	31 {nc}	310 {nc}	--	mg/kg	NA	<0.34	<0.070
4-Nitroaniline	--	--	--	mg/kg	NA	<1.7	<0.20
4-Nitrophenol	--	--	--	mg/kg	NA	<1.7	<0.030
Acenaphthene	340 {nc}	3,300 {nc}	--	mg/kg	NA	<0.34	<0.0067
Acenaphthylene	340 {nc}	3,300 {nc}	--	mg/kg	NA	<0.34	<0.0082
Anthracene	1,700 {nc}	170,000 {max}	--	mg/kg	NA	<0.34	<0.020
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	<0.34	<0.010
Benzo(a)pyrene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	NA	<0.34	<0.010
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	<0.34	<0.11
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	NA	<0.34	<0.0093 J
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	NA	<0.34	<0.11
Benzoic Acid	240,000 {max}	2,500,000 {max}	--	mg/kg	NA	<1.7	NA
Benzyl Alcohol	3,100 {nc}	310,000 {max}	--	mg/kg	NA	<0.67	NA
bis(2-Chloroethoxy)methane	18 {nc}	180 {nc}	--	mg/kg	NA	<0.34	<0.020
bis(2-Chloroethyl)ether	0.19 {ca**}	0.9 {ca**}	--	mg/kg	NA	<0.34	<0.010 J
bis(2-Chloroisopropyl)ether	--	--	--	mg/kg	NA	<0.34	<0.010 J
bis(2-Ethylhexyl)phthalate	35 {ca*}	120 {ca*}	--	mg/kg	NA	<0.34	<0.060
Butylbenzylphthalate	1,200 {nc}	120,000 {max}	--	mg/kg	NA	<0.34	<0.010
Carbazole	24 {ca**}	86 {ca**}	--	mg/kg	NA	<0.34	<0.050 J
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	NA	<0.34	<0.020
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	NA	<0.34	<0.050 J
Dibenzofuran	--	--	--	mg/kg	NA	<0.34	<0.050
Diethylphthalate	4,900 {nc}	490,000 {max}	--	mg/kg	NA	<0.34	<0.0093
Dimethylphthalate	--	--	--	mg/kg	NA	<0.34	<0.010
Di-n-Butylphthalate	610 {nc}	6,200 {nc}	--	mg/kg	NA	<0.34	<0.020
Dinitrotoluene Mix	0.71 {ca}	2.5 {ca}	--	mg/kg	NA	<0.34	<0.010
Di-n-Octylphthalate	--	--	--	mg/kg	NA	<0.34	<0.010
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	NA	<0.34	<0.010
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	NA	<0.34	<0.0070
Hexachlorobenzene	0.3 {ca}	1.1 {ca}	--	mg/kg	NA	<0.34	<0.010
Hexachlorobutadiene	6.2 {ca**}	22 {ca*}	--	mg/kg	NA	<0.34	<0.010
Hexachlorocyclopentadiene	37 {nc}	370 {nc}	--	mg/kg	NA	<0.34	<0.010
Hexachloroethane	35 {ca**}	120 {ca**}	--	mg/kg	NA	<0.34	<0.010
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	<0.34	<0.020 J

Notes found at end of table.

Table B-5. Summary of Analytical Results for Conductive Flooring Samples Collected in 1998 and 1999, Igniter Assembly Area, Gannett Fleming Independent Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	WS-03 03/30/98	IACF2 07/20/98	CF-1 06/24/99
Semivolatile Organics							
Isophorone	510 {ca*}	1,800 {ca*}	--	mg/kg	NA	<0.34	<0.010
Naphthalene	3.9 {ca}	20 {ca}	--	mg/kg	NA	<0.34	<0.0067
Nitrobenzene	3.1 {nc}	28 {nc}	--	mg/kg	NA	<0.34	<0.0070
N-Nitroso-di-n-propylamine	0.069 {ca**}	0.25 {ca**}	--	mg/kg	NA	<0.34	<0.010 J
N-Nitrosodiphenylamine	99 {ca**}	350 {ca**}	--	mg/kg	NA	<0.34	<0.010
Pentachlorophenol	3 {ca}	9 {ca}	--	mg/kg	NA	<1.7	<0.12
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	NA	<0.34	<0.010
Phenol	1,800 {nc}	180,000 {max}	--	mg/kg	NA	<0.34	<0.010
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	NA	<0.34	<0.010
Inorganics							
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	2,680	NA	12,600
Antimony	3.1 {nc}	41 {nc}	--	mg/kg	NA	NA	<0.560
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	204	NA	9.50 K
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	2,080	NA	190
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	NA	NA	1.20 B
Cadmium	7 {nc}	81 {nc}	0.69	mg/kg	2.80	NA	<0.110
Calcium	--	--	--	mg/kg	126,000	NA	1,210
Chromium	280 {ca**}	1,400 {ca**}	65.3	mg/kg	69.3	NA	21.4
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	57.8	NA	23.4
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	54,200	NA	32.5 K
Cyanide	160 {nc}	2,000 {nc}	--	mg/kg	NA	NA	<0.220
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	30,600	NA	35,200
Lead	400 {++}	800 {++}	26.8	mg/kg	308	NA	14.7
Magnesium	--	--	--	mg/kg	100,000	NA	2,570
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	201	NA	913
Mercury	3.1 {sat}	3.1 {sat}	0.13	mg/kg	0.100	NA	<0.110
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	147	NA	27.0
Potassium	--	--	--	mg/kg	778	NA	1,210 J
Selenium	39 {nc}	510 {nc}	--	mg/kg	NA	NA	<0.450
Silver	39 {nc}	510 {nc}	--	mg/kg	15.9	NA	<0.110
Sodium	--	--	--	mg/kg	128	NA	109 B
Thallium	0.51 {nc}	6.6 {nc}	2.11	mg/kg	0.400	NA	<0.790
Vanadium	55 {nc}	720 {nc}	108	mg/kg	NA	NA	26.7
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	18,300	NA	80.3
Asbestos							
Chrysotile	--	--	--	% ASB	NA	NA	NA
Miscellaneous							
pH	--	--	--	pH Units	NA	NA	5.05
Inorganics-TCLP							
TCLP Standard							
Arsenic	5,000	--	--	µg/L	NA	<7	NA
Barium	10,000	--	--	µg/L	NA	302	NA
Cadmium	1,000	--	--	µg/L	NA	86.5	NA
Chromium	5,000	--	--	µg/L	NA	1.7	NA
Lead	5,000	--	--	µg/L	NA	3.5	NA
Mercury	200	--	--	µg/L	NA	<0.2	NA
Selenium	1,000	--	--	µg/L	NA	5.7	NA
Silver	5,000	--	--	µg/L	NA	<2	NA

mg/kg	Milligrams per kilogram.
µg/L	Micrograms per liter.
[a]	USEPA Regional Screening Levels (USEPA 2008a).
[b]	Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.
{ca}	Carcinogen.
{nc}	Noncarcinogen.
*	Noncarcinogen screening level is less than one hundred times the carcinogen screening level.
**	Noncarcinogen screening level is less than ten times the carcinogen screening level.
{++}	The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.
{max}	Concentration may exceed ceiling limit.
{sat}	Screening level may exceed saturation concentration.
B (Inorganics)	Constituent concentration quantified as estimated.
B (Organics)	Constituent was detected in the associated method blank.
J	Constituent concentration quantified as estimated.
K	Estimated concentration bias high.
L	Estimated concentration bias low.
NA	Not Analyzed.
[3.3]	Bracketed concentration indicates laboratory analytical result for duplicate sample.
24,400	Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).
10.6 J	Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).
16	Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Table B-6. Conductive Flooring Analytical Results, Igniter Assembly Area, 2002 US Army Corp of Engineers Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	RFAAP-502 Flooring	RFAAP-504 Flooring	RFAAP-509 Flooring	RFAAP-522 Flooring	RFAAP-529 Flooring	RFAAP-8102-2 Flooring	RFAAP-8102-7A Flooring	RFAAP-8102-7B Flooring	RFAAP-8102A Flooring	RFAAP-XXXX Flooring	RFAAP-1 Flooring	RFAAP-562 Flooring	RFAAP-565 Flooring	RFAAP-571 Flooring
Inorganics																		
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	2,010	2,840	15,700	1,100	1,360	2,690	1,400	1,290	1,240	2,130	1,950	1,940	1,030	1,170
Antimony	3.1 {nc}	41 {nc}	--	mg/kg	<5.1	<9.1	<4.7	<5.9	<3.8	<19	<5.4	<6.2	<5.8	<3.9	<3.7	<18.9	<4.2	<17.9
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	5	62.9	14	7.7	5.6	135	66	75.9	70.2	184	141	52.7	6.6	32.2
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	2,850	6,380	42.1	1,740	69.2	519	398	218	97.6	202	232	13,400	92.9	11,100
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	0.25	ND	0.54	0.33	0.28	0.22	0.31	0.3	0.29	0.34	0.24	ND	0.73	ND
Cadmium	7 {nc}	81 {nc}	0.69	mg/kg	3.7	13.8	3.5	5.8	4.2	2.6	2.6	2.8	2.7	4.6	2.6	11.9	9.9	8.6
Calcium	--	--	--	mg/kg	96,800	79,000	63,000	92,900	84,600	74,200	101,000	101,000	95,700	95,400	79,700	63,800	87,300	45,800
Chromium	23 {nc}	1,460 {ca**}	65.3	mg/kg	88.3	957	95.6	86.8	81.8	67.6	87.9	96.9	88	105	69.9	26.5	81.6	5.5
Cobalt	--	--	72.3	mg/kg	9.3	36.1	11.5	9.1	9.1	66	42.7	46.2	39	87.9	72.1	7.1	11.1	15900
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	70,900	53,700	67,000	73,000	97,100	40,800	79,600	87,500	102,000	96,500	55,400	87,900	66,800	103,000
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	29,000	334,000	39,500	33,700	30,800	27,300	37,700	42,100	37,800	42,000	29,700	21,900	31,300	86.5
Lead	400 {++}	800 {++}	26.8	mg/kg	1,090	7,260	205	412	168	246	147	160	145	349	254	31.3	ND	ND
Magnesium	--	--	--	mg/kg	113,000	101,000	62,100	144,000	140,000	146,000	125,000	114,000	143,000	141,000	125,000	170,000	133,000	60.3
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	147	1600	247	179	151	174	226	231	217	235	182	94.5	142	513
Mercury	3.1 {sat}	3.1 {sat}	0.13	mg/kg	ND	0.02	0.03	ND	ND	1.1	0.11	0.13	0.08	0.26	0.21	ND	ND	ND
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	156	377	149	181	170	695	191	202	185	182	127	97.4	154	ND
Potassium	--	--	--	mg/kg	601	654	551	313	520	ND	581	521	585	941	596	ND	248	ND
Selenium	39 {nc}	510 {nc}	--	mg/kg	ND	ND	ND	ND	ND	15.2	ND	ND	ND	1.4	1	ND	ND	ND
Silver	39 {nc}	510 {nc}	--	mg/kg	2	ND	1.7	3.2	2.6	353	20.7	22.4	22.2	23.8	20.2	ND	4.8	ND
Sodium	--	--	--	mg/kg	406	ND	299	380	250	ND	389	345	395	330	327	ND	267	ND
Thallium	0.51 {nc}	6.6 {nc}	2.11	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	39 {nc}	520 {nc}	108	mg/kg	3.7	84.5	38	3.6	3.6	7.7	6.2	6.4	6	8	7	7.1	3.4	4.3
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	2230	5640	451	1360	395	1910	1070	888	1050	1120	654	111	293	141
Semivolatile Organics																		
1,2,4-Trichlorobenzene	180 {ca**}	220 {sat}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
1,2-Dichlorobenzene	220 {sat}	220 {sat}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
1,3-Dichlorobenzene	--	--	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
1,4-Dichlorobenzene	2.6 {ca}	13 {ca}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
2,2-Oxybis(1-Chloropropane)			--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
2,4,5-Trichlorophenol	610 {nc}	6,200 {nc}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
2,4,6-Trichlorophenol	44 {ca**}	160 {ca**}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
2,4-Dichlorophenol	18 {nc}	180 {nc}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
2,4-Dimethylphenol	120 {nc}	1,200 {nc}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
2,4-Dinitrophenol	12 {nc}	120 {nc}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
2,4-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
2,6-Dinitrotoluene	6.1 {nc}	62 {nc}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
2-Chloronaphthalene	210 {sat}	210 {sat}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
2-Chlorophenol	39 {nc}	510 {nc}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
2-Methylnaphthalene	31 {nc}	440 {sat}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
2-Methylphenol	310 {nc}	3,100 {nc}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
2-Nitroaniline	--	--	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
2-Nitrophenol	--	--	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
3,3'-Dichlorobenzidine	1.1 {ca**}	3.8 {ca**}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
3-Nitroaniline	--	--	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	--	--	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
4-Bromophenyl-phenylether	--	--	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
4-Chloro-3-Methylphenol	--	--	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
4-Chloroaniline	24 {nc}	250 {nc}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
4-Chlorophenyl-phenylether	--	--	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
4-Methylphenol	31 {nc}	310 {nc}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
4-Nitroaniline	--	--	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
4-Nitrophenol	--	--	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Acenaphthene	340 {nc}	3,300 {nc}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Acenaphthylene	340 {nc}	3,300 {nc}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Anthracene	1,700 {nc}	170,000 {max}	--	mg/kg	ND	ND	0.14	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	ND	ND	1.3	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Benzo(a)pyrene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	ND	ND	1.1	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	ND	ND	1.8	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	ND	ND	0.70	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	ND	ND	0.46	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Benzyl Butyl Phthalate			--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	18 {nc}	180 {nc}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
bis(2-Chloroethyl)ether	0.19 {ca**}	0.9 {ca**}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	35 {ca*}	120 {ca*}	--	mg/kg	0.13	0.20	0.34	0.24	0.14	0.046	0.078	0.037	0.031	0.47	NA	NA	NA	NA
Carbazole	24 {ca**}	86 {ca**}	--	mg/kg	ND	ND	0.11	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA

Notes found at end of table.

Table B-6. Conductive Flooring Analytical Results, Igniter Assembly Area, 2002 US Army Corp of Engineers Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	RFAAP-502 Flooring	RFAAP-504 Flooring	RFAAP-509 Flooring	RFAAP-522 Flooring	RFAAP-529 Flooring	RFAAP-8102-2 Flooring	RFAAP-8102-7A Flooring	RFAAP-8102-7B Flooring	RFAAP-8102A Flooring	RFAAP-XXXX Flooring	RFAAP-1 Flooring	RFAAP-562 Flooring	RFAAP-565 Flooring	RFAAP-571 Flooring
Semivolatile Organics																		
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	ND	ND	1.3	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Dibenzofuran	--	--	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Diethylphthalate	4,900 {nc}	490,000 {max}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Dimethylphthalate	--	--	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Di-n-Butylphthalate	610 {nc}	6,200 {nc}	--	mg/kg	140	ND	ND	ND	ND	0.071	ND	ND	ND	ND	NA	NA	NA	NA
Di-n-Octylphthalate	--	--	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.073	NA	NA	NA	NA
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	ND	ND	2.8	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Hexachlorobenzene	0.3 {ca}	1.1 {ca}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Hexachlorobutadiene	6.2 {ca**}	22 {ca*}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Hexachlorocyclopentadiene	37 {nc}	370 {nc}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Hexachloroethane	35 {ca**}	120 {ca**}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	ND	ND	0.54	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Isophorone	510 {ca*}	1,800 {ca**}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Naphthalene	3.9 {ca}	20 {ca}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Nitrobenzene	3.1 {nc}	28 {nc}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	0.069 {ca**}	0.25 {ca**}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
N-Nitrosodiphenylamine	99 {ca**}	350 {ca**}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Pentachlorophenol	3 {ca}	9 {ca}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	ND	ND	0.60	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Phenol	1,800 {nc}	180,000 {max}	--	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	ND	ND	2.1	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA
PCBs																		
PCB-1016	3,900 {nc}	21,000 {ca**}	--	µg/kg	< 7.9	< 7.2	< 8	< 19	< 16	< 3.6	< 3.8	< 4.1	< 4.2	< 3.9	< 3.1	< 3.2	< 3.5	< 3.5
PCB-1221	170 {ca**}	620 {ca**}	--	µg/kg	< 28	< 25	< 28	< 67	< 58	< 13	< 13	< 14	< 15	< 14	< 11	< 11	< 12	< 12
PCB-1232	170 {ca**}	620 {ca**}	--	µg/kg	33	< 42	< 46	< 110	< 94	< 21	< 22	< 24	< 24	< 22	< 18	< 18	< 20	< 20
PCB-1242	220 {ca**}	740 {ca**}	--	µg/kg	< 58	< 53	< 58	< 140	< 120	< 26	< 28	< 30	< 31	< 28	< 23	< 23	< 25	< 26
PCB-1248	220 {ca**}	740 {ca**}	--	µg/kg	< 21	< 19	< 21	< 50	< 43	< 9.5	< 10	< 11	< 11	< 10	< 8.3	< 8.5	< 9.2	< 9.3
PCB-1254	220 {ca**}	740 {ca*}	--	µg/kg	630	740	910	1600	1300	< 5.5	< 5.8	< 6.3	< 6.5	260	< 4.8	< 4.9	120	< 5.4
PCB-1260	220 {ca**}	740 {ca**}	--	µg/kg	< 12	< 11	< 12	< 28	< 24	< 5.2	< 5.5	< 6	< 6.2	< 5.7	< 4.6	< 4.7	< 5.1	< 5.1
VOCs																		
1,1,1-Trichloroethane	680,000 {sat}	680,000 {sat}	--	µg/kg	< 2.7	< 2.5	< 2.8	< 2.6	< 2.3	< 2.5	< 2.6	< 2.8	< 2.9	< 2.7	< 2.2	< 2.2	< 2.4	< 2.4
1,1,2,2-Tetrachloroethane	590 {ca**}	2,900 {ca**}	--	µg/kg	< 3	< 2.8	< 3.1	< 2.9	< 2.5	< 2.8	< 2.9	< 3.1	< 3.2	< 3	< 2.4	< 2.5	< 2.7	< 2.7
1,1,2-Trichloroethane	1,100 {ca}	5,500 {ca}	--	µg/kg	< 2.9	< 2.6	< 2.9	< 2.8	< 2.4	< 2.6	< 2.8	< 3	< 3.1	< 2.9	< 2.3	< 2.3	< 2.5	< 2.6
1,1-Dichloroethane	3,400 {ca}	1,700 {ca}	--	µg/kg	< 2.7	< 2.5	< 2.8	< 2.6	< 2.3	< 2.5	< 2.6	< 2.8	< 2.9	< 2.7	< 2.2	< 2.2	< 2.4	< 2.4
1,1-Dichloroethene	25,000 {nc}	110,000 {nc}	--	µg/kg	< 2.1	< 1.9	< 2.2	< 2	< 1.8	< 1.9	< 2	< 2.2	< 2.3	< 2.1	< 1.7	< 1.7	< 1.9	< 1.9
1,2-Dichloroethane	450 {ca}	220 {ca}	--	µg/kg	< 2.4	< 2.2	< 2.5	< 2.3	< 2	< 2.2	< 2.3	< 2.5	< 2.6	< 2.4	< 1.9	< 2	< 2.1	< 2.2
1,2-Dichloropropane	930 {ca*}	470 {ca*}	--	µg/kg	< 2.7	< 2.5	< 2.8	< 2.6	< 2.3	< 2.5	< 2.6	< 2.8	< 2.9	< 2.7	< 2.2	< 2.2	< 2.4	< 2.4
2-Butanone	28,000,000 {sat}	28,000,000 {sat}	--	µg/kg	< 5.8	< 5.3	< 5.8	< 5.5	< 4.8	< 5.2	< 5.5	< 6	< 6.2	< 5.7	< 4.6	< 4.7	< 5.1	< 5.1
2-Hexanone	--	--	--	µg/kg	< 3.6	< 3.3	< 3.7	< 3.5	< 3	< 3.3	< 3.5	< 3.8	< 3.9	< 3.6	< 2.9	< 3	< 3.2	< 3.3
4-Methyl-2-Pentanone	3,200 {sat}	3,200 {sat}	--	µg/kg	< 3.6	< 3.3	< 3.7	< 3.5	< 3	< 3.3	< 3.5	< 3.8	< 3.9	< 3.6	< 2.9	< 3	< 3.2	< 3.3
Acetone	6,100 {nc}	110,000 {sat}	--	µg/kg	3.2	< 2.4	< 2.6	< 2.5	2.2	< 2.3	< 2.5	< 2.7	4.9	2.9	< 2.1	3.9	3.9	2.9
Benzene	1,100 {ca*}	5,600 {ca*}	--	µg/kg	< 2.7	< 2.5	< 2.8	< 2.6	< 2.3	< 2.5	< 2.6	< 2.8	< 2.9	< 2.7	< 2.2	< 2.2	< 2.4	< 2.4
Bromodichloromethane	10,000 {ca}	46,000 {ca}	--	µg/kg	< 2.6	< 2.4	< 2.6	< 2.5	< 2.1	< 2.3	< 2.5	< 2.7	< 2.8	< 2.6	< 2.1	< 2.1	< 2.3	< 2.3
Bromoform	61,000 {ca*}	220,000 {ca*}	--	µg/kg	< 2.1	< 1.9	< 2.2	< 2	< 1.8	< 1.9	< 2	< 2.2	< 2.3	< 2.1	< 1.7	< 1.7	< 1.9	< 1.9
Bromomethane	790 {nc}	3,500 {nc}	--	µg/kg	< 2.7	< 2.5	< 2.8	< 2.6	< 2.3	< 2.5	< 2.6	< 2.8	< 2.9	< 2.7	< 2.2	< 2.2	< 2.4	< 2.4
Carbon Disulfide	260,000 {sat}	260,000 {sat}	--	µg/kg	< 2.1	< 1.9	< 2.2	< 2	< 1.8	< 1.9	< 2	< 2.2	< 2.3	< 2.1	< 1.7	< 1.7	< 1.9	< 1.9
Carbon Tetrachloride	250 {ca}	1,300{ca}	--	µg/kg	< 2.9	< 2.6	< 2.9	< 2.8	< 2.4	< 2.6	< 2.8	< 3	< 3.1	< 2.9	< 2.3	< 2.3	< 2.5	< 2.6
Chlorobenzene	31,000 {nc}	860,000 {sat}	--	µg/kg	< 2.7	< 2.5	< 2.8	< 2.6	< 2.3	< 2.5	< 2.6	< 2.8	< 2.9	< 2.7	< 2.2	< 2.2	< 2.4	< 2.4
Chloroethane	2,200 {sat}	2,200 {sat}	--	µg/kg	< 3	< 2.8	< 3.1	< 2.9	< 2.5	< 2.8	< 2.9	< 3.1	< 3.2	< 3	< 2.4	< 2.5	< 2.7	< 2.7
Chloroform	300 {ca}	1,500 {ca}	--	µg/kg	< 2.9	< 2.6	< 2.9	< 2.8	< 2.4	< 2.6	< 2.8	< 3	< 3.1	< 2.9	< 2.3	< 2.3	< 2.5	< 2.6
Chloromethane	1,700 {ca*}	8,400 {ca*}	--	µg/kg	< 2.9	< 2.6	< 2.9	< 2.8	< 2.4	< 2.6	< 2.8	< 3	< 3.1	< 2.9	< 2.3	< 2.3	< 2.5	< 2.6
cis-12-Dichloroethene	7,800 {nc}	1,400,000 {sat}	--	µg/kg	< 2.7	< 2.5	< 2.8	< 2.6	< 2.3	< 2.5	< 2.6	< 2.8	< 2.9	< 2.7	< 2.2	< 2.2	< 2.4	< 2.4
cis-13-Dichloropropene	--	--	--	µg/kg	< 1.8	< 1.7	< 1.8	< 1.8	< 1.5	< 1.7	< 1.8	< 1.9	< 2	< 1.8	< 1.5	< 1.5	< 1.6	< 1.6
Dibromochloromethane	5,800 {ca}	2,100 {ca}	--	µg/kg	< 2.3	< 2.1	< 2.3	< 2.2	< 1.9	< 2.1	< 2.2	< 2.4	< 2.4	< 2.3	< 1.8	< 1.8	< 2	< 2
Ethylbenzene	5,700 {ca}	29,000 {ca}	--	µg/kg	< 2.9	< 2.6	< 2.9	< 2.8	< 2.4	< 2.6	< 2.8	< 3	< 3.1	< 2.9	< 2.3	< 2.3	< 2.5	< 2.6
Methylene Chloride	11,000 {ca}	54,000 {ca}	--	µg/kg	10	8.1	14	15	13	8.2	7.3	9	16	16	7	8.5	9.8	10
mp-Xylenes	--	--	--	µg/kg	< 5.3	< 4.8	< 5.4	< 5.1	< 4.4	< 4.8	< 5.1	< 5.5	< 5.7	< 5.3	< 4.2	< 4.3	< 4.7	< 4.7
o-Xylene	300,000 {sat}	300,000 {sat}	--	µg/kg	< 2.4	< 2.2	< 2.5	< 2.3	< 2	< 2.2	< 2.3	< 2.5	< 2.6	< 2.4	< 1.9	< 2	< 2.1	< 2.2
Styrene	1,000,000 {sat}	1,000,000 {sat}	--	µg/kg	< 2.6	< 2.4	< 2.6	< 2.5	< 2.1	< 2.3	< 2.5	< 2.7	< 2.8	< 2.6	< 2.1	< 2.1	< 2.3	< 2.3
Tetrachloroethene	570 {ca}	2,700 {ca}	--	µg/kg	< 2.7	< 2.5	< 2.8	< 2.6	< 2.3	< 2.5	< 2.6	< 2.8	< 2.9	< 2.7	< 2.2	< 2.2	< 2.4	< 2.4
Toluene	930 {sat}	930 {sat}	--	µg/kg	< 2.4	< 2.2	< 2.5	< 2.3	< 2	< 2.2	< 2.3	< 2.5	< 2.6	< 2.4	< 1.9	< 2	< 2.1	< 2.2
trans-1,2-dichloroethene	11 {nc}	50 {nc}	--	µg/kg	< 2.1	< 1.9	< 2.2	< 2	< 1.8	< 1.9	< 2	< 2.2	< 2.3	< 2.1	< 1.7	< 1.7	< 1.9	< 1.9
trans-1,3-dichloropropene	--	--	--	µg/kg	< 1.8	< 1.7	< 1.8	< 1.8	< 1.5	< 1.7	< 1.8	< 1.9	< 2	< 1.8	< 1.5	< 1.5	< 1.6	< 1.6
Trichloroethene	2.8 {ca}	14 {ca}	--	µg/kg	< 1.7	< 1.6	< 1.8	< 1.7	< 1.4	< 1.6	< 1.7	< 1.8	< 1.9	< 1.7	< 1.4	< 1.4	< 1.5	< 1.5
Vinyl Chloride	0.06 {ca}	1.7 {ca}	--	µg/kg	< 3	< 2.8	< 3.1	< 2.9	< 2.5	< 2.8	< 2.9	< 3.1	< 3.2	< 3	< 2.4	< 2.5	< 2.7	< 2.7

Notes found at end of table.

Table B-6. Conductive Flooring Analytical Results, Igniter Assembly Area, 2002 US Army Corp of Engineers Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	RFAAP-502 Flooring	RFAAP-504 Flooring	RFAAP-509 Flooring	RFAAP-522 Flooring	RFAAP-529 Flooring	RFAAP-8102-2 Flooring	RFAAP-8102-7A Flooring	RFAAP-8102-7B Flooring	RFAAP-8102A Flooring	RFAAP-XXXX Flooring	RFAAP-1 Flooring	RFAAP-562 Flooring	RFAAP-565 Flooring	RFAAP-571 Flooring
Pesticides																		
4,4-DDD	2,000 {ca**}	7,200 {ca**}	--	µg/kg	< 0.56	< 1.3	< 0.56	< 1.3	< 1.2	< 0.25	< 0.27	< 0.29	< 0.3	< 0.27	< 0.22	< 0.23	< 0.24	< 0.25
4,4-DDE	1,400 {ca**}	5,100 {ca**}	--	µg/kg	< 0.48	< 1.1	46	< 1.2	< 1	< 0.22	< 0.23	< 0.25	< 0.26	8.4	< 0.19	< 0.2	< 0.21	< 0.22
4,4-DDT	1,700 {ca*}	7,000 {ca*}	--	µg/kg	99	140	62	180	110	< 0.28	9.4	< 0.32	1.2	33	< 0.25	< 0.25	16	< 0.28
Aldrin	29 {ca*}	100 {ca}	--	µg/kg	< 0.71	< 1.6	< 0.72	< 1.7	< 1.5	< 0.32	< 0.34	< 0.37	< 0.38	< 0.35	< 0.28	< 0.29	< 0.31	< 0.32
Alpha-BHC	77 {ca**}	270{ca**}	--	µg/kg	< 0.56	< 1.3	< 0.56	< 1.3	< 1.2	< 0.25	< 0.27	< 0.29	< 0.3	< 0.27	< 0.22	< 0.23	< 0.24	< 0.25
Alpha-Chlordane	--	--	--	µg/kg	< 3.2	< 7.3	< 3.3	< 7.7	< 6.6	< 1.5	< 1.5	< 1.7	< 1.7	< 1.6	< 1.3	< 1.3	< 1.4	< 1.4
Beta-BHC	270 {ca**}	960 {ca**}	--	µg/kg	< 0.48	< 1.1	< 0.49	< 1.2	< 1	< 0.22	< 0.23	< 0.25	< 0.26	< 0.24	< 0.19	< 0.2	< 0.21	< 0.22
Chlordane			--	µg/kg	< 3.2	< 7.3	< 3.3	< 7.7	< 6.6	< 1.5	< 1.5	< 1.7	< 1.7	< 1.6	< 1.3	< 1.3	< 1.4	< 1.4
Delta-BHC	--	--	--	µg/kg	< 0.17	< 0.17	< 0.17	< 0.17	< 0.17	< 0.17	< 0.17	< 0.17	< 0.17	< 0.17	< 0.17	< 0.17	< 0.17	< 0.17
Dieldrin	30 {ca}	110 {ca}	--	µg/kg	30	34	30	64	66	< 0.35	< 0.37	< 0.4	< 0.41	10	< 0.31	< 0.31	4.1	< 0.34
Endosulfan I	--	--	--	µg/kg	< 0.68	< 1.6	< 0.69	< 1.6	< 1.4	< 0.31	< 0.33	< 0.35	< 0.36	< 0.33	< 0.27	< 0.27	< 0.3	< 0.3
Endosulfan II	37,000 {nc}	370,000 {nc}	--	µg/kg	< 0.48	< 1.1	< 0.49	< 1.2	< 1	< 0.22	< 0.23	< 0.25	< 0.26	< 0.24	< 0.19	< 0.2	< 0.21	< 0.22
Endosulfan Sulfate	--	--	--	µg/kg	< 0.42	< 0.97	< 0.43	< 1	< 0.88	< 0.19	< 0.2	< 0.22	< 0.23	< 0.21	< 0.17	< 0.17	< 0.19	< 0.19
Endrin	180 {nc}	18,000 {nc}	--	µg/kg	10	17	5.6	25	16	< 0.21	2.1	< 0.24	< 0.24	3.8	< 0.18	< 0.18	2.1	< 0.2
Endrin Aldehyde	180 {nc}	18,000 {nc}	--	µg/kg	< 0.59	< 1.3	< 0.59	< 1.4	< 1.2	< 0.27	< 0.28	< 0.3	< 0.31	< 0.29	< 0.23	< 0.24	< 0.26	< 0.26
Endrin Ketone	--	--	--	µg/kg	< 0.36	< 0.83	< 0.37	< 0.87	< 0.75	< 0.17	< 0.17	< 0.19	< 0.19	< 0.18	< 0.14	< 0.15	< 0.16	< 0.16
Gamma-BHC (Lindane)	520 {ca*}	2,100 {ca}	--	µg/kg	< 1	< 2.4	< 1.1	< 2.5	< 2.2	0.77	< 0.5	< 0.54	< 0.56	< 0.51	< 0.41	< 0.42	< 0.46	< 0.46
Gamma-Chlordane	--	--	--	µg/kg	< 0.68	< 1.6	< 0.69	< 1.6	< 1.4	< 0.31	< 0.33	< 0.35	< 0.36	< 0.33	< 0.27	< 0.27	< 0.3	0.63
Heptachlor	110 {ca}	380 {ca}	--	µg/kg	< 0.77	< 1.8	< 0.78	< 1.8	< 1.6	< 0.35	< 0.37	< 0.4	< 0.41	< 0.38	< 0.31	< 0.31	< 0.34	< 0.34
Heptachlor Epoxide	53 {ca*}	190 {ca*}	--	µg/kg	< 2.2	< 5.1	< 2.3	< 5.3	< 4.6	< 1	< 1.1	< 1.2	< 1.2	< 1.1	< 0.88	< 0.9	< 0.98	< 0.99
Methoxychlor	31,000 {nc}	310,000 {nc}	--	µg/kg	< 0.71	< 1.6	< 0.72	< 1.7	< 1.5	< 0.32	< 0.34	< 0.37	< 0.38	< 0.35	< 0.28	< 0.29	< 0.31	< 0.32
Toxaphene	440 {ca**}	1,600 {ca**}	--	µg/kg	< 39	< 90	< 40	< 95	< 81	< 18	< 19	< 20	< 21	< 19	< 16	< 16	< 17	< 18
Explosives																		
1,3,5-Trinitrobenzene	180,000 {nc}	1,800,000 {nc}	--	µg/kg	< 3	< 2.8	< 3.1	< 2.9	< 2.5	< 2.8	< 2.9	< 3.1	< 3.2	< 3	< 2.4	< 2.5	< 2.7	< 2.7
1,3-Dinitrobenzene	610 {nc}	6,200 {nc}	--	µg/kg	< 3	< 2.8	< 3.1	< 2.9	< 2.5	< 2.8	< 2.9	< 3.1	< 3.2	< 3	< 2.4	< 2.5	< 2.7	< 2.7
2,4,6-Trinitrotoluene	16,000 {ca**}	57,000 {ca**}	--	µg/kg	< 3	< 2.8	< 3.1	< 2.9	< 2.5	< 2.8	< 2.9	< 3.1	< 3.2	< 3	< 2.4	< 2.5	< 2.7	< 2.7
2,4-Dinitrotoluene	12,000 {nc}	120,000 {nc}	--	µg/kg	< 3	< 2.8	< 3.1	< 2.9	< 2.5	< 2.8	< 2.9	< 3.1	< 3.2	< 3	< 2.4	< 2.5	< 2.7	< 2.7
2,6-Dinitrotoluene	6,100 {nc}	62,000 {nc}	--	µg/kg	< 3	< 2.8	< 3.1	< 2.9	< 2.5	< 2.8	< 2.9	< 3.1	< 3.2	< 3	< 2.4	< 2.5	< 2.7	< 2.7
2-Amino-4,6-Dinitrotoluene	12,000 {nc}	120,000 {nc}	--	µg/kg	< 3	< 2.8	< 3.1	< 2.9	< 2.5	< 2.8	< 2.9	< 3.1	< 3.2	< 3	< 2.4	< 2.5	< 2.7	< 2.7
4-Amino-2,6-Dinitrotoluene	12,000 {nc}	120,000 {nc}	--	µg/kg	< 3	< 2.8	< 3.1	< 2.9	< 2.5	< 2.8	< 2.9	< 3.1	< 3.2	< 3	< 2.4	< 2.5	< 2.7	< 2.7
HMX	310,000 {nc}	3,100,000 {nc}	--	µg/kg	< 12	< 11	< 12	< 12	< 10	< 11	< 12	< 13	< 13	< 12	< 9.6	< 9.8	< 11	< 11
m-Nitrotoluene	--	--	--	µg/kg	< 1.5	< 1.4	< 1.5	< 1.5	< 1.3	< 1.4	< 1.5	< 1.6	< 1.6	< 1.5	< 1.2	< 1.2	< 1.3	< 1.4
Nitrobenzene	3,100 {nc}	28,000 {nc}	--	µg/kg	< 1.5	< 1.4	< 1.5	< 1.5	< 1.3	< 1.4	< 1.5	< 1.6	< 1.6	< 1.5	< 1.2	< 1.2	< 1.3	< 1.4
Nitroglycerine	610 {nc}	6,200 {nc}	--	µg/kg	< 3	< 2.8	< 3.1	< 2.9	< 2.5	< 2.8	< 2.9	< 3.1	< 3.2	< 3	< 2.4	< 2.5	< 2.7	< 2.7
o-Nitrotoluene	78,000 {nc}	1,300,000 {sat}	--	µg/kg	< 1.5	< 1.4	< 1.5	< 1.5	< 1.3	< 1.4	< 1.5	< 1.6	< 1.6	< 1.5	< 1.2	< 1.2	< 1.3	< 1.4
Pentaerythritol Tetranitrate	--	--	--	µg/kg	< 12	< 11	< 12	< 12	< 10	< 11	< 12	< 13	< 13	< 12	< 9.6	< 9.8	< 11	< 11
p-Nitrotoluene	30,000 {ca**}	110,000 {ca*}	--	µg/kg	< 1.5	< 1.4	< 1.5	< 1.5	< 1.3	< 1.4	< 1.5	< 1.6	< 1.6	< 1.5	< 1.2	< 1.2	< 1.3	< 1.4
RDX	4,400 {ca*}	16,000 {ca}	--	µg/kg	< 6.1	< 5.5	< 6.1	< 5.8	< 5	< 5.5	< 5.8	< 6.3	< 6.5	< 6	< 4.8	< 4.9	< 5.3	< 5.4
Tetryl	24,000 {nc}	250,000 {nc}	--	µg/kg	< 12	< 11	< 12	< 12	< 10	< 11	< 12	< 13	< 13	< 12	< 9.6	< 9.8	< 11	< 11
Asbestos																		
Total Asbestos (%)	--	--	--	%	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Chrysotile (%)	--	--	--	%	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Organic (%)	--	--	--	%	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Particulate (%)	--	--	--	%	93	93	93	93	93	93	93	93	93	93	93	93	93	93
TCLP VOCs	TCLP Standard																	
1,1-Dichloroethene	700	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 14	NA	NA	NA	NA	NA
1,2-Dichloroethane	500	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 16	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	7,500	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 4.1	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	7,500	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 18	NA	NA	NA	NA	NA
2,4,5-TP (Silvex)	10,000	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 0.07	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	400,000	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 12	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	2,000	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 9	NA	NA	NA	NA	NA
2,4-D	10,000	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 0.09	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	130	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 6	NA	NA	NA	NA	NA
2-Butanone	-	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 38	NA	NA	NA	NA	NA
2-methylphenol	200,000	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 10	NA	NA	NA	NA	NA
3 & 4-Methylphenol	200,000	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 11	NA	NA	NA	NA	NA
Benzene	500	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 18	NA	NA	NA	NA	NA
Carbon Tetrachloride	500	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 19	NA	NA	NA	NA	NA
Chlordane	30	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA	NA
Chlorobenzene	100,000	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 18	NA	NA	NA	NA	NA
Chloroform	6,000	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 19	NA	NA	NA	NA	NA
Endrin	20	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA	NA
Flash Point	-	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA	NA
Gamma-BHC (Lindane)	400	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA	NA
Heptachlor	8	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA	NA
Heptachlor Epoxide	8	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA	NA
Hexachlorobenzene	130	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 9	NA	NA	NA	NA	NA
Hexachlorobutadiene	500	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 6	NA	NA	NA	NA	NA
Hexachloroethane	3,000	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 6.5	NA	NA	NA	NA	NA
Methoxychlor	10,000	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA	NA
Nitrobenzene	2,000	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 4.3	NA	NA	NA	NA	NA
Pentachlorophenol	100,000	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA							

Notes found at end of table.

Table B-6. Conductive Flooring Analytical Results, Igniter Assembly Area, 2002 US Army Corp of Engineers Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	RFAAP-502 Flooring	RFAAP-504 Flooring	RFAAP-509 Flooring	RFAAP-522 Flooring	RFAAP-529 Flooring	RFAAP-8102-2 Flooring	RFAAP-8102-7A Flooring	RFAAP-8102-7B Flooring	RFAAP-8102A Flooring	RFAAP-XXXX Flooring	RFAAP-1 Flooring	RFAAP-562 Flooring	RFAAP-565 Flooring	RFAAP-571 Flooring
TCLP Metals	TCLP Standard																	
Arsenic	5,000	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 20	NA	NA	NA	NA	NA
Barium	10,000	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 100	NA	NA	NA	NA	NA
Cadmium	1,000	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 3	NA	NA	NA	NA	NA
Chromium	5,000	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 5	NA	NA	NA	NA	NA
Lead	5,000	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 10	NA	NA	NA	NA	NA
Mercury	200	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 1	NA	NA	NA	NA	NA
Selenium	1,000	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 20	NA	NA	NA	NA	NA
Silver	5,000	-	-	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	< 3	NA	NA	NA	NA	NA

mg/kg	Milligrams per kilogram.
µg/kg	Micrograms per kilogram.
µg/L	Micrograms per liter.
[a]	USEPA Regional Screening Levels (USEPA 2008a).
[b]	Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.
{ca}	Carcinogen.
{nc}	Noncarcinogen.
*	Noncarcinogen screening level is less than one hundred times the carcinogen screening level.
**	Noncarcinogen screening level is less than ten times the carcinogen screening level.
{++}	The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.
{max}	Concentration may exceed ceiling limit.
{sat}	Screening level may exceed saturation concentration.
B (Inorganics)	Constituent concentration quantified as estimated.
B (Organics)	Constituent was detected in the associated method blank.
J	Constituent concentration quantified as estimated.
K	Estimated concentration bias high.
L	Estimated concentration bias low.
NA	Not Analyzed.
ND	Not Detected.
[3.3]	Bracketed concentration indicates laboratory analytical result for duplicate sample.
24,400	Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).
10.6 J	Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).
16	Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Table B-7. Soil Analytical Results, Igniter Assembly Area, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]		Units	IASB06 0 - 0.5 06/10/02	IASB06 4 - 6 06/18/02	IASB06 8 - 10 06/18/02	IASB07 0 - 0.5 06/10/02	IASB07 4 - 6 06/18/02	IASB08 0 - 0.5 06/10/02	IASB08 4 - 6 06/18/02	IASB09 0 - 0.5 06/10/02	IASB09 4 - 6 06/18/02	IASB10 0 - 0.5 06/10/02	IASB10 2 - 4 06/18/02	IASB11 0 - 0.5 06/10/02	IASB11 2 - 4 06/18/02	IASB12 0 - 0.5 06/10/02	IASB12 4 - 6 06/18/02	IASB12 8 - 10 06/18/02	IASB13 0 - 0.5 06/11/02	IASB13 1 - 2 06/18/02	IASB13 2 - 4 06/18/02	IASB14 0 - 0.5 06/11/02
Explosives																									
1,3,5-Trinitrobenzene	180 (nc)	1,800 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	0.61 (nc)	6.2 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	16 (ca**)	57 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	6.1 (nc)	62 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Amino-4,6-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Amino-2,6-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinitrotoluene Mix	0.71 (ca)	2.5 (ca)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HMX	310 (nc)	3,100 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m-Nitrotoluene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	3.1 (nc)	28 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitroglycerine	0.61 (nc)	6.2 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Nitrotoluene	78 (nc)	1,300 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentaerythritol Tetranitrate	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Nitrotoluene	30 (ca**)	110 (ca*)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX	4.4 (ca*)	16 (ca)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetryl	24 (nc)	250 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Herbicides																									
2,4,5-T	61 (nc)	620 (nc)	--	mg/kg	<0.113	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-TP	49 (nc)	490 (nc)	--	mg/kg	<0.113	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-D	69 (nc)	770 (nc)	--	mg/kg	<0.226	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-DB	49 (nc)	490 (nc)	--	mg/kg	<1.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dalapon	180 (nc)	1,800 (nc)	--	mg/kg	<1.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dicamba	180 (nc)	1,800 (nc)	--	mg/kg	<0.226	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorprop	--	--	--	mg/kg	<0.226	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinoseb	6.1 (nc)	62 (nc)	--	mg/kg	<0.226	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MCPA	3.1 (nc)	31 (nc)	--	mg/kg	<113	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MCPP	6.1 (nc)	62 (nc)	--	mg/kg	<11.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organochlorine Pesticides																									
4,4'-DDD	2 (ca**)	7.2 (ca**)	--	mg/kg	<0.00755	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	1.4 (ca**)	5.1 (ca**)	--	mg/kg	<0.00755	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	1.7 (ca*)	7 (ca*)	--	mg/kg	<0.00755	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	0.029 (ca*)	0.1 (ca)	--	mg/kg	<0.00755	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alpha-BHC	0.077 (ca**)	0.27 (ca**)	--	mg/kg	<0.00755	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alpha-Chlordane	--	--	--	mg/kg	<0.00755	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beta-BHC	0.27 (ca**)	0.96 (ca**)	--	mg/kg	<0.00755	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Delta-BHC	--	--	--	mg/kg	<0.00755	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	0.03 (ca)	0.11 (ca)	--	mg/kg	<0.00755	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	--	--	--	mg/kg	<0.00755	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	37 (nc)	370 (nc)	--	mg/kg	<0.00755	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan Sulfate	--	--	--	mg/kg	<0.00755	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	1.8 (nc)	18 (nc)	--	mg/kg	<0.00755	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin Aldehyde	1.8 (nc)	18 (nc)	--	mg/kg	<0.00755	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin Ketone	--	--	--	mg/kg	<0.00755	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gamma-BHC (Lindane)	0.52 (ca*)	2.1 (ca)	--	mg/kg	<0.00755	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gamma-Chlordane	--	--	--	mg/kg	<0.00755	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	0.11 (ca)	0.38 (ca)	--	mg/kg	<0.00755	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	0.053 (ca*)	0.19 (ca*)	--	mg/kg	<0.00755	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	31 (nc)	310 (nc)	--	mg/kg	<0.00755	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toxaphene	0.44 (ca**)	1.6 (ca**)	--	mg/kg	<0.377	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs																									
2-Methylnaphthalene	31 (nc)	440 (sat)	--	mg/kg	0.0020 B	<0.0019 [<0.0020]	0.0042 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0015/								

Table B-7. Soil Analytical Results, Igniter Assembly Area, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	IASB06 0 - 0.5 06/10/02	IASB06 4 - 6 06/18/02	IASB06 8 - 10 06/18/02	IASB07 0 - 0.5 06/10/02	IASB07 4 - 6 06/18/02	IASB08 0 - 0.5 06/10/02	IASB08 4 - 6 06/18/02	IASB09 0 - 0.5 06/10/02	IASB09 4 - 6 06/18/02	IASB10 0 - 0.5 06/10/02	IASB10 2 - 4 06/18/02	IASB11 0 - 0.5 06/10/02	IASB11 2 - 4 06/18/02	IASB12 0 - 0.5 06/10/02	IASB12 4 - 6 06/18/02	IASB12 8 - 10 06/18/02	IASB13 0 - 0.5 06/11/02	IASB13 1 - 2 06/18/02	IASB13 2 - 4 06/18/02	IASB14 0 - 0.5 06/11/02
Semivolatile Organics																								
3-Nitroaniline	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-Methylphenol	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	24 {nc}	250 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	31 {nc}	310 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	340 {nc}	3,300 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	340 {nc}	3,300 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	1,700 {nc}	170,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid	240,000 {max}	2,500,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	3,100 {nc}	310,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	18 {nc}	180 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	0.19 {ca**}	0.9 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroisopropyl)ether	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	35 {ca*}	120 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butylbenzylphthalate	1,200 {nc}	120,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	24 {ca**}	86 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	4,900 {nc}	490,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethylphthalate	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-Butylphthalate	610 {nc}	6,200 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinitrotoluene Mix	0.71 {ca}	2.5 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-Octylphthalate	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	0.3 {ca}	1.1 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			

Notes found at end of table.

Table B-7. Soil Analytical Results, Igniter Assembly Area, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]		IASB06 0 - 0.5 06/10/02	IASB06 4 - 6 06/18/02	IASB06 8 - 10 06/18/02	IASB07 0 - 0.5 06/10/02	IASB07 4 - 6 06/18/02	IASB08 0 - 0.5 06/10/02	IASB08 4 - 6 06/18/02	IASB09 0 - 0.5 06/10/02	IASB09 4 - 6 06/18/02	IASB10 0 - 0.5 06/10/02	IASB10 2 - 4 06/18/02	IASB11 0 - 0.5 06/10/02	IASB11 2 - 4 06/18/02	IASB12 0 - 0.5 06/10/02	IASB12 4 - 6 06/18/02	IASB12 8 - 10 06/18/02	IASB13 0 - 0.5 06/11/02	IASB13 1 - 2 06/18/02	IASB13 2 - 4 06/18/02	IASB14 0 - 0.5 06/11/02
Inorganics																								
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	33,700 J	9,510 [12,000]	25,600	31,200 J	23,500	29,700 J	31,800	23,400 J	20,400	20,400 J	27,200	16,900 J	24,100	21,500 J	29,400	28,300	11,000	13,000	42,900	12,400 [12,400]
Antimony	3.1 {nc}	41 {nc}	--	mg/kg	0.240 B	<0.570 L [<0.570 L]	<0.660 L	0.390 B	<0.670 L	0.340 B	<0.660 L	0.460 L	<0.620 L	0.470 L	0.320 B	0.260 B	0.300 B	0.220 B	0.270 B	<0.710 L	0.330 B	<0.640 L	<0.710 L	0.880 L [0.820 L]
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	9.24	2.65 L [2.90 L]	9.66 L	6.29	9.02 L	8.04	10.8 L	11.8	9.96 L	6.73	6.42 L	5.33	9.59 L	6.82	21.4 L	13.5 L	0.820 J	4.36 L	9.52 L	3.55 J [2.78 J]
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	37.3	35.5 [34.5]	25.9	31.2	66.7	34.2	24.8	189	17.1	32.0	48.3	48.4	16.6	48.9	15.6	15.1	107	71.6	20.3	88.7 [102]
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	0.750	<0.220 L [<0.230 L]	0.450 B	0.810	1.60 L	0.640	0.680 L	0.660	0.950 L	0.550 B	3.02 L	0.640	<0.260 L	<0.630	<0.270 L	0.300 B	0.620	0.460 B	0.770 L	0.580 [0.570]
Cadmium	7 {nc}	81 {nc}	0.69	mg/kg	<0.110	<0.110 [<0.110]	<0.130	<0.110	<0.130	<0.110	<0.130	0.310	<0.120	<0.120	<0.120	0.100 J	<0.130	<0.120	<0.140	<0.140	1.15	0.0600 B	<0.140	0.270 [0.230]
Calcium	--	--	--	mg/kg	1,900	330 [350]	515	1,890	686	1,620	626	4,290	325	1,710	2,310	1,040	446	1,160	33.7 B	45.9	123,000	2,020	1,230	69,500 [59,400]
Chromium	280 {ca**}	1,400 {ca**}	65.3	mg/kg	39.1 J	10.1 [14.5]	41.4	38.1 J	45.0	38.8 J	53.2	39.0 J	43.7	33.6 J	57.0	18.8 J	36.5	45.6 J	59.2	43.8	54.4 L	18.7	32.9	157 L [173 L]
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	17.2 J	10.4 J [5.15 J]	3.37 J	422 J	36.0 J	11.2 J	4.46 J	15.3 J	57.0 J	9.00 J	18.6 J	57.2 J	1.47 J	4.48 J	1.42 J	1.67 J	6.69 J	4.79 J	70.1 J	6.56 J [6.68 J]
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	75.6 J	5.13 [6.63]	17.5	51.1 J	22.2	26.9 J	22.1	3,310 J	22.3	27.8 J	31.2	1,360 J	16.0	18.1 J	29.5	28.9	38.1	23.0	34.0	40.0 [47.6]
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	36,900	9,620 [13,100]	39,600	36,900	33,400	35,900	50,800	30,000	38,500	31,500	36,800	20,100	35,700	33,500	77,600	66,000	15,200	17,000	45,400	20,800 [22,200]
Lead	400 {++}	800 {++}	26.8	mg/kg	50.2	11.2 J [10.2 J]	19.2 J	41.7	49.2 J	32.0	33.4 J	141	35.3 J	29.7	27.2 J	66.2	14.7 J	22.2	20.7 J	23.9 J	458	23.6 J	116	1,480 [1,380]
Magnesium	--	--	--	mg/kg	1,430	426 [457]	543	1,850	8,060	1,560	680	4,540	890	1,150	16,700	2,960	385	769	234	218	69,700	1,130	689	41,200 [35,700]
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	213 J	199 [111]	30.5	2,510 J	504	79.8 J	38.1	190 J	183	163 J	476	752 J	53.9	270 J	33.3	37.3	180	356	960	225 [214]
Mercury	3.1 {sat}	3.1 {sat}	0.13	mg/kg	0.0700	0.0300 J [0.0300 J]	0.110	0.0600	0.100	0.0800	0.120	0.130	0.0600	0.0800	0.0700	0.0500 J	0.100	0.0700	0.0300 J	<0.0700	<0.0500	0.0300 J	0.0800	0.0500 J [0.0600]
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	26.1	5.37 [5.92]	12.7	29.5	39.6	17.0	15.7	29.0	20.6	12.7	51.3	19.6	10.7	8.46	11.0	12.9	11.8	8.70	25.9	12.2 [12.9]
Potassium	--	--	--	mg/kg	909	333 J [394]	496	849	3,250	753	514	860	559	563	3,290	795	231 J	563	368 J	288 J	3,350	341 J	509	2,310 [1,980]
Selenium	39 {nc}	510 {nc}	--	mg/kg	<1.13 L	0.770 L [<1.16 L]	<1.34 L	<1.18 L	0.660 L	0.430 L	0.580 L	0.480 L	0.730 L	<1.23 L	<1.27 L	<1.21 L	<1.31 L	<1.26 L	<1.40 L	0.560 L	<1.08	<1.30 L	0.610 L	<1.08 [<1.08]
Silver	39 {nc}	510 {nc}	--	mg/kg	<1.13	<1.14 [<1.16]	<1.34	<1.18	<1.35	<1.19	<1.34	0.700 J	<1.25	<1.23	<1.27	<1.21	<1.31	<1.26	<1.40	<1.42	<1.08	<1.30	<1.42	<1.08 [<1.08]
Sodium	--	--	--	mg/kg	16.7 B	24.9 B [10.9 B]	16.4 B	18.2 B	17.1 B	12.6 B	12.9 B	21.0 B	7.66 B	11.9 B	20.0 B	11.6 B	7.68 B	12.2 B	6.84 B	17.5 B	143 J	10.2 B	7.16 B	88.1 J [79.8 J]
Thallium	0.51 {nc}	6.6 {nc}	2.11	mg/kg	0.280 J	0.140 J [0.110 J]	0.270 J	0.250 J	0.450	0.230 J	0.290 J	0.290 J	0.280 J	0.190 J	0.440	0.290 J	0.390 J	0.120 J	0.210 J	0.220 J	0.200 J	0.190 J	0.800	0.160 J [0.160 J]
Vanadium	55 {nc}	720 {nc}	108	mg/kg	59.2	18.7 [25.1]	62.5	63.2	48.8	60.3	86.7	50.2	62.9	54.3	59.9	33.7	59.9	62.9	97.6	78.1	24.3	32.0	80.7	30.7 [30.7]
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	193 J	15.7 [14.2]	17.2	53.3 J	22.5	44.9 J	28.8	526 J	22.6	38.7 J	38.3	75.4 J	16.1	42.7 J	28.7	29.5	160 J	25.5	40.1	264 J [290 J]
Miscellaneous																								
pH	--	--	--	pH Units	6.17 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	--	--	--	mg/kg	17,500 K	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes found at end of table.

Table B-7. Soil Analytical Results, Igniter Assembly Area, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	IASB14 1 - 2 06/18/02	IASB14 2 - 4 06/18/02	IASB15 0 - 0.5 06/11/02	IASB15 1 - 2 06/18/02	IASB15 2 - 4 06/18/02	IASS01 0 - 0.5 06/10/02	IASS02 0 - 0.5 06/10/02	IASS03 0 - 0.5 06/10/02	IASS04 0 - 0.5 06/10/02	IASS05 0 - 0.5 06/10/02	IATR01 0 - 0.5 06/20/02	IATR02 0 - 0.5 06/20/02	IATR03 0 - 0.5 06/20/02	IATR04 0 - 0.5 06/20/02	IATR05 0 - 0.5 06/20/02	IATR06 0 - 0.5 06/20/02	IATR07 0 - 0.5 06/20/02	IATR08 0 - 0.5 06/20/02
Explosives																						
1,3,5-Trinitrobenzene	180 {nc}	1,800 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.1	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	0.61 {nc}	6.2 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.1	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	16 {ca**}	57 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	6.1 {nc}	62 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2	NA	NA	NA	NA	NA	NA	NA	NA
2-Amino-4,6-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2	NA	NA	NA	NA	NA	NA	NA	NA
4-Amino-2,6-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 K	NA	NA	NA	NA	NA	NA	NA	NA
Dinitrotoluene Mix	0.71 {ca}	2.5 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2	NA	NA	NA	NA	NA	NA	NA	NA
HMX	310 {nc}	3,100 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2	NA	NA	NA	NA	NA	NA	NA	NA
m-Nitrotoluene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.4	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	3.1 {nc}	28 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2	NA	NA	NA	NA	NA	NA	NA	NA
Nitroglycerine	0.61 {nc}	6.2 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.57	NA	NA	NA	NA	NA	NA	NA	NA
o-Nitrotoluene	78 {nc}	1,300 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.4	NA	NA	NA	NA	NA	NA	NA	NA
Pentaerythritol Tetranitrate	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.36	NA	NA	NA	NA	NA	NA	NA	NA
p-Nitrotoluene	30 {ca**}	110 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.4	NA	NA	NA	NA	NA	NA	NA	NA
RDX	4.4 {ca*}	16 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2	NA	NA	NA	NA	NA	NA	NA	NA
Tetryl	24 {nc}	250 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2	NA	NA	NA	NA	NA	NA	NA	NA
Herbicides																						
2,4,5-T	61 {nc}	620 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-TP	49 {nc}	490 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-D	69 {nc}	770 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-DB	49 {nc}	490 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dalapon	180 {nc}	1,800 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dicamba	180 {nc}	1,800 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorprop	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinoseb	6.1 {nc}	62 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MCPA	3.1 {nc}	31 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MCPP	6.1 {nc}	62 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organochlorine Pesticides																						
4,4'-DDD	2 {ca**}	7.2 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	1.4 {ca**}	5.1 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	1.7 {ca*}	7 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	0.029 {ca*}	0.1 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alpha-BHC	0.077 {ca**}	0.27 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alpha-Chlordane	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beta-BHC	0.27 {ca**}	0.96 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Delta-BHC	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	0.03 {ca}	0.11 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	37 {nc}	370 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan Sulfate	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	1.8 {nc}	18 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin Aldehyde	1.8 {nc}	18 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin Ketone	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gamma-BHC (Lindane)	0.52 {ca*}	2.1 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gamma-Chlordane	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	0.11 {ca}	0.38 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	0.053 {ca*}	0.19 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	31 {nc}	310 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toxaphene	0.44 {ca**}	1.6 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs																						
2-Methylnaphthalene	31 {nc}	440 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.0019 B	0.0048	0.0032 B	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	340 {nc}	3,300 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	<0.0021	<0.0022	0.015 B	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	340 {nc}	3,300 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	<0.0021	0.0012 J	<0.0021	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	1,700 {nc}	170,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	<0.0021	0.0013 J	0.028	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.0052	0.010	0.070	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.0059	0.010	0.057	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.013	0.024	0.099	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.0071	0.018	0.031	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.0039	0.0056	0.029	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.0073	0.013	0.056	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	<0.0021	0.0024	0.0078	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.013	0.022	0.16	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	<0.0021	0.00097 J	0.013	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.0056 J	0.0089 J	0.037 J	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	15 {nc}	67 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.0014 B	0.0031 B	0.0045 B	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.0078	0.0099	0.14	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.014	0.019	0.12	NA	NA	NA	NA	NA	NA	NA	NA
PCBs																						
Aroclor-1016	0.39 {nc}	21 {ca**}	--	mg/kg	<0.030	<0.040	<0.030	<0.040	<0.040	NA	NA	NA	NA	<0.040	<0.030	<0.040	<0.040	<0.040	<0.030	<0.030	<0.030	<0.030
Aroclor-1221	0.17 {ca**}	0.62 {ca**}	--	mg/kg	<0.070	<0.090	<0.070	<0.080	<0.090	NA	NA	NA	NA	<0.080	<0.070	<0.080	<0.080	<0.080	<0.070	<0.070	<0.070	<0.070
Aroclor-1232	0.17 {ca**}	0.62 {ca**}	--	mg/kg	<0.030	<0.040	<0.030	<0.040	<0.040	NA	NA	NA	NA	<0.040	<0.030	<0.040	<0.040	<0.040	<0.030	<0.030	<0.030	<0.030
Aroclor-1242	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.030	<0.040	<0.030	<0.040	<0.040	NA	NA	NA	NA	<0.040	<0.030	<0.040	<0.04					

Table B-7. Soil Analytical Results, Igniter Assembly Area, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	IASB14 1 - 2 06/18/02	IASB14 2 - 4 06/18/02	IASB15 0 - 0.5 06/11/02	IASB15 1 - 2 06/18/02	IASB15 2 - 4 06/18/02	IASS01 0 - 0.5 06/10/02	IASS02 0 - 0.5 06/10/02	IASS03 0 - 0.5 06/10/02	IASS04 0 - 0.5 06/10/02	IASS05 0 - 0.5 06/10/02	IATR01 0 - 0.5 06/20/02	IATR02 0 - 0.5 06/20/02	IATR03 0 - 0.5 06/20/02	IATR04 0 - 0.5 06/20/02	IATR05 0 - 0.5 06/20/02	IATR06 0 - 0.5 06/20/02	IATR07 0 - 0.5 06/20/02	IATR08 0 - 0.5 06/20/02
Volatile Organics																						
1,1,1-Trichloroethane	680 {sat}	680 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	0.59 {ca**}	2.9 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	1.1 {ca}	5.5 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	3.4 {ca}	17 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	25 {nc}	110 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	0.45 {ca}	2.2 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	0.93 {ca*}	4.7 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	28,000 {sat}	28,000 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073 J	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073 J	NA	NA	NA	NA	NA	NA	NA	NA
3-Octanone	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.013 J	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	3,200 {sat}	3,200 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	6,100 {nc}	110,000 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.032 B	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	1.1 {ca*}	5.6 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	10 {ca}	46 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	61 {ca*}	220 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	0.79 {nc}	3.5 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Disulfide	260 {sat}	260 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Tetrachloride	0.25 {ca}	1.3 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	31 {nc}	860 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	2,200 {sat}	2,200 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	0.3 {ca}	1.5 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
Chloromethane	1.7 {ca*}	8.4 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	78 {nc}	1,400 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	5.8 {ca}	21 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
d-Limonene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	5.7 {ca}	29 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.015	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	11 {ca}	54 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	15 {nc}	67 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	300 {sat}	300 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	1,000 {sat}	1,000 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	0.57 {ca}	2.7 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	930 {sat}	930 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	11 {nc}	50 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	2.8 {ca}	14 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride	0.06 {ca}	1.7 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0073	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	300 {sat}	300 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.015	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organics																						
1,2,4-Trichlorobenzene	180 {ca**}	220 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	220 {sat}	220 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Diphenylhydrazine	0.61 {ca**}	2.2 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	2.6 {ca}	13 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
1-Methylnaphthalene	22 {ca*}	99 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	610 {nc}	6,200 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	44 {ca**}	160 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	18 {nc}	180 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	120 {nc}	1,200 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	12 {nc}	120 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.0	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	6.1 {nc}	62 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	210 {sat}	210 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	39 {nc}	510 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	31 {nc}	440 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	310 {nc}	3,100 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	1.1 {ca**}	3.8 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA

Notes found at end of table.

Table B-7. Soil Analytical Results, Igniter Assembly Area, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	IASB14 1 - 2 06/18/02	IASB14 2 - 4 06/18/02	IASB15 0 - 0.5 06/11/02	IASB15 1 - 2 06/18/02	IASB15 2 - 4 06/18/02	IASS01 0 - 0.5 06/10/02	IASS02 0 - 0.5 06/10/02	IASS03 0 - 0.5 06/10/02	IASS04 0 - 0.5 06/10/02	IASS05 0 - 0.5 06/10/02	IATR01 0 - 0.5 06/20/02	IATR02 0 - 0.5 06/20/02	IATR03 0 - 0.5 06/20/02	IATR04 0 - 0.5 06/20/02	IATR05 0 - 0.5 06/20/02	IATR06 0 - 0.5 06/20/02	IATR07 0 - 0.5 06/20/02	IATR08 0 - 0.5 06/20/02
Semivolatile Organics																						
3-Nitroaniline	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21 J	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.0	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-Methylphenol	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	24 {nc}	250 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21 J	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	31 {nc}	310 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21 J	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.0	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	340 {nc}	3,300 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.095 J	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	340 {nc}	3,300 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	1,700 {nc}	170,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.16 J	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.39	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.35	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.49	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.24	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.19 J	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid	240,000 {max}	2,500,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.27 B	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	3,100 {nc}	310,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21 J	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	18 {nc}	180 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	0.19 {ca**}	0.9 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroisopropyl)ether	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	35 {ca*}	120 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.18 B	NA	NA	NA	NA	NA	NA	NA	NA
Butylbenzylphthalate	1,200 {nc}	120,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	24 {ca**}	86 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.11 J	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.39	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.078 J	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.031 J	NA	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	4,900 {nc}	490,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
Dimethylphthalate	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-Butylphthalate	610 {nc}	6,200 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.31 B	NA	NA	NA	NA	NA	NA	NA	NA
Dinitrotoluene Mix	0.71 {ca}	2.5 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-Octylphthalate	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.94 L	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.079 J	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	0.3 {ca}	1.1 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	6.2 {ca**}	22 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	37 {nc}	370 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21 L	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	35 {ca**}	120 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.29	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	510 {ca*}	1,800 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	3.9 {ca}	20 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.015 J	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	3.1 {nc}	28 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	0.069 {ca**}	0.25 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	99 {ca**}	350 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	3 {ca}	9 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.0	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.69 L	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	1,800 {nc}	180,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.67	NA	NA	NA	NA	NA	NA	NA	NA
Pyridine	7.8 {nc}	100 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.21	NA	NA	NA	NA	NA	NA	NA	NA

Notes found at end of table.

Table B-7. Soil Analytical Results, Igniter Assembly Area, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	IASB14 1 - 2 06/18/02	IASB14 2 - 4 06/18/02	IASB15 0 - 0.5 06/11/02	IASB15 1 - 2 06/18/02	IASB15 2 - 4 06/18/02	IASS01 0 - 0.5 06/10/02	IASS02 0 - 0.5 06/10/02	IASS03 0 - 0.5 06/10/02	IASS04 0 - 0.5 06/10/02	IASS05 0 - 0.5 06/10/02	IATR01 0 - 0.5 06/20/02	IATR02 0 - 0.5 06/20/02	IATR03 0 - 0.5 06/20/02	IATR04 0 - 0.5 06/20/02	IATR05 0 - 0.5 06/20/02	IATR06 0 - 0.5 06/20/02	IATR07 0 - 0.5 06/20/02	IATR08 0 - 0.5 06/20/02
Inorganics																						
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	27,600	32,200	12,700	33,000	30,200	32,700 J	24,200 J	28,200 J	16,900 J	26,500 J	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	3.1 {nc}	41 {nc}	--	mg/kg	<0.590 L	<0.710 L	0.310 B	<0.650 L	<0.690 L	0.240 B	0.580 L	0.310 B	0.350 B	<0.600 L	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	5.82 L	6.12 L	0.550 J	8.67 L	6.27 L	8.33	8.33	8.02	8.66	8.35	NA	NA	NA	NA	NA	NA	NA	NA
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	11.8	13.8	56.6	48.4	19.0	42.6	72.9	159	277	38.8	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	0.360 B	0.830 L	0.630	0.480 B	0.730 L	0.390 B	0.480 B	0.830	0.670	0.560 B	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	7 {nc}	81 {nc}	0.69	mg/kg	<0.110	<0.140	0.500	<0.130	<0.140	<0.120	<0.120	0.130	0.380	<0.120	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	--	--	--	mg/kg	1,060	1,450	105,000	1,240	1,440	3,170	1,900	2,140	1,420	807	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	280 {ca**}	1,400 {ca**}	65.3	mg/kg	49.8	66.1	57.4 L	38.0	34.8	40.5 J	36.8 J	28.0 J	29.1 J	41.9 J	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	3.43 J	2.93 J	7.70 J	5.96 J	4.20 J	5.29 J	8.73 J	22.7 J	14.6 J	6.97 J	NA	NA	NA	NA	NA	NA	NA	NA
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	25.8	27.8	32.6	61.4	31.5	45.3 J	97.2 J	164 J	661 J	18.7 J	NA	NA	NA	NA	NA	NA	NA	NA
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	43,700	49,800	15,900	39,100	45,300	34,800	32,000	23,100	16,700	32,600	NA	NA	NA	NA	NA	NA	NA	NA
Lead	400 {++}	800 {++}	26.8	mg/kg	24.3 J	29.0 J	476	127	41.7 J	30.2	49.1	95.6	144	31.1	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	--	--	--	mg/kg	652	767	63,200	923	825	1,530	1,330	3,330	4,110	895	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	54.1	60.5	174	166	100	75.5 J	125 J	621 J	452 J	219 J	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	3.1 {sat}	3.1 {sat}	0.13	mg/kg	0.0300 J	0.110	<0.0500	0.0800	0.850	0.0900	0.100	0.100	0.0500 J	0.0800	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	19.8	22.0	12.9	21.8	20.0	17.2	14.9	21.7	17.4	17.2	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	--	--	--	mg/kg	441	511	3,950	658	491	809	847	1,080	863	817	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	39 {nc}	510 {nc}	--	mg/kg	<1.19 L	<1.44 L	<1.10	0.480 L	<1.40 L	<1.26 L	<1.24 L	<1.21 L	<1.32 L	<1.22 L	NA	NA	NA	NA	NA	NA	NA	NA
Silver	39 {nc}	510 {nc}	--	mg/kg	<1.19	<1.44	<1.10	<1.31	<1.40	<1.26	<1.24	<1.21	<1.32	<1.22	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	--	--	--	mg/kg	6.28 B	7.19 B	133 J	13.9 B	9.24 B	22.0 B	14.9 B	22.2 B	18.2 B	12.7 B	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	0.51 {nc}	6.6 {nc}	2.11	mg/kg	0.160 J	0.250 J	0.130 J	0.280 J	0.300 J	0.350 J	0.180 J	0.250 J	0.250 J	0.150 J	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	55 {nc}	720 {nc}	108	mg/kg	76.6	90.6	27.4	71.1	77.9	61.6	56.7	44.8	34.0	56.4	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	44.5	47.2	277 J	79.5	47.0	48.2 J	88.1 J	232 J	670 J	87.9 J	NA	NA	NA	NA	NA	NA	NA	NA
Miscellaneous																						
pH	--	--	--	pH Units	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

mg/kg	Milligrams per kilogram.
[a]	USEPA Regional Screening Levels (USEPA 2008a).
[b]	Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.
{ca}	Carcinogen.
{nc}	Noncarcinogen.
*	Noncarcinogen screening level is less than one hundred times the carcinogen screening level.
**	Noncarcinogen screening level is less than ten times the carcinogen screening level.
{++}	The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.
{max}	Concentration may exceed ceiling limit.
{sat}	Screening level may exceed saturation concentration.
B (Inorganics)	Constituent concentration quantified as estimated.
B (Organics)	Constituent was detected in the associated method blank.
J	Constituent concentration quantified as estimated.
K	Estimated concentration bias high.
L	Estimated concentration bias low.
NA	Not Analyzed.
[3.3]	Bracketed concentration indicates laboratory analytical result for duplicate sample.
24,400	Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).
10.6 J	Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).
16	Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Table B-8. Sediment Analytical Results, Igniter Assembly Area, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]		IASD04 0 - 0.5 06/18/02	IASD05 0 - 0.5 06/19/02	IASD06 0 - 0.5 06/19/02	IASD07 0 - 0.5 06/19/02	IASD08 0 - 0.5 06/19/02	IASD09 0 - 0.5 06/19/02	IASD10 0 - 0.5 06/19/02	IASD11 0 - 0.5 06/19/02	IASD12 0 - 0.5 06/19/02
Explosives													
1,3,5-Trinitrobenzene	180 {nc}	1,800 {nc}	--	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.07 J	<0.1
1,3-Dinitrobenzene	0.61 {nc}	6.2 {nc}	--	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2,4,6-Trinitrotoluene	16 {ca**}	57 {ca**}	--	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
2,4-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
2,6-Dinitrotoluene	6.1 {nc}	62 {nc}	--	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
2-Amino-4,6-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
4-Amino-2,6-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	<0.2	0.04 J	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Dinitrotoluene Mix	0.71 {ca}	2.5 {ca}	--	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
HMX	310 {nc}	3,100 {nc}	--	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
m-Nitrotoluene	--	--	--	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Nitrobenzene	3.1 {nc}	28 {nc}	--	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Nitroglycerine	0.61 {nc}	6.2 {nc}	--	mg/kg	<0.36	<0.39	<0.36	<0.36	<0.36	<0.37	<0.32	<0.36	<0.36
p-Nitrotoluene	78 {nc}	1,300 {sat}	--	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Pentaerythritol Tetranitrate	--	--	--	mg/kg	<0.36	<0.39	<0.36	<0.36	<0.36	<0.37	<0.32	<0.36	<0.36
p-Nitrotoluene	30 {ca**}	110 {ca*}	--	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
RDX	4.4 {ca*}	16 {ca}	--	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Tetryl	24 {nc}	250 {nc}	--	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Herbicides													
2,4,5-T	61 {nc}	620 {nc}	--	mg/kg	<0.0121	<1.3 J	<0.121 J	<1.2 J	<0.123 J	<0.124 J	<1.09 J	NA	<0.12 J
2,4,5-TP	49 {nc}	490 {nc}	--	mg/kg	<0.0121	<1.3 L	<0.121	<1.2 L	<0.123	<0.124	<1.09 L	NA	<0.12
2,4-D	69 {nc}	770 {nc}	--	mg/kg	<0.0242	<2.6 L	<0.242	<2.41 L	<0.246	<0.248	<2.19 L	NA	<0.24
2,4-DB	49 {nc}	490 {nc}	--	mg/kg	<0.121	<13 J	<1.21 J	<12 J	<1.23 J	<1.24 J	<10.9 J	NA	<1.2 J
Dalapon	180 {nc}	1,800 {nc}	--	mg/kg	<0.121	<13 L	<1.21	<12 L	<1.23	<1.24	<10.9 L	NA	<1.2
Dicamba	180 {nc}	1,800 {nc}	--	mg/kg	<0.0242	<2.6 L	<0.242	<2.41 L	<0.246	<0.248	<2.19 L	NA	<0.24
Dichlorprop	--	--	--	mg/kg	<0.0242	<2.6 L	<0.242	<2.41 L	<0.246	<0.248	<2.19 L	NA	<0.24
Dinoseb	6.1 {nc}	62 {nc}	--	mg/kg	<0.0242	<2.6 L	<0.242	<2.41 L	<0.246	<0.248	<2.19 L	NA	<0.24
MCPA	3.1 {nc}	31 {nc}	--	mg/kg	<12.1	<1,300 L	<121	<1,200 L	<123	<124	<1,090 L	NA	<120
MCPP	6.1 {nc}	62 {nc}	--	mg/kg	<12.1	<1,300 L	<121	<1,200 L	<123	<124	<1,090 L	NA	<120
Organochlorine Pesticides													
4,4'-DDD	2 {ca**}	7.2 {ca**}	--	mg/kg	0.00111	<0.00086	0.00079 J	0.00068 J	0.00248	<0.00082	0.00242	NA	0.00191
4,4'-DDE	1.4 {ca**}	5.1 {ca**}	--	mg/kg	<0.0008	0.00301	0.00066 B	0.00072 B	<0.00082	0.00074 B	<0.00072	NA	0.00075 B
4,4'-DDT	1.7 {ca*}	7 {ca*}	--	mg/kg	0.00089 B	0.00385	0.00362	0.00386	0.0067	0.00076 B	0.00233	NA	0.00297
Aldrin	0.029 {ca*}	0.1 {ca*}	--	mg/kg	<0.0008	<0.00086	<0.0008	<0.0008	<0.00082	<0.00082	<0.00072	NA	<0.0008
Alpha-BHC	0.077 {ca**}	0.27 {ca**}	--	mg/kg	<0.0008	<0.00086	<0.0008	<0.0008	<0.00082	<0.00082	<0.00072	NA	<0.0008
Alpha-Chlordane	--	--	--	mg/kg	0.00056 J	0.00301	<0.0008	0.00038 J	<0.00082	<0.00082	<0.00072	NA	<0.0008
Beta-BHC	0.27 {ca**}	0.96 {ca**}	--	mg/kg	<0.0008	<0.00086	<0.0008	0.00017 J	<0.00082	<0.00082	<0.00072	NA	<0.0008
Delta-BHC	--	--	--	mg/kg	<0.0008	<0.00086	<0.0008	<0.0008	<0.00082	<0.00082	0.00104	NA	<0.0008
Dieldrin	0.03 {ca}	0.11 {ca}	--	mg/kg	0.00442	0.00151	0.00074 J	0.00108	<0.00082	0.00089	0.00909	NA	0.00061 J
Endosulfan I	--	--	--	mg/kg	<0.0008	<0.00086	<0.0008	<0.0008	<0.00082	<0.00082	<0.00072	NA	<0.0008
Endosulfan II	37 {nc}	370 {nc}	--	mg/kg	0.00135	0.00052 J	<0.0008	0.00049 J	0.00378	0.00218	0.00123	NA	0.00038 J
Endosulfan Sulfate	--	--	--	mg/kg	<0.0008	<0.00086	<0.0008	<0.0008	<0.00082	<0.00082	<0.00072	NA	<0.0008
Endrin	1.8 {nc}	18 {nc}	--	mg/kg	<0.0008	0.00328	0.00062 J	0.003	<0.00082	<0.00082	<0.00072	NA	<0.0008
Endrin Aldehyde	1.8 {nc}	18 {nc}	--	mg/kg	<0.0008	<0.00086 L	<0.0008 L	<0.0008 L	<0.00082 L	<0.00082 L	<0.00072 L	NA	<0.0008 L
Endrin Ketone	--	--	--	mg/kg	<0.0008	0.00424	<0.0008	0.00148	<0.00082	<0.00082	0.00423	NA	<0.0008
Gamma-BHC (Lindane)	0.52 {ca*}	2.1 {ca}	--	mg/kg	<0.0008	<0.00086	<0.0008	<0.0008	<0.00082	<0.00082	<0.00072	NA	<0.0008
Gamma-Chlordane	--	--	--	mg/kg	<0.0008	0.00408	<0.0008	0.00102	<0.00082	0.00062 J	0.00136	NA	<0.0008
Heptachlor	0.11 {ca}	0.38 {ca}	--	mg/kg	<0.0008	<0.00086	<0.0008	<0.0008	<0.00082	<0.00082	<0.00072	NA	<0.0008
Heptachlor Epoxide	0.053 {ca*}	0.19 {ca*}	--	mg/kg	<0.0008	<0.00086	<0.0008	<0.0008	0.00101	<0.00082	<0.00072	NA	<0.0008
Methoxychlor	31 {nc}	310 {nc}	--	mg/kg	0.00757	0.00257	0.00117	0.00107	0.0105	<0.00082	0.0122	NA	0.0027
Toxaphene	0.44 {ca**}	1.6 {ca**}	--	mg/kg	<0.0402	<0.0434	<0.0404	<0.0401	<0.041	<0.0413	<0.0364	NA	<0.04
PAHs													
2-Methylnaphthalene	31 {nc}	440 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.36	0.012
Acenaphthene	340 {nc}	3,300 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.0043 B	0.0014 B
Acenaphthylene	340 {nc}	3,300 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.0085	0.0028
Anthracene	1,700 {nc}	170,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.014	0.0029
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.060	0.018
Benzo(a)pyrene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.040	0.018
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.10	0.055
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.051	0.022
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.027	0.018
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.098	0.041
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.012	0.0046
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.11 L	0.074 L
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.010	0.0013 J
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.038	0.023
Naphthalene	15 {nc}	67 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.20	0.0082 B
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.25	0.019
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	0.11	0.050
PCBs													
Aroclor-1016	0.39 {nc}	21 {ca**}	--	mg/kg	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.030	<0.040	<0.040
Aroclor-1221	0.17 {ca**}	0.62 {ca**}	--	mg/kg	<0.080	<0.080	<0.080	<0.080	<0.080	<0.080	<0.070	<0.080	<0.080
Aroclor-1232	0.17 {ca**}	0.62 {ca**}	--	mg/kg	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.030	<0.040	<0.040
Aroclor-1242	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.030	<0.040	<0.040
Aroclor-1248	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.030	<0.040	<0.040
Aroclor-1254	0.22 {ca**}	0.74 {ca*}	--	mg/kg	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.030	<0.040	<0.040
Aroclor-1260	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.030	<0.040	<0.040
Total PCBs	0.24 {ca**}	0.86 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes found at end of table.

Table B-8. Sediment Analytical Results, Igniter Assembly Area, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]			IASD04 0 - 0.5 06/18/02	IASD05 0 - 0.5 06/19/02	IASD06 0 - 0.5 06/19/02	IASD07 0 - 0.5 06/19/02	IASD08 0 - 0.5 06/19/02	IASD09 0 - 0.5 06/19/02	IASD10 0 - 0.5 06/19/02	IASD11 0 - 0.5 06/19/02	IASD12 0 - 0.5 06/19/02
Volatile Organics														
1,1,1-Trichloroethane	680 {sat}	680 {sat}	--	mg/kg	<0.0060	<0.0059	<0.0061	<0.0054	<0.0062	<0.0062	<0.0055	<0.0066	<0.0066	
1,1,2,2-Tetrachloroethane	0.59 {ca**}	2.9 {ca**}	--	mg/kg	<0.0060	<0.0059 L	<0.0061 L	<0.0054 L	<0.0062 L	<0.0062 L	<0.0055 L	<0.0066 L	<0.0066 L	
1,1,2-Trichloroethane	1.1 {ca}	5.5 {ca}	--	mg/kg	<0.0060	<0.0059	<0.0061	<0.0054	<0.0062	<0.0062	<0.0055	<0.0066	<0.0066	
1,1-Dichloroethane	3.4 {ca}	17 {ca}	--	mg/kg	<0.0060	<0.0059	<0.0061	<0.0054	<0.0062	<0.0062	<0.0055	<0.0066	<0.0066	
1,1-Dichloroethene	25 {nc}	110 {nc}	--	mg/kg	<0.0060	<0.0059	<0.0061	<0.0054	<0.0062	<0.0062	<0.0055	<0.0066	<0.0066	
1,2-Dichloroethane	0.45 {ca}	2.2 {ca}	--	mg/kg	<0.0060	<0.0059	<0.0061	<0.0054	<0.0062	<0.0062	<0.0055	<0.0066	<0.0066	
1,2-Dichloropropane	0.93 {ca*}	4.7 {ca*}	--	mg/kg	<0.0060	<0.0059	<0.0061	<0.0054	<0.0062	<0.0062	<0.0055	<0.0066	<0.0066	
2-Butanone	28,000 {sat}	28,000 {sat}	--	mg/kg	<0.0060	<0.0059	<0.0061	<0.0054	<0.0062	<0.0062	<0.0055	<0.0066	<0.0066	
2-Hexanone	--	--	--	mg/kg	<0.0060	<0.0059 L	<0.0061 L	<0.0054 L	<0.0062 L	<0.0062 L	<0.0055 L	<0.0066 L	<0.0066 L	
3-Octanone	--	--	--	mg/kg	NA	NA	NA	NA	0.012 J	NA	0.0060 J	NA	0.015 J	
4-Methyl-2-pentanone	3,200 {sat}	3,200 {sat}	--	mg/kg	<0.0060	<0.0059	<0.0061	<0.0054	<0.0062	<0.0062	<0.0055	<0.0066	<0.0066	
Acetone	6,100 {nc}	110,000 {sat}	--	mg/kg	<0.0060	<0.0059	<0.0061	0.011 B	0.033 B	0.022 B	<0.0055	0.045 B	0.16 B	
Benzene	1.1 {ca*}	5.6 {ca*}	--	mg/kg	<0.0060	<0.0059	<0.0061	<0.0054	<0.0062	<0.0062	<0.0055	<0.0066	<0.0066	
Bromodichloromethane	10 {ca}	46 {ca}	--	mg/kg	<0.0060	<0.0059	<0.0061	<0.0054	<0.0062	<0.0062	<0.0055	<0.0066	<0.0066	
Bromoform	61 {ca*}	220 {ca*}	--	mg/kg	<0.0060	<0.0059 L	<0.0061 L	<0.0054 L	<0.0062 L	<0.0062 L	<0.0055 L	<0.0066 L	<0.0066 L	
Bromomethane	0.79 {nc}	3.5 {nc}	--	mg/kg	<0.0060	<0.0059 L	<0.0061 L	<0.0054 L	<0.0062 L	<0.0062 L	<0.0055 L	<0.0066 L	<0.0066 L	
Carbon Disulfide	260 {sat}	260 {sat}	--	mg/kg	<0.0060	<0.0059	<0.0061	<0.0054	<0.0062	<0.0062	<0.0055	<0.0066	<0.0066	
Carbon Tetrachloride	0.25 {ca}	1.3 {ca}	--	mg/kg	<0.0060	<0.0059	<0.0061	<0.0054	<0.0062	<0.0062	<0.0055	<0.0066	<0.0066	
Chlorobenzene	31 {nc}	860 {sat}	--	mg/kg	<0.0060	<0.0059 L	<0.0061 L	<0.0054 L	<0.0062 L	<0.0062 L	<0.0055 L	<0.0066 L	<0.0066 L	
Chloroethane	2,200 {sat}	2,200 {sat}	--	mg/kg	<0.0060	<0.0059	<0.0061	<0.0054	<0.0062	<0.0062	<0.0055	<0.0066	<0.0066	
Chloroform	0.3 {ca}	1.5 {ca}	--	mg/kg	<0.0060	<0.0059	<0.0061	<0.0054	<0.0062	<0.0062	<0.0055	<0.0066	<0.0066	
Chloromethane	1.7 {ca*}	8.4 {ca*}	--	mg/kg	<0.0060	<0.0059 L	<0.0061 L	<0.0054 L	<0.0062 L	<0.0062 L	<0.0055 L	<0.0066 L	<0.0066 L	
cis-1,2-Dichloroethene	78 {nc}	1,400 {sat}	--	mg/kg	<0.0060	<0.0059	<0.0061	<0.0054	<0.0062	<0.0062	<0.0055	<0.0066	<0.0066	
cis-1,3-Dichloropropene	--	--	--	mg/kg	<0.0060	<0.0059	<0.0061	<0.0054	<0.0062	<0.0062	<0.0055	<0.0066	<0.0066	
Dibromochloromethane	5.8 {ca}	21 {ca}	--	mg/kg	<0.0060	<0.0059	<0.0061	<0.0054	<0.0062	<0.0062	<0.0055	<0.0066	<0.0066	
d-Limonene	--	--	--	mg/kg	NA	NA	NA	0.037 J	0.084 J	NA	NA	NA	NA	
Ethylbenzene	5.7 {ca}	29 {ca}	--	mg/kg	<0.0060	<0.0059 L	<0.0061 L	<0.0054 L	<0.0062 L	<0.0062 L	<0.0055 L	<0.0066 L	<0.0066 L	
m,p-Xylene	--	--	--	mg/kg	<0.012	<0.012 L	<0.012 L	<0.011 L	<0.012 L	<0.012 L	<0.011 L	<0.013 L	<0.013 L	
Methylene Chloride	11 {ca}	54 {ca}	--	mg/kg	<0.0060	<0.0059	<0.0061	<0.0054	<0.0062	<0.0062	<0.0055	<0.0066	<0.0066	
Naphthalene	15 {nc}	67 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	
o-Xylene	300 {sat}	300 {sat}	--	mg/kg	<0.0060	<0.0059 L	<0.0061 L	<0.0054 L	<0.0062 L	<0.0062 L	<0.0055 L	<0.0066 L	<0.0066 L	
Styrene	1,000 {sat}	1,000 {sat}	--	mg/kg	<0.0060	<0.0059 L	<0.0061 L	<0.0054 L	<0.0062 L	<0.0062 L	<0.0055 L	<0.0066 L	<0.0066 L	
Tetrachloroethene	0.57 {ca}	2.7 {ca}	--	mg/kg	<0.0060	<0.0059 L	<0.0061 L	<0.0054 L	<0.0062 L	<0.0062 L	<0.0055 L	<0.0066 L	<0.0066 L	
Toluene	930 {sat}	930 {sat}	--	mg/kg	<0.0060	<0.0059 L	<0.0061 L	<0.0054 L	<0.0062 L	<0.0062 L	<0.0055 L	<0.0066 L	<0.0066 L	
trans-1,2-Dichloroethene	11 {nc}	50 {nc}	--	mg/kg	<0.0060	<0.0059	<0.0061	<0.0054	<0.0062	<0.0062	<0.0055	<0.0066	<0.0066	
trans-1,3-Dichloropropene	--	--	--	mg/kg	<0.0060	<0.0059	<0.0061	<0.0054	<0.0062	<0.0062	<0.0055	<0.0066	<0.0066	
Trichloroethene	2.8 {ca}	14 {ca}	--	mg/kg	<0.0060	<0.0059	<0.0061	<0.0054	<0.0062	<0.0062	<0.0055	<0.0066	<0.0066	
Vinyl Chloride	0.06 {ca}	1.7 {ca}	--	mg/kg	<0.0060	<0.0059	<0.0061	<0.0054	<0.0062	<0.0062	<0.0055	<0.0066	<0.0066	
Xylenes (total)	300 {sat}	300 {sat}	--	mg/kg	<0.012	<0.012	<0.012	<0.011	<0.012	<0.012	<0.011	<0.013	<0.013	
Semivolatile Organics														
1,2,4-Trichlorobenzene	180 {ca**}	220 {sat}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.20	
1,2-Dichlorobenzene	220 {sat}	220 {sat}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.20	
1,2-Diphenylhydrazine	0.61 {ca**}	2.2 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1,3-Dichlorobenzene	--	--	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.20	
1,4-Dichlorobenzene	2.6 {ca}	13 {ca}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.20	
1-Methylnaphthalene	22 {ca*}	99 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	
2,4,5-Trichlorophenol	610 {nc}	6,200 {nc}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.20	
2,4,6-Trichlorophenol	44 {ca**}	160 {ca**}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.20	
2,4-Dichlorophenol	18 {nc}	180 {nc}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.20	
2,4-Dimethylphenol	120 {nc}	1,200 {nc}	--	mg/kg	<0.21 L	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.20	
2,4-Dinitrophenol	12 {nc}	120 {nc}	--	mg/kg	<1.0	<2.2	<1.0	<2.0	<1.0	<8.2	<0.91	<1.0	<1.0	
2,4-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.20	
2,6-Dinitrotoluene	6.1 {nc}	62 {nc}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.20	
2-Chloronaphthalene	210 {sat}	210 {sat}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.20	
2-Chlorophenol	39 {nc}	510 {nc}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.20	
2-Methylnaphthalene	31 {nc}	440 {sat}	--	mg/kg	0.014 J	<0.44	<0.21	0.059 J	<0.21	0.22 J	<0.19	0.32	0.0095 J	
2-Methylphenol	310 {nc}	3,100 {nc}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.20	
2-Nitroaniline	--	--	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.20	
2-Nitrophenol	--	--	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.20	
3,3'-Dichlorobenzidine	1.1 {ca**}	3.8 {ca**}	--	mg/kg	<0.21	<0.44 J	<0.21 J	<0.41	<0.21 J	<1.7	<0.19 J	<0.21 J	<0.20 J	
3-Nitroaniline	--	--	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.20	
4,6-Dinitro-2-methylphenol	--	--	--	mg/kg	<1.0	<2.2	<1.0	<2.0	<1.0	<8.2	<0.91	<1.0	<1.0	
4-Bromophenyl-phenylether	--	--	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.20	
4-Chloro-3-Methylphenol	--	--	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.20	
4-Chloroaniline	24 {nc}	250 {nc}	--	mg/kg	<0.21	<0.44	<0.21	<0.						

Table B-8. Sediment Analytical Results, Igniter Assembly Area, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]		Units	IASD04 0 - 0.5 06/18/02	IASD05 0 - 0.5 06/19/02	IASD06 0 - 0.5 06/19/02	IASD07 0 - 0.5 06/19/02	IASD08 0 - 0.5 06/19/02	IASD09 0 - 0.5 06/19/02	IASD10 0 - 0.5 06/19/02	IASD11 0 - 0.5 06/19/02	IASD12 0 - 0.5 06/19/02
Semivolatile Organics														
bis(2-Chloroethoxy)methane	18 {nc}	180 {nc}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.21	<0.20
bis(2-Chloroethyl)ether	0.19 {ca**}	0.9 {ca**}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.21	<0.20
bis(2-Chloroisopropyl)ether	--	--	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.21	<0.20
bis(2-Ethylhexyl)phthalate	35 {ca*}	120 {ca*}	--	mg/kg	0.26 B	1.2 B	0.30 B	0.96 B	0.53 B	0.90 B	0.46 B	0.52 B	0.34 B	
Butylbenzylphthalate	1,200 {nc}	120,000 {max}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19 J	<0.21	<0.21	<0.20
Carbazole	24 {ca**}	86 {ca**}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	2.4	0.032 J	0.016 J		<0.20
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	<0.21	0.070 J	0.034 J	0.028 J	<0.21	7.7	0.30 J	0.10 J		0.049 J
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	0.97 J	0.058 J		<0.21	<0.20
Dibenzofuran	--	--	--	mg/kg	<0.21	<0.44	<0.21	0.018 J	<0.21	0.74 J	<0.19	0.11 J		<0.20
Diethylphthalate	4,900 {nc}	490,000 {max}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.21	<0.20
Dimethylphthalate	--	--	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.21	<0.20
Di-n-Butylphthalate	610 {nc}	6,200 {nc}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.21	<0.20
Dinitrotoluene Mix	0.71 {ca}	2.5 {ca}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.21	<0.20
Di-n-Octylphthalate	--	--	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19 J	<0.21	<0.21	<0.20
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	0.019 J	0.10 J	0.042 J	0.039 J	0.0092 J	22 J	0.52 J	0.12 J		0.049 J
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	1.3 J	0.011 J	<0.21	<0.21	<0.20
Hexachlorobenzene	0.3 {ca}	1.1 {ca}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.21	<0.20
Hexachlorobutadiene	6.2 {ca**}	22 {ca*}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.21	<0.20
Hexachlorocyclopentadiene	37 {nc}	370 {nc}	--	mg/kg	<0.21	<0.44 L	<0.21 L	<0.41 L	<0.21 L	<1.7 L	<0.19 L	<0.21 L	<0.21 L	<0.20 L
Hexachloroethane	35 {ca**}	120 {ca**}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.21	<0.20
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	<0.21	0.060 J	<0.21	<0.41	<0.21	4.2	0.25 J	0.043 J		0.034 J
Isophorone	510 {ca*}	1,800 {ca*}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.21	<0.20
Naphthalene	3.9 {ca}	20 {ca}	--	mg/kg	0.010 J	<0.44	<0.21	0.043 J	<0.21	0.75 J	0.0081 J	0.17 J		<0.20
Nitrobenzene	3.1 {nc}	28 {nc}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.21	<0.20
N-Nitroso-di-n-propylamine	0.069 {ca**}	0.25 {ca**}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.21	<0.20
N-Nitrosodiphenylamine	99 {ca**}	350 {ca**}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.21	<0.20
Pentachlorophenol	3 {ca}	9 {ca}	--	mg/kg	<1.0	<2.2	<1.0	<2.0	<1.0	<8.2	<0.91	<1.0	<1.0	<1.0
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	0.014 J	0.051 J	0.023 J	0.053 J	<0.21 J	16 J	0.24 J	0.28 J		0.022 J
Phenol	1,800 {nc}	180,000 {max}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.21	<0.20
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	0.026 J	0.078 J	0.035 J	0.059 J	0.0088 J	16	0.47 J	0.11 J		0.045 J
Pyridine	7.8 {nc}	100 {nc}	--	mg/kg	<0.21	<0.44	<0.21	<0.41	<0.21	<1.7	<0.19	<0.21	<0.21	<0.20
Inorganics														
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	31,400	21,900 J	20,700 J	12,400 J	17,200 J	22,800 J	17,500 J	16,400 J		19,800 J
Antimony	3.1 {nc}	41 {nc}	--	mg/kg	0.320 B	0.340 B	0.340 B	0.590 B		<0.610 L	<0.620 L	<0.540 L		0.250 B
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	7.94 J	7.56 L	6.93 L	6.20 L	9.43 L	10.5 L	6.21 L	6.60 L		9.10 L
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	38.4	34.1	41.7	31.4	18.6	57.3	36.8	37.5		36.9
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	0.390 B	0.590 B	0.390 B	0.650 K	0.460 B	0.430 B	0.500 B	0.650 K		0.650 K
Cadmium	7 {nc}	81 {nc}	0.69	mg/kg	0.0800 J	0.260	0.270	0.380	<0.120	2.54	0.0800 J	<0.120		0.200
Calcium	--	--	--	mg/kg	24,400 J	3,330 J	40,400 J	118,000 J	1,580 J	3,200 J	2,420 J	1,150 J		4,950 J
Chromium	280 {ca**}	1,400 {ca**}	65.3	mg/kg	36.4 J	39.9	28.4	23.5	31.2	40.4	28.5	31.2		39.0
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	3.90 J	14.8 J	7.69 J	5.90 J	3.50 J	6.48 J	6.99 J	15.1 J		34.5 J
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	16.7 L	31.2	18.8	10.8	14.8	27.9	16.4	30.6		32.1
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	29,600 J	42,600 J	24,100 J	15,000 J	30,800 J	37,900 J	24,700 J	30,400 J		30,600 J
Lead	400 {++}	800 {++}	26.8	mg/kg	24.6	58.9 J	884	46.4 J	19.7	61.8 J	22.9 J	53.0 J		643 J
Magnesium	--	--	--	mg/kg	14,400 J	2,400	30,300	77,100	743	1,400	1,320	1,420		2,630
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	102 J	337 J	217 J	107 J	69.3 J	302 J	156 J	255 J		569 J
Mercury	3.1 {sat}	3.1 {sat}	0.13	mg/kg	0.0900	0.0600 L	0.0500 L	0.0700 L	0.0500 L	0.0500 L	0.0300 L	0.0500 L		0.0500 L
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	12.7	18.8	13.2	9.25	7.93	14.2	13.0	16.5		19.7
Potassium	--	--	--	mg/kg	836	542	2,800	740	388	658	534	651		817
Selenium	39 {nc}	510 {nc}	--	mg/kg	<1.21 L	<1.30 L	<1.21 L	<1.20 L	<1.23 L	<1.24 L	<1.09 L	<1.21 L		0.410 L
Silver	39 {nc}	510 {nc}	--	mg/kg	<1.21	<1.30	<1.21	<1.20	<1.23	<1.24	<1.09	<1.21		<1.20
Sodium	--	--	--	mg/kg	61.9	13.0 B	75.5	173	7.50 B	17.0 B	12.0 B	17.0 B		14.0 B
Thallium	0.51 {nc}	6.6 {nc}	2.11	mg/kg	0.140 J	0.270 B	0.280 J	0.220 B	0.220 B	0.200 B	0.210 B	0.220 B		0.270 B
Vanadium	55 {nc}	720 {nc}	108	mg/kg	54.3 J	71.6	46.8	34.9	56.5	76.3	48.0	50.8		49.8
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	49.8 J	171 J	57.5 J	52.0 J	22.7 J	1,110 J	55.7 J	99.6 J		459 J
Miscellaneous														
pH	--	--	--	pH Units	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.2 J
Total Organic Carbon	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	15,500

mg/kg	Milligrams per kilogram.
[a]	USEPA Regional Screening Levels (USEPA 2008a).
[b]	Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.
{ca}	Carcinogen.
{nc}	Noncarcinogen.
*	Noncarcinogen screening level is less than one hundred times the carcinogen screening level.
**	Noncarcinogen screening level is less than ten times the carcinogen screening level.
{++}	The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.
{max}	Concentration may exceed ceiling limit.
{sat}	Screening level may exceed saturation concentration.
B (Inorganics)	Constituent concentration quantified as estimated.
B (Organics)	Constituent was detected in the associated method blank.
J	Constituent concentration quantified as estimated.
K	Estimated concentration bias high.
L	Estimated concentration bias low.
NA	Not Analyzed.
[3.3]	Bracketed concentration indicates laboratory analytical result for duplicate sample.
24,400	Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).
10.6 J	Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).
16	Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Table B-9. Soil Analytical Results, Igniter Assembly Area, 2005 Shaw Soil Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Units	BPASS01 0 - 0.5 01/26/05	BPASS02 0 - 0.5 01/26/05	BPASS03 0 - 0.5 01/26/05	IASS06 0 - 0.5 01/26/05	IASS07 0 - 0.5 01/26/05	IASS08 0 - 0.5 01/26/05	IASS09 0 - 0.5 01/26/05	IASS10 0 - 0.5 01/26/05	IASS11 0 - 0.5 01/26/05
Sample Components												
Acid Soluble	--	--	%	0.8	0.4	0.3	20	5.7	0.9	13.4	15.5	5.9
Organics	--	--	%	7.3	6.5	6.1	25.1	20.3	6.3	12.5	9.7	9.2
Other	--	--	%	91.2	91.2	93.6	49.4	66.6	92.7	66.7	59.9	83.2
Asbestos												
Actinolite	--	--	%	<0	<0	<0	<0	<0	<0	<0	<0	<0
Amosite	--	--	%	<0	<0	<0	<0	<0	<0	<0	<0	<0
Anthophyllite	--	--	%	<0	<0	<0	<0	<0	<0	<0	<0	<0
Chrysotile	--	--	%	0.8	1.9	<0	5.5	7.4	0.1	7.4	15	1.7
Crocidolite	--	--	%	<0	<0	<0	<0	<0	<0	<0	<0	<0
Tremolite	--	--	%	<0	<0	<0	<0	<0	<0	<0	<0	<0
Total Asbestos	--	--	%	0.8	1.9	<0	5.5	7.4	0.1	7.4	15	1.7

[a] USEPA Regional Screening Levels (USEPA 2008a).
 % Percentage composition.

Table B-10. Conductive Flooring and Building Materials Analytical Results, Igniter Assembly Area, 2005 Shaw Soil Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Sample Name: Sample Matrix: Sample Type/Paint Color: Distance from Building (in): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]		BPADF01 Flooring Deteriorated - 01/26/05	BPAIF01 Flooring Intact - 01/26/05	BPAW01 Wipe - 01/26/05	IADF01 Flooring Deteriorated - 01/26/05	IADF02 Flooring Deteriorated - 01/26/05	IAIF01 Flooring Intact - 01/26/05	IAIF02 Flooring Intact - 01/26/05	IAWM01 Wall Intact - 01/26/05	IAW01 Wipe - 01/26/05	IAW02 Wipe - 01/26/05	IAPC01 Paint Gray - 01/26/05	IAPC02 Paint Light Blue/Green - 01/26/05	IAPC03 Paint Desert Sand - 01/26/05
Units																
Sample Components																
Acid Soluble	--	--	%	36.7	21.3	NA	26.3	31.1	24.8	30.1	68.4	NA	NA	NA	NA	NA
Organics	--	--	%	34.7	33.2	NA	20.4	28.2	23.2	22.4	4.3	NA	NA	NA	NA	NA
Other	--	--	%	21.4	31.8	NA	37.3	30.5	6.4	23.7	27.3	NA	NA	NA	NA	NA
Asbestos																
Actinolite	--	--	%	0.0	0.0	NA	0.0	0.0	0.0	0.0	0.0	NA	NA	NA	NA	NA
Amosite	--	--	%	0.0	0.0	NA	0.0	0.0	0.0	0.0	0.0	NA	NA	NA	NA	NA
Anthophyllite	--	--	%	0.0	0.0	NA	0.0	0.0	0.0	0.0	0.0	NA	NA	NA	NA	NA
Chrysotile	--	--	%	7.1	13.6	NA	16.0	10.2	15.6	23.7	0.0	NA	NA	NA	NA	NA
Crocidolite	--	--	%	0.0	0.0	NA	0.0	0.0	0.0	0.0	0.0	NA	NA	NA	NA	NA
Tremolite	--	--	%	0.0	0.0	NA	0.0	0.0	0.0	0.0	0.0	NA	NA	NA	NA	NA
Total Asbestos	--	--	%	7.1	13.6	NA	16.0	10.2	15.6	23.7	0.0	NA	NA	NA	NA	NA
Total Asbestos	--	--	s/cm ²	NA	NA	11,500,000	NA	NA	NA	NA	NA	1,090,000	9,820,000	NA	NA	NA
Inorganics																
Lead	400 {++}	800 {++}	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,100	37,200	49,500

[a]

USEPA Regional Screening Levels (USEPA 2008a).

in

Inches.

%

Percent composition

s/cm²

Structures per square centimeter.

mg/kg

Milligrams per kilogram.

NA

Not Analyzed.

{++}

The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.

24,400

Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).

10.6 J

Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).

Table B-11. XRF Screening Results for Soil, Sediment, and Conductive Flooring, Igniter Assembly Area, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID	Sample Depth (ft)	Date Collected	Distance From Building (ft)	Lead Result
Adjusted Soil Screening Values-Residential [a]:				400 {++}
Adjusted Soil Screening Values-Industrial [a]:				800 {++}
Facility-Wide Background Values [b]:				26.8
Units:				mg/kg
Building 8102-1				
IAA-R60A	0 - 0.5	07/31/08	1	268
IAA-R60B	0 - 0.5	07/31/08	5	25
IAA-R60C	0 - 0.5	07/31/08	10	22
IAA-R61A	0 - 0.5	07/31/08	1	52
IAA-R61B	0 - 0.5	07/31/08	5	25
IAA-R61C	0 - 0.5	07/31/08	10	45
IAA-R62A	0 - 0.5	07/31/08	1	55
IAA-R62B	0 - 0.5	07/31/08	5	38
IAA-R62C	0 - 0.5	07/31/08	10	41
IAA-R63A	0 - 0.5	07/31/08	1	58
IAA-R63B	0 - 0.5	07/31/08	5	91
IAA-R63C	0 - 0.5	07/31/08	10	62
IAA-R64A	0 - 0.5	07/31/08	1	105
IAA-R64B	0 - 0.5	07/31/08	5	36
IAA-R64C	0 - 0.5	07/31/08	10	35
IAA-R65A	0 - 0.5	07/31/08	1	291
IAA-R65B	0 - 0.5	07/31/08	5	42
IAA-R65C	0 - 0.5	07/31/08	10	16
IAA-R66A	0 - 0.5	07/31/08	1	269
IAA-R66B	0 - 0.5	07/31/08	5	119
IAA-R66C	0 - 0.5	07/31/08	10	49
IAA-R67A	0 - 0.5	07/31/08	1	135
IAA-R67B	0 - 0.5	07/31/08	5	75
IAA-R67C	0 - 0.5	07/31/08	10	34
IAA-R68A	0 - 0.5	07/31/08	1	31
IAA-R68B	0 - 0.5	07/31/08	5	57
IAA-R68C	0 - 0.5	07/31/08	10	31
IAA-R69A	0 - 0.5	07/31/08	1	19
IAA-R69B	0 - 0.5	07/31/08	5	53
IAA-R69C	0 - 0.5	07/31/08	10	32
Building 8102-2				
IAA-R52A	0 - 0.5	07/30/08	1	201
IAA-R52B	0 - 0.5	07/30/08	5	157
IAA-R52C	0 - 0.5	07/30/08	10	21
IAA-R53A	0 - 0.5	07/30/08	1	102
IAA-R53B	0 - 0.5	07/30/08	5	56
IAA-R53C	0 - 0.5	07/30/08	10	54
IAA-R54A	0 - 0.5	07/30/08	1	167
IAA-R54B	0 - 0.5	07/30/08	5	167
IAA-R54C	0 - 0.5	07/30/08	10	25
IAA-R55A	0 - 0.5	07/30/08	1	37
IAA-R55B	0 - 0.5	07/30/08	5	14
IAA-R55C	0 - 0.5	07/30/08	10	18
IAA-R56A	0 - 0.5	07/30/08	1	109
IAA-R56B	0 - 0.5	07/30/08	5	32
IAA-R56C	0 - 0.5	07/30/08	10	21
IAA-R57A	0 - 0.5	07/30/08	1	59
IAA-R57B	0 - 0.5	07/30/08	5	73
IAA-R57C	0 - 0.5	07/30/08	10	53
IAA-R58A	0 - 0.5	07/30/08	1	277
IAA-R58B	0 - 0.5	07/30/08	5	79
IAA-R58C	0 - 0.5	07/30/08	10	33
IAA-R59A	0 - 0.5	07/30/08	1	194
IAA-R59B	0 - 0.5	07/30/08	5	93
IAA-R59C	0 - 0.5	07/30/08	10	56

Notes found at end of table.

Table B-11. XRF Screening Results for Soil, Sediment, and Conductive Flooring, Igniter Assembly Area, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID	Sample Depth (ft)	Date Collected	Distance From Building (ft)	Lead Result
Adjusted Soil Screening Values-Residential [a]:				400 {++}
Adjusted Soil Screening Values-Industrial [a]:				800 {++}
Facility-Wide Background Values [b]:				26.8
Units:				mg/kg
Building 8102-3				
IAA-R44A	0 - 0.5	07/30/08	1	71
IAA-R44B	0 - 0.5	07/30/08	5	94
IAA-R44C	0 - 0.5	07/30/08	10	18
IAA-R45A	0 - 0.5	07/30/08	1	1,156
IAA-R45B	0 - 0.5	07/30/08	5	56
IAA-R45C	0 - 0.5	07/30/08	10	73
IAA-R46A	0 - 0.5	07/30/08	1	1,340
IAA-R46B	0 - 0.5	07/30/08	5	248
IAA-R46C	0 - 0.5	07/30/08	10	12
IAA-R47A	0 - 0.5	07/30/08	1	134
IAA-R47B	0 - 0.5	07/30/08	5	54
IAA-R47C	0 - 0.5	07/30/08	10	41
IAA-R48A	0 - 0.5	07/30/08	1	123
IAA-R48B	0 - 0.5	07/30/08	5	90
IAA-R48C	0 - 0.5	07/30/08	10	43
IAA-R49A	0 - 0.5	07/30/08	1	286
IAA-R49B	0 - 0.5	07/30/08	5	62
IAA-R49C	0 - 0.5	07/30/08	10	45
IAA-R50A	0 - 0.5	07/30/08	1	109
IAA-R50B	0 - 0.5	07/30/08	5	27
IAA-R50C	0 - 0.5	07/30/08	10	54
IAA-R51A	0 - 0.5	07/30/08	1	970
IAA-R51B	0 - 0.5	07/30/08	5	57
IAA-R51C	0 - 0.5	07/30/08	10	40
Building 8102-4				
IAA-R36A	0 - 0.5	07/30/08	1	26
IAA-R36B	0 - 0.5	07/30/08	5	16
IAA-R36C	0 - 0.5	07/30/08	10	29
IAA-R37A	0 - 0.5	07/30/08	1	187
IAA-R37B	0 - 0.5	07/30/08	5	50
IAA-R37C	0 - 0.5	07/30/08	10	36
IAA-R38A	0 - 0.5	07/30/08	1	487
IAA-R38B	0 - 0.5	07/30/08	5	159
IAA-R38C	0 - 0.5	07/30/08	10	53
IAA-R39A	0 - 0.5	07/30/08	1	1,185
IAA-R39B	0 - 0.5	07/30/08	5	101
IAA-R39C	0 - 0.5	07/30/08	10	60
IAA-R40A	0 - 0.5	07/30/08	1	152
IAA-R40B	0 - 0.5	07/30/08	5	87
IAA-R40C	0 - 0.5	07/30/08	10	98
IAA-R41A	0 - 0.5	07/30/08	1	85
IAA-R41B	0 - 0.5	07/30/08	5	55
IAA-R41C	0 - 0.5	07/30/08	10	57
IAA-R42A	0 - 0.5	07/30/08	1	299
IAA-R42B	0 - 0.5	07/30/08	5	123
IAA-R42C	0 - 0.5	07/30/08	10	59
IAA-R43A	0 - 0.5	07/30/08	1	58
IAA-R43B	0 - 0.5	07/30/08	5	88
IAA-R43C	0 - 0.5	07/30/08	10	80

Notes found at end of table.

Table B-11. XRF Screening Results for Soil, Sediment, and Conductive Flooring, Igniter Assembly Area, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID	Sample Depth (ft)	Date Collected	Distance From Building (ft)	Lead Result
Adjusted Soil Screening Values-Residential [a]:				400 {++}
Adjusted Soil Screening Values-Industrial [a]:				800 {++}
Facility-Wide Background Values [b]:				26.8
Units:				mg/kg
Building 8102-5				
IAA-R28A	0 - 0.5	07/30/08	1	380
IAA-R28B	0 - 0.5	07/30/08	5	98
IAA-R28C	0 - 0.5	07/30/08	10	15
IAA-R29A	0 - 0.5	07/30/08	1	159
IAA-R29B	0 - 0.5	07/30/08	5	68
IAA-R29C	0 - 0.5	07/30/08	10	54
IAA-R30A	0 - 0.5	07/30/08	1	201
IAA-R30B	0 - 0.5	07/30/08	5	53
IAA-R30C	0 - 0.5	07/30/08	10	53
IAA-R31A	0 - 0.5	07/30/08	1	290
IAA-R31B	0 - 0.5	07/30/08	5	38
IAA-R31C	0 - 0.5	07/30/08	10	36
IAA-R32A	0 - 0.5	07/30/08	1	338
IAA-R32B	0 - 0.5	07/30/08	5	48
IAA-R32C	0 - 0.5	07/30/08	10	59
IAA-R33A	0 - 0.5	07/30/08	1	164
IAA-R33B	0 - 0.5	07/30/08	5	38
IAA-R33C	0 - 0.5	07/30/08	10	10
IAA-R34A	0 - 0.5	07/30/08	1	154
IAA-R34B	0 - 0.5	07/30/08	5	132
IAA-R34C	0 - 0.5	07/30/08	10	35
IAA-R35A	0 - 0.5	07/30/08	1	201
IAA-R35B	0 - 0.5	07/30/08	5	101
IAA-R35C	0 - 0.5	07/30/08	10	58
Building 8102-6				
IAA-R20A	0 - 0.5	07/30/08	1	125
IAA-R20B	0 - 0.5	07/30/08	5	36
IAA-R20C	0 - 0.5	07/30/08	10	13
IAA-R21A	0 - 0.5	07/30/08	1	21
IAA-R21B	0 - 0.5	07/30/08	5	120
IAA-R21C	0 - 0.5	07/30/08	10	38
IAA-R22A	0 - 0.5	07/30/08	1	92
IAA-R22B	0 - 0.5	07/30/08	5	124
IAA-R22C	0 - 0.5	07/30/08	10	30
IAA-R23A	0 - 0.5	07/30/08	1	74
IAA-R23B	0 - 0.5	07/30/08	5	35
IAA-R23C	0 - 0.5	07/30/08	10	44
IAA-R24A	0 - 0.5	07/30/08	1	150
IAA-R24B	0 - 0.5	07/30/08	5	45
IAA-R24C	0 - 0.5	07/30/08	10	58
IAA-R25A	0 - 0.5	07/30/08	1	114
IAA-R25B	0 - 0.5	07/30/08	5	169
IAA-R25C	0 - 0.5	07/30/08	10	45
IAA-R26A	0 - 0.5	07/30/08	1	85
IAA-R26B	0 - 0.5	07/30/08	5	70
IAA-R26C	0 - 0.5	07/30/08	10	33
IAA-R27A	0 - 0.5	07/30/08	1	54
IAA-R27B	0 - 0.5	07/30/08	5	79
IAA-R27C	0 - 0.5	07/30/08	10	68

Notes found at end of table.

Table B-11. XRF Screening Results for Soil, Sediment, and Conductive Flooring, Igniter Assembly Area, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID	Sample Depth (ft)	Date Collected	Distance From Building (ft)	Lead Result
Adjusted Soil Screening Values-Residential [a]:				400 {++}
Adjusted Soil Screening Values-Industrial [a]:				800 {++}
Facility-Wide Background Values [b]:				26.8
Units:				mg/kg
Building 8102-7				
IAA-R12A	0 - 0.5	07/29/08	1	55
IAA-R12B	0 - 0.5	07/29/08	5	53
IAA-R12C	0 - 0.5	07/29/08	10	31
IAA-R13A	0 - 0.5	07/29/08	1	40
IAA-R13B	0 - 0.5	07/29/08	5	30
IAA-R13C	0 - 0.5	07/29/08	10	26
IAA-R14A	0 - 0.5	07/29/08	1	116
IAA-R14B	0 - 0.5	07/29/08	5	123
IAA-R14C	0 - 0.5	07/29/08	10	42
IAA-R15A	0 - 0.5	07/29/08	1	317
IAA-R15B	0 - 0.5	07/29/08	5	54
IAA-R15C	0 - 0.5	07/29/08	10	38
IAA-R16A	0 - 0.5	07/29/08	1	192
IAA-R16B	0 - 0.5	07/29/08	5	61
IAA-R16C	0 - 0.5	07/29/08	10	29
IAA-R17A	0 - 0.5	07/30/08	1	176
IAA-R17B	0 - 0.5	07/30/08	5	96
IAA-R17C	0 - 0.5	07/30/08	10	74
IAA-R18A	0 - 0.5	07/30/08	1	194
IAA-R18B	0 - 0.5	07/30/08	5	96
IAA-R18C	0 - 0.5	07/30/08	10	47
IAA-R19A	0 - 0.5	07/30/08	1	125
IAA-R19B	0 - 0.5	07/30/08	5	54
IAA-R19C	0 - 0.5	07/30/08	10	28
Building 8102-8				
IAA-R1A	0 - 0.5	07/29/08	1	348
IAA-R1B	0 - 0.5	07/29/08	5	201
IAA-R1C	0 - 0.5	07/29/08	10	13
IAA-R2A	0 - 0.5	07/29/08	1	146
IAA-R2B	0 - 0.5	07/29/08	5	28
IAA-R2C	0 - 0.5	07/29/08	10	13
IAA-R3A	0 - 0.5	07/29/08	1	139
IAA-R3B	0 - 0.5	07/29/08	5	62
IAA-R3C	0 - 0.5	07/29/08	10	55
IAA-R4A	0 - 0.5	07/29/08	1	20
IAA-R4B	0 - 0.5	07/29/08	5	107
IAA-R4C	0 - 0.5	07/29/08	10	47
IAA-R5A	0 - 0.5	07/29/08	1	41
IAA-R5B	0 - 0.5	07/29/08	5	34
IAA-R5C	0 - 0.5	07/29/08	10	105
IAA-R6A	0 - 0.5	07/29/08	1	55
IAA-R6B	0 - 0.5	07/29/08	5	72
IAA-R6C	0 - 0.5	07/29/08	10	32
IAA-R7A	0 - 0.5	07/29/08	1	76
IAA-R7B	0 - 0.5	07/29/08	5	24
IAA-R7C	0 - 0.5	07/29/08	10	35
IAA-R8A	0 - 0.5	07/29/08	1	306
IAA-R8B	0 - 0.5	07/29/08	5	81
IAA-R8C	0 - 0.5	07/29/08	10	67
IAA-R9A	0 - 0.5	07/29/08	1	162
IAA-R9B	0 - 0.5	07/29/08	5	9
IAA-R9C	0 - 0.5	07/29/08	10	43
IAA-R10A	0 - 0.5	07/29/08	1	201
IAA-R10B	0 - 0.5	07/29/08	5	55
IAA-R10C	0 - 0.5	07/29/08	10	32
IAA-R11A	0 - 0.5	07/29/08	1	76
IAA-R11B	0 - 0.5	07/29/08	5	43
IAA-R11C	0 - 0.5	07/29/08	10	54

Notes found at end of table.

Table B-11. XRF Screening Results for Soil, Sediment, and Conductive Flooring, Igniter Assembly Area, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID	Sample Depth (ft)	Date Collected	Distance From Building (ft)	Lead Result
Adjusted Soil Screening Values-Residential [a]:				400 {++}
Adjusted Soil Screening Values-Industrial [a]:				800 {++}
Facility-Wide Background Values [b]:				26.8
Units:				mg/kg
Building 528				
IAA-R70A	0 - 0.5	07/31/08	1	34
IAA-R70B	0 - 0.5	07/31/08	5	31
IAA-R70C	0 - 0.5	07/31/08	10	27
IAA-R71A	0 - 0.5	07/31/08	1	19
IAA-R71B	0 - 0.5	07/31/08	5	35
IAA-R71C	0 - 0.5	07/31/08	10	21
IAA-R72A	0 - 0.5	07/31/08	1	66
IAA-R72B	0 - 0.5	07/31/08	5	180
IAA-R72C	0 - 0.5	07/31/08	10	11
IAA-R73A	0 - 0.5	07/31/08	1	34
IAA-R73B	0 - 0.5	07/31/08	5	38
IAA-R73C	0 - 0.5	07/31/08	10	24
Building 529				
IAA-R74A	0 - 0.5	07/31/08	1	26
IAA-R74B	0 - 0.5	07/31/08	5	14
IAA-R74C	0 - 0.5	07/31/08	10	26
IAA-R75A	0 - 0.5	07/31/08	1	20
IAA-R75B	0 - 0.5	07/31/08	5	26
IAA-R75C	0 - 0.5	07/31/08	10	45
IAA-R76A	0 - 0.5	07/31/08	1	37
IAA-R76B	0 - 0.5	07/31/08	5	24
IAA-R76C	0 - 0.5	07/31/08	10	25
IAA-R77A	0 - 0.5	07/31/08	1	40
IAA-R77B	0 - 0.5	07/31/08	5	37
IAA-R77C	0 - 0.5	07/31/08	10	29
Building XXXX				
IAA-R78A	0 - 0.5	07/31/08	1	30
IAA-R78B	0 - 0.5	07/31/08	5	32
IAA-R78C	0 - 0.5	07/31/08	10	23
IAA-R79A	0 - 0.5	07/31/08	1	30
IAA-R79B	0 - 0.5	07/31/08	5	20
IAA-R79C	0 - 0.5	07/31/08	10	13
Building 522				
IAA-R80A	0 - 0.5	07/31/08	1	476
IAA-R80B	0 - 0.5	07/31/08	5	58
IAA-R80C	0 - 0.5	07/31/08	10	44
IAA-R81A	0 - 0.5	07/31/08	1	405
IAA-R81B	0 - 0.5	07/31/08	5	364
IAA-R81C	0 - 0.5	07/31/08	10	104
IAA-R82A	0 - 0.5	07/31/08	1	717
IAA-R82B	0 - 0.5	07/31/08	5	378
IAA-R82C	0 - 0.5	07/31/08	10	134
IAA-R83A	0 - 0.5	07/31/08	1	2,568
IAA-R83B	0 - 0.5	07/31/08	5	290
IAA-R83C	0 - 0.5	07/31/08	10	104
IAA-R84A	0 - 0.5	07/31/08	1	53
IAA-R84B	0 - 0.5	07/31/08	5	53
IAA-R84C	0 - 0.5	07/31/08	10	30
IAA-R85A	0 - 0.5	07/31/08	1	1,880
IAA-R85B	0 - 0.5	07/31/08	5	1,480
IAA-R85C	0 - 0.5	07/31/08	10	1,039
IAA-R85D	0 - 0.5	07/31/08	15	40
IAA-R86A	0 - 0.5	07/31/08	1	725
IAA-R86B	0 - 0.5	07/31/08	5	378
IAA-R86C	0 - 0.5	07/31/08	10	108

Notes found at end of table.

Table B-11. XRF Screening Results for Soil, Sediment, and Conductive Flooring, Igniter Assembly Area, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID	Sample Depth (ft)	Date Collected	Distance From Building (ft)	Lead Result
Adjusted Soil Screening Values-Residential [a]:				400 {++}
Adjusted Soil Screening Values-Industrial [a]:				800 {++}
Facility-Wide Background Values [b]:				26.8
Units:				mg/kg
Building 522A				
IAA-R87A	0 - 0.5	07/31/08	1	49
IAA-R87B	0 - 0.5	07/31/08	5	19
IAA-R87C	0 - 0.5	07/31/08	10	29
IAA-R88A	0 - 0.5	07/31/08	1	1,532
IAA-R88B	0 - 0.5	07/31/08	5	352
IAA-R88C	0 - 0.5	07/31/08	10	133
IAA-R89A	0 - 0.5	07/31/08	1	1,414
IAA-R89B	0 - 0.5	07/31/08	5	239
IAA-R89C	0 - 0.5	07/31/08	10	136
IAA-R90A	0 - 0.5	07/31/08	1	1,116
IAA-R90B	0 - 0.5	07/31/08	5	416
IAA-R90C	0 - 0.5	07/31/08	10	132
IAA-R91A	0 - 0.5	07/31/08	1	378
IAA-R91B	0 - 0.5	07/31/08	5	267
IAA-R91C	0 - 0.5	07/31/08	10	149
IAA-R92A	0 - 0.5	07/31/08	1	532
IAA-R92B	0 - 0.5	07/31/08	5	397
IAA-R92C	0 - 0.5	07/31/08	10	114
IAA-R93A	0 - 0.5	07/31/08	1	1,516
IAA-R93B	0 - 0.5	07/31/08	5	384
IAA-R93C	0 - 0.5	07/31/08	10	52
Building 509				
IAA-R94A	0 - 0.5	07/31/08	1	191
IAA-R94B	0 - 0.5	07/31/08	5	26
IAA-R94C	0 - 0.5	07/31/08	10	23
IAA-R95A	0 - 0.5	07/31/08	1	93
IAA-R95B	0 - 0.5	07/31/08	5	48
IAA-R95C	0 - 0.5	07/31/08	10	17
IAA-R96A	0 - 0.5	07/31/08	1	19
IAA-R96B	0 - 0.5	07/31/08	5	27
IAA-R96C	0 - 0.5	07/31/08	10	16
IAA-R97A	0 - 0.5	07/31/08	1	34
IAA-R97B	0 - 0.5	07/31/08	5	33
IAA-R97C	0 - 0.5	07/31/08	10	57
Building 508				
IAA-R98A	0 - 0.5	07/31/08	1	10
IAA-R98B	0 - 0.5	07/31/08	5	16
IAA-R98C	0 - 0.5	07/31/08	10	38
IAA-R99A	0 - 0.5	07/31/08	1	29
IAA-R99B	0 - 0.5	07/31/08	5	31
IAA-R99C	0 - 0.5	07/31/08	10	26
IAA-R100A	0 - 0.5	08/01/08	1	21
IAA-R100B	0 - 0.5	08/01/08	5	123
IAA-R100C	0 - 0.5	08/01/08	10	15
IAA-R101A	0 - 0.5	08/01/08	1	89
IAA-R101B	0 - 0.5	08/01/08	5	43
IAA-R101C	0 - 0.5	08/01/08	10	85
Building YYYY				
IAA-R102A	0 - 0.5	08/01/08	1	41
IAA-R102B	0 - 0.5	08/01/08	5	28
IAA-R102C	0 - 0.5	08/01/08	10	18
IAA-R103A	0 - 0.5	08/01/08	1	175
IAA-R103B	0 - 0.5	08/01/08	5	42
IAA-R103C	0 - 0.5	08/01/08	10	29

Notes found at end of table.

Table B-11. XRF Screening Results for Soil, Sediment, and Conductive Flooring, Igniter Assembly Area, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID	Sample Depth (ft)	Date Collected	Distance From Building (ft)	Lead Result
Adjusted Soil Screening Values-Residential [a]:				400 {++}
Adjusted Soil Screening Values-Industrial [a]:				800 {++}
Facility-Wide Background Values [b]:				26.8
Units:				mg/kg
Building 504				
IAA-R104A	0 - 0.5	08/01/08	1	165
IAA-R104B	0 - 0.5	08/01/08	5	98
IAA-R104C	0 - 0.5	08/01/08	10	52
IAA-R105A	0 - 0.5	08/01/08	1	4,896
IAA-R105B	0 - 0.5	08/01/08	5	668
IAA-R105C	0 - 0.5	08/01/08	10	477
IAA-R105D	0 - 0.5	08/01/08	15	313
IAA-R106A	0 - 0.5	08/01/08	1	16,597
IAA-R106B	0 - 0.5	08/01/08	5	8,329
IAA-R106C	0 - 0.5	08/01/08	10	1,107
IAA-R106D	0 - 0.5	08/01/08	15	1,896
IAA-R107A	0 - 0.5	08/01/08	1	330
IAA-R107B	0 - 0.5	08/01/08	5	107
IAA-R107C	0 - 0.5	08/01/08	10	67
IAA-R108A	0 - 0.5	08/01/08	1	3,315
IAA-R108B	0 - 0.5	08/01/08	5	3,357
IAA-R108C	0 - 0.5	08/01/08	10	444
IAA-R108D	0 - 0.5	08/01/08	15	230
IAA-R109A	0 - 0.5	08/01/08	1	5,583
IAA-R109B	0 - 0.5	08/01/08	5	1,355
IAA-R109C	0 - 0.5	08/01/08	10	135
IAA-R110A	0 - 0.5	08/01/08	1	938
IAA-R110B	0 - 0.5	08/01/08	5	857
IAA-R110C	0 - 0.5	08/01/08	10	122
Building 502				
IAA-R111A	0 - 0.5	08/01/08	1	30
IAA-R111B	0 - 0.5	08/01/08	5	49
IAA-R111C	0 - 0.5	08/01/08	10	19
IAA-R112A	0 - 0.5	08/01/08	1	10,280
IAA-R112B	0 - 0.5	08/01/08	5	8,530
IAA-R112C	0 - 0.5	08/01/08	10	4,657
IAA-R112D	0 - 0.5	08/01/08	15	2,121
IAA-R112E	0 - 0.2	08/01/08	20	9,500
IAA-R112E	0.2 - 0.5	08/01/08	20	15,379
IAA-R113A	0 - 0.5	08/01/08	1	2,364
IAA-R113B	0 - 0.5	08/01/08	5	3,772
IAA-R113C	0 - 0.5	08/01/08	10	1,183
IAA-R114A	0 - 0.5	08/01/08	1	50,000
IAA-R114B	0 - 0.5	08/01/08	5	1,330
IAA-R114C	0 - 0.5	08/01/08	10	860
IAA-R114D	0 - 0.5	08/01/08	15	291
IAA-R115A	0 - 0.5	08/01/08	1	14,036
IAA-R115B	0 - 0.5	08/01/08	5	5,449
IAA-R115C	0 - 0.5	08/01/08	10	1,175
IAA-R116A	0 - 0.5	08/01/08	1	6,951
IAA-R116B	0 - 0.5	08/01/08	5	16,953
IAA-R116C	0 - 0.5	08/01/08	10	2,405
IAA-R117A	0 - 0.5	08/01/08	1	6,651
IAA-R117B	0 - 0.5	08/01/08	5	1,818
IAA-R117C	0 - 0.5	08/01/08	10	7,175

Notes found at end of table.

Table B-11. XRF Screening Results for Soil, Sediment, and Conductive Flooring, Igniter Assembly Area, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID	Sample Depth (ft)	Date Collected	Distance From Building (ft)	Lead Result
Adjusted Soil Screening Values-Residential [a]:				400 {++}
Adjusted Soil Screening Values-Industrial [a]:				800 {++}
Facility-Wide Background Values [b]:				26.8
Units:				mg/kg
Building 4				
IAA-R118A	0 - 0.5	08/01/08	1	188
IAA-R118B	0 - 0.5	08/01/08	5	27
IAA-R118C	0 - 0.5	08/01/08	10	40
IAA-R119A	0 - 0.5	08/01/08	1	37
IAA-R119B	0 - 0.5	08/01/08	5	22
IAA-R119C	0 - 0.5	08/01/08	10	34
IAA-R120A	0 - 0.5	08/01/08	1	176
IAA-R120B	0 - 0.5	08/01/08	5	29
IAA-R120C	0 - 0.5	08/01/08	10	39
IAA-R121A	0 - 0.5	08/01/08	1	130
IAA-R121B	0 - 0.5	08/01/08	5	200
IAA-R121C	0 - 0.5	08/01/08	10	23
IAA-R122A	0 - 0.5	08/01/08	1	65
IAA-R122B	0 - 0.5	08/01/08	5	28
IAA-R122C	0 - 0.5	08/01/08	10	52
IAA-R123A	0 - 0.5	08/01/08	1	588
IAA-R123B	0 - 0.5	08/01/08	5	21
IAA-R123C	0 - 0.5	08/01/08	10	27
Building 5				
IAA-R124A	0 - 0.5	08/01/08	1	61
IAA-R124B	0 - 0.5	08/01/08	5	48
IAA-R124C	0 - 0.5	08/01/08	10	50
IAA-R125A	0 - 0.5	08/01/08	1	156
IAA-R125B	0 - 0.5	08/01/08	5	104
IAA-R125C	0 - 0.5	08/01/08	10	341
IAA-R126A	0 - 0.5	08/01/08	1	1,046
IAA-R126B	0 - 0.5	08/01/08	5	885
IAA-R126C	0 - 0.5	08/01/08	10	1,425
IAA-R126D	0 - 0.5	08/01/08	15	121
IAA-R127A	0 - 0.5	08/01/08	1	186
IAA-R127B	0 - 0.5	08/01/08	5	147
IAA-R127C	0 - 0.5	08/01/08	10	287
Building AE (2)				
IAA-R128A	0 - 0.5	08/01/08	1	137
IAA-R128B	0 - 0.5	08/01/08	5	104
IAA-R129A	0 - 0.5	08/01/08	1	178
IAA-R129B	0 - 0.5	08/01/08	5	57
IAA-R129C	0 - 0.5	08/01/08	10	72
IAA-R130A	0 - 0.5	08/01/08	1	80
IAA-R130B	0 - 0.5	08/01/08	5	76
IAA-R130C	0 - 0.5	08/01/08	10	61
IAA-R131A	0 - 0.5	08/01/08	1	259
IAA-R131B	0 - 0.5	08/01/08	5	114
IAA-R131C	0 - 0.5	08/01/08	10	48
Building AF (1)				
IAA-R132A	0 - 0.5	08/01/08	1	36
IAA-R132B	0 - 0.5	08/01/08	5	42
IAA-R132C	0 - 0.5	08/01/08	10	31
IAA-R133A	0 - 0.5	08/01/08	1	35
IAA-R133B	0 - 0.5	08/01/08	5	57
IAA-R133C	0 - 0.5	08/01/08	10	37
IAA-R134A	0 - 0.5	08/01/08	1	49
IAA-R134B	0 - 0.5	08/01/08	5	37
IAA-R134C	0 - 0.5	08/01/08	10	40
Building 570				
IAA-R135A	0 - 0.5	08/01/08	1	43
IAA-R135B	0 - 0.5	08/01/08	5	26
IAA-R135C	0 - 0.5	08/01/08	10	17
IAA-R136A	0 - 0.5	08/01/08	1	54
IAA-R136B	0 - 0.5	08/01/08	5	20
IAA-R136C	0 - 0.5	08/01/08	10	23

Notes found at end of table.

Table B-11. XRF Screening Results for Soil, Sediment, and Conductive Flooring, Igniter Assembly Area, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID	Sample Depth (ft)	Date Collected	Distance From Building (ft)	Lead Result
Adjusted Soil Screening Values-Residential [a]:				400 {++}
Adjusted Soil Screening Values-Industrial [a]:				800 {++}
Facility-Wide Background Values [b]:				26.8
Units:				mg/kg
Building 562				
IAA-R137A	0 - 0.5	08/01/08	1	2,695
IAA-R137B	0 - 0.5	08/01/08	5	274
IAA-R137C	0 - 0.5	08/01/08	10	258
IAA-R138A	0 - 0.5	08/01/08	1	67
IAA-R138B	0 - 0.5	08/01/08	5	62
IAA-R138C	0 - 0.5	08/01/08	10	26
IAA-R139A	0 - 0.5	08/01/08	1	49
IAA-R139B	0 - 0.5	08/01/08	5	24
IAA-R139C	0 - 0.5	08/01/08	10	19
IAA-R140A	0 - 0.5	08/01/08	1	64
IAA-R140B	0 - 0.5	08/01/08	5	12
IAA-R140C	0 - 0.5	08/01/08	10	23
Building 571				
IAA-R141A	0 - 0.5	08/01/08	1	27
IAA-R141B	0 - 0.5	08/01/08	5	17
IAA-R141C	0 - 0.5	08/01/08	10	22
IAA-R142A	0 - 0.5	08/01/08	1	60
IAA-R142B	0 - 0.5	08/01/08	5	42
IAA-R142C	0 - 0.5	08/01/08	10	25
IAA-R143A	0 - 0.5	08/01/08	1	28
IAA-R143B	0 - 0.5	08/01/08	5	19
IAA-R143C	0 - 0.5	08/01/08	10	12
Building 565B				
IAA-R144A	0 - 0.5	08/01/08	1	58
IAA-R144B	0 - 0.5	08/01/08	5	42
IAA-R144C	0 - 0.5	08/01/08	10	31
IAA-R145A	0 - 0.5	08/01/08	1	133
IAA-R146A	0 - 0.5	08/01/08	1	43
IAA-R146B	0 - 0.5	08/01/08	5	57
IAA-R146C	0 - 0.5	08/01/08	10	53
IAA-R147A	0 - 0.5	08/01/08	1	31
IAA-R147B	0 - 0.5	08/01/08	5	18
IAA-R147C	0 - 0.5	08/01/08	10	20
Building 565B				
IAA-R148A	0 - 0.5	08/01/08	1	167
IAA-R148B	0 - 0.5	08/01/08	5	34
IAA-R148C	0 - 0.5	08/01/08	10	35
IAA-R149A	0 - 0.5	08/01/08	1	945
IAA-R149B	0 - 0.5	08/01/08	5	122
IAA-R149C	0 - 0.5	08/01/08	10	12
IAA-R150A	0 - 0.5	08/01/08	1	27
IAA-R150B	0 - 0.5	08/01/08	5	41
IAA-R150C	0 - 0.5	08/01/08	10	22
IAA-R151A	0 - 0.5	08/01/08	1	377
IAA-R151B	0 - 0.5	08/01/08	5	53
IAA-R151C	0 - 0.5	08/01/08	10	48
IAA-R152A	0 - 0.5	08/01/08	1	247
IAA-R152B	0 - 0.5	08/01/08	5	48
IAA-R152C	0 - 0.5	08/01/08	10	22
Building 8102-A				
IAA-R153A	0 - 0.5	08/01/08	1	68
IAA-R153B	0 - 0.5	08/01/08	5	29
IAA-R153C	0 - 0.5	08/01/08	10	22
IAA-R154A	0 - 0.5	08/01/08	1	113
IAA-R154B	0 - 0.5	08/01/08	5	20
IAA-R154C	0 - 0.5	08/01/08	10	23
IAA-R155A	0 - 0.5	08/01/08	1	56
BuildingAD				
IAA-R156A	0 - 0.5	08/01/08	1	66
IAA-R156B	0 - 0.5	08/01/08	5	40
IAA-R156C	0 - 0.5	08/01/08	10	19
IAA-R157A	0 - 0.5	08/01/08	1	64
IAA-R157B	0 - 0.5	08/01/08	5	68
IAA-R157C	0 - 0.5	08/01/08	10	77

Notes found at end of table.

Table B-11. XRF Screening Results for Soil, Sediment, and Conductive Flooring, Igniter Assembly Area, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID	Sample Depth (ft)	Date Collected	Distance From Building (ft)	Lead Result
Adjusted Soil Screening Values-Residential [a]:				400 {++}
Adjusted Soil Screening Values-Industrial [a]:				800 {++}
Facility-Wide Background Values [b]:				26.8
Units:				mg/kg
In-Situ Sediment Screening Results				
IAA-SE001X	0 - 0.5	08/01/08	--	48
IAA-SE002X	0 - 0.5	08/01/08	--	35
IAA-SE003X	0 - 0.5	08/01/08	--	43
IAA-SE004X	0 - 0.5	08/01/08	--	39
IAA-SE005X	0 - 0.5	08/01/08	--	25
IAA-SE006X	0 - 0.5	08/01/08	--	21
IAA-SE007X	0.33	08/01/08	--	21
IAA-SE008X	0.17	08/01/08	--	24
IAA-SE009X	0.17	08/01/08	--	40

[a] USEPA Regional Screening Levels (USEPA 2008a).

[b] Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.

ft Feet.

mg/kg Milligrams per kilogram.

{++} The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.

24,400 Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).

10.6 J Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).

16 Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Table B-12. Soil Analytical Results, Igniter Assembly Area, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected: Corresponding XRF Screening Location: Building :	Adjusted Soil Screening Values Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	IAA-SS024	IAA-SS025	IAA-SS026	IAA-SS027	IAA-SS028	IAA-SS029	IAA-SS030	IAA-SS031	IAA-SS032	IAA-SS033	IAA-SS034	IAA-SS035	IAA-SS036	IAA-SS037	IAA-SS038	IAA-SS039	IAA-SS040	IAA-SS041	IAA-SS042	IAA-SS043
					0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
					08/01/08	08/01/08	08/01/08	08/01/08	08/01/08	08/01/08	08/01/08	08/01/08	08/01/08	08/01/08	08/01/08	08/05/08	08/05/08	08/05/08	08/05/08	08/05/08	08/05/08	08/05/08	08/05/08	08/05/08
					IAA-R100B 508	IAA-R103A YYYY	IAA-R106B 504	IAA-R108B 504	IAA-R112B 502	IAA-R115C 502	IAA-R73C 528	IAA-R76A 529	IAA-R85B 522	IAA-R89A 522A	IAA-R92B 522A	IAA-R154A 8102A	IAA-R142A 571	IAA-R146A 565B	IAA-R151A 565	IAA-R138A 562	IAA-R133B 1	IAA-R131A 2	IAA-R125C 5	IAA-R121B 4
XRF Metals	400 (++)	800 (++)	26.8	mg/kg	280	193	8,329	1,779	8,530	1,175	35	37	830	1,414	397	101	181	49	377	67	57	259	341	23
Lead																								
PCBs																								
Aroclor-1016	0.39 (nc)	21 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1221	0.17 (ca**)	0.62 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1232	0.17 (ca**)	0.62 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1242	0.22 (ca**)	0.74 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1248	0.22 (ca**)	0.74 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1254	0.22 (ca**)	0.74 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1260	0.22 (ca**)	0.74 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PCBs	0.24 (ca**)	0.86 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics																								
Aluminum	7,700 (nc)	990,000 (max)	40,041	mg/kg	21,000	12,500	9,420 [8,330]	11,900	881	9,850	20,200	22,900	5,140	8,330	6,850	22,600	15,400	18,600	27,300 [20,300]	17,700	17,500	16,900	25,200	17,000
Antimony	3.1 (nc)	41 (nc)	--	mg/kg	<3.40 J	<5.60 J	3.00 [12.70 J]	<3.70 J	16.9 J	<3.70 J	<3.80 J	<4.30 J	<3.10 J	<3.20 J	<2.90 J	<4.20 J	<4.20 J	<4.30 J	<4.50 J [<3.80 J]	<4.10 J	<5.00 J	<4.20 J	<4.20 J	<3.90 J
Arsenic	0.39 (ca*)	1.6 (ca)	15.8	mg/kg	56.0	8.10	12.0 [9.70]	11.8	62.9	9.00	13.5	23.8	2.60	5.20	1.60	8.70	6.80	12.0	12.0 [9.20]	6.80	9.90	25.8	18.9	9.60
Barium	1,500 (nc)	190,000 (max)	209	mg/kg	37.7	3,980	714 [548]	223 J	310	288	25.5	35.7	537	3,210	98.5	48.8	74.1	48.1	330 J [127 J]	166	33.0	122	40.2	39.9
Beryllium	16 (nc)	200 (nc)	1.02	mg/kg	0.740 J	0.410 J	0.690 J [0.600 J]	1.00 J	<1.20	0.510 J	0.780 J	0.810 J	0.500 J	0.720 J	0.570 J	0.910 J	0.490 J	0.560 J	0.950 J [0.750 J]	0.460 J	0.750 J	0.660 J	1.70	0.470 J
Cadmium	7 (nc)	81 (nc)	0.69	mg/kg	0.650 J	1.40 J	3.30 [2.10]	2.20	<6.20	0.850 J	<1.30	<1.40	1.30	9.20	2.30	<1.40	<1.40	<1.40	<1.50 [<1.30]	<1.40	<1.70	2.10	0.320 J	<1.30
Calcium	--	--	--	mg/kg	1,160	5,340 J	190,000 J [167,000]	74,000 J	4,130 J	2,330 J	513 J	2,070	165,000	144,000	156,000	1,530	2,150	1,770	1,200 J [1,360]	2,680	8,860	16,900	2,500	1,550
Chromium	280 (ca**)	1,400 (ca**)	65.3	mg/kg	89.3	38.3	1,110 [860]	31.0	986	262	35.9	43.5	13.3	25.0	11.9	38.9	25.3	36.2	46.1 [35.0]	33.7	35.1	43.9	49.7	29.8
Cobalt	2.3 (nc)	30 (nc)	72.3	mg/kg	5.70	<27.8	15.3 [12.1]	16.2 J	26.7	6.70	3.70 J	3.80 J	2.70 J	6.00 J	3.60	9.10	2.80 J	4.50	7.20 [6.60]	2.00 J	5.00	45.3	30.7	3.40 J
Copper	310 (nc)	4,100 (nc)	53.5	mg/kg	152	8,670	697 [645]	94.6	1,170	374	56.7	42.4	833	5,690	32.9	166	137	108	158 J [435 J]	275	139	8,930	110	125
Iron	5,500 (nc)	720,000 (max)	50,962	mg/kg	45,600	25,600	90,900 [74,200]	29,900	328,000	37,200	35,300	44,700	9,450	15,800	10,100	35,100	29,000	33,800	44,500 [32,900]	29,000	33,200	37,300	53,900	29,700
Lead	400 (++)	800 (++)	26.8	mg/kg	118 J	299 J	9,450 J [6,820 J]	744 J	6,160 J	1,750 J	23.4 J	38.0 J	898 J	905 J	294 J	35.0 J	101 J	94.5 J	71.4 J [33.9 J]	111 J	139 J	302 J	199 J	46.7 J
Magnesium				mg/kg	636 J	5,410	45,800 [63,800]	37,100 J	2,200	1,530	576 J	920 J	82,500	86,100	73,100	2,740	1,190 J	1,180 J	1,090 J [1,230 J]	1,170 J	5,220	9,880	1,240 J	1,230 J
Manganese	180 (nc)	2,300 (nc)	2,543	mg/kg	293	394	639 [435]	889 J	1,470	363	104	134	166	191	139	518	137	231	173 [49.0]	89.9	108	703	964	220
Mercury	3.1 (sat)	3.1 (sat)	0.13	mg/kg	0.0590	0.0640	1.90 [1.40]	0.0690	0.130	0.0310 J	0.0460	0.0570	0.0150 J	0.0350	0.0150 J	0.0660	0.0610	0.0640	0.110 [0.0830]	0.0570	0.0510	0.0720	0.0760	0.0590
Nickel	160 (nc)	2,000 (nc)	82.8	mg/kg	13.3	24.5	48.3 [37.2]	22.7	213	22.2	12.3	11.7	8.30	22.9	7.40	14.0	8.70	9.20	16.6 [12.6]	6.20	13.3	29.6	31.4	7.60
Potassium	--	--	--	mg/kg	551 J	585 J	2,640 [2,370]	481 J	<1,250	428 J	484 J	536 J	1,560	2,880	2,580	1,000 J	857 J	622 J	910 [769 J]	493 J	587 J	607 J	802 J	565 J
Selenium	39 (nc)	510 (nc)	--	mg/kg	<1.10	<1.90	<1.30 [<1.10]	<1.20	<6.20	<1.20	<1.30	<1.40	<1.00	<1.10	<0.970	<1.40	<1.40	<1.40	<1.50 [<1.30]	<1.40	<1.70	<1.40	<1.40	<1.30
Silver	39 (nc)	510 (nc)	--	mg/kg	<2.30	<3.70	<2.50 [<2.20]	<2.50	0.380 J	<2.40	<2.50	<2.90	<2.10	<2.10	<1.90	<2.80	<2.80	<2.90	<3.00 [<2.60]	<2.70	<3.30	0.490 J	<2.80	<2.60
Sodium	--	--	--	mg/kg	<1,140	<1,850	<1,260 [<1,110]	<1,230	<1,250	<1,220	<1,270	<1,430	<1,030	<1,060	<972	<1,390	<1,400	<1,450	<1,500 [<1,280]	<1,360	<1,660	<1,390	<1,400	<1,300
Thallium	0.51 (nc)	6.6 (nc)	2.11	mg/kg	<2.30	<3.70	<2.50 [<2.20]	<2.50	<12.5	<2.40	<2.50	<2.90	<2.10	<2.10	<1.90	<2.80	<2.80	<2.90	<3.00 [<2.60]	<2.70	<3.30	<2.80	<2.80	<2.60
Vanadium	55 (nc)	720 (nc)	108	mg/kg	83.4	47.8	28.3 [25.8]	43.5	81.0	31.4	67.9	81.4	14.9	20.3	15.7	64.2	47.5	62.2	79.8 [59.3]	58.2	63.4	60.2	74.4	55.4
Zinc	2,300 (nc)	310,000 (max)	202	mg/kg	82.6 J	862 J	2,120 J [1,720 J]	195 J	1,360 J	495 J	27.7 J	69.3 J	227 J	1,210 J	70.1 J	62.9 J	50.9 J	83.5 J	132 J [103 J]	79.1 J	163 J	839 J	326 J	106 J
Asbestos																								
Asbestos (Yes/No)	--	--	--	--	No	No	No	No	No	No	No	No	No	Yes	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Semivolatile Organics																								
1-Methylnaphthalene	22 (ca*)	99 (ca*)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	31 (nc)	440 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	340 (nc)	3,300 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	340 (nc)	3,300 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	1,700 (nc)	170,000 (max)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)pyrene	0.015 (ca**)	0.21 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	170 (nc)	1,700 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	1.5 (ca**)	21 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	15 (ca**)	210 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	0.015 (ca**)	0.21 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	230 (nc)	2,200 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	230 (nc)	2,200 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	3.9 (ca)	20 (ca)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	1,700 (nc)	170,000 (max)	--	mg/kg	NA																			

Table B-13. Sediment Analytical Results, Igniter Assembly Area, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	IAA-SE001 0 - 0.5 08/01/08	IAA-SE002 0 - 0.5 08/01/08	IAA-SE003 0 - 0.5 08/01/08	IAA-SE004 0 - 0.5 08/01/08
XRF Metals								
Lead	400 {++}	800 {++}	26.8	mg/kg	48 ¹	35 ¹	43 ¹	39 ¹
Inorganics								
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	19,000	16,600	21,200	20,000
Antimony	3.1 {nc}	41 {nc}	--	mg/kg	<4.20 J	<3.90 J	<3.80 J	<3.70 J
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	10.3	9.30	9.50	8.40
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	36.8	44.4	48.5	48.9
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	0.660 J	0.610 J	1.20 J	0.960 J
Cadmium	7 {nc}	81 {nc}	0.69	mg/kg	<1.40	<1.30	0.420 J	0.470 J
Calcium	--	--	--	mg/kg	8,650 J	3,840 J	1,450 J	1,350 J
Chromium	280 {ca**}	1,400 {ca**}	65.3	mg/kg	32.7	28.6	25.1	25.8
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	4.60	4.00	13.0	10.1
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	19.6	19.0	24.8	23.2
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	32,300	29,000	30,100	27,900
Lead	400 {++}	800 {++}	26.8	mg/kg	35.0 J	31.8 J	44.4 J	31.9 J
Magnesium	--	--	--	mg/kg	4,580	1,840	1,810	1,800
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	186	264	369	351
Mercury	3.1 {sat}	3.1 {sat}	0.13	mg/kg	0.0820	0.0930	0.0590	0.0540
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	9.50	7.70	15.2	12.8
Potassium	--	--	--	mg/kg	668 J	643 J	880 J	813 J
Selenium	39 {nc}	510 {nc}	--	mg/kg	<1.40	<1.30	<1.30	<1.20
Silver	39 {nc}	510 {nc}	--	mg/kg	<2.80	<2.60	<2.50	<2.50
Sodium	--	--	--	mg/kg	<1,390	<1,290	<1,260	<1,230
Thallium	0.51 {nc}	6.6 {nc}	2.11	mg/kg	<2.80	<2.60	<2.50	<2.50
Vanadium	55 {nc}	720 {nc}	108	mg/kg	62.6	55.3	53.9	50.7
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	58.5 J	54.5 J	107 J	79.3 J

mg/kg Milligrams per kilogram.

µg/kg Micrograms per kilogram.

µg/L Micrograms per liter.

[a] USEPA Regional Screening Levels (USEPA 2008a).

[b] Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.

1 XRF screening value was from associated in-situ screening point (e.g. IAA-SE001X)

{ca} Carcinogen.

{nc} Noncarcinogen.

* Noncarcinogen screening level is less than one hundred times the carcinogen screening level.

** Noncarcinogen screening level is less than ten times the carcinogen screening level.

{++} The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.

{max} Concentration may exceed ceiling limit.

{sat} Screening level may exceed saturation concentration.

J Constituent concentration quantified as estimated.

NA Not Analyzed.

[3.3] Bracketed concentration indicates laboratory analytical result for duplicate sample.

24,400 Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).

10.6 J Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).

16 Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Table B-14. Surface Water Analytical Results, Igniter Assembly Area, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Date Collected:	Tapwater Screening Values [b]	Units	IAA-VLTW01 08/01/08
Volatile Organics			
1,1,1-Trichloroethane	9,100 {nc}	µg/L	<1.0
1,1,2,2-Tetrachloroethane	0.067 {ca**}	µg/L	<1.0
1,1,2-trichloro-1,2,2-trifluoroethane	59,000 {nc}	µg/L	<1.0
1,1,2-Trichloroethane	0.24 {ca}	µg/L	<1.0
1,1-Dichloroethane	2.4 {ca}	µg/L	<1.0
1,1-Dichloroethene	340 {nc}	µg/L	<1.0
1,2,3-Trichlorobenzene	--	µg/L	<1.0
1,2,4-Trichlorobenzene	19 {ca*}	µg/L	<1.0
1,2-Dibromo-3-chloropropane	0.00032 {ca}	µg/L	<1.0
1,2-Dibromoethane	0.0065 {ca}	µg/L	<1.0
1,2-Dichlorobenzene	370 {nc}	µg/L	<1.0
1,2-Dichloroethane	0.15 {ca}	µg/L	<1.0
1,2-Dichloropropane	0.39 {ca*}	µg/L	<1.0
1,3-Dichlorobenzene	--	µg/L	<1.0
1,4-Dichlorobenzene	0.43 {ca}	µg/L	<1.0
1,4-Dioxane	6.1 {ca**}	µg/L	<5.0
2-Butanone	7,100 {nc}	µg/L	<10
2-Hexanone	--	µg/L	<5.0
4-Methyl-2-pentanone	2,000 {nc}	µg/L	<5.0
Acetone	22,000 {nc}	µg/L	5.1 J
Benzene	0.41 {ca}	µg/L	<1.0
Bromochloromethane	--	µg/L	<1.0
Bromodichloromethane	1.1 {ca}	µg/L	<1.0
Bromoform	8.5 {ca*}	µg/L	<1.0
Bromomethane	8.7 {nc}	µg/L	<1.0
Carbon Disulfide	1,000 {nc}	µg/L	<1.0
Carbon Tetrachloride	0.2 {ca}	µg/L	<1.0
Chlorobenzene	91 {nc}	µg/L	<1.0
Chloroethane	21,000 {nc}	µg/L	<1.0
Chloroform	0.19 {ca}	µg/L	<1.0
Chloromethane	1.8 {ca}	µg/L	<1.0
cis-1,2-Dichloroethene	370 {nc}	µg/L	<1.0
cis-1,3-Dichloropropene	--	µg/L	<1.0
Cyclohexane	13,000 {nc}	µg/L	<1.0
Dibromochloromethane	0.8 {ca}	µg/L	<1.0
Dichlorodifluoromethane	390 {nc}	µg/L	<1.0
Ethylbenzene	1.5 {ca}	µg/L	<1.0
Isopropylbenzene	680 {nc}	µg/L	<1.0
Methyl acetate	37,000 {nc}	µg/L	<1.0
Methyl tert-butyl ether	12 {ca}	µg/L	<1.0
Methylcyclohexane	6,300 {nc}	µg/L	<1.0
Methylene Chloride	4.8 {ca}	µg/L	<1.0
Styrene	1,600 {nc}	µg/L	<1.0
Tetrachloroethene	0.11 {ca}	µg/L	<1.0
Toluene	2,300 {nc}	µg/L	<1.0
trans-1,2-Dichloroethene	110 {nc}	µg/L	<1.0
trans-1,3-Dichloropropene	--	µg/L	<1.0
Trichloroethene	1.7 {ca}	µg/L	<1.0
Trichlorofluoromethane	1,300 {nc}	µg/L	<1.0
Vinyl Chloride	0.016 {ca}	µg/L	<1.0
Xylenes (total)	200 {nc}	µg/L	<1.0

Notes found at end of table.

Table B-14. Surface Water Analytical Results, Igniter Assembly Area, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Date Collected:	Tapwater Screening Values [b]	Units	IAA-VLTW01 08/01/08
Semivolatile Organics			
1-Methylnaphthalene	2.3 {ca}	µg/L	<0.046
2-Methylnaphthalene	150 {nc}	µg/L	<0.046
Acenaphthene	2,200 {nc}	µg/L	<0.046
Acenaphthylene	- -	µg/L	<0.046
Anthracene	11,000 {nc}	µg/L	<0.046
Benzo(a)anthracene	0.029 {ca**}	µg/L	<0.046
Benzo(a)pyrene	0.0029 {ca**}	µg/L	<0.046
Benzo(b)fluoranthene	0.029 {ca**}	µg/L	<0.046
Benzo(g,h,i)perylene	- -	µg/L	<0.046
Benzo(k)fluoranthene	0.29 {ca**}	µg/L	<0.046
Chrysene	2.9 {ca**}	µg/L	<0.046
Dibenzo(a,h)anthracene	0.0029 {ca**}	µg/L	<0.046
Fluoranthene	1,500 {nc}	µg/L	<0.046
Fluorene	1,500 {nc}	µg/L	<0.046
Indeno(1,2,3-cd)pyrene	0.029 {ca**}	µg/L	<0.046 J
Naphthalene	6.2 {nc}	µg/L	<0.046
Phenanthrene	- -	µg/L	<0.046
Pyrene	1,100 {nc}	µg/L	<0.046
Inorganics			
Aluminum	37,000 {nc}	µg/L	3,710
Antimony	15 {nc}	µg/L	<15.0
Arsenic	0.045 {ca}	µg/L	<5.00
Barium	7,300 {nc}	µg/L	372
Beryllium	73 {nc}	µg/L	<5.00
Cadmium	18 {nc}	µg/L	3.00 J
Calcium	- -	µg/L	43,700
Chromium	- -	µg/L	8.40 J
Cobalt	- -	µg/L	<15.0
Copper	1,500 {nc}	µg/L	1,460
Iron	26,000 {nc}	µg/L	10,700
Lead	- -	µg/L	6,160
Magnesium	- -	µg/L	20,900
Manganese	880 {nc}	µg/L	236
Mercury	0.63 {nc}	µg/L	0.0880 J
Nickel	730 {nc}	µg/L	5.10 J
Potassium	- -	µg/L	35,100
Selenium	180 {nc}	µg/L	<5.00
Silver	180 {nc}	µg/L	<10.0
Sodium	- -	µg/L	17,600
Thallium	2.4 {nc}	µg/L	<10.0
Vanadium	180 {nc}	µg/L	10.2 J
Zinc	11,000 {nc}	µg/L	761

µg/L

[a]

{ca}

{nc}

*

**

J

24,400

Micrograms per liter.

USEPA Regional Screening Levels (USEPA 2008a).

Adjusted tap-water screening levels used to assess surface water at the NRU.

Carcinogen.

Noncarcinogen.

Noncarcinogen screening level is less than one hundred times the carcinogen screening level.

Noncarcinogen screening level is less than ten times the carcinogen screening level.

Constituent concentration quantified as estimated.

Highlighted value indicates constituent concentration is above tapwater screening value.

Table B-15. Surface Soil Analytical Results, 2009 ARCADIS Supplemental Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(): Date Collected:		IAA5-SS001A 0-0.25 07/15/09	IAA5-SS001B 0-0.25 07/15/09	IAA5-SS001C 0-0.25 07/15/09	IAA5-SS001D 0-0.25 07/15/09	IAA5-SS001E 0-0.25 07/15/09	IAA8102-SS001A 0-0.25 07/13/09	IAA8102-SS001B 0-0.25 07/13/09	IAA8102-SS001C 0-0.25 07/13/09	IAA8102-SS001D 0-0.25 07/13/09	IAA8102-SS001E 0-0.25 07/13/09	IAA-SS044A 0-0.5 07/14/08	IAA-SS044B 0-0.5 07/14/08	IAA-SS045A 0-0.5 07/14/08	IAA-SS045B 0-0.5 07/14/08
Asbestos															
Asbestos weight percent	%	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	17.2	0.1	0.1 U	0.1 U	0.1 U	2.2	0.1 U	2.4	0.1
Chrysotile	struc.	41	2	23	2	3	53	56	2	2	3	96	56	63	52
Percent Moisture															
Percent Moisture	%	24	22	20	24	22	58	20	16	16	16				
Soil Particle Size															
3/4"	%	0	0	0	0	0	0	0	0	0.26	0	NA	NA	NA	NA
3/8"	%	7.8	0	10	25	4.1	0.76	0.019	0	2.0	3.8	NA	NA	NA	NA
d < 75 µm	%	4.0	2.1	2.6	4.7	4.2	7.3	6.2	6.1	6.6	5.2	NA	NA	NA	NA
No. 10	%	31	34	30	20	26	8.3	31	32	23	23	NA	NA	NA	NA
No. 200	%	4.3	8.8	5.1	12	14	30	13	9.8	18	17	NA	NA	NA	NA
No. 4	%	38	12	35	12	15	3.3	15	25	11	13	NA	NA	NA	NA
No. 40	%	15	43	17	27	36	51	34	27	40	38	NA	NA	NA	NA

U

NA

ND

The compound was analyzed for but not detected. The associated value is the compound quantitation limit.

Not Analyzed

Not Detected

Table B-15. Surface Soil Analytical Results, 2009 ARCADIS Supplemental Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(): Date Collected:		IAA-SS046A 0-0.5 07/14/08	IAA-SS046B 0-0.5 07/14/08	IAA-SS047A 0-0.5 07/14/08	IAA-SS047B 0-0.5 07/14/08	IAA-SS048A 0-0.5 07/14/08	IAA-SS048B 0-0.5 07/14/08	IAA-SS049A 0-0.5 07/14/08	IAA-SS049B 0-0.5 07/14/08
Asbestos									
Asbestos weight percent	%	0.2	0.2	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Chrysotile	struc.	51	60	24	11	9	1	14	8
Percent Moisture									
Percent Moisture	%								
Soil Particle Size									
3/4"	%	NA	NA	NA	NA	NA	NA	NA	NA
3/8"	%	NA	NA	NA	NA	NA	NA	NA	NA
d < 75 µm	%	NA	NA	NA	NA	NA	NA	NA	NA
No. 10	%	NA	NA	NA	NA	NA	NA	NA	NA
No. 200	%	NA	NA	NA	NA	NA	NA	NA	NA
No. 4	%	NA	NA	NA	NA	NA	NA	NA	NA
No. 40	%	NA	NA	NA	NA	NA	NA	NA	NA

U

NA

ND

The compo

Not Analyzi

Not Detectc

Table B-16. Activity Based Air Sampling Results, 2009 ARCADIS Supplemental Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Date Collected:	Method	Units	IAA5-AA1 07/15/09	IAA5-AP1 07/15/09	IAA5-AA2 07/15/09	IAA5-AP2 07/15/09	IAA5-BK2 07/15/09	IAA8102-AA1 07/14/09	IAA8102-AP1 07/15/09	IAA8102-AA2 No Date	IAA8102-AP2 07/13/09	IAA8102-BK2 07/13/09
Asbestos												
Air Concentration	AHERA	s/cc	0	0	0	0	0	0.00588	0.050	0	0	0
Loading on Filter	AHERA	s/mm2	0	0	0	0	0	11.0	26.2	0	0	0
Number of structures	AHERA	struc.	0	0	0	0	0	6.0	17.0	0	0	0
Air Concentration	PCME	s/cc	0	0	0	0	0	0.00098	0	0	0	0
Loading on Filter	PCME	s/mm2	0	0	0	0	0	1.8	0	0	0	0
Number of structures	PCME	struc.	0	0	0	0	0	1	0	0	0	0
Air Concentration	TEM	s/cc	0	0	0	0	0	0.00783	0.053	0	0	0
Loading on Filter	TEM	s/mm2	0	0	0	0	0	14.7	27.7	0	0	0
Number of structures	TEM	struc.	0	0	0	0	0	8.0	18.0	0	0	0

s/cc: structures per cubic centimeter
S/mm2: structures per square millimeter
struc: structures
AHERA - Asbestos hazard emergency response act
PCE - Phase contrast microscopy
TEM - Transmission electron microscopy

Appendix C

Summary of Laboratory Analytical
Results from BDDT Site
Investigations

Table C-1. Soil Analytical Results, Building Debris Disposal Trench, 1997 ATK Preliminary Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background	Units	SOIL/CREOSOTE SAMPLE 0-1 10/17/97
PAHs					
Anthracene	1,700 {nc}	170,000 {max}	--	mg/kg	200
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	491
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	330
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	168
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	96
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	314
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	76.7
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	1,302
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	183
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	160
Naphthalene	3.9 {nc}	20 {nc}	--	mg/kg	57.2
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	1,336
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	930

mg/kg

Milligrams per kilogram.

[a]

USEPA Regional Screening Levels (USEPA 2008a).

{ca}

Carcinogen.

{nc}

Noncarcinogen.

*

Noncarcinogen screening level is less than one hundred times the carcinogen screening level.

**

Noncarcinogen screening level is less than ten times the carcinogen screening level.

{max}

Concentration may exceed ceiling limit.

24,400

Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).

10.6 J

Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).

Table C-2. Sediment Analytical Results, Building Debris Disposal Trench, 1998 Gannett Fleming Independent Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	SD-06 3/31/98 -	SD-07 3/31/98 -	SD-08 3/31/98 -
TCL SVOCs							
Anthracene	1,700 {nc}	170,000 {max}	--	mg/kg	ND	ND	0.4
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	ND	ND	1.02
Benzo(a)pyrene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	ND	ND	0.98
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	ND	ND	1.36
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	ND	ND	0.95
Bis(2-Ethylhexyl)phthalate	35 {ca*}	120 {ca*}	--	mg/kg	ND	0.07	ND
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	ND	ND	1.32
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	ND	ND	3.49
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	ND	ND	0.42
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	ND	ND	2.68
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	ND	ND	2.23
TAL Inorganics							
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	21,800	19,000	13,100
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	4.6	5	2.9
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	113	112	55.7
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	1.2	1.2	0.9
Calcium	--	--	--		26,800	95,300	1,220
Chromium	280 {ca}	1,460 {ca}	65.3	mg/kg	39.2	49.3	27.2
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	19.1	15.8	16.1
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	16.6	32.1	45.5
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	31,700	31,200	22,400
Lead	400 {++}	800 {++}	26.8	mg/kg	16.5	33	58.7
Magnesium	--	--	--	mg/kg	10,400	7,540	4,400
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	1,250	960	815
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	20.4	16.7	16.6
Potassium	--	--	--	mg/kg	2,870	2,280	1,360
Sodium	--	--	--	mg/kg	ND	120	ND
Vanadium	55 {nc}	720 {nc}	108	mg/kg	60.5	56.6	42.4
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	43.4	47.3	74.6

mg/kg

Milligrams per kilogram.

[a]

USEPA Regional Screening Levels (USEPA 2008a).

[b]

Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.

{ca}

Carcinogen.

{nc}

Noncarcinogen.

*

Noncarcinogen screening level is less than one hundred times the carcinogen screening level.

**

Noncarcinogen screening level is less than ten times the carcinogen screening level.

{++}

The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.

{max}

Concentration may exceed ceiling limit.

ND

Not Detected.

24,400

Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).

10.6 J

Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).

Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

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Table C-3. Surface Water Analytical Results, Building Debris Disposal Trench, 1998 Gannett Fleming Independent Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Date Collected:	Adjusted Tapwater Screening Values [a]	Units	SW-07 03/31/98
Inorganics			
Calcium	- -	µg/L	60,300
Iron	26,000 {nc}	µg/L	165
Magnesium	- -	µg/L	14,800
Potassium	- -	µg/L	2,800
Sodium	- -	µg/L	32,400

µg/L Micrograms per liter.

[a] USEPA Regional Screening Levels (USEPA 2008a).

Adjusted tap-water screening levels used to assess surface water at the NRU.

{ca} Carcinogen.

{nc} Noncarcinogen.

28,000 Highlighted value indicates constituent concentration is above adjusted tap water RSL.

Table C-4. Soil Analytical Results, Building Debris Disposal Trench, 1998 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

[illegible]

Notes found at end of table.

Table C-4. Soil Analytical Results, Building Debris Disposal Trench, 1998 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

[illegible]

Notes found at end of table.

Table C-4. Soil Analytical Results, Building Debris Disposal Trench, 1998 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	DTSB42 0.5 - 1 08/18/98	DTSB43 0.5 - 1 08/18/98	DTSB44 0.5 - 1 08/18/98	DTSB45 0.5 - 1 08/18/98
Explosives								
1,3,5-Trinitrobenzene	220 (nc)	2,700 (nc)	--	mg/kg	<0.2	<0.2	<0.2 [<0.3]	<0.2
1,3-Dinitrobenzene	0.61 (nc)	6.2 (nc)	--	mg/kg	<0.2	<0.2	<0.2 [<0.3]	<0.2
2,4,6-Trinitrotoluene	3.6 (ca**)	42 (ca**)	--	mg/kg	<0.2	<0.2	<0.2 [<0.3]	<0.2
2,4-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	<0.2	<0.2	<0.2 [<0.3]	<0.2
2,6-Dinitrotoluene	6.1 (nc)	62 (nc)	--	mg/kg	<0.2	<0.2	<0.2 [<0.3]	<0.2
2-Amino-4,6-Dinitrotoluene	15 (nc)	190 (nc)	--	mg/kg	<0.2	<0.2	<0.2 [<0.3]	<0.2
4-Amino-2,6-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	<0.2	<0.2	<0.2 [<0.3]	<0.2
Dinitrotoluene Mix	0.71 (ca)	2.5 (ca)	--	mg/kg	<0.2	<0.2	<0.2 [<0.3]	<0.2
HMX	310 (nc)	3,100 (nc)	--	mg/kg	<0.2	<0.2	<0.2 [<0.3]	<0.2
m-Nitrotoluene	--	--	--	mg/kg	<0.2	<0.2	<0.2 [<0.3]	<0.2
Nitrobenzene	3.1 (nc)	28 (nc)	--	mg/kg	<0.2	<0.2	<0.2 [<0.3]	<0.2
Nitroglycerine	0.61 (nc)	6.2 (nc)	--	mg/kg	<1.1	<1.2	<1.2 [<1.3]	<1.1
o-Nitrotoluene	78 (nc)	1,300 (sat)	--	mg/kg	<0.2	<0.2	<0.2 [<0.3]	<0.2
Pentaerythritol Tetranitrate	--	--	--	mg/kg	<1.1	<1.2	<1.2 [<1.3]	<1.1
p-Nitrotoluene	30 (ca**)	110 (ca*)	--	mg/kg	<0.2	<0.2	<0.2 [<0.3]	<0.2
RDX	4.4 (ca*)	16 (ca)	--	mg/kg	<0.2	<0.2	<0.2 [<0.3]	<0.2
Tetryl	24 (nc)	250 (nc)	--	mg/kg	<0.2	<0.2	<0.2 [<0.3]	<0.2
PAHs								
Acenaphthene	340 (nc)	3,300 (nc)	--	mg/kg	0.26 J	0.38 J	2.4 J [<2.2]	<0.43
Acenaphthylene	340 (nc)	3,300 (nc)	--	mg/kg	<0.83	<1.2	<8.3 [<4.3]	<0.85
Anthracene	1,700 (nc)	170,000 (max)	--	mg/kg	0.64	1.3	6.4 [1.3]	0.49
Benzo(a)anthracene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	1.4	1.9	9.6 [2.0]	1.2
Benzo(a)pyrene	0.015 (ca**)	0.21 (ca**)	--	mg/kg	1.7 J	1.9 J	10 J [2.1 J]	1.3 J
Benzo(b)fluoranthene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	2.3	2.5	13 [3.0]	1.9
Benzo(b,j)perylene	170 (nc)	1,700 (nc)	--	mg/kg	0.81 J	0.77 J	3.9 J [0.93 J]	0.72 J
Benzo(k)fluoranthene	1.6 (ca**)	21 (ca**)	--	mg/kg	1.0	1.2	6.0 [1.6]	0.82
Chrysene	15 (ca**)	210 (ca**)	--	mg/kg	1.8	2.2	11 [2.4]	1.6
Dibenzo(a,h)anthracene	0.015 (ca**)	0.21 (ca**)	--	mg/kg	0.090	0.090 J	0.70 J [0.11 J]	0.090
Fluoranthene	230 (nc)	2,200 (nc)	--	mg/kg	4.9 J	6.5 J	34 J [7.5 J]	4.1 J
Fluorene	230 (nc)	2,200 (nc)	--	mg/kg	0.29	0.69	4.8 [0.52]	<0.080
Indeno(1,2,3-cd)pyrene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	0.90	0.93	4.9 [1.0]	0.76
Naphthalene	3.9 (nc)	20 (nc)	--	mg/kg	<0.42	<0.60	<4.2 [<2.2]	<0.43
Phenanthrene	1,700 (nc)	170,000 (max)	--	mg/kg	3.7	5.6	33 [6.9]	2.6
Pyrene	170 (nc)	1,700 (nc)	--	mg/kg	3.8	5.0	26 [5.7]	3.2
Volatile Organics								
1,1,1,2-Tetrachloroethane	2 (ca)	9.8 (ca)	--	mg/kg	<0.0020	<0.0020	<0.0020 [<0.0020]	<0.0020 J
1,1,1-Trichloroethane	680 (sat)	680 (sat)	--	mg/kg	<0.0010	<0.0010	<0.0010 [<0.0010]	<0.0010 J
1,1,2,2-Tetrachloroethane	0.59 (ca**)	2.9 (ca**)	--	mg/kg	<0.0020 J	<0.0020 J	<0.0020 [<0.0020]	<0.0020 J
1,1,2-Trichloroethane	1.1 (ca)	5.5 (ca)	--	mg/kg	<0.0020	<0.0020	<0.0020 [<0.0020]	<0.0020 J
1,1-Dichloroethane	3.4 (ca)	17 (ca)	--	mg/kg	<0.0020	<0.0020	<0.0020 [<0.0020]	<0.0020 J
1,1-Dichloroethene	25 (nc)	110 (nc)	--	mg/kg	<0.0020	<0.0020	<0.0030 [<0.0030]	<0.0020 J
1,1-Dichloropropene	--	--	--	mg/kg	<0.0020	<0.0020	<0.0020 [<0.0020]	<0.0020 J
1,2,3-Trichlorobenzene	--	--	--	mg/kg	<0.0020 J	<0.0020 J	<0.0020 [<0.0020]	<0.0020 J
1,2,3-Trichloropropane	0.091 (ca)	0.41 (ca)	--	mg/kg	<0.0030 J	<0.0030 J	<0.0030 [<0.0030]	<0.0030 J
1,2,4-Trichlorobenzene	180 (ca**)	220 (sat)	--	mg/kg	<0.0020 J	<0.0020 J	<0.0020 [<0.0020]	<0.0020 J
1,2,4-Trimethylbenzene	6.7 (nc)	28 (nc)	--	mg/kg	<0.0020 J	<0.0020 J	<0.0020 [<0.0020]	<0.0020 J
1,2-Dibromo-3-chloropropane	0.0056 (ca)	0.073 (ca)	--	mg/kg	<0.0060 J	<0.0060 J	<0.0070 [<0.0070]	<0.0060 J
1,2-Dibromoethane	0.034 (ca)	0.17 (ca)	--	mg/kg	<0.0020	<0.0020	<0.0020 [<0.0020]	<0.0020 J
1,2-Dichlorobenzene	220 (sat)	220 (sat)	--	mg/kg	<0.0010 J	<0.0010 J	<0.0010 [<0.0010]	<0.0010 J
1,2-Dichloroethane	0.45 (ca)	2.2 (ca)	--	mg/kg	<0.0010	<0.0010	<0.0010 [<0.0010]	<0.0010 J
1,2-Dichloropropane	0.93 (ca*)	4.7 (ca*)	--	mg/kg	<0.0040	<0.0040	<0.0050 [<0.0050]	<0.0040 J
1,3,5-Trimethylbenzene	--	--	--	mg/kg	<0.0020 J	<0.0020 J	<0.0020 [<0.0020]	<0.0020 J
1,3-Dichlorobenzene	--	--	--	mg/kg	<0.0020 J	<0.0020 J	<0.0020 [<0.0020]	<0.0020 J
1,3-Dichloropropane	160 (nc)	1,600 (sat)	--	mg/kg	<0.0020	<0.0020	<0.0020 [<0.0020]	<0.0020 J
1,4-Dichlorobenzene	2.6 (ca)	13 (ca)	--	mg/kg	<0.0020 J	NA	<0.0020 [<0.0020]	<0.0020 J
2,2-Dichloropropane	--	--	--	mg/kg	<0.0010	<0.0010	<0.0010 [<0.0010]	<0.0010 J
2-Butanone	2,800 (nc)	19,000 (nc)	--	mg/kg	<0.0060	<0.0060	<0.0070 [<0.0070]	<0.0060 J
2-Chloroethyl Vinyl Ether	--	--	--	mg/kg	<0.0060	<0.0060	<0.0070 [<0.0070]	<0.0060 J
2-Chlorotoluene	1,000 (sat)	1,000 (sat)	--	mg/kg	<0.0010 J	<0.0010 J	<0.0020 [<0.0020]	<0.0010 J
2-Hexanone	--	--	--	mg/kg	<0.0060	<0.0060	<0.0070 [<0.0070]	<0.0060 J
4-Chlorotoluene	290 (sat)	290 (sat)	--	mg/kg	<0.0010 J	<0.0010 J	<0.0010 [<0.0010]	<0.0010 J
4-Methyl-2-pentanone	530 (nc)	5,200 (sat)	--	mg/kg	<0.0060	<0.0060	<0.0070 [<0.0070]	<0.0060 J
Acetone	6,100 (nc)	61,000 (nc)	--	mg/kg	<0.0060	<0.0060	<0.0070 [<0.0070]	<0.0060 J
Acrolein	0.016 (nc)	0.068 (nc)	--	mg/kg	<0.0060	<0.0060	<0.0070 [<0.0070]	<0.0060 J
Acrylonitrile	0.24 (ca*)	1.2 (ca*)	--	mg/kg	<0.0060	<0.0060	<0.0070 [<0.0070]	<0.0060 J
Benzene	1.1 (ca*)	5.6 (ca*)	--	mg/kg	<0.0010	<0.0010	<0.0010 [<0.0010]	<0.0010 J
Bromobenzene	--	--	--	mg/kg	<0.0010 J	<0.0010 J	<0.0010 [<0.0010]	<0.0010 J
Bromochloromethane	--	--	--	mg/kg	<0.0020	<0.0020	<0.0020 [<0.0020]	<0.0020 J
Bromodichloromethane	10 (ca)	46 (ca)	--	mg/kg	<0.0010	<0.0010	<0.0010 [<0.0010]	<0.0010 J
Bromoform	61 (ca*)	220 (ca*)	--	mg/kg	<0.0060	<0.0060	<0.0070 [<0.0070]	<0.0060 J
Bromomethane	0.79 (nc)	3.5 (nc)	--	mg/kg	<0.0050	<0.0050	<0.0050 [<0.0050]	<0.0050 J
Carbon Disulfide	67 (nc)	300 (nc)	--	mg/kg	<0.0060	<0.0060	<0.0070 [<0.0070]	<0.0060 J
Carbon Tetrachloride	0.25 (ca)	1.3 (ca)	--	mg/kg	<0.0050	<0.0050	<0.0050 [<0.0050]	<0.0050 J
Chlorobenzene	31 (nc)	860 (sat)	--	mg/kg	<0.0010	<0.0010	<0.0020 [<0.0020]	<0.0010 J
Chloroethane	2,200 (sat)	2,200 (sat)	--	mg/kg	<0.0060	<0.0060	<0.0070 [<0.0070]	<0.0060 J
Chloroform	0.3 (ca)	1.5 (ca)	--	mg/kg	<0.0020	<0.0020	<0.0020 [<0.0020]	<0.0020 J
Chloromethane	1.7 (ca*)	8.4 (ca*)	--	mg/kg	<0.0040	<0.0040	<0.0040 [<0.0040]	<0.0040 J
cis-1,2-Dichloroethene	78 (nc)	1,300 (sat)	--	mg/kg	<0.0020	<0.0020	<0.0020 [<0.0020]	<0.0020 J
cis-1,3-Dichloropropene	--	--	--	mg/kg	<0.0010	<0.0010	<0.0010 [<0.0010]	<0.0010 J
Dibromochloromethane	5.8 (ca)	21 (ca)	--	mg/kg	<0.0090	<0.0090	<0.0090 [<0.0090]	<0.0090 J
Dibromomethane	78 (nc)	3,000 (sat)	--	mg/kg	<0.0020	<0.0020	<0.0020 [<0.0020]	<0.0020 J
Dichlorodifluoromethane	19 (nc)	78 (nc)	--	mg/kg	<0.0020	<0.0020	<0.0020 [<0.0020]	<0.0020 J
Ethylbenzene	5.7 (ca)	29 (ca)	--	mg/kg	<0.0010	<0.0010	<0.0020 [<0.0020]	<0.0010 J
Hexachlorobutadiene	6.2 (ca**)	22 (ca*)	--	mg/kg	<0.0010 J	<0.0010 J	<0.0010 [<0.0010]	<0.0010 J
Isopropylbenzene	310 (sat)	310 (sat)	--	mg/kg	<0.0020 J	<0.0020 J	<0.0020 [<0.0020]	<0.0020 J
m,p-Xylene	60 (nc)	260 (nc)	--	mg/kg	<0.0030	<0.0030	<0.0030 [<0.0030]	<0.0030 J
Methylene Chloride	11 (ca)	54 (ca)	--	mg/kg	<0.0010	0.0050 K	<0.0010 [0.0050 K]	0.0050 J
n-Butylbenzene	--	--	--	mg/kg	<0.0020 J	<0.0020 J	<0.0020 [<0.0020]	<0.0020 J
n-Propylbenzene	--	--	--	mg/kg	<0.0020 J	<0.0020 J	<0.0020 [<0.0020]	<0.0020 J
o-Xylene	300 (sat)	300 (sat)	--	mg/kg	<0.0020	<0.0020	<0.0020 [<0.0020]	<0.0020 J
p-Isopropyltoluene	--	--	--	mg/kg	<0.0010 J	<0.0010 J	<0.0010 [<0.0010]	<0.0010 J
sec-Butylbenzene	--	--	--	mg/kg	<0.0020 J	<0.0020 J	<0.0020 [<0.0020]	<0.0020 J
Styrene	1,000 (sat)	1,000 (sat)	--	mg/kg	<0.0030	<0.0030	<0.0030 [<0.0030]	<0.0030 J
tert-Butylbenzene	--	--	--	mg/kg	<0.0020 J	<0.0020 J	<0.0020 [<0.0020]	<0.0020 J
Tetrachloroethene	0.57 (ca)	2.7 (ca)	--	mg/kg	<0.0010	<0.0010	<0.0020 [<0.0020]	<0.0010 J
Toluene	500 (nc)	4600 (nc)	--	mg/kg	<0.0020	<0.0020	<0.0020 [<0.0020]	<0.0020 J
trans-1,2-Dichloroethene	11 (nc)	50 (nc)	--	mg/kg	<0.0060	<0.0050	<0.0060 [<0.0060]	<0.0060 J
trans-1,3-Dichloropropene	--	--	--	mg/kg	<0.0010	<0.0010	<0.0010 [<0.0010]	<0.0010 J
Trichloroethene	2.8 (ca)	14 (ca)	--	mg/kg	<0.0030	<0.0030	<0.0040 [<0.0040]	<0.0030 J
Trichlorofluoromethane	80 (nc)	1,300 (sat)	--	mg/kg	<0.0020	<0.0020	<0.0020 [<0.0020]	<0.0020 J
Vinyl Acetate	99 (nc)	2,800 (sat)	--	mg/kg	<0.0060	<0.0060	<0.0070 [<0.0070]	<0.0060 J
Vinyl Chloride	0.06 (ca)	1.7 (ca)	--	mg/kg	<0.0020	<0.0020	<0.0020 [<0.0020]	<0.0020 J
Xylenes (total)	60 (nc)	260 (nc)	--	mg/kg	<0.0030	<0.0030	<0.0030 [<0.0030]	<0.0030

Notes found at end of table.

Table C-4. Soil Analytical Results, Building Debris Disposal Trench, 1998 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	DTSB42 0.5 - 1 08/18/98	DTSB43 0.5 - 1 08/18/98	DTSB44 0.5 - 1 08/18/98	DTSB45 0.5 - 1 08/18/98
Semivolatile Organics								
1,2,4-Trichlorobenzene	8.7 (ca**)	40 (ca**)	--	mg/kg	NA	NA	NA	NA
1,2-Dichlorobenzene	220 (sat)	220 (sat)	--	mg/kg	NA	NA	NA	NA
1,2-Diphenylhydrazine	0.61 (ca**)	2.2 (ca**)	--	mg/kg	<0.43	<0.42	<0.45 [<0.45]	<0.43
1,3-Dichlorobenzene	--	--	--	mg/kg	NA	NA	NA	NA
1,4-Dichlorobenzene	2.6 (ca)	13 (ca)	--	mg/kg	NA	NA	NA	NA
2,4,5-Trichlorophenol	610 (nc)	6,200 (nc)	--	mg/kg	<1.0	<1.0	<1.1 [<1.1]	<1.0
2,4,6-Trichlorophenol	44 (ca**)	160 (ca**)	--	mg/kg	<0.43	<0.42	<0.45 [<0.45]	<0.43
2,4-Dichlorophenol	18 (nc)	180 (nc)	--	mg/kg	<0.43	<0.42	<0.45 [<0.45]	<0.43
2,4-Dimethylphenol	120 (nc)	1,200 (nc)	--	mg/kg	<0.43	<0.42	<0.45 [<0.45]	<0.43
2,4-Dinitrophenol	12 (nc)	120 (nc)	--	mg/kg	<2.1	<2.1	<2.2 [<2.2]	<2.1
2-Chloronaphthalene	210 (sat)	210 (sat)	--	mg/kg	<0.43	<0.42	<0.45 [<0.45]	<0.43
2-Chlorophenol	39 (nc)	510 (nc)	--	mg/kg	<0.43	<0.42	<0.45 [<0.45]	<0.43
2-Methylnaphthalene	31 (nc)	440 (sat)	--	mg/kg	<0.43	<0.42	0.19 K [0.090 J]	<0.43
2-Methylphenol	310 (nc)	3,100 (nc)	--	mg/kg	<0.43	<0.42	<0.45 [<0.45]	<0.43
2-Nitroaniline	--	--	--	mg/kg	<2.1	<2.1	<2.2 [<2.2]	<2.1
2-Nitrophenol	--	--	--	mg/kg	<0.43	<0.42	<0.45 [<0.45]	<0.43
3,3'-Dichlorobenzidine	1.1 (ca**)	3.8 (ca**)	--	mg/kg	<0.84	<0.83	<8.8 [<0.88 J]	<0.84
3-Nitroaniline	--	--	--	mg/kg	<2.1	<2.1	<2.2 [<2.2]	<2.1
4,6-Dinitro-2-methylphenol	--	--	--	mg/kg	<2.1	<2.1	<2.2 J [<2.2]	<0.43
4-Bromophenyl-phenylether	--	--	--	mg/kg	<0.43	<0.42	<0.45 J [<0.45]	<0.43
4-Chloro-3-Methylphenol	--	--	--	mg/kg	<0.84	<0.83	<0.88 [<0.88]	<0.84
4-Chloroaniline	24 (nc)	250 (nc)	--	mg/kg	<0.84	<0.83	<0.88 [<0.88]	<0.84
4-Chlorophenyl-phenylether	--	--	--	mg/kg	<0.43	<0.42	<0.45 [<0.45]	<0.43
4-Methylphenol	31 (nc)	310 (nc)	--	mg/kg	<0.43	<0.42	<0.45 [<0.45]	<0.43
4-Nitroaniline	--	--	--	mg/kg	<2.1	<2.1	<2.2 [<2.2]	<2.1
4-Nitrophenol	--	--	--	mg/kg	<2.1	<2.1	<2.2 [<2.2]	<2.1
Acenaphthene	340 (nc)	3,300 (nc)	--	mg/kg	NA	NA	NA	NA
Acenaphthylene	340 (nc)	3,300 (nc)	--	mg/kg	NA	NA	NA	NA
Anthracene	1,700 (nc)	170,000 (max)	--	mg/kg	NA	NA	NA	NA
Benzo(a)anthracene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	NA	NA	NA	NA
Benzo(a)pyrene	0.015 (ca**)	0.21 (ca**)	--	mg/kg	NA	NA	NA	NA
Benzo(b)fluoranthene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	NA	NA	NA	NA
Benzo(g,h,i)perylene	170 (nc)	1,700 (nc)	--	mg/kg	NA	NA	NA	NA
Benzo(k)fluoranthene	1.5 (ca**)	21 (ca**)	--	mg/kg	NA	NA	NA	NA
Benzoic Acid	240,000 (max)	2,500,000 (max)	--	mg/kg	<2.1	<2.1	<2.2 [<2.2]	<2.1
Benzyl Alcohol	3,100 (nc)	310,000 (max)	--	mg/kg	<0.84	<0.83	<0.88 [<0.88]	<0.84
bis(2-Chloroethoxy)methane	18 (nc)	180 (nc)	--	mg/kg	<0.43	<0.42	<0.45 [<0.45]	<0.43
bis(2-Chloroethyl)ether	0.19 (ca**)	0.9 (ca**)	--	mg/kg	<0.43	<0.42	<0.45 [<0.45]	<0.43
bis(2-Chloroisopropyl)ether	--	--	--	mg/kg	<0.43	<0.42	<0.45 [<0.45]	<0.43
bis(2-Ethylhexyl)phthalate	35 (ca*)	120 (ca*)	--	mg/kg	<0.43	<0.42	<4.5 [<0.45 J]	<0.43
Butylbenzylphthalate	260 (ca*)	910 (ca*)	--	mg/kg	<0.43	<0.42	<4.5 [<0.45 J]	<0.43
Carbazole	24 (ca**)	86 (ca**)	--	mg/kg	0.070 J	<0.42	6.3 J [1.4 J]	<0.43
Chrysene	15 (ca**)	210 (ca**)	--	mg/kg	NA	NA	NA	NA
Dibenzo(a,h)anthracene	0.015 (ca**)	0.21 (ca**)	--	mg/kg	NA	NA	NA	NA
Dibenzofuran	--	--	--	mg/kg	<0.43	<0.42	1.4 K [0.44 J]	<0.43
Diethylphthalate	4,900 (nc)	490,000 (max)	--	mg/kg	<0.43	<0.42	<0.45 [<0.45]	<0.43
Dimethylphthalate	--	--	--	mg/kg	<0.43	<0.42	<0.45 [<0.45]	<0.43
Di-n-Butylphthalate	610 (nc)	6,200 (nc)	--	mg/kg	0.070 B	<0.42	<0.45 J [<0.45]	0.12 B
Di-n-Octylphthalate	--	--	--	mg/kg	<0.43	<0.42	<4.5 J [<0.45 J]	<0.43
Fluoranthene	230 (nc)	2,200 (nc)	--	mg/kg	NA	NA	NA	NA
Fluorene	230 (nc)	2,200 (nc)	--	mg/kg	NA	NA	NA	NA
Hexachlorobenzene	0.3 (ca)	1.1 (ca)	--	mg/kg	<0.43	<0.42	<0.45 J [<0.45]	<0.43
Hexachlorocyclopentadiene	37 (nc)	370 (nc)	--	mg/kg	<0.43	<0.42	<0.45 [<0.45]	<0.43
Hexachloroethane	35 (ca**)	120 (ca**)	--	mg/kg	<0.43	<0.42	<0.45 [<0.45]	<0.43
Indeno(1,2,3-cd)pyrene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	NA	NA	NA	NA
Isophorone	510 (ca*)	1,800 (ca*)	--	mg/kg	<0.43	<0.42	<0.45 [<0.45]	<0.43
Naphthalene	15 (nc)	67 (nc)	--	mg/kg	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	0.069 (ca**)	0.25 (ca**)	--	mg/kg	<0.43	<0.42	<0.45 [<0.45]	<0.43
N-Nitrosodiphenylamine	99 (ca**)	350 (ca**)	--	mg/kg	<0.43	<0.42	<0.45 J [<0.45]	<0.43
Pentachlorophenol	3 (ca)	9 (ca)	--	mg/kg	<2.1	<2.1	<2.2 J [<2.2]	<2.1
Phenanthrene	1,700 (nc)	170,000 (max)	--	mg/kg	NA	NA	NA	NA
Pheno	1,800 (nc)	180,000 (max)	--	mg/kg	<0.43	<0.42	<0.45 [<0.45]	<0.43
Pyrene	170 (nc)	1,700 (nc)	--	mg/kg	NA	NA	NA	NA
Inorganics								
Aluminum	7,700 (nc)	990,000 (max)	40,041	mg/kg	13,200	16,000	28,500 [13,000]	8,890
Antimony	3.1 (nc)	41 (nc)	--	mg/kg	<0.650	<0.640	<0.670 [<0.670]	<0.650
Arsenic	0.39 (ca*)	1.6 (ca)	15.8	mg/kg	7.60	7.40	5.70 [7.60 K]	3.60
Barium	1,500 (nc)	190,000 (max)	209	mg/kg	64.8 K	60.3 K	63.6 K [56.2 B]	45.5 K
Beryllium	16 (nc)	200 (nc)	1.02	mg/kg	1.20 B	1.10 B	1.60 K [1.20]	0.740 B
Cadmium	7 (nc)	81 (nc)	0.69	mg/kg	<0.130	<0.130	<0.130 [<0.140]	<0.130
Calcium	--	--	--	mg/kg	1,680 B	1,280 B	1,530 B [1,160 B]	920 B
Chromium	280 (ca)	1,460 (ca)	65.3	mg/kg	63.4	50.2	36.0 [58.5]	27.3
Cobalt	2.3 (nc)	30 (nc)	72.3	mg/kg	21.1	22.1	13.3 [21.8]	13.3
Copper	310 (nc)	4,100 (nc)	53.5	mg/kg	30.5	26.3	24.3 [27.9]	19.4
Iron	5,500 (nc)	720,000 (max)	50,962	mg/kg	43,500	42,600	47,500 [43,600]	20,000
Lead	400 (++)	800 (++)	26.8	mg/kg	34.4	38.2	7.80 [55.6]	22.7
Magnesium	--	--	--	mg/kg	5,390	9,120	19,100 [6,680]	4,000
Manganese	180 (nc)	2,300 (nc)	2,543	mg/kg	1,170	1,190	571 [1,250]	746
Mercury	3.1 (sat)	3.1 (sat)	0.13	mg/kg	<0.130	<0.130	<0.130	<0.130
Nickel	160 (nc)	2,000 (nc)	62.8	mg/kg	14.0	16.1	24.2 [12.1]	9.60
Potassium	--	--	--	mg/kg	1,590 K	2,370 K	3,890 K [1,390 K]	886 K
Selenium	39 (nc)	510 (nc)	--	mg/kg	<0.650 L	<0.640 L	<0.670 L [<0.670 L]	<0.650 L
Silver	39 (nc)	510 (nc)	--	mg/kg	<0.260 L	<0.260 L	<0.270 L [<0.270 L]	<0.260 L
Sodium	--	--	--	mg/kg	123 B	114 B	138 B [108 B]	97.6 B
Thallium	0.51 (nc)	6.6 (nc)	2.11	mg/kg	<0.260 L	<0.260 L	0.300 B [<0.270 L]	1.00 B
Vanadium	55 (nc)	720 (nc)	108	mg/kg	77.0 J	75.7 J	72.5 J [76.7 J]	36.6 J
Zinc	2,300 (nc)	310,000 (max)	202	mg/kg	102 B	137 B	58.6 B [87.5 B]	54.4 B

mg/kg	Milligrams per kilogram.
[a]	USEPA Regional Screening Levels (USEPA 2008a).
[b]	Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.
(ca)	Carcinogen.
(nc)	Noncarcinogen.
*	Noncarcinogen screening level is less than one hundred times the carcinogen screening level.
**	Noncarcinogen screening level is less than ten times the carcinogen screening level.
(++)	The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.
(max)	Concentration may exceed ceiling limit.
(sat)	Screening level may exceed saturation concentration.
B (Inorganics)	Constituent concentration
B (Organics)	Constituent was detected in
J	Constituent concentration
K	Estimated concentration
L	Estimated concentration bias low.
NA	Not Analyzed.
[3.3]	Bracketed concentration
24,400	Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).
10.6 J	Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).
16	Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Table C-5. Sediment Analytical Results, Building Debris Disposal Trench, 1998 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	DTSD01 0 - 0.5 07/17/98	DTSD01 0 - 0.5 08/17/98	DTSD02 0 - 0.5 07/17/98	DTSD02 0 - 0.5 08/17/98	DTSD03 0 - 0.5 07/17/98	DTSD03 0 - 0.5 08/17/98	DTSD04 0 - 0.5 08/17/98
Explosives											
1,3,5-Trinitrobenzene	220 [nc]	2,700 [nc]	--	mg/kg	<0.25	<0.2	<0.25	<0.2	<0.25	<0.2	<0.3
1,3-Dinitrobenzene	0.61 [nc]	6.2 [nc]	--	mg/kg	<0.25	<0.2	<0.25	<0.2	<0.25	<0.2	<0.3
2,4,6-Trinitrotoluene	3.6 [ca**]	42 [ca**]	--	mg/kg	<0.25	<0.2	<0.25	<0.2	<0.25	<0.2	<0.3
2,4-Dinitrotoluene	12 [nc]	120 [nc]	--	mg/kg	<0.25	<0.2	<0.25	<0.2	<0.25	<0.2	<0.3
2,6-Dinitrotoluene	6.1 [nc]	62 [nc]	--	mg/kg	<0.25	<0.2	<0.25	<0.2	<0.25	<0.2	<0.3
2-Amino-4,6-Dinitrotoluene	15 [nc]	190 [nc]	--	mg/kg	<0.25	<0.2	<0.25	<0.2	<0.25	<0.2	<0.3
4-Amino-2,6-Dinitrotoluene	12 [nc]	120 [nc]	--	mg/kg	<0.25	<0.2	<0.25	<0.2	<0.25	<0.2	<0.3
Dinitrotoluene Mix	0.71 [ca]	2.5 [ca]	--	mg/kg	<0.25	<0.2	<0.25	<0.2	<0.25	<0.2	<0.3
HMX	310 [nc]	3,100 [nc]	--	mg/kg	<0.25	<0.2	<0.25	<0.2	<0.25	<2	<0.3
m-Nitrotoluene	--	--	--	mg/kg	<0.25	<0.2	<0.25	<0.2	<0.25	<0.2	<0.3
Nitrobenzene	3.1 [nc]	28 [nc]	--	mg/kg	<0.25	<0.2	<0.25	<0.2	<0.25	<0.2	<0.3
Nitroglycerine	0.61 [nc]	6.2 [nc]	--	mg/kg	<1.3	<1.1	<1.2	<1.2	<1.2	<1.1	<1.3
o-Nitrotoluene	78 [nc]	1,300 [sat]	--	mg/kg	<0.25	<0.2	<0.25	<0.2	<0.25	<0.2	<0.3
Pentaerythritol Tetranitrate	--	--	--	mg/kg	<1.3	<1.1	<1.2	<1.2	<1.2	<1.1	<1.3
p-Nitrotoluene	30 [ca**]	110 [ca*]	--	mg/kg	<0.25	<0.2	<0.25	<0.2	<0.25	<0.2	<0.3
RDX	4.4 [ca*]	16 [ca]	--	mg/kg	<0.25	<0.2	<0.25	<0.2	<0.25	<0.2	<0.3
Tetryl	24 [nc]	250 [nc]	--	mg/kg	<0.25	<0.2	<0.25	<0.2	<0.25	<0.2	<0.3
PAHs											
Acenaphthene	340 [nc]	3,300 [nc]	--	mg/kg	<0.030	<0.60	<0.020	<0.49	<0.020	<0.47 J	<0.50
Acenaphthylene	340 [nc]	3,300 [nc]	--	mg/kg	<0.060	<1.2	<0.050	<0.97	<0.050	<0.94 J	<1.0
Anthracene	1,700 [nc]	170,000 [max]	--	mg/kg	<0.0031	<0.060	<0.0026	<0.040	<0.0028	<0.040 J	0.030 J
Benzo(a)anthracene	0.15 [ca**]	2.1 [ca**]	--	mg/kg	<0.0031	0.010 J	<0.0026	<0.040	<0.0028	<0.040 J	0.030 J
Benzo(a)pyrene	0.015 [ca**]	0.21 [ca**]	--	mg/kg	<0.0031	0.030 J	<0.0026	<0.040	<0.0028	<0.040 J	0.020 J
Benzo(b)fluoranthene	0.15 [ca**]	2.1 [ca**]	--	mg/kg	<0.0061	<0.12	<0.0052	<0.090	<0.0056	<0.090 J	<0.10
Benzo(g,h,i)perylene	170 [nc]	1,700 [nc]	--	mg/kg	<0.0061	<0.12	<0.0052	<0.090	<0.0056	<0.090 J	0.040 J
Benzo(k)fluoranthene	1.5 [ca**]	21 [ca**]	--	mg/kg	<0.0031	<0.060	<0.0026	<0.040	<0.0028	<0.040 J	0.010 J
Chrysene	15 [ca**]	210 [ca**]	--	mg/kg	<0.0031	0.020 J	0.0044	<0.040	<0.0028	<0.040 J	0.090
Dibenzo(a,h)anthracene	0.015 [ca**]	0.21 [ca**]	--	mg/kg	<0.0061	<0.12	<0.0052	<0.090	<0.0056	<0.090 J	<0.10
Fluoranthene	230 [nc]	2,200 [nc]	--	mg/kg	0.010	0.030 J	0.010	<0.090	0.010	0.010 J	0.20
Fluorene	230 [nc]	2,200 [nc]	--	mg/kg	<0.0061	<0.12	<0.0052	<0.090	<0.0056	<0.090 J	<0.10
Indeno(1,2,3-cd)pyrene	0.15 [ca**]	2.1 [ca**]	--	mg/kg	<0.0031	<0.060	<0.0026	<0.040	<0.0028	<0.040 J	0.040 J
Naphthalene	3.9 [nc]	20 [nc]	--	mg/kg	<0.030	<0.60	<0.020	<0.49	<0.020	<0.47 J	<0.50
Phenanthrene	1,700 [nc]	170,000 [max]	--	mg/kg	0.0049	0.040 J	0.0042	<0.040	0.0048	0.020 J	0.21
Pyrene	170 [nc]	1,700 [nc]	--	mg/kg	0.010	0.020 J	0.010	<0.040	0.010	<0.040 J	0.10
Volatile Organics											
1,1,1,2-Tetrachloroethane	2 [ca]	9.8 [ca]	--	mg/kg	<0.0020 J	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
1,1,1-Trichloroethane	680 [sat]	680 [sat]	--	mg/kg	<0.0010 J	<0.0020	<0.0020	<0.0010 J	<0.0020	<0.0010	<0.0010
1,1,2,2-Tetrachloroethane	0.59 [ca**]	2.9 [ca**]	--	mg/kg	<0.0020	<0.0030 J	<0.0030	<0.0020 J	<0.0030	<0.0020	<0.0020
1,1,2-Trichloroethane	1.1 [ca]	5.5 [ca]	--	mg/kg	<0.0020 J	<0.0020	<0.0020	<0.0020 J	<0.0020 J	<0.0020	<0.0020
1,1-Dichloroethane	3.4 [ca]	17 [ca]	--	mg/kg	<0.0020 J	<0.0020	<0.0020	<0.0020 J	<0.0020	<0.0020	<0.0020
1,1-Dichloroethene	25 [nc]	110 [nc]	--	mg/kg	<0.0030 J	<0.0030	<0.0030	<0.0030 J	<0.0030	<0.0030	<0.0030
1,1-Dichloropropene	--	--	--	mg/kg	<0.0020 J	<0.0020	<0.0020	<0.0020 J	<0.0020	<0.0020	<0.0020
1,2,3-Trichlorobenzene	--	--	--	mg/kg	<0.0020 J	<0.0020 J	<0.0020	<0.0020 J	<0.0020	<0.0020	<0.0020
1,2,3-Trichloropropane	0.091 [ca]	0.41 [ca]	--	mg/kg	<0.0040 J	<0.0040 J	<0.0040	<0.0040 J	<0.0040	<0.0040	<0.0040
1,2,4-Trichlorobenzene	180 [ca**]	220 [sat]	--	mg/kg	<0.0020 J	<0.0020 J	<0.0020	<0.0020 J	<0.0020	<0.0020	<0.0020
1,2,4-Trimethylbenzene	6.7 [nc]	28 [nc]	--	mg/kg	<0.0020 J	<0.0030 J	<0.0030	<0.0020 J	<0.0030	<0.0020	<0.0020
1,2-Dibromo-3-chloropropane	0.0056 [ca]	0.073 [ca]	--	mg/kg	<0.0080 J	<0.0090 J	<0.0090	<0.0070 J	<0.0090	<0.0070	<0.0080
1,2-Dibromoethane	0.034 [ca]	0.17 [ca]	--	mg/kg	<0.0020	<0.0030	<0.0030	<0.0020	<0.0030	<0.0020	<0.0020
1,2-Dichlorobenzene	220 [sat]	220 [sat]	--	mg/kg	<0.0020 J	<0.0020 J	<0.0020	<0.0010 J	<0.0020	<0.0010	<0.0020
1,2-Dichloroethane	0.45 [ca]	2.2 [ca]	--	mg/kg	<0.0020 J	<0.0020	<0.0020	<0.0010 J	<0.0020	<0.0010	<0.0020
1,2-Dichloropropane	0.93 [ca*]	4.7 [ca*]	--	mg/kg	<0.0050 J	<0.0060	<0.0060	<0.0050 J	<0.0060	<0.0050	<0.0050
1,3,5-Trimethylbenzene	--	--	--	mg/kg	<0.0020 J	<0.0030 J	<0.0030	<0.0020 J	<0.0030	<0.0020	<0.0020
1,3-Dichlorobenzene	--	--	--	mg/kg	<0.0020 J	<0.0020 J	<0.0020	<0.0020 J	<0.0020	<0.0020	<0.0020
1,3-Dichloropropane	160 [nc]	1,600 [sat]	--	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
1,4-Dichlorobenzene	2.6 [ca]	13 [ca]	--	mg/kg	<0.0020 J	<0.0020 J	<0.0020	<0.0020 J	<0.0020	<0.0020	<0.0020
2,2-Dichloropropane	--	--	--	mg/kg	<0.0020 J	<0.0020	<0.0020	<0.0010 J	<0.0020	<0.0010	<0.0020
2-Butanone	2,800 [nc]	19,000 [nc]	--	mg/kg	<0.0080 J	<0.0090	<0.0090	<0.0070 J	<0.0090	<0.0070	<0.0080
2-Chloroethyl Vinyl Ether	--	--	--	mg/kg	<0.0080 J	<0.0090	<0.0090	<0.0070 J	<0.0090	<0.0070	<0.0080
2-Chlorotoluene	1,000 [sat]	1,000 [sat]	--	mg/kg	<0.0020 J	<0.0020 J	<0.0020	<0.0020 J	<0.0020	<0.0020	<0.0020
2-Hexanone	--	--	--	mg/kg	<0.0080	<0.0090	<0.0090	<0.0070	<0.0090	<0.0070	<0.0080
4-Chlorotoluene	290 [sat]	290 [sat]	--	mg/kg	<0.0020 J	<0.0020 J	<0.0020	<0.0010 J	<0.0020	<0.0010	<0.0020
4-Methyl-2-pentanone	530 [nc]	5,200 [sat]	--	mg/kg	<0.0080	<0.0090	<0.0090	<0.0070	<0.0090	<0.0070	<0.0080
Acetone	6,100 [nc]	61,000 [nc]	--	mg/kg	<0.0080 J	<0.0090 J	<0.0090	<0.0070 J	<0.0090	<0.0070 J	<0.0080 J
Acrolein	0.016 [nc]	0.068 [nc]	--	mg/kg	<0.0080 J	<0.0090	<0.0090	<0.0070 J	<0.0090	<0.0070	<0.0080
Acrylonitrile	0.24 [ca*]	1.2 [ca*]	--	mg/kg	<0.0080 J	<0.0090	<0.0090	<0.0070 J	<0.0090	<0.0070	<0.0080

Notes found at end of table.

Table C-5. Sediment Analytical Results, Building Debris Disposal Trench, 1998 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	DTSD01 0 - 0.5 07/17/98	DTSD01 0 - 0.5 08/17/98	DTSD02 0 - 0.5 07/17/98	DTSD02 0 - 0.5 08/17/98	DTSD03 0 - 0.5 07/17/98	DTSD03 0 - 0.5 08/17/98	DTSD04 0 - 0.5 08/17/98
Volatile Organics (cont'd)											
Benzene	1.1 {ca*}	5.6 {ca*}	--	mg/kg	<0.0020 J	<0.0020	<0.0020	<0.0010 J	<0.0020	<0.0010	<0.0020
Bromobenzene	--	--	--	mg/kg	<0.0020 J	<0.0020 J	<0.0020	<0.0010 J	<0.0020	<0.0010	<0.0020
Bromochloromethane	--	--	--	mg/kg	<0.0030 J	<0.0030	<0.0030	<0.0020 J	<0.0030	<0.0020	<0.0030
Bromodichloromethane	10 {ca}	46 {ca}	--	mg/kg	<0.0020 J	<0.0020	<0.0020	<0.0010 J	<0.0020	<0.0010	<0.0020
Bromoform	61 {ca*}	220 {ca*}	--	mg/kg	<0.0010	<0.00090	<0.00090	<0.00070	<0.00090	<0.0010	<0.00080
Bromomethane	0.79 {nc}	3.5 {nc}	--	mg/kg	<0.0060 J	<0.0060	<0.0070	<0.0050 J	<0.0070	<0.0050	<0.0060
Carbon Disulfide	67 {nc}	300 {nc}	--	mg/kg	<0.0080 J	<0.0090	<0.0090	<0.0070 J	<0.0090	<0.0070	<0.0080
Carbon Tetrachloride	0.25 {ca}	1.3 {ca}	--	mg/kg	<0.0060 J	<0.0070	<0.0070	<0.0060 J	<0.0070	<0.0060	<0.0060
Chlorobenzene	31 {nc}	860 {sat}	--	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Chloroethane	2,200 {sat}	2,200 {sat}	--	mg/kg	<0.0080 J	<0.0090	<0.0090	<0.0070 J	<0.0090	<0.0070	<0.0080
Chloroform	0.3 {ca}	1.5 {ca}	--	mg/kg	<0.0020 J	<0.0020	<0.0020	<0.0020 J	<0.0020	<0.0020	<0.0020
Chloromethane	1.7 {ca*}	8.4 {ca*}	--	mg/kg	<0.0050 J	<0.0060	<0.0060	<0.0050 J	<0.0060	<0.0050	<0.0050
cis-1,2-Dichloroethene	78 {nc}	1,300 {sat}	--	mg/kg	<0.0030 J	<0.0030	<0.0030	<0.0020 J	<0.0030	<0.0020	<0.0030
cis-1,3-Dichloropropene	--	--	--	mg/kg	<0.0020 J	<0.0020	<0.0020	<0.0010 J	<0.0020	<0.0010	<0.0020
Dibromochloromethane	5.8 {ca}	21 {ca}	--	mg/kg	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dibromomethane	78 {nc}	3,000 {sat}	--	mg/kg	<0.0020 J	<0.0020	<0.0020	<0.0020 J	<0.0030	<0.0020	<0.0020
Dichlorodifluoromethane	19 {nc}	78 {nc}	--	mg/kg	<0.0020 J	<0.0030	<0.0030	<0.0020 J	<0.0030	<0.0020	<0.0030
Ethylbenzene	5.7 {ca}	29 {ca}	--	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Hexachlorobutadiene	6.2 {ca**}	22 {ca*}	--	mg/kg	<0.0020 J	<0.0020 J	<0.0020	<0.0010 J	<0.0020	<0.0010	<0.0020
Isopropylbenzene	310 {sat}	310 {sat}	--	mg/kg	<0.0020 J	<0.0020 J	<0.0020	<0.0020 J	<0.0020	<0.0020	<0.0020
m,p-Xylene	60 {nc}	260 {nc}	--	mg/kg	<0.0040	<0.0040	<0.0040	<0.0030	<0.0040	<0.0030	<0.0040
Methylene Chloride	11 {ca}	54 {ca}	--	mg/kg	<0.0020 J	<0.0020	<0.0020	<0.0010 J	<0.0020	0.0050	<0.0020
n-Butylbenzene	--	--	--	mg/kg	<0.0030 J	<0.0030 J	<0.0030	<0.0020 J	<0.0030	<0.0020	<0.0030
n-Propylbenzene	--	--	--	mg/kg	<0.0020 J	<0.0020 J	<0.0020	<0.0020 J	<0.0020	<0.0020	<0.0020
o-Xylene	300 {sat}	300 {sat}	--	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
p-Isopropyltoluene	--	--	--	mg/kg	<0.0010 J	0.0040 J	<0.0020	<0.0010 J	<0.0020	<0.0010	<0.0010
sec-Butylbenzene	--	--	--	mg/kg	<0.0020 J	<0.0020 J	<0.0020	<0.0020 J	<0.0020	<0.0020	<0.0020
Styrene	1,000 {sat}	1,000 {sat}	--	mg/kg	<0.00040	<0.00030	<0.00040	<0.00030	<0.00040	<0.00030	<0.00030
tert-Butylbenzene	--	--	--	mg/kg	<0.0020 J	<0.0020 J	<0.0020	<0.0020 J	<0.0020	<0.0020	<0.0020
Tetrachloroethene	0.57 {ca}	2.7 {ca}	--	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Toluene	500 {nc}	4600 {nc}	--	mg/kg	<0.0020 J	<0.0020	<0.0020	<0.0020 J	<0.0020	<0.0020	<0.0020
trans-1,2-Dichloroethene	11 {nc}	50 {nc}	--	mg/kg	<0.0060 J	<0.0070	<0.0070	<0.0060 J	<0.0080	<0.0060	<0.0070
trans-1,3-Dichloropropene	--	--	--	mg/kg	<0.0020 J	<0.0020	<0.0020	<0.0010 J	<0.0020	<0.0010	<0.0020
Trichloroethene	2.8 {ca}	14 {ca}	--	mg/kg	<0.0040 J	<0.0040	<0.0040	0.0030 J	<0.0050	<0.0040	<0.0040
Trichlorofluoromethane	80 {nc}	1,300 {sat}	--	mg/kg	<0.0020 J	<0.0020	<0.0020	<0.0020 J	<0.0020	<0.0020	<0.0020
Vinyl Acetate	99 {nc}	2,800 {sat}	--	mg/kg	<0.0080 J	<0.0090	<0.0090	<0.0070 J	<0.0090	<0.0070	<0.0080
Vinyl Chloride	0.06 {ca}	1.7 {ca}	--	mg/kg	<0.0030 J	<0.0030	<0.0030	<0.0030 J	<0.0030	<0.0030	<0.0030
Xylenes (total)	60 {nc}	260 {nc}	--	mg/kg	<0.0040	<0.0040	<0.0040	<0.0030	<0.0040	<0.0030	<0.0040
Semivolatile Organics											
1,2-Diphenylhydrazine	0.61 {ca**}	2.2 {ca**}	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
2,4,5-Trichlorophenol	610 {nc}	6,200 {nc}	--	mg/kg	<1.2	<1.4	<1.4	<1.1	<1.4	<1.1	<1.3
2,4,6-Trichlorophenol	44 {ca**}	160 {ca**}	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
2,4-Dichlorophenol	18 {nc}	180 {nc}	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
2,4-Dimethylphenol	120 {nc}	1,200 {nc}	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
2,4-Dinitrophenol	12 {nc}	120 {nc}	--	mg/kg	<2.5	<2.8	<2.9	<2.3	<2.9	<2.4	<2.6
2-Chloronaphthalene	210 {sat}	210 {sat}	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
2-Chlorophenol	39 {nc}	510 {nc}	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
2-Methylnaphthalene	31 {nc}	440 {sat}	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
2-Methylphenol	310 {nc}	3,100 {nc}	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
2-Nitroaniline	--	--	--	mg/kg	<2.5	<2.8	<2.9	<2.3	<2.9	<2.4	<2.6
2-Nitrophenol	--	--	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
3,3'-Dichlorobenzidine	1.1 {ca**}	3.8 {ca**}	--	mg/kg	<0.98	<1.1	<1.1	<0.90	<1.2	<0.93	<1.0
3-Nitroaniline	--	--	--	mg/kg	<2.5	<2.8	<2.9	<2.3	<2.9	<2.4	<2.6
4,6-Dinitro-2-methylphenol	--	--	--	mg/kg	<2.5	<2.8	<2.9	<2.3	<2.9	<2.4	<2.6
4-Bromophenyl-phenylether	--	--	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
4-Chloro-3-Methylphenol	--	--	--	mg/kg	<0.98	<1.1	<1.1	<0.90	<1.2	<0.93	<1.0
4-Chloroaniline	24 {nc}	250 {nc}	--	mg/kg	<0.98	<1.1	<1.1	<0.90	<1.2	<0.93	<1.0
4-Chlorophenyl-phenylether	--	--	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
4-Methylphenol	31 {nc}	310 {nc}	--	mg/kg	<0.50	<0.57	<0.58	<0.46	0.060 J	<0.47	<0.52
4-Nitroaniline	--	--	--	mg/kg	<2.5	<2.8	<2.9	<2.3	<2.9	<2.4	<2.6
4-Nitrophenol	--	--	--	mg/kg	<2.5	<2.8	<2.9	<2.3	<2.9	<2.4	<2.6
Benzoic Acid	240,000 {max}	2,500,000 {max}	--	mg/kg	<2.5	<2.8	<2.9	<2.3	<2.9	<2.4	<2.6
Benzyl Alcohol	3,100 {nc}	310,000 {max}	--	mg/kg	<0.98	<1.1	<1.1	<0.90	<1.2	<0.93	<1.0
bis(2-Chloroethoxy)methane	18 {nc}	180 {nc}	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
bis(2-Chloroethyl)ether	0.19 {ca**}	0.9 {ca**}	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
bis(2-Chloroisopropyl)ether	--	--	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
bis(2-Ethylhexyl)phthalate	35 {ca*}	120 {ca*}	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
Butylbenzylphthalate	1,200 {nc}	120,000 {max}	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52

Notes found at end of table.

Table C-5. Sediment Analytical Results, Building Debris Disposal Trench, 1998 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	DTSD01 0 - 0.5 07/17/98	DTSD01 0 - 0.5 08/17/98	DTSD02 0 - 0.5 07/17/98	DTSD02 0 - 0.5 08/17/98	DTSD03 0 - 0.5 07/17/98	DTSD03 0 - 0.5 08/17/98	DTSD04 0 - 0.5 08/17/98
Semivolatile Organics (cont'd)											
Carbazole	24 {ca**}	86 {ca**}	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
Dibenzofuran	--	--	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
Diethylphthalate	4,900 {nc}	490,000 {max}	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
Dimethylphthalate	--	--	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
Di-n-Butylphthalate	610 {nc}	6,200 {nc}	--	mg/kg	<0.50	0.080 B	<0.58	<0.46	<0.59	<0.47	0.090 B
Di-n-Octylphthalate	--	--	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
Hexachlorobenzene	0.3 {ca}	1.1 {ca}	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
Hexachlorocyclopentadiene	37 {nc}	370 {nc}	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
Hexachloroethane	35 {ca**}	120 {ca**}	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
Isophorone	510 {ca*}	1,800 {ca*}	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
N-Nitroso-di-n-propylamine	0.069 {ca**}	0.25 {ca**}	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
N-Nitrosodiphenylamine	99 {ca**}	350 {ca**}	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
Pentachlorophenol	3 {ca}	9 {ca}	--	mg/kg	<2.5	<2.8	<2.9	<2.3	<2.9	<2.4	<2.6
Phenol	1,800 {nc}	180,000 {max}	--	mg/kg	<0.50	<0.57	<0.58	<0.46	<0.59	<0.47	<0.52
Inorganics											
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	17,200	8,690	15,200	8,980	10,800	9,250	8,970
Antimony	3.1 {nc}	41 {nc}	--	mg/kg	<0.740	<0.860	<0.870	<0.690	<0.880	<0.690	<0.780
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	6.50	5.00 J	8.00	11.6 J	4.20	13.2	5.40 J
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	93.5 K	75.0 K	92.0 K	104 K	72.5 K	358 L	80.7 K
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	0.960 B	0.750 J	1.20 B	1.10	0.700 B	1.30 B	0.740 J
Cadmium	7 {nc}	81 {nc}	0.69	mg/kg	<0.150	<0.170	<0.170	<0.140	<0.180	<0.140	<0.160
Calcium	--	--	--	mg/kg	59,900	60,400 J	50,800	88,100 J	64,100	62,600	98,600 J
Chromium	280 {ca}	1,460 {ca}	65.3	mg/kg	43.8	22.3	52.5	56.2	24.9	73.0	33.6
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	15.4 K	8.80 L	15.0 K	27.6 L	8.80 K	26.2 L	10.9 L
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	15.0 B	10.1 B	14.8 B	4.40 B	11.7 B	13.3 B	10.3 B
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	29,900	20,400	32,300	44,900	17,300	56,200	20,200
Lead	400 {++}	800 {++}	26.8	mg/kg	18.1	17.8	21.2	23.5	14.2	28.6	15.3
Magnesium	--	--	--	mg/kg	6,620	3,070 B	6,790	7,720	3,750	4,560	6,130
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	468	904 J	614	1,640 J	387	3,340	539 J
Mercury	3.1 {sat}	3.1 {sat}	0.13	mg/kg	<0.150	<0.170	<0.180	<0.140	<0.170	<0.140	<0.160
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	16.3 K	7.90 J	16.4 K	8.00 J	10.6 K	20.8 K	8.70 J
Potassium	--	--	--	mg/kg	2,140 J	776 K	1,930 J	1,760 K	1,180 J	1,250 K	1,670 K
Selenium	39 {nc}	510 {nc}	--	mg/kg	<0.740 L	<0.860	<0.870 L	<0.690	<0.880 L	<0.690 L	<0.780
Silver	39 {nc}	510 {nc}	--	mg/kg	0.860 B	<0.350	<0.350	<0.280	<0.350	<0.280 L	<0.310
Sodium	--	--	--	mg/kg	510 B	225 B	275 B	187 B	344 B	260 B	257 B
Thallium	0.51 {nc}	6.6 {nc}	2.11	mg/kg	<0.300 L	1.10 B	0.380 B	<0.280 L	<0.350 L	0.760 B	<0.310 L
Vanadium	55{nc}	720 {nc}	108	mg/kg	56.0 K	33.5 L	55.5 K	69.5 L	31.6 K	75.7 K	34.7 L
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	46.9 B	41.7 B	51.9 B	32.6 B	44.3 B	46.8 B	35.7 B

mg/kg

[a]

[b]

{ca}

{nc}

*

**

{++}

{max}

{sat}

B (Inorganics)

B (Organics)

J

K

L

NA

[3.3]

24,400

10.6 J

16

Milligrams per kilogram.

USEPA Regional Screening Levels (USEPA 2008a).

Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.

Carcinogen.

Noncarcinogen.

Noncarcinogen screening level is less than one hundred times the carcinogen screening level.

Noncarcinogen screening level is less than ten times the carcinogen screening level.

The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.

Concentration may exceed ceiling limit.

Screening level may exceed saturation concentration.

Constituent concentration

Constituent was detected

Constituent concentration

Estimated concentration

Estimated concentration bias low.

Not Analyzed.

Bracketed concentration indicates laboratory analytical result for duplicate sample.

Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).

Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).

Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Table C-6. Surface Water Analytical Results, Building Debris Disposal Trench, 1998 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Date Collected:	Tapwater Screening Values	Units	DTSW1 07/17/98	DTSW1 08/17/98	DTSW2 07/17/98	DTSW2 08/17/98	DTSW3 07/17/98	DTSW3 08/17/98	DTSW4 08/17/98
Explosives									
1,3,5-Trinitrobenzene	1,100 (nc)	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5
1,3-Dinitrobenzene	3.7 (nc)	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5
2,4,6-Trinitrotoluene	1.8 (ca**)	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	NA	NA
2,4-Dinitrotoluene	73 (nc)	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5
2,6-Dinitrotoluene	37 (nc)	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5
2-Amino-4,6-Dinitrotoluene	73 (nc)	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5
4-Amino-2,6-Dinitrotoluene	73 (nc)	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5
Dinitrotoluene Mix	0.099 (ca)	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5
HMX	1,800 (nc)	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5
m-Nitrotoluene	730 (nc)	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5
Nitrobenzene	3.4 (nc)	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5
Nitroglycerine	3.7 (nc)	µg/L	<2.5	<2.5	<2.5	<2.5	<2.5	NA	<2.5
o-Nitrotoluene	370 (nc)	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5
Pentaerythritol Tetranitrate	- -	µg/L	<2.5	<2.5	<2.5	<2.5	<2.5	NA	<2.5
p-Nitrotoluene	4.2 (ca*)	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5
RDX	0.61 (ca)	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5
Tetryl	150 (nc)	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5
PAHs									
Acenaphthene	2,200 (nc)	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	NA	<0.10
Acenaphthylene	2,200 (nc)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	NA	<1.0
Anthracene	11,000 (nc)	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	NA	<0.050
Benzo(a)anthracene	0.029 (ca**)	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	NA	<0.050
Benzo(a)pyrene	0.0029 (ca**)	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	NA	<0.050
Benzo(b)fluoranthene	0.029 (ca**)	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	NA	<0.10
Benzo(g,h,i)perylene	1,100 (nc)	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	NA	<0.10
Benzo(k)fluoranthene	0.29 (ca**)	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	NA	<0.050
Chrysene	2.9 (ca**)	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	NA	<0.050
Dibenzo(a,h)anthracene	0.0029 (ca**)	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	NA	<0.10
Fluoranthene	1,500 (nc)	µg/L	<0.10 J	<0.10	<0.10 J	<0.10	<0.10 J	NA	<0.10
Fluorene	1,500 (nc)	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	NA	<0.10
Indeno(1,2,3-cd)pyrene	0.029 (ca**)	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	NA	<0.050
Naphthalene	0.14 (ca)	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	NA	<0.10
Phenanthrene	11,000 (nc)	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	NA	<0.050
Pyrene	1,100 (nc)	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	NA	<0.050
Volatile Organics									
1,1,1,2-Tetrachloroethane	0.52 (ca)	µg/L	<1.0	<0.90	<1.0	<0.90	<1.0	<0.90	<0.90
1,1,1-Trichloroethane	9,100 (nc)	µg/L	<1.0	<0.90	<1.0	<0.90	<1.0	<0.90	<0.90
1,1,2,2-Tetrachloroethane	0.067 (ca**)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	0.24 (ca)	µg/L	<1.0	<0.90	<1.0	<0.90	<1.0	<0.90	<0.90
1,1-Dichloroethane	2.4 (ca)	µg/L	<1.0	<0.40	<1.0	<0.40	<1.0	<0.40	<0.40
1,1-Dichloroethene	340 (nc)	µg/L	<1.0	<0.60	<1.0	<0.60	<1.0	<0.60	<0.60
1,1-Dichloropropene	- -	µg/L	<1.0	<0.70	<1.0	<0.70	<1.0	<0.70	<0.70
1,2,3-Trichlorobenzene	- -	µg/L	<1.0	<0.70	<1.0	<0.70	<1.0	<0.70	<0.70
1,2,3-Trichloropropane	0.0096 (ca)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2,4-Trichlorobenzene	8.2 (nc)	µg/L	<1.0	<0.80	<1.0	<0.80	<1.0	<0.80	<0.80
1,2,4-Trimethylbenzene	15 (nc)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dibromo-3-chloropropane	0.00032 (ca)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dibromoethane	0.0065 (ca)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	370 (nc)	µg/L	NA	NA	NA	NA	<1.0	<0.80	<0.80
1,2-Dichloroethane	0.15 (ca)	µg/L	<1.0	<0.90	<1.0	<0.90	<1.0	<0.90	<0.90
1,2-Dichloropropane	0.39 (ca*)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3,5-Trimethylbenzene	- -	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	370 (nc)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloropropane	730 (nc)	µg/L	<1.0	<0.90	<1.0	<0.90	<1.0	<0.90	<0.90
1,4-Dichlorobenzene	0.43 (ca)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2,2-Dichloropropane	- -	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Butanone	7,100 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Chloroethyl Vinyl Ether	- -	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Chlorotoluene	730 (nc)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Hexanone	- -	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
4-Chlorotoluene	2,600 (nc)	µg/L	<1.0	<0.90	<1.0	<0.90	<1.0	<0.90	<0.90
4-Methyl-2-pentanone	2,000 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acetone	22,000 (nc)	µg/L	<5.0	<5.0 J	<5.0	<5.0 J	<5.0	<5.0 J	<5.0 J
Acrolein	0.042 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acrylonitrile	0.045 (ca*)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Benzene	0.41 (ca)	µg/L	<1.0	<0.90	<1.0	<0.90	<1.0	<0.90	<0.90
Bromobenzene	- -	µg/L	<1.0	<0.70	<1.0	<0.70	<1.0	<0.70	<0.70
Bromochloromethane	- -	µg/L	<1.0	<0.90	<1.0	<0.90	<1.0	<0.90	<0.90
Bromodichloromethane	1.1 (ca)	µg/L	<1.0	<0.60	<1.0	<0.60	<1.0	23	<0.60
Bromoform	8.5 (ca*)	µg/L	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<0.50
Bromomethane	8.7 (nc)	µg/L	<2.0	<2.0 J	<2.0	<2.0 J	<2.0	<2.0 J	<2.0 J
Carbon Disulfide	1,000 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Carbon Tetrachloride	0.2 (ca)	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Chlorobenzene	91 (nc)	µg/L	<1.0	<0.90	<1.0	<0.90	<1.0	<0.90	<0.90
Chloroethane	21,000 (nc)	µg/L	<2.0	<2.0	<2.0	<2.0 J	<2.0	<2.0 J	<2.0 J
Chloroform	0.19 (ca)	µg/L	<1.0	<0.80	<1.0	<0.80	<1.0	4.0	<0.80
Chloromethane	1.8 (ca)	µg/L	<2.0	<2.0 J	<2.0	<2.0	<2.0	<2.0	<2.0
cis-1,2-Dichloroethene	370 (nc)	µg/L	<1.0	<0.80	<1.0	<0.80	<1.0	<0.80	<0.80
cis-1,3-Dichloropropene	- -	µg/L	<1.0	<0.10	<1.0	<0.10	<1.0	<0.10	<0.10
Dibromochloromethane	0.8 (ca)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dibromomethane	370 (nc)	µg/L	<1.0	<0.90	<1.0	<0.90	<1.0	<0.90	<0.90
Dichlorodifluoromethane	390 (nc)	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Ethylbenzene	1.5 (ca)	µg/L	<1.0	<0.90	<1.0	<0.90	<1.0	<0.90	<0.90
Hexachlorobutadiene	0.86 (ca*)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Isopropylbenzene	680 (nc)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
m,p-Xylene	200 (nc)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene Chloride	4.8 (ca)	µg/L	<1.0	<0.70	<1.0	<0.70	<1.0	<0.70	<0.70
n-Butylbenzene	- -	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
n-Propylbenzene	- -	µg/L	<1.0	<0.90	<1.0	<0.90	<1.0	<0.90	<0.90
o-Xylene	1,400 (nc)	µg/L	<1.0	<0.90	<1.0	<0.90	<1.0	<0.90	<0.90
p-Isopropyltoluene	680 (nc)	µg/L	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<0.50
sec-Butylbenzene	- -	µg/L	<1.0	<0.60	<1.0	<0.60	<1.0	<0.60	<0.60
Styrene	1,600 (nc)	µg/L	<1.0	<0.50	<1.0	<0.50	<1.0	<0.50	<0.50
tert-Butylbenzene	- -	µg/L	<1.0	<0.70	<1.0	<0.70	<1.0	<0.70	<0.70
Tetrachloroethene	0.11 (ca)	µg/L	<1.0	<0.90	<1.0	<0.90	<1.0	<0.90	<0.90
Toluene	2,300 (nc)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-Dichloroethene	110 (nc)	µg/L	<1.0	<0.70	<1.0	<0.70	<1.0	<0.70	<0.70
trans-1,3-Dichloropropene	- -	µg/L	<1.0	<0.20	<1.0	<0.20	<1.0	<0.20	<0.20
Trichloroethene	1.7 (ca)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	1,300 (nc)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl Acetate	410 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Vinyl Chloride	0.016 (ca)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes (total)	200 (nc)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Notes found at end of table.

Table C-6. Surface Water Analytical Results, Building Debris Disposal Trench, 1998 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Date Collected:	Tapwater Screening Values	Units	DTSW1 07/17/98	DTSW1 08/17/98	DTSW2 07/17/98	DTSW2 08/17/98	DTSW3 07/17/98	DTSW3 08/17/98	DTSW4 08/17/98
Semivolatile Organics									
1,2-Dichlorobenzene	370 (nc)	µg/L	<10	<10	<10	<10	NA	NA	NA
1,2-Diphenylhydrazine	0.084 (ca**)	µg/L	<10	<10	<10	<10	<10	<10	<10
1-Methylnaphthalene	2.3 (ca)	µg/L	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	3,700 (nc)	µg/L	<50	<50	<50	<50	<50	<50	<50
2,4,6-Trichlorophenol	6.1 (ca**)	µg/L	<10	<10	<10	<10	<10	<10	<10
2,4-Dichlorophenol	110 (nc)	µg/L	<10	<10	<10	<10	<10	<10	<10
2,4-Dimethylphenol	730 (nc)	µg/L	<10	<10	<10	<10	<10	<10	<10
2,4-Dinitrophenol	73 (nc)	µg/L	<50	<50	<50	<50	<50	<50	<50
2-Chloronaphthalene	2,900 (nc)	µg/L	<10	<10	<10	<10	<10	<10	<10
2-Chlorophenol	180 (nc)	µg/L	<10	<10	<10	<10	<10	<10	<10
2-Methylnaphthalene	150 (nc)	µg/L	<10	<10	<10	<10	<10	<10	<10
2-Methylphenol	1,800 (nc)	µg/L	<10	<10	<10	<10	<10	<10	<10
2-Nitroaniline	--	µg/L	<50	<50	<50	<50	<50	<50	<50
2-Nitrophenol	--	µg/L	<10	<10	<10	<10	<10	<10	<10
3,3'-Dichlorobenzidine	0.15 (ca**)	µg/L	<20	<20	<20	<20	<20	<20	<20
3-Nitroaniline	--	µg/L	<50	<50	<50	<50	<50	<50	<50
4,6-Dinitro-2-methylphenol	--	µg/L	<50	<50	<50	<50	<50	<50	<50
4-Bromophenyl-phenylether	--	µg/L	<10	<10	<10	<10	<10	<10	<10
4-Chloro-3-Methylphenol	--	µg/L	<20	<20	<20	<20	<20	<20	<20
4-Chloroaniline	150 (nc)	µg/L	<20	<20	<20	<20	<20	<20	<20
4-Chlorophenyl-phenylether	--	µg/L	<10	<10	<10	<10	<10	<10	<10
4-Methylphenol	180 (nc)	µg/L	<10	<10	<10	<10	<10	<10	<10
4-Nitroaniline	--	µg/L	<50	<50	<50	<50	<50	<50	<50
4-Nitrophenol	--	µg/L	<50	<50	<50	<50	<50	<50	<50
Acenaphthene	2,200 (nc)	µg/L	NA	NA	NA	NA	NA	<10	NA
Acenaphthylene	--	µg/L	NA	NA	NA	NA	NA	<10	NA
Anthracene	11,000 (nc)	µg/L	NA	NA	NA	NA	NA	<10	NA
Benzo(a)anthracene	0.029 (ca**)	µg/L	NA	NA	NA	NA	NA	<10	NA
Benzo(a)pyrene	0.0029 (ca**)	µg/L	NA	NA	NA	NA	NA	<10	NA
Benzo(b)fluoranthene	0.029 (ca**)	µg/L	NA	NA	NA	NA	NA	<10	NA
Benzo(g,h,i)perylene	--	µg/L	NA	NA	NA	NA	NA	<10	NA
Benzo(k)fluoranthene	0.29 (ca**)	µg/L	NA	NA	NA	NA	NA	<10	NA
Benzoic Acid	150,000 (max)	µg/L	<50	<50	<50	<50	<50	<50	<50
Benzyl Alcohol	18,000 (nc)	µg/L	<20	<20	<20	<20	<20	<20	<20
bis(2-Chloroethoxy)methane	110 (nc)	µg/L	<10	<10	<10	<10	<10	<10	<10
bis(2-Chloroethyl)ether	0.012 (ca**)	µg/L	<10	<10	<10	<10	<10	<10	<10
bis(2-Chloroisopropyl)ether	--	µg/L	<10	<10	<10	<10	<10	<10	<10
bis(2-Ethylhexyl)phthalate	4.8 (ca)	µg/L	<10	<10	<10	<10	<10	<10	<10
Butylbenzylphthalate	35 (ca)	µg/L	<10	<10	<10	<10	<10	<10	<10
Carbazole	3.4 (ca**)	µg/L	<10	<10	<10	<10	<10	<10	<10
Chrysene	2.9 (ca**)	µg/L	NA	NA	NA	NA	NA	<10	NA
Dibenzo(a,h)anthracene	0.0029 (ca**)	µg/L	NA	NA	NA	NA	NA	<10	NA
Dibenzofuran	37 (nc)	µg/L	<10	<10	<10	<10	<10	<10	<10
Diethylphthalate	29,000 (nc)	µg/L	<10	<10	<10	<10	<10	<10	<10
Dimethylphthalate	--	µg/L	<10	<10	<10	<10	<10	<10	<10
Di-n-Butylphthalate	3,700 (nc)	µg/L	2.0 B	<10	3.0 B	<10	<10	<10	<10
Di-n-Octylphthalate	3,700 (nc)	µg/L	<10	<10	<10	<10	<10	<10	<10
Fluoranthene	1,500 (nc)	µg/L	NA	NA	NA	NA	NA	<10	NA
Fluorene	1,500 (nc)	µg/L	NA	NA	NA	NA	NA	<10	NA
Hexachlorobenzene	0.042 (ca)	µg/L	<10	<10	<10	<10	<10	<10	<10
Hexachlorocyclopentadiene	220 (nc)	µg/L	<10	<10	<10	<10	<10	<10	<10
Hexachloroethane	4.8 (ca**)	µg/L	<10	<10	<10	<10	<10	<10	<10
Indeno(1,2,3-cd)pyrene	0.029 (ca**)	µg/L	NA	NA	NA	NA	NA	<10	NA
Isophorone	71 (ca)	µg/L	<10	<10	<10	<10	<10	<10	<10
Naphthalene	6.2 (nc)	µg/L	NA	NA	NA	NA	NA	<10	NA
N-Nitroso-di-n-propylamine	0.0096 (ca**)	µg/L	<10	<10	<10	<10	<10	<10	<10
N-Nitrosodiphenylamine	14 (ca**)	µg/L	<10	<10	<10	<10	<10	<10	<10
Pentachlorophenol	0.56 (ca)	µg/L	<50	<50	<50	<50	<50	<50	<50
Phenanthrene	--	µg/L	NA	NA	NA	NA	NA	<10	NA
Phenol	11,000 (nc)	µg/L	<10	<10	<10	<10	<10	<10	<10
Pyrene	1,100 (nc)	µg/L	<10	NA	NA	NA	NA	<10	NA
Inorganics									
Aluminum	37,000 (nc)	µg/L	68.5 B	82.3 J	67.9 B	78.5 J	76.7 B	49.8 J	67.4 J
Antimony	15 (nc)	µg/L	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00
Arsenic	0.045 (ca)	µg/L	<7.00	<7.00 J	<7.00	<7.00 J	<7.00	<7.00	<7.00 J
Barium	7,300 (nc)	µg/L	60.6 B	64.5 K	60.1 B	66.5 K	66.2 B	60.0 L	61.0 K
Beryllium	73 (nc)	µg/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Cadmium	18 (nc)	µg/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Calcium	--	µg/L	50,600 B	63,100 J	50,100 B	65,000 J	55,100 B	56,000	59,900 J
Chromium	55,000 (nc)	µg/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Cobalt	11 (nc)	µg/L	<2.00 L	<2.00 L	<2.00 L	<2.00 L	<2.00 L	<2.00 L	<2.00 L
Copper	1,500 (nc)	µg/L	18.1 B	34.8 J	19.8 B	27.4 J	30.7 B	12.0 K	16.7 J
Iron	26,000 (nc)	µg/L	114 B	105	127 B	106	115 B	76.3 J	87.6 J
Lead	15 (nc)	µg/L	<2.00	4.60 K	<2.00	2.30 K	<2.00	<2.00	<2.00
Magnesium	--	µg/L	13,700 B	14,100	13,600 B	14,600	15,000 B	12,700	13,200
Manganese	880 (nc)	µg/L	5.60 B	3.40 J	5.30 B	3.60 J	5.40 B	4.00 J	3.40 J
Mercury	0.63 (nc)	µg/L	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Nickel	730 (nc)	µg/L	2.80 K	5.50 J	2.80 K	5.00 J	2.70 K	3.40 K	3.20 J
Potassium	--	µg/L	1,930 B	2,490 K	1,980 B	2,510 K	2,110 B	2,340 K	2,260 K
Selenium	180 (nc)	µg/L	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00 L	<5.00
Silver	180 (nc)	µg/L	2.10 B	<2.00	<2.00 J	<2.00	<2.00 J	<2.00 L	<2.00
Sodium	--	µg/L	26,900	26,500 K	26,900	25,300 K	29,300	22,400 K	25,600 K
Thallium	2.4 (nc)	µg/L	<2.00 L	<2.00 L	5.70 B	6.10 L	2.30 B	<2.00 L	7.20 L
Vanadium	260 (nc)	µg/L	<2.00	<2.00 L	<2.00	<2.00 L	<2.00	<2.00	<2.00 L
Zinc	11,000 (nc)	µg/L	20.2 B	46.2 J	21.9 B	34.2 J	20.4 B	38.7 K	21.6 J

µg/L

Micrograms per liter.

[a]

USEPA Regional Screening Levels (USEPA 2008a). Adjusted tap-water screening levels used to assess surface water at the NRU.

{ca}

Carcinogen.

{nc}

Noncarcinogen.

*

Noncarcinogen screening level is less than one hundred times the carcinogen screening level.

**

Noncarcinogen screening level is less than ten times the carcinogen screening level.

{max}

Concentration may exceed ceiling limit.

B (Inorganics)

Constituent concentration quantified as estimated.

B (Organics)

Constituent was detected in the associated method blank.

J

Constituent concentration quantified as estimated.

K

Estimated concentration bias high.

L

Estimated concentration bias low.

NA

Not Analyzed.

24,400

Highlighted value indicates constituent concentration is above adjusted tap water RSL.

Table C-7. Soil Analytical Results, Building Debris Disposal Trench, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	DTSB46 0 - 0.5 06/12/02	DTSB46 1 - 3 06/12/02	DTSB47 0 - 0.5 06/12/02	DTSB47 1 - 3 06/12/02
Herbicides								
2,4,5-T	61 (nc)	620 (nc)	--	mg/kg	<0.0125	NA	NA	NA
2,4,5-TP	49 (nc)	490 (nc)	--	mg/kg	<0.0125	NA	NA	NA
2,4-D	69 (nc)	770 (nc)	--	mg/kg	0.171	NA	NA	NA
2,4-DB	49 (nc)	490 (nc)	--	mg/kg	<0.125	NA	NA	NA
Dalapon	180 (nc)	1,800 (nc)	--	mg/kg	0.099 J	NA	NA	NA
Dicamba	180 (nc)	1,800 (nc)	--	mg/kg	0.00849 K	NA	NA	NA
Dichloroprop	--	--	--	mg/kg	<0.025	NA	NA	NA
Dinoseb	6.1 (nc)	62 (nc)	--	mg/kg	<0.025	NA	NA	NA
MCPA	3.1 (nc)	31 (nc)	--	mg/kg	<12.5	NA	NA	NA
MCPP	6.1 (nc)	62 (nc)	--	mg/kg	13.5	NA	NA	NA
Organochlorine Pesticides								
4,4'-DDD	2 (ca**)	7.2 (ca**)	--	mg/kg	0.0034 J	NA	NA	NA
4,4'-DDE	1.4 (ca**)	5.1 (ca**)	--	mg/kg	<0.00834	NA	NA	NA
4,4'-DDT	1.7 (ca*)	7 (ca*)	--	mg/kg	<0.00834	NA	NA	NA
Aldrin	0.029 (ca*)	0.1 (ca)	--	mg/kg	<0.00834	NA	NA	NA
Alpha-BHC	0.077 (ca**)	0.27 (ca**)	--	mg/kg	<0.00834	NA	NA	NA
Alpha-Chlordane	1.6 (ca*)	6.5 (ca**)	--	mg/kg	<0.00834	NA	NA	NA
Beta-BHC	0.27 (ca**)	0.96 (ca**)	--	mg/kg	<0.00834	NA	NA	NA
Delta-BHC	0.52 (ca**)	2.1 (ca**)	--	mg/kg	<0.00834	NA	NA	NA
Dieldrin	0.03 (ca)	0.11 (ca)	--	mg/kg	<0.00834 L	NA	NA	NA
Endosulfan I	--	--	--	mg/kg	<0.00834	NA	NA	NA
Endosulfan II	37 (nc)	370 (nc)	--	mg/kg	<0.00834	NA	NA	NA
Endosulfan Sulfate	--	--	--	mg/kg	<0.00834 J	NA	NA	NA
Endrin	1.8 (nc)	18 (nc)	--	mg/kg	<0.00834	NA	NA	NA
Endrin Aldehyde	1.8 (nc)	18 (nc)	--	mg/kg	<0.00834 L	NA	NA	NA
Endrin Ketone	--	--	--	mg/kg	<0.00834	NA	NA	NA
Gamma-BHC (Lindane)	0.52 (ca*)	2.1 (ca)	--	mg/kg	<0.00834	NA	NA	NA
Gamma-Chlordane	1.6 (ca*)	6.5 (ca**)	--	mg/kg	<0.00834	NA	NA	NA
Heptachlor	0.11 (ca)	0.38 (ca)	--	mg/kg	<0.00834	NA	NA	NA
Heptachlor Epoxide	0.053 (ca*)	0.19 (ca*)	--	mg/kg	<0.00834	NA	NA	NA
Methoxychlor	31 (nc)	310 (nc)	--	mg/kg	0.0291 J	NA	NA	NA
Toxaphene	0.44 (ca**)	1.6 (ca**)	--	mg/kg	<0.416	NA	NA	NA
PAHs								
2-Methylnaphthalene	31 (nc)	440 (sat)	--	mg/kg	5.1	0.0012 B	0.054 B [0.0025]	0.00095 B
Acenaphthene	340 (nc)	3,300 (nc)	--	mg/kg	27	0.0066 B	1.5 [0.021]	0.0020 B
Acenaphthylene	340 (nc)	3,300 (nc)	--	mg/kg	0.24 J	0.0021 J	<0.0026 [0.0020 J]	0.00087 J
Anthracene	1,700 (nc)	170,000 (max)	--	mg/kg	37	0.0091	2.7 [0.034]	0.0036
Benzo(a)anthracene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	66	0.030	7.6 [0.12]	0.016
Benzo(a)pyrene	0.015 (ca**)	0.21 (ca**)	--	mg/kg	57	0.021	6.5 [0.10]	0.013
Benzo(b)fluoranthene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	81	0.046	10 [0.19]	0.022
Benzo(g,h,i)perylene	170 (nc)	1,700 (nc)	--	mg/kg	38	0.020	4.2 [0.079]	0.012
Benzo(k)fluoranthene	1.5 (ca**)	21 (ca**)	--	mg/kg	26	0.011	3.1 [0.050]	0.0062
Chrysene	15 (ca**)	210 (ca**)	--	mg/kg	61	0.033	7.6 [0.13]	0.015
Dibenzo(a,h)anthracene	0.015 (ca**)	0.21 (ca**)	--	mg/kg	9.9	0.0050	1.1 [0.018]	0.0027
Fluoranthene	230 (nc)	2,200 (nc)	--	mg/kg	180	0.097	20 [0.29]	0.040
Fluorene	230 (nc)	2,200 (nc)	--	mg/kg	28	0.0073	1.6 [0.018]	0.0020 J
Indeno(1,2,3-cd)pyrene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	47	0.025	5.2 [0.090]	0.013
Naphthalene	3.9 (nc)	20 (nc)	--	mg/kg	29	0.0023 B	0.14 B [0.0025 B]	0.0011 B
Phenanthrene	1,700 (nc)	170,000 (max)	--	mg/kg	160	0.077	16 [0.22]	0.023
Pyrene	170 (nc)	1,700 (nc)	--	mg/kg	130	0.078 J	16 [0.26 J]	0.033 J
PCBs								
Aroclor-1016	0.39 (nc)	21 (ca**)	--	mg/kg	<0.040	<0.040	<0.040 [0.040]	<0.040
Aroclor-1221	0.17 (ca**)	0.62 (ca**)	--	mg/kg	<0.080	<0.080	<0.080 [0.080]	<0.080
Aroclor-1232	0.17 (ca**)	0.62 (ca**)	--	mg/kg	<0.040	<0.040	<0.040 [0.040]	<0.040
Aroclor-1242	0.22 (ca**)	0.74 (ca**)	--	mg/kg	<0.040	<0.040	<0.040 [0.040]	<0.040
Aroclor-1248	0.22 (ca**)	0.74 (ca**)	--	mg/kg	<0.040	<0.040	<0.040 [0.040]	<0.040
Aroclor-1254	0.22 (ca**)	0.74 (ca*)	--	mg/kg	<0.040	<0.040	<0.040 [0.040]	<0.040
Aroclor-1260	0.22 (ca**)	0.74 (ca**)	--	mg/kg	<0.040	<0.040	<0.040 [0.040]	<0.040
Volatile Organics								
1,1,1-Trichloroethane	680 (sat)	680 (sat)	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
1,1,2,2-Tetrachloroethane	0.59 (ca**)	2.9 (ca**)	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
1,1,2-Trichloroethane	1.1 (ca)	5.5 (ca)	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
1,1-Dichloroethane	3.4 (ca)	17 (ca)	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
1,1-Dichloroethene	25 (nc)	110 (nc)	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
1,2-Dichloroethane	0.45 (ca)	2.2 (ca)	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
1,2-Dichloropropane	0.93 (ca*)	4.7 (ca*)	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
2-Butanone	2,800 (nc)	19,000 (nc)	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
2-Hexanone	--	--	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
4-Methyl-2-pentanone	530 (nc)	5,200 (sat)	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
Acetone	6,100 (nc)	61,000 (nc)	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
Benzene	1.1 (ca*)	5.6 (ca*)	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
Bromodichloromethane	10 (ca)	46 (ca)	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
Bromoform	61 (ca*)	220 (ca*)	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
Bromomethane	0.79 (nc)	3.5 (nc)	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
Carbon Disulfide	67 (nc)	300 (nc)	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
Carbon Tetrachloride	0.25 (ca)	1.3 (ca)	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
Chlorobenzene	31 (nc)	860 (sat)	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
Chloroethane	2,200 (sat)	2,200 (sat)	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
Chloroform	0.3 (ca)	1.5 (ca)	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
Chloromethane	1.7 (ca*)	8.4 (ca*)	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
cis-1,2-Dichloroethene	78 (nc)	1,300 (sat)	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
cis-1,3-Dichloropropene	--	--	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
Dibromochloromethane	5.8 (ca)	21 (ca)	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
Ethylbenzene	5.7 (ca)	29 (ca)	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
m,p-Xylene	60 (nc)	260 (nc)	--	mg/kg	<0.014	<0.011	<0.013 [0.013]	<0.011
Methylene Chloride	11 (ca)	54 (ca)	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
o-Xylene	300 (sat)	300 (sat)	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056
Styrene	1,000 (sat)	1,000 (sat)	--	mg/kg	<0.0069	<0.0056	<0.0067 [0.0067]	<0.0056

Notes found at end of table.

Table C-7. Soil Analytical Results, Building Debris Disposal Trench, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	DTSB46 0 - 0.5 06/12/02	DTSB46 1 - 3 06/12/02	DTSB47 0 - 0.5 06/12/02	DTSB47 1 - 3 06/12/02
Volatile Organics								
Tetrachloroethene	0.57 {ca}	2.7 {ca}	--	mg/kg	<0.0069	<0.0056	<0.0067 [<0.0067]	<0.0056
Toluene	500 {nc}	4600 {nc}	--	mg/kg	<0.0069	<0.0056	<0.0067 [<0.0067]	<0.0056
trans-1,2-Dichloroethene	11 {nc}	50 {nc}	--	mg/kg	<0.0069	<0.0056	<0.0067 [<0.0067]	<0.0056
trans-1,3-Dichloropropene	--	--	--	mg/kg	<0.0069	<0.0056	<0.0067 [<0.0067]	<0.0056
Trichloroethene	2.8 {ca}	14 {ca}	--	mg/kg	<0.0069	<0.0056	<0.0067 [<0.0067]	<0.0056
Vinyl Chloride	0.06 {ca}	1.7 {ca}	--	mg/kg	<0.0069	<0.0056	<0.0067 [<0.0067]	<0.0056
Xylenes (total)	60 {nc}	260 {nc}	--	mg/kg	<0.014	<0.011	<0.013 [<0.013]	<0.011
Inorganics								
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	15,400	15,700	15,500 [16,200]	16,500
Antimony	3.1 {nc}	41 {nc}	--	mg/kg	0.220 B	<0.610 L	0.330 B [0.240 B]	<0.620 L
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	4.00	2.11	3.65 [4.05]	4.51
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	58.2	61.5	78.7 [62.5]	56.0
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	1.11 K	1.11 K	1.20 K [1.24 K]	1.38 K
Cadmium	7 {nc}	81 {nc}	0.69	mg/kg	0.100 J	<0.120	<0.120 [0.0500 B]	<0.120
Calcium	--	--	--	mg/kg	1,340 J	1,120 J	850 J [896 J]	988 J
Chromium	280 {ca}	1,460 {ca}	65.3	mg/kg	27.4 J	23.2 J	39.3 J [41.4 J]	42.7 J
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	19.2 J	10.7 J	24.3 J [20.2 J]	26.1 J
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	83.4 L	19.8 L	25.9 L [27.1 L]	19.3 L
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	23,300 J	21,100 J	40,000 J [32,000 J]	35,600 J
Lead	400 {++}	800 {++}	26.8	mg/kg	37.7 K	14.1 K	18.2 K [21.4 K]	18.4 K
Magnesium	--	--	--	mg/kg	4,040	4,300	5,000 [5,750]	5,680
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	946 J	484 J	1,490 J [1,060 J]	981 J
Mercury	3.1 {sat}	3.1 {sat}	0.13	mg/kg	0.0300 J	0.0300 J	0.0300 J [0.0300 J]	0.0200 J
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	15.1	17.0	17.2 [17.4]	17.8
Potassium	--	--	--	mg/kg	1,530	1,370	1,630 [1,840]	1,630
Selenium	39 {nc}	510 {nc}	--	mg/kg	0.430 L	<1.23 L	<1.22 L [<1.21 L]	<1.24 L
Silver	39 {nc}	510 {nc}	--	mg/kg	<1.25 L	<1.23 L	<1.22 L [<1.21 L]	<1.24 L
Sodium	--	--	--	mg/kg	22.0 B	18.0 B	18.0 B [23.0 B]	18.0 B
Thallium	0.51 {nc}	6.6 {nc}	2.11	mg/kg	0.350 J	0.210 J	0.230 J [0.280 J]	0.200 J
Vanadium	55{nc}	720 {nc}	108	mg/kg	44.6 J	38.4 J	65.3 J [61.3 J]	66.2 J
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	91.7 J	42.6 J	41.2 J [47.4 J]	39.5 J
Miscellaneous								
pH	--	--	--	pH Units	6.68 J	6.3 J	NA	NA
Total Organic Carbon	--	--	--	mg/kg	17,300 K	12,500 K	NA	NA

mg/kg Milligrams per kilogram.

[a] USEPA Regional Screening Levels (USEPA 2008a).

[b] Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.

{ca} Carcinogen.

{nc} Noncarcinogen.

* Noncarcinogen screening level is less than one hundred times the carcinogen screening level.

** Noncarcinogen screening level is less than ten times the carcinogen screening level.

{++} The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.

{max} Concentration may exceed ceiling limit.

{sat} Screening level may exceed saturation concentration.

B (Inorganics) Constituent concentration quantified as estimated.

B (Organics) Constituent was detected in the associated method blank.

J Constituent concentration quantified as estimated.

K Estimated concentration bias high.

L Estimated concentration bias low.

NA Not Analyzed.

[3.3] Bracketed concentration indicates laboratory analytical result for duplicate sample.

24,400 Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).

10.6 J Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).

16 Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Table C-8. Sediment Analytical Results, Building Debris Disposal Trench, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	DTSW/SD05 0 - 0.5 06/20/02	DTSW/SD06 0 - 0.5 06/20/02	DTSW/SD07 0 - 0.5 06/20/02	DTSW/SD08 0 - 0.5 06/20/02	DTSW/SD09 0 - 0.5 06/20/02	DTSW/SD10 0 - 0.5 06/20/02
Herbicides										
2,4,5-T	61 (nc)	620 (nc)	--	mg/kg	<0.02 J	NA	<0.0198 J [<0.021 J]	NA	NA	NA
2,4,5-TP	49 (nc)	490 (nc)	--	mg/kg	<0.02	NA	<0.0198 [<0.021]	NA	NA	NA
2,4-D	69 (nc)	770 (nc)	--	mg/kg	<0.0401	NA	<0.0395 [<0.0419]	NA	NA	NA
2,4-DB	49 (nc)	490 (nc)	--	mg/kg	<0.2 J	NA	<0.198 J [<0.21 J]	NA	NA	NA
Dalapon	180 (nc)	1,800 (nc)	--	mg/kg	<0.2	NA	<0.198 [<0.21]	NA	NA	NA
Dicamba	180 (nc)	1,800 (nc)	--	mg/kg	<0.0401 L	NA	<0.0395 L [<0.0419 L]	NA	NA	NA
Dichlorprop	--	--	--	mg/kg	<0.0401	NA	<0.0395 [<0.0419]	NA	NA	NA
Dinoseb	6.1 (nc)	62 (nc)	--	mg/kg	<0.0401 J	NA	<0.0395 J [<0.0419 J]	NA	NA	NA
MCPA	3.1 (nc)	31 (nc)	--	mg/kg	<20	NA	<19.8 [<21]	NA	NA	NA
MCPP	6.1 (nc)	62 (nc)	--	mg/kg	<20	NA	<19.8 [<21]	NA	NA	NA
Organochlorine Pesticides										
4,4'-DDD	2 (ca**)	7.2 (ca**)	--	mg/kg	0.00115 J	NA	0.0011 J [0.0011 J]	NA	NA	NA
4,4'-DDE	1.4 (ca**)	5.1 (ca**)	--	mg/kg	0.00212 B	NA	0.00169 B [0.00141 B]	NA	NA	NA
4,4'-DDT	1.7 (ca*)	7 (ca*)	--	mg/kg	0.00123 B	NA	0.00069 B [0.00067 B]	NA	NA	NA
Aldrin	0.029 (ca*)	0.1 (ca*)	--	mg/kg	<0.00134	NA	<0.00132 [<0.0014]	NA	NA	NA
Alpha-BHC	0.077 (ca**)	0.27 (ca**)	--	mg/kg	<0.00134	NA	<0.00132 [<0.0014]	NA	NA	NA
Alpha-Chlordane	1.6 (ca**)	6.5 (ca**)	--	mg/kg	0.00037 J	NA	0.00039 J [0.00033 J]	NA	NA	NA
Beta-BHC	0.27 (ca**)	0.96 (ca**)	--	mg/kg	<0.00134	NA	<0.00132 [<0.0014]	NA	NA	NA
Delta-BHC	0.52 (ca**)	2.1 (ca**)	--	mg/kg	<0.00134	NA	0.00354 [0.0065]	NA	NA	NA
Dieldrin	0.03 (ca*)	0.11 (ca*)	--	mg/kg	0.00159	NA	0.0014 [0.00121 J]	NA	NA	NA
Endosulfan I	--	--	--	mg/kg	<0.00134	NA	<0.00132 [<0.0014]	NA	NA	NA
Endosulfan II	37 (nc)	370 (nc)	--	mg/kg	<0.00134	NA	<0.00132 [<0.0014]	NA	NA	NA
Endosulfan Sulfate	--	--	--	mg/kg	<0.00134	NA	<0.00132 [<0.0014]	NA	NA	NA
Endrin	1.8 (nc)	18 (nc)	--	mg/kg	<0.00134	NA	<0.00132 [<0.0014]	NA	NA	NA
Endrin Aldehyde	1.8 (nc)	18 (nc)	--	mg/kg	<0.00134	NA	<0.00132 [<0.0014]	NA	NA	NA
Endrin Ketone	--	--	--	mg/kg	<0.00134	NA	<0.00132 [<0.0014]	NA	NA	NA
Gamma-BHC (Lindane)	0.52 (ca*)	2.1 (ca*)	--	mg/kg	<0.00134	NA	<0.00132 [<0.0014]	NA	NA	NA
Gamma-Chlordane	1.6 (ca**)	6.5 (ca**)	--	mg/kg	<0.00134	NA	<0.00132 [<0.0014]	NA	NA	NA
Heptachlor	0.11 (ca*)	0.38 (ca*)	--	mg/kg	<0.00134	NA	<0.00132 [<0.0014]	NA	NA	NA
Heptachlor Epoxide	0.053 (ca*)	0.19 (ca*)	--	mg/kg	<0.00134	NA	<0.00132 [<0.0014]	NA	NA	NA
Methoxychlor	31 (nc)	310 (nc)	--	mg/kg	<0.00134	NA	<0.00132 [<0.0014]	NA	NA	NA
Toxaphene	0.44 (ca**)	1.6 (ca**)	--	mg/kg	<0.0667	NA	<0.0658 [<0.0698]	NA	NA	NA
PAHs										
2-Methylnaphthalene	31 (nc)	440 (sat)	--	mg/kg	0.030	0.025	0.015 [0.019]	0.0042 B	0.0060 B	0.074
Acenaphthene	340 (nc)	3,300 (nc)	--	mg/kg	0.13	0.0025 B	0.0036 B [<0.0036]	0.0018 B	0.0023 B	0.24
Acenaphthylene	340 (nc)	3,300 (nc)	--	mg/kg	<0.0068	0.0017 J	<0.0034 [<0.0036]	<0.0032	<0.0041	<0.0061
Anthracene	1,700 (nc)	170,000 (max)	--	mg/kg	0.19	0.0044	0.0053 [0.0027 J]	0.0023 J	0.0029 J	0.41
Benzo(a)anthracene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	0.41	0.020	0.015 [0.011]	0.013	0.015	0.88
Benzo(a)pyrene	0.015 (ca**)	0.21 (ca**)	--	mg/kg	0.35	0.017	0.013 [0.012]	0.013	0.014	0.71
Benzo(b)fluoranthene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	0.62	0.034	0.023 [0.024]	0.026	0.025	1.2
Benzo(g,h,i)perylene	170 (nc)	1,700 (nc)	--	mg/kg	0.17 J	0.011 J	0.0069 J [0.0064 J]	0.0082 J	0.0088 J	0.28 J
Benzo(k)fluoranthene	1.5 (ca**)	21 (ca**)	--	mg/kg	0.17	0.013	0.0080 [0.0051]	0.0076	0.0090	0.37
Chrysene	15 (ca**)	210 (ca**)	--	mg/kg	0.40	0.022	0.014 [0.014]	0.015	0.015	0.80
Dibenzo(a,h)anthracene	0.015 (ca**)	0.21 (ca**)	--	mg/kg	0.041	0.0029 J	<0.0034 [<0.0036]	<0.0032	<0.0041	0.076
Fluoranthene	230 (nc)	2,200 (nc)	--	mg/kg	1.0	0.034	0.024 [0.019]	0.024	0.024	2.0
Fluorene	230 (nc)	2,200 (nc)	--	mg/kg	0.13	0.0030 J	0.0038 [0.0026 J]	0.0024 J	0.0028 J	0.24
Indeno(1,2,3-cd)pyrene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	0.20	0.012	0.0080 [0.0075]	0.0099	0.011	0.36
Naphthalene	3.9 (nc)	20 (nc)	--	mg/kg	0.053 B	0.024 B	0.019 B [0.024 B]	0.014 B	0.014 B	0.091
Phenanthrene	1,700 (nc)	170,000 (max)	--	mg/kg	1.0	0.034	0.022 [0.016]	0.012	0.013	1.9
Pyrene	170 (nc)	1,700 (nc)	--	mg/kg	0.94 J	0.035 J	0.027 J [0.022 J]	0.025 J	0.025 J	1.7 J
PCBs										
Aroclor-1016	0.39 (nc)	21 (ca**)	--	mg/kg	<0.060	<0.050	<0.060 [<0.060]	<0.060	<0.070	<0.050
Aroclor-1221	0.17 (ca**)	0.62 (ca**)	--	mg/kg	<0.13	<0.12	<0.13 [<0.14]	<0.12	<0.15	<0.11
Aroclor-1232	0.17 (ca**)	0.62 (ca**)	--	mg/kg	<0.060	<0.050	<0.060 [<0.060]	<0.060	<0.070	<0.050
Aroclor-1242	0.22 (ca**)	0.74 (ca**)	--	mg/kg	<0.060	<0.050	<0.060 [<0.060]	<0.060	<0.070	<0.050
Aroclor-1248	0.22 (ca**)	0.74 (ca**)	--	mg/kg	<0.060	<0.050	<0.060 [<0.060]	<0.060	<0.070	<0.050
Aroclor-1254	0.22 (ca**)	0.74 (ca**)	--	mg/kg	<0.060	<0.050	<0.060 [<0.060]	<0.060	<0.070	<0.050
Aroclor-1260	0.22 (ca**)	0.74 (ca**)	--	mg/kg	<0.060	<0.050	<0.060 [<0.060]	<0.060	<0.070	<0.050
Volatile Organics										
1,1,1-Trichloroethane	680 (sat)	680 (sat)	--	mg/kg	<0.010	<0.0090	<0.0099 [<0.010]	<0.0094	<0.012	<0.0089
1,1,2,2-Tetrachloroethane	0.59 (ca**)	2.9 (ca**)	--	mg/kg	<0.010 L	<0.0090 L	<0.0099 L [<0.010 L]	<0.0094 L	<0.012 L	<0.0089 L
1,1,2-Trichloroethane	1.1 (ca)	5.5 (ca)	--	mg/kg	<0.010	<0.0090	<0.0099 [<0.010]	<0.0094	<0.012	<0.0089
1,1-Dichloroethane	3.4 (ca)	17 (ca)	--	mg/kg	<0.010	<0.0090	<0.0099 [<0.010]	<0.0094	<0.012	<0.0089
1,1-Dichloroethene	25 (nc)	110 (nc)	--	mg/kg	<0.010	<0.0090	<0.0099 [<0.010]	<0.0094	<0.012	<0.0089
1,2-Dichloroethane	0.45 (ca)	2.2 (ca)	--	mg/kg	<0.010	<0.0090	<0.0099 [<0.010]	<0.0094	<0.012	<0.0089
1,2-Dichloropropane	0.93 (ca*)	4.7 (ca*)	--	mg/kg	<0.010	<0.0090	<0.0099 [<0.010]	<0.0094	<0.012	<0.0089
2-Butanone	2,800 (nc)	19,000 (nc)	--	mg/kg	<0.010	<0.0090	<0.0099 [<0.010]	<0.0094	<0.012	<0.0089
2-Hexanone	--	--	--	mg/kg	<0.010 L	<0.0090 L	<0.0099 L [<0.010 L]	<0.0094 L	<0.012 L	<0.0089 L
4-Methyl-2-pentanone	530 (nc)	5,200 (sat)	--	mg/kg	<0.010	<0.0090	<0.0099 [<0.010]	<0.0094	<0.012	<0.0089
Acetone	6,100 (nc)	61,000 (nc)	--	mg/kg	0.030 B	0.022 B	0.032 B [0.037 B]	0.028 B	<0.012	0.025 B
Benzene	1.1 (ca*)	5.6 (ca*)	--	mg/kg	<0.010	<0.0090	<0.0099 [<0.010]	<0.0094	<0.012	<0.0089
Bromodichloromethane	10 (ca)	46 (ca)	--	mg/kg	<0.010	<0.0090	<0.0099 [<0.010]	<0.0094	<0.012	<0.0089
Bromoform	61 (ca)	220 (ca*)	--	mg/kg	<0.010 L	<0.0090 L	<0.0099 L [<0.010 L]	<0.0094 L	<0.012 L	<0.0089 L
Bromomethane	0.79 (nc)	3.5 (nc)	--	mg/kg	<0.010 L	<0.0090 L	<0.0099 L [<0.010 L]	<0.0094 L	<0.012 L	<0.0089 L
Carbon Disulfide	67 (nc)	300 (nc)	--	mg/kg	0.00099 B	0.0010 B	0.0012 B [0.0015 B]	0.0014 B	0.0014 B	0.0013 B
Carbon Tetrachloride	0.25 (ca)	1.3 (ca)	--	mg/kg	<0.010	<0.0090	<0.0099 [<0.010]	<0.0094	<0.012	<0.0089
Chlorobenzene	31 (nc)	860 (sat)	--	mg/kg	<0.010 L	<0.0090 L	<0.0099 L [<0.010 L]	<0.0094 L	<0.012 L	<0.0089 L
Chloroethane	2,200 (sat)	2,200 (sat)	--	mg/kg	<0.010	<0.0090	<0.0099 [<0.010]	<0.0094	<0.012	<0.0089
Chloroform	0.3 (ca)	1.5 (ca)	--	mg/kg	<0.010	<0.0090	<0.0099 [<0.010]	<0.0094	<0.012	<0.0089
Chloromethane	1.7 (ca*)	8.4 (ca*)	--	mg/kg	<0.010 L	<0.0090 L	<0.0099 L [<0.010 L]	<0.0094 L	<0.012 L	<0.0089 L
cis-1,2-Dichloroethene	78 (nc)	1,300 (sat)	--	mg/kg	<0.010	<0.0090	<0.0099 [<0.010]	<0.0094	<0.012	<0.0089
cis-1,3-Dichloropropene	--	--	--	mg/kg	<0.010	<0.0090	<0.0099 [<0.010]	<0.0094	<0.012	<0.0089
Dibromochloromethane	5.8 (ca)	21 (ca)	--	mg/kg	<0.010	<0.0090	<0.0099 [<0.010]	<0.0094	<0.012	<0.0089
Dibromomethane	78 (nc)	3,000 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	19 (nc)	78 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA
Ethylbenzene	5.7 (ca)	29 (ca)	--	mg/kg	<0.010 L	<0.0090 L	<0.0099 L [<0.010 L]	<0.0094 L	<0.012 L	<0.0089 L
m,p-Xylene	60 (nc)	260 (nc)	--	mg/kg	<0.020 L	<0.018 L	<0.020 L [<0.021 L]	<0.019 L	<0.024 L	<0.018 L
Methylene Chloride	11 (ca)	54 (ca)	--	mg/kg	<0.010	<0.0090	<0.0099 [<0.010]	<0.0094	<0.012	<0.0089
o-Xylene	300 (sat)	300 (sat)	--	mg/kg	<0.010 L	<0.0090 L	<0.0099 L [<0.010 L]	<0.0094 L	<0.012 L	<0.0089 L
Styrene	1,000 (sat)	1,000 (sat)	--	mg/kg	<0.010 L	<0.0090 L	<0.0099 L [<0.010 L]	<0.0094 L	<0.012 L	<0.0089 L
Tetrachloroethene	0.57 (ca)	2.7 (ca)	--	mg/kg	<0.010 L	<0.0090 L	<0.0099 L [<0.010 L]	<0.0094 L	<0.012 L	<0.0089 L
Toluene	500 (nc)	4600 (nc)	--	mg/kg	0.00094 B	<0.0090 L	0.0011 B [0.0011 B]	<0.0094 L	<0.012 L	0.0027 B
trans-1,2-Dichloroethene	11 (nc)	50 (nc)	--	mg/kg	<0.010	<0.0090	<0.0099 [<0.010]	<0.0094	<0.012	<0.0089
trans-1,3-Dichloropropene	--	--	--	mg/kg	<0.010	<0.0090	<0.0099 [<0.010]	<0.0094	<0.012	<0.0089
Trichloroethene	2.8 (ca)	14 (ca)	--	mg/kg	<0.010	<0.0090	<0.0099 [<0.010]	<0.0094	<0.012	<0.0089
Vinyl Chloride	0.06 (ca)	1.7 (ca)	--	mg/kg	<0.010	<0.0090	<0.0099 [<0.010]	<0.0094	<0.012	<0.0089
Xylenes (total)	60 (nc)	260 (nc)	--	mg/kg	<0.020	<0.018	<0.020 [<0.021]	<0.019	<0.024	<0.018

Notes found at end of table.

Table C-8. Sediment Analytical Results, Building Debris Disposal Trench, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	DTSW/SD05 0 - 0.5 06/20/02	DTSW/SD06 0 - 0.5 06/20/02	DTSW/SD07 0 - 0.5 06/20/02	DTSW/SD08 0 - 0.5 06/20/02	DTSW/SD09 0 - 0.5 06/20/02	DTSW/SD10 0 - 0.5 06/20/02
Inorganics										
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	17,100	14,900	15,500 [15,700]	18,600	20,200	12,500
Antimony	3.1 {nc}	41 {nc}	-	mg/kg	0.890 L	0.470 B	<0.980 L [<1.05 L]	<0.930 L	<1.19 L	0.370 B
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	2.59 J	1.96 J	<0.980 [2.25 J]	3.59 J	3.08 J	4.37 J
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	95.3	76.9	85.3 [88.0]	98.8	99.1	90.7
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	1.03 J	0.940 J	0.880 J [0.840 J]	1.12 J	0.970 J	1.09 J
Cadmium	7 {nc}	81 {nc}	0.69	mg/kg	<0.200	<0.180	<0.190 [<0.210]	<0.180	<0.230	<0.170
Calcium	-	-	-	mg/kg	78,000	46,100	52,600 [59,400]	72,100	76,200	89,500
Chromium	280 {ca}	1,460 {ca}	65.3	mg/kg	29.6 J	29.0 J	24.0 J [22.8 J]	32.2 J	31.1 J	48.7 J
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	10.6 L	11.4 L	10.7 L [9.40 L]	12.7 L	11.0 L	13.5 L
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	12.9 J	11.1 J	11.1 J [11.5 J]	11.2 J	12.1 J	12.7 J
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	19,800	24,500	18,500 [16,400]	22,900	19,500	22,700
Lead	400 {++}	800 {++}	26.8	mg/kg	19.0 J	14.9 J	10.7 J [17.2 J]	17.7 J	21.4 J	18.2 J
Magnesium	-	-	-	mg/kg	5,010	3,950	5,140 [4,030]	5,320	4,810	7,010
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	641	510	589 [562]	829	627	555
Mercury	3.1 {sat}	3.1 {sat}	0.13	mg/kg	0.0400 L	0.0300 L	<0.0900 L [<0.100 L]	<0.0900 L	<0.110 L	<0.0800 L
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	13.2	12.1	14.0 [14.1]	14.6	14.0	13.1
Potassium	-	-	-	mg/kg	1,510	1,280	1,440 [1,320]	1,810	1,840	2,200
Selenium	39 {nc}	510 {nc}	-	mg/kg	<2.00	<1.80	<1.98 [<2.10]	<1.88	<2.39	<1.78
Silver	39 {nc}	510 {nc}	-	mg/kg	<2.00	<1.80	<1.98 [<2.10]	<1.88	<2.39	<1.78
Sodium	-	-	-	mg/kg	105 J	87.4 J	103 J [107 J]	95.2 J	130 J	134 J
Thallium	0.51 {nc}	6.6 {nc}	2.11	mg/kg	0.190 J	0.140 J	0.0900 J [0.160 J]	0.150 J	0.150 J	0.330 J
Vanadium	55 {nc}	720 {nc}	108	mg/kg	38.7 L	43.1 L	37.0 L [33.7 L]	45.4 L	38.4 L	37.2 L
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	44.7 J	37.7 J	38.4 J [38.6 J]	38.4 J	47.2 J	37.6 J

mg/kg

Milligrams per kilogram.

[a]

USEPA Regional Screening Levels (USEPA 2008a).

[b]

Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.

{ca}

Carcinogen.

{nc}

Noncarcinogen.

*

Noncarcinogen screening level is less than one hundred times the carcinogen screening level.

**

Noncarcinogen screening level is less than ten times the carcinogen screening level.

{++}

The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.

{max}

Concentration may exceed ceiling limit.

{sat}

Screening level may exceed saturation concentration.

B (Inorganics)

Constituent concentration quantified as estimated.

B (Organics)

Constituent was detected in the associated method blank.

J

Constituent concentration quantified as estimated.

K

Estimated concentration bias high.

L

Estimated concentration bias low.

NA

Not Analyzed.

[3.3]

Bracketed concentration indicates laboratory analytical result for duplicate sample.

24,400

Highlighted value indicates constituent concentration is above adjusted soil RSL

10.6 J

Highlighted value indicates constituent concentration is above adjusted soil RSL

16

Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Table C-9. Surface Water Analytical Results, Building Debris Disposal Trench, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Date Collected:	Tapwater Screening Values	Units	DTSW/SD05 06/20/02	DTSW/SD06 06/20/02	DTSW/SD07 06/20/02	DTSW/SD08 06/20/02	DTSW/SD09 06/20/02	DTSW/SD10 06/20/02
Herbicides								
2,4,5-T	370 {nc}	µg/L	<0.1	NA	<0.1	NA	NA	NA
2,4,5-TP	290 {nc}	µg/L	<0.1	NA	<0.1	NA	NA	NA
2,4-D	370 {nc}	µg/L	<0.5	NA	<0.5	NA	NA	NA
2,4-DB	290 {nc}	µg/L	<2	NA	<2	NA	NA	NA
Dalapon	1,100 {nc}	µg/L	<2	NA	<2	NA	NA	NA
Dicamba	1,100 {nc}	µg/L	<0.5 L	NA	<0.5 L	NA	NA	NA
Dichlorprop	- -	µg/L	<0.5	NA	<0.5	NA	NA	NA
Dinoseb	37 {nc}	µg/L	<0.5	NA	<0.5	NA	NA	NA
MCPA	18 {nc}	µg/L	<125	NA	<125	NA	NA	NA
MCPP	37 {nc}	µg/L	<125	NA	<125	NA	NA	NA
Organochlorine Pesticides								
4,4'-DDD	0.28 {ca**}	µg/L	<0.02	NA	<0.02	NA	NA	NA
4,4'-DDE	0.2 {ca**}	µg/L	<0.02	NA	<0.02	NA	NA	NA
4,4'-DDT	0.2 {ca*}	µg/L	0.00516 J	NA	<0.02	NA	NA	NA
Aldrin	0.004 {ca}	µg/L	<0.02	NA	<0.02	NA	NA	NA
Alpha-BHC	0.011 {ca**}	µg/L	<0.02	NA	<0.02	NA	NA	NA
Alpha-Chlordane	- -	µg/L	<0.02	NA	<0.02	NA	NA	NA
Beta-BHC	0.037 {ca**}	µg/L	<0.02	NA	<0.02	NA	NA	NA
Delta-BHC	0.061 {ca}	µg/L	<0.02	NA	<0.02	NA	NA	NA
Dieldrin	0.0042 {ca}	µg/L	0.00548 J	NA	0.00591 J	NA	NA	NA
Endosulfan I	220 {nc}	µg/L	<0.02	NA	<0.02	NA	NA	NA
Endosulfan II	220 {nc}	µg/L	<0.02	NA	<0.02	NA	NA	NA
Endosulfan Sulfate	220 {nc}	µg/L	<0.02	NA	<0.02	NA	NA	NA
Endrin	11 {nc}	µg/L	<0.02	NA	<0.02	NA	NA	NA
Endrin Aldehyde	11 {nc}	µg/L	<0.02	NA	<0.02	NA	NA	NA
Endrin Ketone	11 {nc}	µg/L	0.00437 J	NA	0.00599 J	NA	NA	NA
Gamma-BHC (Lindane)	0.061 {ca}	µg/L	<0.02	NA	<0.02	NA	NA	NA
Gamma-Chlordane	0.19 {ca}	µg/L	<0.02	NA	<0.02	NA	NA	NA
Heptachlor	0.015 {ca}	µg/L	<0.02	NA	<0.02	NA	NA	NA
Heptachlor Epoxide	0.0074 {ca*}	µg/L	<0.02	NA	<0.02	NA	NA	NA
Methoxychlor	180 {nc}	µg/L	<0.02	NA	<0.02	NA	NA	NA
Toxaphene	0.061 {ca**}	µg/L	<1	NA	<1	NA	NA	NA
PAHs								
2-Methylnaphthalene	150 {nc}	µg/L	0.030 B	0.030 B	<0.050	<0.050	0.030 B	0.13 B
Acenaphthene	2,200 {nc}	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.050
Acenaphthylene	2,200 {nc}	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.040 J
Anthracene	11,000 {nc}	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(a)anthracene	0.029 {ca**}	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(a)pyrene	0.0029 {ca**}	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(b)fluoranthene	0.029 {ca**}	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(g,h,i)perylene	1,100 {nc}	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(k)fluoranthene	0.29 {ca**}	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chrysene	2.9 {ca**}	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dibenzo(a,h)anthracene	0.0029 {ca**}	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Fluoranthene	1,500 {nc}	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Fluorene	1,500 {nc}	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	0.030 J
Indeno(1,2,3-cd)pyrene	0.029 {ca**}	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Naphthalene	0.14 {ca}	µg/L	0.040 B	0.040 B	0.030 B	0.030 B	0.040 B	0.13 B
Phenanthrene	11,000 {nc}	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Pyrene	1,100 {nc}	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
PCBs								
Aroclor-1016	0.96 {ca**}	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Aroclor-1221	0.0068 {ca**}	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Aroclor-1232	0.0068 {ca**}	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Aroclor-1242	0.034 {ca**}	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Aroclor-1248	0.034 {ca**}	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Aroclor-1254	0.034 {ca*}	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Aroclor-1260	0.034 {ca**}	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Volatile Organics								
1,1,1-Trichloroethane	9,100 {nc}	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	0.067 {ca**}	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	0.24 {ca}	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	2.4 {ca}	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene	340 {nc}	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	0.15 {ca}	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	0.39 {ca*}	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Butanone	7,100 {nc}	µg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
2-Hexanone	- -	µg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
4-Methyl-2-pentanone	2,000 {nc}	µg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
Acetone	22,000 {nc}	µg/L	<4.0 J	<4.0 J	<4.0 J	<4.0 J	<4.0 J	<4.0 J
Benzene	0.41 {ca}	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	1.1 {ca}	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	8.5 {ca*}	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	8.7 {nc}	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon Disulfide	1,000 {nc}	µg/L	0.30 B	<1.0	0.22 B	0.34 B	0.31 B	0.29 B

Notes found at end of table.

Table C-9. Surface Water Analytical Results, Building Debris Disposal Trench, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Date Collected:	Tapwater Screening Values	Units	DTSW/SD05 06/20/02	DTSW/SD06 06/20/02	DTSW/SD07 06/20/02	DTSW/SD08 06/20/02	DTSW/SD09 06/20/02	DTSW/SD10 06/20/02
Volatile Organics								
Carbon Tetrachloride	0.2 {ca}	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	91 {nc}	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	21,000 {nc}	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroform	0.19 {ca}	µg/L	0.11 J	0.11 J	0.070 J	0.080 J	<1.0	0.090 J
Chloromethane	1.8 {ca}	µg/L	<1.0 L	<1.0 L	<1.0 L	<1.0 L	<1.0 L	<1.0 L
cis-1,2-Dichloroethene	370 {nc}	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
cis-1,3-Dichloropropene	- -	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dibromochloromethane	0.8 {ca}	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	1.5 {ca}	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
m,p-Xylene	200 {nc}	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Methylene Chloride	4.8 {ca}	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
o-Xylene	1,400 {nc}	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Styrene	1,600 {nc}	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	0.11 {ca}	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	2,300 {nc}	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,2-Dichloroethene	110 {nc}	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,3-Dichloropropene	- -	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	1.7 {ca}	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl Chloride	0.016 {ca}	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes (total)	200 {nc}	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Inorganics								
Aluminum	37,000 {nc}	µg/L	340	245	120 J	343	603	300
Antimony	15 {nc}	µg/L	<5.00	0.740 B	0.380 B	<5.00	<5.00	<5.00
Arsenic	0.045 {ca}	µg/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Barium	7,300 {nc}	µg/L	77.1	75.7	72.6	82.5	77.4	77.6
Beryllium	73 {nc}	µg/L	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Cadmium	18 {nc}	µg/L	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Calcium	- -	µg/L	54,100	52,300	47,000	52,500	48,300	54,900
Chromium	55,000 {nc}	µg/L	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Cobalt	11 {nc}	µg/L	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0
Copper	1,500 {nc}	µg/L	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0
Iron	26,000 {nc}	µg/L	238 J	314 J	203 J	328 J	507 J	294 J
Lead	15 {nc}	µg/L	1.10 B	0.340 B	0.300 B	0.210 B	0.480 B	0.150 B
Magnesium	- -	µg/L	16,200	15,900	15,400	17,400	15,900	16,100
Manganese	880 {nc}	µg/L	10.8	11.5	12.2	17.2	19.8	10.8
Mercury	0.63 {nc}	µg/L	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Nickel	730 {nc}	µg/L	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0
Potassium	- -	µg/L	3,250	3,050	3,210	3,670	3,360	3,160
Selenium	180 {nc}	µg/L	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00
Silver	180 {nc}	µg/L	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Sodium	- -	µg/L	31,500	31,100	31,200	35,300	32,200	31,200
Thallium	2.4 {nc}	µg/L	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Vanadium	260 {nc}	µg/L	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0
Zinc	11,000 {nc}	µg/L	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0
Perchlorate								
Perchlorate	26 {nc}	µg/L	<1	<1	<1	<1	<1	<1
Miscellaneous								
Hardness	- -	µg/L	202,000	196,000	181,000	NA	NA	204,000

µg/L

[a]

{ca}

{nc}

*

**

{max}

B (Inorganics)

B (Organics)

J

K

L

NA

[3.3]

24,400

Micrograms per liter.

USEPA Regional Screening Levels (USEPA 2008a). Adjusted tap-water screening levels used to assess surface water at the NRU.

Carcinogen.

Noncarcinogen.

Noncarcinogen screening level is less than one hundred times the carcinogen screening level.

Noncarcinogen screening level is less than ten times the carcinogen screening level.

Concentration may exceed ceiling limit.

Constituent concentration quantified as estimated.

Constituent was detected in the associated method blank.

Constituent concentration quantified as estimated.

Estimated concentration bias high.

Estimated concentration bias low.

Not Analyzed.

Bracketed concentration indicates laboratory analytical result for duplicate sample.

Highlighted value indicates constituent concentration is above adjusted tap water RSL.

Table C-10. Soil Analytical Results, Building Debris Disposal Trench, 2004 Shaw Additional Characterization Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values	Units	DTSB48 0 - 0.5 07/13/04	DTSB50 0 - 0.5 07/13/04	DTSB51 0 - 0.5 07/13/04	DTSB52 0 - 0.5 07/13/04	DTSB54 0 - 0.5 07/13/04	DTSB55 0 - 0.5 07/13/04	DTSB56 0 - 0.5 07/13/04	DTSB57 0 - 0.5 07/13/04
PCBs												
Aroclor-1016	0.39 {nc}	21 {ca**}	--	mg/kg	<0.12 [<0.12]	<0.13	<0.12	<0.13	<0.14	<0.13	<0.14	<0.13
Aroclor-1221	0.17 {ca**}	0.62 {ca**}	--	mg/kg	<0.12 [<0.12]	<0.13	<0.12	<0.13	<0.14	<0.13	<0.14	<0.13
Aroclor-1232	0.17 {ca**}	0.62 {ca**}	--	mg/kg	<0.12 [<0.12]	<0.13	<0.12	<0.13	<0.14	<0.13	<0.14	<0.13
Aroclor-1242	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.12 [<0.12]	<0.13	<0.12	<0.13	<0.14	<0.13	<0.14	<0.13
Aroclor-1248	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.12 [<0.12]	<0.13	<0.12	<0.13	<0.14	<0.13	<0.14	<0.13
Aroclor-1254	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.12 [<0.12]	<0.13	<0.12	<0.13	<0.14	<0.13	<0.14	<0.13
Aroclor-1260	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.12 [<0.12]	<0.13	<0.12	<0.13	<0.14	<0.13	<0.14	<0.13
Semivolatile Organics												
2-Methylnaphthalene	31 {nc}	440 {sat}	--	mg/kg	0.092 [0.061]	<0.0087	0.051	<0.043	<0.0091	0.51 J	0.011	<0.0088
Acenaphthene	340 {nc}	3,300 {nc}	--	mg/kg	0.73 [0.75]	0.026	0.82	0.64	<0.0091	13	0.30	<0.0088
Acenaphthylene	340 {nc}	3,300 {nc}	--	mg/kg	0.15 J [0.12 J]	0.016	0.083 J	<0.043	<0.0091	0.31 J	0.072 J	<0.0088
Anthracene	1,700 {nc}	170,000 {max}	--	mg/kg	1.6 [1.7]	0.094	1.9	1.1	<0.0091	23	0.65	<0.0088
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	3.7 [3.2]	0.21	3.5	2.2	<0.0091	43	1.3	<0.0088
Benzo(a)pyrene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	2.8 [2.6]	0.18	2.7	2.0	<0.0091	32	0.97	<0.0088
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	4.7 [4.3]	0.33	4.4	3.0	0.012	54	2.3	<0.0088
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	1.5 J [1.3 J]	0.13	1.3 J	1.0	<0.0091	15 J	0.54 J	<0.0088
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	1.6 [1.6]	0.084	1.6	0.94	<0.0091	16	2.3	<0.0088
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	3.4 [3.3]	0.23	3.4	2.1	<0.0091	43	1.3	<0.0088
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	0.55 J [0.43 J]	0.037	<0.33	0.31	<0.0091	<3.4	0.21 J	<0.0088
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	9.9 [9.0]	0.54	9.8	6.7	0.013	130	3.4	<0.0088
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	0.69 [0.69]	0.024	0.84	0.59	<0.0091	13	0.27	<0.0088
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	1.4 J [1.2 J]	0.12	1.2 J	1.0	<0.0091	15 J	0.55 J	<0.0088
Naphthalene	15 {nc}	67 {nc}	--	mg/kg	0.40 J [0.21 J]	<0.0087	0.15 J	0.086	<0.0091	1.3 J	0.024 J	<0.0088
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	7.4 J [7.2 J]	0.30	8.3 J	5.5	<0.0091	110 J	2.5 J	<0.0088
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	7.6 [7.2]	0.37	7.9	4.3	0.012	99	2.7	<0.0088
Miscellaneous												
Percent Solids	--	--	--	%	83 [83]	77	81	77	74	78	74	75

Notes found at end of table.

Table C-10. Soil Analytical Results, Building Debris Disposal Trench, 2004 Shaw Additional Characterization Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values	Units	DTSB58 0 - 0.5 07/13/04	DTSB59 0 - 0.5 07/13/04	DTSB60 0 - 0.5 07/13/04	DTSB62 0 - 0.5 07/13/04	DTSB63 0 - 0.5 07/13/04	DTSB64 0 - 0.5 07/13/04	DTSB65 0 - 0.5 07/13/04	DTSB66 0 - 0.5 07/13/04	DTSB67 0 - 0.5 07/13/04	DTSB68 0 - 0.5 07/13/04	DTSB69 0 - 0.5 07/13/04	DTSB70 0 - 0.5 07/13/04
PCBs																
Aroclor-1016	0.39 {nc}	21 {ca**}	--	mg/kg	<0.16	<0.13 L [<0.13]	<0.17	<0.14	<0.13	<0.050 J	<0.15	<0.13	<0.13	<0.14	<0.13	<0.046
Aroclor-1221	0.17 {ca**}	0.62 {ca**}	--	mg/kg	<0.16	<0.13 L [<0.13]	<0.17	<0.14	<0.13	<0.050 J	<0.15	<0.13	<0.13	<0.14	<0.13	<0.046
Aroclor-1232	0.17 {ca**}	0.62 {ca**}	--	mg/kg	<0.16	<0.13 L [<0.13]	<0.17	<0.14	<0.13	<0.050 J	<0.15	<0.13	<0.13	<0.14	<0.13	<0.046
Aroclor-1242	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.16	<0.13 L [<0.13]	<0.17	<0.14	<0.13	<0.050 J	<0.15	<0.13	<0.13	<0.14	<0.13	<0.046
Aroclor-1248	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.16	<0.13 L [<0.13]	<0.17	<0.14	<0.13	<0.050 J	<0.15	<0.13	<0.13	<0.14	<0.13	<0.046
Aroclor-1254	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.16	<0.13 L [<0.13]	<0.17	<0.14	<0.13	<0.050 J	<0.15	<0.13	<0.13	<0.14	<0.13	<0.046
Aroclor-1260	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.16	<0.13 L [<0.13]	<0.17	<0.14	<0.13	<0.050 J	<0.15	<0.13	<0.13	<0.14	<0.13	<0.046
Semivolatile Organics																
2-Methylnaphthalene	31 {nc}	440 {sat}	--	mg/kg	<0.010 L	0.054 J [0.058 J]	<0.011	<0.0091	<0.0087	<0.030	<0.010	<0.0084	2.0	<0.0092	<0.0085	<0.0092
Acenaphthene	340 {nc}	3,300 {nc}	--	mg/kg	0.062 L	0.69 J [1.2 J]	<0.011	<0.0091	0.049 J	0.16	<0.010	<0.0084	10	0.11	0.022	0.013
Acenaphthylene	340 {nc}	3,300 {nc}	--	mg/kg	0.011 J	0.099 J [0.13 J]	<0.011	<0.0091	0.013 J	<0.030	<0.010	<0.0084	0.21 J	0.043 J	<0.0085	<0.0092
Anthracene	1,700 {nc}	170,000 {max}	--	mg/kg	0.15 L	1.5 [2.4]	<0.011	<0.0091	0.13 J	0.34	0.021	<0.0084	17	0.29	0.043	0.037
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	0.35 L	2.9 [3.9]	<0.011	<0.0091	0.34 J	0.96	0.058	<0.0084	27	0.69	0.16	0.10
Benzo(a)pyrene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	0.27 L	2.2 [3.2]	<0.011	<0.0091	0.28 J	0.88	0.058	<0.0084	22	0.60	0.15	0.11 L
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	0.43 L	3.7 [5.6]	<0.011	<0.0091	0.46 J	1.5	0.11	<0.0084	36	1.1	0.25	0.13
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	0.18 L	1.1 J [1.5 J]	<0.011	<0.0091	0.19 J	0.49	0.041	<0.0084	11 J	0.35 J	0.085	0.076
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	0.15 L	1.0 [1.3]	<0.011	<0.0091	0.14	0.33	0.031	<0.0084	9.3	0.26	0.066	0.087 L
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	0.38 L	2.7 [4.1]	<0.011	<0.0091	0.38 J	0.97	0.066	<0.0084	25	0.77	0.16	0.13 L
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	<0.010 L	0.37 J [0.41 J]	<0.011	<0.0091	<0.0087	<0.030	0.012	<0.0084	3.6 J	0.12 J	0.023	<0.0092
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	0.94	8.3 [12]	0.012	0.0091	0.84 J	2.6	0.15	<0.0084	78	1.7	0.42	0.35 L
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	0.069 L	0.67 [1.1]	<0.011	<0.0091	0.045 J	0.14	<0.010	<0.0084	10	0.096	0.018	0.012
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	0.17 J	1.1 J [1.6 J]	<0.011	<0.0091	0.17 J	0.49	0.035	<0.0084	10 J	0.34 J	0.078	0.076
Naphthalene	15 {nc}	67 {nc}	--	mg/kg	<0.010 L	0.15 J [0.14 J]	<0.011	<0.0091	<0.0087	0.042	<0.010	<0.0084	11 J	0.015 J	<0.0085	<0.0092
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	0.73 J	6.7 J [11 J]	<0.011	<0.0091	0.43 J	1.5	0.067	<0.0084	74 J	1.1 J	0.24	0.16
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	0.70	6.2 [10]	<0.011	<0.0091	0.69 J	1.5	0.10	<0.0084	60	1.4	0.27	0.22
Miscellaneous																
Percent Solids	--	--	--	%	64	77 [78]	58	73	77	66	66	79	76	73	79	72

Notes found at end of table.

Table C-10. Soil Analytical Results, Building Debris Disposal Trench, 2004 Shaw Additional Characterization Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values	Units	DTSB71 0 - 0.5 07/13/04	DTSB72 0 - 0.5 07/13/04	DTSB73 0 - 0.5 07/13/04	DTSB74 0 - 0.5 07/13/04	DTSB75 0 - 0.5 07/13/04	DTSB76 0 - 0.5 07/13/04	DTSB77 0 - 0.5 07/13/04	DTSB78 0 - 0.5 07/13/04	DTSB48 1 - 3 07/20/04	DTSB55 1 - 3 07/20/04	DTSB59 1 - 3 07/20/04	DTSB67 1 - 3 07/20/04
PCBs																
Aroclor-1016	0.39 {nc}	21 {ca**}	--	mg/kg	<0.047 [<0.048]	<0.044	<0.044 L	<0.040	0.045 [<0.045]	<0.040	<0.045	<0.046	<0.041	<0.042	<0.041	<0.041
Aroclor-1221	0.17 {ca**}	0.62 {ca**}	--	mg/kg	<0.047 [<0.048]	<0.044	<0.044 L	<0.040	0.045 [<0.045]	<0.040	<0.045	<0.046	<0.041	<0.042	<0.041	<0.041
Aroclor-1232	0.17 {ca**}	0.62 {ca**}	--	mg/kg	<0.047 [<0.048]	<0.044	<0.044 L	<0.040	0.045 [<0.045]	<0.040	<0.045	<0.046	<0.041	<0.042	<0.041	<0.041
Aroclor-1242	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.047 [<0.048]	<0.044	<0.044 L	<0.040	0.045 [<0.045]	<0.040	<0.045	<0.046	<0.041	<0.042	<0.041	<0.041
Aroclor-1248	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.047 [<0.048]	<0.044	<0.044 L	<0.040	0.045 [<0.045]	<0.040	<0.045	<0.046	<0.041	<0.042	<0.041	<0.041
Aroclor-1254	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.047 [<0.048]	<0.044	<0.044 L	<0.040	0.045 [<0.045]	<0.040	<0.045	<0.046	<0.041	<0.042	<0.041	<0.041
Aroclor-1260	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.047 [<0.048]	<0.044	<0.044 L	<0.040	0.045 [<0.045]	<0.040	<0.045	<0.046	<0.041	<0.042	<0.041	<0.041
Semivolatile Organics																
2-Methylnaphthalene	31 {nc}	440 {sat}	--	mg/kg	<0.0095 [<0.0097]	<0.0087	<0.0089	<0.0081	0.090 [<0.00]	<0.0081	<0.18	<0.0092	0.089	0.024	<0.0083	<0.0081
Acenaphthene	340 {nc}	3,300 {nc}	--	mg/kg	0.028 [0.038]	0.011	<0.0089	<0.0081	0.063 J [0.26]	0.11 J	2.5	<0.0092	1.8	0.078	<0.0083	<0.0081
Acenaphthylene	340 {nc}	3,300 {nc}	--	mg/kg	<0.0095 [<0.0097]	<0.0087	<0.0089	<0.0081	0.011 [0.016]	0.0089	<0.18	<0.0092	<0.081	<0.0083	<0.0083	<0.0081
Anthracene	1,700 {nc}	170,000 {max}	--	mg/kg	0.068 [0.071]	0.030	0.018	<0.0081	0.20 J [0.63]	0.22 J	4.8	0.018	3.1	0.073	<0.0083	<0.0081
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	0.20 [0.22]	0.069	0.040	0.0093	0.45 J [1.2 J]	0.46 J	6.5	0.074	5.9	1.15	<0.0083	<0.0081
Benzo(a)pyrene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	0.19 [0.20]	0.067	0.034	0.0089	0.42 J [1.1 J]	0.39 J	6.3	0.079	5.0	0.12	<0.0083	<0.0081
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	0.21 [0.26]	0.097	0.039	0.014	0.45 J [1.2 J]	0.59 J	6.8	0.12	7.7	0.18	<0.0083	<0.0081
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	0.12 [0.14]	0.052	0.024	<0.0081	0.28 J [0.80 J]	0.21 J	4.3	0.050	3.0	0.061	<0.0083	<0.0081
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	0.16 [0.15]	0.048	0.035	<0.0081	0.32 J [0.82 J]	0.18 J	4.8	0.034	2.4	0.056	<0.0083	<0.0081
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	0.24 [0.26]	0.084	0.048	0.0089	0.55 J [1.3 J]	0.43 J	7.1	0.072	5.2	0.14	<0.0083	<0.0081
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	0.056 J [0.064 J]	0.024 J	<0.0089	<0.0081	0.13 J [<0.009]	0.060 J	<0.18	0.015	<0.081	0.020	<0.0083	<0.0081
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	0.65 [0.66]	0.19	0.11	0.015	1.4 J [3.7 J]	1.2 J	27	0.16	17	0.47	<0.0083	<0.0081
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	0.026 [0.035]	0.011	<0.0089	<0.0081	0.070 J [0.27]	0.11 J	2.8	<0.0092	1.8	0.072	<0.0083	<0.0081
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	0.12 [0.14]	0.052	0.024	<0.0081	0.28 J [0.75 J]	0.21 J	4.2	0.043	2.9	0.068	<0.0083	<0.0081
Naphthalene	15 {nc}	67 {nc}	--	mg/kg	<0.0095 [0.011]	<0.0087	<0.0089	<0.0081	0.13 J [0.015]	<0.0081	0.25	<0.0092	0.32	0.16	<0.0083	<0.0081
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	0.33 [0.41]	0.13	0.072	<0.0081	0.83 J [2.9 J]	0.95 J	22	0.077	14	0.43	<0.0083	<0.0081
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	0.40 [0.44]	0.14	0.076	0.013	0.82 J [2.1 J]	0.81 J	7.7 J	0.12	9.8	0.28 J	<0.0083	<0.0081
Miscellaneous																
Percent Solids	--	--	--	%	71 [69]	76	75	83	74 [74]	83	74	72	82	80	81	82

Notes found at end of table.

Table C-10. Soil Analytical Results, Building Debris Disposal Trench, 2004 Shaw Additional Characterization Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values	Units	DTSB77 1 - 3 07/20/04	DTSB80 0 - 0.5 07/20/04	DTSB81 0 - 0.5 07/20/04	DTSB82 0 - 0.5 07/20/04	DTSB83 0 - 0.5 07/20/04	DTSB84 0 - 0.5 07/20/04	DTSB85 0 - 0.5 07/20/04	DTSB86 0 - 0.5 07/20/04	DTSB87 0 - 0.5 07/20/04	DTSB88 0 - 0.5 07/20/04	DTSB89 0 - 0.5 07/23/04
PCBs															
Aroclor-1016	0.39 {nc}	21 {ca**}	--	mg/kg	<0.040	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.037
Aroclor-1221	0.17 {ca**}	0.62 {ca**}	--	mg/kg	<0.040	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.037
Aroclor-1232	0.17 {ca**}	0.62 {ca**}	--	mg/kg	<0.040	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.037
Aroclor-1242	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.040	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.037
Aroclor-1248	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.040	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.037
Aroclor-1254	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.040	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.037
Aroclor-1260	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.040	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.037
Semivolatile Organics															
2-Methylnaphthalene	31 {nc}	440 {sat}	--	mg/kg	<0.0080	<0.0081	<0.0091	<0.0085	<0.0085	<0.0086	<0.0088	<0.0082	<0.0081	<0.0083	<0.0074
Acenaphthene	340 {nc}	3,300 {nc}	--	mg/kg	<0.0080	<0.0081	<0.0091	<0.0085	<0.0085	<0.0086	<0.0088	<0.0082	<0.0081	<0.0083	0.013
Acenaphthylene	340 {nc}	3,300 {nc}	--	mg/kg	<0.0080	<0.0081	0.020	<0.0085	<0.0085	<0.0086	<0.0088	<0.0082	<0.0081	<0.0083	0.0081
Anthracene	1,700 {nc}	170,000 {max}	--	mg/kg	<0.0080	<0.0081	0.056	<0.0085	<0.0085	<0.0086	<0.0088	<0.0082	<0.0081	0.015	0.038
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	<0.0080	0.024 K	0.11	<0.0085	0.014	<0.0086	<0.0088	0.023	0.0097	0.061	0.076
Benzo(a)pyrene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	<0.0080	0.024 K	0.093	<0.0085	0.011	<0.0086	<0.0088	0.025	0.010	0.052	0.068
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	<0.0080	0.041 K	0.22	<0.0085	0.017	<0.0086	<0.0088	0.045	0.018	0.084	0.12
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	<0.0080	0.018	0.071	<0.0085	<0.0085	<0.0086	<0.0088	0.020	0.0085	0.038	0.055
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	<0.0080	0.0085 K	0.069	<0.0085	<0.0085	<0.0086	<0.0088	0.014	<0.0081	0.024	0.037
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	<0.0080	0.024 K	0.13	<0.0085	0.014	<0.0086	<0.0088	0.027	0.011	0.051	0.076
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	<0.0080	<0.0081	<0.0091	<0.0085	<0.0085	<0.0086	<0.0088	<0.0082	<0.0081	<0.0083	0.016
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	<0.0080	0.050 K	0.21	<0.0085	0.037	<0.0086	<0.0088	0.061	0.023	0.15	0.21
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	<0.0080	<0.0081	<0.0091	<0.0085	<0.0085	<0.0086	<0.0088	<0.0082	<0.0081	<0.0083	0.010
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	<0.0080	0.017 K	0.069	<0.0085	<0.0085	<0.0086	<0.0088	0.019	<0.0081	0.036	0.050
Naphthalene	15 {nc}	67 {nc}	--	mg/kg	<0.0080	<0.0081	<0.0091	<0.0085	<0.0085	<0.0086	<0.0088	<0.0082	<0.0081	<0.0083	<0.0074
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	<0.0080	0.022 K	0.073	<0.0085	0.026	<0.0086	<0.0088	0.021	0.0085	0.076	0.11
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	<0.0080	0.035 K	0.16	<0.0085	0.022	<0.0086	<0.0088	0.040	0.015	0.094	0.13
Miscellaneous															
Percent Solids	--	--	--	%	84	82	73	79	79	78	76	81	83	80	91

mg/kg Milligrams per
[a] USEPA Regional Screening Levels (USEPA 2008a).
{ca} Carcinogen.
{nc} Noncarcinogen.
* Noncarcinogen screening level is less than one hundred times the carcinogen screening level.
** Noncarcinogen screening level is less than ten times the carcinogen screening level.
{++} The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.
{max} Concentration may exceed ceiling limit.
{sat} Screening level may exceed saturation concentration.
B (Inorganics) Constituent concentration quantified as estimated.
B (Organics) Constituent was detected in the associated method blank.
J Constituent concentration quantified as estimated.
K Estimated concentration bias high.
L Estimated concentration bias low.
NA Not Analyzed.
[3.3] Bracketed concentration indicates laboratory analytical result for
24,400 Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).
10.6 J Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).

Table C-11. Soil Analytical Results, Building Debris Disposal Trench, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values	Units	BDDT-SS001 0 - 1 07/28/08	BDDT-SB001 2 - 3 07/28/08	BDDT-SB001 3 - 4 07/28/08	BDDT-SS002 0 - 1 07/28/08	BDDT-SB002 2 - 3 07/28/08	BDDT-SB002 3 - 4 07/28/08	BDDT-SS003 0 - 1 07/28/08	BDDT-SS004 0 - 1 07/28/08
Semivolatile Organics												
1-Methylnaphthalene	22 {ca*}	99 {ca*}	--	mg/kg	0.0036 J	<0.0042	<0.0042	0.0026 J	<0.0041	<0.0041	<0.0045	0.0020 J
2-Methylnaphthalene	31 {nc}	440 {sat}	--	mg/kg	0.0045	<0.0042	<0.0042	0.0035 J	<0.0041	<0.0041	<0.0045	<0.0042
Acenaphthene	340 {nc}	3,300 {nc}	--	mg/kg	0.072	0.023	<0.0042	0.059	0.0085	0.013	<0.0045	<0.0042
Acenaphthylene	340 {nc}	3,300 {nc}	--	mg/kg	0.018	<0.0042	<0.0042	0.0063	<0.0041	<0.0041	<0.0045	<0.0042
Anthracene	1,700 {nc}	170,000 {max}	--	mg/kg	0.19	0.039	<0.0042	0.12	0.0076	0.020	<0.0045	<0.0042
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	0.41	0.087	<0.0042	0.31	0.026	0.074	<0.0045	<0.0042
Benzo(a)pyrene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	0.34	0.070	<0.0042	0.26	0.025	0.051	<0.0045	<0.0042
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	0.59	0.11	<0.0042	0.38	0.032	0.079	0.0042 J	0.0050
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	0.27	0.046	<0.0042	0.19	0.016	0.032	<0.0045	0.0063
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	0.29	0.048	<0.0042	0.21	0.016	0.032	0.0029 J	0.0072
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	0.53	0.10	<0.0042	0.36	0.033	0.081	<0.0045	<0.0042
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	0.074	0.013	<0.0042	0.053	<0.0041	0.0093	<0.0045	<0.0042
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	1.2	0.28	<0.0042	0.86	0.10	0.20	0.0072	0.012
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	0.063	0.021	<0.0042	0.051	0.0064	0.0095	<0.0045	<0.0042
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	0.31 J	0.050 J	<0.0042 J	0.21 J	0.018 J	0.041 J	<0.0045 J	<0.0042 J
Naphthalene	15 {nc}	67 {nc}	--	mg/kg	0.0076	<0.0042	<0.0042	<0.0041	<0.0041	<0.0041	<0.0045	<0.0042
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	0.72	0.20	<0.0042	0.57	0.068	0.11	0.0071	0.0068
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	1.1	0.22	<0.0042	0.85	0.067	0.19	0.0073	0.011

mg/kg Milligrams per kilogram.
[a] USEPA Regional Screening Levels (USEPA 2008a).
{ca} Carcinogen.
{nc} Noncarcinogen.
* Noncarcinogen screening level is less than one hundred times the carcinogen screening level.
** Noncarcinogen screening level is less than ten times the carcinogen screening level.
{max} Concentration may exceed ceiling limit.
{sat} Screening level may exceed saturation concentration.
J Constituent concentration quantified as estimated.
[3.3] Bracketed concentration indicates laboratory analytical result for duplicate sample.
24,400 Highlighted value indicates constituent concentration is above adjusted soil RSL
10.6 J Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).

Table C-11. Soil Analytical Results, Building Debris Disposal Trench, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values	Units	BDDT-SS005 0 - 1 07/28/08	BDDT-SS006 0 - 1 07/28/08	BDDT-SS007 0 - 1 07/28/08	BDDT-SS008 0 - 1 07/28/08
Semivolatile Organics								
1-Methylnaphthalene	22 {ca*}	99 {ca*}	--	mg/kg	<0.0040 [<0.0040]	<0.0039	<0.0044	<0.0041
2-Methylnaphthalene	31 {nc}	440 {sat}	--	mg/kg	0.0025 J [<0.0040]	<0.0039	<0.0044	<0.0041
Acenaphthene	340 {nc}	3,300 {nc}	--	mg/kg	<0.0040 [<0.0040]	<0.0039	<0.0044	<0.0041
Acenaphthylene	340 {nc}	3,300 {nc}	--	mg/kg	<0.0040 [<0.0040]	<0.0039	<0.0044	<0.0041
Anthracene	1,700 {nc}	170,000 {max}	--	mg/kg	<0.0040 [<0.0040]	<0.0039	<0.0044	<0.0041
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	<0.0040 [<0.0040]	<0.0039	<0.0044	<0.0041
Benzo(a)pyrene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	<0.0040 [<0.0040]	<0.0039	<0.0044	<0.0041
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	0.0079 [0.0038 J]	0.0051	<0.0044	<0.0041
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	<0.0040 [<0.0040]	<0.0039	<0.0044	<0.0041
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	0.0026 J [0.0017 J]	0.0021 J	<0.0044	<0.0041
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	<0.0040 [<0.0040]	<0.0039	<0.0044	<0.0041
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	<0.0040 [<0.0040]	<0.0039	<0.0044	<0.0041
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	0.014 J [<0.0040 J]	0.0074	0.0052	<0.0041
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	<0.0040 [<0.0040]	<0.0039	<0.0044	<0.0041
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	<0.0040 J [<0.0040 J]	<0.0039 J	<0.0044 J	<0.0041 J
Naphthalene	15 {nc}	67 {nc}	--	mg/kg	<0.0040 [<0.0040]	<0.0039	<0.0044	<0.0041
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	0.012 [0.0070]	0.0078	0.0047	<0.0041
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	0.012 J [<0.0040 J]	0.0066	0.0054	<0.0041

mg/kg

[a]

{ca}

{nc}

*

**

{max}

{sat}

J

{3.3}

24,400

10.6 J

Milligrams per kilogram.

USEPA Regional Screening Levels (USEPA 2008a).

Carcinogen.

Noncarcinogen.

Noncarcinogen screening level is less than one hundred times the carcinogen screening level.

Noncarcinogen screening level is less than ten times the carcinogen screening level.

Concentration may exceed ceiling limit.

Screening level may exceed saturation concentration.

Constituent concentration quantified as estimated.

Bracketed concentration indicates laboratory analytical result for duplicate sample.

Highlighted value indicates constituent concentration is above adjusted soil RSL

Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).

Table C-12. Sediment Analytical Results, Building Debris Disposal Trench, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values	Units	BDDT-SE001 0 - 0.5 07/28/08	BDDT-SE002 0 - 0.5 07/28/08	BDDT-SE003 0 - 0.5 07/28/08	BDDT-SE004 0 - 0.5 07/28/08
Semivolatile Organics								
1-Methylnaphthalene	22 {ca*}	99 {ca*}	--	mg/kg	<0.0044 J	<0.0045	<0.0048	0.0048 J
2-Methylnaphthalene	31 {nc}	440 {sat}	--	mg/kg	<0.0044 J	<0.0045	<0.0048	0.0075
Acenaphthene	340 {nc}	3,300 {nc}	--	mg/kg	<0.0044 J	<0.0045	<0.0048	0.055
Acenaphthylene	340 {nc}	3,300 {nc}	--	mg/kg	<0.0044 J	<0.0045	<0.0048	<0.0062
Anthracene	1,700 {nc}	170,000 {max}	--	mg/kg	<0.0044 J	<0.0045	<0.0048	0.083
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	<0.0044 J	<0.0045	0.0026 J	0.17
Benzo(a)pyrene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	<0.0044 J	<0.0045	<0.0048	0.13
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	<0.0044 J	<0.0045	0.0041 J	0.17
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	<0.0044 J	<0.0045	<0.0048	0.086
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	<0.0044 J	<0.0045	0.0017 J	0.085
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	<0.0044 J	<0.0045	0.0040 J	0.19
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	<0.0044 J	<0.0045	<0.0048	0.026 J
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	<0.0044 J	<0.0045	0.0082	0.57
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	<0.0044 J	<0.0045	<0.0048	0.063
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	<0.0044 J	<0.0045 J	<0.0048 J	0.093 J
Naphthalene	15 {nc}	67 {nc}	--	mg/kg	<0.0044 J	<0.0045	<0.0048	0.021
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	<0.0044 J	<0.0045	0.0056	0.47
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	<0.0044 J	<0.0045	0.0060	0.32

mg/kg

Milligrams per kilogram.

[a]

USEPA Regional Screening Levels (USEPA 2008a).

{ca}

Carcinogen.

{nc}

Noncarcinogen.

*

Noncarcinogen screening level is less than one hundred times the carcinogen screening level.

**

Noncarcinogen screening level is less than ten times the carcinogen screening level.

{max}

Concentration may exceed ceiling limit.

{sat}

Screening level may exceed saturation concentration.

J

Constituent concentration quantified as estimated.

24,400

Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).

10.6 J

Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).

Table C-13. Surface Water Analytical Results, Building Debris Disposal Trench, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Date Collected:	Tapwater Screening Values	Units	BDDT-SW001 07/28/08	BDDT-SW002 07/28/08	BDDT-SW003 07/28/08	BDDT-SW004 07/28/08
Semivolatile Organics						
1-Methylnaphthalene	2.3 {ca}	µg/L	<0.050	<0.056	<0.046	<0.053 J
2-Methylnaphthalene	150 {nc}	µg/L	<0.050	<0.056	<0.046	<0.053 J
Acenaphthene	2,200 {nc}	µg/L	<0.050	<0.056	<0.046	<0.053 J
Acenaphthylene	- -	µg/L	<0.050	<0.056	<0.046	<0.053 J
Anthracene	11,000 {nc}	µg/L	<0.050	<0.056	<0.046	<0.053 J
Benzo(a)anthracene	0.029 {ca**}	µg/L	<0.050	<0.056	<0.046	<0.053 J
Benzo(a)pyrene	0.0029 {ca**}	µg/L	<0.050	<0.056	<0.046	<0.053 J
Benzo(b)fluoranthene	0.029 {ca**}	µg/L	<0.050	<0.056	<0.046	<0.053 J
Benzo(g,h,i)perylene	- -	µg/L	<0.050	<0.056	<0.046	<0.053 J
Benzo(k)fluoranthene	0.29 {ca**}	µg/L	<0.050	<0.056	<0.046	<0.053 J
Chrysene	2.9 {ca**}	µg/L	<0.050	<0.056	<0.046	<0.053 J
Dibenzo(a,h)anthracene	0.0029 {ca**}	µg/L	<0.050	<0.056	<0.046	<0.053 J
Fluoranthene	1,500 {nc}	µg/L	<0.050	<0.056	<0.046	<0.053 J
Fluorene	1,500 {nc}	µg/L	<0.050	<0.056	<0.046	<0.053 J
Indeno(1,2,3-cd)pyrene	0.029 {ca**}	µg/L	<0.050 J	<0.056 J	<0.046 J	<0.053 J
Naphthalene	6.2 {nc}	µg/L	<0.050	<0.056	<0.046	<0.053 J
Phenanthrene	- -	µg/L	<0.050	<0.056	<0.046	<0.053 J
Pyrene	1,100 {nc}	µg/L	<0.050	<0.056	<0.046	<0.053 J

µg/L Micrograms per liter.

{a} USEPA Regional Screening Levels (USEPA 2008a). Adjusted tap-water screening levels used to assess surface water at the NRU.

{ca} Carcinogen.

{nc} Noncarcinogen.

* Noncarcinogen screening level is less than one hundred times the carcinogen screening level.

** Noncarcinogen screening level is less than ten times the carcinogen screening level.

J Constituent concentration quantified as estimated.

24,400 Highlighted value indicates constituent concentration is above adjusted tap water RSL.

Appendix D

Summary of Laboratory Analytical
Results from WBG Site Investigations

Table D-1. Soil Analytical Results, Western Burning Ground, 1997 Gannett Fleming Independent Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	SS-04 0 - 0.5 06/03/97	SS-04a 0 - 0.5 06/03/97	SS-05 0 - 0.5 06/03/97
Dioxin/Furan							
1,2,3,4,6,7,8-HpCDD	0.00039 {ca**}	0.0016 {ca**}	--	mg/kg	0.000021925	0.00001374	0.00001422
1,2,3,4,6,7,8-HpCDF	0.00032 {ca**}	0.0011 {ca**}	--	mg/kg	0.000002541 B	0.000001492 B	0.000002285 B
1,2,3,4,7,8-HxCDF	0.000032 {ca**}	0.00011 {ca**}	--	mg/kg	ND	ND	0.000000756 J
1,2,3,6,7,8-HxCDD	0.000039 {ca**}	0.00016 {ca**}	--	mg/kg	0.000001062 J	0.000000503	ND
1,2,3,7,8,9-HxCDD	0.000039 {ca**}	0.00016 {ca**}	--	mg/kg	0.000000567 J	ND	ND
OCDD	0.013 {ca**}	0.053 {ca**}	--	mg/kg	0.00083547	0.00051434	0.00067782
OCDF	0.011 {ca**}	0.038 {ca**}	--	mg/kg	0.00000397 B	0.000002011 B	0.000003306 B
Total HpCDDs	--	--	--	mg/kg	0.000018718	0.00001187	0.000013721
Total HpCDFs	--	--	--	mg/kg	0.000004247 I	0.000002527 I	0.000004699 I
Total HxCDDs	--	--	--	mg/kg	0.000004853 J	0.000003464	0.000003753
Total HxCDFs	--	--	--	mg/kg	0.000007154 J	0.000004695 I	0.000015869 I
Total PeCDFs	--	--	--	mg/kg	0.000001176	0.000002388 I	0.000003891 I
Total TCDFs	--	--	--	mg/kg	ND	0.000001169 I	0.000001248 I
PCBs							
Aroclor-1254	0.22 {ca**}	0.74 {ca*}	--	mg/kg	0.084	0.047	ND
Volatile Organics							
Acetone	6,100 {nc}	61,000 {nc}	--	mg/kg	ND	ND	0.0040 B
Carbon Disulfide	67 {nc}	300 {nc}	--	mg/kg	0.00080 J	ND	ND
Methylene Chloride	11 {ca}	54 {ca}	--	mg/kg	0.0030 B	0.0030 B	0.0020 B
Semivolatile Organics							
bis(2-Ethylhexyl)phthalate	35 {ca*}	120 {ca*}	--	mg/kg	0.10 J	0.090 J	0.070 J
Di-n-Butylphthalate	610 {nc}	6,200 {nc}	--	mg/kg	0.040 J	ND	ND
Inorganics							
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	18,700	20,300	13,600
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	9.70	6.10	7.20
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	22.4 J	23.8 J	35.6 J
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	0.700	0.600	0.600
Calcium	--	--	--	mg/kg	980	702	1,080
Chromium	280 {ca}	1,460 {ca}	65.3	mg/kg	39.1	37.1	34.4
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	12.3	13.6	5.10
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	57.6	25.6	26.4
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	47,800	39,100	35,700
Lead	400 {++}	800 {++}	26.8	mg/kg	42.9	27.5	310
Magnesium	--	--	--	mg/kg	763	657	524
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	255	347	188
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	15.0	18.9	10.2
Potassium	--	--	--	mg/kg	684	674	458
Vanadium	55{nc}	720 {nc}	108	mg/kg	73.7	67.6	66.3
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	162	85.7	205

mg/kg	Milligrams per kilogram.
[a]	USEPA Regional Screening Levels (USEPA 2008a).
[b]	Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.
{ca}	Carcinogen.
{nc}	Noncarcinogen.
*	Noncarcinogen screening level is less than one hundred times the carcinogen screening level.
**	Noncarcinogen screening level is less than ten times the carcinogen screening level.
{++}	The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.
{max}	Concentration may exceed ceiling limit.
B (Inorganics)	Constituent concentration quantified as estimated.
B (Organics)	Constituent was detected in the associated method blank.
J	Constituent concentration quantified as estimated.
K	Estimated concentration bias high.
L	Estimated concentration bias low.
NA	Not Analyzed.
ND	Not Detected.
24,400	Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).
10.6 J	Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).
16	Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Table D-2. Sediment Analytical Results, Western Burning Ground, 1997 Gannett Fleming Independent Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	SD-01 0 - 0.5 06/04/97	SD-02 0 - 0.5 06/04/97
Organochlorine Pesticides						
4,4'-DDE	1.4 {ca**}	5.1 {ca**}	--	mg/kg	ND	R
PCBs						
Total PCBs	0.24 {ca**}	0.86 {ca**}	--	mg/kg	ND	ND
Volatile Organics						
2-Butanone	2,800 {nc}	19,000 {nc}	--	mg/kg	0.015	0.019
Acetone	6,100 {nc}	61,000 {nc}	--	mg/kg	0.056 B	0.078 B
Methylene Chloride	11 {ca}	54 {ca}	--	mg/kg	0.0020 B	0.0020 B
Toluene	500 {nc}	4600 {nc}	--	mg/kg	0.10	0.010 J
Semivolatile Organics						
4-Methylphenol	31 {nc}	310 {nc}	--	mg/kg	0.50 J	0.20 J
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	0.090 J	0.10 J
Benzo(a)pyrene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	0.090 J	ND
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	0.090 J	0.10 J
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	0.090 J	0.10 J
bis(2-Ethylhexyl)phthalate	35 {ca*}	120 {ca*}	--	mg/kg	0.060 J	0.18 J
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	0.090 J	0.13 J
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	0.30 J	0.20 J
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	0.12 J	0.15 J
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	0.20 J	0.15 J
Inorganics						
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	7,760	8,140
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	5.10	4.80
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	55.4	68.0 J
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	1.10	0.700
Calcium	--	--	--	mg/kg	9,190	6,110
Chromium	280 {ca}	1,460 {ca}	65.3	mg/kg	29.9	20.6
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	5.20	6.50
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	28.3	85.1
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	18,500	14,200
Lead	400 {++}	800 {++}	26.8	mg/kg	23.5	36.6
Magnesium	--	--	--	mg/kg	3,260	1,480
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	112	245
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	10.6	8.80
Potassium	--	--	--	mg/kg	435	479
Sodium	--	--	--	mg/kg	118	100
Thallium	0.51 {nc}	6.6 {nc}	2.11	mg/kg	0.200	0.200
Vanadium	55{nc}	720 {nc}	108	mg/kg	30.7	27.2
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	69.5	61.2

mg/kg	Milligrams per kilogram.
[a]	USEPA Regional Screening Levels (USEPA 2008a).
[b]	Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.
{ca}	Carcinogen.
{nc}	Noncarcinogen.
*	Noncarcinogen screening level is less than one hundred times the carcinogen screening level.
**	Noncarcinogen screening level is less than ten times the carcinogen screening level.
{++}	The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.
{max}	Concentration may exceed ceiling limit.
B (Inorganics)	Constituent concentration quantified as estimated.
B (Organics)	Constituent was detected in the associated method blank.
J	Constituent concentration quantified as estimated.
K	Estimated concentration bias high.
L	Estimated concentration bias low.
NA	Not Analyzed.
ND	Not Detected.
24,400	Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).
10.6 J	Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).
16	Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Table D-3. Surface Water Analytical Results, Western Burning Ground, 1997 Gannett Fleming Independent Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Date Collected:	Tapwater Screening Values [a]	Units	SW-01 06/05/97	SW-02 06/04/97
Inorganics				
Calcium	- -	µg/L	73,600	77,200
Iron	26,000 {nc}	µg/L	ND	297
Lead	15 {nc}	µg/L	ND	2.00
Magnesium	- -	µg/L	12,600	13,800
Manganese	880 {nc}	µg/L	ND	26.0
Potassium	- -	µg/L	2,700	2,610
Sodium	- -	µg/L	6,540	22,400
Vanadium	260 {nc}	µg/L	79.0	75.0

µg/L

Micrograms per liter.

[a]

USEPA Regional Screening Levels (USEPA 2008a).

Adjusted tap-water screening levels used to assess surface water at the NRU.

{ca}

Carcinogen.

{nc}

Noncarcinogen.

NA

Not Analyzed.

ND

Not Detected.

[3.3]

Bracketed concentration indicates laboratory analytical result for duplicate sample.

24,400

Highlighted value indicates constituent concentration is above adjusted tap water RSL.

Table D-4. Soil Analytical Results, Western Burning Ground, 1998 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	WBGSB1 0 - 2 08/05/98	WBGSB1 2 - 4 08/05/98	WBGSB2 0 - 2 08/05/98	WBGSB2 6 - 8 08/05/98	WBGSB2 9 - 11 08/05/98	WBGSB3 0 - 1 08/05/98	WBGSB4 0 - 1.5 08/05/98	WBGSB5 0 - 2 08/05/98
Explosives												
1,3,5-Trinitrobenzene	220 (nc)	2,700 (nc)	--	mg/kg	<0.2	<0.2	<0.2	<0.3 [<0.2]	<0.3	<0.2	<0.2	<0.2
1,3-Dinitrobenzene	0.61 (nc)	6.2 (nc)	--	mg/kg	<0.2	<0.2	<0.2	<0.3 [<0.2]	<0.3	<0.2	<0.2	<0.2
2,4,6-Trinitrotoluene	3.6 (ca**)	42 (ca**)	--	mg/kg	<0.2	<0.2	<0.2	<0.3 [<0.2]	<0.3	<0.2	<0.2	<0.2
2,4-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	<0.2	<0.2	<0.2	<0.3 [<0.2]	<0.3	<0.2	<0.2	<0.2
2,6-Dinitrotoluene	6.1 (nc)	62 (nc)	--	mg/kg	<0.2	<0.2	<0.2	<0.3 [<0.2]	<0.3	<0.2	<0.2	<0.2
2-Amino-4,6-Dinitrotoluene	15 (nc)	190 (nc)	--	mg/kg	<0.2	<0.2	<0.2	<0.3 [<0.2]	<0.3	<0.2	<0.2	<0.2
4-Amino-2,6-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	<0.2	<0.2	<0.2	<0.3 [<0.2]	<0.3	<0.2	<0.2	<0.2
Dinitrotoluene Mix	0.71 (ca)	2.5 (ca)	--	mg/kg	<0.2	<0.2	<0.2	<0.3 [<0.2]	<0.3	<0.2	<0.2	<0.2
HMX	310 (nc)	3,100 (nc)	--	mg/kg	<2.4	<2.4	<2.4	<2.5 [<2.4]	<2.5	<2.4	<2.4	<2.3
m-Nitrotoluene	--	--	--	mg/kg	<0.2	<0.2	<0.2	<0.3 [<0.2]	<0.3	<0.2	<0.2	<0.2
Nitrobenzene	3.1 (nc)	28 (nc)	--	mg/kg	<0.2	<0.2	<0.2	<0.3 [<0.2]	<0.3	<0.2	<0.2	<0.2
Nitroglycerine	0.61 (nc)	6.2 (nc)	--	mg/kg	<1.2	<1.2	<1.2	<1.3 [<1.2]	<1.3	<1.2	<1.2	<1.1
o-Nitrotoluene	78 (nc)	1,300 (sat)	--	mg/kg	<0.2	<0.2	<0.2	<0.3 [<0.2]	<0.3	<0.2	<0.2	<0.2
Pentaerythritol Tetranitrate	--	--	--	mg/kg	<1.2	<1.2	<1.2	<1.3 [<1.2]	<1.3	<1.2	<1.2	<1.1
p-Nitrotoluene	30 (ca**)	110 (ca*)	--	mg/kg	<0.2	<0.2	<0.2	<0.3 [<0.2]	<0.3	<0.2	<0.2	<0.2
RDX	4.4 (ca*)	16 (ca)	--	mg/kg	<0.2	<0.2	<0.2	<0.3 [<0.2]	<0.3	<0.2	<0.2	<0.2
Tetryl	24 (nc)	250 (nc)	--	mg/kg	<0.2	<0.2	<0.2	<0.3 [<0.2]	<0.3	<0.2	<0.2	<0.2
Volatile Organics												
1,1,1,2-Tetrachloroethane	2 (ca)	9.8 (ca)	--	mg/kg	<0.0010	<0.0010	<0.0010	<0.0020 [<0.0020]	<0.0020	<0.0010 J	<0.0010 J	<0.0020
1,1,1-Trichloroethane	680 (sat)	680 (sat)	--	mg/kg	<0.0010	<0.0010	<0.0010	<0.0010 J [<0.0010]	<0.0010 J	<0.0010	<0.0010	<0.0010
1,1,2,2-Tetrachloroethane	0.59 (ca**)	2.9 (ca**)	--	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020 J [<0.0020]	<0.0020 J	<0.0020 J	<0.0020 J	<0.0020
1,1,2-Trichloroethane	1.1 (ca)	5.5 (ca)	--	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020 J [<0.0020]	<0.0020 J	<0.0020	<0.0020	<0.0020
1,1-Dichloroethane	3.4 (ca)	17 (ca)	--	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020 J [<0.0020]	<0.0020 J	<0.0010	<0.0020	<0.0020
1,1-Dichloroethene	25 (nc)	110 (nc)	--	mg/kg	<0.0020	<0.0020	<0.0020	<0.0030 J [<0.0030]	<0.0030 J	<0.0020	<0.0020	<0.0020
1,1-Dichloropropene	--	--	--	mg/kg	<0.0010	<0.0010	<0.0010	<0.0020 J [<0.0020]	<0.0020 J	<0.0010	<0.0010	<0.0010
1,2,3-Trichlorobenzene	--	--	--	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020 J [<0.0020]	<0.0020 J	<0.0020 J	<0.0020 J	<0.0020
1,2,3-Trichloropropane	0.091 (ca)	0.41 (ca)	--	mg/kg	<0.0030	<0.0030	<0.0030	<0.0040 J [<0.0040]	<0.0040 J	<0.0030 J	<0.0030 J	<0.0030
1,2,4-Trichlorobenzene	180 (ca**)	220 (sat)	--	mg/kg	<0.0010	<0.0010	<0.0010	<0.0020 J [<0.0020]	<0.0020 J	<0.0010 J	<0.0010 J	<0.0020
1,2,4-Trimethylbenzene	6.7 (nc)	28 (nc)	--	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020 J [<0.0020]	<0.0020 J	<0.0020 J	<0.0020 J	<0.0020
1,2-Dibromo-3-chloropropane	0.0056 (ca)	0.073 (ca)	--	mg/kg	<0.0060	<0.0060	<0.0060	<0.0070 J [<0.0070]	<0.0070 J	<0.0060 J	<0.0060 J	<0.0060
1,2-Dibromoethane	0.034 (ca)	0.17 (ca)	--	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020 J [<0.0020]	<0.0020	<0.0020 J	<0.0020 J	<0.0020
1,2-Dichlorobenzene	220 (sat)	220 (sat)	--	mg/kg	<0.0010	<0.0010	<0.0010	<0.0010 J [<0.0010]	<0.0010 J	<0.0010 J	<0.0010 J	<0.0010
1,2-Dichloroethane	0.45 (ca)	2.2 (ca)	--	mg/kg	<0.0010	<0.0010	<0.0010	<0.0010 J [<0.0010]	<0.0010 J	<0.0010	<0.0010	<0.0010
1,2-Dichloropropane	0.93 (ca*)	4.7 (ca*)	--	mg/kg	<0.0040	<0.0040	<0.0040	<0.0050 J [<0.0050]	<0.0050 J	<0.0040	<0.0040	<0.0040
1,3,5-Trimethylbenzene	--	--	--	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020 J [<0.0020]	<0.0020 J	<0.0020 J	<0.0020 J	<0.0020
1,3-Dichlorobenzene	--	--	--	mg/kg	<0.0010	<0.0010	<0.0010	<0.0020 J [<0.0020]	<0.0020 J	<0.0010 J	<0.0010 J	<0.0020
1,3-Dichloropropane	160 (nc)	1,600 (sat)	--	mg/kg	<0.0010	<0.0010	<0.0010	<0.0020 J [<0.0020]	<0.0020	<0.0010 J	<0.0010 J	<0.0020
1,4-Dichlorobenzene	2.6 (ca)	13 (ca)	--	mg/kg	<0.0010	<0.0010	<0.0010	<0.0020 J [<0.0020]	<0.0020 J	<0.0010 J	<0.0010 J	<0.0020
2,2-Dichloropropane	--	--	--	mg/kg	<0.0010	<0.0010	<0.0010	<0.0010 J [<0.0010]	<0.0010 J	<0.0010	<0.0010	<0.0010
2-Butanone	2,800 (nc)	19,000 (nc)	--	mg/kg	<0.0060	<0.0060	R	<0.0070 J [<0.0070 J]	<0.0070 J	R	R	<0.0060 J
2-Chloroethyl Vinyl Ether	--	--	--	mg/kg	<0.0060	<0.0060	<0.0060	<0.0070 J [<0.0070]	<0.0070 J	<0.0060	<0.0060	<0.0060
2-Chlorotoluene	1,000 (sat)	1,000 (sat)	--	mg/kg	<0.0010	<0.0010	<0.0010	<0.0020 J [<0.0020]	<0.0020 J	<0.0010 J	<0.0010 J	<0.0010
2-Hexanone	--	--	--	mg/kg	<0.0060	<0.0060	<0.0060	<0.0070 J [<0.0070 J]	<0.0070 J	<0.0060 J	R	<0.0060 J
4-Chlorotoluene	290 (sat)	290 (sat)	--	mg/kg	<0.0010	<0.0010	<0.0010	<0.0010 J [<0.0010]	<0.0010 J	<0.0010 J	<0.0010 J	<0.0010
4-Methyl-2-pentanone	530 (nc)	5,200 (sat)	--	mg/kg	<0.0060	<0.0060	<0.0060	<0.0070 J [<0.0070]	<0.0070	<0.0060 J	<0.0060 J	<0.0060
Acetone	6,100 (nc)	61,000 (nc)	--	mg/kg	<0.0060	<0.0060	<0.0060	<0.0070 J [<0.0070]	<0.0070 J	<0.0060	<0.0060	<0.0060
Acrolein	0.016 (nc)	0.068 (nc)	--	mg/kg	<0.0060	<0.0060	<0.0060	<0.0070 J [<0.0070]	<0.0070 J	<0.0060	<0.0060	<0.0060
Acrylonitrile	0.24 (ca*)	1.2 (ca*)	--	mg/kg	<0.0060	<0.0060	<0.0060	<0.0070 J [<0.0070]	<0.0070 J	<0.0060	<0.0060	<0.0060
Benzene	1.1 (ca*)	5.6 (ca*)	--	mg/kg	<0.0010	<0.0010	<0.0010	<0.0010 J [<0.0010]	<0.0010 J	<0.0010	<0.0010	<0.0010
Bromobenzene	--	--	--	mg/kg	<0.0010	<0.0010	<0.0010	<0.0010 J [<0.0010]	<0.0010 J	<0.0010 J	<0.0010 J	<0.0010
Bromochloromethane	--	--	--	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020 J [<0.0020]	<0.0020 J	<0.0020	<0.0020	<0.0020
Bromodichloromethane	10 (ca)	46 (ca)	--	mg/kg	<0.0010	<0.0010	<0.0010	<0.0010 J [<0.0010]	<0.0010 J	<0.0010	<0.0010	<0.0010
Bromoform	61 (ca*)	220 (ca*)	--	mg/kg	<0.00060	<0.00060	<0.00060	<0.00070 J [<0.00070]	<0.00070	<0.00060 J	<0.00060 J	<0.00060
Bromomethane	0.79 (nc)	3.5 (nc)	--	mg/kg	<0.0040	<0.0040	<0.0040	<0.0050 J [<0.0050]	<0.0060 J	<0.0040	<0.0040	<0.0050
Carbon Disulfide	67 (nc)	300 (nc)	--	mg/kg	<0.0060	<0.0060	<0.0060	<0.0070 J [<0.0070]	<0.0070 J	<0.0060	<0.0060	<0.0060
Carbon Tetrachloride	0.25 (ca)	1.3 (ca)	--	mg/kg	<0.0050	<0.0050	<0.0050	<0.0060 J [<0.0060]	<0.0060 J	<0.0040	<0.0050	<0.0050
Chlorobenzene	31 (nc)	860 (sat)	--	mg/kg	<0.0010	<0.0010	<0.0010	<0.0020 J [<0.0020]	<0.0020	<0.0010 J	<0.0010 J	<0.0010
Chloroethane	2,200 (sat)	2,200 (sat)	--	mg/kg	<0.0060	<0.0060	<0.0060	<0.0070 J [<0.0070]	<0.0070 J	<0.0060	<0.0060	<0.0060
Chloroform	0.3 (ca)	1.5 (ca)	--	mg/kg	<0.0010	<0.0010	<0.0010	<0.0020 J [<0.0020]	<0.0020 J	<0.0010	<0.0010	<0.0010
Chloromethane	1.7 (ca*)	8.4 (ca*)	--	mg/kg	<0.0040	<0.0040	<0.0040	<0.0050 J [<0.0050]	<0.0050 J	<0.0040	<0.0040	<0.0040
cis-1,2-Dichloroethene	78 (nc)	1,300 (sat)	--	mg/kg	<0.0020	<0.0020	<0.0020	<0.0020 J [<0.0020]	<0.0020 J	<0.0020	<0.0020	<0.0020
cis-1,3-Dichloropropene	--	--	--	mg/kg	<0.0010	<0.0010	<0.0010	<0.0010 J [<0.0010]	<0.0010 J	<0.0010	<0.0010	<0.0010
Dibromochloromethane	5.8 (ca)	21 (ca)	--	mg/kg	<0.00080	<0.00080	<0.00080	<0.0010 J [<0.0010]	<0.0010	<0.00080 J	<0.00080 J	<0.00080
Dibromomethane	78 (nc)	3,000 (sat)	--	mg/kg	<0.0020</							

Table D-4. Soil Analytical Results, Western Burning Ground, 1998 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	WBGSB1 0 - 2 08/05/98	WBGSB1 2 - 4 08/05/98	WBGSB2 0 - 2 08/05/98	WBGSB2 6 - 8 08/05/98	WBGSB2 9 - 11 08/05/98	WBGSB3 0 - 1 08/05/98	WBGSB4 0 - 1.5 08/05/98	WBGSB5 0 - 2 08/05/98
Semivolatile Organics												
1,2,4-Trichlorobenzene	8.7 {ca**}	40 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	220 {sat}	220 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Diphenylhydrazine	0.61 {ca**}	2.2 {ca**}	--	mg/kg	<0.38	NA	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
1,3-Dichlorobenzene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	2.6 {ca}	13 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	610 {nc}	6,200 {nc}	--	mg/kg	<0.92	<0.94	<0.92	<1.1 [<1.1]	<1.2	<0.89	<0.93	<0.98
2,4,6-Trichlorophenol	44 {ca**}	160 {ca**}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
2,4-Dichlorophenol	18 {nc}	180 {nc}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
2,4-Dimethylphenol	120 {nc}	1,200 {nc}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
2,4-Dinitrophenol	12 {nc}	120 {nc}	--	mg/kg	<1.9	<1.9	<1.9	<2.3 [<2.3]	<2.4	<1.8	<1.9	<2.0
2,4-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	6.1 {nc}	62 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	210 {sat}	210 {sat}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
2-Chlorophenol	39 {nc}	510 {nc}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
2-Methylnaphthalene	31 {nc}	440 {sat}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
2-Methylphenol	310 {nc}	3,100 {nc}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
2-Nitroaniline	--	--	--	mg/kg	<1.9	<1.9	<1.9	<2.3 [<2.3]	<2.4	<1.8	<1.9	<2.0
2-Nitrophenol	--	--	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
3,3'-Dichlorobenzidine	1.1 {ca**}	3.8 {ca**}	--	mg/kg	<0.75	<0.76	<0.75	<0.92 [<0.92]	<0.94	<0.72	<0.76 J	<0.79
3-Nitroaniline	--	--	--	mg/kg	<1.9	<1.9	<1.9	<2.3 [<2.3]	<2.4	<1.8	<1.9	<2.0
4,6-Dinitro-2-methylphenol	--	--	--	mg/kg	<1.9	<1.9	<1.9	<2.3 [<2.3]	<2.4	<1.8	<1.9	<2.0
4-Bromophenyl-phenylether	--	--	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
4-Chloro-3-Methylphenol	--	--	--	mg/kg	<0.75	<0.76	<0.75	<0.92 [<0.92]	<0.94	<0.72	<0.76	<0.79
4-Chloroaniline	24 {nc}	250 {nc}	--	mg/kg	<0.75	<0.76	<0.75	<0.92 [<0.92]	<0.94	<0.72	<0.76	<0.79
4-Chlorophenyl-phenylether	--	--	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
4-Methylphenol	31 {nc}	310 {nc}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
4-Nitroaniline	--	--	--	mg/kg	<1.9	<1.9	<1.9	<2.3 [<2.3]	<2.4	<1.8	<1.9	<2.0
4-Nitrophenol	--	--	--	mg/kg	<1.9	<1.9	<1.9	<2.3 [<2.3]	<2.4	<1.8	<1.9	<2.0
Acenaphthene	340 {nc}	3,300 {nc}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
Acenaphthylene	340 {nc}	3,300 {nc}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
Anthracene	1,700 {nc}	170,000 {max}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	0.040 J	<0.40
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	0.16 J	0.15 J	<0.40
Benzo(a)pyrene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	<0.38 J	<0.39	<0.38	<0.46 [<0.46]	<0.48	0.40 J	0.33 J	<0.40
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	<0.38 J	<0.39	<0.38	<0.46 [<0.46]	<0.48	0.62 J	0.48 J	<0.40
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	<0.38 J	<0.39	<0.38	<0.46 [<0.46]	<0.48	0.17 J	0.13 J	<0.40
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	<0.38 J	<0.39	<0.38	<0.46 [<0.46]	<0.48	0.51 J	0.40 J	<0.40
Benzoic Acid	240,000 {max}	2,500,000 {max}	--	mg/kg	<1.9	<1.9	<1.9	<2.3 [<2.3]	<2.4	<1.8	<1.9	<2.0
Benzyl Alcohol	3,100 {nc}	310,000 {max}	--	mg/kg	<0.75	<0.76	<0.75	<0.92 [<0.92]	<0.94	<0.72	<0.76	<0.79
bis(2-Chloroethoxy)methane	18 {nc}	180 {nc}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
bis(2-Chloroethyl)ether	0.19 {ca**}	0.9 {ca**}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
bis(2-Chloroisopropyl)ether	--	--	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
bis(2-Ethylhexyl)phthalate	35 {ca*}	120 {ca*}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	0.040 J	<0.38 J	<0.40
Butylbenzylphthalate	260 {ca*}	910 {ca*}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38 J	<0.40
Carbazole	24 {ca**}	86 {ca**}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	0.040 J	<0.40
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	0.24 J	0.22 J	<0.40
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	<0.38 J	<0.39	<0.38	<0.46 [<0.46]	<0.48	R	R	<0.40
Dibenzofuran	--	--	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
Diethylphthalate	4,900 {nc}	490,000 {max}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
Dimethylphthalate	--	--	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
Di-n-Butylphthalate	610 {nc}	6,200 {nc}	--	mg/kg	<0.38	<0.39	<0.38	0.080 J [<0.46]	<0.48	<0.37	<0.38	<0.40
Dinitrotoluene Mix	0.71 {ca}	2.5 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-Octylphthalate	--	--	--	mg/kg	<0.38 J	<0.39	<0.38	<0.46 [<0.46]	<0.48	R	R	<0.40
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	0.33 J	0.33 J	<0.40
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
Hexachlorobenzene	0.3 {ca}	1.1 {ca}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
Hexachlorobutadiene	6.2 {ca**}	22 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	37 {nc}	370 {nc}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
Hexachloroethane	35 {ca**}	120 {ca**}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	<0.38 J	<0.39	<0.38	<0.46 [<0.46]	<0.48	0.15 J	0.13 J	<0.40
Isophorone	510 {ca*}	1,800 {ca*}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
Naphthalene	3.9 {ca}	20 {ca}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
Nitrobenzene	3.1 {nc}	28 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	0.069 {ca**}	0.25 {ca**}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
N-Nitrosodiphenylamine	99 {ca**}	350 {ca**}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	0.060 J	<0.38	<0.40
Pentachlorophenol	3 {ca}	9 {ca}	--	mg/kg	<1.9	<1.9	<1.9	<2.3 [<2.3]	<2.4	<1.8	<1.9	<2.0
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	0.12 J	0.19 J	<0.40
Phenol	1,800 {nc}	180,000 {max}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	<0.37	<0.38	<0.40
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	<0.38	<0.39	<0.38	<0.46 [<0.46]	<0.48	0.40	0.43 J	<0.40

Notes found at end of table.

Table D-4. Soil Analytical Results, Western Burning Ground, 1998 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	WBGSB1 0 - 2 08/05/98	WBGSB1 2 - 4 08/05/98	WBGSB2 0 - 2 08/05/98	WBGSB2 6 - 8 08/05/98	WBGSB2 9 - 11 08/05/98	WBGSB3 0 - 1 08/05/98	WBGSB4 0 - 1.5 08/05/98	WBGSB5 0 - 2 08/05/98
Inorganics												
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	12,500	14,200	10,100	12,700 [23,500]	27,000	14,500	13,200	15,300
Antimony	3.1 {nc}	41 {nc}	- -	mg/kg	<0.560	<0.570	<0.560	<0.690 [<0.680]	<0.710	5.30 K	<0.580	<0.580
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	9.40 K	7.80 K	17.0 K	3.70 K [5.10 K]	5.30 K	35.8	37.9	9.80 K
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	210 K	26.9 K	457 K	22.3 B [43.1 K]	45.9 K	610 K	584 K	49.6 K
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	0.320 J	0.700	0.480 J	2.70 [3.00]	1.40	0.290 J	0.420 J	0.540 J
Cadmium	7 {nc}	81 {nc}	0.69	mg/kg	0.450 J	<0.110	1.90	<0.140 [<0.140]	0.300 J	2.70	0.400 J	<0.120
Calcium	- -	- -	- -	mg/kg	33,900	2,570 B	97,300	4,710 B [7,060 B]	37,300	47,600	10,600 B	9,430 B
Chromium	280 {ca}	1,460 {ca}	65.3	mg/kg	195	41.5	233	28.0 [47.4]	64.1	249	34.9	38.2
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	7.20 K	7.80 K	8.70 K	7.90 K [12.1 K]	16.4 K	10.9 K	8.30 K	8.60 K
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	556	18.0 B	203	14.9 B [18.2 B]	13.9 B	1,340	194	53.4
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	34,500	27,300	26,300	19,900 [30,800]	28,700	42,900	28,000	39,300
Lead	400 {++}	800 {++}	26.8	mg/kg	2,070	179	2,450	9.50 [18.7]	13.3	3,990	2,480	44.5
Magnesium	- -	- -	- -	mg/kg	18,900	2,490 B	21,000	17,900 [41,100]	58,900	23,200	4,910	3,560
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	177	44.9	312	255 [222]	247	548	161	139
Mercury	3.1 {sat}	3.1 {sat}	0.13	mg/kg	<0.110	<0.120	<0.120	<0.140 [<0.140]	<0.140	<0.110	<0.120	<0.120
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	11.6 K	12.0 K	18.6 K	17.7 K [29.0 K]	20.0 K	28.4 K	17.7 K	11.7 K
Potassium	- -	- -	- -	mg/kg	1,100 K	1,040 K	1,950 K	2,860 K [7,170 K]	10,600 K	1,620 K	836 K	1,030 K
Selenium	39 {nc}	510 {nc}	- -	mg/kg	<0.560	<0.570	<0.560	<0.690 [<0.680]	<0.710	<0.560	<0.580	<0.580
Silver	39 {nc}	510 {nc}	- -	mg/kg	<0.230 L	<0.230 L	0.240 B	<0.280 L [<0.270 L]	<0.280 L	0.500 B	<0.230 L	<0.230 L
Sodium	- -	- -	- -	mg/kg	111 B	49.1 B	217 B	65.8 B [66.8 B]	120 B	384 B	123 B	78.7 B
Thallium	0.51 {nc}	6.6 {nc}	2.11	mg/kg	<0.230 L	<0.230 L	0.410 B	<0.280 L [<0.270 L]	0.670 B	0.860 B	<0.230 L	<0.230 L
Vanadium	55{nc}	720 {nc}	108	mg/kg	45.9 K	56.2 K	33.5 K	38.3 K [63.4 K]	67.7 K	53.9 K	54.0 K	70.3 K
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	1,100	57.6 B	2,520	47.4 B [75.5 B]	57.3 B	3,250	1,280	126 B
mg/kg	Milligrams per kilogram.											
[a]	USEPA Regional Screening Levels (USEPA 2008a).											
[b]	Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.											
{ca}	Carcinogen.											
{nc}	Noncarcinogen.											
*	Noncarcinogen screening level is less than one hundred times the carcinogen screening level.											
**	Noncarcinogen screening level is less than ten times the carcinogen screening level.											
{++}	The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.											
{max}	Concentration may exceed ceiling limit.											
{sat}	Screening level may exceed saturation concentration.											
B (Inorganics)	Constituent concentration quantified as estimated.											
B (Organics)	Constituent was detected in the associated method blank.											
J	Constituent concentration quantified as estimated.											
K	Estimated concentration bias high.											
L	Estimated concentration bias low.											
NA	Not Analyzed.											
[3.3]	Bracketed concentration indicates laboratory analytical result for duplicate sample.											
24,400	Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).											
10.6 J	Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).											
16	Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.											

Table D-5. Soil Analytical Results, Western Burning Ground, 1999 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]		WBGSB6 0 - 2 05/26/99	WBGSB7 0 - 2 05/26/99	WBGSB8 0 - 2 05/26/99	WBGSB9 0 - 2 05/26/99	WBGSB10 0 - 2 05/26/99	WBGSB11 0 - 2 05/26/99	WBGBC1 0 - 2 08/18/99	WBGBC1 5 - 7 08/18/99	WBGSB12 0 - 4 08/18/99	WBGSB13 0 - 2 10/06/99	WBGSB13 2 - 4 10/06/99	WBGSB14 0 - 2 10/06/99	WBGSB14 2 - 4 10/06/99	WBGSB15 0 - 2 10/06/99	WBGSB15 2 - 4 10/06/99
Explosives																			
1,3,5-Trinitrobenzene	220 (nc)	2,700 (nc)	--	mg/kg	<0.25 J	<0.25 J	<0.26 J [<0.26 J]	<0.25 J	<0.24 J	<0.23 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	0.61 (nc)	6.2 (nc)	--	mg/kg	<0.25	<0.25	<0.26 [<0.26]	<0.25	<0.24	<0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	3.6 (ca**)	42 (ca**)	--	mg/kg	<0.25	<0.25	<0.26 [<0.26]	<0.25	<0.24	<0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	<0.25	<0.25	<0.26 [<0.26]	<0.25	<0.24	<0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	6.1 (nc)	62 (nc)	--	mg/kg	<0.25	<0.25	<0.26 [<0.26]	<0.25	<0.24	<0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Amino-4,6-Dinitrotoluene	15 (nc)	190 (nc)	--	mg/kg	<0.25 J	<0.25 J	<0.26 J [<0.26 J]	<0.25 J	<0.24 J	<0.23 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Amino-2,6-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	<0.25 J	<0.25 J	<0.26 J [<0.26 J]	<0.25 J	<0.24 J	<0.23 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinitrotoluene Mix	0.71 (ca)	2.5 (ca)	--	mg/kg	<0.25	<0.25	<0.26 [<0.26]	<0.25	<0.24	<0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA
HMX	310 (nc)	3,100 (nc)	--	mg/kg	<0.25	<0.25	<0.26 [<0.26]	<0.25	<0.24	<0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA
m-Nitrotoluene	--	--	--	mg/kg	<0.25	<0.25	<0.26 [<0.26]	<0.25	<0.24	<0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	3.1 (nc)	28 (nc)	--	mg/kg	<0.25	<0.25	<0.26 [<0.26]	<0.25	<0.24	<0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitroglycerine	0.61 (nc)	6.2 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Nitrotoluene	78 (nc)	1,300 (sat)	--	mg/kg	<0.25	<0.25	<0.26 [<0.26]	<0.25	<0.24	<0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentaerythritol Tetranitrate	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Nitrotoluene	30 (ca**)	110 (ca*)	--	mg/kg	<0.25	<0.25	<0.26 [<0.26]	<0.25	<0.24	<0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX	4.4 (ca*)	16 (ca)	--	mg/kg	<0.25	<0.25	<0.26 [<0.26]	<0.25	<0.24	<0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetryl	24 (nc)	250 (nc)	--	mg/kg	<0.25	<0.25	<0.26 [<0.26]	<0.25	<0.24	<0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs																			
Acenaphthene	340 (nc)	3,300 (nc)	--	mg/kg	<0.030 J	<0.030 J	<0.030 [<0.030 J]	0.32 J	<0.030 J	<0.030 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	340 (nc)	3,300 (nc)	--	mg/kg	<0.030	<0.030	<0.030 [<0.030]	<0.030	<0.030	<0.020	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	1,700 (nc)	170,000 (max)	--	mg/kg	<0.020	<0.020	<0.020 [<0.020]	<0.020	<0.020	<0.010	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	<0.020	<0.020	<0.020 [<0.020]	<0.020	<0.020	<0.020	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	0.015 (ca**)	0.21 (ca**)	--	mg/kg	<0.020	<0.020	<0.020 [<0.020]	<0.020	<0.020	<0.020	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	<0.030	<0.030	<0.030 [<0.030]	0.020 J	<0.030	<0.020	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	170 (nc)	1,700 (nc)	--	mg/kg	<0.030	<0.030	<0.030 [<0.030]	<0.030	<0.030	<0.020	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	1.5 (ca**)	21 (ca**)	--	mg/kg	<0.030	<0.020	<0.030 [<0.030]	<0.030	<0.020	<0.020	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	15 (ca**)	210 (ca**)	--	mg/kg	<0.020	<0.020	<0.020 [0.020 J]	<0.020	<0.020	<0.020	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	0.015 (ca**)	0.21 (ca**)	--	mg/kg	<0.020	<0.020	<0.030 [<0.030]	<0.020	<0.020	<0.020	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	230 (nc)	2,200 (nc)	--	mg/kg	<0.020	<0.020	<0.020 [<0.020]	<0.020	<0.020	<0.020	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	230 (nc)	2,200 (nc)	--	mg/kg	<0.030	<0.030	<0.030 [<0.030]	<0.030	<0.030	<0.020	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	<0.010	<0.010	<0.010 [<0.020]	<0.010	<0.010	<0.010	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	3.9 (nc)	20 (nc)	--	mg/kg	<0.040	<0.040	<0.040 [<0.040]	<0.040	<0.030	<0.030	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	1,700 (nc)	170,000 (max)	--	mg/kg	<0.020	<0.020	<0.020 [<0.020]	<0.020	<0.020	<0.020	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	170 (nc)	1,700 (nc)	--	mg/kg	<0.020	<0.020	<0.020 [<0.020]	0.040 J	<0.020	<0.020	NA	NA	NA	NA	NA	NA	NA	NA	NA
Volatile Organics																			
1,1,1,2-Tetrachloroethane	2 (ca)	9.8 (ca)	--	mg/kg	<0.0015	<0.0015	<0.0015 [<0.0016]	<0.0015	<0.0014	<0.0014	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	680 (sat)	680 (sat)	--	mg/kg	<0.0011	<0.0011	<0.0012 [<0.0012]	<0.0011	<0.0011	<0.0010	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	0.59 (ca**)	2.9 (ca**)	--	mg/kg	<0.0020	<0.0020	<0.0021 [<0.0021]	<0.0020	<0.0019	<0.0018	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	1.1 (ca)	5.5 (ca)	--	mg/kg	<0.0017	<0.0017	<0.0017 [<0.0018]	<0.0017	<0.0016	<0.0015	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	3.4 (ca)	17 (ca)	--	mg/kg	<0.0016	<0.0016	<0.0017 [<0.0017]	<0.0016	<0.0016	<0.0015	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	25 (nc)	110 (nc)	--	mg/kg	<0.0024	<0.0024	<0.0025 [<0.0025]	<0.0024	<0.0023	<0.0022	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloropropene	--	--	--	mg/kg	<0.0014	<0.0014	<0.0015 [<0.0015]	<0.0014	<0.0014	<0.0013	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichlorobenzene	--	--	--	mg/kg	<0.0018	<0.0017	<0.0018 [<0.0018]	<0.0018	<0.0017	<0.0016	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	0.091 (ca)	0.41 (ca)	--	mg/kg	<0.0031	<0.0031	<0.0032 [<0.0032]	<0.0031	<0.0030	<0.0028	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	180 (ca**)	220 (sat)	--	mg/kg	<0.0015	<0.0015	<0.0015 [<0.0016]	<0.0015	<0.0014	<0.0014	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	6.7 (nc)	28 (nc)	--	mg/kg	<0.0020	<0.0020	<0.0021 [<0.0021]	<0.0020	<0.0019	<0.0018	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	0.0056 (ca)	0.073 (ca)	--	mg/kg	<0.0063	<0.0063	<0.0064 [<0.0065]	<0.0063	<0.0060	<0.0057	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane	0.034 (ca)	0.17 (ca)	--	mg/kg	<0.0020	<0.0020	<0.0021 [<0.0021]	<0.0020	<0.0019	<0.0018	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	220 (sat)	220 (sat)	--	mg/kg	<0.0013	<0.0012	<0.0013 [<0.0013]	<0.0013	<0.0012	<0.0011	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	0.45 (ca)	2.2 (ca)	--	mg/kg	<0.0013	<0.0012	<0.0013 [<0.0013]	<0.0013	<0.0012	<0.0011	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	0.93 (ca*)	4.7 (ca*)	--	mg/kg	<0.0043	<0.0042	<0.0044 [<0.0044]	<0.0043	<0.0041	<0.0039	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	--	--	--	mg/kg	<0.0020	<0.0020	<0.0021 [<0.0021]	<0.0020	<0.0019	<0.0018	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	--	--	--	mg/kg	<0.0015	<0.0015	<0.0015 [<0.0016]	<0.0015	<0.0014	<0.0014	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropane	160 (nc)	1,600 (sat)	--	mg/kg	<0.0015	<0.0015	<0.0015 [<0.0016]	<0.0015	<0.0014	<0.0014	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	2.6 (ca)	13 (ca)	--	mg/kg	<0.0015	<0.0015	<0.0015 [<0.0016]	<0.0015	<0.0014	<0.0014	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2-Dichloropropane	--	--	--	mg/kg	<0.0013	<0.0012	<0.0013 [<0.0013]	<0.0013	<0.0012	<0.0011	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	2,800 (nc)	19,000 (nc)	--	mg/kg	R	R	R [R]	R	R	R	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloroethyl Vinyl Ether	--	--	--	mg/kg	<0.0063	<0.0062	<0.0064 [<0.0065]	<0.0063	<0.0060	<0.0057	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorotoluene	1,000 (sat)	1,000 (sat)	--	mg/kg	<0.0014	<0.0014	<0.0014 [<0.0014]	<0.0014	<0.0013	<0.0013	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	--	--	--	mg/kg	<0.0063	<0.0062	<0.0064 [<0.0065]	<0.0063	<0.0060	<0.0057	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorotoluene	290 (sat)	290 (sat)	--	mg/kg	<0.0013	<0.0012	<0.0013 [<0.0013]	<0.0013	<0.0012	<0.0011	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	530 (nc)	5,200 (sat)	--	mg/kg	<0.0063	<0.0062	<0.0064 [<0.0065]	<0.0063	<0.0060	<0.0057	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	6,100 (nc)	61,000 (nc)	--	mg/kg	<0.0063 J	<0.0062 J	<0.0064 J [<0.0065 J]	<0.0063 J	0.070 J	<0.0057 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrolein	0.016 (nc)	0.068 (nc)	--	mg/kg	R	R	R [R]	R	R	R	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	0.24 (ca*)	1.2 (ca*)	--	mg/kg	R	R	R [R]	R	R	R	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	1.1 (ca*)	5.6 (ca*)	--	mg/kg	<0.0013	<0.0012	<0.0013 [<0.0013]	<0.0013	<0.0012	<0.0011	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromobenzene	--	--	--	mg/kg	<0.0013	<0.0012	<0.0013 [<0.0013]	<0.0013	<0.0012	<0.0011	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	--	--	--	mg/kg	<0.0021	<0.0021	<0.0022 [<0.0022]	<0.0021	<0.0021	<0.0019	NA	NA	NA	NA	NA				

Notes found at end of table.

Table D-5. Soil Analytical Results, Western Burning Ground, 1999 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	WBGSB6 0 - 2 05/26/99	WBGSB7 0 - 2 05/26/99	WBGSB8 0 - 2 05/26/99	WBGSB9 0 - 2 05/26/99	WBGSB10 0 - 2 05/26/99	WBGSB11 0 - 2 05/26/99	WBGBC1 0 - 2 08/18/99	WBGBC1 5 - 7 08/18/99	WBGBC12 0 - 4 08/18/99	WBGSB13 0 - 2 10/06/99	WBGSB13 2 - 4 10/06/99	WBGSB14 0 - 2 10/06/99	WBGSB14 2 - 4 10/06/99	WBGSB15 0 - 2 10/06/99	WBGSB15 2 - 4 10/06/99
Volatile Organics																			
Chloromethane	1.7 {ca*}	8.4 {ca*}	--	mg/kg	<0.0042	<0.0041	<0.0043 [0.0043]	<0.0042	<0.0040	<0.0038	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	78 {nc}	1,300 {sat}	--	mg/kg	<0.0022	<0.0021	<0.0022 [0.0022]	<0.0022	<0.0021	<0.0020	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	--	--	--	mg/kg	<0.0013	<0.0012	<0.0013 [0.0013]	<0.0013	<0.0012	<0.0011	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	5.8 {ca}	21 {ca}	--	mg/kg	<0.00090	<0.00090	<0.00090 [0.00090]	<0.00090	<0.00080	<0.00080	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromomethane	78 {nc}	3,000 {sat}	--	mg/kg	<0.0018	<0.0018	<0.0018 [0.0019]	<0.0018	<0.0017	<0.0016	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	19 {nc}	78 {nc}	--	mg/kg	<0.0021	<0.0020	<0.0021 [0.0021]	<0.0021	<0.0020	<0.0019	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	5.7 {ca}	29 {ca}	--	mg/kg	<0.0014	<0.0014	<0.0014 [0.0014]	<0.0014	<0.0013	<0.0013	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	6.2 {ca**}	22 {ca*}	--	mg/kg	<0.0013	<0.0012	<0.0013 [0.0013]	<0.0013	<0.0012	<0.0011	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	310 {sat}	310 {sat}	--	mg/kg	<0.0016	<0.0016	<0.0017 [0.0017]	<0.0016	<0.0016	<0.0015	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	60 {nc}	260 {nc}	--	mg/kg	<0.0029	<0.0028	<0.0029 [0.0030]	<0.0029	<0.0028	<0.0026	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	11 {ca}	54 {ca}	--	mg/kg	<0.0013	<0.0012	<0.0013 [0.0013]	<0.0013	<0.0012	<0.0011	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	--	--	--	mg/kg	<0.0021	<0.0021	<0.0022 [0.0022]	<0.0021	<0.0020	<0.0019	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	--	--	--	mg/kg	<0.0016	<0.0016	<0.0017 [0.0017]	<0.0016	<0.0016	<0.0015	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	300 {sat}	300 {sat}	--	mg/kg	<0.0015	<0.0015	<0.0015 [0.0016]	<0.0015	<0.0014	<0.0014	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Isopropyltoluene	--	--	--	mg/kg	<0.0011	<0.0011	0.0048 [0.0012]	<0.0011	<0.0011	<0.0010	NA	NA	NA	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	--	--	--	mg/kg	<0.0015	<0.0015	<0.0015 [0.0016]	<0.0015	<0.0014	<0.0014	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	1,000 {sat}	1,000 {sat}	--	mg/kg	<0.00030	<0.00020	<0.00030 [0.00030]	<0.00030	<0.00020	<0.00020	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butylbenzene	--	--	--	mg/kg	<0.0015	<0.0015	<0.0015 [0.0016]	<0.0015	<0.0014	<0.0014	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	0.57 {ca}	2.7 {ca}	--	mg/kg	<0.0014	<0.0014	<0.0014 [0.0014]	<0.0014	<0.0013	<0.0013	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	500 {nc}	4600 {nc}	--	mg/kg	<0.0016	<0.0015	<0.0016 [0.0016]	<0.0016	<0.0015	<0.0014	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	11 {nc}	50 {nc}	--	mg/kg	<0.0053	<0.0052	<0.0054 [0.0055]	<0.0053	<0.0051	<0.0048	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	--	--	--	mg/kg	<0.0013	<0.0012	<0.0013 [0.0013]	<0.0013	<0.0012	<0.0011	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	2.8 {ca}	14 {ca}	--	mg/kg	<0.0032	<0.0032	<0.0033 [0.0034]	<0.0032	<0.0031	<0.0029	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane	80 {nc}	1,300 {sat}	--	mg/kg	<0.0014	<0.0014	<0.0015 [0.0015]	<0.0014	<0.0014	<0.0013	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Acetate	99 {nc}	2,800 {sat}	--	mg/kg	<0.0063 J	<0.0062 J	<0.0064 J [0.0065 J]	<0.0063 J	<0.0060 J	<0.0057 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride	0.06 {ca}	1.7 {ca}	--	mg/kg	<0.0023	<0.0023	<0.0024 [0.0024]	<0.0023	<0.0023	<0.0021	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	60 {nc}	260 {nc}	--	mg/kg	<0.0029	<0.0028	<0.0029 [0.0030]	<0.0029	<0.0028	<0.0026	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organics																			
1,2,4-Trichlorobenzene	8.7 {ca**}	40 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.36	<0.36	<0.37	<0.38 [0.37]	<0.34 [0.37]	NA	NA	<0.37	<0.37
1,2-Dichlorobenzene	220 {sat}	220 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.36	<0.36	<0.37	<0.38 [0.37]	<0.34 [0.37]	NA	NA	<0.37	<0.37
1,2-Diphenylhydrazine	0.61 {ca**}	2.2 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.36	<0.36	<0.37	<0.38 [0.37]	<0.34 [0.37]	NA	NA	<0.37	<0.37
1,4-Dichlorobenzene	2.6 {ca}	13 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.36	<0.36	<0.37	<0.38 [0.37]	<0.34 [0.37]	NA	NA	<0.37	<0.37
2,4,5-Trichlorophenol	610 {nc}	6,200 {nc}	--	mg/kg	<1.0	<0.98	<1.0 [1.0]	<1.0	<0.97	<0.92	<0.96	<0.97	<0.98	<1.0 [1.0]	<0.92 [1.0]	NA	NA	<1.0	<1.0
2,4,6-Trichlorophenol	44 {ca**}	160 {ca**}	--	mg/kg	<0.38	<0.37	<0.39 [0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [0.37]	<0.34 [0.37]	NA	NA	<0.37	<0.37
2,4-Dichlorophenol	18 {nc}	180 {nc}	--	mg/kg	<0.38	<0.37	<0.39 [0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [0.37]	<0.34 [0.37]	NA	NA	<0.37	<0.37
2,4-Dimethylphenol	120 {nc}	1,200 {nc}	--	mg/kg	<0.38	<0.37	<0.39 [0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [0.37]	<0.34 [0.37]	NA	NA	<0.37	<0.37
2,4-Dinitrophenol	12 {nc}	120 {nc}	--	mg/kg	<2.5	<2.5	<2.6 [2.6]	<2.5	<2.4	<2.3	<2.4	<2.4	<2.5	<2.6 [2.5]	<2.3 [2.5]	NA	NA	<2.5	<2.5
2,4-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.36	<0.36	<0.37	<0.38 [0.37]	<0.34 [0.37]	NA	NA	<0.37	<0.37
2,6-Dinitrotoluene	6.1 {nc}	62 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.36	<0.36	<0.37	<0.38 [0.37]	<0.34 [0.37]	NA	NA	<0.37	<0.37
2-Chloronaphthalene	210 {sat}	210 {sat}	--	mg/kg	<0.38	<0.37	<0.39 [0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [0.37]	<0.34 [0.37]	NA	NA	<0.37	<0.37
2-Chlorophenol	39 {nc}	510 {nc}	--	mg/kg	<0.38	<0.37	<0.39 [0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [0.37]	<0.34 [0.37]	NA	NA	<0.37	<0.37
2-Methylnaphthalene	31 {nc}	440 {sat}	--	mg/kg	<0.38	<0.37	<0.39 [0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [0.37]	<0.34 [0.37]	NA	NA	<0.37	<0.37
2-Methylphenol	310 {nc}	3,100 {nc}	--	mg/kg	<0.38	<0.37	<0.39 [0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [0.37]	<0.34 [0.37]	NA	NA	<0.37	<0.37
2-Nitroaniline	--	--	--	mg/kg	<2.5	<2.5	<2.6 [2.6]	<2.5	<2.4	<2.3	<2.4	<2.4	<2.5	<2.6 [2.5]	<2.3 [2.5]	NA			

Table D-5. Soil Analytical Results, Western Burning Ground, 1999 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	WBGSB6 0 - 2 05/26/99	WBGSB7 0 - 2 05/26/99	WBGSB8 0 - 2 05/26/99	WBGSB9 0 - 2 05/26/99	WBGSB10 0 - 2 05/26/99	WBGSB11 0 - 2 05/26/99	WBGBC1 0 - 2 08/18/99	WBGBC1 5 - 7 08/18/99	WBGBC1 0 - 4 08/18/99	WBGSB12 0 - 2 10/06/99	WBGBC13 2 - 4 10/06/99	WBGBC14 0 - 2 10/06/99	WBGBC14 2 - 4 10/06/99	WBGBC15 0 - 2 10/06/99	WBGBC15 2 - 4 10/06/99
Semivolatile Organics																			
Fluorene	230 (nc)	2,200 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.36	<0.36	<0.37	<0.38 [<0.37]	<0.34 [<0.37]	NA	NA	<0.37	<0.37
Hexachlorobenzene	0.3 (ca)	1.1 (ca)	--	mg/kg	<0.38	<0.37	<0.39 [<0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [<0.37]	<0.34 [<0.37]	NA	NA	<0.37	<0.37
Hexachlorobutadiene	6.2 (ca**)	22 (ca*)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.36	<0.36	<0.37	<0.38 [<0.37]	<0.34 [<0.37]	NA	NA	<0.37	<0.37
Hexachlorocyclopentadiene	37 (nc)	370 (nc)	--	mg/kg	<0.38	<0.37	<0.39 [<0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [<0.37]	<0.34 [<0.37]	NA	NA	<0.37	<0.37
Hexachloroethane	35 (ca**)	120 (ca**)	--	mg/kg	<0.38	<0.37	<0.39 [<0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [<0.37]	<0.34 [<0.37]	NA	NA	<0.37	<0.37
Indeno(1,2,3-cd)pyrene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.36	<0.36	<0.37	<0.38 J [<0.37 J]	<0.34 J [<0.37 J]	NA	NA	<0.37 J	<0.37 J
Isophorone	510 (ca*)	1,800 (ca*)	--	mg/kg	<0.38	<0.37	<0.39 [<0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [<0.37]	<0.34 [<0.37]	NA	NA	<0.37	<0.37
Naphthalene	3.9 (ca)	20 (ca)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.36	<0.36	<0.37	<0.38 [<0.37]	<0.34 [<0.37]	NA	NA	<0.37	<0.37
Nitrobenzene	3.1 (nc)	28 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.36	<0.36	<0.37	<0.38 [<0.37]	<0.34 [<0.37]	NA	NA	<0.37	<0.37
N-Nitroso-di-n-propylamine	0.069 (ca**)	0.25 (ca**)	--	mg/kg	<0.38	<0.37	<0.39 [<0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [<0.37]	<0.34 [<0.37]	NA	NA	<0.37	<0.37
N-Nitrosodiphenylamine	99 (ca**)	350 (ca**)	--	mg/kg	<0.38	<0.37	<0.39 [<0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [<0.37]	<0.34 [<0.37]	NA	NA	<0.37	<0.37
Pentachlorophenol	3 (ca)	9 (ca)	--	mg/kg	<2.5	<2.5	<2.6 [<2.6]	<2.5	<2.4	<2.3	<2.4	<2.4	<2.5	<2.6 [<2.5]	<2.3 [<2.5]	NA	NA	<2.5	<2.5
Phenanthrene	1,700 (nc)	170,000 (max)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.36	<0.36	<0.37	<0.38 [<0.37]	<0.34 [<0.37]	NA	NA	<0.37	<0.37
Phenol	1,800 (nc)	180,000 (max)	--	mg/kg	<0.38	<0.37	<0.39 [<0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [<0.37]	<0.34 [<0.37]	NA	NA	<0.37	<0.37
Pyrene	170 (nc)	1,700 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.36	<0.36	<0.37	<0.38 [<0.37]	<0.34 [<0.37]	NA	NA	<0.37	<0.37
Inorganics																			
Aluminum	7,700 (nc)	990,000 (max)	40,041	mg/kg	17,100	14,700	15,800 [18,800]	15,500	14,800	8,570	27,900	46,500	18,300	10,600 [10,300]	11,700 [14,100]	16,000	11,400	10,400	14,600
Antimony	3.1 (nc)	41 (nc)	--	mg/kg	<0.630	<0.610	1.90 B [<0.650]	<0.620	<0.580	<0.560	1.70 B	2.20 B	1.70 B	<0.490 [<0.500]	<0.500 [<0.500]	<0.590	<0.620	<0.490	<0.500
Arsenic	0.39 (ca*)	1.6 (ca)	15.8	mg/kg	11.6	10.0	17.1 [15.8]	14.9	8.50	6.00 B	11.2 K	11.4 K	9.80 K	6.80 B [8.70 L]	8.00 L [8.40 L]	11.3 L	8.40 L	7.40 B	9.20 L
Barium	1,500 (nc)	190,000 (max)	209	mg/kg	11.5 L	20.6 L	35.9 L [19.4 L]	72.2 L	30.0 L	22.9 L	33.1	105	23.8 J	14.7 J [19.8 J]	27.8 [24.3]	17.2 J	24.4 J	17.0 J	17.6 J
Beryllium	16 (nc)	200 (nc)	1.02	mg/kg	0.610 K	0.520 K	0.650 K [0.490 K]	0.780 K	0.570 K	0.230 K	0.830 B	2.50	0.550 B	0.590 B [0.620 B]	1.30 B [1.00 B]	0.680 B	0.690 B	0.670 B	1.10 B
Cadmium	7 (nc)	81 (nc)	0.69	mg/kg	0.440	0.300	0.740 [0.790]	0.540	0.330	<0.110	<0.120	0.310 J	<0.120	<0.100 [<0.100]	<0.100 [<0.100]	<0.120	<0.120	<0.100	<0.100
Calcium	--	--	--	mg/kg	533	856	1,300 [1,050]	1,780	1,630	660	3,730	4,630	1,300	714 [1,040]	1,230 [1,480]	826	1,450	643	1,250
Chromium	280 (ca)	1,460 (ca)	65.3	mg/kg	37.7	28.1	46.6 [49.7]	45.7	30.6	22.2	39.4	65.3	35.7	23.9 [28.2]	37.3 [29.6]	32.3	30.6	24.1	43.1
Cobalt	2.3 (nc)	30 (nc)	72.3	mg/kg	7.10	8.20	7.20 [4.80]	11.9	6.00	5.80	17.0	17.3	8.30	6.20 [22.6]	23.0 [14.4]	17.9	7.70	7.50	10.6
Copper	310 (nc)	4,100 (nc)	53.5	mg/kg	35.7 K	21.6	40.0 K [29.0 K]	33.8 K	21.1	10.4	28.1	43.0	20.0	17.7 [20.4]	18.2 [25.5]	24.6	21.8	18.4	27.2
Iron	5,500 (nc)	720,000 (max)	50,962	mg/kg	37,600	31,800	39,300 [54,000]	39,100	35,000	20,400	46,000	43,700	36,400	29,000 [32,800]	27,800 [39,800]	40,300	31,600	30,300	42,700
Lead	400 (++)	800 (++)	26.8	mg/kg	21.0 J	15.1 J	79.4 J [17.7 J]	43.6 J	11.6	11.6	33.2	18.6	19.0	19.3 [25.3]	25.5 [29.0]	33.3	21.3	18.0	25.6
Magnesium	--	--	--	mg/kg	337	416	688 [735]	1,100	601	319	3,990	31,300	866	434 J [474 J]	2,510 [897]	699	912	526	372 J
Manganese	180 (nc)	2,300 (nc)	2,543	mg/kg	70.7 K	87.0 K	82.8 K [60.2 K]	122 K	71.3 K	131 K	268	256	111	79.9 [162]	241 [183]	192	83.2	92.5	71.5
Mercury	3.1 (sat)	3.1 (sat)	0.13	mg/kg	<0.130	<0.120	<0.130 [<0.120]	0.210 K	0.210 K	<0.110	0.190	<0.120	0.200	<0.100 [<0.100]	<0.100 [<0.100]	<0.110	<0.120	<0.100	0.140 K
Nickel	160 (nc)	2,000 (nc)	62.8	mg/kg	17.9 K	11.5 K	15.1 K [11.3 K]	16.2 K	10.7 K	5.30	18.4	36.0	12.8	9.00 [8.60]	13.6 [15.7]	13.8	10.7	9.60	19.5
Potassium	--	--	--	mg/kg	488	545	704 [625]	684	583	444	1,240	5,960	969	488 J [528]	861 [619]	958	788	512	634
Selenium	39 (nc)	510 (nc)	--	mg/kg	<0.500 L	<0.490 L	<0.510 L [<0.520 L]	<0.500 L	<0.580 L	1.20	<0.590	<0.590	<0.610	<0.490 L [<0.500 L]	<0.500 L [<0.500 L]	<0.590 L	<0.620 L	<0.490 L	<0.500 L
Silver	39 (nc)	510 (nc)	--	mg/kg	0.350 B	0.280 B	0.360 B [0.470 B]	0.410 B	0.280 B	0.130 B	<0.120	<0.120	<0.120	1.50 [1.90]	1.60 [2.30]	<0.120	<0.120	1.80	2.00
Sodium	--	--	--	mg/kg	120 B	123 B	159 B [124 B]	148 B	112 B	119 B	116 B	153 B	90.0 B	119 B [113 B]	102 B [103 B]	176 B	163 B	91.8 B	95.7 B
Thallium	0.51 (nc)	6.6 (nc)	2.11	mg/kg	<0.880	<0.850	<0.890 [<0.910]	<0.870	<0.810	<0.780	<0.820 J	<0.830 J	<0.850 J	<0.690 [<0.700]	<0.700 [<0.690]	<0.830	<0.880	<0.680	<0.690
Vanadium	55(nc)	720 (nc)	108	mg/kg	82.8 K	61.7 K	86.2 K [90.7 K]	82.3 K	63.8 K	39.0 K	74.9	75.8	65.9	49.7 [58.5]	52.5 [68.9]	78.5	62.2	55.7	76.2
Zinc	2,300 (nc)	310,000 (max)	202	mg/kg	59.5 K	30.9 K	381 K [118]	96.5 K	25.7 K	15.2 K	414	59.5	32.8	25.7 K [32.4 K]	28.4 K [29.6 K]	30.3	33.0	23.7 K	31.8 K
Miscellaneous																			
pH	--	--	--	pH Units	6.15	NA	NA	6.6	NA	5.95	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	--	--	--	mg/kg	1,736	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics-TCLP	TCLP Screening Value																		
Arsenic	5,000	--	--	µg/L	NA	NA	NA	<6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	10,000	--	--	µg/L	NA	NA	NA	341	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	1,000	--	--	µg/L	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	5,000	--	--	µg/L	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	5,000	--	--	µg/L	NA	NA	NA	<2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	200	--	--	µg/L	NA	NA	NA	<0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	1,000	--	--	µg/L	NA	NA	NA	<4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	5,000	--	--	µg/L	NA	NA	NA	1.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes found at end of table.

Table D-5. Soil Analytical Results, Western Burning Ground, 1999 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	WBGSB16 0 - 2 10/06/99	WBGSB16 2 - 4 10/06/99	WBGSB17 0 - 2 10/06/99	WBGSB17 2 - 4 10/06/99	WBGSB18 0 - 2 10/06/99	WBGSB18 2 - 4 10/06/99	WBGSB19 0 - 2 10/06/99	WBGSB19 2 - 4 10/06/99	WBGSB20 0 - 2 10/06/99	WBGSB20 2 - 4 10/06/99	WBGSB21 0 - 2 10/06/99	WBGSB21 2 - 4 10/06/99
Explosives																
1,3,5-Trinitrobenzene	220 {nc}	2,700 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	0.61 {nc}	6.2 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	3.6 {ca**}	42 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	6.1 {nc}	62 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Amino-4,6-Dinitrotoluene	15 {nc}	190 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Amino-2,6-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinitrotoluene Mix	0.71 {ca}	2.5 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HMX	310 {nc}	3,100 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m-Nitrotoluene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	3.1 {nc}	28 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitroglycerine	0.61 {nc}	6.2 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Nitrotoluene	78 {nc}	1,300 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentaerythritol Tetranitrate	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Nitrotoluene	30 {ca**}	110 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX	4.4 {ca*}	16 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetryl	24 {nc}	250 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs																
Acenaphthene	340 {nc}	3,300 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	340 {nc}	3,300 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	1,700 {nc}	170,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	3.9 {nc}	20 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Volatile Organics																
1,1,1,2-Tetrachloroethane	2 {ca}	9.8 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	680 {sat}	680 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	0.59 {ca**}	2.9 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	1.1 {ca}	5.5 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	3.4 {ca}	17 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	25 {nc}	110 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloropropene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichlorobenzene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	0.091 {ca}	0.41 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	180 {ca**}	220 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	6.7 {nc}	28 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	0.0056 {ca}	0.073 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane	0.034 {ca}	0.17 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	220 {sat}	220 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	0.45 {ca}	2.2 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	0.93 {ca*}	4.7 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropane	160 {nc}	1,600 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	2.6 {ca}	13 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2-Dichloropropane	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	2,800 {nc}	19,000 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloroethyl Vinyl Ether	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorotoluene	1,000 {sat}	1,000 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorotoluene	290 {sat}	290 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	530 {nc}	5,200 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	6,100 {nc}	61,000 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrolein	0.016 {nc}	0.068 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	0.24 {ca*}	1.2 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	1.1 {ca*}	5.6 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromobenzene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	10 {ca}	46 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	61 {ca*}	220 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	0.79 {nc}	3.5 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Disulfide	67 {nc}	300 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Tetrachloride	0.25 {ca}	1.3 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	31 {nc}	860 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	2,200 {sat}	2,200 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	0.3 {ca}	1.5 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes found at end of table.

Table D-5. Soil Analytical Results, Western Burning Ground, 1999 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	WBGSB16 0 - 2 10/06/99	WBGSB16 2 - 4 10/06/99	WBGSB17 0 - 2 10/06/99	WBGSB17 2 - 4 10/06/99	WBGSB18 0 - 2 10/06/99	WBGSB18 2 - 4 10/06/99	WBGSB19 0 - 2 10/06/99	WBGSB19 2 - 4 10/06/99	WBGSB20 0 - 2 10/06/99	WBGSB20 2 - 4 10/06/99	WBGSB21 0 - 2 10/06/99	WBGSB21 2 - 4 10/06/99
Volatile Organics																
Chloromethane	1.7 (ca*)	8.4 (ca*)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	78 (nc)	1,300 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	5.8 (ca)	21 (ca)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromomethane	78 (nc)	3,000 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	19 (nc)	78 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	5.7 (ca)	29 (ca)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	6.2 (ca**)	22 (ca*)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	310 (sat)	310 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	60 (nc)	260 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	11 (ca)	54 (ca)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	300 (sat)	300 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Isopropyltoluene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	1,000 (sat)	1,000 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butylbenzene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	0.57 (ca)	2.7 (ca)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	500 (nc)	4600 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	11 (nc)	50 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	2.8 (ca)	14 (ca)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane	80 (nc)	1,300 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Acetate	99 (nc)	2,800 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride	0.06 (ca)	1.7 (ca)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	60 (nc)	260 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organics																
1,2,4-Trichlorobenzene	8.7 (ca**)	40 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
1,2-Dichlorobenzene	220 (sat)	220 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
1,2-Diphenylhydrazine	0.61 (ca**)	2.2 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
1,4-Dichlorobenzene	2.6 (ca)	13 (ca)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
2,4,5-Trichlorophenol	610 (nc)	6,200 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<1.0 [<0.94]	<0.94 [<1.0]	NA	NA	<0.98	<0.10
2,4,6-Trichlorophenol	44 (ca**)	160 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.050
2,4-Dichlorophenol	18 (nc)	180 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.090
2,4-Dimethylphenol	120 (nc)	1,200 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
2,4-Dinitrophenol	12 (nc)	120 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<2.5 [<2.4]	<2.4 [<2.5]	NA	NA	<2.5	<0.19
2,4-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
2,6-Dinitrotoluene	6.1 (nc)	62 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
2-Chloronaphthalene	210 (sat)	210 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
2-Chlorophenol	39 (nc)	510 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.050
2-Methylnaphthalene	31 (nc)	440 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
2-Methylphenol	310 (nc)	3,100 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.070
2-Nitroaniline	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<2.5 [<2.4]	<2.4 [<2.5]	NA	NA	<2.5	<0.14
2-Nitrophenol	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.12
3,3'-Dichlorobenzidine	1.1 (ca**)	3.8 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.75 [<0.70]	<0.70 [<0.75]	NA	NA	<0.74	<0.16
3-Nitroaniline	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<2.5 [<2.4]	<2.4 [<2.5]	NA	NA	<2.5	<0.15
4,6-Dinitro-2-methylphenol	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<2.5 [<2.4]	<2.4 [<2.5]	NA	NA	<2.5	<0.24
4-Bromophenyl-phenylether	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
4-Chloro-3-Methylphenol	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.75 [<0.70]	<0.70 [<0.75]	NA	NA	<0.74	<0.070
4-Chloroaniline	24 (nc)	250 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.75 [<0.70]	<0.70 [<0.75]	NA	NA	<0.74	<0.070
4-Chlorophenyl-phenylether	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
4-Methylphenol	31 (nc)	310 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.070
4-Nitroaniline	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<2.5 [<2.4]	<2.4 [<2.5]	NA	NA	<2.5	<0.20
4-Nitrophenol	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<2.5 [<2.4]	<2.4 [<2.5]	NA	NA	<2.5	<0.030
Acenaphthene	340 (nc)	3,300 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Acenaphthylene	340 (nc)	3,300 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Anthracene	1,700 (nc)	170,000 (max)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Benzo(a)anthracene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Benzo(a)pyrene	0.015 (ca**)	0.21 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Benzo(b)fluoranthene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 J [<0.35 J]	<0.35 J [<0.38 J]	NA	NA	<0.37 J	<0.12 J
Benzo(g,h,i)perylene	170 (nc)	1,700 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 J [<0.35 J]	<0.35 J [<0.38 J]	NA	NA	<0.37 J	<0.030 J
Benzo(k)fluoranthene	1.5 (ca**)	21 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.11
Benzoic Acid	240,000 (max)	2,500,000 (max)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	3,100 (nc)	310,000 (max)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	18 (nc)	180 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
bis(2-Chloroethyl)ether	0.19 (ca**)	0.9 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
bis(2-Chloroisopropyl)ether	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
bis(2-Ethylhexyl)phthalate	35 (ca*)	120 (ca*)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.070
Butylbenzylphthalate	260 (ca*)	910 (ca*)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Carbazole	24 (ca**)	86 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.050
Chrysene	15 (ca**)	210 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Dibenzo(a,h)anthracene	0.015 (ca**)	0.21 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 J [<0.35 J]	<0.35 J [<0.38 J]	NA	NA	<0.37 J	<0.050 J
Dibenzofuran	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.060
Diethylphthalate	4,900 (nc)	490,000 (max)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Dimethylphthalate	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Di-n-Butylphthalate	610 (nc)	6,200 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Dinitrotoluene Mix	0.71 (ca)	2.5 (ca)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Di-n-Octylphthalate	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Fluoranthene	230 (nc)	2,200 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030

Notes found at end of table.

Table D-5. Soil Analytical Results, Western Burning Ground, 1999 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	WBGSB16 0 - 2 10/06/99	WBGSB16 2 - 4 10/06/99	WBGSB17 0 - 2 10/06/99	WBGSB17 2 - 4 10/06/99	WBGSB18 0 - 2 10/06/99	WBGSB18 2 - 4 10/06/99	WBGSB19 0 - 2 10/06/99	WBGSB19 2 - 4 10/06/99	WBGSB20 0 - 2 10/06/99	WBGSB20 2 - 4 10/06/99	WBGSB21 0 - 2 10/06/99	WBGSB21 2 - 4 10/06/99
Semivolatle Organics																
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Hexachlorobenzene	0.3 {ca}	1.1 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Hexachlorobutadiene	6.2 {ca**}	22 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Hexachlorocyclopentadiene	37 {nc}	370 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Hexachloroethane	35 {ca**}	120 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 J [<0.35 J]	<0.35 J [<0.38 J]	NA	NA	<0.37 J	<0.030 J
Isophorone	510 {ca*}	1,800 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Naphthalene	3.9 {ca}	20 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Nitrobenzene	3.1 {nc}	28 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
N-Nitroso-di-n-propylamine	0.069 {ca**}	0.25 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
N-Nitrosodiphenylamine	99 {ca**}	350 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Pentachlorophenol	3 {ca}	9 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	<2.5 [<2.4]	<2.4 [<2.5]	NA	NA	<2.5	<0.12
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Phenol	1,800 {nc}	180,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Inorganics																
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	13,700 [13,200]	15,900	15,400	15,700	15,700	12,900	14,500 [10,700]	8,650 [8,290]	20,900	15,700	11,100	14,600
Antimony	3.1 {nc}	41 {nc}	--	mg/kg	<0.610 [<0.610]	<0.630	<0.640	<0.640	<0.590	<0.590	<0.500 [<0.500]	<0.500 [<0.490]	<0.590	<0.610	<0.490	0.610 J
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	12.5 L [12.0 L]	12.5 L	11.9 L	13.0 L	10.2 L	8.10 L	5.40 B [5.10 B]	6.40 B [5.60 B]	9.90 L	14.3 L	8.50 L	11.6 L
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	26.3 [22.9 J]	20.7 J	19.6 J	17.1 J	18.5 J	16.4 J	20.0 [22.7]	23.0 [19.0 J]	17.5 J	23.9 J	25.5	22.0 J
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	0.960 B [0.680 B]	0.930 B	0.770 B	0.810 B	0.560 B	0.350 B	1.00 B [0.720 B]	0.530 B [0.430 B]	1.10 B	0.660 B	0.710 B	0.750 B
Cadmium	7 {nc}	81 {nc}	0.69	mg/kg	<0.120 [<0.120]	<0.130	<0.130	<0.130	<0.120	<0.120	<0.100 [<0.100]	<0.100 [<0.100]	<0.0100	<0.120	<0.100	<0.120
Calcium	--	--	--	mg/kg	1,300 [1,190]	1,420	1,130	1,430	836	843	760 [920]	828 [776]	1,680	2,940	1,220	1,360
Chromium	280 {ca}	1,460 {ca}	65.3	mg/kg	37.5 [34.1]	41.1	39.4	40.4	38.8	38.7	35.3 [28.8]	22.6 [20.5]	45.7	41.3	28.8	34.8
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	31.4 [14.8]	10.1	11.0	7.30	6.30	5.40 J	7.10 [7.60]	8.10 [7.90]	17.7	8.90	8.60	10.0
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	29.8 [24.5]	23.9	27.4	31.4	22.9	19.9	21.3 [15.5]	11.9 [13.1]	32.3	27.5	19.3	26.5
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	46,700 [40,300]	42,500	44,300	48,800	39,700	39,800	39,200 [27,300]	23,400 [22,800]	43,400	47,100	32,300	40,600
Lead	400 {++}	800 {++}	26.8	mg/kg	44.4 [29.9]	25.3	26.9	26.9	19.6	12.6	15.1 [14.8]	18.0 [14.5]	28.9	23.6	24.0	24.0
Magnesium	--	--	--	mg/kg	693 [588 J]	12,000	698	708	609	713	627 [967]	481 J [518]	2,480	808	784	605
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	241 [160]	125	119	119	74.6	47.4	45.7 [197]	129 [103]	119	148	158	127
Mercury	3.1 {sat}	3.1 {sat}	0.13	mg/kg	<0.120 [<0.120]	<0.120	<0.130	<0.120	<0.120	<0.120	<0.100 [<0.100]	<0.100 [<0.100]	0.160 K	0.180 K	<0.100	<0.120
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	14.4 [12.1]	14.1	13.8	16.0	12.6	7.60	12.2 [8.90]	6.70 [5.30]	20.0	14.4	9.40	13.8
Potassium	--	--	--	mg/kg	690 [621]	1,030	728	981	534 J	708	670 [523]	652 [646]	1,420	973	442 J	629
Selenium	39 {nc}	510 {nc}	--	mg/kg	<0.610 L [<0.610 L]	<0.630 L	<0.640 L	<0.640 L	<0.590 L	<0.590 L	<0.500 L [<0.500 L]	<0.500 L [<0.490 L]	<0.590 L	<0.610 L	<0.490 L	<0.590 L
Silver	39 {nc}	510 {nc}	--	mg/kg	<0.120 [<0.120]	<0.130	<0.130	<0.130	<0.120	<0.120	2.20 [1.50]	1.40 [1.30]	<0.120	<0.120	1.70	<0.120
Sodium	--	--	--	mg/kg	149 B [144 B]	163 B	142 B	151 B	134 B	126 B	104 B [107 B]	92.7 B [97.2 B]	131 B	154 B	95.2 B	124 B
Thallium	0.51 {nc}	6.6 {nc}	2.11	mg/kg	<0.850 [<0.850]	<0.880	<0.890	<0.890	<0.830	<0.820	<0.690 [<0.700]	<0.700 [<0.690]	<0.820	<0.850	<0.680	<0.820
Vanadium	55{nc}	720 {nc}	108	mg/kg	81.6 [75.0]	74.9	83.5	88.9	80.6	71.0	70.2 [51.0]	42.1 [41.9]	84.6	92.3	57.3	77.5
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	54.7 [43.9]	39.7	40.1	53.3	29.2	16.9	28.1 K [17.7 K]	17.6 K [16.2 K]	38.2	38.3	33.7 K	40.0
Miscellaneous																
pH	--	--	--	pH Units	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics-TCLP	TCLP Screening Value															
Arsenic	5,000	--	--	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	10,000	--	--	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	1,000	--	--	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	5,000	--	--	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	5,000	--	--	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	200	--	--	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	1,000	--	--	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	5,000	--	--	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

mg/kg	Milligrams per kilogram.
µg/L	Micrograms per liter.
[a]	USEPA Regional Screening Levels (USEPA 2008a).
[b]	Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.
{ca}	Carcinogen.
{nc}	Noncarcinogen.
*	Noncarcinogen screening level is less than one hundred times the carcinogen screening level.
**	Noncarcinogen screening level is less than ten times the carcinogen screening level.
{++}	The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.
{max}	Concentration may exceed ceiling limit.
{sat}	Screening level may exceed saturation concentration.
B (Inorganics)	Constituent concentration quantified as estimated.
B (Organics)	Constituent was detected in the associated method blank.
J	Constituent concentration quantified as estimated.
K	Estimated concentration bias high.
L	Estimated concentration bias low.
NA	Not Analyzed.
[3.3]	Bracketed concentration indicates laboratory analytical result for duplicate sample.
24,400	Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).
10.6 J	Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).
16	Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Table D-5. Soil Analytical Results, Western Burning Ground, 1999 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]		WBGSB6 0 - 2 05/26/99	WBGSB7 0 - 2 05/26/99	WBGSB8 0 - 2 05/26/99	WBGSB9 0 - 2 05/26/99	WBGSB10 0 - 2 05/26/99	WBGSB11 0 - 2 05/26/99	WBGBC1 0 - 2 08/18/99	WBGBC1 5 - 7 08/18/99	WBGSB12 0 - 4 08/18/99	WBGSB13 0 - 2 10/06/99	WBGSB13 2 - 4 10/06/99	WBGSB14 0 - 2 10/06/99	WBGSB14 2 - 4 10/06/99	WBGSB15 0 - 2 10/06/99	WBGSB15 2 - 4 10/06/99
Explosives																			
1,3,5-Trinitrobenzene	220 (nc)	2,700 (nc)	--	mg/kg	<0.25 J	<0.25 J	<0.26 J [<0.26 J]	<0.25 J	<0.24 J	<0.23 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	0.61 (nc)	6.2 (nc)	--	mg/kg	<0.25	<0.25	<0.26 [<0.26]	<0.25	<0.24	<0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	3.6 (ca**)	42 (ca**)	--	mg/kg	<0.25	<0.25	<0.26 [<0.26]	<0.25	<0.24	<0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	<0.25	<0.25	<0.26 [<0.26]	<0.25	<0.24	<0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	6.1 (nc)	62 (nc)	--	mg/kg	<0.25	<0.25	<0.26 [<0.26]	<0.25	<0.24	<0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Amino-4,6-Dinitrotoluene	15 (nc)	190 (nc)	--	mg/kg	<0.25 J	<0.25 J	<0.26 J [<0.26 J]	<0.25 J	<0.24 J	<0.23 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Amino-2,6-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	<0.25 J	<0.25 J	<0.26 J [<0.26 J]	<0.25 J	<0.24 J	<0.23 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinitrotoluene Mix	0.71 (ca)	2.5 (ca)	--	mg/kg	<0.25	<0.25	<0.26 [<0.26]	<0.25	<0.24	<0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA
HMX	310 (nc)	3,100 (nc)	--	mg/kg	<0.25	<0.25	<0.26 [<0.26]	<0.25	<0.24	<0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA
m-Nitrotoluene	--	--	--	mg/kg	<0.25	<0.25	<0.26 [<0.26]	<0.25	<0.24	<0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	3.1 (nc)	28 (nc)	--	mg/kg	<0.25	<0.25	<0.26 [<0.26]	<0.25	<0.24	<0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitroglycerine	0.61 (nc)	6.2 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Nitrotoluene	78 (nc)	1,300 (sat)	--	mg/kg	<0.25	<0.25	<0.26 [<0.26]	<0.25	<0.24	<0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentaerythritol Tetranitrate	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Nitrotoluene	30 (ca**)	110 (ca*)	--	mg/kg	<0.25	<0.25	<0.26 [<0.26]	<0.25	<0.24	<0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX	4.4 (ca*)	16 (ca)	--	mg/kg	<0.25	<0.25	<0.26 [<0.26]	<0.25	<0.24	<0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetryl	24 (nc)	250 (nc)	--	mg/kg	<0.25	<0.25	<0.26 [<0.26]	<0.25	<0.24	<0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs																			
Acenaphthene	340 (nc)	3,300 (nc)	--	mg/kg	<0.030 J	<0.030 J	<0.030 [<0.030 J]	0.32 J	<0.030 J	<0.030 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	340 (nc)	3,300 (nc)	--	mg/kg	<0.030	<0.030	<0.030 [<0.030]	<0.030	<0.030	<0.020	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	1,700 (nc)	170,000 (max)	--	mg/kg	<0.020	<0.020	<0.020 [<0.020]	<0.020	<0.020	<0.010	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	<0.020	<0.020	<0.020 [<0.020]	<0.020	<0.020	<0.020	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	0.015 (ca**)	0.21 (ca**)	--	mg/kg	<0.020	<0.020	<0.020 [<0.020]	<0.020	<0.020	<0.020	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	<0.030	<0.030	<0.030 [<0.030]	0.020 J	<0.030	<0.020	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	170 (nc)	1,700 (nc)	--	mg/kg	<0.030	<0.030	<0.030 [<0.030]	<0.030	<0.030	<0.020	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	1.5 (ca**)	21 (ca**)	--	mg/kg	<0.030	<0.020	<0.030 [<0.030]	<0.030	<0.020	<0.020	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	15 (ca**)	210 (ca**)	--	mg/kg	<0.020	<0.020	<0.020 [0.020 J]	<0.020	<0.020	<0.020	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	0.015 (ca**)	0.21 (ca**)	--	mg/kg	<0.020	<0.020	<0.030 [<0.030]	<0.020	<0.020	<0.020	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	230 (nc)	2,200 (nc)	--	mg/kg	<0.020	<0.020	<0.020 [<0.020]	<0.020	<0.020	<0.020	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	230 (nc)	2,200 (nc)	--	mg/kg	<0.030	<0.030	<0.030 [<0.030]	<0.030	<0.030	<0.020	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	<0.010	<0.010	<0.010 [<0.020]	<0.010	<0.010	<0.010	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	3.9 (nc)	20 (nc)	--	mg/kg	<0.040	<0.040	<0.040 [<0.040]	<0.040	<0.030	<0.030	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	1,700 (nc)	170,000 (max)	--	mg/kg	<0.020	<0.020	<0.020 [<0.020]	<0.020	<0.020	<0.020	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	170 (nc)	1,700 (nc)	--	mg/kg	<0.020	<0.020	<0.020 [<0.020]	0.040 J	<0.020	<0.020	NA	NA	NA	NA	NA	NA	NA	NA	NA
Volatile Organics																			
1,1,1,2-Tetrachloroethane	2 (ca)	9.8 (ca)	--	mg/kg	<0.0015	<0.0015	<0.0015 [<0.0016]	<0.0015	<0.0014	<0.0014	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	680 (sat)	680 (sat)	--	mg/kg	<0.0011	<0.0011	<0.0012 [<0.0012]	<0.0011	<0.0011	<0.0010	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	0.59 (ca**)	2.9 (ca**)	--	mg/kg	<0.0020	<0.0020	<0.0021 [<0.0021]	<0.0020	<0.0019	<0.0018	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	1.1 (ca)	5.5 (ca)	--	mg/kg	<0.0017	<0.0017	<0.0017 [<0.0018]	<0.0017	<0.0016	<0.0015	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	3.4 (ca)	17 (ca)	--	mg/kg	<0.0016	<0.0016	<0.0017 [<0.0017]	<0.0016	<0.0016	<0.0015	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	25 (nc)	110 (nc)	--	mg/kg	<0.0024	<0.0024	<0.0025 [<0.0025]	<0.0024	<0.0023	<0.0022	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloropropene	--	--	--	mg/kg	<0.0014	<0.0014	<0.0015 [<0.0015]	<0.0014	<0.0014	<0.0013	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichlorobenzene	--	--	--	mg/kg	<0.0018	<0.0017	<0.0018 [<0.0018]	<0.0018	<0.0017	<0.0016	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	0.091 (ca)	0.41 (ca)	--	mg/kg	<0.0031	<0.0031	<0.0032 [<0.0032]	<0.0031	<0.0030	<0.0028	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	180 (ca**)	220 (sat)	--	mg/kg	<0.0015	<0.0015	<0.0015 [<0.0016]	<0.0015	<0.0014	<0.0014	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	6.7 (nc)	28 (nc)	--	mg/kg	<0.0020	<0.0020	<0.0021 [<0.0021]	<0.0020	<0.0019	<0.0018	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	0.0056 (ca)	0.073 (ca)	--	mg/kg	<0.0063	<0.0063	<0.0064 [<0.0065]	<0.0063	<0.0060	<0.0057	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane	0.034 (ca)	0.17 (ca)	--	mg/kg	<0.0020	<0.0020	<0.0021 [<0.0021]	<0.0020	<0.0019	<0.0018	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	220 (sat)	220 (sat)	--	mg/kg	<0.0013	<0.0012	<0.0013 [<0.0013]	<0.0013	<0.0012	<0.0011	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	0.45 (ca)	2.2 (ca)	--	mg/kg	<0.0013	<0.0012	<0.0013 [<0.0013]	<0.0013	<0.0012	<0.0011	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	0.93 (ca*)	4.7 (ca*)	--	mg/kg	<0.0043	<0.0042	<0.0044 [<0.0044]	<0.0043	<0.0041	<0.0039	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	--	--	--	mg/kg	<0.0020	<0.0020	<0.0021 [<0.0021]	<0.0020	<0.0019	<0.0018	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	--	--	--	mg/kg	<0.0015	<0.0015	<0.0015 [<0.0016]	<0.0015	<0.0014	<0.0014	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropane	160 (nc)	1,600 (sat)	--	mg/kg	<0.0015	<0.0015	<0.0015 [<0.0016]	<0.0015	<0.0014	<0.0014	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	2.6 (ca)	13 (ca)	--	mg/kg	<0.0015	<0.0015	<0.0015 [<0.0016]	<0.0015	<0.0014	<0.0014	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2-Dichloropropane	--	--	--	mg/kg	<0.0013	<0.0012	<0.0013 [<0.0013]	<0.0013	<0.0012	<0.0011	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	2,800 (nc)	19,000 (nc)	--	mg/kg	R	R	R [R]	R	R	R	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloroethyl Vinyl Ether	--	--	--	mg/kg	<0.0063	<0.0062	<0.0064 [<0.0065]	<0.0063	<0.0060	<0.0057	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorotoluene	1,000 (sat)	1,000 (sat)	--	mg/kg	<0.0014	<0.0014	<0.0014 [<0.0014]	<0.0014	<0.0013	<0.0013	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	--	--	--	mg/kg	<0.0063	<0.0062	<0.0064 [<0.0065]	<0.0063	<0.0060	<0.0057	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorotoluene	290 (sat)	290 (sat)	--	mg/kg	<0.0013	<0.0012	<0.0013 [<0.0013]	<0.0013	<0.0012	<0.0011	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	530 (nc)	5,200 (sat)	--	mg/kg	<0.0063	<0.0062	<0.0064 [<0.0065]	<0.0063	<0.0060	<0.0057	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	6,100 (nc)	61,000 (nc)	--	mg/kg	<0.0063 J	<0.0062 J	<0.0064 J [<0.0065 J]	<0.0063 J	0.070 J	<0.0057 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrolein	0.016 (nc)	0.068 (nc)	--	mg/kg	R	R	R [R]	R	R	R	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	0.24 (ca*)	1.2 (ca*)	--	mg/kg	R	R	R [R]	R	R	R	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	1.1 (ca*)	5.6 (ca*)	--	mg/kg	<0.0013	<0.0012	<0.0013 [<0.0013]	<0.0013	<0.0012	<0.0011	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromobenzene	--	--	--	mg/kg	<0.0013	<0.0012	<0.0013 [<0.0013]	<0.0013	<0.0012	<0.0011	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	--	--	--	mg/kg	<0.0021	<0.0021	<0.0022 [<0.0022]	<0.0021	<0.0021	<0.0019	NA	NA	NA	NA	NA				

Notes found at end of table.

Table D-5. Soil Analytical Results, Western Burning Ground, 1999 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	WBGSB6 0 - 2 05/26/99	WBGSB7 0 - 2 05/26/99	WBGSB8 0 - 2 05/26/99	WBGSB9 0 - 2 05/26/99	WBGSB10 0 - 2 05/26/99	WBGSB11 0 - 2 05/26/99	WBGBC1 0 - 2 08/18/99	WBGBC1 5 - 7 08/18/99	WBGBC12 0 - 4 08/18/99	WBGSB13 0 - 2 10/06/99	WBGSB13 2 - 4 10/06/99	WBGSB14 0 - 2 10/06/99	WBGSB14 2 - 4 10/06/99	WBGSB15 0 - 2 10/06/99	WBGSB15 2 - 4 10/06/99
Volatile Organics																			
Chloromethane	1.7 {ca*}	8.4 {ca*}	--	mg/kg	<0.0042	<0.0041	<0.0043 [0.0043]	<0.0042	<0.0040	<0.0038	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	78 {nc}	1,300 {sat}	--	mg/kg	<0.0022	<0.0021	<0.0022 [0.0022]	<0.0022	<0.0021	<0.0020	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	--	--	--	mg/kg	<0.0013	<0.0012	<0.0013 [0.0013]	<0.0013	<0.0012	<0.0011	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	5.8 {ca}	21 {ca}	--	mg/kg	<0.00090	<0.00090	<0.00090 [0.00090]	<0.00090	<0.00080	<0.00080	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromomethane	78 {nc}	3,000 {sat}	--	mg/kg	<0.0018	<0.0018	<0.0018 [0.0019]	<0.0018	<0.0017	<0.0016	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	19 {nc}	78 {nc}	--	mg/kg	<0.0021	<0.0020	<0.0021 [0.0021]	<0.0021	<0.0020	<0.0019	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	5.7 {ca}	29 {ca}	--	mg/kg	<0.0014	<0.0014	<0.0014 [0.0014]	<0.0014	<0.0013	<0.0013	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	6.2 {ca**}	22 {ca*}	--	mg/kg	<0.0013	<0.0012	<0.0013 [0.0013]	<0.0013	<0.0012	<0.0011	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	310 {sat}	310 {sat}	--	mg/kg	<0.0016	<0.0016	<0.0017 [0.0017]	<0.0016	<0.0016	<0.0015	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	60 {nc}	260 {nc}	--	mg/kg	<0.0029	<0.0028	<0.0029 [0.0030]	<0.0029	<0.0028	<0.0026	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	11 {ca}	54 {ca}	--	mg/kg	<0.0013	<0.0012	<0.0013 [0.0013]	<0.0013	<0.0012	<0.0011	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	--	--	--	mg/kg	<0.0021	<0.0021	<0.0022 [0.0022]	<0.0021	<0.0020	<0.0019	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	--	--	--	mg/kg	<0.0016	<0.0016	<0.0017 [0.0017]	<0.0016	<0.0016	<0.0015	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	300 {sat}	300 {sat}	--	mg/kg	<0.0015	<0.0015	<0.0015 [0.0016]	<0.0015	<0.0014	<0.0014	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Isopropyltoluene	--	--	--	mg/kg	<0.0011	<0.0011	0.0048 [0.0012]	<0.0011	<0.0011	<0.0010	NA	NA	NA	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	--	--	--	mg/kg	<0.0015	<0.0015	<0.0015 [0.0016]	<0.0015	<0.0014	<0.0014	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	1,000 {sat}	1,000 {sat}	--	mg/kg	<0.00030	<0.00020	<0.00030 [0.00030]	<0.00030	<0.00020	<0.00020	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butylbenzene	--	--	--	mg/kg	<0.0015	<0.0015	<0.0015 [0.0016]	<0.0015	<0.0014	<0.0014	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	0.57 {ca}	2.7 {ca}	--	mg/kg	<0.0014	<0.0014	<0.0014 [0.0014]	<0.0014	<0.0013	<0.0013	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	500 {nc}	4600 {nc}	--	mg/kg	<0.0016	<0.0015	<0.0016 [0.0016]	<0.0016	<0.0015	<0.0014	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	11 {nc}	50 {nc}	--	mg/kg	<0.0053	<0.0052	<0.0054 [0.0055]	<0.0053	<0.0051	<0.0048	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	--	--	--	mg/kg	<0.0013	<0.0012	<0.0013 [0.0013]	<0.0013	<0.0012	<0.0011	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	2.8 {ca}	14 {ca}	--	mg/kg	<0.0032	<0.0032	<0.0033 [0.0034]	<0.0032	<0.0031	<0.0029	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane	80 {nc}	1,300 {sat}	--	mg/kg	<0.0014	<0.0014	<0.0015 [0.0015]	<0.0014	<0.0014	<0.0013	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Acetate	99 {nc}	2,800 {sat}	--	mg/kg	<0.0063 J	<0.0062 J	<0.0064 J [0.0065 J]	<0.0063 J	<0.0060 J	<0.0057 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride	0.06 {ca}	1.7 {ca}	--	mg/kg	<0.0023	<0.0023	<0.0024 [0.0024]	<0.0023	<0.0023	<0.0021	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	60 {nc}	260 {nc}	--	mg/kg	<0.0029	<0.0028	<0.0029 [0.0030]	<0.0029	<0.0028	<0.0026	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organics																			
1,2,4-Trichlorobenzene	8.7 {ca**}	40 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.36	<0.36	<0.37	<0.38 [0.37]	<0.34 [0.37]	NA	NA	<0.37	<0.37
1,2-Dichlorobenzene	220 {sat}	220 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.36	<0.36	<0.37	<0.38 [0.37]	<0.34 [0.37]	NA	NA	<0.37	<0.37
1,2-Diphenylhydrazine	0.61 {ca**}	2.2 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.36	<0.36	<0.37	<0.38 [0.37]	<0.34 [0.37]	NA	NA	<0.37	<0.37
1,4-Dichlorobenzene	2.6 {ca}	13 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.36	<0.36	<0.37	<0.38 [0.37]	<0.34 [0.37]	NA	NA	<0.37	<0.37
2,4,5-Trichlorophenol	610 {nc}	6,200 {nc}	--	mg/kg	<1.0	<0.98	<1.0 [1.0]	<1.0	<0.97	<0.92	<0.96	<0.97	<0.98	<1.0 [1.0]	<0.92 [1.0]	NA	NA	<1.0	<1.0
2,4,6-Trichlorophenol	44 {ca**}	160 {ca**}	--	mg/kg	<0.38	<0.37	<0.39 [0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [0.37]	<0.34 [0.37]	NA	NA	<0.37	<0.37
2,4-Dichlorophenol	18 {nc}	180 {nc}	--	mg/kg	<0.38	<0.37	<0.39 [0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [0.37]	<0.34 [0.37]	NA	NA	<0.37	<0.37
2,4-Dimethylphenol	120 {nc}	1,200 {nc}	--	mg/kg	<0.38	<0.37	<0.39 [0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [0.37]	<0.34 [0.37]	NA	NA	<0.37	<0.37
2,4-Dinitrophenol	12 {nc}	120 {nc}	--	mg/kg	<2.5	<2.5	<2.6 [2.6]	<2.5	<2.4	<2.3	<2.4	<2.4	<2.5	<2.6 [2.5]	<2.3 [2.5]	NA	NA	<2.5	<2.5
2,4-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.36	<0.36	<0.37	<0.38 [0.37]	<0.34 [0.37]	NA	NA	<0.37	<0.37
2,6-Dinitrotoluene	6.1 {nc}	62 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.36	<0.36	<0.37	<0.38 [0.37]	<0.34 [0.37]	NA	NA	<0.37	<0.37
2-Chloronaphthalene	210 {sat}	210 {sat}	--	mg/kg	<0.38	<0.37	<0.39 [0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [0.37]	<0.34 [0.37]	NA	NA	<0.37	<0.37
2-Chlorophenol	39 {nc}	510 {nc}	--	mg/kg	<0.38	<0.37	<0.39 [0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [0.37]	<0.34 [0.37]	NA	NA	<0.37	<0.37
2-Methylnaphthalene	31 {nc}	440 {sat}	--	mg/kg	<0.38	<0.37	<0.39 [0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [0.37]	<0.34 [0.37]	NA	NA	<0.37	<0.37
2-Methylphenol	310 {nc}	3,100 {nc}	--	mg/kg	<0.38	<0.37	<0.39 [0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [0.37]	<0.34 [0.37]	NA	NA	<0.37	<0.37
2-Nitroaniline	--	--	--	mg/kg	<2.5	<2.5	<2.6 [2.6]	<2.5	<2.4	<2.3	<2.4	<2.4	<2.5	<2.6 [2.5]	<2.3 [2.5]	NA			

Table D-5. Soil Analytical Results, Western Burning Ground, 1999 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	WBGSB6 0 - 2 05/26/99	WBGSB7 0 - 2 05/26/99	WBGSB8 0 - 2 05/26/99	WBGSB9 0 - 2 05/26/99	WBGSB10 0 - 2 05/26/99	WBGSB11 0 - 2 05/26/99	WBGBC1 0 - 2 08/18/99	WBGBC1 5 - 7 08/18/99	WBGBC1 0 - 4 08/18/99	WBGSB12 0 - 2 10/06/99	WBGBC13 2 - 4 10/06/99	WBGBC14 0 - 2 10/06/99	WBGBC14 2 - 4 10/06/99	WBGBC15 0 - 2 10/06/99	WBGBC15 2 - 4 10/06/99
Semivolatile Organics																			
Fluorene	230 (nc)	2,200 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.36	<0.36	<0.37	<0.38 [<0.37]	<0.34 [<0.37]	NA	NA	<0.37	<0.37
Hexachlorobenzene	0.3 (ca)	1.1 (ca)	--	mg/kg	<0.38	<0.37	<0.39 [<0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [<0.37]	<0.34 [<0.37]	NA	NA	<0.37	<0.37
Hexachlorobutadiene	6.2 (ca**)	22 (ca*)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.36	<0.36	<0.37	<0.38 [<0.37]	<0.34 [<0.37]	NA	NA	<0.37	<0.37
Hexachlorocyclopentadiene	37 (nc)	370 (nc)	--	mg/kg	<0.38	<0.37	<0.39 [<0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [<0.37]	<0.34 [<0.37]	NA	NA	<0.37	<0.37
Hexachloroethane	35 (ca**)	120 (ca**)	--	mg/kg	<0.38	<0.37	<0.39 [<0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [<0.37]	<0.34 [<0.37]	NA	NA	<0.37	<0.37
Indeno(1,2,3-cd)pyrene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.36	<0.36	<0.37	<0.38 J [<0.37 J]	<0.34 J [<0.37 J]	NA	NA	<0.37 J	<0.37 J
Isophorone	510 (ca*)	1,800 (ca*)	--	mg/kg	<0.38	<0.37	<0.39 [<0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [<0.37]	<0.34 [<0.37]	NA	NA	<0.37	<0.37
Naphthalene	3.9 (ca)	20 (ca)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.36	<0.36	<0.37	<0.38 [<0.37]	<0.34 [<0.37]	NA	NA	<0.37	<0.37
Nitrobenzene	3.1 (nc)	28 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.36	<0.36	<0.37	<0.38 [<0.37]	<0.34 [<0.37]	NA	NA	<0.37	<0.37
N-Nitroso-di-n-propylamine	0.069 (ca**)	0.25 (ca**)	--	mg/kg	<0.38	<0.37	<0.39 [<0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [<0.37]	<0.34 [<0.37]	NA	NA	<0.37	<0.37
N-Nitrosodiphenylamine	99 (ca**)	350 (ca**)	--	mg/kg	<0.38	<0.37	<0.39 [<0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [<0.37]	<0.34 [<0.37]	NA	NA	<0.37	<0.37
Pentachlorophenol	3 (ca)	9 (ca)	--	mg/kg	<2.5	<2.5	<2.6 [<2.6]	<2.5	<2.4	<2.3	<2.4	<2.4	<2.5	<2.6 [<2.5]	<2.3 [<2.5]	NA	NA	<2.5	<2.5
Phenanthrene	1,700 (nc)	170,000 (max)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.36	<0.36	<0.37	<0.38 [<0.37]	<0.34 [<0.37]	NA	NA	<0.37	<0.37
Phenol	1,800 (nc)	180,000 (max)	--	mg/kg	<0.38	<0.37	<0.39 [<0.39]	<0.38	<0.36	<0.34	<0.36	<0.36	<0.37	<0.38 [<0.37]	<0.34 [<0.37]	NA	NA	<0.37	<0.37
Pyrene	170 (nc)	1,700 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.36	<0.36	<0.37	<0.38 [<0.37]	<0.34 [<0.37]	NA	NA	<0.37	<0.37
Inorganics																			
Aluminum	7,700 (nc)	990,000 (max)	40,041	mg/kg	17,100	14,700	15,800 [18,800]	15,500	14,800	8,570	27,900	46,500	18,300	10,600 [10,300]	11,700 [14,100]	16,000	11,400	10,400	14,600
Antimony	3.1 (nc)	41 (nc)	--	mg/kg	<0.630	<0.610	1.90 B [<0.650]	<0.620	<0.580	<0.560	1.70 B	2.20 B	1.70 B	<0.490 [<0.500]	<0.500 [<0.500]	<0.590	<0.620	<0.490	<0.500
Arsenic	0.39 (ca*)	1.6 (ca)	15.8	mg/kg	11.6	10.0	17.1 [15.8]	14.9	8.50	6.00 B	11.2 K	11.4 K	9.80 K	6.80 B [8.70 L]	8.00 L [8.40 L]	11.3 L	8.40 L	7.40 B	9.20 L
Barium	1,500 (nc)	190,000 (max)	209	mg/kg	11.5 L	20.6 L	35.9 L [19.4 L]	72.2 L	30.0 L	22.9 L	33.1	105	23.8 J	14.7 J [19.8 J]	27.8 [24.3]	17.2 J	24.4 J	17.0 J	17.6 J
Beryllium	16 (nc)	200 (nc)	1.02	mg/kg	0.610 K	0.520 K	0.650 K [0.490 K]	0.780 K	0.570 K	0.230 K	0.830 B	2.50	0.550 B	0.590 B [0.620 B]	1.30 B [1.00 B]	0.680 B	0.690 B	0.670 B	1.10 B
Cadmium	7 (nc)	81 (nc)	0.69	mg/kg	0.440	0.300	0.740 [0.790]	0.540	0.330	<0.110	<0.120	0.310 J	<0.120	<0.100 [<0.100]	<0.100 [<0.100]	<0.120	<0.120	<0.100	<0.100
Calcium	--	--	--	mg/kg	533	856	1,300 [1,050]	1,780	1,630	660	3,730	4,630	1,300	714 [1,040]	1,230 [1,480]	826	1,450	643	1,250
Chromium	280 (ca)	1,460 (ca)	65.3	mg/kg	37.7	28.1	46.6 [49.7]	45.7	30.6	22.2	39.4	65.3	35.7	23.9 [28.2]	37.3 [29.6]	32.3	30.6	24.1	43.1
Cobalt	2.3 (nc)	30 (nc)	72.3	mg/kg	7.10	8.20	7.20 [4.80]	11.9	6.00	5.80	17.0	17.3	8.30	6.20 [22.6]	23.0 [14.4]	17.9	7.70	7.50	10.6
Copper	310 (nc)	4,100 (nc)	53.5	mg/kg	35.7 K	21.6	40.0 K [29.0 K]	33.8 K	21.1	10.4	28.1	43.0	20.0	17.7 [20.4]	18.2 [25.5]	24.6	21.8	18.4	27.2
Iron	5,500 (nc)	720,000 (max)	50,962	mg/kg	37,600	31,800	39,300 [54,000]	39,100	35,000	20,400	46,000	43,700	36,400	29,000 [32,800]	27,800 [39,800]	40,300	31,600	30,300	42,700
Lead	400 (++)	800 (++)	26.8	mg/kg	21.0 J	15.1 J	79.4 J [17.7 J]	43.6 J	11.6	11.6	33.2	18.6	19.0	19.3 [25.3]	25.5 [29.0]	33.3	21.3	18.0	25.6
Magnesium	--	--	--	mg/kg	337	416	688 [735]	1,100	601	319	3,990	31,300	866	434 J [474 J]	2,510 [897]	699	912	526	372 J
Manganese	180 (nc)	2,300 (nc)	2,543	mg/kg	70.7 K	87.0 K	82.8 K [60.2 K]	122 K	71.3 K	131 K	268	256	111	79.9 [162]	241 [183]	192	83.2	92.5	71.5
Mercury	3.1 (sat)	3.1 (sat)	0.13	mg/kg	<0.130	<0.120	<0.130 [<0.120]	0.210 K	0.210 K	<0.110	0.190	<0.120	0.200	<0.100 [<0.100]	<0.100 [<0.100]	<0.110	<0.120	<0.100	0.140 K
Nickel	160 (nc)	2,000 (nc)	62.8	mg/kg	17.9 K	11.5 K	15.1 K [11.3 K]	16.2 K	10.7 K	5.30	18.4	36.0	12.8	9.00 [8.60]	13.6 [15.7]	13.8	10.7	9.60	19.5
Potassium	--	--	--	mg/kg	488	545	704 [625]	684	583	444	1,240	5,960	969	488 J [528]	861 [619]	958	788	512	634
Selenium	39 (nc)	510 (nc)	--	mg/kg	<0.500 L	<0.490 L	<0.510 L [<0.520 L]	<0.500 L	<0.580 L	1.20	<0.590	<0.590	<0.610	<0.490 L [<0.500 L]	<0.500 L [<0.500 L]	<0.590 L	<0.620 L	<0.490 L	<0.500 L
Silver	39 (nc)	510 (nc)	--	mg/kg	0.350 B	0.280 B	0.360 B [0.470 B]	0.410 B	0.280 B	0.130 B	<0.120	<0.120	<0.120	1.50 [1.90]	1.60 [2.30]	<0.120	<0.120	1.80	2.00
Sodium	--	--	--	mg/kg	120 B	123 B	159 B [124 B]	148 B	112 B	119 B	116 B	153 B	90.0 B	119 B [113 B]	102 B [103 B]	176 B	163 B	91.8 B	95.7 B
Thallium	0.51 (nc)	6.6 (nc)	2.11	mg/kg	<0.880	<0.850	<0.890 [<0.910]	<0.870	<0.810	<0.780	<0.820 J	<0.830 J	<0.850 J	<0.690 [<0.700]	<0.700 [<0.690]	<0.830	<0.880	<0.680	<0.690
Vanadium	55(nc)	720 (nc)	108	mg/kg	82.8 K	61.7 K	86.2 K [90.7 K]	82.3 K	63.8 K	39.0 K	74.9	75.8	65.9	49.7 [58.5]	52.5 [68.9]	78.5	62.2	55.7	76.2
Zinc	2,300 (nc)	310,000 (max)	202	mg/kg	59.5 K	30.9 K	381 K [118]	96.5 K	25.7 K	15.2 K	414	59.5	32.8	25.7 K [32.4 K]	28.4 K [29.6 K]	30.3	33.0	23.7 K	31.8 K
Miscellaneous																			
pH	--	--	--	pH Units	6.15	NA	NA	6.6	NA	5.95	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	--	--	--	mg/kg	1,736	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics-TCLP	TCLP Screening Value																		
Arsenic	5,000	--	--	µg/L	NA	NA	NA	<6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	10,000	--	--	µg/L	NA	NA	NA	341	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	1,000	--	--	µg/L	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	5,000	--	--	µg/L	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	5,000	--	--	µg/L	NA	NA	NA	<2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	200	--	--	µg/L	NA	NA	NA	<0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	1,000	--	--	µg/L	NA	NA	NA	<4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	5,000	--	--	µg/L	NA	NA	NA	1.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes found at end of table.

Table D-5. Soil Analytical Results, Western Burning Ground, 1999 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	WBGSB16 0 - 2 10/06/99	WBGSB16 2 - 4 10/06/99	WBGSB17 0 - 2 10/06/99	WBGSB17 2 - 4 10/06/99	WBGSB18 0 - 2 10/06/99	WBGSB18 2 - 4 10/06/99	WBGSB19 0 - 2 10/06/99	WBGSB19 2 - 4 10/06/99	WBGSB20 0 - 2 10/06/99	WBGSB20 2 - 4 10/06/99	WBGSB21 0 - 2 10/06/99	WBGSB21 2 - 4 10/06/99
Explosives																
1,3,5-Trinitrobenzene	220 {nc}	2,700 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	0.61 {nc}	6.2 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	3.6 {ca**}	42 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	6.1 {nc}	62 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Amino-4,6-Dinitrotoluene	15 {nc}	190 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Amino-2,6-Dinitrotoluene	12 {nc}	120 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinitrotoluene Mix	0.71 {ca}	2.5 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HMX	310 {nc}	3,100 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m-Nitrotoluene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	3.1 {nc}	28 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitroglycerine	0.61 {nc}	6.2 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Nitrotoluene	78 {nc}	1,300 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentaerythritol Tetranitrate	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Nitrotoluene	30 {ca**}	110 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX	4.4 {ca*}	16 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetryl	24 {nc}	250 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs																
Acenaphthene	340 {nc}	3,300 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	340 {nc}	3,300 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	1,700 {nc}	170,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	3.9 {nc}	20 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Volatile Organics																
1,1,1,2-Tetrachloroethane	2 {ca}	9.8 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	680 {sat}	680 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	0.59 {ca**}	2.9 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	1.1 {ca}	5.5 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	3.4 {ca}	17 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	25 {nc}	110 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloropropene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichlorobenzene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	0.091 {ca}	0.41 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	180 {ca**}	220 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	6.7 {nc}	28 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	0.0056 {ca}	0.073 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane	0.034 {ca}	0.17 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	220 {sat}	220 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	0.45 {ca}	2.2 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	0.93 {ca*}	4.7 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropane	160 {nc}	1,600 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	2.6 {ca}	13 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2-Dichloropropane	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	2,800 {nc}	19,000 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloroethyl Vinyl Ether	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorotoluene	1,000 {sat}	1,000 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorotoluene	290 {sat}	290 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	530 {nc}	5,200 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	6,100 {nc}	61,000 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrolein	0.016 {nc}	0.068 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	0.24 {ca*}	1.2 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	1.1 {ca*}	5.6 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromobenzene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromochloromethane	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	10 {ca}	46 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	61 {ca*}	220 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	0.79 {nc}	3.5 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Disulfide	67 {nc}	300 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Tetrachloride	0.25 {ca}	1.3 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	31 {nc}	860 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	2,200 {sat}	2,200 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	0.3 {ca}	1.5 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes found at end of table.

Table D-5. Soil Analytical Results, Western Burning Ground, 1999 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	WBGSB16 0 - 2 10/06/99	WBGSB16 2 - 4 10/06/99	WBGSB17 0 - 2 10/06/99	WBGSB17 2 - 4 10/06/99	WBGSB18 0 - 2 10/06/99	WBGSB18 2 - 4 10/06/99	WBGSB19 0 - 2 10/06/99	WBGSB19 2 - 4 10/06/99	WBGSB20 0 - 2 10/06/99	WBGSB20 2 - 4 10/06/99	WBGSB21 0 - 2 10/06/99	WBGSB21 2 - 4 10/06/99
Volatile Organics																
Chloromethane	1.7 (ca*)	8.4 (ca*)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	78 (nc)	1,300 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	5.8 (ca)	21 (ca)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromomethane	78 (nc)	3,000 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	19 (nc)	78 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	5.7 (ca)	29 (ca)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	6.2 (ca**)	22 (ca*)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	310 (sat)	310 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m,p-Xylene	60 (nc)	260 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	11 (ca)	54 (ca)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	300 (sat)	300 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Isopropyltoluene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	1,000 (sat)	1,000 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butylbenzene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	0.57 (ca)	2.7 (ca)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	500 (nc)	4600 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	11 (nc)	50 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	2.8 (ca)	14 (ca)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane	80 (nc)	1,300 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Acetate	99 (nc)	2,800 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride	0.06 (ca)	1.7 (ca)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	60 (nc)	260 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organics																
1,2,4-Trichlorobenzene	8.7 (ca**)	40 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
1,2-Dichlorobenzene	220 (sat)	220 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
1,2-Diphenylhydrazine	0.61 (ca**)	2.2 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
1,4-Dichlorobenzene	2.6 (ca)	13 (ca)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
2,4,5-Trichlorophenol	610 (nc)	6,200 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<1.0 [<0.94]	<0.94 [<1.0]	NA	NA	<0.98	<0.10
2,4,6-Trichlorophenol	44 (ca**)	160 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.050
2,4-Dichlorophenol	18 (nc)	180 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.090
2,4-Dimethylphenol	120 (nc)	1,200 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
2,4-Dinitrophenol	12 (nc)	120 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<2.5 [<2.4]	<2.4 [<2.5]	NA	NA	<2.5	<0.19
2,4-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
2,6-Dinitrotoluene	6.1 (nc)	62 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
2-Chloronaphthalene	210 (sat)	210 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
2-Chlorophenol	39 (nc)	510 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.050
2-Methylnaphthalene	31 (nc)	440 (sat)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
2-Methylphenol	310 (nc)	3,100 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.070
2-Nitroaniline	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<2.5 [<2.4]	<2.4 [<2.5]	NA	NA	<2.5	<0.14
2-Nitrophenol	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.12
3,3'-Dichlorobenzidine	1.1 (ca**)	3.8 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.75 [<0.70]	<0.70 [<0.75]	NA	NA	<0.74	<0.16
3-Nitroaniline	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<2.5 [<2.4]	<2.4 [<2.5]	NA	NA	<2.5	<0.15
4,6-Dinitro-2-methylphenol	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<2.5 [<2.4]	<2.4 [<2.5]	NA	NA	<2.5	<0.24
4-Bromophenyl-phenylether	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
4-Chloro-3-Methylphenol	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.75 [<0.70]	<0.70 [<0.75]	NA	NA	<0.74	<0.070
4-Chloroaniline	24 (nc)	250 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.75 [<0.70]	<0.70 [<0.75]	NA	NA	<0.74	<0.070
4-Chlorophenyl-phenylether	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
4-Methylphenol	31 (nc)	310 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.070
4-Nitroaniline	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<2.5 [<2.4]	<2.4 [<2.5]	NA	NA	<2.5	<0.20
4-Nitrophenol	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<2.5 [<2.4]	<2.4 [<2.5]	NA	NA	<2.5	<0.030
Acenaphthene	340 (nc)	3,300 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Acenaphthylene	340 (nc)	3,300 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Anthracene	1,700 (nc)	170,000 (max)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Benzo(a)anthracene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Benzo(a)pyrene	0.015 (ca**)	0.21 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Benzo(b)fluoranthene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 J [<0.35 J]	<0.35 J [<0.38 J]	NA	NA	<0.37 J	<0.12 J
Benzo(g,h,i)perylene	170 (nc)	1,700 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 J [<0.35 J]	<0.35 J [<0.38 J]	NA	NA	<0.37 J	<0.030 J
Benzo(k)fluoranthene	1.5 (ca**)	21 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.11
Benzoic Acid	240,000 (max)	2,500,000 (max)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	3,100 (nc)	310,000 (max)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	18 (nc)	180 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
bis(2-Chloroethyl)ether	0.19 (ca**)	0.9 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
bis(2-Chloroisopropyl)ether	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
bis(2-Ethylhexyl)phthalate	35 (ca*)	120 (ca*)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.070
Butylbenzylphthalate	260 (ca*)	910 (ca*)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Carbazole	24 (ca**)	86 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.050
Chrysene	15 (ca**)	210 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Dibenzo(a,h)anthracene	0.015 (ca**)	0.21 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 J [<0.35 J]	<0.35 J [<0.38 J]	NA	NA	<0.37 J	<0.050 J
Dibenzofuran	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.060
Diethylphthalate	4,900 (nc)	490,000 (max)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Dimethylphthalate	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Di-n-Butylphthalate	610 (nc)	6,200 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Dinitrotoluene Mix	0.71 (ca)	2.5 (ca)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Di-n-Octylphthalate	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Fluoranthene	230 (nc)	2,200 (nc)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030

Notes found at end of table.

Table D-5. Soil Analytical Results, Western Burning Ground, 1999 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	WBGSB16 0 - 2 10/06/99	WBGSB16 2 - 4 10/06/99	WBGSB17 0 - 2 10/06/99	WBGSB17 2 - 4 10/06/99	WBGSB18 0 - 2 10/06/99	WBGSB18 2 - 4 10/06/99	WBGSB19 0 - 2 10/06/99	WBGSB19 2 - 4 10/06/99	WBGSB20 0 - 2 10/06/99	WBGSB20 2 - 4 10/06/99	WBGSB21 0 - 2 10/06/99	WBGSB21 2 - 4 10/06/99
Semivolatle Organics																
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Hexachlorobenzene	0.3 {ca}	1.1 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Hexachlorobutadiene	6.2 {ca**}	22 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Hexachlorocyclopentadiene	37 {nc}	370 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Hexachloroethane	35 {ca**}	120 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 J [<0.35 J]	<0.35 J [<0.38 J]	NA	NA	<0.37 J	<0.030 J
Isophorone	510 {ca*}	1,800 {ca*}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Naphthalene	3.9 {ca}	20 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Nitrobenzene	3.1 {nc}	28 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
N-Nitroso-di-n-propylamine	0.069 {ca**}	0.25 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
N-Nitrosodiphenylamine	99 {ca**}	350 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Pentachlorophenol	3 {ca}	9 {ca}	--	mg/kg	NA	NA	NA	NA	NA	NA	<2.5 [<2.4]	<2.4 [<2.5]	NA	NA	<2.5	<0.12
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Phenol	1,800 {nc}	180,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.37 [<0.35]	<0.35 [<0.38]	NA	NA	<0.37	<0.030
Inorganics																
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	13,700 [13,200]	15,900	15,400	15,700	15,700	12,900	14,500 [10,700]	8,650 [8,290]	20,900	15,700	11,100	14,600
Antimony	3.1 {nc}	41 {nc}	--	mg/kg	<0.610 [<0.610]	<0.630	<0.640	<0.640	<0.590	<0.590	<0.500 [<0.500]	<0.500 [<0.490]	<0.590	<0.610	<0.490	0.610 J
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	12.5 L [12.0 L]	12.5 L	11.9 L	13.0 L	10.2 L	8.10 L	5.40 B [5.10 B]	6.40 B [5.60 B]	9.90 L	14.3 L	8.50 L	11.6 L
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	26.3 [22.9 J]	20.7 J	19.6 J	17.1 J	18.5 J	16.4 J	20.0 [22.7]	23.0 [19.0 J]	17.5 J	23.9 J	25.5	22.0 J
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	0.960 B [0.680 B]	0.930 B	0.770 B	0.810 B	0.560 B	0.350 B	1.00 B [0.720 B]	0.530 B [0.430 B]	1.10 B	0.660 B	0.710 B	0.750 B
Cadmium	7 {nc}	81 {nc}	0.69	mg/kg	<0.120 [<0.120]	<0.130	<0.130	<0.130	<0.120	<0.120	<0.100 [<0.100]	<0.100 [<0.100]	<0.0100	<0.120	<0.100	<0.120
Calcium	--	--	--	mg/kg	1,300 [1,190]	1,420	1,130	1,430	836	843	760 [920]	828 [776]	1,680	2,940	1,220	1,360
Chromium	280 {ca}	1,460 {ca}	65.3	mg/kg	37.5 [34.1]	41.1	39.4	40.4	38.8	38.7	35.3 [28.8]	22.6 [20.5]	45.7	41.3	28.8	34.8
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	31.4 [14.8]	10.1	11.0	7.30	6.30	5.40 J	7.10 [7.60]	8.10 [7.90]	17.7	8.90	8.60	10.0
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	29.8 [24.5]	23.9	27.4	31.4	22.9	19.9	21.3 [15.5]	11.9 [13.1]	32.3	27.5	19.3	26.5
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	46,700 [40,300]	42,500	44,300	48,800	39,700	39,800	39,200 [27,300]	23,400 [22,800]	43,400	47,100	32,300	40,600
Lead	400 {++}	800 {++}	26.8	mg/kg	44.4 [29.9]	25.3	26.9	26.9	19.6	12.6	15.1 [14.8]	18.0 [14.5]	28.9	23.6	24.0	24.0
Magnesium	--	--	--	mg/kg	693 [588 J]	12,000	698	708	609	713	627 [967]	481 J [518]	2,480	808	784	605
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	241 [160]	125	119	119	74.6	47.4	45.7 [197]	129 [103]	119	148	158	127
Mercury	3.1 {sat}	3.1 {sat}	0.13	mg/kg	<0.120 [<0.120]	<0.120	<0.130	<0.120	<0.120	<0.120	<0.100 [<0.100]	<0.100 [<0.100]	0.160 K	0.180 K	<0.100	<0.120
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	14.4 [12.1]	14.1	13.8	16.0	12.6	7.60	12.2 [8.90]	6.70 [5.30]	20.0	14.4	9.40	13.8
Potassium	--	--	--	mg/kg	690 [621]	1,030	728	981	534 J	708	670 [523]	652 [646]	1,420	973	442 J	629
Selenium	39 {nc}	510 {nc}	--	mg/kg	<0.610 L [<0.610 L]	<0.630 L	<0.640 L	<0.640 L	<0.590 L	<0.590 L	<0.500 L [<0.500 L]	<0.500 L [<0.490 L]	<0.590 L	<0.610 L	<0.490 L	<0.590 L
Silver	39 {nc}	510 {nc}	--	mg/kg	<0.120 [<0.120]	<0.130	<0.130	<0.130	<0.120	<0.120	2.20 [1.50]	1.40 [1.30]	<0.120	<0.120	1.70	<0.120
Sodium	--	--	--	mg/kg	149 B [144 B]	163 B	142 B	151 B	134 B	126 B	104 B [107 B]	92.7 B [97.2 B]	131 B	154 B	95.2 B	124 B
Thallium	0.51 {nc}	6.6 {nc}	2.11	mg/kg	<0.850 [<0.850]	<0.880	<0.890	<0.890	<0.830	<0.820	<0.690 [<0.700]	<0.700 [<0.690]	<0.820	<0.850	<0.680	<0.820
Vanadium	55{nc}	720 {nc}	108	mg/kg	81.6 [75.0]	74.9	83.5	88.9	80.6	71.0	70.2 [51.0]	42.1 [41.9]	84.6	92.3	57.3	77.5
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	54.7 [43.9]	39.7	40.1	53.3	29.2	16.9	28.1 K [17.7 K]	17.6 K [16.2 K]	38.2	38.3	33.7 K	40.0
Miscellaneous																
pH	--	--	--	pH Units	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics-TCLP	TCLP Screening Value															
Arsenic	5,000	--	--	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	10,000	--	--	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	1,000	--	--	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	5,000	--	--	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	5,000	--	--	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	200	--	--	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	1,000	--	--	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	5,000	--	--	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

mg/kg	Milligrams per kilogram.
µg/L	Micrograms per liter.
[a]	USEPA Regional Screening Levels (USEPA 2008a).
[b]	Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.
{ca}	Carcinogen.
{nc}	Noncarcinogen.
*	Noncarcinogen screening level is less than one hundred times the carcinogen screening level.
**	Noncarcinogen screening level is less than ten times the carcinogen screening level.
{++}	The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.
{max}	Concentration may exceed ceiling limit.
{sat}	Screening level may exceed saturation concentration.
B (Inorganics)	Constituent concentration quantified as estimated.
B (Organics)	Constituent was detected in the associated method blank.
J	Constituent concentration quantified as estimated.
K	Estimated concentration bias high.
L	Estimated concentration bias low.
NA	Not Analyzed.
[3.3]	Bracketed concentration indicates laboratory analytical result for duplicate sample.
24,400	Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).
10.6 J	Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).
16	Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Table D-6. Excavated Soil Sampling Results From Test Pitting Activites, Western Burning Ground, 1999 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	TCLP Standard	Units	WBGDW1 0 - 2 05/26/99	WBGDW2 0 - 2 05/26/99	WBGDW3 0 - 2 05/26/99	WBGDW4 0 - 2 05/26/99	WBGDW5 0 - 2 05/26/99	WBGDW6 0 - 2 05/26/99	WBGDW7 06/21/99	WBGDW15 06/28/99	WBGDW16 07/13/99	WBGDW17 07/14/99	WBGDW18 07/15/99	WBGDW19 07/15/99	WBGDW20 07/15/99	WBGDW21 07/15/99	WBGDW22 07/22/99	WBGDW23 07/22/99	WBGDW23 07/29/99	WBGDW24 07/23/99	WBGDW25 07/23/99	WBGDW26 10/06/99
Inorganics-TCLP																						
Arsenic	5,000	µg/L	<6	<6	<6	<6	<6	<6	<6	<6	7.7	6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6
Barium	10,000	µg/L	48.5	905	42.1	120	24.2	24	116	628	126	485	346	272	497	847	221	553	326	588	423	108
Cadmium	1,000	µg/L	<1	3.9	<1	<1	<1	1.3	<1	1.3	<1	<1	5.6	2.9	2.3	8.2	2.4	3.4	1.6	2.1	4.5	<1
Chromium	5,000	µg/L	<1	3.2	<1	<1	<1	<1	337	103	5.6	113	13	<1	144	19.5	<1	6.9	66	<1	17.2	<1
Lead	5,000	µg/L	<2	11.4	2.2	<2	5.3	<2	272	9.1	88.9	468	284	424	558	157	3,530	721	172	221	8.6	
Mercury	200	µg/L	<0.2	<0.2	0.75	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Selenium	1,000	µg/L	<4	5	<4	4.5	<4	<4	<4	<4	<5	12.9	10.6	11.1	10.2	<5	6.2	<5	<5	<5	<5	<5
Silver	5,000	µg/L	<1	<1	1.1	<1	<1	<1	<1	<1	<1	1.3	1.2	<1	<1	<1	1	<1	<1	1	<1	<1

µg/L

J

NA

[3.3]

24,400

Micrograms per liter.
Constituent concentration quantified as estimated.
Not Analyzed.
Bracketed concentration indicates laboratory analytical result for duplicate sample.
Highlighted value indicates constituent concentration is above TCLP Screening Value.

Table D-7. Test Pit Confirmation Soil Samples, Western Burning Ground, 1999 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	WBGTP1A 2.5 - 3 06/22/99	WBGTP1B 3 - 3.5 06/23/99	WBGTP1B 3.5 - 4 07/23/99	WBGTP1S 1 - 1.5 06/22/99	WBGTP1S 1 - 1.5 06/23/99	WBGTP2A 2.5 - 3 06/22/99	WBGTP2B 3 - 3.5 06/22/99	WBGTP2S 1 - 1.5 06/22/99	WBGTP3A 2.5 - 3 06/23/99	WBGTP3S 1 - 1.5 06/23/99	WBGTP4A 2.5 - 3 06/24/99	WBGTP4B 2 - 2.5 06/24/99	WBGTP4S 0.5 - 1 06/24/99	WBGTP5A 2.5 - 3 06/24/99	WBGTP5B 2.5 - 3 06/24/99	WBGTP6A 2.5 - 3 06/23/99	WBGTP7A 2.5 - 3 07/13/99	WBGTP7B 2.5 - 3 07/14/99	WBGTP7S 1 - 1.5 07/14/99	WBGTP8A 3 - 3.5 07/13/99	WBGTP8B 3 - 3.5 07/13/99	WBGTP9A 2.5 - 3 06/24/99	WBGTP9S 1 - 1.5 06/24/99	WBGTP10A 2.5 - 3 07/15/99		
Dioxin/Furan																														
1,2,3,4,6,7,8-HpCDD	0.00039 (ca**)	0.0016 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	0.000243	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.000133	NA	NA	NA	NA	NA	NA	NA	NA	
1,2,3,4,6,7,8-HpCDF	0.00032 (ca**)	0.0011 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	0.00000042	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0000256	NA	NA	NA	NA	NA	NA	NA	NA	
1,2,3,4,7,8,9-HpCDF	0.00032 (ca**)	0.0011 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.0000001	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000151	NA	NA	NA	NA	NA	NA	NA	NA	
1,2,3,4,7,8-HxCDD	0.000039 (ca**)	0.00016 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	0.00000723	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000168	NA	NA	NA	NA	NA	NA	NA	NA	
1,2,3,4,7,8-HxCDF	0.000032 (ca**)	0.00011 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.00000006	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000181	NA	NA	NA	NA	NA	NA	NA	NA	
1,2,3,6,7,8-HxCDD	0.000039 (ca**)	0.00016 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	0.000023	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000389	NA	NA	NA	NA	NA	NA	NA	NA	
1,2,3,6,7,8-HxCDF	0.000032 (ca**)	0.00011 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.00000006	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000218	NA	NA	NA	NA	NA	NA	NA	NA	
1,2,3,7,8,9-HxCDD	0.000039 (ca**)	0.00016 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	0.0000181	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000325	NA	NA	NA	NA	NA	NA	NA	NA	
1,2,3,7,8,9-HxCDF	0.000032 (ca**)	0.00011 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.00000007	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000052	NA	NA	NA	NA	NA	NA	NA	NA	
1,2,3,7,8-PeCDD	0.0000039 (ca**)	0.000016 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	0.00000685	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000141	NA	NA	NA	NA	NA	NA	NA	NA	
1,2,3,7,8-PeCDF	0.00011 (ca**)	0.00038 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.00000005	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000144	NA	NA	NA	NA	NA	NA	NA	NA	
2,3,4,6,7,8-HxCDF	0.000032 (ca**)	0.00011 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.00000006	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000342	NA	NA	NA	NA	NA	NA	NA	NA	
2,3,4,7,8-PeCDF	0.000011 (ca**)	0.000038 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.00000005	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000155	NA	NA	NA	NA	NA	NA	NA	NA	
2,3,7,8-TCDD	0.0000045 (ca*)	0.000018 (ca*)	--	mg/kg	NA	NA	NA	NA	NA	NA	0.00000047	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000417	NA	NA	NA	NA	NA	NA	NA	NA	
2,3,7,8-TCDF	0.000032 (ca**)	0.00011 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	<0.00000007	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000225	NA	NA	NA	NA	NA	NA	NA	NA	
OCDD	0.013 (ca**)	0.053 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	0.00721	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00648 J	NA	NA	NA	NA	NA	NA	NA	NA	
OCDF	0.011 (ca**)	0.038 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	0.00000127	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0000472	NA	NA	NA	NA	NA	NA	NA	NA	
Total HpCDDs	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	0.00000023	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000178	NA	NA	NA	NA	NA	NA	NA	NA	
Total HpCDFs	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	0.00000042	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000647	NA	NA	NA	NA	NA	NA	NA	NA	
Total HxCDDs	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	0.0002	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0000045	NA	NA	NA	NA	NA	NA	NA	NA	
Total HxCDFs	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	0.00000087	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000473	NA	NA	NA	NA	NA	NA	NA	NA	
Total PeCDDs	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	0.0000355	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0000107	NA	NA	NA	NA	NA	NA	NA	NA	
Total PeCDFs	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	0.00000085	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0000542	NA	NA	NA	NA	NA	NA	NA	NA	
Total TCDDs	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	0.0000032	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000978	NA	NA	NA	NA	NA	NA	NA	NA	
Total TCDFs	--	--	--	mg/kg	NA	NA	NA	NA	NA	NA	0.00000015	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0000562	NA	NA	NA	NA	NA	NA	NA	NA	
Semivolatile Organics																														
1,2,4-Trichlorobenzene	8.7 (ca**)	40 (ca**)	--	mg/kg	<0.41	<0.41	NA	<0.42	<0.38	<0.41	<0.39	<0.40	<0.39	<0.40	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.38	<0.37	<0.39 <0.39	<0.37	<0.36	<0.010	<0.010	<0.34		
1,2-Dichlorobenzene	220 (sat)	220 (sat)	--	mg/kg	<0.41	<0.41	NA	<0.42	<0.38	<0.41	<0.39	<0.40	<0.39	<0.40	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.38	<0.37	<0.39 <0.39	<0.37	<0.36	<0.020	<0.020	<0.34		
1,2-Diphenylhydrazine	0.61 (ca**)	2.2 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1,3-Dichlorobenzene	--	--	--	mg/kg	<0.41	<0.41	NA	<0.42	<0.38	<0.41	<0.39	<0.40	<0.39	<0.40	<0.0062	<0.0061	<0.0060	<0.0060	<0.0061	<0.0061	<0.38	<0.37	<0.39 <0.39	<0.37	<0.36	<0.0061	<0.0058	<0.34		
1,4-Dichlorobenzene	2.6 (ca)	13 (ca)	--	mg/kg	<0.41	<0.41	NA	<0.42	<0.38	<0.41	<0.39	<0.40	<0.39	<0.40	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.38	<0.37	<0.39 <0.39	<0.37	<0.36	<0.010	<0.010	<0.34		
2,4,5-Trichlorophenol	610 (nc)	6,200 (nc)	--	mg/kg	<1.0	<1.0	NA	<1.0	<0.91	<0.99	<0.94	<0.98	<0.95	<0.96	<0.11	<0.11	<0.11	<0.10	<0.11	<0.11	<1.1	<1.0	<1.1 <1.0	<0.98	<0.96	<0.11	<1.0	<0.92		
2,4,6-Trichlorophenol	44 (ca**)	160 (ca**)	--	mg/kg	<0.41	<0.41	NA	<0.42	<0.38	<0.41	<0.39	<0.40	<0.39	<0.40	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.38	<0.37	<0.39 <0.39	<0.37	<0.36	<0.050	<0.050	<0.34		
2,4-Dichlorophenol	18 (nc)	180 (nc)	--	mg/kg	<0.41	<0.41	NA	<0.42	<0.38	<0.41	<0.39	<0.40	<0.39	<0.40	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.38	<0.37	<0.39 <0.39	<0.37	<0.36	<0.10	<0.090	<0.34		
2,4-Dimethylphenol																														

Table D-7. Test Pit Confirmation Soil Samples, Western Burning Ground, 1999 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	WBGTP1A 2.5 - 3 06/22/99	WBGTP1B 3 - 3.5 06/23/99	WBGTP1B 3.5 - 4 07/23/99	WBGTP1S 1 - 1.5 06/22/99	WBGTP1SB 1 - 1.5 06/23/99	WBGTP2A 2.5 - 3 06/22/99	WBGTP2B 3 - 3.5 06/22/99	WBGTP2S 1 - 1.5 06/22/99	WBGTP3A 2.5 - 3 06/23/99	WBGTP3S 1 - 1.5 06/23/99	WBGTP4A 2.5 - 3 06/24/99	WBGTP4B 2 - 2.5 06/24/99	WBGTP4S 0.5 - 1 06/24/99	WBGTP5A 2.5 - 3 06/24/99	WBGTP5B 2.5 - 3 06/24/99	WBGTP6A 2.5 - 3 06/23/99	WBGTP7A 2.5 - 3 07/13/99	WBGTP7B 2.5 - 3 07/14/99	WBGTP7S 1 - 1.5 07/14/99	WBGTP8A 3 - 3.5 07/13/99	WBGTP8B 3 - 3.5 07/13/99	WBGTP9A 2.5 - 3 06/24/99	WBGTP9S 1 - 1.5 06/24/99	WBGTP10A 2.5 - 3 07/15/99	
Inorganics																													
Aluminum	7,700 (nc)	990,000 (max)	40,041	mg/kg	11,700	9,950	10,300	10,000	8,270	8,450	6,910	11,600	16,700	11,200	14,700	15,000	14,300	14,300	15,200	9,480	11,800	9,090	15,300 [14,900]	13,300	10,400	10,400	12,300	10,800	
Antimony	3.1 (nc)	41 (nc)	--	mg/kg	<0.620	<0.630	1.30 B	<0.630	<0.570	<0.620	<0.580	<0.610	<0.590	<0.590	<0.630	<0.610	<0.610	<0.600	<0.620	<0.680	<0.630	<0.620	<0.640 [<0.650]	<0.620	<0.600	<0.610	<0.590	<0.570	
Arsenic	0.39 (ca*)	1.6 (ca)	15.8	mg/kg	6.50 B	6.00 B	5.40 B	4.20 B	4.40 B	3.80 B	1.70 B	7.30	9.80	5.40 B	9.70 K	9.20 K	9.40 K	7.20 B	8.30 K	3.70 B	4.50 B	2.80 B	7.80 B [7.10 B]	4.30 B	3.40 B	9.70 K	9.50 K	7.30 B	
Barium	1,500 (nc)	190,000 (max)	209	mg/kg	24.4	38.6	56.0	21.5 J	25.4	17.0 J	13.7 J	52.5	51.8	22.9 J	25.7	26.8	15.2	24.4	29.5	18.9 J	24.3 J	22.5 J	14.0 J [14.5 J]	22.4 J	21.6 J	184	28.9	33.2	
Beryllium	16 (nc)	200 (nc)	1.02	mg/kg	0.770 B	0.850 B	0.910 B	0.360 B	0.290 B	0.490 B	0.240 B	0.670 B	1.20 B	0.520 B	0.440 B	0.290 B	0.300 B	0.160 B	0.260 B	<0.140	0.290 B	<0.120	0.230 B [0.320 B]	0.300 B	0.370 B	0.140 B	0.290 B	0.490 B	
Cadmium	7 (nc)	81 (nc)	0.69	mg/kg	<0.120	<0.130	<0.120	<0.130	<0.110	<0.120	<0.120	0.200 K	0.280 K	<0.130	<0.130	<0.120	<0.120	<0.120	<0.120	<0.140	<0.130	<0.120	<0.130 [<0.130]	<0.120	<0.120	0.750	<0.120	<0.110	
Calcium	--	--	--	mg/kg	1,420	1,840	7,020	990	912	2,030	1,860	3,840	7,190	2,650	1,640	2,890	657	1,060	2,610	1,170	1,440	1,320	758 [748]	1,270	1,710	29,200	2,010	2,090	
Chromium	280 (ca)	1,460 (ca)	65.3	mg/kg	38.6 K	47.9 K	69.6	25.0 K	22.0 K	24.9 K	23.3 K	41.3 K	45.2 K	35.8 K	41.1	36.4	34.6	30.7	34.1	29.0 K	33.0	17.7 K	38.8 [34.5]	30.3	23.8	34.5	34.0	28.9	
Cobalt	2.3 (nc)	30 (nc)	72.3	mg/kg	11.8 K	7.80	7.10 K	8.50	6.20	7.90	2.30 J	9.50 K	16.1 K	9.00	13.3	8.40	6.60	6.90	8.30	1.90 J	6.30 K	2.70 K	4.30 K [4.20 K]	3.20 K	6.20 K	6.10 J	8.80	7.70 K	
Copper	310 (nc)	4,100 (nc)	53.5	mg/kg	23.5	22.5	26.1 K	12.2	11.8	16.7	10.0	66.0 K	34.1 K	20.3	25.2 K	23.1 K	24.6 K	16.7 K	23.0 K	12.6	16.2 K	9.20	20.5 K [20.0 K]	15.2	19.1 K	122 K	45.1 K	20.3 K	
Iron	5,500 (nc)	720,000 (max)	50,962	mg/kg	36,400	30,200	30,100	25,000	21,100	25,200	16,400	30,900	36,300	32,300	38,900	34,700	39,500	29,900	32,200	22,800	25,900	16,700	36,700 [34,900]	24,800	26,400	25,800	39,500	30,600	
Lead	400 (++)	800 (++)	26.8	mg/kg	34.0	231	808	14.8	17.9	25.4	54.8	173	137	19.5	39.6	36.8	19.9	14.1	32.6	9.30	81.4	17.4	11.5 [13.1]	9.40	15.6	265	33.3	26.0	
Magnesium	--	--	--	mg/kg	836	2,340	4,020	462 J	458 J	771	521 J	2,170	4,150	890	1,170	1,350	510	689	1,290	549 J	943	765	522 J [449 J]	1,050	1,120	4,640	511	856	
Manganese	180 (nc)	2,300 (nc)	2,543	mg/kg	123 K	109 K	144	117 K	123 K	125 K	38.5 K	149 K	160 K	81.9 K	132	92.0	74.0	83.1	85.1	21.3 K	60.7	48.1	46.3 [44.2]	39.5	98.3	152	157	99.1	
Mercury	3.1 (sat)	3.1 (sat)	0.13	mg/kg	<0.120	<0.130	<0.120	0.210	<0.110	0.200	<0.110	0.130	<0.120	<0.120	<0.130	<0.120	<0.120	<0.120	<0.120	0.210	<0.130	<0.120	<0.130 [<0.120]	<0.120	<0.120	<0.120	<0.110	<0.120	
Nickel	160 (nc)	2,000 (nc)	62.8	mg/kg	11.1 J	10.3 J	10.0 K	4.40 J	4.20 J	7.10 J	2.60 J	10.8 J	15.9 J	11.7 J	12.2	9.90	10.2	8.00	10.3	2.50 J	5.10	2.80 J	6.10 [6.00]	5.90	5.80	10.1	10.0 B	7.50	
Potassium	--	--	--	mg/kg	766	1,010	1,020 J	438 J	335 J	678	382 J	741	1,750	418 J	835 J	1,090 J	573 J	1,120 J	1,110 J	1,250	807 J	1,070 J	1,300 J [1,190 J]	942 J	796 J	866 J	452 J	1,370 J	
Selenium	39 (nc)	510 (nc)	--	mg/kg	<0.500	0.610 K	<0.610 L	<0.500	<0.450	0.580 J	<0.470	<0.490	<0.470	0.520 K	<0.500	<0.490	<0.490	<0.480	<0.490	0.720 K	<0.510	<0.620	<0.640 [<0.650]	<0.500	<0.480	<0.490	<0.470	<0.570	
Silver	39 (nc)	510 (nc)	--	mg/kg	<0.120	<0.130	0.240 B	<0.130	<0.110	<0.120	<0.120	<0.120	<0.120	<0.130	<0.120	<0.120	<0.120	<0.120	<0.120	<0.140	0.140 B	<0.120	0.240 B [0.200 B]	0.220 B	0.120 B	0.140	<0.120	0.210 B	
Sodium	--	--	--	mg/kg	194 B	61.6 B	23.7 B	122 B	45.2 B	133 B	109 B	130 B	81.6 B	46.5 B	75.5 B	99.1 B	68.0 B	111 B	106 B	59.0 B	166 B	249 B	236 B [233 B]	198 B	169 B	116 B	58.0 B	183 B	
Thallium	0.51 (nc)	6.6 (nc)	2.11	mg/kg	<0.870	<0.880	<0.850	<0.880	<0.790	<0.870	<0.810	<0.860	<0.830	1.20 J	<0.880	<0.860	<0.850	<0.830	<0.860	<0.950	<0.890	<0.870	<0.900 [<0.910]	<0.870	<0.840	<0.860	<0.820	<0.790	
Vanadium	55(nc)	720 (nc)	108	mg/kg	69.3 K	52.3 K	57.4 K	47.7 K	35.7 K	49.4 K	44.7 K	55.7 K	57.4 K	50.1 K	69.7	63.7	71.0	56.3	60.5	42.3 K	51.8 K	36.5 K	91.1 K [82.9 K]	56.1 K	43.0 K	48.2	62.3	58.4 K	
Zinc	2,300 (nc)	310,000 (max)	202	mg/kg	29.0 K	86.6 K	311 J	22.1 K	26.5 K	25.1 K	18.5 K	214 K	309 K	178 K	40.7	57.0	132	26.2	58.4	25.3 K	63.6	17.2 K	25.6 K [26.7 K]	95.4	72.8	685 L	689	45.5	
Miscellaneous																													
pH	--	--	--	pH Units	6.85	6.7	NA	6.9	6.8	6.75	6.95	6.85	6.65	6.75	6.45	6.15	7.15	6.25	6.3	6.25	6.3	6.6	6.65 [6.6]	6.35	6.3	7.05	7.25	7.5	

Notes found at end of table.

Table D-7. Test Pit Confirmation Soil Samples, Western Burning Ground, 1999 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]		Units	WBGTP10B 2.5 - 3 07/15/99	WBGTP10S 0.5 - 1 07/15/99	WBGTP11A 2.5 - 3 07/15/99	WBGTP11B 2.5 - 3 07/15/99	WBGTP12A 2.5 - 3 07/15/99	WBGTP12S 0.5 - 1 07/15/99	WBGTP13A 1.5 - 2 07/22/99	WBGTP13B 1 - 1.5 07/22/99	WBGTP13S 1.5 - 2 07/22/99	WBGTP14A 2 - 2.5 07/22/99	WBGTP14B 1.5 - 2 07/22/99	WBGTP15A 1.5 - 2 07/15/99	WBGTP16A 0.5 - 1 07/22/99	WBGTP16A 0.5 - 1 09/14/99	WBGTP17A 0.5 - 1 07/22/99	WBGTP18A 1 - 1.5 07/22/99	WBGTP18S 1 - 1.5 07/22/99	WBGTP19A 2.5 - 3 07/29/99	WBGTP19S 2.5 - 3 07/29/99
Dioxin/Furan																								
1,2,3,4,6,7,8-HpCDD	0.00039 (ca**)	0.0016 (ca**)	--	mg/kg	0.0000452	NA	NA	NA	NA	0.000128	0.000145	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0000548	NA	0.000039 B	NA
1,2,3,4,6,7,8-HpCDF	0.00032 (ca**)	0.0011 (ca**)	--	mg/kg	0.00000137	NA	NA	NA	NA	0.0000226	0.0000132	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000044	NA	0.00000036 B	NA
1,2,3,4,7,8,9-HpCDF	0.00032 (ca**)	0.0011 (ca**)	--	mg/kg	<0.000002	NA	NA	NA	NA	0.00000105	0.00000098	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00000011	NA	0.00000011 B	NA
1,2,3,4,7,8-HxCDD	0.000039 (ca**)	0.00016 (ca**)	--	mg/kg	0.00000088	NA	NA	NA	NA	0.00000236	0.00000209 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000092	NA	0.00000051	NA
1,2,3,4,7,8-HxCDF	0.000032 (ca**)	0.00011 (ca**)	--	mg/kg	0.00000041	NA	NA	NA	NA	0.00000179	0.00000145 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000013	NA	0.00000013 B	NA
1,2,3,6,7,8-HxCDD	0.000039 (ca**)	0.00016 (ca**)	--	mg/kg	0.00000131	NA	NA	NA	NA	0.00000063	0.000000503	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000176	NA	0.00000096	NA
1,2,3,6,7,8-HxCDF	0.000032 (ca**)	0.00011 (ca**)	--	mg/kg	0.00000029	NA	NA	NA	NA	0.00000158	0.00000115	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000009	NA	0.00000011 B	NA
1,2,3,7,8,9-HxCDD	0.000039 (ca**)	0.00016 (ca**)	--	mg/kg	0.0000017	NA	NA	NA	NA	0.00000623	0.00000412	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000409	NA	0.00000092	NA
1,2,3,7,8,9-HxCDF	0.000032 (ca**)	0.00011 (ca**)	--	mg/kg	<0.00000014	NA	NA	NA	NA	0.000000054	<0.00000005	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.00000008	NA	<0.00000005	NA
1,2,3,7,8-PeCDD	0.0000039 (ca**)	0.000016 (ca**)	--	mg/kg	0.00000057	NA	NA	NA	NA	0.00000183	0.00000168	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000081	NA	0.00000005 B	NA
1,2,3,7,8-PeCDF	0.00011 (ca**)	0.00038 (ca**)	--	mg/kg	0.00000038	NA	NA	NA	NA	0.00000121	0.00000124	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000011	NA	0.00000009 B	NA
2,3,4,6,7,8-HxCDF	0.000032 (ca**)	0.00011 (ca**)	--	mg/kg	0.00000021	NA	NA	NA	NA	0.00000185	0.0000015	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000001	NA	0.00000011 B	NA
2,3,4,7,8-PeCDF	0.000011 (ca**)	0.000038 (ca**)	--	mg/kg	0.00000049	NA	NA	NA	NA	0.00000185	0.00000172	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000014	NA	0.00000015 B	NA
2,3,7,8-TCDD	0.0000045 (ca*)	0.000018 (ca*)	--	mg/kg	0.00000024	NA	NA	NA	NA	0.00000054	0.00000053	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000032	NA	0.00000045 B	NA
2,3,7,8-TCDF	0.000032 (ca**)	0.00011 (ca**)	--	mg/kg	0.00000044	NA	NA	NA	NA	0.00000166	0.00000184	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000012	NA	0.00000008	NA
OCDD	0.013 (ca**)	0.053 (ca**)	--	mg/kg	0.00543 J	NA	NA	NA	NA	0.0055 J	0.0083 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0032	NA	0.00436 J	NA
OCDF	0.011 (ca**)	0.038 (ca**)	--	mg/kg	0.00000186 B	NA	NA	NA	NA	0.0000254	0.0000181	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000125	NA	0.00000054 B	NA
Total HpCDDs	--	--	--	mg/kg	0.000109	NA	NA	NA	NA	0.00026	0.000296	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.000141	NA	0.0000755 B	NA
Total HpCDFs	--	--	--	mg/kg	0.00000344	NA	NA	NA	NA	0.0000471	0.0000285	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000044	NA	0.00000047 B	NA
Total HxCDDs	--	--	--	mg/kg	0.0000166	NA	NA	NA	NA	0.000059	0.0000409	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0000234	NA	0.0000045	NA
Total HxCDFs	--	--	--	mg/kg	0.00000125 B	NA	NA	NA	NA	0.0000235	0.0000131	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000117	NA	0.00000072 B	NA
Total PeCDDs	--	--	--	mg/kg	0.00000318	NA	NA	NA	NA	0.0000174	0.0000161	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000562	NA	0.00000158 B	NA
Total PeCDFs	--	--	--	mg/kg	0.00000165	NA	NA	NA	NA	0.0000214	0.0000183	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000068	NA	0.00000102	NA
Total TCDDs	--	--	--	mg/kg	0.00000024	NA	NA	NA	NA	0.00000669	0.0000049	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0000011	NA	0.00000058 B	NA
Total TCDFs	--	--	--	mg/kg	0.00000037	NA	NA	NA	NA	0.0000258	0.0000291	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00000053	NA	0.00000048	NA
Semivolatile Organics																								
1,2,4-Trichlorobenzene	8.7 (ca**)	40 (ca**)	--	mg/kg	<0.34	<0.36	<0.34	<0.35	<0.33	<0.36	<0.36	<0.37	<0.34	<0.39	<0.49	<0.35	<0.38	NA	<0.37	<0.43	<0.37	<0.38	<0.38	
1,2-Dichlorobenzene	220 (sat)	220 (sat)	--	mg/kg	<0.34	<0.36	<0.34	<0.35	<0.33	<0.36	<0.36	<0.37	<0.34	<0.39	<0.49	<0.35	<0.38	NA	<0.37	<0.43	<0.37	<0.38	<0.38	
1,2-Diphenylhydrazine	0.61 (ca**)	2.2 (ca**)	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1,3-Dichlorobenzene	--	--	--	mg/kg	<0.34	<0.36	<0.34	<0.35	<0.33	<0.36	<0.36	<0.37	<0.34	<0.39	<0.49	<0.35	<0.38	NA	<0.37	<0.43	<0.37	<0.38	<0.38	
1,4-Dichlorobenzene	2.6 (ca)	13 (ca)	--	mg/kg	<0.34	<0.36	<0.34	<0.35	<0.33	<0.36	<0.36	<0.37	<0.34	<0.39	<0.49	<0.35	<0.38	NA	<0.37	<0.43	<0.37	<0.38	<0.38	
2,4,5-Trichlorophenol	610 (nc)	6,200 (nc)	--	mg/kg	<0.90	<0.97	<0.90	<0.94	<0.89	<0.97	<0.96	<1.0	<0.93	<1.0	<1.3	<0.95	<1.0	NA	<1.0	<1.2	<1.0	<1.0	<1.0	
2,4,6-Trichlorophenol	44 (ca**)	160 (ca**)	--	mg/kg	<0.34	<0.36	<0.34	<0.35	<0.33	<0.36	<0.36	<0.37	<0.34	<0.39	<0.49	<0.35	<0.38	NA	<0.37	<0.43	<0.37	<0.38	<0.38	
2,4-Dichlorophenol	18 (nc)	180 (nc)	--	mg/kg	<0.34	<0.36	<0.34	<0.35	<0.33	<0.36	<0.36	<0.37	<0.34	<0.39	<0.49	<0.35	<0.38	NA	<0.37	<0.43	<0.37	<0.38	<0.38	
2,4-Dimethylphenol	120 (nc)	1,200 (nc)	--	mg/kg	<0.34	<0.36	<0.34	<0.35	<0.33	<0.36	<0.36	<0.37	<0.34	<0.39	<0.49	<0.35	<0.38	NA	<0.37	<0.43	<0.37	<0.38	<0.38	
2,4-Dinitrophenol	12 (nc)	120 (nc)	--	mg/kg	<2.3	<2.4	<2.3	<2.4	<2.3	<2.4	<2.4 J	<2.5 J	<2.3 J	<2.6 J	<3.3 J	<2.4	<2.5 J	NA	<2.5 J	<2.9	<2.5 J	<2.6	<2.6	
2,4-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	<0.34	<0.36	<0.34	<0.35	<0.33	<0.36	<0.36	<0.37	<0.34	<0.39	<0.49	<0.35	<0.38	NA	<0.37	<0.43	<0.37	<0.38	<0.38	
2,6-Dinitrotoluene	6.1 (nc)	62 (nc)	--	mg/kg	<0.34	<0.36	<0.34	<0.35	<0.33	<0.36	<0.36	<0.37	<0.34	<0.39	<0.49	<0.35	<0.38	NA	<0.37	<0.43	<0.37	<0.38	<0.38	
2-Chloronaphthalene	210 (sat)	210 (sat)	--	mg/kg	<0.34	<0.36	<0.34	<0.35	<0.33	<0.36														

Table D-7. Test Pit Confirmation Soil Samples, Western Burning Ground, 1999 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	WBGTP10B 2.5 - 3 07/15/99	WBGTP10S 0.5 - 1 07/15/99	WBGTP11A 2.5 - 3 07/15/99	WBGTP11B 2.5 - 3 07/15/99	WBGTP12A 2.5 - 3 07/15/99	WBGTP12S 0.5 - 1 07/15/99	WBGTP13A 1.5 - 2 07/22/99	WBGTP13B 1 - 1.5 07/22/99	WBGTP13S 1.5 - 2 07/22/99	WBGTP14A 2 - 2.5 07/22/99	WBGTP14B 1.5 - 2 07/22/99	WBGTP15A 1.5 - 2 07/15/99	WBGTP16A 0.5 - 1 07/22/99	WBGTP16A 0.5 - 1 09/14/99	WBGTP17A 0.5 - 1 07/22/99	WBGTP18A 1 - 1.5 07/22/99	WBGTP18S 1 - 1.5 07/22/99	WBGTP19A 2.5 - 3 07/29/99	WBGTP19S 2.5 - 3 07/29/99
Inorganics																							
Aluminum	7,700 (nc)	990,000 (max)	40,041	mg/kg	7,520	13,300	5,760	13,800	9,390	11,300	9,150	11,000	18,700	11,400	25,400	8,690	12,100	9,020	15,200	23,800	12,300	13,500	12,400
Antimony	3.1 (nc)	41 (nc)	--	mg/kg	<0.570	<0.610	<0.550	<0.580	<0.560	<0.610	0.710 B	1.20 B	1.30 B	<0.650	1.50 B	<0.590	1.00 B	1.20 B	1.10 B	1.40 B	0.700 B	<0.620	<0.640
Arsenic	0.39 (ca*)	1.6 (ca)	15.8	mg/kg	2.60 B	13.0	2.70 B	8.20	7.50 B	8.70	3.80 B	4.90 B	5.30 B	5.10 B	10.7 K	4.00 B	5.50	8.10 K	6.50 B	4.70 B	7.00 B	9.60	8.80
Barium	1,500 (nc)	190,000 (max)	209	mg/kg	14.7 J	15.3 J	20.0 J	95.9	132	108	21.7 J	24.3	73.1	19.7 J	47.5	26.7	12.2 J	69.4	14.5 J	69.2	38.0	31.3	36.5
Beryllium	16 (nc)	200 (nc)	1.02	mg/kg	<0.110	0.550 B	0.120 B	0.710 B	0.340 B	0.490 B	0.310 B	0.790 B	2.50 J	0.690 B	1.70 J	0.240 B	0.590 B	3.40	0.960 B	3.90 J	0.880 B	0.810 B	0.860 B
Cadmium	7 (nc)	81 (nc)	0.69	mg/kg	<0.110	<0.120	<0.110	0.220 K	0.360 K	0.190 K	<0.120	<0.120	<0.110	<0.130	<0.160	<0.120	<0.130	<0.110	<0.130	<0.140	<0.120	<0.120	<0.130
Calcium	--	--	--	mg/kg	1,430	796	1,040	15,700	29,000	2,610	2,870	2,330	7,740	2,660	9,800	1,750	1,400	4,670	2,200	3,600	1,460	1,500	1,750
Chromium	280 (ca)	1,460 (ca)	65.3	mg/kg	13.5 K	36.6	12.5 K	35.1	23.4	37.3	46.2	42.4	45.8	31.7	67.0	22.4	47.4	22.0	45.0	72.8	32.1	30.5	33.5
Cobalt	2.3 (nc)	30 (nc)	72.3	mg/kg	1.40 K	10.0 K	2.30 K	6.80 K	5.60 K	8.90 K	3.20 K	21.1 K	20.1 K	7.80 K	10.5 K	2.20 K	7.00 K	18.7	10.2 K	28.4 K	10.3 K	10.1	14.1
Copper	310 (nc)	4,100 (nc)	53.5	mg/kg	8.20 K	26.1 K	7.10 K	63.6	55.8	108	19.3 K	24.0 K	26.3 K	27.0 K	36.0 K	10.1 K	21.1 K	31.6	30.7 K	35.7 K	28.4 K	23.6	26.1
Iron	5,500 (nc)	720,000 (max)	50,962	mg/kg	14,300	44,100	13,400	27,300	19,700	33,600	32,100	39,200	34,200	37,700	52,400	17,100	36,200	32,700	47,700	52,900	34,700	34,800	34,800
Lead	400 (++)	800 (++)	26.8	mg/kg	8.90	23.2	7.90	89.7	161	116	135	113	140	42.4	41.0	12.1 K	681	34.2	21.9	27.4	40.2	15.7	27.5
Magnesium	--	--	--	mg/kg	475 J	381 J	408 J	6,330	7,470	1,340	1,090	1,050	10,500	939	14,000	1,900	608 J	2,810	509 J	5,450	1,330	1,020	920
Manganese	180 (nc)	2,300 (nc)	2,543	mg/kg	27.2 K	208	42.4 K	113	115	152	72.8	152	297	94.7	157	59.0	57.3	911	65.9	146	170	105	150
Mercury	3.1 (sat)	3.1 (sat)	0.13	mg/kg	<0.110	<0.120	<0.110	<0.110	<0.110	<0.120	<0.120	<0.120	<0.120	<0.130	<0.160	<0.120	<0.130	0.240	<0.110	<0.140	<0.120	<0.120	<0.130
Nickel	160 (nc)	2,000 (nc)	62.8	mg/kg	1.30 J	11.3	1.80 J	11.6	7.30	10.6	4.00 K	9.40 K	27.6 K	9.10 K	21.1 K	2.30 J	7.70 K	37.0	15.2 K	37.3 K	9.70 K	11.4	12.5
Potassium	--	--	--	mg/kg	465 J	830 J	930 J	1,560 J	1,050 J	544 J	441 J	639 J	1,860 J	1,030 J	3,340 J	599 J	581 J	501 J	431 J	988 J	562 J	655	618 J
Selenium	39 (nc)	510 (nc)	--	mg/kg	<0.570	<0.610	<0.550	<0.580	<0.560	<0.610	<0.590 L	<0.600 L	<0.560 L	<0.650 L	<0.800 L	<0.590	<0.630 L	<0.560 L	<0.630 L	<0.700 L	<0.620 L	<0.620	<0.640
Silver	39 (nc)	510 (nc)	--	mg/kg	0.160 B	0.290 B	<0.110	0.180 B	0.160 B	0.260 B	0.260 B	0.720 B	<0.110	0.170 B	0.150 B	0.130	<0.110 L	0.240 B	<0.140	0.130 B	<0.120	<0.130	<0.130
Sodium	--	--	--	mg/kg	158 B	148 B	150 B	201 B	212 B	165 B	148 B	139 B	162 B	<1.00	23.2 B	162 B	144 B	119 B	150 B	193 B	138 B	246 B	236
Thallium	0.51 (nc)	6.6 (nc)	2.11	mg/kg	0.820 J	<0.850	<0.770	<0.810	<0.780	<0.850	<0.830	<0.850	<0.790	<0.910	<1.10	<0.830	<0.890	<0.780 L	<0.880	<0.980	<0.880	<0.860	<0.900
Vanadium	55(nc)	720 (nc)	108	mg/kg	29.6 K	77.1 K	28.0 K	48.4 K	38.4 K	63.1 K	56.2 K	68.3 K	63.6 K	65.9 K	96.4 K	37.3 K	67.9 K	51.6	87.9 K	59.4 K	55.5	56.4	56.4
Zinc	2,300 (nc)	310,000 (max)	202	mg/kg	22.7 K	113	16.0 K	172	305	613	90.2 J	48.5 J	42.3 J	93.4 J	85.6 J	23.3 K	80.6 J	173	46.9 J	44.3 J	60.5 J	19.1	36.3
Miscellaneous																							
pH	--	--	--	pH Units	7.75	7.45	7.55	7	7.4	7.6	7	7.15	7.05	6.95	6.9	7.25	6.95	NA	6.8	6.8	7.2	5.1	5.85

mg/kg	Milligrams per kilogram.
[a]	USEPA Regional Screening Levels (USEPA 2008a).
[b]	Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.
{ca}	Carcinogen.
{nc}	Noncarcinogen.
*	Noncarcinogen screening level is less than one hundred times the carcinogen screening level.
**	Noncarcinogen screening level is less than ten times the carcinogen screening level.
{++}	The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.
{max}	Concentration may exceed ceiling limit.
{sat}	Screening level may exceed saturation concentration.
B (Inorganics)	Constituent concentration quantified as estimated.
B (Organics)	Constituent was detected in the associated method blank.
J	Constituent concentration quantified as estimated.
K	Estimated concentration bias high.
L	Estimated concentration bias low.
NA	Not Analyzed.
[3.3]	Bracketed concentration indicates laboratory analytical result for duplicate sample.
24,400	Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).
10.6 J	Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).
16	Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Table D-8. Sediment Analytical Results, Western Burning Ground, 1998 and 1999 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	WBGSD1 0 - 0.5 07/16/98	WBGSD2 0 - 0.5 07/16/98	WBGSD3 0 - 0.5 07/16/98	WBGSD4 0 - 0.5 05/27/99	WBGSD5 0 - 0.5 05/27/99	WBGSD6 0 - 0.5 06/16/99	WBGSD6 0 - 0.5 05/27/99
Explosives											
1,3,5-Trinitrobenzene	220 (nc)	2,700 (nc)	--	mg/kg	<0.25	<0.25	<0.25	NA	NA	NA	NA
1,3-Dinitrobenzene	0.61 (nc)	6.2 (nc)	--	mg/kg	<0.25	<0.25	<0.25	NA	NA	NA	NA
2,4,6-Trinitrotoluene	3.6 (ca**)	42 (ca**)	--	mg/kg	<0.25	<0.25	<0.25	NA	NA	NA	NA
2,4-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	<0.25	<0.25	<0.25	NA	NA	NA	NA
2,6-Dinitrotoluene	6.1 (nc)	62 (nc)	--	mg/kg	<0.25	<0.25	<0.25	NA	NA	NA	NA
2-Amino-4,6-Dinitrotoluene	15 (nc)	150 (nc)	--	mg/kg	<0.25	<0.25	<0.25	NA	NA	NA	NA
4-Amino-2,6-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	<0.25	<0.25	<0.25	NA	NA	NA	NA
Dinitrotoluene Mix	0.71 (ca)	2.5 (ca)	--	mg/kg	<0.25	<0.25	<0.25	NA	NA	NA	NA
HMX	310 (nc)	3,100 (nc)	--	mg/kg	<0.25	<0.25	<0.25	NA	NA	NA	NA
m-Nitrotoluene	--	--	--	mg/kg	<0.25	<0.25	<0.25	NA	NA	NA	NA
Nitrobenzene	3.1 (nc)	28 (nc)	--	mg/kg	<0.25	<0.25	<0.25	NA	NA	NA	NA
Nitroglycerine	0.61 (nc)	6.2 (nc)	--	mg/kg	<1.2	<1.2	<1.2	NA	NA	NA	NA
o-Nitrotoluene	78 (nc)	1,300 (sat)	--	mg/kg	<0.25	<0.25	<0.25	NA	NA	NA	NA
Pentaerythritol Tetranitrate	--	--	--	mg/kg	<1.2	<1.2	<1.2	NA	NA	NA	NA
p-Nitrotoluene	30 (ca**)	110 (ca*)	--	mg/kg	<0.25	<0.25	<0.25	NA	NA	NA	NA
RDX	4.4 (ca*)	16 (ca)	--	mg/kg	<0.25	<0.25	<0.25	NA	NA	NA	NA
Tatol	24 (nc)	250 (nc)	--	mg/kg	<0.25	<0.25	<0.25	NA	NA	NA	NA
Volatiles Organics											
1,1,1,2-Tetrachloroethane	2 (ca)	9.8 (ca)	--	mg/kg	<0.0020	<0.0030	<0.0030	NA	NA	NA	NA
1,1,1-Trichloroethane	680 (sat)	680 (sat)	--	mg/kg	<0.0010	<0.0020	<0.0030	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	0.59 (ca**)	2.9 (ca**)	--	mg/kg	<0.0020	<0.0040 J	<0.0050	NA	NA	NA	NA
1,1,2-Trichloroethane	11 (nc)	5.5 (ca)	--	mg/kg	<0.0020	<0.0030 J	<0.0030	NA	NA	NA	NA
1,1-Dichloroethane	3.4 (ca)	17 (ca)	--	mg/kg	<0.0020	<0.0040	<0.0040	NA	NA	NA	NA
1,1-Dichloroethene	25 (nc)	110 (nc)	--	mg/kg	<0.0030	<0.0050	<0.0060	NA	NA	NA	NA
1,1-Dichloropropene	--	--	--	mg/kg	<0.0020	<0.0030	<0.0030	NA	NA	NA	NA
1,2,3-Trichlorobenzene	--	--	--	mg/kg	<0.0020	<0.0040	<0.0040	NA	NA	NA	NA
1,2,3-Trichloropropane	0.091 (ca)	0.41 (ca)	--	mg/kg	<0.0030	<0.0070 J	<0.0070	NA	NA	NA	NA
1,2,4-Trichlorobenzene	180 (ca*)	220 (sat)	--	mg/kg	<0.0020	<0.0040	<0.0040	NA	NA	NA	NA
1,2,4-Trimethylbenzene	8.7 (nc)	28 (nc)	--	mg/kg	<0.0020	<0.0040 J	<0.0050	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	0.0056 (ca)	0.073 (ca)	--	mg/kg	<0.0070	<0.010 J	<0.010	NA	NA	NA	NA
1,2-Dibromoethane	0.034 (ca)	0.17 (ca)	--	mg/kg	<0.0020	<0.0040	<0.0050	NA	NA	NA	NA
1,2-Dichlorobenzene	220 (sat)	220 (sat)	--	mg/kg	<0.0010	<0.0030 J	<0.0030	NA	NA	NA	NA
1,2-Dichloroethane	0.45 (ca)	2.2 (ca)	--	mg/kg	<0.0020	<0.0030	<0.0030	NA	NA	NA	NA
1,2-Dichloropropane	0.93 (ca*)	4.7 (ca*)	--	mg/kg	<0.0050	<0.0090	<0.010	NA	NA	NA	NA
1,3,5-Trimethylbenzene	--	--	--	mg/kg	<0.0020	<0.0040 J	<0.0050	NA	NA	NA	NA
1,3-Dichlorobenzene	--	--	--	mg/kg	<0.0020	<0.0030 J	<0.0030	NA	NA	NA	NA
1,3-Dichloropropane	160 (nc)	1,600 (sat)	--	mg/kg	<0.0020	<0.0030	<0.0030	NA	NA	NA	NA
1,4-Dichlorobenzene	2.6 (ca)	13 (ca)	--	mg/kg	<0.0020	<0.0030 J	<0.0030	NA	NA	NA	NA
1,2-Dichloropropane	--	--	--	mg/kg	<0.0020	<0.0030	<0.0030	NA	NA	NA	NA
2-Butanone	2,800 (nc)	19,000 (nc)	--	mg/kg	<0.0070	<0.010	<0.010	NA	NA	NA	NA
2-Chloroethyl Vinyl Ether	--	--	--	mg/kg	<0.0070	<0.010	<0.010	NA	NA	NA	NA
2-Chlorotoluene	1,000 (sat)	1,000 (sat)	--	mg/kg	<0.0020	<0.0030 J	<0.0030	NA	NA	NA	NA
2-Hexanone	--	--	--	mg/kg	<0.0070	<0.010	<0.010	NA	NA	NA	NA
4-Chlorotoluene	290 (sat)	290 (sat)	--	mg/kg	<0.0010	<0.0030 J	<0.0030	NA	NA	NA	NA
4-Methyl-2-pentanone	530 (nc)	5,200 (sat)	--	mg/kg	<0.0020	<0.0030	<0.0030	NA	NA	NA	NA
Acetone	6,100 (nc)	61,000 (nc)	--	mg/kg	0.0030 J	<0.010	0.020 J	NA	NA	NA	NA
Acrolein	0.016 (nc)	0.068 (nc)	--	mg/kg	<0.0070	<0.010	<0.010	NA	NA	NA	NA
Acrylonitrile	0.24 (ca*)	1.2 (ca*)	--	mg/kg	<0.0070	<0.010	<0.010	NA	NA	NA	NA
Benzene	1.1 (ca*)	5.6 (ca*)	--	mg/kg	<0.0010	<0.0030	<0.0030	NA	NA	NA	NA
Bromobenzene	--	--	--	mg/kg	<0.0010	<0.0030 J	<0.0030	NA	NA	NA	NA
Bromochloromethane	--	--	--	mg/kg	<0.0020	<0.0050	<0.0050	NA	NA	NA	NA
Bromodichloromethane	10 (ca)	46 (ca)	--	mg/kg	<0.0010	<0.0030	<0.0030	NA	NA	NA	NA
Bromofom	61 (ca*)	220 (ca*)	--	mg/kg	<0.0070	<0.0010	<0.0010	NA	NA	NA	NA
Bromomethane	0.79 (nc)	3.5 (nc)	--	mg/kg	<0.0050	<0.010	<0.010	NA	NA	NA	NA
Carbon Disulfide	67 (nc)	300 (nc)	--	mg/kg	<0.0070	<0.010	<0.010	NA	NA	NA	NA
Carbon Tetrachloride	0.25 (ca)	1.3 (ca)	--	mg/kg	<0.0050	<0.010	<0.010	NA	NA	NA	NA
Chlorobenzene	31 (nc)	860 (sat)	--	mg/kg	<0.0020	<0.0030	<0.0030	NA	NA	NA	NA
Chloroethane	2,200 (sat)	2,200 (sat)	--	mg/kg	<0.0070	<0.010	<0.010	NA	NA	NA	NA
Chloroform	0.3 (ca)	1.5 (ca)	--	mg/kg	<0.0020	<0.0030	<0.0030	NA	NA	NA	NA
Chloromethane	1.7 (ca*)	8.4 (ca*)	--	mg/kg	<0.0040	<0.0090	<0.010	NA	NA	NA	NA
cis-1,2-Dichloroethene	78 (nc)	1,300 (sat)	--	mg/kg	<0.0020	<0.0050	<0.0050	NA	NA	NA	NA
cis-1,3-Dichloropropene	--	--	--	mg/kg	<0.0010	<0.0030	<0.0030	NA	NA	NA	NA
Dibromochloromethane	5.8 (ca)	21 (ca)	--	mg/kg	<0.0090	<0.0020	<0.0020	NA	NA	NA	NA
Dibromomethane	78 (nc)	3,000 (sat)	--	mg/kg	<0.0020	<0.0040	<0.0040	NA	NA	NA	NA
Dichlorodifluoromethane	19 (nc)	78 (nc)	--	mg/kg	<0.0020	<0.0050	<0.0050	NA	NA	NA	NA
Ethylbenzene	5.7 (ca)	29 (ca)	--	mg/kg	<0.0020	<0.0030	<0.0030	NA	NA	NA	NA
Hexachlorobutadiene	6.2 (ca*)	22 (ca*)	--	mg/kg	<0.0010	<0.0030 J	<0.0030	NA	NA	NA	NA
Isopropylbenzene	310 (sat)	310 (sat)	--	mg/kg	<0.0020	<0.0040 J	<0.0040	NA	NA	NA	NA
m,p-Xylene	60 (nc)	260 (nc)	--	mg/kg	<0.0030	<0.0060	<0.0070	NA	NA	NA	NA
Methylene Chloride	11 (ca)	54 (ca)	--	mg/kg	<0.0010	<0.0030	<0.0030	NA	NA	NA	NA
n-Butylbenzene	--	--	--	mg/kg	<0.0020	<0.0050 J	<0.0050	NA	NA	NA	NA
n-Propylbenzene	--	--	--	mg/kg	<0.0020	<0.0040 J	<0.0040	NA	NA	NA	NA
o-Xylene	300 (sat)	300 (sat)	--	mg/kg	<0.0020	<0.0030	<0.0030	NA	NA	NA	NA
p-Isopropyltoluene	--	--	--	mg/kg	<0.0010	<0.0020 J	<0.0030	NA	NA	NA	NA
sec-Butylbenzene	--	--	--	mg/kg	<0.0020	<0.0030 J	<0.0030	NA	NA	NA	NA
Styrene	1,000 (sat)	1,000 (sat)	--	mg/kg	<0.0030	<0.0060	<0.0010	NA	NA	NA	NA
tert-Butylbenzene	--	--	--	mg/kg	<0.0020	<0.0030 J	<0.0030	NA	NA	NA	NA
Tetrachloroethene	0.57 (ca)	2.7 (ca)	--	mg/kg	<0.0020	<0.0030	<0.0030	NA	NA	NA	NA
Toluene	500 (nc)	4600 (nc)	--	mg/kg	0.0040	0.040	0.010	NA	NA	NA	NA
trans-1,2-Dichloroethene	11 (nc)	50 (nc)	--	mg/kg	<0.0060	<0.010	<0.010	NA	NA	NA	NA
trans-1,3-Dichloropropene	--	--	--	mg/kg	<0.0010	<0.0030	<0.0030	NA	NA	NA	NA
Trichloroethene	2.8 (ca)	14 (ca)	--	mg/kg	<0.0040	<0.0070	<0.0070	NA	NA	NA	NA
Trichlorofluoromethane	80 (nc)	1,300 (sat)	--	mg/kg	<0.0020	<0.0030	<0.0030	NA	NA	NA	NA
Vinyl Acetate	99 (nc)	2,800 (sat)	--	mg/kg	<0.0070	<0.010	<0.010	NA	NA	NA	NA
Vinyl Chloride	0.06 (ca)	1.7 (ca)	--	mg/kg	<0.0020	<0.0050	<0.0050	NA	NA	NA	NA
Xylenes (total)	60 (nc)	260 (nc)	--	mg/kg	<0.0030	<0.0060	<0.0070	NA	NA	NA	NA

Notes found at end of table.

Table D-8. Sediment Analytical Results, Western Burning Ground, 1998 and 1999 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	WBGSD1 0 - 0.5 07/16/98	WBGSD2 0 - 0.5 07/16/98	WBGSD3 0 - 0.5 07/16/98	WBGSD4 0 - 0.5 05/27/99	WBGSD5 0 - 0.5 05/27/99	WBGSD6 0 - 0.5 06/16/99	WBGSD6 0 - 0.5 05/27/99
Semivolatile Organics											
1,2,4-Trichlorobenzene	8.7 (ca**)	40 (ca**)	--	mg/kg	NA	NA	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
1,2-Dichlorobenzene	220 (sat)	220 (sat)	--	mg/kg	NA	NA	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
1,2-Diphenylhydrazine	0.61 (ca**)	2.2 (ca**)	--	mg/kg	<0.42	<0.92	<0.94	NA	NA	NA	NA
1,3-Dichlorobenzene	--	--	--	mg/kg	NA	NA	NA	<0.69	<1.1	NA	<0.93 (<0.85)
1,4-Dichlorobenzene	2.6 (ca)	13 (ca)	--	mg/kg	NA	NA	NA	<0.69	<1.1	NA	<0.93 (<0.85)
2,4,5-Trichlorophenol	610 (nc)	6,200 (nc)	--	mg/kg	<1.0	<2.2	<2.3	<1.9	<3.0	NA	<2.5 (<2.3)
2,4,6-Trichlorophenol	44 (ca**)	160 (ca**)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
2,4-Dichlorophenol	18 (nc)	180 (nc)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
2,4-Dimethylphenol	120 (nc)	1,200 (nc)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
2,4-Dinitrophenol	12 (nc)	120 (nc)	--	mg/kg	<2.1	<4.6	<4.7	<4.7	<7.4	NA	<6.3 (<5.7)
2,4-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	NA	NA	NA	<0.69	<1.1	NA	<0.93 (<0.85)
2,6-Dinitrotoluene	6.1 (nc)	62 (nc)	--	mg/kg	NA	NA	NA	<0.69	<1.1	NA	<0.93 (<0.85)
2-Chloronaphthalene	210 (sat)	210 (sat)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
2-Chlorophenol	39 (nc)	510 (nc)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
2-Methylnaphthalene	31 (nc)	440 (sat)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
2-Methylphenol	310 (nc)	3,100 (nc)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
3-Nitroaniline	--	--	--	mg/kg	<2.1	<4.6	<4.7	<4.7	<7.4	NA	<6.3 (<5.7)
3-Nitrophenol	--	--	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
3,3'-Dichlorobenzidine	1.1 (ca**)	3.8 (ca**)	--	mg/kg	<0.82	<1.8	<1.9	<1.4	<2.2	NA	<1.9 (<1.7)
3-Nitroaniline	--	--	--	mg/kg	<2.1	<4.6	<4.7	<4.7	<7.4	NA	<6.3 (<5.7)
4,6-Dinitro-2-methylphenol	--	--	--	mg/kg	<2.1	<4.6	<4.7	<4.7	<7.4	NA	<6.3 (<5.7)
4-Bromodiphenyl-phenylether	--	--	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
4-Chloro-2-methylphenol	--	--	--	mg/kg	<0.82	<1.8	<1.9	<1.4	<2.2	NA	<1.9 (<1.7)
4-Chloroaniline	24 (nc)	250 (nc)	--	mg/kg	<0.82	<1.8	<1.9	<1.4	<2.2	NA	<1.9 (<1.7)
4-Chlorophenyl-phenylether	--	--	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
4-Methylphenol	31 (nc)	310 (nc)	--	mg/kg	<0.42	2.2	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
4-Nitroaniline	--	--	--	mg/kg	<2.1	<4.6	<4.7	<4.7	<7.4	NA	<6.3 (<5.7)
4-Nitrophenol	--	--	--	mg/kg	<2.1	<4.6	<4.7	<4.7	<7.4	NA	<6.3 (<5.7)
4-Nitrophenol	340 (nc)	3,300 (nc)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Acenaphthylene	340 (nc)	3,300 (nc)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Anthracene	1,700 (nc)	170,000 (max)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Benzo(a)anthracene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Benzo(a)pyrene	0.015 (ca**)	0.21 (ca**)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Benzo(b)fluoranthene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Benzo(g,h,i)perylene	170 (nc)	1,700 (nc)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Benzo(k)fluoranthene	1.5 (ca**)	21 (ca**)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Benzoic Acid	240,000 (max)	2,500,000 (max)	--	mg/kg	<2.1	<4.6	<4.7	NA	NA	NA	NA
Benzyl Alcohol	3,100 (nc)	310,000 (max)	--	mg/kg	<0.82	<1.8	<1.9	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	18 (nc)	180 (nc)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
bis(2-Chloroethyl)ether	0.19 (ca**)	0.8 (ca**)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
bis(2-Chloroisopropyl)ether	--	--	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
bis(2-Ethylhexyl)phthalate	35 (ca*)	120 (ca*)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	0.15	NA	<0.93 (<0.85)
Butylbenzylphthalate	260 (ca*)	910 (ca*)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Carbazole	24 (ca**)	86 (ca**)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Chrysene	15 (ca**)	210 (ca**)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Dibenzof(a,h)anthracene	0.015 (ca**)	0.21 (ca**)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Dibenzofuran	--	--	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Diethylphthalate	4,900 (nc)	490,000 (max)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Dimethylphthalate	--	--	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Di-n-Butylphthalate	610 (nc)	6,200 (nc)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Dinitrotoluene Mix	0.71 (ca)	2.5 (ca)	--	mg/kg	NA	NA	NA	<0.69	<1.1	NA	<0.93 (<0.85)
Di-n-Octylphthalate	--	--	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Fluoranthene	230 (nc)	2,200 (nc)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Fluorene	230 (nc)	2,200 (nc)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Hexachlorobenzene	0.3 (ca)	1.1 (ca)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Hexachlorobutadiene	6.2 (ca**)	22 (ca*)	--	mg/kg	NA	NA	NA	<0.69	<1.1	NA	<0.93 (<0.85)
Hexachlorocyclopentadiene	37 (nc)	370 (nc)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Hexachloroethane	35 (ca**)	120 (ca**)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Indeno(1,2,3-cd)pyrene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Isophorone	510 (ca*)	1,800 (ca*)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Naphthalene	3.9 (ca)	20 (ca)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Nitrobenzene	3.1 (nc)	28 (nc)	--	mg/kg	NA	NA	NA	<0.69	<1.1	NA	<0.93 (<0.85)
N-Nitroso-di-n-propylamine	0.069 (ca**)	0.25 (ca**)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
N-Nitrosodiphenylamine	99 (ca**)	350 (ca**)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Pentachlorophenol	3 (ca)	9 (ca)	--	mg/kg	<2.1	<4.6	<4.7	<4.7	<7.4	NA	<6.3 (<5.7)
Phenanthrene	1,700 (nc)	170,000 (max)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Phenol	1,800 (nc)	180,000 (max)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Pyrene	170 (nc)	1,700 (nc)	--	mg/kg	<0.42	<0.92	<0.94	<0.69	<1.1	NA	<0.93 (<0.85)
Inorganics											
Aluminum	7,700 (nc)	990,000 (max)	40,041	mg/kg	23,100	23,900	6,720	6,730	5,790	13,800	6,010 (6,670)
Antimony	3.1 (nc)	41 (nc)	--	mg/kg	<0.650	<1.30	<1.40	1.20 B	<1.80	<1.60	1.70 B (<1.40)
Arsenic	0.39 (ca*)	1.6 (ca)	15.8	mg/kg	10.3	10.0	2.90	3.30 B	5.30 B	3.90 B	4.20 B (4.90 B)
Barium	1,500 (nc)	190,000 (max)	209	mg/kg	96.7 K	65.2 K	47.3 K	46.2 L	72.1 L	67.0 J	50.1 L (50.0 J)
Beryllium	1.6 (nc)	202 (nc)	1.92	mg/kg	1.20 B	0.800 B	0.930 B	0.710 K	0.450 K	<0.330 L	0.540 K (0.520)
Cadmium	7 (nc)	81 (nc)	0.69	mg/kg	<0.130	<0.270	<0.280	<0.230	<0.360	<0.330	<0.310 (<0.280)
Calcium	--	--	--	mg/kg	2,450 B	30,400	11,800 B	15,700	70,800	56,300	22,300 (23,000)
Chromium	280 (ca)	1,460 (ca)	65.3	mg/kg	40.0	46.8	26.0	21.9	39.3	96.9	25.0 (24.9)
Cobalt	2.3 (nc)	30 (nc)	72.3	mg/kg	25.1 K	13.5 K	3.20 K	10.2	5.50	8.90 J	7.30 (8.00)
Copper	310 (nc)	4,100 (nc)	53.5	mg/kg	15.4 B	18.8 B	15.0 B	16.6 K	24.4	19.8 K	26.7 K (27.2 K)
Iron	5,500 (nc)	720,000 (max)	50,952	mg/kg	36,800	33,900	8,530	15,300	12,700	20,100	15,500 (16,100)
Lead	400 (++)	800 (++)	26.8	mg/kg	28.1	26.8	18.7	20.8 J	347.7	899	29.5 J (31.0 J)
Magnesium	--	--	--	mg/kg	2,140 B	4,010	1,800 B	1,780	3,170	4,350	1,720 (1,830)
Manganese	180 (nc)	2,300 (nc)	2,543	mg/kg	721	165	25.9	121 K	155 K	144	238 K (238 K)
Mercury	3.1 (sat)	3.1 (sat)	0.13	mg/kg	<0.140	<0.270	<0.290	<0.230	<0.370	<0.360	<0.300 (<0.270)
Nickel	150 (nc)	2,000 (nc)	62.8	mg/kg	17.9 K	17.9 K	7.70 K	8.70 K	5.00 K	11.2 J	7.00 K (7.50 K)
Potassium	--	--	--	mg/kg	1,350 J	2,210 J	376 B	448	568	1,110 J	440 (498)
Selenium	39 (nc)	510 (nc)	--	mg/kg	<0.650 L	<1.30 L	<1.40 L	<0.930 L	<1.40 L	<1.30	1.30 L (1.30 J)
Silver	39 (nc)	510 (nc)	--	mg/kg	0.790 B	1.60 B	0.950 B	<0.230	<0.360	<0.330	<0.310 (<0.280)
Sodium	--	--	--	mg/kg	194 B	389 B	398 B	292 B	577 B	422 B	516 B (456 B)
Thallium	0.51 (nc)	6.8 (nc)	2.11	mg/kg	1.70 B	<0.940 L	<0.960 L	<1.60	<2.50	<2.30	<2.20 (<2.00)
Vanadium	55(nc)	720 (nc)	108	mg/kg	66.2 K	67.3 K	20.1 K	33.0 K	23.6 K	34.8	31.4 K (32.1 K)
Zinc	2,300 (nc)	310,000 (max)	202	mg/kg	38.0 B	41.8 B	65.9 B	30.5 K	104 K	209	42.0 K (44.3 K)
Miscellaneous											
Total Organic Carbon	--	--	--	mg/kg	NA	NA	NA	21,842	39,276	NA	37,330 (35,146)

mg/kg

Milligrams per kilogram.

[a]

USEPA Regional Screening Levels (USEPA 2008a).

[b]

Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.

(ca)

Table D-9. Surface Water Analytical Results, Western Burning Ground, 1998 and 1999 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Date Collected:	Tapwater Screening Values [a]	Units	WBGSW1 07/16/98	WBGSW2 07/16/98	WBGSW3 07/16/98	WBGSW4 05/27/99	WBGSW5 05/27/99	WBGSW6 05/27/99
Explosives								
1,3,5-Trinitrobenzene	1.100 (nc)	µg/L	<0.5	<0.5 L	<0.5	NA	NA	NA
1,3-Dinitrobenzene	3.7 (nc)	µg/L	<0.5	<0.5 L	<0.5	NA	NA	NA
2,4,6-Trinitrotoluene	2.2 (ca**)	µg/L	<0.5	<0.5 L	<0.5	NA	NA	NA
2,4-Dinitrotoluene	73 (nc)	µg/L	<0.5	<0.5 L	<0.5	NA	NA	NA
2,6-Dinitrotoluene	37 (nc)	µg/L	<0.5	<0.5 L	<0.5	NA	NA	NA
2-Amino-4,6-Dinitrotoluene	73 (nc)	µg/L	<0.5	<0.5 L	<0.5	NA	NA	NA
4-Amino-2,6-Dinitrotoluene	73 (nc)	µg/L	<0.5	<0.5 L	<0.5	NA	NA	NA
Dinitrotoluene Mix	0.099 (ca)	µg/L	<0.5	<0.5	<0.5	NA	NA	NA
HMX	1.800 (nc)	µg/L	<0.5	<0.5 L	<0.5	NA	NA	NA
m-Nitrotoluene	-	µg/L	<0.5	<0.5 L	<0.5	NA	NA	NA
Nitrobenzene	3.4 (nc)	µg/L	<0.5	<0.5 L	<0.5	NA	NA	NA
Nitroglycerine	3.7 (nc)	µg/L	<2.5	<2.5 L	<2.5	NA	NA	NA
o-Nitrotoluene	370 (nc)	µg/L	<0.5	<0.5 L	<0.5	NA	NA	NA
Pentaerythritol Tetranitrate	-	µg/L	<2.5	<2.5 L	<2.5	NA	NA	NA
Perchlorate	26 (nc)	µg/L	NA	NA	NA	NA	NA	NA
p-Nitrotoluene	4.2 (ca*)	µg/L	<0.5	<0.5 L	<0.5	NA	NA	NA
RDX	0.61 (ca)	µg/L	<0.5	<0.5 L	<0.5	NA	NA	NA
Tetryl	150 (nc)	µg/L	<0.5	<0.5 L	<0.5	NA	NA	NA
PAHs								
2-Methylnaphthalene	150 (nc)	µg/L	NA	NA	NA	NA	NA	NA
Acenaphthene	2,200 (nc)	µg/L	NA	NA	<0.10	NA	NA	NA
Acenaphthylene	-	µg/L	NA	NA	<1.0	NA	NA	NA
Anthracene	11,000 (nc)	µg/L	NA	NA	<0.050	NA	NA	NA
Benzo(a)anthracene	0.029 (ca**)	µg/L	NA	NA	<0.050	NA	NA	NA
Benzo(a)pyrene	0.0029 (ca**)	µg/L	NA	NA	<0.050	NA	NA	NA
Benzo(b)fluoranthene	0.029 (ca**)	µg/L	NA	NA	<0.10	NA	NA	NA
Benzo(g,h,i)perylene	-	µg/L	NA	NA	<0.10	NA	NA	NA
Benzo(k)fluoranthene	0.29 (ca**)	µg/L	NA	NA	<0.050	NA	NA	NA
Chrysene	2.9 (ca**)	µg/L	NA	NA	<0.050	NA	NA	NA
Dibenz(a,h)anthracene	0.0029 (ca**)	µg/L	NA	NA	<0.10	NA	NA	NA
Fluoranthene	1,500 (nc)	µg/L	NA	NA	<0.10	NA	NA	NA
Fluorene	1,500 (nc)	µg/L	NA	NA	<0.10	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.029 (ca**)	µg/L	NA	NA	<0.050	NA	NA	NA
Naphthalene	6.2 (nc)	µg/L	NA	NA	<0.10	NA	NA	NA
Phenanthrene	-	µg/L	NA	NA	<0.050	NA	NA	NA
Pyrene	1,100 (nc)	µg/L	NA	NA	<0.050	NA	NA	NA
Volatile Organics								
1,1,1,2-Tetrachloroethane	0.52 (ca)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
1,1,1-Trichloroethane	9.100 (nc)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
1,1,2,2-Tetrachloroethane	0.067 (ca**)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
1,1,2-Trichloroethane	0.24 (ca)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
1,1-Dichloroethane	2.4 (ca)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
1,1-Dichloroethene	340 (nc)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
1,1-Dichloropropene	-	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
1,2,3-Trichlorobenzene	-	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
1,2,3-Trichloropropane	0.0096 (ca)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
1,2,4-Trichlorobenzene	19 (ca*)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
1,2,4-Trimethylbenzene	15 (nc)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
1,2-Dibromo-3-chloropropane	0.00032 (ca)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
1,2-Dibromoethane	0.0065 (ca)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
1,2-Dichlorobenzene	370 (nc)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
1,2-Dichloroethane	0.15 (ca)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
1,2-Dichloropropane	0.39 (ca*)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
1,3,5-Trimethylbenzene	-	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
1,3-Dichlorobenzene	-	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
1,3-Dichloropropane	730 (nc)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
1,4-Dichlorobenzene	0.43 (ca)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
2,2-Dichloropropane	-	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
2-Butanone	7,100 (nc)	µg/L	<5.0	<5.0	<5.0	NA	NA	NA
2-Chloroethyl Vinyl Ether	-	µg/L	<5.0	<5.0	<5.0	NA	NA	NA
2-Chlorotoluene	730 (nc)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
2-Hexanone	-	µg/L	<5.0	<5.0	<5.0	NA	NA	NA
4-Chlorotoluene	2,600 (nc)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
4-Methyl-2-pentanone	2,000 (nc)	µg/L	<5.0	<5.0	<5.0	NA	NA	NA
Acetone	22,000 (nc)	µg/L	<5.0	<5.0	<5.0	NA	NA	NA
Acrolein	0.042 (nc)	µg/L	<5.0	<5.0	<5.0	NA	NA	NA
Acrylonitrile	0.045 (ca*)	µg/L	<5.0	<5.0	<5.0	NA	NA	NA
Benzene	0.41 (ca)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
Bromobenzene	-	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
Bromochloromethane	-	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
Bromodichloromethane	1.1 (ca)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
Bromoform	8.5 (ca*)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
Bromomethane	8.7 (nc)	µg/L	<2.0	<2.0	<2.0	NA	NA	NA
Carbon Disulfide	1,000 (nc)	µg/L	<5.0	<5.0	<5.0	NA	NA	NA
Carbon Tetrachloride	0.2 (ca)	µg/L	<2.0	<2.0	<2.0	NA	NA	NA
Chlorobenzene	91 (nc)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
Chloroethane	21,000 (nc)	µg/L	<2.0	<2.0	<2.0	NA	NA	NA
Chloroform	0.19 (ca)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
Chloromethane	1.8 (ca)	µg/L	<2.0	<2.0	<2.0	NA	NA	NA
cis-1,2-Dichloroethene	370 (nc)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
cis-1,3-Dichloropropene	-	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
Dibromochloromethane	0.8 (ca)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
Dibromomethane	370 (nc)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
Dichlorodifluoromethane	390 (nc)	µg/L	<2.0	<2.0	<2.0	NA	NA	NA
Ethylbenzene	1.5 (ca)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
Hexachlorobutadiene	0.86 (ca*)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
Isopropylbenzene	680 (nc)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
m,p-Xylene	-	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
Methylene Chloride	4.8 (ca)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
n-Butylbenzene	-	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
n-Propylbenzene	-	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
o-Xylene	1,400 (nc)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
p-Isopropyltoluene	-	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
sec-Butylbenzene	-	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
Styrene	1,600 (nc)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
tert-Butylbenzene	-	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
Tetrachloroethene	0.11 (ca)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
Toluene	2,300 (nc)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
trans-1,2-Dichloroethene	110 (nc)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
trans-1,3-Dichloropropene	-	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
Trichloroethene	1.7 (ca)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
Trichlorofluoromethane	1,300 (nc)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
Vinyl Acetate	410 (nc)	µg/L	<5.0	<5.0	<5.0	NA	NA	NA
Vinyl Chloride	0.016 (ca)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA
Xylenes (total)	200 (nc)	µg/L	<1.0	<1.0	<1.0	NA	NA	NA

Notes found at end of table.

Table D-9. Surface Water Analytical Results, Western Burning Ground, 1998 and 1999 ICF KE Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Date Collected:	Tapwater Screening Values [a]	Units	WBGSW1 07/16/98	WBGSW2 07/16/98	WBGSW3 07/16/98	WBGSW4 05/27/99	WBGSW5 05/27/99	WBGSW6 05/27/99
Semivolatile Organics								
1,2,4-Trichlorobenzene	19 (ca*)	µg/L	<10	<10	<10	<10	<10	<10
1,2-Dichlorobenzene	370 (nc)	µg/L	<10	<10	<10	<10	<10	<10
1,2-Diphenylhydrazine	0.084 (ca**)	µg/L	<10	<10	NA	NA	NA	NA
1,3-Dichlorobenzene	-	µg/L	NA	NA	NA	<10	<10	<10
1,4-Dichlorobenzene	0.43 (ca)	µg/L	NA	NA	NA	<10	<10	<10
2,4,5-Trichlorophenol	3,700 (nc)	µg/L	<50	<50	<50	<10	<10	<10
2,4,6-Trichlorophenol	6.1 (ca**)	µg/L	<10	<10	<10	<10	<10	<10
2,4-Dichlorophenol	110 (nc)	µg/L	<10	<10	<10	<10	<10	<10
2,4-Dimethylphenol	730 (nc)	µg/L	<10	<10	<10	<10	<10	<10
2,4-Dinitrophenol	73 (nc)	µg/L	<50	<50	<50	<10	<10	<10
2,4-Dinitrotoluene	73 (nc)	µg/L	NA	NA	NA	<10	<10	<10
2,6-Dinitrotoluene	37 (nc)	µg/L	NA	NA	NA	<10	<10	<10
2-Chloronaphthalene	2,900 (nc)	µg/L	<10	<10	<10	<10	<10	<10
2-Chlorophenol	180 (nc)	µg/L	<10	<10	<10	<10	<10	<10
2-Methylnaphthalene	150 (nc)	µg/L	<10	<10	<10	<10	<10	<10
2-Methylphenol	1,800 (nc)	µg/L	<10	<10	<10	<10	<10	<10
2-Nitroaniline	-	µg/L	<50	<50	<50	<10	<10	<10
2-Nitrophenol	-	µg/L	<10	<10	<10	<10	<10	<10
3,3'-Dichlorobenzidine	0.15 (ca**)	µg/L	<20	<20	<20	<10	<10	<10
3-Nitroaniline	-	µg/L	<50	<50	<50	<10	<10	<10
4,6-Dinitro-2-methylphenol	-	µg/L	<50	<50	<50	<10	<10	<10
4-Bromophenyl-phenylether	-	µg/L	<10	<10	<10	<10	<10	<10
4-Chloro-3-Methylphenol	-	µg/L	<20	<20	<20	<10	<10	<10
4-Chloroaniline	150 (nc)	µg/L	<20	<20	<10	<10	<10	<10
4-Chlorophenyl-phenylether	-	µg/L	<10	<10	<10	<10	<10	<10
4-Methylphenol	180 (nc)	µg/L	<10	<10	<10	<10	<10	<10
4-Nitroaniline	-	µg/L	<50	<50	<50	<10	<10	<10
4-Nitrophenol	-	µg/L	<50	<50	<50	<10	<10	<10
Acenaphthene	2,200 (nc)	µg/L	<10	<10	NA	<10	<10	<10
Acenaphthylene	-	µg/L	<10	<10	NA	<10	<10	<10
Anthracene	11,000 (nc)	µg/L	<10	<10	<10	<10	<10	<10
Benzo(a)anthracene	0.029 (ca**)	µg/L	<10	<10	NA	<10	<10	<10
Benzo(a)pyrene	0.0029 (ca**)	µg/L	<10	<10	NA	<10	<10	<10
Benzo(b)fluoranthene	0.029 (ca**)	µg/L	<10	<10	NA	<10	<10	<10
Benzo(g,h,i)perylene	-	µg/L	<10	<10	NA	<10	<10	<10
Benzo(k)fluoranthene	0.29 (ca**)	µg/L	<10	<10	NA	<10	<10	<10
Benzoic Acid	150,000 (max)	µg/L	<50	<50	<50	NA	NA	NA
Benzyl Alcohol	18,000 (nc)	µg/L	<20	<20	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	110 (nc)	µg/L	<10	<10	<10	<10 J	<10	<10 J
bis(2-Chloroethyl)ether	0.012 (ca**)	µg/L	<10	<10	<10	<10	<10	<10
bis(2-Chloroisopropyl)ether	-	µg/L	<10	<10	<10	<10	<10	<10
bis(2-Ethylhexyl)phthalate	4.8 (ca)	µg/L	<10	<10	<10	<10	<10	<10
Butylbenzylphthalate	7,300 (nc)	µg/L	<10	<10	<10	<10	<10	<10
Carbazole	3.4 (ca*)	µg/L	<10	<10	<10	<10	<10	<10
Chrysene	2.9 (ca*)	µg/L	<10	<10	NA	<10	<10	<10
Dibenzo(a,h)anthracene	0.0029 (ca**)	µg/L	<10	<10	NA	<10	<10	<10
Dibenzofuran	-	µg/L	<10	<10	<10	<10	<10	<10
Diethylphthalate	29,000 (nc)	µg/L	1.0 J	<10	<10	<10	<10	<10
Dimethylphthalate	-	µg/L	<10	<10	<10	<10	<10	<10
Di-n-Butylphthalate	3,700 (nc)	µg/L	<10	<10	<10	<10	0.13 B	<10
Dinitrotoluene Mix	0.099 (ca)	µg/L	NA	NA	NA	<10	<10	<10
Dim-Octylphthalate	-	µg/L	<10	<10	<10	<10	<10	<10
Fluoranthene	1,500 (nc)	µg/L	<10	<10	NA	<10	<10	<10
Fluorene	1,500 (nc)	µg/L	<10	<10	NA	<10	<10	<10
Hexachlorobenzene	0.042 (ca)	µg/L	<10	<10	<10	<10	<10	<10
Hexachlorobutadiene	0.86 (ca*)	µg/L	NA	NA	NA	<10	<10	<10
Hexachlorocyclopentadiene	220 (nc)	µg/L	<10	<10	<10	<10	<10	<10
Hexachloroethane	4.8 (ca*)	µg/L	<10	<10	<10	<10	<10	<10
Indeno(1,2,3-cd)pyrene	0.029 (ca**)	µg/L	<10	<10	NA	<10	<10	<10
Isochlorone	71 (ca)	µg/L	<10	<10	<10	<10	<10	<10
Naphthalene	6.2 (nc)	µg/L	<10	<10	NA	<10	<10	<10
Nitrobenzene	3.4 (nc)	µg/L	NA	NA	NA	<10	<10	<10
N-Nitroso-di-n-propylamine	0.0096 (ca**)	µg/L	<10	<10	<10	<10	<10	<10
N-Nitrosodiphenylamine	14 (ca*)	µg/L	<10	<10	<10	<10	<10	<10
Pentachlorophenol	0.56 (ca)	µg/L	<50	<50	<50	<10	<10	<10
Phenanthrene	-	µg/L	<10	<10	NA	<10	<10	<10
Phenol	11,000 (nc)	µg/L	<10	<10	<10	<10 J	<10	<10 J
Pyrene	1,100 (nc)	µg/L	<10	<10	NA	<10	<10	<10
Inorganics								
Aluminum	37,000 (nc)	µg/L	66.6 B	63.0 B	39.2 B	232 B	67.9 B	91.8 B
Antimony	15 (nc)	µg/L	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00
Arsenic	0.045 (ca)	µg/L	<7.00	<7.00	<7.00	<6.00	8.60 B	10.4 K
Barium	7,300 (nc)	µg/L	79.2 B	73.4 B	54.0 B	56.4 J	63.1 L	63.9 J
Beryllium	73 (nc)	µg/L	<1.00	<1.00	<1.00	1.10 B	<1.00	<1.00
Cadmium	18 (nc)	µg/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Calcium	-	µg/L	61,900 B	56,700 B	66,500 B	70,300	73,400	71,100
Chromium	55,000 (nc)	µg/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Cobalt	11 (nc)	µg/L	<2.00 L	<2.00 L	<2.00 L	<1.00	<1.00	<1.00
Copper	1,500 (nc)	µg/L	19.6 B	15.0 B	23.5 B	20.2 K	4.10 B	2.20 K
Iron	26,000 (nc)	µg/L	307 B	434 B	41.6 B	261 J	88.0 B	180
Lead	15 (nc)	µg/L	<2.00	<2.00	<2.00	<2.00 L	4.00 B	<2.00 L
Magnesium	-	µg/L	15,300 B	14,200 B	12,100 B	12,900	14,900	15,000
Manganese	880 (nc)	µg/L	10.2 B	18.5 B	2.00 B	24.0	14.1 K	11.4 J
Mercury	0.63 (nc)	µg/L	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Nickel	730 (nc)	µg/L	1.40 K	1.50 K	<1.00	<1.00	<1.00	<1.00
Potassium	-	µg/L	2,100 B	2,010 B	1,900 B	2,090 J	2,090	2,090 J
Selenium	180 (nc)	µg/L	<5.00	<5.00	<5.00	<4.00	<4.00 L	<4.00
Silver	180 (nc)	µg/L	<2.00 J	<2.00 J	<2.00 J	1.20 K	<1.00	1.00 K
Sodium	-	µg/L	29,700	27,800	21,100	25,700	35,000	37,100
Thallium	2.4 (nc)	µg/L	5.40 B	<2.00 L	2.30 B	<7.00 L	<7.00	<7.00 L
Vanadium	260 (nc)	µg/L	<2.00	<2.00	<2.00	1.20 K	1.20 B	1.10 K
Zinc	11,000 (nc)	µg/L	21.3 B	21.1 B	23.7 B	21.3 K	18.4 B	19.3 K
Perchlorate								
Perchlorate	26 (nc)	µg/L	NA	NA	NA	<3	<3	<3
Miscellaneous								
Total Organic Carbon	-	µg/L	NA	NA	NA	<100,000	<100,000	<100,000

µg/L Micrograms per liter.
 [a] USEPA Regional Screening Levels (USEPA 2008a). Adjusted tap-water screening levels used to assess surface water at the NRU.
 (ca) Carcinogen.
 (nc) Noncarcinogen.
 * Noncarcinogen screening level is less than one hundred times the carcinogen screening level.
 ** Noncarcinogen screening level is less than ten times the carcinogen screening level.
 {max} Concentration may exceed ceiling limit.
 B (Inorganics) Constituent concentration quantified as estimated.
 B (Organics) Constituent was detected in the associated method blank.
 J Constituent concentration quantified as estimated.
 K Estimated concentration bias high.
 L Estimated concentration bias low.
 NA Not Analyzed.
 {3.3} Bracketted concentration indicates laboratory analytical result for duplicate sample.
 24,400 Highlighted value indicates constituent concentration is above adjusted tap water RSL.

Table D-10. Soil Analytical Results, Western Burning Ground, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]		Units	WBGSB22 0 - 0.5 06/18/02	WBGSB22 2 - 4 06/19/02	WBGSB22 6 - 8 06/19/02	WBGSB23 0 - 0.5 06/18/02	WBGSB23 2 - 4 06/19/02	WBGSB23 6 - 8 06/19/02	WBGSB24 0 - 0.5 06/18/02	WBGSB24 2 - 4 06/19/02	WBGSB24 6 - 8 06/19/02	WBGSB25 0 - 0.5 06/18/02	WBGSB25 2 - 4 06/19/02	WBGSB25 6 - 8 06/19/02	WBGTR01 0 - 0.5 06/18/02
Dioxin/Furan																		
1,2,3,4,6,7,8-HpCDD	0.00039 (ca**)	0.0016 (ca**)	--	mg/kg	0.0000203	0.0002122 J	0.000001232	0.00002764	0.00001744 J	0.00000181	0.00002537	0.00002548	0.00000304	0.0001572	0.00000383	0.00000124	NA	NA
1,2,3,4,6,7,8-HpCDF	0.00032 (ca**)	0.0011 (ca**)	--	mg/kg	0.00000001	0.00003587 J	0.000000137	0.00000013	0.00000016 J	0.00000016	0.000000463	<0.00000013	<0.00000009	0.00003102	<0.00000016	<0.00000011	NA	NA
1,2,3,4,7,8,9-HpCDF	0.00032 (ca**)	0.0011 (ca**)	--	mg/kg	<0.00000005	0.00000405 J	0.000000016 J	<0.00000007	<0.00000004	<0.00000003	0.000000023	<0.00000016	<0.00000011	0.00000205	<0.00000021	<0.00000015	NA	NA
1,2,3,4,7,8-HxCDD	0.000039 (ca**)	0.00016 (ca**)	--	mg/kg	0.00000028	0.00000663 J	0.000000026	0.00000055	<0.00000007	<0.00000007	0.000000029	<0.00000021	<0.00000021	0.00000333	<0.00000027	<0.00000022	NA	NA
1,2,3,4,7,8-HxCDF	0.000032 (ca**)	0.00011 (ca**)	--	mg/kg	0.00000019	0.00001183 J	0.00000006	0.00000032	<0.00000003	<0.00000003	0.000000062	<0.00000001	<0.00000007	0.00000564	<0.00000012	<0.00000009	NA	NA
1,2,3,6,7,8-HxCDD	0.000039 (ca**)	0.00016 (ca**)	--	mg/kg	0.00000037 J	0.00001314 J	0.000000045	0.00000079	<0.00000005	<0.00000006	0.000000076	<0.00000016	<0.00000017	0.00000661	<0.00000021	<0.00000017	NA	NA
1,2,3,6,7,8-HxCDF	0.000032 (ca**)	0.00011 (ca**)	--	mg/kg	0.00000018 J	0.00000849 J	0.000000027	0.00000039 J	<0.00000003	<0.00000003	0.000000047 J	<0.00000001	<0.00000007	0.00000508 J	<0.00000012	<0.00000009	NA	NA
1,2,3,7,8,9-HxCDD	0.000039 (ca**)	0.00016 (ca**)	--	mg/kg	0.00000104	0.00002996 J	0.00000081	0.00000162	0.00000032 J	0.00000031	0.00000105	<0.00000016	<0.00000016	0.00000834	<0.00000021	<0.00000017	NA	NA
1,2,3,7,8,9-HxCDF	0.000032 (ca**)	0.00011 (ca**)	--	mg/kg	<0.00000007	0.00000182 J	<0.00000005	<0.00000009	<0.00000003	<0.00000004	<0.00000003	<0.00000011	<0.00000008	0.00000045	<0.00000014	<0.0000001	NA	NA
1,2,3,7,8-PeCDD	0.0000039 (ca**)	0.000016 (ca**)	--	mg/kg	<0.00000001	0.000000413 J	0.000000025 J	<0.00000011	<0.00000006	<0.00000007	0.00000002	<0.00000015	<0.00000011	0.00000173	<0.00000017	<0.00000013	NA	NA
1,2,3,7,8-PeCDF	0.00011 (ca**)	0.00038 (ca**)	--	mg/kg	<0.00000007	0.000000416 J	0.000000019	<0.00000008	<0.00000004	<0.00000004	0.00000001	<0.00000001	<0.00000007	0.00000107	<0.00000001	<0.00000008	NA	NA
2,3,4,6,7,8-HxCDF	0.000032 (ca**)	0.00011 (ca**)	--	mg/kg	<0.00000006	0.00000528 J	0.000000026	0.00000014	<0.00000004	<0.00000004	0.000000017 J	<0.00000011	<0.00000008	0.00000238	<0.00000014	<0.00000001	NA	NA
2,3,4,7,8-PeCDF	0.000011 (ca**)	0.000038 (ca**)	--	mg/kg	<0.00000008	0.00000641 J	0.000000024	<0.00000009	<0.00000005	<0.00000004	0.000000013	<0.00000011	<0.00000007	0.00000149	<0.00000011	<0.00000008	NA	NA
2,3,7,8-TCDD	0.0000045 (ca*)	0.000018 (ca*)	--	mg/kg	<0.00000006	0.00000404 J	<0.00000007	0.00000151	<0.00000005	<0.00000005	0.000000032 J	<0.00000015	<0.00000013	0.00000077 J	<0.00000017	<0.00000013	NA	NA
2,3,7,8-TCDF	0.000032 (ca**)	0.00011 (ca**)	--	mg/kg	<0.00000006 J	0.00001035 J	0.000000035 J	<0.00000007 J	<0.00000003	<0.00000003	<0.00000021 J	<0.00000013	<0.00000011	0.0000017 J	<0.00000014	<0.00000009	NA	NA
OCDD	0.013 (ca**)	0.053 (ca**)	--	mg/kg	0.003301 J	0.003034 J	0.001028 J	0.002912 J	0.006013 J	0.0001833 J	0.003963 J	0.005689 J	0.0003054 J	0.002972 J	0.0002626 J	0.00005723 J	NA	NA
OCDF	0.011 (ca**)	0.038 (ca**)	--	mg/kg	0.00000202 B	0.00005688 J	0.00000242 B	0.00000155 B	0.0000014 B	0.00001049 J	0.00000223 J	0.00000093 J	0.000005862 J	<0.00000039 J	0.00000253 J	0.000000253 J	NA	NA
Total HpCDDs	--	--	--	mg/kg	0.00004377	0.0004875 J	0.00003006	0.00005739	0.00003269 J	0.00000382	0.00000508	0.00004247	0.00000662	0.0003078	0.00000941	0.00000347	NA	NA
Total HpCDFs	--	--	--	mg/kg	0.00000221	0.00000816 J	0.000000266	0.000000266	0.00000052 J	0.00000066	0.00001178	<0.00000013	<0.00000009	0.00007396	<0.00000016	0.00000009	NA	NA
Total HxCDDs	--	--	--	mg/kg	0.00000519	0.0001282 J	0.0000014	0.00000097	0.00000054 J	0.00000031	0.00000502	0.00000173	<0.00000016	0.00007337	<0.00000021	<0.00000017	NA	NA
Total HxCDFs	--	--	--	mg/kg	0.00000079	0.00007702 J	0.000000113	0.00000012	<0.00000003	<0.00000003	0.000000378	<0.00000001	<0.00000007	0.0000445	<0.00000012	<0.00000009	NA	NA
Total PeCDDs	--	--	--	mg/kg	<0.00000001	0.00001327 J	<0.00000008	<0.00000011	<0.00000006	<0.00000007	0.00000002	<0.00000015	<0.00000011	0.00000654	<0.00000017	<0.00000013	NA	NA
Total PeCDFs	--	--	--	mg/kg	0.00000035	0.00006234 J	0.00000074	0.00000094	<0.00000004	<0.00000004	0.00000012	<0.00000007	<0.00000007	0.0000191	<0.00000001	<0.00000008	NA	NA
Total TCDDs	--	--	--	mg/kg	<0.00000006	0.00002637 J	<0.00000007	0.00000005	<0.00000005	<0.00000005	0.00000004	<0.00000015	<0.00000013	0.00000671	<0.00000017	<0.00000013	NA	NA
Total TCDFs	--	--	--	mg/kg	0.00000041	0.0001252 J	0.000000428	0.00000176	<0.00000003	<0.00000003	0.00000192	<0.00000013	<0.00000011	0.00002448	<0.00000014	<0.00000009	NA	NA
Explosives																		
1,3,5-Trinitrobenzene	220 (nc)	2,700 (nc)	--	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
1,3-Dinitrobenzene	6.2 (nc)	--	--	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
2,4,6-Trinitrotoluene	3.6 (ca**)	42 (ca**)	--	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	NA
2,4-Dinitrotoluene	12 (nc)	--	--	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	NA
2,6-Dinitrotoluene	6.1 (nc)	62 (nc)	--	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	NA
2-Amino-4,6-Dinitrotoluene	15 (nc)	190 (nc)	--	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	NA
4-Amino-2,6-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	NA
Dinitrotoluene Mix	0.71 (ca)	2.5 (ca)	--	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	NA
HMX	310 (nc)	3,100 (nc)	--	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	NA
m-Nitrotoluene	--	--	--	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	NA
Nitrobenzene	3.1 (nc)	28 (nc)	--	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	NA
Nitroglycerine	0.61 (nc)	6.2 (nc)	--	mg/kg	<0.3	<0.35	<0.37	<0.3	<0.41	<0.38	<0.3	<0.38	<0.35	<0.3	<0.35	<0.39	<0.39	NA
o-Nitrotoluene	78 (nc)	1,300 (sat)	--	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	NA
Pentaerythritol Tetranitrate	--	--	--	mg/kg	<0.3	<0.35	<0.37	<0.3	<0.41	<0.38	0.11 J	<0.38	<0.35	<0.3	<0.35	<0.39	<0.39	NA
p-Nitrotoluene	30 (ca**)	110 (ca*)	--	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	NA
RDX	4.4 (ca*)	16 (ca)	--	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	NA
Tetryl	24 (nc)	250 (nc)	--	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	NA
Herbicides																		
2,4,5-T	61 (nc)	620 (nc)	--	mg/kg	<0.0101	NA	NA	<0.0101	NA	NA	NA	<0.0102	NA	NA	<0.101	NA	NA	NA
2,4,5-TP	49 (nc)	490 (nc)	--	mg/kg	<0.0101	NA	NA	<0.0101	NA	NA	NA	<0.0102	NA	NA	0.0078 J	NA	NA	

Table D-10. Soil Analytical Results, Western Burning Ground, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	WBGSB22 0 - 0.5 06/18/02	WBGSB22 2 - 4 06/19/02	WBGSB22 6 - 8 06/19/02	WBGSB23 0 - 0.5 06/18/02	WBGSB23 2 - 4 06/19/02	WBGSB23 6 - 8 06/19/02	WBGSB24 0 - 0.5 06/18/02	WBGSB24 2 - 4 06/19/02	WBGSB24 6 - 8 06/19/02	WBGSB25 0 - 0.5 06/18/02	WBGSB25 2 - 4 06/19/02	WBGSB25 6 - 8 06/19/02	WBGTR01 0 - 0.5 06/18/02
PAHs																	
2-Methylnaphthalene	31 (nc)	440 (sat)	--	mg/kg	0.0016 B	0.0093	0.0010 B	0.0028 B	0.0063	0.0062	0.0029 B	0.0052	<0.0020	0.023	<0.0020	<0.0022	NA
Acenaphthene	340 (nc)	3,300 (nc)	--	mg/kg	<0.0017	0.0030 B	<0.0021	<0.0017	0.0032 B	0.0037 B	0.036	0.0019 B	<0.0020	0.025	<0.0020	<0.0022	NA
Acenaphthylene	340 (nc)	3,300 (nc)	--	mg/kg	<0.0017	0.0016 J	<0.0021	<0.0017	0.0027	0.0038	<0.0017	0.0019 J	<0.0020	0.0039	<0.0020	<0.0022	NA
Anthracene	1,700 (nc)	170,000 (max)	--	mg/kg	0.00037 J	0.021	<0.0021	<0.0017	<0.0023	0.0011 J	0.089	0.0011 J	<0.0020	0.10	<0.0020	<0.0022	NA
Benzo(a)anthracene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	0.0019	0.21	0.0026	0.0037	<0.0023	<0.0022	0.58	0.0071	<0.0020	0.97	<0.0020	<0.0022	NA
Benzo(a)pyrene	0.015 (ca**)	0.21 (ca**)	--	mg/kg	0.0017	0.33	0.0029	0.0064	<0.0023	<0.0022	0.54	0.0060	<0.0020	1.1	<0.0020	<0.0022	NA
Benzo(b)fluoranthene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	0.0034	0.53	0.0053	0.013	<0.0023	<0.0022	0.97	0.013	<0.0020	1.8	<0.0020	<0.0022	NA
Benzo(g,h,i)perylene	170 (nc)	1,700 (nc)	--	mg/kg	0.0017	0.23	0.0023	0.0082	<0.0023	<0.0022	0.56	0.0038	<0.0020	0.96	<0.0020	<0.0022	NA
Benzo(k)fluoranthene	1.5 (ca**)	21 (ca**)	--	mg/kg	0.0010 J	0.15	0.0016 J	0.0036	<0.0023	<0.0022	0.26	0.0033	<0.0020	0.53	<0.0020	<0.0022	NA
Chrysene	15 (ca**)	210 (ca**)	--	mg/kg	0.0018	0.21	0.0024	0.0053	<0.0023	<0.0022	0.59	0.0074	<0.0020	0.99	<0.0020	<0.0022	NA
Dibenz(a,h)anthracene	0.015 (ca**)	0.21 (ca**)	--	mg/kg	<0.0017	0.062 J	<0.0021	0.0026	<0.0023	<0.0022	0.13	0.0013 J	<0.0020	0.22	<0.0020	<0.0022	NA
Fluoranthene	230 (nc)	2,200 (nc)	--	mg/kg	0.0031	0.23	0.0037	0.0069	0.00096 J	<0.0022	0.97	0.0096	<0.0020	1.6	<0.0020	<0.0022	NA
Fluorene	230 (nc)	2,200 (nc)	--	mg/kg	<0.0017	0.0046	<0.0021	0.00094 J	0.0020 J	0.0024	0.028	0.0014 J	<0.0020	0.027	<0.0020	<0.0022	NA
Indeno(1,2,3-cd)pyrene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	0.0018	0.28	0.0027	0.0094	<0.0023	<0.0022	0.60	0.0047	<0.0020	1.1	<0.0020	<0.0022	NA
Naphthalene	3.9 (nc)	20 (nc)	--	mg/kg	0.00087 B	0.0089	0.0013 B	0.0016 B	0.0079 B	0.0068 B	0.0027 B	0.0069 B	<0.0020	0.018	<0.0020	<0.0022	NA
Phenanthrene	1,700 (nc)	170,000 (max)	--	mg/kg	0.0020	0.099	<0.0021	0.0045	0.0016 J	0.0020 J	0.62	0.0039	<0.0020	0.69	<0.0020	<0.0022	NA
Pyrene	170 (nc)	1,700 (nc)	--	mg/kg	0.0028	0.26 J	0.0043 J	0.0070	0.0012 J	<0.0022 J	1.1	0.010 J	<0.0020 J	1.6	<0.0020 J	<0.0022 J	NA
PCBs																	
Aroclor-1016	0.39 (nc)	21 (ca**)	--	mg/kg	<0.030	<0.030	<0.040	<0.030	<0.040	<0.040	<0.030	<0.040	<0.030	<0.030	<0.030	<0.040	<0.030
Aroclor-1221	0.17 (ca**)	0.62 (ca**)	--	mg/kg	<0.060	<0.070	<0.080	<0.060	<0.090	<0.080	<0.060	<0.080	<0.070	<0.060	<0.070	<0.080	<0.070
Aroclor-1232	0.17 (ca**)	0.62 (ca**)	--	mg/kg	<0.030	<0.030	<0.040	<0.030	<0.040	<0.040	<0.030	<0.040	<0.030	<0.030	<0.030	<0.040	<0.030
Aroclor-1242	0.22 (ca**)	0.74 (ca**)	--	mg/kg	<0.030	<0.030	<0.040	<0.030	<0.040	<0.040	<0.030	<0.040	<0.030	<0.030	<0.030	<0.040	<0.030
Aroclor-1248	0.22 (ca**)	0.74 (ca**)	--	mg/kg	<0.030	<0.030	<0.040	<0.030	<0.040	<0.040	<0.030	<0.040	<0.030	<0.030	<0.030	<0.040	<0.030
Aroclor-1254	0.22 (ca**)	0.74 (ca*)	--	mg/kg	<0.030	0.87	<0.040	<0.030	<0.040	<0.040	<0.030	<0.040	<0.030	<0.030	<0.030	<0.040	<0.030
Aroclor-1260	0.22 (ca**)	0.74 (ca**)	--	mg/kg	<0.030	<0.030	<0.040	<0.030	<0.040	<0.040	<0.030	<0.040	<0.030	<0.030	<0.030	<0.040	<0.030
Volatile Organics																	
1,1,1-Trichloroethane	680 (sat)	680 (sat)	--	mg/kg	<0.0045	<0.0053	<0.0063	<0.0055	<0.0069	<0.0064	<0.0051	<0.0063	<0.0053	<0.0046	<0.0053	<0.0072	NA
1,1,2,2-Tetrachloroethane	0.59 (ca**)	2.9 (ca**)	--	mg/kg	<0.0045	<0.0053	<0.0063	<0.0055	<0.0069	<0.0064	<0.0051	<0.0063	<0.0053	<0.0046	<0.0053	<0.0072	NA
1,1,2-Trichloroethane	1.1 (ca)	5.5 (ca)	--	mg/kg	<0.0045	<0.0053	<0.0063	<0.0055	<0.0069	<0.0064	<0.0051	<0.0063	<0.0053	<0.0046	<0.0053	<0.0072	NA
1,1-Dichloroethane	3.4 (ca)	17 (ca)	--	mg/kg	<0.0045	<0.0053	<0.0063	<0.0055	<0.0069	<0.0064	<0.0051	<0.0063	<0.0053	<0.0046	<0.0053	<0.0072	NA
1,1-Dichloroethene	25 (nc)	110 (nc)	--	mg/kg	<0.0045	<0.0053	<0.0063	<0.0055	<0.0069	<0.0064	<0.0051	<0.0063	<0.0053	<0.0046	<0.0053	<0.0072	NA
1,2-Dichloroethane	0.45 (ca)	2.2 (ca)	--	mg/kg	<0.0045	<0.0053	<0.0063	<0.0055	<0.0069	<0.0064	<0.0051	<0.0063	<0.0053	<0.0046	<0.0053	<0.0072	NA
1,2-Dichloropropane	0.93 (ca*)	4.7 (ca*)	--	mg/kg	<0.0045	<0.0053	<0.0063	<0.0055	<0.0069	<0.0064	<0.0051	<0.0063	<0.0053	<0.0046	<0.0053	<0.0072	NA
2-Butanone	2,800 (nc)	19,000 (nc)	--	mg/kg	<0.0045	<0.0053	<0.0063	<0.0055	<0.0069	<0.0064	<0.0051	<0.0063	<0.0053	<0.0046	<0.0053	<0.0072	NA
2-Hexanone	--	--	--	mg/kg	<0.0045	<0.0053	<0.0063	<0.0055	<0.0069	<0.0064	<0.0051	<0.0063	<0.0053	<0.0046	<0.0053	<0.0072	NA
4-Methyl-2-pentanone	530 (nc)	5,200 (sat)	--	mg/kg	<0.0045	<0.0053	<0.0063	<0.0055	<0.0069	<0.0064	<0.0051	<0.0063	<0.0053	<0.0046	<0.0053	<0.0072	NA
Acetone	6,100 (nc)	61,000 (nc)	--	mg/kg	0.043 B	<0.0053	<0.0063	<0.0055	<0.0069	<0.0064	<0.0051	<0.0063	<0.0053	<0.0046	<0.0053	<0.0072	NA
Benzene	1.1 (ca*)	5.6 (ca*)	--	mg/kg	<0.0045	<0.0053	<0.0063	<0.0055	<0.0069	<0.0064	<0.0051	<0.0063	<0.0053	<0.0046	<0.0053	<0.0072	NA
Bromodichloromethane	10 (ca)	46 (ca)	--	mg/kg	<0.0045	<0.0053	<0.0063	<0.0055	<0.0069	<0.0064	<0.0051	<0.0063	<0.0053	<0.0046	<0.0053	<0.0072	NA
Bromoform	61 (ca*)	220 (ca*)	--	mg/kg	<0.0045	<0.0053 L	<0.0063 L	<0.0055	<0.0069 L	<0.0064 L	<0.0051	<0.0063 L	<0.0053 L	<0.0046	<0.0053 L	<0.0072 L	NA
Bromomethane	0.79 (nc)	3.5 (nc)	--	mg/kg	<0.0045	<0.0053	<0.0063	<0.0055	<0.0069	<0.0064	<0.0051	<0.0063	<0.0053	<0.0046	<0.0053	<0.0072	NA
Carbon Disulfide	67 (nc)	300 (nc)	--	mg/kg	<0.0045	<0.0053	<0.0063	<0.0055	<0.0069	0.00046 B	<0.0051	<0.0063	<0.0053	<0.0046	0.00039 B	<0.0072	NA
Carbon Tetrachloride	0.25 (ca)	1.3 (ca)	--	mg/kg	<0.0045	<0.0053	<0.0063	<0.0055	<0.0069	<0.0064	<0.0051	<0.0063	<0.0053	<0.0046	<0.0053	<0.0072	NA
Chlorobenzene	31 (nc)	860 (sat)	--	mg/kg	<0.0045	<0.0053	<0.0063	<0.0055	<0.0069	<0.0064	<0.0051	<0.0063	<0.0053	<0.0046	<0.0053	<0.0072	NA
Chloroethane	2,200 (sat)	2,200 (sat)	--	mg/kg	<0.0045	<0.0053	<0.0063	<0.0055	<0.0069	<0.0064	<0.0051	<0.0063	<0.0053	<0.0046	<0.0053	<0.0072	NA
Chloroform	0.3 (ca)	1.5 (ca)	--	mg/kg	<0.0045	<0.0053	<0.0063	<0.0055	<0.0069	<0.0064	<0.0051	<0.0063	<0.0053	<0.0046	<0.0053	<0.0072	NA
Chloromethane	1.7 (ca*)	8.4 (ca*)	--	mg/kg	<0.0045	<0.0053	<0.0063	<0.0055	<0.0069	<0.0064	<0.0051	<0.0063	<0.0053	<0.0046	<0.0053	<0.0072	NA
cis-1,2-Dichloroethene	78 (nc)	1,300 (sat)	--	mg/kg	<0.0045	<0.0053	<0.0063	<0.0055	<0.0069	<0.0064	<0.0051	<0.0063	<0.0053	<0.0046	<0.0053	<0.0072	NA
cis-1,3-Dichloropropene	--	--	--	mg/kg	<0.0045	<0.0053	<0.0063	<0.0055	<0.0069	<0.0064	<0.0051	<0.0063	<0.0053	<0.0046	<0.0053	<0.0072	NA
Dibromochloromethane	5.8 (ca)	21 (ca)	--	mg/kg	<0.0045	<0.0053	<0.0063	<0.0055	<0.0069	<0.0064	<0.0051	<0.0063	<0.0053	<0.0046	<0.		

Table D-10. Soil Analytical Results, Western Burning Ground, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	WBGSB22 0 - 0.5 06/18/02	WBGSB22 2 - 4 06/19/02	WBGSB22 6 - 8 06/19/02	WBGSB23 0 - 0.5 06/18/02	WBGSB23 2 - 4 06/19/02	WBGSB23 6 - 8 06/19/02	WBGSB24 0 - 0.5 06/18/02	WBGSB24 2 - 4 06/19/02	WBGSB24 6 - 8 06/19/02	WBGSB25 0 - 0.5 06/18/02	WBGSB25 2 - 4 06/19/02	WBGSB25 6 - 8 06/19/02	WBGTR01 0 - 0.5 06/18/02
Semivolatile Organics																	
3,3'-Dichlorobenzidine	1.1 (ca**)	3.8 (ca**)	--	mg/kg	<0.17 J	<0.20	<0.21	<0.17 J	<0.23	<0.22	<0.17 J	<0.22	<0.20	<0.17 J	<0.20	<0.22	NA
3-Nitroaniline	--	--	--	mg/kg	<0.17	<0.20 J	<0.21 J	<0.17	<0.23 J	<0.22 J	<0.17	<0.22 J	<0.20 J	<0.17	<0.20 J	<0.22 J	NA
4,6-Dinitro-2-methylphenol	--	--	--	mg/kg	<0.84 L	<0.97	<1.0	<0.84 L	<1.1	<1.1	<0.85 L	<1.1	<0.98	<0.85 L	<0.98	<1.1	NA
4-Bromophenyl-phenylether	--	--	--	mg/kg	<0.17	<0.20	<0.21	<0.17	<0.23	<0.22	<0.17	<0.22	<0.20	<0.17	<0.20	<0.22	NA
4-Chloro-3-Methylphenol	--	--	--	mg/kg	<0.17	<0.20	<0.21	<0.17	<0.23	<0.22	<0.17	<0.22	<0.20	<0.17	<0.20	<0.22	NA
4-Chloroaniline	24 (nc)	250 (nc)	--	mg/kg	<0.17	<0.20	<0.21	<0.17	<0.23	<0.22	<0.17	<0.22	<0.20	<0.17	<0.20	<0.22	NA
4-Chlorophenyl-phenylether	--	--	--	mg/kg	<0.17	<0.20	<0.21	<0.17	<0.23	<0.22	<0.17	<0.22	<0.20	<0.17	<0.20	<0.22	NA
4-Methylphenol	31 (nc)	310 (nc)	--	mg/kg	<0.17	<0.20	<0.21	<0.17	<0.23	<0.22	<0.17	<0.22	<0.20	<0.17	<0.20	<0.22	NA
4-Nitroaniline	--	--	--	mg/kg	<0.17	<0.20 J	<0.21 J	<0.17	<0.23 J	<0.22 J	<0.17	<0.22 J	<0.20 J	<0.17	<0.20 J	<0.22 J	NA
4-Nitrophenol	--	--	--	mg/kg	<0.84	<0.97	<1.0	<0.84	<1.1	<1.1	<0.85	<1.1	<0.98	<0.85	<0.98	<1.1	NA
Acenaphthene	340 (nc)	3,300 (nc)	--	mg/kg	<0.17	<0.20	<0.21	<0.17	<0.23	<0.22	0.023 J	<0.22	<0.20	0.015 J	<0.20	<0.22	NA
Acenaphthylene	340 (nc)	3,300 (nc)	--	mg/kg	<0.17	<0.20	<0.21	<0.17	<0.23	<0.22	<0.17	<0.22	<0.20	<0.17	<0.20	<0.22	NA
Anthracene	1,700 (nc)	170,000 (max)	--	mg/kg	<0.17	0.031 J	<0.21	<0.17	<0.23	<0.22	0.061 J	<0.22	<0.20	0.051 J	<0.20	<0.22	NA
Benzo(a)anthracene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	<0.17	0.28	<0.21	0.0085 J	<0.23	<0.22	0.38	<0.22	<0.20	0.32	<0.20	<0.22	NA
Benzo(a)pyrene	0.015 (ca**)	0.21 (ca**)	--	mg/kg	<0.17	0.55	<0.21	<0.17	<0.23	<0.22	0.37	<0.22	<0.20	0.40	<0.20	<0.22	NA
Benzo(b)fluoranthene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	<0.17	0.76	<0.21	<0.17	<0.23	<0.22	0.73	<0.22	<0.20	0.65	<0.20	<0.22	NA
Benzo(g,h,i)perylene	170 (nc)	1,700 (nc)	--	mg/kg	<0.17	0.62	<0.21	<0.17	<0.23	<0.22	0.31	<0.22	<0.20	0.28	<0.20	<0.22	NA
Benzo(k)fluoranthene	1.5 (ca**)	21 (ca**)	--	mg/kg	<0.17	0.23	<0.21	<0.17	<0.23	<0.22	0.19	<0.22	<0.20	0.15 J	<0.20	<0.22	NA
Benzoic Acid	240,000 (max)	2,500,000 (max)	--	mg/kg	<0.84	<0.97	<1.0	<0.84	<1.1	<1.1	<0.85	<1.1	<0.98	<0.85	<0.98	<1.1	NA
Benzyl Alcohol	3,100 (nc)	310,000 (max)	--	mg/kg	<0.17	<0.20 J	<0.21 J	<0.17	<0.23 J	<0.22 J	<0.17	<0.22 J	<0.20 J	<0.17	<0.20 J	<0.22 J	NA
bis(2-Chloroethoxy)methane	18 (nc)	180 (nc)	--	mg/kg	<0.17	<0.20	<0.21	<0.17	<0.23	<0.22	<0.17	<0.22	<0.20	<0.17	<0.20	<0.22	NA
bis(2-Chloroethyl)ether	0.19 (ca**)	0.9 (ca**)	--	mg/kg	<0.17	<0.20	<0.21	<0.17	<0.23	<0.22	<0.17	<0.22	<0.20	<0.17	<0.20	<0.22	NA
bis(2-Chloroisopropyl)ether	--	--	--	mg/kg	<0.17	<0.20	<0.21	<0.17	<0.23	<0.22	<0.17	<0.22	<0.20	<0.17	<0.20	<0.22	NA
bis(2-Ethylhexyl)phthalate	35 (ca*)	120 (ca*)	--	mg/kg	0.16 B	0.83 B	<0.21	0.21 B	<0.23	<0.22	0.16 B	<0.22	<0.20	0.67 B	<0.20	<0.22	NA
Butylbenzylphthalate	260 (ca*)	910 (ca*)	--	mg/kg	<0.17	0.16 B	<0.21	<0.17	<0.23	<0.22	<0.17	<0.22	<0.20	<0.17	<0.20	<0.22	NA
Carbazole	24 (ca**)	86 (ca**)	--	mg/kg	<0.17	0.023 J	<0.21 J	<0.17	<0.23 J	<0.22 J	0.10 J	<0.22 J	<0.20 J	0.038 J	<0.20 J	<0.22 J	NA
Chrysene	15 (ca**)	210 (ca**)	--	mg/kg	<0.17	0.36	<0.21	<0.17	<0.23	<0.22	0.47	<0.22	<0.20	0.32	<0.20	<0.22	NA
Dibenzo(a,h)anthracene	0.015 (ca**)	0.21 (ca**)	--	mg/kg	<0.17	0.17 J	<0.21	<0.17	<0.23	<0.22	<0.17	<0.22	<0.20	0.076 J	<0.20	<0.22	NA
Dibenzofuran	--	--	--	mg/kg	<0.17	0.010 J	<0.21	<0.17	<0.23	<0.22	0.011 J	<0.22	<0.20	0.014 J	<0.20	<0.22	NA
Diethylphthalate	4,900 (nc)	490,000 (max)	--	mg/kg	<0.17	<0.20	<0.21	<0.17	<0.23	<0.22	<0.17	<0.22	<0.20	<0.17	<0.20	<0.22	NA
Dimethylphthalate	--	--	--	mg/kg	<0.17	<0.20	<0.21	<0.17	<0.23	<0.22	<0.17	<0.22	<0.20	<0.17	<0.20	<0.22	NA
Di-n-Butylphthalate	610 (nc)	6,200 (nc)	--	mg/kg	<0.17	<0.20	<0.21	<0.17	<0.23	<0.22	<0.17	<0.22	<0.20	<0.17	<0.20	<0.22	NA
Dinitrotoluene Mix	0.71 (ca)	2.5 (ca)	--	mg/kg	<0.17	<0.20	<0.21	<0.17	<0.23	<0.22	<0.17	<0.22	<0.20	<0.17	<0.20	<0.22	NA
Di-n-Octylphthalate	--	--	--	mg/kg	<0.17	<0.20	<0.21	0.016 J	<0.23	<0.22	<0.17	<0.22	<0.20	<0.17	<0.20	<0.22	NA
Fluoranthene	230 (nc)	2,200 (nc)	--	mg/kg	<0.17	0.39	<0.21	0.0089 J	<0.23	<0.22	0.89	<0.22	<0.20	0.44	<0.20	<0.22	NA
Fluorene	230 (nc)	2,200 (nc)	--	mg/kg	<0.17	<0.20	<0.21	<0.17	<0.23	<0.22	0.016 J	<0.22	<0.20	0.014 J	<0.20	<0.22	NA
Hexachlorobenzene	0.3 (ca)	1.1 (ca)	--	mg/kg	<0.17	<0.20	<0.21	<0.17	<0.23	<0.22	<0.17	<0.22	<0.20	<0.17	<0.20	<0.22	NA
Hexachlorobutadiene	6.2 (ca**)	22 (ca*)	--	mg/kg	<0.17	<0.20	<0.21	<0.17	<0.23	<0.22	<0.17	<0.22	<0.20	<0.17	<0.20	<0.22	NA
Hexachlorocyclopentadiene	37 (nc)	370 (nc)	--	mg/kg	<0.17 L	<0.20	<0.21	<0.17 L	<0.23	<0.22	<0.17 L	<0.22	<0.20	<0.17 L	<0.20	<0.22	NA
Hexachloroethane	35 (ca**)	120 (ca**)	--	mg/kg	<0.17	<0.20	<0.21	<0.17	<0.23	<0.22	<0.17	<0.22	<0.20	<0.17	<0.20	<0.22	NA
Indeno(1,2,3-cd)pyrene	0.15 (ca**)	2.1 (ca**)	--	mg/kg	<0.17	0.70 J	<0.21	<0.17	<0.23	<0.22	0.32	<0.22	<0.20	0.32	<0.20	<0.22	NA
Isophorone	510 (ca*)	1,800 (ca*)	--	mg/kg	<0.17	<0.20	<0.21	<0.17	<0.23	<0.22	<0.17	<0.22	<0.20	<0.17	<0.20	<0.22	NA
Naphthalene	3.9 (ca)	20 (ca)	--	mg/kg	<0.17	0.015 J	<0.21	<0.17	<0.23	<0.22	<0.17	<0.22	<0.20	<0.17	<0.20	<0.22	NA
Nitrobenzene	3.1 (nc)	28 (nc)	--	mg/kg	<0.17	<0.20	<0.21	<0.17	<0.23	<0.22	<0.17	<0.22	<0.20	<0.17	<0.20	<0.22	NA
N-Nitroso-di-n-propylamine	0.069 (ca**)	0.25 (ca**)	--	mg/kg	<0.17	<0.20	<0.21	<0.17	<0.23	<0.22	<0.17	<0.22	<0.20	<0.17	<0.20	<0.22	NA
N-Nitrosodiphenylamine	99 (ca**)	350 (ca**)	--	mg/kg	<0.17	<0.20	<0.21	<0.17	<0.23	<0.22	<0.17	<0.22	<0.20	<0.17	<0.20	<0.22	NA
Pentachlorophenol	3 (ca)	9 (ca)	--	mg/kg	<0.84	<0.97	<1.0	<0.84	<1.1	<1.1	<0.85	<1.1	<0.98	<0.85	<0.98	<1.1	NA
Phenanthrene	1,700 (nc)	170,000 (max)	--	mg/kg	<0.17	0.17 J	<0.21	<0.17	<0.23	<0.22	0.43	<0.22	<0.20	0.25	<0.20	<0.22	NA
Phenol	1,800 (nc)	180,000 (max)	--	mg/kg	<0.17	<0.20	<0.21	<0.17	<0.23	<0.22	<0.17	<0.22	<0.20	<0.17	<0.20	<0.22	NA
Pyrene	170 (nc)	1,700 (nc)	--	mg/kg	<0.17	0.39	<0.21	0.0068 J	<0.23	<0.22	0.67	<0.22	<0.20	0.38 J	<0.20	<0.22	NA
Pyridine	7.8 (nc)	100 (nc)	--	mg/kg	<0.17	<0.20	<0.21	<0.17	<0.23	<0.22	<0.17	<0.22	<0.20	<0.17	<0.20	<0.22	NA
Inorganics																	
Aluminum	7,700 (nc)	990,000 (max)	40,041	mg/kg	18,200	20,900	33,200	23,900	24,100	41,600	22,100	19,300	9,600	17,500	15,300	31,600	NA
Antimony	3.1 (nc)	41 (nc)	--	mg/kg	<0.500 L	4.											

Table D-11. Sediment Analytical Results, Western Burning Ground, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]		WBGSW/SD07 0 - 0.5 06/26/02	WBGSW/SD08 0 - 0.5 06/25/02	WBGSW/SD09 0 - 0.5 06/25/02	WBGSW/SD10 0 - 0.5 06/26/02	WBGSD11 0 - 0.5 06/27/02	WBGSD12 0 - 0.5 06/26/02	WBGSW/SD13 0 - 0.5 06/26/02	WBGSW/SD14 0 - 0.5 06/25/02	WBGSW/SD15 0 - 0.5 06/27/02
Dioxin/Furan													
1.2.3.4.6.7.8-HpCDD	0.00039 (ca**)	0.0016 (ca**)	--	mg/kg	0.00001793	0.00000211 J	0.00002099	0.00002501	0.00007199	0.00003719	NA	NA	NA
1.2.3.4.6.7.8-HpCDF	0.00032 (ca**)	0.0011 (ca**)	--	mg/kg	0.00000094	<0.0000017	0.00000285	0.0000053	0.0000063	0.0000177	NA	NA	NA
1.2.3.4.7.8.9-HpCDF	0.00032 (ca**)	0.0011 (ca**)	--	mg/kg	<0.00000025	<0.00000023	0.00000026	0.00000054 J	<0.00000033	<0.00000024	NA	NA	NA
1.2.3.4.7.8-HxCDD	0.000039 (ca**)	0.00016 (ca**)	--	mg/kg	<0.00000034	<0.00000032	<0.0000003	<0.00000026	0.00000103	0.00000071	NA	NA	NA
1.2.3.4.7.8-HxCDF	0.000032 (ca**)	0.00011 (ca**)	--	mg/kg	<0.00000002	<0.00000014	0.00000092 J	0.00000168	<0.00000002	<0.00000019	NA	NA	NA
1.2.3.6.7.8-HxCDD	0.000039 (ca**)	0.00016 (ca**)	--	mg/kg	<0.00000027	<0.00000026	<0.00000024	0.00000148	0.00000204 J	0.00000099 J	NA	NA	NA
1.2.3.6.7.8-HxCDF	0.000032 (ca**)	0.00011 (ca**)	--	mg/kg	<0.00000019	<0.00000014	<0.00000014	0.00000173 J	<0.00000019	<0.00000019	NA	NA	NA
1.2.3.7.8.9-HxCDD	0.000039 (ca**)	0.00016 (ca**)	--	mg/kg	<0.00000026	<0.00000026	0.00000093	0.00000155	0.00000239	0.00000144 J	NA	NA	NA
1.2.3.7.8.9-HxCDF	0.000032 (ca**)	0.00011 (ca**)	--	mg/kg	<0.00000023	<0.00000019	<0.00000019	<0.00000025	<0.00000023	<0.00000022	NA	NA	NA
1.2.3.7.8-PeCDD	0.000039 (ca**)	0.00016 (ca**)	--	mg/kg	<0.00000037	<0.00000022	<0.00000025	<0.00000029	<0.00000022	<0.00000023	NA	NA	NA
1.2.3.7.8-PeCDF	0.00011 (ca**)	0.00038 (ca**)	--	mg/kg	<0.00000021	<0.00000012	<0.00000012	<0.00000002	<0.00000002	<0.00000019	NA	NA	NA
2.3.4.6.7.8-HxCDF	0.000032 (ca**)	0.00011 (ca**)	--	mg/kg	<0.00000023	<0.00000018	<0.00000018	0.00000094 J	<0.00000023	<0.00000022	NA	NA	NA
2.3.4.7.8-PeCDF	0.000011 (ca**)	0.000038 (ca**)	--	mg/kg	<0.00000022	<0.00000014	<0.00000013	0.00000141	<0.00000021	<0.00000019	NA	NA	NA
2.3.7.8-TCDD	0.0000045 (ca*)	0.000018 (ca*)	--	mg/kg	<0.00000032	<0.00000024	<0.00000022	<0.00000017	<0.00000028	<0.00000027	NA	NA	NA
2.3.7.8-TCDF	0.000032 (ca**)	0.00011 (ca**)	--	mg/kg	<0.00000035	<0.00000014	<0.00000015	0.00000283 J	<0.00000003	<0.00000028	NA	NA	NA
OCDD	0.013 (ca**)	0.053 (ca**)	--	mg/kg	0.0007224	0.0001412	0.001106	0.001119	0.003422	0.001753	NA	NA	NA
OCDF	0.011 (ca**)	0.038 (ca**)	--	mg/kg	0.00000244 J	<0.00000003 J	0.00000662 J	0.00001139	0.00001515	0.00000398	NA	NA	NA
Total HpCDDs	--	--	--	mg/kg	0.00004226	0.00000315	0.00004811	0.00005053	0.0001538	0.00008485	NA	NA	NA
Total HpCDFs	--	--	--	mg/kg	0.00000265	<0.00000017	0.00000781	0.00001135	0.00001837	0.00000177	NA	NA	NA
Total HxCDDs	--	--	--	mg/kg	0.00000236	<0.00000026	0.00000397	0.00001213	0.00001657	0.00000876	NA	NA	NA
Total HxCDFs	--	--	--	mg/kg	0.00000187	<0.00000014	0.000000258	0.00000654	0.00000514	0.00000154	NA	NA	NA
Total PeCDDs	--	--	--	mg/kg	<0.00000037	<0.00000022	<0.00000025	<0.00000029	0.00000055	<0.00000023	NA	NA	NA
Total PeCDFs	--	--	--	mg/kg	<0.00000021	<0.00000012	<0.00000012	0.00000779	0.00000965	0.00000088	NA	NA	NA
Total TCDDs	--	--	--	mg/kg	<0.00000032	<0.00000024	<0.00000022	0.00000233	<0.00000028	<0.00000027	NA	NA	NA
Total TCDFs	--	--	--	mg/kg	<0.00000035	<0.00000014	<0.00000015	0.00003442	<0.00000003	<0.00000028	NA	NA	NA
Explosives													
1.3.5-Trinitrobenzene	220 (nc)	2,700 (nc)	--	mg/kg	NA	<0.1	<0.2	<0.2	<0.2	0.41	NA	NA	NA
1.3-Dinitrobenzene	0.61 (nc)	6.2 (nc)	--	mg/kg	NA	<0.1	<0.2	<0.2	<0.2	<0.2	NA	NA	NA
2.4.6-Trinitrotoluene	3.6 (ca**)	42 (ca**)	--	mg/kg	NA	<0.2	<0.4	<0.4	<0.4	<0.4	NA	NA	NA
2.4-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	NA	<0.2	<0.4	<0.4	<0.4	<0.4	NA	NA	NA
2.6-Dinitrotoluene	6.1 (nc)	62 (nc)	--	mg/kg	NA	<0.2	<0.4	<0.4	<0.4	<0.4	NA	NA	NA
2-Amino-4.6-Dinitrotoluene	15 (nc)	190 (nc)	--	mg/kg	NA	<0.2	<0.4	<0.4	<0.4	<0.4	NA	NA	NA
4-Amino-2.6-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	NA	<0.2	<0.4	<0.4	<0.4	<0.4	NA	NA	NA
Dinitrotoluene Mix	0.71 (ca)	2.5 (ca)	--	mg/kg	NA	<0.2	<0.4	<0.4	<0.4	<0.4	NA	NA	NA
HMX	310 (nc)	3,100 (nc)	--	mg/kg	NA	<0.2	<0.4	<0.4	<0.4	<0.4	NA	NA	NA
m-Nitrotoluene	--	--	--	mg/kg	NA	<0.4	<0.8	<0.8	<0.8	<0.8	NA	NA	NA
Nitrobenzene	3.1 (nc)	28 (nc)	--	mg/kg	NA	<0.2	<0.4	<0.4	<0.4	<0.4	NA	NA	NA
Nitroglycerine	0.61 (nc)	6.2 (nc)	--	mg/kg	NA	<0.46	<1.03	<1.07	<1.41	0.96 J	NA	NA	NA
o-Nitrotoluene	78 (nc)	1,300 (sat)	--	mg/kg	NA	<0.4	<0.8	<0.8	<0.8	<0.8	NA	NA	NA
Pentaerythritol Tetranitrate	--	--	--	mg/kg	NA	<0.46	<1.03	<1.07	<1.41	<1.28	NA	NA	NA
p-Nitrotoluene	30 (ca**)	110 (ca*)	--	mg/kg	NA	<0.4	<0.8	<0.8	<0.8	<0.8	NA	NA	NA
RDX	4.4 (ca*)	16 (ca)	--	mg/kg	NA	<0.2	<0.4	<0.4	<0.4	<0.4	NA	NA	NA
Tetryl	24 (nc)	250 (nc)	--	mg/kg	NA	<0.2	<0.4	<0.4	<0.4	<0.4	NA	NA	NA
Herbicides													
2.4.5-T	61 (nc)	620 (nc)	--	mg/kg	NA	<0.0153	NA	<0.0178	NA	NA	<0.0379	0.00757 J	<0.214
2.4.5-TP	49 (nc)	490 (nc)	--	mg/kg	NA	<0.0153	NA	<0.0178	NA	NA	<0.0379	<0.024	<0.214
2.4-D	69 (nc)	770 (nc)	--	mg/kg	NA	0.385	NA	<0.0356	NA	NA	<0.0758	6.83	<0.427
2.4-DB	49 (nc)	490 (nc)	--	mg/kg	NA	<0.153 L	NA	<0.178 L	NA	NA	<0.379 L	<0.24 L	<2.14 L
Dalapon	180 (nc)	1,800 (nc)	--	mg/kg	NA	<0.153	NA	<0.178	NA	NA	<0.379	<0.24	<2.14
Dicamba	180 (nc)	1,800 (nc)	--	mg/kg	NA	0.0322 B	NA	<0.0356	NA	NA	<0.0758	<0.0481	<0.427
Dichlorprop	--	--	--	mg/kg	NA	<0.0307	NA	<0.0356	NA	NA	<0.0758	<0.0481	<0.427
Dinoseb	6.1 (nc)	62 (nc)	--	mg/kg	NA	<0.0307 L	NA	<0.0356 L	NA	NA	<0.0758 L	<0.0481 L	<0.427 L
MCPA	3.1 (nc)	31 (nc)	--	mg/kg	NA	<15.3	NA	<17.8	NA	NA	<37.9	<24	<214
MCPP	6.1 (nc)	62 (nc)	--	mg/kg	NA	3.56 B	NA	<17.8	NA	NA	<37.9	<24	<214
Organochlorine Pesticides													
4.4'-DDD	2 (ca**)	7.2 (ca**)	--	mg/kg	NA	0.00033 J	NA	0.00099 J	NA	NA	0.00152 J	0.00063 J	<0.00143
4.4'-DDE	1.4 (ca**)	5.1 (ca**)	--	mg/kg	NA	0.00308	NA	0.0027 B	NA	NA	0.00203 B	<0.0016	0.00152 B
4.4'-DDT	1.7 (ca*)	7 (ca*)	--	mg/kg	NA	<0.00102	NA	0.0119	NA	NA	<0.00253	0.00356	0.00142 B
Aldrin	0.029 (ca*)	0.1 (ca)	--	mg/kg	NA	<0.00102	NA	<0.00119	NA	NA	<0.00253	<0.0016	<0.00143
Alpha-BHC	0.077 (ca**)	0.27 (ca**)	--	mg/kg	NA	<0.00102	NA	<0.00119	NA	NA	<0.00253	<0.0016	<0.00143
Alpha-Chlordane	1.6 (ca**)	6.5 (ca**)	--	mg/kg	NA	0.00021 J	NA	<0.00119	NA	NA	<0.00253	<0.0016	0.00071 J
Beta-BHC	0.27 (ca**)	0.96 (ca**)	--	mg/kg	NA	<0.00102	NA	<0.00119	NA	NA	<0.00253	<0.0016	<0.00143
Delta-BHC	0.52 (ca**)	2.1 (ca**)	--	mg/kg	NA	0.00095 B	NA	<0.00119	NA	NA	<0.00253	<0.0016	<0.00143
Dieldrin	0.03 (ca)	0.11 (ca)	--	mg/kg	NA	<0.00102	NA	0.00347	NA	NA	<0.00253	<0.0016	<0.00143
Endosulfan I	--	--	--	mg/kg	NA	<0.00102	NA	<0.00119	NA	NA	<0.00253	<0.0016	<0.00143
Endosulfan II	37 (nc)	370 (nc)	--	mg/kg	NA	<0.00102	NA	0.00161	NA	NA	<0.00253	0.00094 J	<0.00143
Endosulfan Sulfate	--	--	--	mg/kg	NA	<0.00102	NA	<0.00119	NA	NA	<0.00253	<0.0016	<0.00143
Endrin	1.8 (nc)	18 (nc)	--	mg/kg	NA	<0.00102	NA	<0.00119	NA	NA	<0.00253	<0.0016	<0.00143
Endrin Aldehyde	1.8 (nc)	18 (nc)	--	mg/kg	NA	<0.00102							

Table D-11. Sediment Analytical Results, Western Burning Ground, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	WBGSW/SD07 0 - 0.5 06/26/02	WBGSW/SD08 0 - 0.5 06/25/02	WBGSW/SD09 0 - 0.5 06/25/02	WBGSW/SD10 0 - 0.5 06/26/02	WBGSD11 0 - 0.5 06/27/02	WBGSD12 0 - 0.5 06/26/02	WBGSW/SD13 0 - 0.5 06/26/02	WBGSW/SD14 0 - 0.5 06/25/02	WBGSW/SD15 0 - 0.5 06/27/02
Phenanthrene	1,700 (nc)	170,000 (max)	--	mg/kg	0.014	<0.0040	2.8	<0.0030	<0.0040	NA	NA	NA	NA
Pyrene	170 (nc)	1,700 (nc)	--	mg/kg	0.015	<0.0040	5.0	<0.0030	0.0017 J	NA	NA	NA	NA
Notes found at end of table.													
PCBs													
Aroclor-1016	0.39 (nc)	21 (ca**)	--	mg/kg	<0.080	<0.050	<0.050	<0.050	<0.070	<0.070	<0.12	<0.080	<0.070
Aroclor-1221	0.17 (ca**)	0.62 (ca**)	--	mg/kg	<0.16	<0.10	<0.11	<0.11	<0.15	<0.14	<0.25	<0.16	<0.14
Aroclor-1232	0.17 (ca**)	0.62 (ca**)	--	mg/kg	<0.080	<0.050	<0.050	<0.050	<0.070	<0.070	<0.12	<0.080	<0.070
Aroclor-1242	0.22 (ca**)	0.74 (ca**)	--	mg/kg	<0.080	<0.050	<0.050	<0.050	<0.070	<0.070	<0.12	<0.080	<0.070
Aroclor-1248	0.22 (ca**)	0.74 (ca**)	--	mg/kg	<0.080	<0.050	<0.050	<0.050	<0.070	<0.070	<0.12	<0.080	<0.070
Aroclor-1254	0.22 (ca**)	0.74 (ca*)	--	mg/kg	<0.080	<0.050	<0.050	<0.050	<0.070	<0.070	<0.12	<0.080	<0.070
Aroclor-1260	0.22 (ca**)	0.74 (ca**)	--	mg/kg	<0.080	<0.050	<0.050	<0.050	<0.070	<0.070	<0.12	<0.080	<0.070
Volatile Organics													
1,1,1-Trichloroethane	680 (sat)	680 (sat)	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
1,1,2,2-Tetrachloroethane	0.59 (ca**)	2.9 (ca**)	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
1,1,2-Trichloroethane	1.1 (ca)	5.5 (ca)	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
1,1-Dichloroethane	3.4 (ca)	17 (ca)	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
1,1-Dichloroethene	25 (nc)	110 (nc)	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
2-Chloroethane	0.45 (ca)	2.2 (ca)	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
2-Dichloropropane	0.93 (ca*)	4.7 (ca*)	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
2-Butanone	2,800 (nc)	19,000 (nc)	--	mg/kg	0.17	<0.0077	<0.0086	<0.0089	0.090	0.18	<0.019	<0.012	<0.011
2-Hexanone	--	--	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
4-Methyl-2-pentanone	530 (nc)	5,200 (sat)	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
Acetone	6,100 (nc)	61,000 (nc)	--	mg/kg	0.23 B	<0.0077 J	<0.0086 J	0.048 B	0.14 B	0.20 B	0.10 B	0.037 B	0.077 B
Benzene	1.1 (ca*)	5.6 (ca*)	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
Bromodichloromethane	10 (ca)	46 (ca)	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
Bromoform	61 (ca*)	220 (ca*)	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
Bromomethane	0.79 (nc)	3.5 (nc)	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
Carbon Disulfide	67 (nc)	300 (nc)	--	mg/kg	<0.013	<0.0077	<0.0086	0.0012 B	0.0013 B	<0.011	0.0014 B	0.0015 B	0.0013 B
Carbon Tetrachloride	0.25 (ca)	1.3 (ca)	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
Chlorobenzene	31 (nc)	860 (sat)	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
Chloroethane	2,200 (sat)	2,200 (sat)	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
Chloroform	0.3 (ca)	1.5 (ca)	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
Chloromethane	1.7 (ca*)	8.4 (ca*)	--	mg/kg	<0.013 L	<0.0077 L	<0.0086 L	<0.0089 L	<0.012 L	<0.011 L	<0.019 L	<0.012 L	<0.011 L
cis-1,2-Dichloroethene	78 (nc)	1,300 (sat)	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
cis-1,3-Dichloropropene	--	--	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
Dibromochloromethane	5.8 (ca)	21 (ca)	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
Ethylbenzene	5.7 (ca)	29 (ca)	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
m,p-Xylene	60 (nc)	260 (nc)	--	mg/kg	<0.025	<0.015	<0.017	<0.018	<0.024	<0.021	<0.038	<0.024	<0.021
Methylene Chloride	11 (ca)	54 (ca)	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
o-Xylene	300 (sat)	300 (sat)	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
Styrene	1,000 (sat)	1,000 (sat)	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
Tetrachloroethene	0.57 (ca)	2.7 (ca)	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
Toluene	500 (nc)	4600 (nc)	--	mg/kg	<0.013	<0.0077	<0.0086	0.0078 J	0.61 J	<0.011	<0.019	<0.012	0.00092 B
trans-1,2-Dichloroethene	11 (nc)	50 (nc)	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
trans-1,3-Dichloropropene	--	--	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
Trichloroethene	2.8 (ca)	14 (ca)	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
Vinyl Chloride	0.06 (ca)	1.7 (ca)	--	mg/kg	<0.013	<0.0077	<0.0086	<0.0089	<0.012	<0.011	<0.019	<0.012	<0.011
Xylenes (total)	60 (nc)	260 (nc)	--	mg/kg	<0.025	<0.015	<0.017	<0.018	<0.024	<0.021	<0.038	<0.024	<0.021
Semivolatile Organics													
1,2,4-Trichlorobenzene	8.7 (ca**)	40 (ca**)	--	mg/kg	<0.43	<0.26	0.012 J	<0.30	<0.40	<0.36	<0.64	0.023 J	<0.36
1,2-Dichlorobenzene	220 (sat)	220 (sat)	--	mg/kg	<0.43	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	<0.41	<0.36
1,3-Dichlorobenzene	--	--	--	mg/kg	<0.43	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	<0.41	<0.36
1,4-Dichlorobenzene	2.6 (ca)	13 (ca)	--	mg/kg	<0.43	<0.26	0.012 J	<0.30	<0.40	<0.36	<0.64	0.049 J	<0.36
2,4,5-Trichlorophenol	610 (nc)	6,200 (nc)	--	mg/kg	<0.43	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	<0.41	<0.36
2,4,6-Trichlorophenol	44 (ca**)	160 (ca**)	--	mg/kg	<0.43	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	<0.41	<0.36
2,4-Dichlorophenol	18 (nc)	180 (nc)	--	mg/kg	<0.43	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	<0.41	<0.36
2,4-Dimethylphenol	120 (nc)	1,200 (nc)	--	mg/kg	<0.43	<0.26 L	<0.29 L	<0.30	<0.40	<0.36	<0.64	<0.41 L	<0.36
2,4-Dinitrophenol	12 (nc)	120 (nc)	--	mg/kg	<2.1	<0.26	<0.29	<1.5	<2.0	<1.8	<3.1	<0.41	<1.8
2,4-Dinitrotoluene	12 (nc)	120 (nc)	--	mg/kg	<0.43	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	<0.41	<0.36
2,6-Dinitrotoluene	6.1 (nc)	62 (nc)	--	mg/kg	<0.43	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	<0.41	<0.36
2-Chloronaphthalene	210 (sat)	210 (sat)	--	mg/kg	<0.43	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	<0.41	<0.36
2-Chlorophenol	39 (nc)	510 (nc)	--	mg/kg	<0.43	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	<0.41	<0.36
2-Methylnaphthalene	31 (nc)	440 (sat)	--	mg/kg	0.056 J	<0.26	0.012 J	<0.30	<0.40	<0.36	<0.64	0.065 J	<0.36
2-Methylphenol	310 (nc)	3,100 (nc)	--	mg/kg	<0.43	<0.26 L	<0.29 L	<0.30	<0.40	<0.36	<0.64	<0.41 L	<0.36
2-Nitroaniline	--												

Table D-11. Sediment Analytical Results, Western Burning Ground, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	WBGSW/SD07 0 - 0.5 06/26/02	WBGSW/SD08 0 - 0.5 06/25/02	WBGSW/SD09 0 - 0.5 06/25/02	WBGSW/SD10 0 - 0.5 06/26/02	WBGSD11 0 - 0.5 06/27/02	WBGSD12 0 - 0.5 06/26/02	WBGSW/SD13 0 - 0.5 06/26/02	WBGSW/SD14 0 - 0.5 06/25/02	WBGSW/SD15 0 - 0.5 06/27/02
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	0.39 J	<0.26	<0.29	<0.30	<0.40	0.065 J	<0.64	0.56	0.023 J
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	<0.43	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	0.098 J	<0.36
Dibenzofuran	--	--	--	mg/kg	0.10 J	<1.3	<1.4	<0.30	<0.40	<0.36	<0.64	0.039 J	<0.36
Diethylphthalate	4,900 {nc}	490,000 {max}	--	mg/kg	<0.43	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	<0.41	<0.36
Dimethylphthalate	--	--	--	mg/kg	<0.43	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	<0.41	<0.36
Di-n-Butylphthalate	610 {nc}	6,200 {nc}	--	mg/kg	<0.43	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	<0.41	<0.36
Dinitrotoluene Mix	0.71 {ca}	2.5 {ca}	--	mg/kg	<0.43	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	<0.41	<0.36
Di-n-Octylphthalate	--	--	--	mg/kg	<0.43	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	<0.41	<0.36
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	1.1	<0.26	<0.29	<0.30	<0.40	0.13 J	<0.64	0.63	0.050 J
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	0.18 J	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	0.071 J	<0.36
Hexachlorobenzene	0.3 {ca}	1.1 {ca}	--	mg/kg	<0.43	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	<0.41	<0.36
Hexachlorobutadiene	6.2 {ca**}	22 {ca*}	--	mg/kg	<0.43	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	<0.41	<0.36
Hexachlorocyclopentadiene	37 {nc}	370 {nc}	--	mg/kg	<0.43 J	<0.26 J	<0.29 J	<0.30 J	<0.40 J	<0.36 J	<0.64 J	<0.41 J	<0.36 J

Notes found at end of table.

Semivolatile Organics													
Hexachloroethane	35 {ca**}	120 {ca**}	--	mg/kg	<0.43	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	<0.41	<0.36
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	0.24 J	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	0.25 J	<0.36
Isophorone	510 {ca*}	1,800 {ca*}	--	mg/kg	<0.43	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	<0.41	<0.36
Naphthalene	3.9 {ca}	20 {ca}	--	mg/kg	0.27 J	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	0.058 J	<0.36
Nitrobenzene	3.1 {nc}	28 {nc}	--	mg/kg	<0.43	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	<0.41	<0.36
N-Nitroso-di-n-propylamine	0.069 {ca**}	0.25 {ca**}	--	mg/kg	<0.43	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	<0.41	<0.36
N-Nitrosodiphenylamine	99 {ca**}	350 {ca**}	--	mg/kg	<0.43	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	<0.41	<0.36
Pentachlorophenol	3 {ca}	9 {ca}	--	mg/kg	<2.1	<1.3	<1.4	<1.5	<2.0	<1.8	<3.1	<2.0	<1.8
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	1.1	<0.26	<0.29	<0.30	<0.40	0.066 J	<0.64	0.52	0.026 J
Phenol	1,800 {nc}	180,000 {max}	--	mg/kg	<0.43	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	0.086 B	<0.36
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	0.90	<0.26	<0.29	<0.30	<0.40	0.11 J	<0.64	0.73	0.030 J
Pyridine	7.8 {nc}	100 {nc}	--	mg/kg	<0.43	<0.26	<0.29	<0.30	<0.40	<0.36	<0.64	<0.41	<0.36
Inorganics													
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	7,110 J	29,200	12,700	18,700 J	14,600 J	19,300 J	5,400 J	14,300	22,000 J
Antimony	3.1 {nc}	41 {nc}	--	mg/kg	<1.25 L	<0.760 L	<0.850 L	3.10 L	<1.18 L	0.740 B	<1.89 L	0.570 B	<1.07 L
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	1.44 J	4.28 J	16.6 J	5.51 J	1.74 J	2.32 J	30.4 J	3.38 J	3.08 J
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	32.3	129	32.8	179	73.3	58.1	94.7	113	70.8
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	1.20 J	1.67 B	0.850 B	2.27	0.760 J	0.740 J	0.560 J	0.890 B	0.950 J
Cadmium	7 {nc}	81 {nc}	0.69	mg/kg	0.190 J	<0.150	<0.170	2.70	0.140 B	<0.210	<0.370	0.150 B	<0.210
Calcium	--	--	--	mg/kg	5,530	1,820 J	28,400 J	27,300	38,500	13,300	14,200	61,100 J	38,400
Chromium	280 {ca}	1,460 {ca}	65.3	mg/kg	116	41.2 J	39.0 J	15,400	22.4	26.9	5.17 B	21.1 J	28.4
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	7.10 J	16.1	8.79	84.1	6.50 J	8.30 J	9.60 J	7.60 J	9.30 J
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	6.36 J	17.4	8.48	188 J	12.8 J	11.9 J	13.7 J	11.1	17.2 J
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	19,700	31,200	32,700	44,100	15,600	15,200	293,000	14,200	19,300
Lead	400 {++}	800 {++}	26.8	mg/kg	22.5	16.3	44.6	109,000	29.4	28.5	5.61 B	18.7	29.0
Magnesium	--	--	--	mg/kg	1,870	4,810	5,510	4,170	3,580	1,680	863	2,500	10,200
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	43.6 B	479	339	295	126	264	2,310	1,540	206
Mercury	3.1 {sat}	0.13	0.13	mg/kg	<0.120	0.0600 J	0.0300 J	0.0600 J	0.0500 J	0.0500 J	<0.180	0.0900 J	0.0500 J
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	9.70 J	26.8	9.27	26.7	11.1	12.3	4.40 J	10.7	17.8
Potassium	--	--	--	mg/kg	290 J	2,160	777	831	734	854	320 J	786	1,270
Selenium	39 {nc}	510 {nc}	--	mg/kg	<2.50 L	<1.53 L	<1.71 L	<1.78 L	1.30 J	0.810 J	<3.79 L	<2.40 L	<2.14 L
Silver	39 {nc}	510 {nc}	--	mg/kg	<2.50 L	<1.53	<1.71	8.42 L	<2.35 L	<2.14 L	<3.79 L	<2.40	<2.14 L
Sodium	--	--	--	mg/kg	85.8	89.0 J	72.0 J	138	133	86.6	164	126 J	176
Thallium	0.51 {nc}	6.6 {nc}	2.11	mg/kg	0.130 J	0.220 B	0.100 B	0.260 J	0.170 J	0.210 J	0.740 J	0.200 B	0.200 J
Vanadium	55{nc}	720 {nc}	108	mg/kg	40.6	59.3	52.2	106 J	29.6	32.4	14.0 J	22.4	41.0
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	44.4 J	31.6 J	22.0 J	17,300	59.2 J	50.3 J	17.1 J	52.5 J	65.5 J
Miscellaneous													
Total Organic Carbon	--	--	--	mg/kg	53,700 K	NA	NA	28,600 K	24,200 K	NA	NA	NA	NA

mg/kg	Milligrams per kilogram.
[a]	USEPA Regional Screening Levels (USEPA 2008a).
[b]	Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.
{ca}	Carcinogen.
{nc}	Noncarcinogen.
*	Noncarcinogen screening level is less than one hundred times the carcinogen screening level.
**	Noncarcinogen screening level is less than ten times the carcinogen screening level.
{++}	The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.
{max}	Concentration may exceed ceiling limit.
{sat}	Screening level may exceed saturation concentration.
B (Inorganics)	Constituent concentration quantified as estimated.
B (Organics)	Constituent was detected in the associated method blank.
J	Constituent concentration quantified as estimated.
K	Estimated concentration bias high.
L	Estimated concentration bias low.
NA	Not Analyzed.
[3.3]	Bracketed concentration indicates laboratory analytical result for duplicate sample.
24,400	Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).
10.6 J	Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).
16	Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Table D-12. Surface Water Analytical Results, Western Burning Ground, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Date Collected:	Tapwater Screening Values [a]	Units	WBGW/SD07 06/26/02	WBGW/SD08 06/25/02	WBGW/SD09 06/25/02	WBGW/SD10 06/26/02	WBGW/SD13 06/26/02	WBGW/SD14 06/25/02	WBGW/SD15 06/27/02
Dioxin/Furan									
1,2,3,4,6,7,8-HpCDD	--	µg/L	<0.0000308	<0.0000253	<0.00001026	<0.00000196	NA	NA	NA
1,2,3,4,6,7,8-HpCDF	--	µg/L	<0.0000016	<0.00000136	<0.00000396	<0.00000126	NA	NA	NA
1,2,3,4,7,8,9-HpCDF	--	µg/L	<0.00000207	<0.00000176	<0.00000512	<0.00000164	NA	NA	NA
1,2,3,4,7,8-HxCDD	--	µg/L	<0.00000215	<0.00000257	<0.00000715	<0.00000177	NA	NA	NA
1,2,3,4,7,8-HxCDF	--	µg/L	<0.00000132	<0.00000121	<0.00000316	<0.00000114	NA	NA	NA
1,2,3,6,7,8-HxCDD	--	µg/L	<0.00000168	<0.00000201	<0.0000056	<0.00000138	NA	NA	NA
1,2,3,6,7,8-HxCDF	--	µg/L	<0.00000128	<0.00000118	<0.00000307	<0.00000111	NA	NA	NA
1,2,3,7,8,9-HxCDD	--	µg/L	<0.00000163	<0.00000195	<0.00000542	<0.00000134	NA	NA	NA
1,2,3,7,8,9-HxCDF	--	µg/L	<0.00000151	<0.00000139	<0.00000362	<0.00000131	NA	NA	NA
1,2,3,7,8-PeCDD	--	µg/L	<0.00000149	<0.00000179	<0.00000458	<0.00000114	NA	NA	NA
1,2,3,7,8-PeCDF	0.000015 (ca**)	µg/L	<0.00000094	<0.00000103	<0.00000274	<0.0000008	NA	NA	NA
2,3,4,6,7,8-HxCDF	--	µg/L	<0.0000015	<0.00000138	<0.0000036	<0.0000013	NA	NA	NA
2,3,4,7,8-PeCDF	0.0000015 (ca**)	µg/L	<0.00000098	<0.00000108	<0.00000286	<0.00000084	NA	NA	NA
2,3,7,8-TCDD	0.00000052 (ca*)	µg/L	<0.00000166	<0.00000156	<0.00000431	<0.00000137	NA	NA	NA
2,3,7,8-TCDF	0.00000045 (ca**)	µg/L	<0.00000138	<0.00000135	<0.00000287	<0.00000104	NA	NA	NA
OCDD	0.0015 (ca**)	µg/L	0.00001406 B	0.00003293 B	0.00003504 B	0.00002524 B	NA	NA	NA
OCDF	0.0015 (ca**)	µg/L	<0.00000544	<0.00000466	<0.00001257	<0.00000323	NA	NA	NA
Total HpCDDs	0.000045 (ca**)	µg/L	<0.00000308	<0.00000253	<0.00001026	<0.00000196	NA	NA	NA
Total HpCDFs	0.000045 (ca**)	µg/L	<0.0000016	<0.00000136	<0.00000396	<0.00000126	NA	NA	NA
Total HxCDDs	0.0000045 (ca**)	µg/L	<0.00000163	<0.00000195	<0.00000542	<0.00000134	NA	NA	NA
Total HxCDFs	0.0000045 (ca**)	µg/L	<0.00000128	<0.00000118	<0.00000307	<0.00000111	NA	NA	NA
Total PeCDDs	0.00000045 (ca**)	µg/L	<0.00000149	<0.00000179	<0.00000458	<0.00000114	NA	NA	NA
Total PeCDFs	--	µg/L	<0.00000094	<0.00000103	<0.00000274	<0.0000008	NA	NA	NA
Total TCDDs	--	µg/L	<0.00000166	<0.00000156	<0.00000431	<0.00000137	NA	NA	NA
Total TCDFs	--	µg/L	<0.00000138	<0.00000135	<0.00000287	<0.00000104	NA	NA	NA
Explosives									
1,3,5-Trinitrobenzene	1.100 (nc)	µg/L	<0.13	<0.13	<0.13	<0.13	NA	NA	NA
1,3-Dinitrobenzene	3.7 (nc)	µg/L	<0.13	<0.13	<0.13	<0.13	NA	NA	NA
2,4,6-Trinitrotoluene	2.2 (ca**)	µg/L	<0.26	<0.26	<0.26	<0.26	NA	NA	NA
2,4-Dinitrotoluene	73 (nc)	µg/L	<0.13	<0.13	<0.13	<0.13	NA	NA	NA
2,6-Dinitrotoluene	37 (nc)	µg/L	<0.26	<0.26	<0.26	<0.26	NA	NA	NA
2-Amino-4,6-Dinitrotoluene	73 (nc)	µg/L	<0.26	<0.26	<0.26	<0.26	NA	NA	NA
4-Amino-2,6-Dinitrotoluene	73 (nc)	µg/L	<0.26	<0.26	<0.26	<0.26	NA	NA	NA
Dinitrotoluene Mix	0.099 (ca)	µg/L	<0.26	<0.26	<0.26	<0.26	NA	NA	NA
HMX	1.800 (nc)	µg/L	<0.26	<0.26	<0.26	<0.26	NA	NA	NA
m-Nitrotoluene	--	µg/L	<0.52	0.36 J	0.38 J	<0.52	NA	NA	NA
Nitrobenzene	3.4 (nc)	µg/L	<0.26	<0.26	<0.26	<0.26	NA	NA	NA
Nitroglycerine	3.7 (nc)	µg/L	<0.97 L	<0.97 L	<0.97 L	<0.97 L	NA	NA	NA
o-Nitrotoluene	370 (nc)	µg/L	<0.52	<0.52	<0.52	<0.52	NA	NA	NA
Pentaerythritol Tetranitrate	--	µg/L	<0.97 L	<0.97 L	<0.97 L	<0.97 L	NA	NA	NA
p-Nitrotoluene	4.2 (ca*)	µg/L	<0.52	<0.52	<0.52	<0.52	NA	NA	NA
RDX	0.61 (ca)	µg/L	<0.26	<0.26	<0.26	<0.26	NA	NA	NA
Tetryl	150 (nc)	µg/L	<0.26	<0.26	<0.26	<0.26	NA	NA	NA
Herbicides									
2,4,5-T	370 (nc)	µg/L	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1
2,4,5-TP	290 (nc)	µg/L	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1
2,4-D	370 (nc)	µg/L	NA	3.68	NA	<0.5	<0.5	3.56	<0.5
2,4-DB	290 (nc)	µg/L	NA	<2	NA	<2	<2	<2	<2
Dalapon	1,100 (nc)	µg/L	NA	<2	NA	<2	<2	<2	<2
Dicamba	1,100 (nc)	µg/L	NA	<0.5	NA	<0.5 L	<0.5 L	<0.5	<0.5 L
Dichlorprop	--	µg/L	NA	<0.5	NA	<0.5	<0.5	<0.5	<0.5
Dinoseb	37 (nc)	µg/L	NA	<0.5	NA	<0.5	<0.5	<0.5	<0.5
MCPA	18 (nc)	µg/L	NA	<125	NA	<125	<125	<125	<125
MCPP	37 (nc)	µg/L	NA	54.1 J	NA	<125	<125	<125	<125
Organochlorine Pesticides									
4,4'-DDD	0.28 (ca**)	µg/L	NA	<0.02	NA	<0.02	<0.02	<0.02	<0.02
4,4'-DDE	0.2 (ca**)	µg/L	NA	<0.02	NA	<0.02	<0.02	<0.02	<0.02
4,4'-DDT	0.2 (ca*)	µg/L	NA	<0.02	NA	<0.02	<0.02	<0.02	<0.02
Aldrin	0.004 (ca)	µg/L	NA	<0.02	NA	<0.02	<0.02	<0.02	<0.02
Alpha-BHC	0.011 (ca**)	µg/L	NA	<0.02	NA	<0.02	<0.02	<0.02	<0.02
Alpha-Chlordane	--	µg/L	NA	<0.02	NA	<0.02	<0.02	<0.02	<0.02
Beta-BHC	0.037 (ca**)	µg/L	NA	<0.02	NA	<0.02	<0.02	<0.02	<0.02
Delta-BHC	--	µg/L	NA	<0.02	NA	<0.02	<0.02	<0.02	<0.02
Dieldrin	0.0042 (ca)	µg/L	NA	0.00521 J	NA	<0.02	0.00358 J	0.00901 J	<0.02
Endosulfan I	--	µg/L	NA	<0.02	NA	<0.02	<0.02	<0.02	<0.02
Endosulfan II	--	µg/L	NA	<0.02	NA	<0.02	<0.02	<0.02	<0.02
Endosulfan Sulfate	--	µg/L	NA	<0.02	NA	<0.02	<0.02	<0.02	<0.02
Endrin	11 (nc)	µg/L	NA	<0.02	NA	<0.02	<0.02	<0.02	<0.02
Endrin Aldehyde	--	µg/L	NA	<0.02	NA	<0.02	<0.02	<0.02	<0.02
Endrin Ketone	--	µg/L	NA	<0.02	NA	<0.02	<0.02	<0.02	<0.02
Gamma-BHC (Lindane)	0.061 (ca)	µg/L	NA	<0.02	NA	<0.02	<0.02	<0.02	<0.02
Gamma-Chlordane	--	µg/L	NA	<0.02	NA	<0.02	<0.02	<0.02	<0.02
Heptachlor	0.015 (ca)	µg/L	NA	<0.02	NA	<0.02	<0.02	<0.02	<0.02
Heptachlor Epoxide	0.0074 (ca*)	µg/L	NA	<0.02	NA	<0.02	<0.02	<0.02	<0.02
Methoxychlor	180 (nc)	µg/L	NA	<0.02	NA	<0.02	<0.02	<0.02	<0.02
Toxaphene	0.061 (ca**)	µg/L	NA	<1	NA	<1	<1	<1	<1
PAHs									
2-Methylnaphthalene	150 (nc)	µg/L	0.030 J	<0.050	<0.050	0.030 J	NA	NA	NA
Acenaphthene	2,200 (nc)	µg/L	0.020 J	<0.050	<0.050	<0.050	NA	NA	NA
Acenaphthylene	--	µg/L	<0.050	<0.050	<0.050	<0.050	NA	NA	NA
Anthracene	11,000 (nc)	µg/L	0.020 J	<0.050	<0.050	<0.050	NA	NA	NA
Benzo(a)anthracene	0.029 (ca**)	µg/L	<0.050	<0.050	<0.050	<0.050	NA	NA	NA
Benzo(a)pyrene	0.0029 (ca**)	µg/L	<0.050	<0.050	<0.050	<0.050	NA	NA	NA
Benzo(b)fluoranthene	0.029 (ca**)	µg/L	<0.050	<0.050	<0.050	<0.050	NA	NA	NA
Benzo(g,h,i)perylene	--	µg/L	<0.050 J	<0.050 J	<0.050 J	<0.050 J	NA	NA	NA
Benzo(k)fluoranthene	0.29 (ca**)	µg/L	<0.050	<0.050	<0.050	<0.050	NA	NA	NA
Chrysene	2.9 (ca**)	µg/L	<0.050	<0.050	<0.050	<0.050	NA	NA	NA
Dibenzo(a,h)anthracene	0.0029 (ca**)	µg/L	<0.050 J	<0.050 J	<0.050 J	<0.050 J	NA	NA	NA
Fluoranthene	1,500 (nc)	µg/L	<0.050	<0.050	<0.050	<0.050	NA	NA	NA
Fluorene	1,500 (nc)	µg/L	0.030 J	<0.050	<0.050	<0.050	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.029 (ca**)	µg/L	<0.050 J	<0.050 J	<0.050 J	<0.050 J	NA	NA	NA
Naphthalene	6.2 (nc)	µg/L	0.020 B	<0.050	<0.050	0.040 B	NA	NA	NA
Phenanthrene	--	µg/L	0.030 J	<0.050	<0.050	<0.050	NA	NA	NA
Pyrene	1,100 (nc)	µg/L	<0.050	<0.050	<0.050	<0.050	NA	NA	NA

Notes found at end of table.

Table D-12. Surface Water Analytical Results, Western Burning Ground, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Date Collected:	Tapwater Screening Values [a]	Units	WBGWS/SD07 06/26/02	WBGWS/SD08 06/25/02	WBGWS/SD09 06/25/02	WBGWS/SD10 06/26/02	WBGWS/SD13 06/26/02	WBGWS/SD14 06/25/02	WBGWS/SD15 06/27/02
PCBs									
Aroclor-1016	0.96 (ca**)	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10 L	<0.10	<0.10
Aroclor-1221	0.0068 (ca**)	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20 L	<0.20	<0.20
Aroclor-1232	0.0068 (ca**)	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10 L	<0.10	<0.10
Aroclor-1242	0.034 (ca**)	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10 L	<0.10	<0.10
Aroclor-1248	0.034 (ca**)	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10 L	<0.10	<0.10
Aroclor-1254	0.034 (ca*)	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10 L	<0.10	<0.10
Aroclor-1260	0.034 (ca**)	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10 L	<0.10	<0.10
Volatile Organics									
1,1,1-Trichloroethane	9,100 (nc)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	0.067 (ca**)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	0.24 (ca)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethane	2.4 (ca)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethene	340 (nc)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	0.15 (ca)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	0.39 (ca*)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Butanone	7,100 (nc)	µg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
2-Hexanone	--	µg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
4-Methyl-2-pentanone	2,000 (nc)	µg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
Acetone	22,000 (nc)	µg/L	2.8 J	<4.0 J	<4.0 J	<4.0 J	<4.0 J	<4.0 J	<4.0 J
Benzene	0.41 (ca)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	1.1 (ca)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	8.5 (ca*)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	8.7 (nc)	µg/L	<1.0 L	<1.0 L	<1.0 L	<1.0 L	<1.0 L	<1.0 L	<1.0 L
Carbon Disulfide	1,000 (nc)	µg/L	0.23 B	0.13 B	0.12 B	0.25 B	0.21 B	0.18 B	0.070 B
Carbon Tetrachloride	0.2 (ca)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	91 (nc)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	21,000 (nc)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroform	0.19 (ca)	µg/L	0.13 J	0.60 J	0.47 J	1.1	<1.0	<1.0	<1.0
Chloromethane	1.8 (ca)	µg/L	<1.0 L	<1.0 L	<1.0 L	<1.0 L	<1.0 L	<1.0 L	<1.0 L
cis-1,2-Dichloroethene	370 (nc)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	0.12 J	<1.0
cis-1,3-Dichloropropene	--	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dibromochloromethane	0.8 (ca)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	1.5 (ca)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
m,p-Xylene	--	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Methylene Chloride	4.8 (ca)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
o-Xylene	1,400 (nc)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Styrene	1,600 (nc)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethene	0.11 (ca)	µg/L	<1.0	<1.0	<1.0	<1.0	0.16 J	<1.0	<1.0
Toluene	2,300 (nc)	µg/L	<1.0	<1.0	<1.0	0.21 J	<1.0	<1.0	<1.0
trans-1,2-Dichloroethene	110 (nc)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
trans-1,3-Dichloropropene	--	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethene	1.7 (ca)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	0.11 J	<1.0
Vinyl Chloride	0.016 (ca)	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes (total)	200 (nc)	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Semivolatile Organics									
1,2,4-Trichlorobenzene	19 (ca*)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichlorobenzene	370 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	0.21 J	<5.0	<5.0
1,3-Dichlorobenzene	--	µg/L	<5.0	<5.0	<5.0	<5.0	0.21 J	<5.0	<5.0
1,4-Dichlorobenzene	0.43 (ca)	µg/L	<5.0	<5.0	<5.0	<5.0	0.28 J	<5.0	<5.0
2,4,5-Trichlorophenol	3,700 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,4,6-Trichlorophenol	6.1 (ca**)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,4-Dichlorophenol	110 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,4-Dimethylphenol	730 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,4-Dinitrophenol	73 (nc)	µg/L	<25	<25	<25	<25	<25	<25	<25
2,4-Dinitrotoluene	73 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2,6-Dinitrotoluene	37 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Chloronaphthalene	2,900 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Chlorophenol	180 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Methylnaphthalene	150 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Methylphenol	1,800 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Nitroaniline	--	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Nitrophenol	--	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
3,3'-Dichlorobenzidine	0.15 (ca**)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
3-Nitroaniline	--	µg/L	<5.0 J	<5.0	<5.0	<5.0 J	<5.0 J	<5.0	<5.0 J
4,6-Dinitro-2-methylphenol	--	µg/L	<25	<25	<25	<25	<25	<25	<25
4-Bromophenyl-phenylether	--	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
4-Chloro-3-Methylphenol	--	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
4-Chloroaniline	150 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
4-Chlorophenyl-phenylether	--	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
4-Methylphenol	180 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
4-Nitroaniline	--	µg/L	<5.0 J	<5.0 J	<5.0 J	<5.0 J	<5.0 J	<5.0 J	<5.0 J
4-Nitrophenol	--	µg/L	<25	<25	<25	<25	<25	<25	<25
Acenaphthene	2,200 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acenaphthylene	--	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Anthracene	11,000 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Benzo(a)anthracene	0.029 (ca**)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Benzo(a)pyrene	0.0029 (ca**)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Benzo(b)fluoranthene	0.029 (ca**)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Benzo(g,h,i)perylene	--	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Benzo(k)fluoranthene	0.29 (ca**)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Benzoic Acid	150,000 (max)	µg/L	<25	5.2 J	<25	5.2 J	<25	6.7 J	<25
Benzyl Alcohol	18,000 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
bis(2-Chloroethoxy)methane	110 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
bis(2-Chloroethoxy)ether	0.012 (ca**)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
bis(2-Chloroisopropoxy)ether	--	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
bis(2-Ethylhexyloxy)phthalate	4.8 (ca)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	2.6 J	<5.0
Butylbenzylphthalate	7,300 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	0.63 B	<5.0
Carbazole	3.4 (ca**)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Chrysene	2.9 (ca**)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Dibenzo(a,h)anthracene	0.0029 (ca**)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Dibenzofuran	--	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Diethylphthalate	29,000 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Dimethylphthalate	--	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Di-n-Butylphthalate	3,700 (nc)	µg/L	<5.0	0.60 B	0.91 B	<5.0	<5.0	0.67 B	<5.0
Dinitrotoluene Mix	0.099 (ca)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Di-n-Octylphthalate	--	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Fluoranthene	1,500 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0

Notes found at end of table.

Table D-12. Surface Water Analytical Results, Western Burning Ground, 2002 Shaw Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Date Collected:	Tapwater Screening Values [a]	Units	WBGSW/SD07 06/26/02	WBGSW/SD08 06/25/02	WBGSW/SD09 06/25/02	WBGSW/SD10 06/26/02	WBGSW/SD13 06/26/02	WBGSW/SD14 06/25/02	WBGSW/SD15 06/27/02
Semivolatile Organics									
Fluorene	1,500 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hexachlorobenzene	0.042 (ca)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hexachlorobutadiene	0.86 (ca*)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hexachlorocyclopentadiene	220 (nc)	µg/L	<5.0 J	<5.0 J	<5.0 J	<5.0 J	<5.0 J	<5.0 J	<5.0 J
Hexachloroethane	4.8 (ca**)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Indeno(1,2,3-cd)pyrene	0.029 (ca**)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Isophorone	71 (ca)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Naphthalene	6.2 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Nitrobenzene	3.4 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
N-Nitroso-di-n-propylamine	0.0096 (ca**)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
N-Nitrosodiphenylamine	14 (ca**)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Pentachlorophenol	0.56 (ca)	µg/L	<25	<25	<25	<25	<25	<25	<25
Phenanthrene	--	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Phenol	11,000 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Pyrene	1,100 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Pyridine	37 (nc)	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Inorganics									
Aluminum	37,000 (nc)	µg/L	284	200 J	150 J	304	811	120 J	428
Antimony	15 (nc)	µg/L	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00
Arsenic	0.045 (ca)	µg/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Barium	7,300 (nc)	µg/L	70.7	80.3	80.8	84.9	148	101	110
Beryllium	73 (nc)	µg/L	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Cadmium	18 (nc)	µg/L	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Calcium	--	µg/L	73,800	59,300	59,000	61,500	90,700	70,700	86,100
Chromium	--	µg/L	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Cobalt	--	µg/L	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0
Copper	1,500 (nc)	µg/L	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0
Iron	26,000 (nc)	µg/L	204	303	281	428	50,900	131	310
Lead	--	µg/L	0.370 B	1.20 B	1.30 B	28.9	0.170 B	<2.00	0.210 B
Magnesium	--	µg/L	13,900	17,200	17,000	17,100	21,000	15,800	20,200
Manganese	880 (nc)	µg/L	5.30 J	10.3	21.7	23.6	1,470	47.4	7.40 J
Mercury	0.63 (nc)	µg/L	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Nickel	730 (nc)	µg/L	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0	<40.0
Potassium	--	µg/L	3,710	3,790	3,540	3,820	4,080	2,500 J	3,300
Selenium	180 (nc)	µg/L	<5.00	<5.00	<5.00	<5.00	<5.00	0.440 B	<5.00
Silver	180 (nc)	µg/L	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Sodium	--	µg/L	22,200	36,600	36,200	35,900	37,600	29,000	63,900
Thallium	2.4 (nc)	µg/L	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Vanadium	180 (nc)	µg/L	<50.0	<50.0	<50.0	<50.0	<50.0	16.0 J	<50.0
Zinc	11,000 (nc)	µg/L	18.0 J	<20.0	<20.0	20.6	<20.0	<20.0	<20.0
Perchlorate									
Perchlorate	26 (nc)	µg/L	<1	<1	<1	<1	<1	1.71	<1
Miscellaneous									
Hardness	--	µg/L	242,000	219,000	217,000	224,000	313,000	242,000	298,000

µg/L Micrograms per liter.

[a] USEPA Regional Screening Levels (USEPA 2008a). Adjusted tap-water screening levels used to assess surface water at the NRU.

{ca} Carcinogen.

{nc} Noncarcinogen.

* Noncarcinogen screening level is less than one hundred times the carcinogen screening level.

** Noncarcinogen screening level is less than ten times the carcinogen screening level.

{max} Concentration may exceed ceiling limit.

B (Inorganics) Constituent concentration quantified as estimated.

B (Organics) Constituent was detected in the associated method blank.

J Constituent concentration quantified as estimated.

K Estimated concentration bias high.

L Estimated concentration bias low.

NA Not Analyzed.

[3.3] Bracketed concentration indicates laboratory analytical result for duplicate sample.

24,400 Highlighted value indicates constituent concentration is above adjusted tap water RSL.

Table D-13. XRF Field Screening Results, Western Burning Ground, 2004 Shaw Additional Characterization Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Sample Location	XRF Lead Concentration (mg/kg)	Cooresponding Laboratory Sample ID	Sample Location	XRF Lead Concentration (mg/kg)	Cooresponding Laboratory Sample ID
Unlined Drainage Ditch			Unlined Drainage Ditch		
SB1A	104	-	WBGSB26A	< 55	WBGSB26A
SB1B	< 70	-	--	--	WBGSB27A
SB2A	411	-	WBGSB28A	120	WBGSB28A
SB2B	< 63	-	DD1	< 52	WBGSB40A
SB3A	< 82	-	DD2	< 49	
SB4A	165	-	DD3	< 49	WBGSB39A
SB4B	< 52	-	Slope to Pond		
SB5A	< 70	-	SL1	98	WBGSB34A
SB5B	922	-	SL3	69.9	WBGSB35A
SB6A	< 66	-	SL5	< 61	
SB6B	< 55	WBGSB49B	SL7	< 57	WBGSB36A
SB7A	< 78	-	SL9	< 65	
SB7B	< 68	-	SL10	< 56	WBGSB37A
SB8A	< 60	-	SL11	< 63	WBGSB41A
SB8B	647	-	SL12	< 53	WBGSB38A
SB8C	< 62	WBGSB46C	SL13	< 41	
SB9A	< 64	-	SL14	< 55	WBGSB42A
SB9B	< 57	WBGSB52B	SL15	52	WBGSB29A
SB10A	< 59	WBGSB45A	SL16	< 54	WBGSB30A
SB10B	< 75	WBGSB45B	Swale to Pond		
SB11A	< 66	-	SW1	< 49	WBGSB33A
SB11B	1,010	-	SW3	72.5	
SB11C	< 80	WBGSB47C	SW5	76.5	
SB12A	< 61	WBGSB43A	SW7	< 54	WBGSB32A
SB12B	< 65	WBGSB43B	SW9	< 62	
SB13A	< 70	-	SW11	< 57	
SB13B	< 58	WBGSB51B	SW13	< 62	WBGSB31A
SB14A	< 63	-	Pond Sediment		
SB14B	538	-	SD1	18,300	
SB14C	< 83	WBGSB48C	SD2	4,970	
SB15A	< 61	-	SD3	213	
SB15B	< 87	-	SD4	524	
SB16A	< 54	-	SD5	332	
SB16B	< 63	WBGSB50B	SD6	242	
SB17A	< 67	-	SD7	657	
SB17B	< 54	-	SD8	2,100	
SB18A	< 58	-	SD9	117	WBGSD17
SB18B	< 56	-	SD10	61.2	WBGSD18
SB19A	< 61	-	SD11	< 28	WBGSD19
SB19B	< 60	-	SD12	< 71	WBGSD20
SB20A	< 63	-	SD13	< 53	WBGSD21
SB20B	< 65	-	SD14	< 48	WBGSD22
SB21A	< 59	-	--	--	WBGSD16
SB21B	< 71	-	Pond Perimeter		
SB22A	< 65	-	PD1	< 39	-
SB22B	< 65	-	PD2	< 50	-
SB23A	< 66	-	PD3	< 55	-
SB23B	< 100	-			
SB24A	< 62	WBGSB44A			
SB24B	< 61	WBGSB44B			
SB25A	< 73	-			
SB28A	120	-			
SB29A	< 60	-			
SB32A	65.8	-			
SB33A	206	-			
SB33B	< 61	-			
SB34A	477	-			
SB35A	< 55	-			

mg/kg

Milligrams per kilogram.

538

Highlighted value indicates constituent concentration is above residential adjusted soil RSL (USEPA 2008a).

1,010

Highlighted value indicates constituent concentration is above industrial adjusted soil RSL (USEPA 2008a).

16

Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Note: Inorganics facility-wide background value taken from *Facility-Wide Background Study Report*, IT Corporation, 2001.

Table D-14. Soil Analytical Results, Western Burning Ground, 2004 Shaw Additional Characterization Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	WBGSB26 0 - 0.5 07/16/04	WBGSB27 0 - 0.5 07/16/04	WBGSB28 0 - 0.5 07/16/04	WBGSB29 0 - 0.5 07/19/04	WBGSB30 0 - 0.5 07/19/04	WBGSB31 0 - 0.5 07/19/04	WBGSB32 0 - 0.5 07/19/04	WBGSB33 0 - 0.5 07/19/04	WBGSB34 0 - 0.5 07/19/04	WBGSB35 0 - 0.5 07/20/04	WBGSB36 0 - 0.5 07/20/04	WBGSB37 0 - 0.5 07/20/04	WBGSB38 0 - 0.5 07/19/04	WBGSB39 0 - 0.5 07/19/04	WBGSB40 0 - 0.5 07/19/04	WBGSB41 0 - 0.5 07/19/04
PAHs																				
2-Methylnaphthalene	31 {nc}	440 {sat}	--	mg/kg	<0.0091	<0.0094	<0.0085 [0.016]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	340 {nc}	3,300 {nc}	--	mg/kg	<0.0091	<0.0094	<0.0085 [<0.0087]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	340 {nc}	3,300 {nc}	--	mg/kg	<0.0091	<0.0094	<0.0085 [<0.0087]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	1,700 {nc}	170,000 {max}	--	mg/kg	0.015	0.052	<0.0085 [<0.0087]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	0.089	0.42	0.021 J [0.036 J]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	0.091	0.51	0.029 J [0.050 J]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	0.17	0.64	0.046 J [0.081 J]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	0.074	0.27	0.027 [0.037]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	0.044	0.17	0.017 [0.025]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	0.11	0.33	0.026 [0.043]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	<0.0091	0.080	<0.0085 [<0.0087]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	0.23	0.61	0.048 [0.067]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	<0.0091	<0.0094	<0.0085 [<0.0087]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	0.069	0.27	0.025 [0.035]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	3.9 {nc}	20 {nc}	--	mg/kg	<0.0091	<0.0094	<0.0085 [0.0092]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	0.087	0.20	0.016 [0.023]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	0.14 J	0.39	0.028 J [0.041]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs																				
Aroclor-1016	0.39 {nc}	21 {ca**}	--	mg/kg	<0.045	<0.047	<0.042 [<0.044]	<0.043	<0.044	<0.041	<0.044	<0.050	<0.040	<0.044	<0.045	<0.042	<0.041	<0.044	<0.040	<0.040
Aroclor-1221	0.17 {ca**}	0.62 {ca**}	--	mg/kg	<0.045	<0.047	<0.042 [<0.044]	<0.043	<0.044	<0.041	<0.044	<0.050	<0.040	<0.044	<0.045	<0.042	<0.041	<0.044	<0.040	<0.040
Aroclor-1232	0.17 {ca**}	0.62 {ca**}	--	mg/kg	<0.045	<0.047	<0.042 [<0.044]	<0.043	<0.044	<0.041	<0.044	<0.050	<0.040	<0.044	<0.045	<0.042	<0.041	<0.044	<0.040	<0.040
Aroclor-1242	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.045	<0.047	<0.042 [<0.044]	<0.043	<0.044	<0.041	<0.044	<0.050	<0.040	<0.044	<0.045	<0.042	<0.041	<0.044	<0.040	<0.040
Aroclor-1248	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.045	<0.047	<0.042 [<0.044]	<0.043	<0.044	<0.041	<0.044	<0.050	<0.040	<0.044	<0.045	<0.042	<0.041	<0.044	<0.040	<0.040
Aroclor-1254	0.22 {ca**}	0.74 {ca*}	--	mg/kg	<0.045	<0.047	<0.042 [<0.044]	<0.043	<0.044	<0.041	<0.044	<0.050	<0.040	<0.044	<0.045	<0.042	<0.041	<0.044	<0.040	<0.040
Aroclor-1260	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.045	<0.047	<0.042 [<0.044]	<0.043	<0.044	<0.041	<0.044	<0.050	<0.040	<0.044	<0.045	<0.042	<0.041	<0.044	<0.040	<0.040
Inorganics																				
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	15,700	19,000	21,800 [22,400]	40,000	34,300	24,200	28,500	20,100	30,400	33,700	39,000	26,300	24,400	16,500	15,700	27,000
Antimony	3.1 {nc}	41 {nc}	--	mg/kg	<0.360 L	1.60 B	0.610 B [0.570 B]	0.830 B	0.610 B	0.850 B	0.470 B	0.760 B	0.520 B	<0.300	0.800 B	0.530 J	0.420 J	<0.330	0.490 J	0.360 J
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	8.30	9.50	9.40 [9.90]	10.8	13.3	9.40	9.80	7.90	10.8	8.60	15.8	10.2	9.00	6.10	5.60	7.20
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	45.5	128	81.7 [86.5]	72.9	55.8	34.1	74.1	53.8	54.9	83.5	56.4	34.4	43.5	72.5	39.2	51.6
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	0.830 J	0.920 J	1.30 J [1.40 J]	2.80	2.90	0.630	1.40	1.30	1.60	2.30	3.10	1.40	1.10	0.870	0.740	1.60
Cadmium	7 {nc}	81 {nc}	0.69	mg/kg	<0.0380	0.380 J	0.0840 J [0.0880 J]	0.420 J	0.370 J	0.200 J	0.400 J	0.300 J	0.390 J	0.0820 B	0.590 J	<0.0310	<0.0320	0.0780 B	<0.0330	<0.0290
Calcium	--	--	--	mg/kg	1,650	8,840	3,980 [4,000]	5,740 J	4,330 J	1,230 J	4,030 J	5,320 J	3,390 J	7,550	7,950 J	3,130	2,920	2,400	1,150	1,600
Chromium	280 {ca}	1,460 {ca}	65.3	mg/kg	26.7	44.8	45.2 [45.5]	59.5	54.8	35.6	43.4	32.7	49.6	51.8 J	58.5	39.7 J	37.4 J	24.2 J	25.0 J	46.8 J
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	14.5	10.2	9.80 [11.2]	21.1	30.6	10.8	13.6	11.1	16.5	16.6	30.6	17.4	13.6	7.50	16.0	13.3
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	15.6	47.1	28.6 [29.8]	31.2	28.3	17.5	21.0	20.5	22.6	24.0	31.4	25.2	19.3	16.2	11.7	19.3
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	24,900	24,600	28,300 [29,200]	37,800	37,000	30,900	31,100	21,600	33,300	30,000	41,400	32,000	29,200	17,600	18,300	32,400
Lead	400 {++}	800 {++}	26.8	mg/kg	32.5	279	114 [112]	33.5	41.0	19.6	31.8	43.1	85.6	54.9	45.8	29.1	27.8	38.0	28.7	19.3
Magnesium	--	--	--	mg/kg	1,220 K	3,390	3,140 [3,230]	9,210	4,710	752	6,230	3,010	4,230	12,200	6,750	2,750	2,800	1,530	1,780	4,850
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	637	428	251 [294]	280	283	180	364	224	212	233	282	154	166	292	449	193
Mercury	3.1 {sat}	3.1 {sat}	0.13	mg/kg	0.0610	0.0700	0.0670 [0.0600]	0.120	0.130	0.0800	0.0970	0.0850	0.0920	0.110	0.130	0.100	0.0760 B	0.0360 B	0.0410 B	0.0530 B
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	14.9	17.3	20.7 [21.4]	35.2	33.6	12.1	22.6	16.6	24.3	29.6	36.8	21.1	19.2	12.3	12.9	24.1
Potassium	--	--	--	mg/kg	702	1,120	1,200 [1,250]	2,910	2,050	792	1,620	1,200	1,690	2,530	2,820	1,600	1,470	612	764	1,270
Selenium	39 {nc}	510 {nc}	--	mg/kg	1.10 B	0.750 B	0.860 B [0.720 B]	0.830 B	1.00 B	0.740 B	<0.660	<0.740	0.730 B	<0.590	0.850 B	0.780 B	<0.590	<0.640	<0.600	0.740 B
Silver	39 {nc}	510 {nc}	--	mg/kg	<0.140	<0.140	<0.130 [<0.140]	<0.240	<0.280	<0.120	<0.130	<0.150	<0.120	<0.120	<0.280	<0.120	<0.120	<0.130	<0.120	<0.110
Sodium	--	--	--	mg/kg	62.1 B	136 B	84.5 B [77.9 B]	72.0 B	72.5 B	75.8 B	80.7 B	101 B	70.6 B	51.2 J	82.7 B	54.2 J	58.4 B	75.8 B	43.0 B	43.0 B
Thallium	0.51 {nc}	6.6 {nc}	2.11	mg/kg	<0.420	<0.430	<0.380 [<0.410]	<0.370	<0.420	<0.360	<0.400	<0.450	<0.350	<0.360	<0.420	<0.350	<0.360	<0.390	<0.360	<0.320
Vanadium	55{nc}	720 {nc}	108	mg/kg	46.1	48.0	53.9 [56.5]	80.9	74.2	63.5	63.0	46.1	66.5	62.1	84.7	63.4	58.4	37.5	43.0	65.6
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	43.6	459	202 [200]	55.9	51.6	28.7	51.9	56.3	48.7	45.5	52.0	41.0	37.2	67.5	34.1	32.1
Miscellaneous																				
Percent Solids	--	--	--	%	73	71	79 [77]	78	76	81	76	67	83	75	74	79	82	76	83	84

Notes found at end of table.

Table D-14. Soil Analytical Results, Western Burning Ground, 2004 Shaw Additional Characterization Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	WBGSB42 0 - 0.5 07/19/04	WBGSB43 0 - 0.5 07/19/04	WBGSB43 4 - 5 07/19/04	WBGSB44 0 - 0.5 07/19/04	WBGSB44 1 - 2 07/19/04	WBGSB45 0 - 0.5 07/19/04	WBGSB45 4 - 5 07/19/04	WBGSB46 4 - 5 07/19/04	WBGSB47 5 - 6 07/19/04	WBGSB48 4 - 5 07/19/04	WBGSB49 1 - 2 07/19/04	WBGSB50 3 - 4 07/19/04	WBGSB51 3 - 4 07/19/04	WBGSB52 3 - 4 07/19/04	WBGSB53 0 - 0.5 09/14/04
PAHs																			
2-Methylnaphthalene	31 {nc}	440 {sat}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	340 {nc}	3,300 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	340 {nc}	3,300 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	1,700 {nc}	170,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	3.9 {nc}	20 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs																			
Aroclor-1016	0.39 {nc}	21 {ca**}	--	mg/kg	<0.043	<0.041 [<0.041]	<0.043	<0.040	<0.037	<0.040	<0.042	<0.044	<0.043	<0.043	<0.043 [<0.040]	<0.042	<0.041	<0.041	NA
Aroclor-1221	0.17 {ca**}	0.62 {ca**}	--	mg/kg	<0.043	<0.041 [<0.041]	<0.043	<0.040	<0.037	<0.040	<0.042	<0.044	<0.043	<0.043	<0.043 [<0.040]	<0.042	<0.041	<0.041	NA
Aroclor-1232	0.17 {ca**}	0.62 {ca**}	--	mg/kg	<0.043	<0.041 [<0.041]	<0.043	<0.040	<0.037	<0.040	<0.042	<0.044	<0.043	<0.043	<0.043 [<0.040]	<0.042	<0.041	<0.041	NA
Aroclor-1242	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.043	<0.041 [<0.041]	<0.043	<0.040	<0.037	<0.040	<0.042	<0.044	<0.043	<0.043	<0.043 [<0.040]	<0.042	<0.041	<0.041	NA
Aroclor-1248	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.043	<0.041 [<0.041]	<0.043	<0.040	<0.037	<0.040	<0.042	<0.044	<0.043	<0.043	<0.043 [<0.040]	<0.042	<0.041	<0.041	NA
Aroclor-1254	0.22 {ca**}	0.74 {ca*}	--	mg/kg	<0.043	<0.041 [<0.041]	<0.043	<0.040	<0.037	<0.040	<0.042	<0.044	<0.043	<0.043	<0.043 [<0.040]	<0.042	<0.041	<0.041	NA
Aroclor-1260	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.043	<0.041 [<0.041]	<0.043	<0.040	<0.037	<0.040	<0.042	<0.044	<0.043	<0.043	<0.043 [<0.040]	<0.042	<0.041	<0.041	NA
Inorganics																			
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	29,800	17,500 [16,500]	31,700	23,600	13,200	19,600	31,900	31,000	53,700	31,600	23,800 [24,000]	38,200	29,200	26,700	24,200 [22,000]
Antimony	3.1 {nc}	41 {nc}	--	mg/kg	<0.320	0.530 L [0.580 B]	<0.340	0.320 J	0.330 B	0.560 J	0.600 B	<0.340	0.950 B	1.10 B	0.390 B [0.650 B]	<0.600	0.520 B	0.410 B	0.520 B [<0.310 L]
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	12.9	4.50 [4.70]	12.6	9.80	5.30	8.70	12.7	5.90	10.1	10.3	9.90 [9.20]	12.8	8.00	8.70	10.3 [9.80]
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	43.0	90.0 [93.9]	20.6	31.0	35.1	33.6	39.6	58.6	181	95.6	27.0 [29.8]	28.7	62.0	88.1	32.8 [31.7]
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	1.90	1.30 [1.20]	1.10	0.890	0.550	0.810	1.40	2.70	3.30	1.40	0.880 [0.980]	0.890	1.40	1.80	0.990 [0.980]
Cadmium	7 {nc}	81 {nc}	0.69	mg/kg	<0.0340	0.0660 B [0.220 J]	<0.0370	<0.0330	<0.0290	<0.0310	<0.0350	<0.0360	0.0900 B	0.0740 B	<0.0300 [0.200 J]	<0.0640	0.240 B	0.300 J	0.140 J [0.0690 J]
Calcium	--	--	--	mg/kg	3,840	3,860 [3,760 J]	1,060	1,220	1,460	1,020	1,310	1,800	5,180	7,160	733 [691 J]	1,490	5,150	14,700	2,280 [2,250]
Chromium	280 {ca}	1,460 {ca}	65.3	mg/kg	46.1 J	102 J [33.3 J]	49.4 J	43.9 J	21.5 J	33.2 J	44.8 J	75.3 J	80.6 J	57.3 J	35.6 J [34.6]	52.2	40.3	62.8	38.4 [36.9]
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	25.0	11.0 [11.4]	20.2	13.4	7.20	11.5	16.5	23.2	12.9	12.5	7.20 [9.10]	18.0	17.9	9.30	10.3 [10.8]
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	24.6	12.9 [12.7]	25.8	23.1	9.50	16.6	24.6	40.9	35.5	258	18.1 [18.2]	26.2	19.0	18.7	19.6 [19.2]
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	37,100	19,300 [17,900]	47,400	40,600	19,500	28,200	44,800	52,100	47,700	38,800	35,000 [33,200]	51,500	31,100	23,700	33,500 [32,700]
Lead	400 {++}	800 {++}	26.8	mg/kg	35.5	19.4 [19.7]	27.2	59.6	19.5	29.1	24.3	17.4	19.8	163	18.6 [21.8]	18.9	17.0	20.7	33.3 [32.0]
Magnesium	--	--	--	mg/kg	3,490	5,340 [5,130]	1,190	1,260	583	865	1,350	3,270	38,500	7,490	758 [807]	1,010	3,880	16,500	1,720 K [1,800 K]
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	238	416 [430]	146	158	171	184	203	489	294	230	127 [176]	262	145	220	136 [136]
Mercury	3.1 {sat}	3.1 {sat}	0.13	mg/kg	0.110 B	0.0320 B [0.0300 J]	0.110 B	0.0640 B	0.0410 B	0.0590 B	0.0860 B	0.0500 B	0.0330 B	0.0300 B	0.110 B [0.0570 J]	0.0450	0.0580	0.0650	0.0650 [0.0690]
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	27.1	20.4 [14.6]	22.7	16.4	8.00	13.3	26.8	38.2	47.5	26.7	16.1 [16.9]	21.1	23.0	23.7	16.6 [15.7]
Potassium	--	--	--	mg/kg	1,600	929 K [925 K]	1,060	1,030	602	745	1,160	1,020	2,230	1,380	990 [1,020]	1,130	1,480	1,290	1,170 K [1,150 K]
Selenium	39 {nc}	510 {nc}	--	mg/kg	<0.610	<0.560 [<0.600]	1.40 J	<0.590	<0.520	0.740 B	1.10 J	<0.670	<0.650	0.610 J	0.840 J [0.950 J]	<1.20	0.740 J	<0.600	0.830 J [1.10 J]
Silver	39 {nc}	510 {nc}	--	mg/kg	<0.250	<0.110 [<0.120]	<0.140	<0.240	<0.110	<0.120	<0.130	<1.40 L	<0.130	<0.120	<0.110 [<0.120]	<0.120 L	<0.130 L	<0.120 L	<0.120 [<0.120]
Sodium	--	--	--	mg/kg	47.9 B	58.1 B [81.8 B]	48.6 B	58.9 B	55.6 B	57.2 B	51.4 B	<33.8	77.6 B	99.8 B	53.9 B [88.4 B]	88.4 B	81.6 B	84.4 B	66.5 B [65.6 B]
Thallium	0.51 {nc}	6.6 {nc}	2.11	mg/kg	<0.370	<0.340 [<0.370]	<0.410	<0.360	<0.320	<0.350	<0.390	<0.410	<0.400	<0.360	<0.340 [<0.350]	<0.710	<0.380	<0.360	<0.370 [<0.360]
Vanadium	55{nc}	720 {nc}	108	mg/kg	73.1	46.9 [39.3]	88.5	67.5	38.7	56.5	83.4	96.0	99.8	73.3	68.5 [64.5]	98.6	63.4	56.8	65.6 [64.0]
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	41.8	41.9 [44.0]	43.8	68.6	61.6	42.7	38.2	32.0	67.1	315	31.3 [30.6]	37.2	32.4	39.6	35.9 [33.2]
Miscellaneous																			
Percent Solids	--	--	--	%	77	82 [82]	78	83	89	84	80	76	77	79	78 [84]	79	82	82	83 [84]

mg/kg	Milligrams per kilogram.
[a]	USEPA Regional Screening Levels (USEPA 2008a).
[b]	Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.
{ca}	Carcinogen.
{nc}	Noncarcinogen.
*	Noncarcinogen screening level is less than one hundred times the carcinogen screening level.
**	Noncarcinogen screening level is less than ten times the carcinogen screening level.
{++}	The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.
{max}	Concentration may exceed ceiling limit.
{sat}	Screening level may exceed saturation concentration.
B (Inorganics)	Constituent concentration quantified as estimated.
B (Organics)	Constituent was detected in the associated method blank.
J	Constituent concentration quantified as estimated.
K	Estimated concentration bias high.
L	Estimated concentration bias low.
NA	Not Analyzed.
[3.3]	Bracketed concentration indicates laboratory analytical result for duplicate sample.
24,400	Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).
10.6 J	Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).
16	Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Table D-15. Sediment Analytical Results, Western Burning Ground, 2004 Shaw Additional Characterization Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values- Residential [a]	Adjusted Soil Screening Values- Industrial [a]	Facility-Wide Background Values [b]	Units	WBGSD16 0 - 0.5 07/16/04	WBGSD17 0 - 0.5 07/22/04	WBGSD18 0 - 0.5 07/22/04	WBGSD19 0 - 0.5 07/22/04	WBGSD20 0 - 0.5 07/22/04	WBGSD21 0 - 0.5 07/22/04	WBGSD22 0 - 0.5 07/22/04	WBGSD23 0 - 0.5 09/14/04	WBGSD24 0 - 0.5 09/14/04	WBGSD25 0 - 0.5 09/14/04
PAHs														
2-Methylnaphthalene	31 {nc}	440 {sat}	--	mg/kg	<0.016 [<0.016]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	340 {nc}	3,300 {nc}	--	mg/kg	<0.016 [0.029]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	340 {nc}	3,300 {nc}	--	mg/kg	<0.016 [<0.016]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	1,700 {nc}	170,000 {max}	--	mg/kg	0.078 [0.048]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	0.078 J [0.16 J]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	0.087 J [0.17 J]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	0.17 [0.27]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	0.054 J [0.095 J]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	0.053 J [0.12 J]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	0.099 J [0.17 J]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	<0.016 [<0.016]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	0.18 J [0.39 J]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	<0.016 [0.026]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	0.060 [0.096]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	3.9 {ca}	20 {ca}	--	mg/kg	<0.016 [<0.016]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	0.074 J [0.22 J]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	0.12 J [0.27 J]	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs														
Aroclor-1016	0.39 {nc}	21 {ca**}	--	mg/kg	<0.079 [<0.082]	<0.083 L	<0.079	<0.081	<0.082 J	<0.083	<0.064	NA	NA	NA
Aroclor-1221	0.17 {ca**}	0.62 {ca**}	--	mg/kg	<0.079 [<0.082]	<0.083 L	<0.079	<0.081	<0.082 J	<0.083	<0.064	NA	NA	NA
Aroclor-1232	0.17 {ca**}	0.62 {ca**}	--	mg/kg	<0.079 [<0.082]	<0.083 L	<0.079	<0.081	<0.082 J	<0.083	<0.064	NA	NA	NA
Aroclor-1242	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.079 [<0.082]	<0.083 L	<0.079	<0.081	<0.082 J	<0.083	<0.064	NA	NA	NA
Aroclor-1248	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.079 [<0.082]	<0.083 L	<0.079	<0.081	<0.082 J	<0.083	<0.064	NA	NA	NA
Aroclor-1254	0.22 {ca**}	0.74 {ca*}	--	mg/kg	<0.079 [<0.082]	<0.083 L	<0.079	<0.081	<0.082 J	<0.083	<0.064	NA	NA	NA
Aroclor-1260	0.22 {ca**}	0.74 {ca**}	--	mg/kg	<0.079 [<0.082]	<0.083 L	<0.079	<0.081	<0.082 J	<0.083	<0.064	NA	NA	NA
Inorganics														
Aluminum	7,700 {nc}	990,000 {max}	40,041	mg/kg	19,300 [18,400]	30,900	23,800	25,400	20,100	18,800	14,400	28,500	20,000	19,300
Antimony	3.1 {nc}	41 {nc}	--	mg/kg	<0.430 [<0.480]	<0.470	<0.490 L	0.750 B	0.690 B	<0.460	0.610 B	0.510 B	<0.470	<0.430
Arsenic	0.39 {ca*}	1.6 {ca}	15.8	mg/kg	9.60 [11.0]	8.50	5.50	6.10	4.50	4.20	9.60	9.90	5.40	5.40
Barium	1,500 {nc}	190,000 {max}	209	mg/kg	63.3 [59.5]	108	105	112	119	113	60.7	60.6	109	95.3
Beryllium	16 {nc}	200 {nc}	1.02	mg/kg	1.10 J [1.20 J]	1.70	1.10	1.20	0.900	0.840	0.920	1.90	1.10	1.10
Cadmium	7 {nc}	81 {nc}	0.69	mg/kg	<0.0450 [0.0900 J]	0.470 B	0.460 B	0.490 B	0.440 B	0.410 B	0.470 J	0.120 J	0.250 J	0.270 J
Calcium	--	--	--	mg/kg	14,500 [24,000]	69,900	76,500	65,700	120,000	101,000	25,700	29,200	75,100	63,600
Chromium	280 {ca}	1,460 {ca}	65.3	mg/kg	42.7 [44.4]	80.6	45.6	37.8	33.0	43.1	66.8	54.7	34.2	31.4
Cobalt	2.3 {nc}	30 {nc}	72.3	mg/kg	17.2 [15.7]	13.8	7.80	8.10	6.40	6.50	8.10	17.4	7.90	7.30
Copper	310 {nc}	4,100 {nc}	53.5	mg/kg	19.3 [21.0]	24.5	19.1	19.2	15.6	15.1	12.0	21.6	17.9	17.9
Iron	5,500 {nc}	720,000 {max}	50,962	mg/kg	31,500 [35,700]	27,000	19,900	22,100	16,400	16,400	28,600	27,700	19,400	19,300
Lead	400 {++}	800 {++}	26.8	mg/kg	45.5 [40.6]	523	207	95.0	134	276	112	152	79.8	37.6
Magnesium	--	--	--	mg/kg	4,200 J [9,140 J]	6,610	4,690	5,010	4,170	3,700	1,840	6,820	4,970	4,390
Manganese	180 {nc}	2,300 {nc}	2,543	mg/kg	1,700 [1,370]	241	156	157	191	158	163	91.1	143	129
Mercury	3.1 {sat}	3.1 {sat}	0.13	mg/kg	0.0410 J [0.0540]	0.0670	0.0520	0.0400	0.0330 J	0.0410 J	0.0360	0.0760	0.0550	0.0490 J
Nickel	160 {nc}	2,000 {nc}	62.8	mg/kg	17.0 [16.7]	22.7	16.4	16.5	13.2	12.2	10.9	24.0	14.6	14.2
Potassium	--	--	--	mg/kg	1,140 [920]	1,860	1,210 K	1,250	1,060	975	698	2,120	1,290	973
Selenium	39 {nc}	510 {nc}	--	mg/kg	<1.70 [<0.930]	<0.910	<0.940	<0.960	<1.00	<0.890	1.20 J	<0.820	<0.910	<0.840
Silver	39 {nc}	510 {nc}	--	mg/kg	<0.340 [<0.190]	<0.190 L	<0.190 L	<0.200 L	<0.210 L	<0.180 L	<0.140 L	<0.170	<0.180	<0.170
Sodium	--	--	--	mg/kg	123 B [179 B]	237 B	233 B	251 B	243 B	235 B	144 B	182 B	232 B	197 B
Thallium	0.51 {nc}	6.6 {nc}	2.11	mg/kg	<1.00 [<0.560]	<0.560	<0.570	<0.590	<0.620	<0.540	<0.430	<0.500	<0.550	<0.510
Vanadium	55{nc}	720 {nc}	108	mg/kg	52.8 [61.5]	55.5	41.5	43.3	35.5	33.8	57.4	56.2	38.1	37.2
Zinc	2,300 {nc}	310,000 {max}	202	mg/kg	63.1 [65.4]	165	118	96.3	93.7	121	59.3	59.9	82.2	71.3
Miscellaneous														
Percent Solids	--	--	--	%	42 [41]	40	42	41	41	40	52	43	40	42

mg/kg	Milligrams per kilogram.
[a]	USEPA Regional Screening Levels (USEPA 2008a).
[b]	Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.
{ca}	Carcinogen.
{nc}	Noncarcinogen.
*	Noncarcinogen screening level is less than one hundred times the carcinogen screening level.
**	Noncarcinogen screening level is less than ten times the carcinogen screening level.
{++}	The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.
{max}	Concentration may exceed ceiling limit.
{sat}	Screening level may exceed saturation concentration.
B (Inorganics)	Constituent concentration quantified as estimated.
B (Organics)	Constituent was detected in the associated method blank.
J	Constituent concentration quantified as estimated.
K	Estimated concentration bias high.
L	Estimated concentration bias low.
NA	Not Analyzed.
[3.3]	Bracketed concentration indicates laboratory analytical result for duplicate sample.
24,400	Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).
10.6 J	Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).
16	Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Table D-16. Fish Tissue Analytical Results, Western Burning Ground, 2004 Shaw Additional Characterization Sampling, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Fish Type: Sample Type: Date Collected:	Units	WBGTS01 Bluegill Whole Body 07/21/04	WBGTS02 Bluegill Whole Body 07/21/04	WBGTS03 Bluegill Whole Body 07/21/04	WBGTS04 Bluegill Whole Body 07/21/04	WBGTS05 Bluegill Whole Body 07/21/04	WBGTS06 Bluegill Whole Body 07/21/04	WBGTS07 Bluegill Whole Body 07/21/04	WBGTS08 White Sucker Whole Body 07/21/04	WBGTS15 Bluegill Fillet 07/21/04	WBGTS16 Bluegill Fillet 07/21/04	WBGTS17 Bluegill Fillet 07/21/04	WBGTS18 Bluegill Fillet 07/21/04	WBGTS19 Bluegill Fillet 07/21/04	WBGTS20 Bluegill Fillet 07/21/04	WBGTS21 Bluegill Fillet 07/21/04	WBGTS22 Common Carp Fillet 07/21/04
PCBs																	
Aroclor-1016	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050 J	<0.050	<0.050	<0.050
Aroclor-1221	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050 J	<0.050	<0.050	<0.050
Aroclor-1232	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050 J	<0.050	<0.050	<0.050
Aroclor-1242	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050 J	<0.050	<0.050	<0.050
Aroclor-1248	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050 J	<0.050	<0.050	<0.050
Aroclor-1254	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050 J	<0.050	<0.050	<0.050
Aroclor-1260	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050 J	<0.050	<0.050	<0.050
Inorganics																	
Aluminum	mg/kg	19.7	24.9	11.3	<7.60	34.7	<7.50	50.7	14.9	<7.80	<7.50	<7.40	<7.40	<7.40	<7.40	<7.40	<7.40
Antimony	mg/kg	<0.700	<0.740	<0.750	<0.760	<0.730	<0.750	<0.740	<0.740	<0.780	<0.750	<0.740	<0.740	<0.740	<0.740	<0.740	<0.740
Arsenic	mg/kg	<0.700	<0.740	<0.750	<0.760	<0.730	<0.750	<0.740	<0.740	<0.780	<0.750	<0.740	<0.740	<0.740	<0.740	<0.740	<0.740
Barium	mg/kg	1.80	2.10	1.00	0.880	0.840	2.00	2.40	0.750	<0.190	0.240	0.250	1.00	0.290	0.380	0.340	<0.180
Beryllium	mg/kg	<0.0700	<0.0740	<0.0750	<0.0760	<0.0730	<0.0750	<0.0740	<0.0740	<0.0780	<0.0750	<0.0740	<0.0740	<0.0740	<0.0740	<0.0740	<0.0740
Cadmium	mg/kg	<0.210	<0.220	<0.220	<0.230	<0.220	<0.220	<0.220	<0.220	<0.230	<0.220	<0.220	<0.220	<0.220	<0.220	<0.220	<0.220
Calcium	mg/kg	8,940	14,300	9,360	9,970	7,390	10,700	6,280	5,490	688	2,180	1,790	8,720	1,650	2,840	1,130	604 L
Chromium	mg/kg	0.260	0.440	0.350	0.650	0.470	0.300	0.630	0.420	<0.190	<0.190	<0.190	0.240	<0.180	<0.190	<0.190	<0.180
Cobalt	mg/kg	<0.170	<0.190	<0.190	<0.190	<0.180	<0.190	<0.190	<0.190	<0.190	<0.190	<0.190	<0.180	<0.180	<0.190	<0.190	<0.180
Copper	mg/kg	0.560	0.470	<0.370	0.440	<0.360	0.450	0.470	0.800	<0.390	0.560	<0.370	<0.370	<0.370	<0.370	<0.370	0.520
Iron	mg/kg	44.8	60.4	38.9	30.1	70.6	24.0	74.2	31.2	<5.80	<5.60	<5.60	<5.50	<5.50	<5.60	<5.60	11.9
Lead	mg/kg	<0.350	<0.370	<0.370	<0.380	<0.360	<0.370	<0.370	<0.370	<0.390	<0.370	<0.370	<0.370	<0.370	<0.370	<0.370	<0.370
Magnesium	mg/kg	286	402	356	275	313	294	262	270	262	236	232	300	232	234	209	206
Manganese	mg/kg	2.30	3.50	1.70	1.40	1.00	2.70	2.00	0.800	<0.190	0.230	<0.190	0.760	<0.180	0.240	0.530	<0.180
Mercury	mg/kg	0.0370	0.0400	0.0710	0.0780	0.0470	0.0280	0.0280	0.0240	0.0560	0.0870	0.0300	0.0690	<0.0190	0.0500	0.0360	0.0870
Nickel	mg/kg	<0.350	<0.370	<0.370	<0.380	<0.360	<0.370	<0.370	<0.370	<0.390	<0.370	<0.370	<0.370	<0.370	<0.370	<0.370	<0.370
Potassium	mg/kg	2,600 J	2,590 J	2,650 J	2,720 J	2,750 J	2,640 J	2,670 J	2,870 J	3,170 J	2,840 J	2,990 J	2,600 J	2,900 J	2,770 J	2,850 J	2,790 J
Selenium	mg/kg	<0.700	<0.740	<0.750	<0.760	<0.730	<0.750	<0.740	<0.740	<0.780	<0.750	<0.740	<0.740	<0.740	<0.740	<0.740	<0.740
Silver	mg/kg	<0.100	<0.110	<0.110	<0.110	<0.110	<0.110	<0.110	<0.110	<0.120	<0.110	<0.110	<0.110	<0.110	<0.110	<0.110	<0.110
Sodium	mg/kg	1,140 J	1,060 J	1,190 J	1,100 J	962 J	962 J	1,010 J	717 J	693 J	902 J	858 J	1,070 J	869 J	764 J	792 J	418 J
Thallium	mg/kg	<1.00	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	<1.20	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10
Vanadium	mg/kg	<0.350	<0.370	<0.370	<0.380	<0.360	<0.370	<0.370	<0.370	<0.390	<0.370	<0.370	<0.370	<0.370	<0.370	<0.370	<0.370
Zinc	mg/kg	15.3	25.1	20.0	17.2	16.8	13.7	12.5	10.7	9.10	11.5	9.30	13.5	9.00	11.2	8.60	6.90
Miscellaneous																	
Percent Lipids	%	0.71	0.72	0.87	0.7	0.82	3.6	3.2	6.1	0.05	0.07	0.67	0.04	0.48	0.11	0.36	6.4

mg/kg Milligrams per kilogram.

Table D-17. Sediment Analytical Results, Western Burning Ground, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Sample Depth(Feet): Date Collected:	Adjusted Soil Screening Values-Residential [a]	Adjusted Soil Screening Values-Industrial [a]	Facility-Wide Background Values [b]	Units	WBG-SE001 0 - 1 07/30/08	WBG-SE002 0 - 1 07/30/08	WBG-SE003 0 - 1 07/30/08	WBG-SE004 0 - 1 07/30/08	WBG-SE005 0 - 0.5 07/31/08	WBG-SE006 0 - 0.5 07/31/08
Semivolatile Organics										
1-Methylnaphthalene	22 {ca*}	99 {ca*}	--	mg/kg	NA	NA	NA	NA	<0.0074	0.0026 J
2-Methylnaphthalene	31 {nc}	440 {sat}	--	mg/kg	NA	NA	NA	NA	<0.0074	0.0028 J
Acenaphthene	340 {nc}	3,300 {nc}	--	mg/kg	NA	NA	NA	NA	<0.0074	0.014
Acenaphthylene	340 {nc}	3,300 {nc}	--	mg/kg	NA	NA	NA	NA	<0.0074	<0.0046
Anthracene	1,700 {nc}	170,000 {max}	--	mg/kg	NA	NA	NA	NA	<0.0074	0.025
Benzo(a)anthracene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	NA	NA	NA	0.0055 J	0.042
Benzo(a)pyrene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	NA	NA	NA	NA	<0.0074	0.038
Benzo(b)fluoranthene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	NA	NA	NA	0.0096	0.047
Benzo(g,h,i)perylene	170 {nc}	1,700 {nc}	--	mg/kg	NA	NA	NA	NA	<0.0074	0.020
Benzo(k)fluoranthene	1.5 {ca**}	21 {ca**}	--	mg/kg	NA	NA	NA	NA	0.0053 J	0.029
Chrysene	15 {ca**}	210 {ca**}	--	mg/kg	NA	NA	NA	NA	0.0087 J	0.042 J
Dibenzo(a,h)anthracene	0.015 {ca**}	0.21 {ca**}	--	mg/kg	NA	NA	NA	NA	<0.0074	0.0061
Fluoranthene	230 {nc}	2,200 {nc}	--	mg/kg	NA	NA	NA	NA	0.015 J	0.11 J
Fluorene	230 {nc}	2,200 {nc}	--	mg/kg	NA	NA	NA	NA	<0.0074	0.014
Indeno(1,2,3-cd)pyrene	0.15 {ca**}	2.1 {ca**}	--	mg/kg	NA	NA	NA	NA	<0.0074 J	0.024 J
Naphthalene	3.9 {ca}	20 {ca}	--	mg/kg	NA	NA	NA	NA	<0.0074	<0.0046
Phenanthrene	1,700 {nc}	170,000 {max}	--	mg/kg	NA	NA	NA	NA	0.0067 J	0.087
Pyrene	170 {nc}	1,700 {nc}	--	mg/kg	NA	NA	NA	NA	0.018	0.094
Inorganics										
Lead	400 {++}	800 {++}	26.8	mg/kg	1,550	500	1,070	255 [212]	NA	NA

mg/kg	Milligrams per kilogram.
[a]	USEPA Regional Screening Levels (USEPA 2008a).
[b]	Inorganics facility-wide background value taken from Facility-Wide Background Study Report, IT Corporation, 2001.
{ca}	Carcinogen.
{nc}	Noncarcinogen.
*	Noncarcinogen screening level is less than one hundred times the carcinogen screening level.
**	Noncarcinogen screening level is less than ten times the carcinogen screening level.
{++}	The screening level for lead is based on noncancer effects but uses a non-standard method and, therefore, is not adjusted by 0.1.
{max}	Concentration may exceed ceiling limit.
{sat}	Screening level may exceed saturation concentration.
B (Inorganics)	Constituent concentration quantified as estimated.
B (Organics)	Constituent was detected in the associated method blank.
J	Constituent concentration quantified as estimated.
K	Estimated concentration bias high.
L	Estimated concentration bias low.
NA	Not Analyzed.
[3.3]	Bracketed concentration indicates laboratory analytical result for duplicate sample.
24,400	Highlighted value indicates constituent concentration is above adjusted soil RSL (Residential).
10.6 J	Highlighted value indicates constituent concentration is above adjusted soil RSL (Industrial).
16	Bolded inorganics constituent concentration indicates concentration is above facility-wide background value.

Table D-18. Surface Water Analytical Results, Western Burning Ground, 2008 ARCADIS Remedial Investigation, Radford Army Ammunition Plant, Radford, Virginia.

Location ID: Date Collected:	Tapwater Screening Values [a]	Units	WBG-SW002 07/30/08	WBG-SW003 07/30/08	WBG-SW004 07/30/08	WBG-SW005 07/31/08	WBG-SW006 07/31/08
Semivolatile Organics							
1-Methylnaphthalene	2.3 {ca}	µg/L	NA	NA	NA	0.026 J	<0.047
2-Methylnaphthalene	150 {nc}	µg/L	NA	NA	NA	0.033 J	<0.047
Acenaphthene	2,200 {nc}	µg/L	NA	NA	NA	0.040 J	<0.047
Acenaphthylene	- -	µg/L	NA	NA	NA	<0.050	<0.047
Anthracene	11,000 {nc}	µg/L	NA	NA	NA	0.030 J	<0.047
Benzo(a)anthracene	0.029 {ca**}	µg/L	NA	NA	NA	<0.050	<0.047
Benzo(a)pyrene	0.0029 {ca**}	µg/L	NA	NA	NA	<0.050	<0.047
Benzo(b)fluoranthene	0.029 {ca**}	µg/L	NA	NA	NA	<0.050	<0.047
Benzo(g,h,i)perylene	- -	µg/L	NA	NA	NA	<0.050	<0.047
Benzo(k)fluoranthene	0.29 {ca**}	µg/L	NA	NA	NA	<0.050	<0.047
Chrysene	2.9 {ca**}	µg/L	NA	NA	NA	<0.050	<0.047
Dibenzo(a,h)anthracene	0.0029 {ca**}	µg/L	NA	NA	NA	<0.050	<0.047
Fluoranthene	1,500 {nc}	µg/L	NA	NA	NA	<0.050	<0.047
Fluorene	1,500 {nc}	µg/L	NA	NA	NA	0.034 J	<0.047
Indeno(1,2,3-cd)pyrene	0.029 {ca**}	µg/L	NA	NA	NA	<0.050 J	<0.047 J
Naphthalene	6.2 {nc}	µg/L	NA	NA	NA	<0.050	<0.047
Phenanthrene	- -	µg/L	NA	NA	NA	0.050	0.018 J
Pyrene	1,100 {nc}	µg/L	NA	NA	NA	<0.050	<0.047
Inorganics							
Lead	15 {nc}	µg/L	20.5	47.5	106	NA	NA

µg/L	Micrograms per liter.
[a]	USEPA Regional Screening Levels (USEPA 2008a). Adjusted tap-water screening levels used to assess surface water at the NRU.
{ca}	Carcinogen.
{nc}	Noncarcinogen.
*	Noncarcinogen screening level is less than one hundred times the carcinogen screening level.
**	Noncarcinogen screening level is less than ten times the carcinogen screening level.
J	Constituent concentration quantified as estimated.
K	Estimated concentration bias high.
L	Estimated concentration bias low.
NA	Not Analyzed.
[3.3]	Bracketed concentration indicates laboratory analytical result for duplicate sample
24,400	Highlighted value indicates constituent concentration is above adjusted tap water RSL.

Appendix E

Site Specific Preliminary Remediation
Goal Calculations

Table E1. Derivation of Pathway-Specific Remediation Goals for Soils in the Bag Loading Area Based on Residential Exposure of Adults

Pathway-Specific Remediation Goals Based on Potential Cancer Risk

Ingestion		$PRG_o = (TR \cdot BW \cdot 365 \text{ days}) / [(CSF_o \cdot EF \cdot 10 \text{ yrs} \cdot ADAF \cdot IR \cdot FI \cdot CF) + (CSF_o \cdot EF \cdot 14 \text{ yrs} \cdot IR \cdot FI \cdot CF)]$									
	TR	BW	AT	ADAF	CSF _o	EF	Cumulative Total ED	IR	FI	CF	PRG _o
COC	unitless	kg	days	unitless	(mg/kg-d) ⁻¹	days/year	years	mg/day	unitless	kg/mg	mg/kg
Aroclor 1254	1.00E-06	70	25550	1	2	350	24	100	1	1.00E-06	1.06
Benzo(a)pyrene	1.00E-06	70	25550	2.1	7.3	350	24	100	1	1.00E-06	0.20

Dermal		$PRG_d = (TR \cdot BW \cdot AT) / (CSF_d \cdot SA \cdot AF \cdot ABS \cdot EF \cdot ADAF \cdot 10 \text{ yrs} \cdot CF) + (CSF_d \cdot SA \cdot AF \cdot ABS \cdot EF \cdot 14 \text{ yrs} \cdot CF)$										
	TR	BW	AT	ADAF	CSF _d	SA	AF	ABS	EF	ED	CF	PRG _d
COC	unitless	kg	days	unitless	(mg/kg-d) ⁻¹	cm ² /day	mg/cm ²	unitless	days/year	years	kg/mg	mg/kg
Aroclor 1254	1.00E-06	70	25550	1	2	5700	0.07	0.13	350	24	1.00E-06	2.05
Benzo(a)pyrene	1.00E-06	70	25550	2.1	7.3	5700	0.07	0.13	350	24	1.00E-06	0.39

Inhalation		PRG _i =(TR*AT)/(IUR*EF*ADAF*10 yrs*CF*1/PEF)+(IUR*EF*14 yrs*CF*1/PEF)							
COC	TR	AT	IUR	ADAF	EF	ED	CF	PEF	PRG _i
	unitless	days	(µg/mg ³) ⁻¹	unitless	days/year	year	µg/mg	kg/m ³	mg/kg
Aroclor 1254	1.00E-06	25550	0.00057	1	350	24	1000	1.36E+09	7,257
Benzo(a)pyrene	1.00E-06	25550	0.0011	2.1	350	24	1000	1.36E+09	2,579

Potentially mutagenic carcinogens (i.e., PAHs) adjusted to incorporate ADAFs of 2.1 for 10 years (ages 6 to 16) and 1 for the remaining 14 years as an adult.

Table E2. Derivation of Pathway-Specific Remediation Goals for Soils in the Bag Loading Area Based on Residential Exposure of Children

Pathway-Specific Remediation Goals Based on Potential Cancer Risk

Ingestion $PRG_o = (TR \cdot BW \cdot AT) / (CSF_o \cdot EF \cdot ADAF \cdot 2 \text{ yrs} \cdot IR \cdot FI \cdot CF) + (CSF_o \cdot EF \cdot ADAF \cdot 4 \text{ yrs} \cdot IR \cdot FI \cdot CF)$												
	TR	BW	AT	CSF _o	EF	ADAF (0 to 2 yrs)	ADAF (2 to 6 yrs)	Total ED	IR	FI	CF	PRG _o
COC	unitless	kg	days	(mg/kg-d) ⁻¹	days/year	unitless	unitless	years	mg/day	unitless	kg/mg	mg/kg
Aroclor 1254	1.00E-06	15	25550	2	350	1	1	6	200	1	1.00E-06	0.46
Benzo(a)pyrene	1.00E-06	15	25550	7.3	350	4.6	2.1	6	200	1	1.00E-06	0.04

Dermal $PRG_d = (TR \cdot BW \cdot AT) / (CSF_d \cdot SA \cdot AF \cdot ABS \cdot EF \cdot ADAF \cdot 2 \text{ yrs} \cdot CF) + (CSF_d \cdot SA \cdot AF \cdot ABS \cdot EF \cdot ADAF \cdot 4 \text{ yrs} \cdot CF)$													
	TR	BW	AT	CSF _d	SA	ADAF (0 to 2 yrs)	ADAF (2 to 6 yrs)	AF	ABS	EF	Total ED	CF	PRG _d
COC	unitless	kg	days	(mg/kg-d) ⁻¹	cm ² /day	unitless	unitless	mg/cm ²	unitless	days/year	years	kg/mg	mg/kg
Aroclor 1254	1.00E-06	15	25550	2	2800	1	1	0.2	0.14	350	6	1.00E-06	1.2
Benzo(a)pyrene	1.00E-06	15	25550	7.3	2800	4.6	2.1	0.2	0.13	350	6	1.00E-06	0.12

Inhalation $PRG_i = (TR \cdot AT) / (IUR \cdot EF \cdot ADAF \cdot 2 \text{ yrs} \cdot CF \cdot 1 / PEF) + (IUR \cdot EF \cdot ADAF \cdot 4 \text{ yrs} \cdot CF \cdot 1 / PEF)$										
	TR	AT	IUR	EF	Total ED	ADAF (0 to 2 yrs)	ADAF (2 to 6 yrs)	CF	PEF	PRG _i
COC	unitless	days	(µg/mg ³) ⁻¹	days/year	year	unitless	unitless	µg/mg	kg/m ³	mg/kg
Aroclor 1254	1.00E-06	25550	0.00057	350	6	1	1	1000	1.36E+09	29,029
Benzo(a)pyrene	1.00E-06	25550	0.0011	350	6	4.6	2.1	1000	1.36E+09	5,128

Pathway-Specific Remediation Goals Based on Potential Noncancer Hazard

Ingestion $PRG_o = (THQ \cdot BW \cdot AT \cdot RfD_o) / (EF \cdot ED \cdot IR \cdot FI \cdot CF)$										
	THQ	BW	AT	RfD _o	EF	ED	IR	FI	CF	PRG _o
COC	unitless	kg	days	mg/kg-day	days/year	years	mg/day	unitless	kg/mg	mg/kg
Aroclor 1254	1.0	15	2190	0.00002	350	6	200	1	1.00E-06	1.56
Copper	1.0	15	2190	0.04	350	6	200	1	1.00E-06	3,129

Dermal $PRG_d = (THQ \cdot BW \cdot AT \cdot RfD_d) / (SA \cdot AF \cdot ABS \cdot EF \cdot ED \cdot CF)$											
	THQ	BW	AT	RfD _d	SA	AF	ABS	EF	ED	CF	PRG _d
COC	unitless	kg	days	mg/kg-day	cm ² /day	mg/cm ²	unitless	days/year	years	kg/mg	mg/kg
Aroclor 1254	1.0	15	2190	0.00002	2800	0.2	0.13	350	6	1.00E-06	4.3
Copper	1.0	15	2190	0.04	2800	0.2	0.01	350	6	1.00E-06	111,735

Potentially mutagenic carcinogens (i.e., PAHs) adjusted to incorporate ADAFs of 4.6 for 2 years (ages 0 to 2) and 2.1 for 4 years (ages 2 to 6)

Table E3. Derivation of Preliminary Remediation Goals for Soils in the Bag Loading Area Based on Exposures to Construction Workers

Pathway-Specific Preliminary Remediation Goals Based on Potential Noncancer Hazard											
Ingestion		$PRG_o = (THQ \cdot BW \cdot AT \cdot RfD_o) / (EF \cdot ED \cdot IR \cdot FI \cdot CF)$									
	THQ	BW	AT	RfD _o	EF	ED	IR	FI	CF	PRG _o	
COC	unitless	kg	days	mg/kg-day	days/year	years	mg/day	unitless	kg/mg	mg/kg	
Copper	1	70	182	0.04	130	1	330	1	1.00E-06	11,879	

Dermal		$PRG_d = (THQ \cdot BW \cdot AT \cdot RfD_d) / (SA \cdot AF \cdot ABS \cdot EF \cdot ED \cdot CF)$									
	THQ	BW	AT	RfD _d	SA	AF	ABS	EF	ED	CF	PRG _d
COC	unitless	kg	days	mg/kg-day	cm ² /day	mg/cm ²	unitless	days/year	years	kg/mg	mg/kg
Copper	1	70	182	0.04	3300	0.3	0.01	130	1	1.00E-06	395,960

Table E4. Derivation of Pathway-Specific Remediation Goals for Soils in the Ignitor Assembly Area Based on Residential Exposure of Adults

Pathway-Specific Remediation Goals Based Potential Cancer Risk

Ingestion		$PRG_o = (TR \cdot BW \cdot AT) / (CSF_o \cdot EF \cdot ED \cdot IR \cdot FI \cdot CF)$								
	TR	BW	AT	CSF	EF	ED	IR	FI	CF	PRG _o
COC	unitless	kg	days	(mg/kg-d) ⁻¹	days/year	years	mg/day	unitless	kg/mg	mg/kg
Aroclor 1254	1.00E-06	70	25550	2	350	24	100	1	1.00E-06	1.06

Dermal		$PRG_d = (TR \cdot BW \cdot AT) / (CSF_d \cdot SA \cdot AF \cdot ABS \cdot EF \cdot ED \cdot CF)$									
	TR	BW	AT	CSF _d	SA	AF	ABS	EF	ED	CF	PRG _d
COC	unitless	kg	days	(mg/kg-d) ⁻¹	cm ² /day	mg/cm ²	unitless	days/year	years	kg/mg	mg/kg
Aroclor 1254	1.00E-06	70	25550	2	5700	0.07	0.13	350	24	1.00E-06	2.1

Inhalation		$PRG_i = (TR \cdot AT) / (IUR \cdot EF \cdot ED \cdot CF \cdot 1 / PEF)$							
	TR	AT	IUR	EF	ED	CF	PEF	PRG _i	
COC	unitless	days	(µg/mg ³) ⁻¹	days/year	year	µg/mg	kg/m ³	mg/kg	
Aroclor 1254	1.00E-06	25550	0.00057	350	24	1000	1.36E+09	7,257	

Pathway-Specific Remediation Goals Based on Potential Noncancer Hazard

Ingestion		$PRG_o = (THQ \cdot BW \cdot AT \cdot RfD_o) / (EF \cdot ED \cdot IR \cdot FI \cdot CF)$								
	THQ	BW	AT	RfD _o	EF	ED	IR	FI	CF	PRG _o
COC	unitless	kg	days	mg/kg-day	days/year	years	mg/day	unitless	kg/mg	mg/kg
Aroclor 1254	1.0	70	10950	0.00002	350	30	100	1	1.00E-06	15

Dermal		$PRG_d = (THQ \cdot BW \cdot AT \cdot RfD_d) / (SA \cdot AF \cdot ABS \cdot EF \cdot ED \cdot CF)$									
	THQ	BW	AT	RfD _d	SA	AF	ABS	EF	ED	CF	PRG _d
COC	unitless	kg	days	mg/kg-day	cm ² /day	mg/cm ²	unitless	days/year	years	kg/mg	mg/kg
Aroclor 1254	1.0	70	10950	0.00002	5700	0.07	0.14	350	30	1.00E-06	26

Table E5. Derivation of Preliminary Remediation Goals for Soils in the Ignitor Assembly Area Based on Residential Exposure of Children

Pathway-Specific Preliminary Remediation Goals Based on Potential Cancer Risk

Ingestion		$PRG_o = (TR \cdot BW \cdot AT) / (CSF_o \cdot EF \cdot ED \cdot IR \cdot FI \cdot CF)$								
	TR	BW	AT	CSF _o	EF	ED	IR	FI	CF	PRG _o
COC	unitless	kg	days	(mg/kg-d) ⁻¹	days/year	years	mg/day	unitless	kg/mg	mg/kg
Aroclor 1254	1.00E-06	15	25550	2	350	6	200	1	1.00E-06	0.46

Dermal		$PRG_d = (TR \cdot BW \cdot AT) / (CSF_d \cdot SA \cdot AF \cdot ABS \cdot EF \cdot ED \cdot CF)$									
	TR	BW	AT	CSF _d	SA	AF	ABS	EF	ED	CF	PRG _d
COC	unitless	kg	days	(mg/kg-d) ⁻¹	cm ² /day	mg/cm ²	unitless	days/year	years	kg/mg	mg/kg
Aroclor 1254	1.00E-06	15	25550	2	2800	0.2	0.14	350	6	1.00E-06	1.2

Inhalation		$PRG_i = (TR \cdot AT) / (IUR \cdot EF \cdot ED \cdot CF \cdot 1 / PEF)$							
	TR	AT	IUR	EF	ED	CF	PEF	PRG _i	
COC	unitless	days	(µg/mg ³) ⁻¹	days/year	year	µg/mg	kg/m ³	mg/kg	
Aroclor 1254	1.00E-06	25550	0.00057	350	6	1000	1.36E+09	29,029	

Pathway-Specific Preliminary Remediation Goals Based on Potential Noncancer Hazards

Ingestion		$PRG_o = (THQ \cdot BW \cdot AT \cdot RfD_o) / (EF \cdot ED \cdot IR \cdot FI \cdot CF)$								
	THQ	BW	AT	RfD _o	EF	ED	IR	FI	CF	PRG _o
COC	unitless	kg	days	mg/kg-day	days/year	years	mg/day	unitless	kg/mg	mg/kg
Aroclor 1254	1.0	15	2190	0.00002	350	6	200	1	1.00E-06	1.56
Copper	1.0	15	2190	0.04	350	6	200	1	1.00E-06	3,129

Dermal		$PRG_d = (THQ \cdot BW \cdot AT \cdot RfD_d) / (SA \cdot AF \cdot ABS \cdot EF \cdot ED \cdot CF)$									
	THQ	BW	AT	RfD _d	SA	AF	ABS	EF	ED	CF	PRG _d
COC	unitless	kg	days	mg/kg-day	cm ² /day	mg/cm ²	unitless	days/year	years	kg/mg	mg/kg
Aroclor 1254	1.0	15	2190	0.00002	2800	0.2	0.14	350	6	1.00E-06	4.0
Copper	1.0	15	2190	0.04	2800	0.2	0.01	350	6	1.00E-06	111,735

Potentially mutagenic carcinogens (i.e., PAHs) adjusted to incorporate ADAFs of 4.6 for 2 years (ages 0 to 2) and 2.1 for 4 years (ages 2 to 6)

Table E6. Derivation of Preliminary Remediation Goals for Sediment in the Western Burning Ground Based on Residential Exposure of Children

Pathway-Specific Preliminary Remediation Goals Based on Potential Noncancer Hazard

Ingestion		$PRG_o = (THQ \cdot BW \cdot AT \cdot RfD_o) / (EF \cdot ED \cdot IR \cdot FI \cdot CF)$								
	THQ	BW	AT	RfD _o	EF	ED	IR	FI	CF	PRG _o
COC	unitless	kg	days	mg/kg-day	days/year	years	mg/day	unitless	kg/mg	mg/kg
Chromium	1.0	15	2190	0.003	48	6	100	1	1.00E-06	3,422

Dermal		$PRG_d = (THQ \cdot BW \cdot AT \cdot RfD_d) / (SA \cdot AF \cdot ABS \cdot EF \cdot ED \cdot CF)$									
	THQ	BW	AT	RfD _d	SA	AF	ABS	EF	ED	CF	PRG _d
COC	unitless	kg	days	mg/kg-day	cm ² /day	mg/cm ²	unitless	days/year	years	kg/mg	mg/kg
Chromium	1.0	15	2190	0.000075	1900	0.2	0.01	48	6	1.00E-06	2,251

Table E7. Summary of Receptor-Specific Risk-Based PRGs for the Bag Loading Area

Cancer

COC	Residential Adult				Residential Child				Combined Adult/Child PRG (mg/kg)
	PRG _o mg/kg	PRG _d mg/kg	PRG _i mg/kg	PRG _s mg/kg	PRG _o mg/kg	PRG _d mg/kg	PRG _i mg/kg	PRG _s mg/kg	
Aroclor 1254	1.06	2.05	7,257	0.699	0.46	1.2	29,029	0.33	0.23
Benzo(a)pyrene	0.20	0.39	2,579	0.13	0.04	0.12	5128	0.03	0.025

Non-Cancer

COC	Residential Child				Non-Cancer PRG (mg/kg)
	PRG _o mg/kg	PRG _d mg/kg	PRG _i mg/kg	PRG _s mg/kg	
Copper	3129	111,735	NA	3,044	3,044

Construction Worker

COC	Cancer				Noncancer				Final PRGs (mg/kg)
	PRG _o mg/kg	PRG _d mg/kg	PRG _i mg/kg	PRG _s mg/kg	PRG _o mg/kg	PRG _d mg/kg	PRG _i mg/kg	PRG _s mg/kg	
Copper	NA	NA	NA	NA	11,879	395,960	NA	11,533	11,533

Table E8. Summary of Receptor-Specific Risk-Based PRGs for the Igniter Assembly Area

Cancer

COC	Residential Adult				Residential Child				Combined Adult/Child PRG (mg/kg)
	PRG _o mg/kg	PRG _d mg/kg	PRG _i mg/kg	PRG _s mg/kg	PRG _o mg/kg	PRG _d mg/kg	PRG _i mg/kg	PRG _s mg/kg	
Aroclor 1254	1.06	2.05	7,257	0.70	0.46	1.2	29,029	0.33	0.23

Non-Cancer

COC	Residential Child				Non-Cancer PRG (mg/kg)
	PRG _o mg/kg	PRG _d mg/kg	PRG _i mg/kg	PRG _s mg/kg	
Copper	3129	111,735	NA	3,044	3,044

Appendix F

Summary of Assumptions Utilized for
Preparing Response Action Cost
Estimates

BLA and IAA CF-2 – Land Use Controls (LUCs)

Description:

Land Use Controls (LUC) will be implemented to minimize the exposure pathway for areas which drive the unacceptable human health risks and hazards. LUCs will consist of land use restrictions and the installation of signs prohibiting specific activities at the site. The land use restrictions will maintain the industrial/military property use of the area.

ASSUMPTIONS:

1. LUC will consist of sign installation
2. Permitting not required
3. Site is easily accessible

ADMINISTRATIVE ACTIONS

Engineers Estimate

1. Land-Use Controls

Assumptions:

- GIS support at \$750
- Coordinate LUC implementation and prepare public notice at \$1500
- Legal support \$2000
- Estimated cost would be \$4250.

RS Means

2. Fence Installation

Assumptions:

- • Fencing not included under this option.

3. Sign Installation

Vendor Quotes

Assumptions:

- Vendor cost for sign manufacturing and shipping \$110 each
- One hour to install each sign at \$95 hour
- Estimated cost would be \$205 per sign
- Assume signs installed on all buildings at multiple points of entry

ANNUAL INSPECTION AND FIVE YEAR REVIEW

Engineering Estimate

1. Annual Inspection and Reporting

Assumptions:

- Annual inspection requires twelve hours to complete at \$95/hour
- Report requires 12 hours at \$95/hour
- Conducted for 30 yrs

Engineering Estimate

2. Five Year Review

Assumptions:

- Draft, Draft Final and Final reports
- Lump sum per site of \$15,000
- 6 reviews conducted over 30 yr period

Engineering Estimate

IMPLEMENTATION COST

1. Administration and Legal

Assumptions:

- Assume 5% of capital costs.

Engineering Estimate

2. CMI Plan

Assumptions:

- Assume \$20,000.

Engineering Estimate

3. Completion Report

Assumptions:

- Assume \$15,000.

Engineering Estimate

4. Cost Contingency

Assumptions:

- Assume 25% of capital costs.

Engineering Estimate

5. O&M Contingency

Assumptions:

- Assume 15% of O&M Costs.

BLA and IAA CF- 3 – Removal of Degraded Flooring and Off-Site Disposal

Description:

All conductive flooring from both the BLA and IAA will be removed. Conductive Flooring will removed from the building foundation and disposed of at an approved off-site disposal facility. Removal of degraded flooring will remove the exposure pathways and mitigate risk to human health. As all conductive flooring will be removed from the Sites, long term monitoring and LUCs will not be required for flooring.

ASSUMPTIONS:

1. Flooring at both locations does not contain energetic materials
2. Site work will occur in level C PPE
3. Access to the site is unobstructed
4. All buildings, including Building 404 and 407, will be deemed safe to work in and around without additional structural stabilization

Engineering Estimate

ADMINISTRATIVE ACTIONS

1. Land-Use Controls

Assumptions:

- Not Required.

2. Pre-Work Coordination

Assumptions:

- 10 day asbestos abatement notification
- DOT Permits (if necessary)
- Coordinate facility work permits and contractor site access

Engineering Estimate

GENERAL ACTIONS / SITE PREPARATION

1. Focused Asbestos Survey

Assumptions:

- Assume that this will not be required

Engineering Estimate

2. Focused Asbestos Survey Report

Assumptions:

- Assume that this is not required

Engineering Estimate

Engineering Estimate

3. Structural Evaluation of Building 404 and 407

Assumptions:

- One structural engineer
- Two days to complete evaluation of buildings
- Includes rental equipment for inspection (i.e. man lifts)
- Inspection results to be summarized in report format
- Only includes Buildings 404 and 407 at the BLA. All other buildings at the BLA and IAA are in structurally good condition.

Engineering Estimate

4. Mobilization/Demobilization

Assumptions:

- Cost to mobilize equipment and personnel to site.
- Includes installation of site trailer, Porta-Johns, health and safety equipment.

Engineering Estimate

5. Dust Suppression Systems and Air Monitoring Equipment

Assumptions:

- Dust suppression will consist of material wetting systems using potable water
- Air monitoring (both personal sampling and perimeter/ambient sampling) will be performed during site work.
- Negative air enclosures will not be required for performing the work.
- Work will be completed over 30-day period

Engineering Estimate

6. Decontamination Controls

Assumptions:

- Establishment of the exclusion zone, decontamination zone, and support zone
- Wet decontamination of equipment, level C PPE to be drummed and disposed of at landfill
- Decon pad or Ready Spill berm to be used for equipment decontamination

CONDUCTIVE FLOORING ABATEMENT

Engineering Estimate

1. Remove Conductive Flooring

Assumptions:

- Material can be removed by manual scraping.
- Assumed that no residual energetic materials (i.e., black powder) present in the removal/encapsulation areas and that no additional precautions, except misting with water, will be required during the removal/encapsulation

Engineering Estimate

2. Waste Characterization

Assumptions:

- Analyze for the following TCLP parameters: Metals, VOC, SVOC, Pesticides, Herbicides, PCB and for ignitability, pH and reactivity
- Analyze samples for asbestos content

Engineering Estimate

3. Transportation and Disposal

Assumptions:

- Conductive flooring is assumed to be non-hazardous
- Flooring will be disposed of at an off-Site facility approved to accept asbestos containing materials

Engineering Estimate

4. Site Restoration

Assumptions:

- Site clean-up
- Revegetate disturbed soil

IMPLEMENTATION COST

Engineering Estimate

1. Administration and Legal

Assumptions:

- Assume 5% of capital costs.

Engineering Estimate

2. CMI Plan

Assumptions:

- Assume \$25,000.

Engineering Estimate

3. Procurement

Assumptions:

- Assume 18% of capital costs.

Engineering Estimate

4. Construction Management

Assumptions:

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Engineering Estimate

- Assume 12% of capital costs.

5. Completion Report

Assumptions:

- Assume \$20,000.

Engineering Estimate

6. Cost Contingency

Assumptions:

- Assume 25% of capital costs.

Engineering Estimate

7. O&M Contingency

Assumptions:

- There is no O&M for this alternative

BLA CF- 4 – Removal of Degraded Flooring, Capping (Epoxy) Intact Flooring and Off-Site Disposal with Institutional Controls

Description:

Conductive flooring from the BLA will be removed or sealed. Conductive Flooring that is degraded will removed from the building foundation and disposed of in an approved off-site disposal facility. Flooring that is deemed intact will be sealed with an epoxy coating. Removal of degraded flooring and sealing of intact flooring will remove the exposure pathways and mitigate risk to human health. Because intact flowing will be left in place, long term monitoring and maintenance will be necessary to maintain the integrity of the sealant, and ensure the protectiveness of this alternative. LUCs would be put in place to maintain the current industrial/military land use of the area and minimize traffic in areas where flooring is sealed.

ASSUMPTIONS:

1. Flooring at does not contain energetic materials
2. Site work will occur in level C PPE
3. Access to the site is unobstructed
4. All buildings, including Buildings 404 and 407 will be deemed safe to work in and around without additional structural stabilization

Engineering Estimate

ADMINISTRATIVE ACTIONS

1. Land-Use Controls

Assumptions:

- GIS support at \$750
- Coordinate LUC implementation and prepare public notice: \$1500
- Legal support \$2000
- Estimated cost would be \$4250.

Engineering Estimate

2. Permitting

Assumptions:

- 10 day asbestos abatement notification
- DOT Permits (if necessary)
- Coordinate facility work permits and contractor site access

Engineering Estimate

GENERAL ACTIONS / SITE PREPARATION

1. Focused Asbestos Survey

Assumptions:

- Not required

Engineering Estimate

2. Focused Asbestos Survey Report

Assumptions:

- Not required

Engineering Estimate

3. Structural Evaluation of Building 404 and 407

Assumptions:

- One structural engineer
- Two days to complete evaluation of buildings
- Includes rental equipment for inspection (i.e. man lifts)
- Inspection results to be summarized in report format
- Only includes Buildings 404 and 407 at the BLA.

Engineering Estimate

4. Mobilization/Demobilization

Assumptions:

- Cost to mobilize equipment and personnel to site.
- Includes installation of site trailer, Porta-Johns, health and safety equipment.

Engineering Estimate

5. Dust Suppression Systems and Air Monitoring Equipment

Assumptions:

- Dust suppression will consist of material wetting systems using potable water
- Air monitoring (both personal sampling and perimeter/ambient sampling) will be performed during site work.
- Negative air enclosures will not be required for performing the work.
- Work will be completed over 30-day period

Engineering Estimate

6. Decontamination Controls

Assumptions:

- Establishment of the exclusion zone, decontamination zone, and support zone
- Wet decontamination of equipment, level C PPE to be drummed and disposed of at landfill
- Decon pad or Ready Spill berm to be used for equipment decontamination

CONDUCTIVE FLOORING ABATEMENT

Engineering Estimate

1. Remove Degraded Conductive Flooring

Assumptions:

- Based on visual observation of selected building remnants
- Approx 75% of conductive flooring is in deteriorated state and requires removal
- Assumed that no residual energetic materials (i.e., black powder) present in the removal/encapsulation areas and that no additional precautions, except misting with water, will be required during the removal/encapsulation

Engineering Estimate

2. Seal Intact Conductive Flooring

Assumptions:

- Approx 25% of flooring is intact and can be sealed
- Based on visual observation of selected building remnants
- Seal will consist of spray on epoxy liner.

Engineering Estimate

3. Waste Characterization

Assumptions:

- Analyze for the following TCLP parameters: Metals, VOC, SVOC, Pesticides, Herbicides, PCB and for ignitability, pH and reactivity
- Analyze samples for asbestos content

Engineering Estimate

4. Transportation and Disposal

Assumptions:

- Conductive flooring is assumed to be non-hazardous
- Flooring will be disposed of at an off-site facility approved to accept asbestos containing materials

Engineering Estimate

5. Site Restoration

Assumptions:

- Site clean-up
- Revegetate disturbed soil

O&M, ANNUAL INSPECTION AND FIVE YEAR REVIEW

Engineering Estimate

1. Annual Inspection and Reporting

Assumptions:

- Annual inspection requires 12 hours to complete at \$95/hour (includes travel)
- Report requires 12 hours at \$95/hour

Engineering Estimate

2. Five Year Review

Assumptions:

- Draft, Draft Final and Final reports

Engineering Estimate

3. O&M

Assumptions:

- Intact flooring that has been coated with sealant will require periodic reapplication of sealant
- Annual cost will be 5% of original Capital Cost

IMPLEMENTATION COST

Engineering Estimate

1. Administration and Legal

Assumptions:

- Assume 5% of capital costs.

Engineering Estimate

2. CMI Plan

Assumptions:

- Assume \$20,000.

Engineering Estimate

3. Procurement

Assumptions:

- Assume 18% of capital costs.

Engineering Estimate

4. Construction Management

Assumptions:

- Assume 12% of capital costs.

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Engineering Estimate

5. Completion Report

Assumptions:

- Assume \$15,000.

Engineering Estimate

6. Cost Contingency

Assumptions:

- Assume 25% of capital costs.

Engineering Estimate

7. O&M Contingency

Assumptions:

- Assume 15% of O&M Costs.

BLA and IAA SL-2 – Land Use Controls (LUCs)

Description:

Land Use Controls (LUC) will be implemented to minimize the exposure pathway for areas which drive the unacceptable human health risks and hazards. LUCs will consist of land use restrictions and the installation of fencing and signs to prohibit specific activities at the site. The land use restrictions will maintain the current industrial/military property use of the area.

ASSUMPTIONS:

1. LUC will consist of fence and sign installation
2. Permitting not required
3. Site is easily accessible

ADMINISTRATIVE ACTIONS

Engineers Estimate

1. Land-Use Controls

Assumptions:

- GIS support at \$750
- Coordinate LUC implementation and prepare public notice - \$1500
- Legal Support \$2000
- Estimated cost would be \$4250.

RS Means

2. Fence Installation

Assumptions:

- Includes Labor and Materials
- Fence to be placed around perimeter of site buildings where soil concentrations are above RALs. Assumes RAL exceedances at all buildings with conductive flooring.
- Industrial Chain linked Fence

Vendor Quote

3. Sign Installation

Assumptions:

- Vendor cost for sign manufacturing and shipping \$110 each
- One hour to install each sign at \$95 hour
- Estimated cost would be \$205 per sign

ANNUAL INSPECTION AND FIVE YEAR REVIEW

Engineering Estimate

1. Annual Inspection and Reporting

Assumptions:

- Annual inspection requires 12 hours to complete at \$95/hour (includes travel)
- Report requires 12 hours at \$95/hour

Engineering Estimate

- Conducted for 30 years

2. Five Year Review

Assumptions:

- Draft, Draft Final and Final reports
- Lump sum per site of \$15,000/review
- 6 Reviews conducted over 30 year period

Engineering Estimate

3. Annual O&M

Assumptions

- Minimal Repairs required for fencing and signs on annual basis

Engineering Estimate

IMPLEMENTATION COST

1. Administration and Legal

Assumptions:

- Assume 5% of capital costs.

Engineering Estimate

2. CMI Plan

Assumptions:

- Assume \$20,000.

Engineering Estimate

3. Completion Report

Assumptions:

- Assume \$15,000.

Engineering Estimate

4. Cost Contingency

Assumptions:

- Assume 25% of capital costs.

Engineering Estimate

5. O&M Contingency

Assumptions:

- Assume 15% of O&M Costs.

BLA and IAA SL-3 – Vegetative Soil Cover and Institutional Controls

Description:

A clean soil cover will be constructed at the BLA and IAA over soils that have the highest concentrations of COCs from the flooring. At the BLA and IAA this cover will extend to a minimum distance of 2-ft from the open sides of the buildings; however, this distance may be extended at the BLA to cover soils with concentrations above the industrial RALs. A soil cover will remove the exposure pathway for areas which drive the unacceptable human health risks and hazards. Land use controls to include land use restrictions and installation of signage may be employed at the site to mitigate remaining risk. Land use restrictions would maintain the current industrial/military use of the area.

ASSUMPTIONS:

1. Terrain mostly level.
2. Install 8 inch soil cover (1 ft lift of common borrow followed by a 0.5 ft lift of top soil)
3. Full soil cap only extends over soils where industrial RALs are exceeded.
4. Soil cap will not be installed at closed end of buildings where no flooring impacts are present
5. Re-vegetate disturbed soil.

ADMINISTRATIVE ACTIONS

1. Land-Use Controls

Assumptions:

- GIS support at \$750
- Coordinate LUC implementation and prepare public notice \$1000
- Legal support \$1500
- Estimated cost would be \$3250.

2. Sign Installation

Assumptions:

- Vendor cost for sign manufacturing and shipping \$110 each
- One hour to install each sign at \$95 hour
- Estimated cost would be \$205 per sign

GENERAL ACTIONS / SITE PREPARATION

1. Mobilization / Demobilization

Assumptions:

- Cost to mobilize equipment and personnel to site.
- Includes installation of site trailer, Porta-Johns, health and safety equipment.

Previous Project

Vendor Quote

Engineering Estimate

Engineering Estimate

2. Clear and Grub

Assumptions:

- Clearing and grubbing to be performed using conventional equipment
- Equipment Rental
- Vegetative debris would be chipped and spread on-site
- Estimated daily cost would be \$3,000.

Engineering Estimate

3. Install, Maintain, and Remove Erosion and Sediment Controls

Assumptions:

- E&SC controls may consist of straw bales or silt fence
- Install E&SC controls as appropriate as a Best Management Practice

Engineering Estimate

4. Site Surveying

Assumptions:

- Daily rate of \$1,400
- Survey will take 1 days to complete
- Conduct two surveys (pre and post soil work)

Engineering Estimate

5. Pre Activity Confirmation Sampling

- Minimum of 4 samples per building area
- Samples submitted for laboratory analysis and field screening
- Metals, PAHs, and PCBs. Costs included XRF rental

Engineering Estimate

6. Decontamination Controls

Assumptions:

- All equipment used during excavation will be decontaminated upon completion of the work.
- Decon pad or Ready Spill berm to be used for equipment decontamination

SOIL COVER INSTALLATION

Engineering Estimate

1. Import and Place Common Borrow

BLA Assumptions:

- Soil Cover to extend over 9,000 SF; common borrow placed in two 4 inch lifts => total of 250 CY of Common Borrow to be placed

IAA Assumptions:

- Soil Cover to extend over 14,000 SF; common borrow placed in two 4 inch lifts => total of 305 CY of Common Borrow to be placed

General Assumptions

- 1 CY = 1.2 ton => 300 tons of common borrow at the BLA; 475 tons at the IAA
- \$20 per ton of Common Borrow

Engineers Estimate

2. Import and Place Top Soil

Assumptions:

- Top soil to be placed in one 6-inch lift on top of cap => total of 185 CY of top soil to be placed at BLA; 300 CY at the IAA
- 1 CY topsoil cost \$35.00 including placement

Engineers Estimate

3. Site Restoration

Assumptions:

- Revegetate disturbed areas with native grasses
- Remove silt fence, if needed
- Site clean-up

O&M, ANNUAL INSPECTION AND FIVE YEAR REVIEW

Engineering Estimate

1. Annual Inspection and Reporting

Assumptions:

- Annual inspection requires 12 hours to complete at \$95/hour
- Report requires 12 hours at \$95/hour

Engineering Estimate

2. Five Year Review

Assumptions:

- Draft, Draft Final and Final reports

Engineering Estimate

3. O&M

Assumptions:

- Mowing of cap performed as part of regular mowing program for facility.
- O&M costs are 2.5% of soil cover installation

Engineering Estimate

4. CAP Repairs O&M

Assumptions

- Annual repairs to cap (minor soil work) 2.5% of soil cover installation.

IMPLEMENTATION COST

Engineering Estimate

1. Administration and Legal

Assumptions:

- Assume 5% of capital costs.

Engineering Estimate

2. CMI Plan

Assumptions:

- Assume \$20,000.

Engineering Estimate

3. Procurement

Assumptions:

- Assume 18% of capital costs.

Engineering Estimate

4. Construction Management

Assumptions:

- Assume 12% of capital costs.

Engineering Estimate

5. Completion Report

Assumptions:

- Assume \$15,000.

Engineering Estimate

6. Cost Contingency

Assumptions:

- Assume 25% of capital costs.

Engineering Estimate

7. O&M Contingency

Assumptions:

- Assume 15% of O&M Costs.

BLA and IAA SL- 4 – Excavation, Transportation, and Off-Site Disposal of Soil Exceeding Industrial PRGs with Institutional Controls

Description:

Soil Exceeding the industrial RALs will be excavated and disposed of off-site in an approved landfill. Soil will be excavated to a depth of 1 ft below ground surface, backfilled and then graded to match the existing topography. Soil Removal with LUCs will remove the exposure pathway for areas which drive the unacceptable human health risks and hazards. LUCs will need to be implemented in conjunction with the excavation and disposal to maintain the land use as industrial/military because soil with COCs above the residential PRGs will be left in place.

ASSUMPTIONS:

1. Terrain mostly level.
2. Excavate soil to a depth of 1 ft below ground surface
3. Back fill excavation with 1 ft of common borrow followed by 0.5 ft of top soil
4. Re-vegetate disturbed soil with native grasses
5. LUCs and annual inspections required.

ADMINISTRATIVE ACTIONS

Engineering Estimate

1. Land-Use Controls

Assumptions:

- GIS support at \$750
- Coordinate LUC implementation and prepare public notice \$1000
- Legal Support \$1500
- Estimated cost would be \$3250.

Engineering Estimate

2. Sign Installation

Assumptions:

- Vendor cost for sign manufacturing and shipping \$110 each
- One hour to install each sign at \$95 hour
- Estimated cost would be \$205 per sign

GENERAL ACTIONS / SITE PREPARATION

Engineering Estimate

1. Mobilization / Demobilization

Assumptions:

- Cost to mobilize equipment and personnel to site.
- Includes installation of site trailer, Porta-Johns, health and safety equipment.

Engineering Estimate

2. Clear and Grub

Assumptions:

- Clearing and grubbing to be performed by using conventional equipment
- Rental of equipment
- Assume cleared vegetation will be chipped and spread on-site
- Estimated daily cost would be \$3000.

Engineering Estimate

3. Utility Clearance

Assumptions

- Private utility locator
- One day to clear proposed excavation area

Engineering Estimate

4. Install, Maintain, and Remove Erosion and Sediment Controls

Assumptions:

- E&SC controls may consist of straw bales or silt fence
- Install E&SC controls as appropriate as a Best Management Practice

5. XRF Rental

Vendor Quote

Assumptions:

- Used during 2 week excavation event; Cost \$3,500/week.

6. Site Surveying

Vendor Quote

Assumptions:

- Daily rate of \$1,400
- Survey will take 0.5 days to complete
- Conduct two surveys

7. MEC Avoidance

Vendor Quote

Assumptions:

- Not required

8. Decontamination Controls

Engineering Estimate

Assumptions:

- All equipment will be decontaminated upon completion of soil work
- Decon pad or Ready Spill berm to be used for equipment decontamination

EXCAVATION, DISPOSAL AND BACKFILL

1. Excavation, transportation, and disposal of impacted soil

Engineers Estimate

BLA Assumptions:

- Areal extent of excavation is 3,300 SF, to a depth of 1 ft below ground surface; total volume of excavation is 130 CY
- 1 CY = 1.2 ton => 145 tons of soil to dispose of
- Assume non-hazardous
- Non-haz cost \$167/ton

IAA Assumptions:

- Areal extent of excavation is 5,300 SF, to a depth of 1 ft below ground surface; total volume of excavation is 196 CY
- 1 CY = 1.2 ton => 235 tons of soil to dispose of
- Assume non-hazardous
- Non-haz cost \$167/ton

2. Excavation Confirmation Sampling

Engineering Estimate

Assumptions:

- Collect one sample every 25 linear feet of excavation wall
- Analyze sample for total metals, PAHs, asbestos

3. Import and Place Common Borrow

Engineering Estimate

Assumptions:

- Backfill area of excavation with 1 ft of common borrow
- \$20 per ton of Common Borrow

4. Import and Place Top Soil

Engineering Estimate

Assumptions:

- Backfill area of excavation with 0.5 ft of top soil
- 1 CY topsoil cost \$28.00

5. Waste Characterization

Vendor Quote

Assumptions:

- Collect one sample per 20 tons soil disposed
- Analyze for the following TCLP parameters: Metals, VOC, SVOC, Pesticides, Herbicides, PCB and for ignitability, pH and reactivity

6. Site Restoration

Engineers Estimate

Assumptions:

- Revegetate disturbed soil with native grasses
- Remove silt fence, if needed
- Site clean-up

O&M, ANNUAL INSPECTION AND FIVE YEAR REVIEW

1. Annual Inspection and Reporting

BBLES

Assumptions:

- Annual inspection requires 12 hours to complete at \$95/hour (includes travel)
- Report requires 12 hours at \$95/hour
- Conducted for 30 yearss

2. Five Year Review

Engineering Estimate

Assumptions:

- Draft, Draft Final and Final reports
- Perform 6 reviews of 30 year period

IMPLEMENTATION COST

1. Administration and Legal

Engineering Estimate

Assumptions:

- Assume 5% of capital costs.

2. CMI Plan

Engineering Estimate

Assumptions:

- Assume \$20,000.

3. Procurement

Engineering Estimate

Assumptions:

- Assume 18% of capital costs.

4. Construction Management

Engineering Estimate

Assumptions:

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- Assume 12% of capital costs.

5. Completion Report

Engineering Estimate

Assumptions:

- Assume \$15,000.

6. Cost Contingency

Engineering Estimate

Assumptions:

- Assume 25% of capital costs.

7. O&M Contingency

Engineering Estimate

Assumptions:

- Assume 15% of O&M Costs.

SL- 4 – Excavation, Transportation, and Off-Site Disposal of Soil Exceeding Residential PRGs

Description:

Soil Exceeding the Residential RALs will be excavated and disposed of off-site in an approved landfill. Soil will be excavated to a depth of 1 ft below ground surface, backfilled and then graded to match the existing topography. Removal of soil exceeding the residential RALs will remove the exposure pathway for areas which drive the unacceptable human health risks and hazards, and yield a site without use restrictions. Thus, no LUCs or long term monitoring are required for this option.

ASSUMPTIONS:

1. Terrain mostly level.
2. Excavate soil to a depth of 1.5 ft below ground surface
3. Back fill excavation with 1.5 ft of common borrow followed by 0.5 ft of top soil
4. Re-vegetate disturbed soil.

ADMINISTRATIVE ACTIONS

1. Land-Use Controls

Assumptions:

- Not Required.

GENERAL ACTIONS / SITE PREPARATION

1. Mobilization / Demobilization

Assumptions:

- Cost to mobilize equipment and personnel to site.
- Includes installation of site trailer, Porta-Johns, health and safety equipment.

2. Clear and Grub

Assumptions:

- Clearing and grubbing to be performed using conventional equipment
- Includes equipment rental
- Assume chipped vegetation can be spread on-site
- Estimated daily cost would be \$3,000.

Engineering Estimate

Engineering Estimate

Engineering Estimate

Engineering Estimate

3. Utility Clearance

Assumptions

- Private utility locator
- One day to clear proposed excavation area

Engineering Estimate

4. Install, Maintain, and Remove Erosion and Sediment Controls

Assumptions:

- E&SC controls may consist of straw bales or silt fence
- Install E&SC controls as appropriate as a Best Management Practice

Vendor Quote

5. XRF Rental

Assumptions:

- XRF weekly rental rate \$3,500. Used to field screen samples

Vendor Quote

6. Site Surveying

Assumptions:

- Daily rate of \$1,400
- Survey will take 1 days to complete

Vendor Quote

7. MEC Avoidance

Assumptions:

- Not required

Engineering Estimate

8. Decontamination Controls

Assumptions:

- All equipment decontaminated upon completion of excavation activities
- Decon pad or Ready Spill berm to be used for equipment decontamination

EXCAVATION, DISPOSAL AND BACKFILL

Engineers Estimate

1. Excavation, transportation, and disposal of impacted soil

BLA Assumptions:

- Areal extent of excavation is 27,000 SF, to a depth of 1 ft below ground surface; total volume of excavation is 1000 CY
- 1 CY = 1.2 ton => 1200 tons of soil to dispose of
- Assume non-hazardous

- Non-haz cost \$167/ton

IAA Assumptions:

- Areal extent of excavation is 5,300 SF, to a depth of 1 ft below ground surface; total volume of excavation is 196 CY
- 1 CY = 1.2 ton => 235 tons of soil to dispose of
- Assume non-hazardous
- Non-haz cost \$167/ton

2. Excavation Confirmation Sampling

Engineering Estimate

Assumptions:

- Collect one sample every 25 linear feet of excavation wall
- Analyze sample for total metals

3. Import and Place Common Borrow

Engineering Estimate

Assumptions:

- Backfill area of excavation with 1 ft of common borrow
- \$20 per ton of Common Borrow

4. Import and Place Top Soil

Engineering Estimate

Assumptions:

- Backfill area of excavation with 0.5 ft of top soil
- 1 CY topsoil cost \$28.00

5. Waste Characterization

Vendor Quote

Assumptions:

- Analyze for the following TCLP parameters: Metals, VOC, SVOC, Pesticides, Herbicides, PCB and for ignitability, pH and reactivity

6. Site Restoration

Engineers Estimate

Assumptions:

- Revegetate disturbed soil
- Remove silt fence, if needed
- Site clean-up

IMPLEMENTATION COST

1. Administration and Legal

Engineering Estimate

Assumptions:

- Assume 5% of capital costs.

2. CMI Plan

Engineering Estimate

Assumptions:

- Assume \$20,000.

3. Procurement

Engineering Estimate

Assumptions:

- Assume 18% of capital costs.

4. Construction Management

Engineering Estimate

Assumptions:

- Assume 12% of capital costs.

5. Completion Report

Engineering Estimate

Assumptions:

- Assume \$15,000.

6. Cost Contingency

Engineering Estimate

Assumptions:

- Assume 25% of capital costs.

7. O&M Contingency

Engineering Estimate

Assumptions:

- Assume 15% of O&M Costs.

BDDT SL-2 – Land Use Controls (LUCs)

Description:

Land Use Controls (LUC) will be implemented to minimize the exposure pathway for areas which drive the unacceptable human health risks and hazards. LUCs will consist of land use restrictions and the installation of signs to prohibit specific activities at the site. The land use restrictions will maintain the current industrial/military property use of the area.

ASSUMPTIONS:

1. LUCs will consist of sign installation
2. Permitting not required
3. Site is easily accessible

ADMINISTRATIVE ACTIONS

Engineers Estimate

1. Land-Use Controls

Assumptions:

- GIS support at \$750
- Coordinate LUC implementation and prepare public notice - \$1500
- Legal Support \$2000
- Estimated cost would be \$4250.

Vendor Quote

2. Sign Installation

Assumptions:

- Vendor cost for sign manufacturing and shipping \$110 each
- One hour to install each sign at \$95 hour
- Estimated cost would be \$205 per sign

ANNUAL INSPECTION AND FIVE YEAR REVIEW

Engineering Estimate

1. Annual Inspection and Reporting

Assumptions:

- Annual inspection requires 12 hours to complete at \$95/hour (includes travel)
- Report requires 12 hours at \$95/hour
- Conducted for 30 years

Engineering Estimate

2. Five Year Review

Assumptions:

- Draft, Draft Final and Final reports
- Lump sum per site of \$15,000/review
- 6 Reviews conducted over 30 year period

Engineering Estimate

3. Annual O&M

Assumptions

- Minimal Repairs required for fencing and signs on annual basis

Engineering Estimate

IMPLEMENTATION COST

Engineering Estimate

1. Administration and Legal

Assumptions:

- Assume 5% of capital costs.

Engineering Estimate

2. CMI Plan

Assumptions:

- Assume \$20,000.

Engineering Estimate

3. Completion Report

Assumptions:

- Assume \$15,000.

Engineering Estimate

4. Cost Contingency

Assumptions:

- Assume 25% of capital costs.

Engineering Estimate

5. O&M Contingency

Assumptions:

- Assume 15% of O&M Costs.

SL- 3 – Partial Excavation, Transportation, Off-Site Disposal, and Institutional Controls

Description:

Soil Exceeding the Residential RALs within the down gradient depositional area will be excavated and disposed of off-site in an approved landfill. Soil will be excavated to a depth of 1 ft below ground surface, backfilled and then graded to match the existing topography. Soil impacted with COCs will remain within the BDDT trench, as such, ICs will have to be maintained to ensure that the rip-rap within the trench is inspected and maintained. In addition, the land use restrictions will maintain the current industrial/military property use of the area.

ASSUMPTIONS:

1. Terrain mostly level.
2. All work to be performed in level D PPE
3. Excavate soil to a depth of 1.0 ft below ground surface
4. Soil to be transported and disposed of as Non-hazardous
5. Back fill excavation with 1 ft of Top Soil, soil will be compacted, so factor in additional 25% for compaction
6. Re-vegetate disturbed soil.

Engineering Estimate

ADMINISTRATIVE ACTIONS

1. Land-Use Controls

Assumptions:

- GIS support at \$750
- Coordinate LUC implementation and prepare public notice - \$1500
- Legal Support \$2000
- Estimated cost would be \$4250.

Vendor Quote

2. Sign Installation

Assumptions:

- Vendor cost for sign manufacturing and shipping \$110 each
- One hour to install each sign at \$95 hour
- Estimated cost would be \$205 per sign

GENERAL ACTIONS / SITE PREPARATION

Engineering Estimate

1. Mobilization / Demobilization

Assumptions:

- Cost to mobilize equipment and personnel to site.
- Includes installation of site trailer, Porta-Johns, health and safety equipment.

Engineering Estimate

2. Utility Clearance

Assumptions

- Private utility locator
- One day to clear proposed excavation area

Engineering Estimate

3. Install, Maintain, and Remove Erosion and Sediment Controls

Assumptions:

- E&SC controls may consist of straw bales or silt fence
- Install E&SC controls as appropriate as a Best Management Practice

Engineering Estimate

4. Decontamination Pad

Assumptions:

- All equipment decontaminated upon completion of excavation activities
- Decon pad or Ready Spill berm to be used for equipment decontamination

5. Install, Maintain, and Remove Temporary Access Road

Engineers Estimate

Assumptions:

- Access road to be installed west of site, approximately 1,000 LF
- Must be designed to accommodate a 25 cubic yard end dump truck
- Constructed of Dense Graded Aggregate underlain by geotextile, dimensions of 8 ft wide and 0.5 ft thick.

SOIL EXCAVATION, TRANSPORTATION and DISPOSAL

Engineering Estimate

1. Excavation of Down Gradient Depositional Area

Assumptions:

- Areal extent of excavation is 15,300 SF, to a depth of 1 ft below ground surface; total volume of excavation is 566 CY
- End dump truck is 25 CY; 23 trucks required
- Site access issues will limit ability of excavator to load soils, approximately 3-4 trucks per day; thus 7 days
- Live loading of soil directly into dump truck
- 1 CY = 1.8 tons; thus 1000 tons of soils to dispose of

Vendor Quote

2. Waste Characterization (Parts A&B)

Assumptions:

- Analyze for the following TCLP parameters: Metals, VOC, SVOC, Pesticides, Herbicides, PCB and for ignitability, pH and reactivity
- Two liquid samples required for decontamination water
- Collect one soil sample per 500 tons of soil; two samples required

Engineering Estimate

3. Excavation Confirmation Sampling

Assumptions:

- Collect composite samples on a 25 ft grid
- Analyze sample for total metals

Engineering Estimate

4. Transportation and Disposal of Soil

Assumptions:

- 1000 tons to dispose of
- Transport and dispose of as non-hazardous

5. Import and Place Backfill

Engineers Estimate

Assumptions:

- Backfill area of excavation with 1 ft of fill
- Area of excavation is 15,300 SF
- 566 CY, but compaction will require an additional 25% for a total of 700 CY required for backfill
- \$20 per CY of Common Borrow

Engineering Estimate

6. Site Restoration

Assumptions:

- Revegetate disturbed soil
- Remove silt fence, if needed
- Site clean-up

ANNUAL INSPECTION AND FIVE YEAR REVIEW

Engineering Estimate

1. Annual Inspection and Reporting

Assumptions:

- Annual inspection requires 12 hours to complete at \$95/hour (includes travel)
- Report requires 12 hours at \$95/hour
- Conducted for 30 years

Engineering Estimate

2. Five Year Review

Assumptions:

- Draft, Draft Final and Final reports
- Lump sum per site of \$15,000/review
- 6 Reviews conducted over 30 year period

Engineering Estimate

3. Annual O&M

Assumptions

- Minimal Repairs required for fencing and signs on annual basis

IMPLEMENTATION COST

Engineering Estimate

1. Administration and Legal

Assumptions:

- Assume 5% of capital costs.

Engineering Estimate

2. CMI Plan

Assumptions:

- Assume \$20,000.

Engineering Estimate

3. Procurement

Assumptions:

- Assume 18% of capital costs.
4. Construction Management

Engineering Estimate

Assumptions:

- Assume 12% of capital costs.

Engineering Estimate

5. Completion Report

Assumptions:

- Assume \$15,000.

Engineering Estimate

6. Cost Contingency

Assumptions:

- Assume 25% of capital costs.

Engineers Estimate

7. O&M Contingency

Assumptions:

- Assume 15% of O&M Costs.

SL- 4 – Excavation, Transportation, and Off-Site Disposal

Description:

Soil Exceeding the Residential RALs within the down gradient depositional area and the BDDT trench will be excavated and disposed of off-site in an approved landfill. Rip-rap from within the trench will be stockpiled and saved for later reuse as part of the site restoration. Soil will be excavated to a depth of 1 ft below ground surface within the depositional area and to a depth of 2 ft from within the trench, backfilled, and then graded to match the existing topography. As this option will remove all of the soils identified as posing a risk/hazard, no further action will be required at this site.

ASSUMPTIONS:

1. Terrain mostly level.
2. All work to be performed in level D PPE
3. Excavate soil to a depth of 1.0 ft below ground surface within the depositional area, and to a depth of 2 ft within the trench
4. Soil to be transported and disposed of as Non-hazardous
5. Back fill excavation with Top Soil, soil will be compacted, so factor in additional 25% for compaction
6. Re-vegetate disturbed soil.

ADMINISTRATIVE ACTIONS – Not Required

GENERAL ACTIONS / SITE PREPARATION

Engineering Estimate

1. Mobilization / Demobilization

Assumptions:

- Cost to mobilize equipment and personnel to site.
- Includes installation of site trailer, Porta-Johns, health and safety equipment.

Engineering Estimate

2. Utility Clearance

Assumptions

- Private utility locator
- One day to clear proposed excavation area

Engineering Estimate

3. Install, Maintain, and Remove Erosion and Sediment Controls

Assumptions:

- E&SC controls may consist of straw bales or silt fence
- Install E&SC controls as appropriate as a Best Management Practice

Engineering Estimate

4. Decontamination Pad

Assumptions:

- All equipment decontaminated upon completion of excavation activities
- Decon pad or Ready Spill berm to be used for equipment decontamination

5. Install, Maintain, and Remove Temporary Access Road

Engineers Estimate

Assumptions:

- Access road to be installed west of site, approximately 1,000 LF
- Must be designed to accommodate a 25 cubic yard end dump truck
- Constructed of Dense Graded Aggregate underlain by geotextile, dimensions of 8 ft wide and 0.5 ft thick.

Engineering Estimate

6. Segregate Clean Rip-Rap from Trench for Reuse

Assumptions:

- Rip-rap is not impacted and can be reused
- Use excavator to transfer stone from trench to stockpile

SOIL EXCAVATION, TRANSPORTATION and DISPOSAL

Engineering Estimate

1. Excavation of Down Gradient Depositional Area

Assumptions:

- Areal extent of deposition excavation is 15,300 SF, to a depth of 1 ft below ground surface
- Areal extent of trench excavation is 10,200 SF, to a depth of 2 ft below ground surface
- Total volume to excavate is 1,300 CY
- End dump truck is 25 CY; 52 trucks required
- Site access issues will limit ability of excavator to load soils, approximately 3-4 trucks per day; thus 14 days
- Live loading of soil directly into dump truck
- 1 CY = 1.8 tons; thus 2378 tons of soils to dispose of

Vendor Quote

2. Waste Characterization (Parts A&B)

Assumptions:

- Analyze for the following TCLP parameters: Metals, VOC, SVOC, Pesticides, Herbicides, PCB and for ignitability, pH and reactivity
- Two liquid samples required for decontamination water
- Collect one soil sample per 500 tons of soil; five samples required

Engineering Estimate

3. Excavation Confirmation Sampling

Assumptions:

- Collect composite samples on a 25 ft grid
- Analyze sample for total metals

Engineering Estimate

4. Transportation and Disposal of Soil

Assumptions:

- 2378 tons to dispose of
- Transport and dispose of as non-hazardous

5. Import and Place Backfill

Engineers Estimate

Assumptions:

- Backfill area of excavation with 1 ft of fill
- Volume of excavation is $(15,300 \text{ SF} * 1 \text{ ft}) + (10,200 \text{ SF} * 2 \text{ ft}) = 1316 \text{ CY}$
- 1,316 CY, but compaction will require an additional 25% for a total of 1650 CY required for backfill
- \$20 per CY of Common Borrow

Engineering Estimate

6. Import, Place, and Install Geotextile fabric

Assumptions:

- Install geotextile over foot print of BDDT trench prior to placement of Rip-Rap for erosion and sediment control
- Cost includes procurement and installation

Engineering Estimate

7. Place Stockpiled Rip-Rap Back Into Trench

Assumptions:

- Excavator is required to reinstall rip-rap

Engineering Estimate

8. Site Restoration

Assumptions:

- Revegetate disturbed soil
- Remove silt fence, if needed
- Site clean-up

IMPLEMENTATION COST

Engineering Estimate

1. Administration and Legal

Assumptions:

- Assume 5% of capital costs.

Engineering Estimate

2. CMI Plan

Assumptions:

- Assume \$20,000.

Engineering Estimate

3. Procurement

Assumptions:

- Assume 18% of capital costs.

4. Construction Management

Engineering Estimate

Assumptions:

- Assume 12% of capital costs.

Engineering Estimate

5. Completion Report

Assumptions:

- Assume \$15,000.

Engineering Estimate

6. Cost Contingency

Assumptions:

- Assume 25% of capital costs.

Engineering Estimate

7. O&M Contingency

Assumptions:

- Assume 15% of O&M Costs.

SBG SD-2 – Land Use Controls (LUCs)

Description:

Land Use Controls (LUC) will be implemented to minimize the exposure pathway for areas which drive the unacceptable human health risks and hazards. LUCs will consist of land use restrictions and the installation of signs prohibiting specific activities at the site. The land use restrictions will maintain the industrial/military property use of the area.

ASSUMPTIONS:

1. LUC will consist of sign installation
2. Permitting not required
3. Site is easily accessible

ADMINISTRATIVE ACTIONS

Engineers Estimate

1. Land-Use Controls

Assumptions:

- GIS support at \$750
- Coordinate LUC implementation and prepare public notice - \$2000
- Legal support \$5000
- Estimated cost would be \$7750.

Vendor Quote

2. Sign Installation

Assumptions:

- Vendor cost for sign manufacturing and shipping \$110 each
- One hour to install each sign at \$95 hour
- Estimated cost would be \$205 per sign
- 15 signs installed around perimeter of pond

ANNUAL INSPECTION AND FIVE YEAR REVIEW

Engineering Estimate

1. Annual Inspection and Reporting

Assumptions:

- Annual inspection requires twelve hours to complete at \$95/hour (includes travel)
- Report requires 12 hours at \$95/hour
- Conducted for 30 years

Engineering Estimate

2. Five Year Review

Assumptions:

- Draft, Draft Final and Final reports
- Lump sum per site of \$15,000

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- Six conducted over 30 year period

Engineering Estimate

IMPLEMENTATION COST

1. Administration and Legal

Engineering Estimate

Assumptions:

- Assume 5% of capital costs.

2. CMI Plan

Engineering Estimate

Assumptions:

- Assume \$20,000.

3. Completion Report

Engineering Estimate

Assumptions:

- Assume \$10,000.

4. Cost Contingency

Engineering Estimate

Assumptions:

- Assume 25% of capital costs.

5. O&M Contingency

Assumptions:

- Assume 15% of O&M Costs.

SD-3 – Excavation, Transportation, and Off-Site Disposal of Sediment

Description:

Contaminated sediments located at the Western Burring Ground exceeding the Residential RALs will be excavated and disposed of in a permitted landfill as non-hazardous waste. Prior to sediment excavation, the excavation area will be surveyed to delineate the boundaries, and then isolated with a portable dam to allow dry access to the excavation area and also to prevent the migration of contaminated sediment. After excavation, the sediment will be stabilized with portland cement and then transported off-site for disposal. The excavated shore-line will not be backfilled. Sediment excavation will remove the exposure pathway for areas which drive the unacceptable human health risks and hazards. The completed action will allow for unrestricted land use and clean closure.

ASSUMPTIONS:

1. Work can be performed from shoreline; work platform does not need to be constructed.
2. Assume an average water column depth of 5 ft or less
3. Attainment Area will be isolated with a portable dam
4. Water from dammed area can be pumped back to lake side with minimal treatment.
5. Sediment will be excavated to a depth of two feet below surface
6. No O&M or LUCs will be required after the completion of this remedial action.

ADMINISTRATIVE ACTIONS

Pre-Work Coordination with Army to obtain facility work permits and site access for contractors.

GENERAL ACTIONS / SITE PREPARATION

Engineering Estimate

1. Mobilization / Demobilization

Assumptions:

- Cost to mobilize equipment and personnel to site.
- Includes installation of site trailer, Porta-Johns, health and safety equipment.

Engineering Estimate

2. Clear and Grub

Assumptions:

- Clearing and grubbing to be performed using conventional equipment
- Boulders/Rocks from excavation area can be left on-site.
- Estimated daily cost of labor and equipment would be \$3000.

Engineering Estimate

3. Utility Clearance

Assumptions

- Private utility locator
- One day to clear proposed work areas

Engineering Estimate

4. Install, Maintain, and Remove Erosion and Sediment Controls

Assumptions:

- E&SC controls may consist of straw bales or silt fence
- Install E&SC controls as appropriate as a Best Management Practice

Vendor Quote

5. Site Surveying

Assumptions:

- Daily rate of \$1,500
- Survey will take 1 days to complete
- Conduct two surveys (pre and post work)

Engineering Estimate

6. Decontamination Controls

Assumptions:

- Equipment will be decontaminated upon completion of site work.
- Equipment will be decontaminated off-site prior to site work
- Decon pad or Ready Spill berm to be used for equipment decontamination

SEDIMENT EXCAVATION, STABILIZATION, TRANSPORT AND DISPOSAL

Vendor Price Quote,
Hydro-Barrier Solutions

1. Aqua Barrier Installation

Assumptions:

- Utilized to isolate the excavation area and to mitigate potential migration of sediment during construction activities
- Can be deployed in a water column of 6 ft or less
- Can be deployed from the shore using heavy equipment (excavator)
- One day to deploy and one day for removal using excavator
- Exterior dimension of excavation is 70 x 70 x 100; \$7
- 5 per LF
- Cost of shipping is \$2000, which includes the cost for a technician to oversee deployment.
- Deployment time assumes for concurrent dewatering of excavation area

Engineering Estimate

2. Excavation of Sediment Via Excavator

Assumptions:

- Extended Boom Excavator rental rate of \$2000 per day,
- Excavation anticipated for two days

Engineering Estimate

3. Stabilize Sediment with Portland Cement

Assumptions:

- Stabilize sediment using 10% Portland cement by volume
- Approximately 2 pallets of cement required
- Construct a stabilization pad consisting of 4 jersey barriers, aggregate and geotextile
- Approximately 2 day to stabilize all sediment
- Mix using excavator bucket

Vendor Quote

4 A&B. Waste Characterization

Assumptions:

- Analyze for the following TCLP parameters: Metals, VOC, SVOC, Pesticides, Herbicides, PCB and for ignitability, pH and reactivity
- 5 sediment samples collected minimum
- 2 decon water samples collected

Vendor Quote

5. Excavation and Confirmation Sampling

Assumptions:

- Samples analyzed for total metals
- 24 to 48 hour turn around time
- 12 samples collected at a minimum

Vendor Quote

6. XRF Rental For Field Screening

Assumptions:

- XRF sample analysis to confirm preliminary excavation extent
- Final Limit of excavation to be confirmed with lab sample analysis
- \$5000 weekly rental rate

Engineering Estimate

7. Dewatering/Water Treatment equipment

Assumptions:

- Pumps necessary to dewater excavation area
- Dewatering to occur concurrently with aqua barrier installation
- Water will be filtered to minimize sediment pumped to lake-side
- Water does not require any additional treatment

Engineering Estimate

8. Transporation and Disposal of Sediment

Assumptions:

- Dispose of as non-hazardous waste

Engineering Estimate

- \$265/ton
- 1 CY stabilized sediment => 1.8 tons; thus 70 CY of sediment = 126 tons
- With 25% contingency = 160 tons

9. Site Restoration

Assumptions:

- Revegetate disturbed areas (i.e. from staging of equipment)
- Remove silt fence, if needed
- Site clean-up

Engineering Estimate

10. Backfill

Assumptions:

- Not Required

IMPLEMENTATION COST

Engineering Estimate

1. Administration and Legal

Assumptions:

- Assume 5% of capital costs.

Engineering Estimate

2. CMI Plan

Assumptions:

- Assume \$30,000.

Engineering Estimate

3. Procurement

Assumptions:

- Assume 18% of capital costs.

Engineering Estimate

4. Construction Management

Assumptions:

- Assume 12% of capital costs.

Engineering Estimate

5. Completion Report

Assumptions:

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Engineering Estimate

- Assume \$20,000.

6. Cost Contingency

Assumptions:

- Assume 25% of capital costs.

Engineering Estimate

7. O&M Contingency

Assumptions:

- This option does not require long term O&M or LUCs.