Final
Second Periodic Review Report for
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA
USEPA ID VA1210020730

Prepared For:

U.S. Army Environmental Command
2450 Connell Road, Building 2264
Fort Sam Houston, Texas
and
Radford Army Ammunition Plant
Radford, Virginia

August 2018

Prepared By:

U.S. Army Corps of Engineers
Buffalo District
1776 Niagara Street
Buffalo, New York 14207

Final
Second Periodic Review Report
for

Radford Army Ammunition Plant
Radford, Virginia

August 2018

Prepared for:
U.S. Army Environmental Command
Fort Sam Houston, Texas
and
Radford Army Ammunition Plant
Radford, Virginia

Approved by: **Date:**

18 SEP 2018

James H. Scott, III
Lieutenant Colonel, US Army
Commanding
Radford Army Ammunition Plant

[This page intentionally left blank]

TABLE OF CONTENTS

TABLES

TABLES (Continued)

ATTACHMENTS

FIGURES

FIGURES (Continued)

LIST OF ACRONYMS AND ABBREVIATIONS

ASD	Alternate Source Demonstration
ATSDR	Agency for Toxic Substances and Disease Registry
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CA	Corrective Action
CMO	Corrective Measure Objectives
CMS	Corrective Measures Study
CT	carbon tetrachloride
DCA	dichloroethane
DCE	dichloroethylene
DNX	hexahydro-1,3,5-dinitroso-5-nitro-1,3,5-triazine
DO	dissolved oxygen
GO/CO	government owned/contractor operated
GPSs	Groundwater Protection Standards
HHRA	human health risk assessment
HWMU	hazardous waste management unit
IC	Institutional Controls
IMWP	interim measures work plan
LOD	limits of detection
LOQ	limits of quantitation
MCL	maximum contaminant level
MNA	monitored natural attenuation
MNX	hexahydro-1-nitroso-3,5-dinitro-1,2,5-triazine
ORP	oxidation reduction potential
PCE	tetrachloroethylene
PETN	pentaerythritol tetranitrate
RAB	restoration and advisory board
RCRA	Resource Conservation and Recovery Act
RDX	cyclotrimethylenetrinitramine
RFAAP	Radford Army Ammunition Plant
RFI	RCRA Facility Investigation
RSL	regional screening level
SLERA	screening level ecological risk assessment
SWMU	solid waste management unit
TCA	trichloroethane
TCDD	tetrachlorodibenzodioxin
TCE	trichloroethylene
TCLP	toxicity characteristic leaching procedure
TEQ	toxicity equivalence
TIC	total inorganic carbon
TNT	trinitrotoluene

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

TNX	hexahydro-1,3,5-trinitroso-1,3,5-triazine
TOC	total organic carbon
USACE	United States Army Corps of Engineers
USAEC	United States Army Environmental Command
VDEQ	Virginia Department of Environmental Quality
VDGIF	Virginia Department of Game and Inland Fisheries

EXECUTIVE SUMMARY

This is the second periodic review of remedial actions at the Radford Army Ammunition Plant (RFAAP) located in Radford, Virginia. RFAAP is a government owned/contractor operated installation that occupies 6,900 acres in the mountains of southwest Virginia in Pulaski and Montgomery Counties. Portions of RFAAP soil and groundwater were impacted by historical processes in the production and storage of munitions. Corrective actions have been in progress at the RFAAP since the early 1980s. The remedies at RFAAP are performed under two frameworks: the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Resource and Conservation Recovery Act (RCRA). This review will focus on the RCRA sites; the CERCLA sites will be reviewed under separate cover.

Remedies are implemented on a site-by-site basis under RCRA Hazardous Waste Management Permit (VA1210020730) via both post-closure care and corrective action. The purpose of this review is to evaluate information from the 14 sites listed below, where residual contaminants remain at levels that do not allow for clean closure, to determine if the remedies are and will continue to be protective of human health and the environment. The sites included in this review are:

Sites subject to RCRA Corrective Action Permit:

- CC-001/SSA-72, Oleum Plant Acidic Wastewater Sump
- CC-002/SSA-77, Garbage Incinerator (Building 7219)
- CC-003/SSA-30/79, Asbestos Disposal Trenches 1 and 2
- RAAP-001/SWMU 51, TNT Waste Acid Neutralization Pits
- RAAP-005/SWMU 13, Waste Propellant Burning Ground
- RAAP-009/SWMU 40, Landfill Nitro Area
- RAAP-011/SWMU 41B, Red Water Ash Burial Ground
- RAAP-013/SWMU 49, Red Water Ash Burial #2 and RAAP-018/SWMU 48, Oily Water Burial Area
- RAAP-014/SWMU 54, Propellant Burning Ash Disposal
- RAAP-023/SWMU 43, Sanitary Landfill No. 2
- RAAP-024/SWMU 45, Landfill No. 3
- RAAP-001-R-01, Southeast Hillside Area of Army Reserve Small Arms Range (ARSAR)

Sites subject to RCRA Post-Closure Care Permit:

- RAAP-039/HWMU 16, Hazardous Waste Landfill
- RAAP-042/HWMU 5, Surface Impoundment #5

Although sites governed by an environmental restoration authority other than the CERCLA do not require five-year reviews, the United States Army Environmental Command (USAEC) uses the CERCLA framework to evaluate the selected site-specific remedies under the Army Cleanup Program.

This review was triggered by the signature date of the last review (10 March 2014) and was completed April 2017 through March 2018. The selected remedies include institutional controls, engineering controls, and groundwater remedies including monitored natural attenuation and long-term monitoring. Historical environmental data and data collected since the last review were evaluated to develop protectiveness statements. This review determined that all remedies reviewed are currently protective of human health and the environment, and are expected to remain protective in the future.

This review identified one finding and recommendation not affecting protectiveness:

- For CC-001/SSA-72, institutional controls to prohibit residential use may no longer be warranted due to the decreased toxicity of the main constituents driving the previous need for remedial action. Evaluate CC-001/SSA-72 for clean closure

Also, two opportunities for optimization were identified for RAAP-013/SWMU 49:

- The remedy allows for the modification of the monitoring frequency of monitoring wells from quarterly to annually following four consecutive quarters of results below the RGs. Based on this criteria, the following monitoring wells could be sampled annually: 48MW01, 49MW01, 49MW02, 90MW04, 50MW02, 13MW02, and 13MW04.
- The monitoring program includes several VOCs that are not identified as COCs or associated degradation products or attenuation parameters. The Army may discuss streamlining the monitoring program with regulators to remove all parameters not identified as COCs, degradation products, or attenuation parameters as a potential cost saving measure.

Periodic Review Summary Form

SITE IDENTIFICATION

Site Name: Radford Army Ammunition Plant

EPA ID: VA1210020730

Region: 3	**State:** VA	**City/County:** Pulaski/Montgomery

SITE STATUS

NPL Status: Non-NPL

Multiple OUs? Yes	**Has the site achieved construction completion?** No

REVIEW STATUS

Lead agency: Other Federal Agency
If "Other Federal Agency" was selected above, enter Agency name: Army

Author name (Federal or State Project Manager): James McKenna

Author affiliation: Installation Restoration Program Manager

Review period: April 2017 – March 2019

Date of site inspection: 30 July 2017

Type of review: Discretionary

Review number: 2

Triggering action date: 10 March 2014

Due date *(five years after triggering action date)*: 10 March 2019

Periodic Review Summary Form (continued)

Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Periodic Review:

CC-001/SSA-72, CC-002/SSA-77, CC-003/SSA-30/79, RAAP-001/SWMU 51, RAAP-005/SWMU 13, RAAP-009/SWMU 40, RAAP-011/SWMU 41B, RAAP-018/SWMU 48, RAAP-013/SWMU 49, RAAP-014/SWMU 54, RAAP-018/SWMU 48, RAAP-023/SWMU-43, RAAP-024/SWMU 45, RAAP-039/HWMU 16, RAAP-042/HWMU 5, RAAP-001-R-01

Protectiveness Statement(s)

Operable Unit: CC-001/SSA-72	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):* Click here to enter date.

Protectiveness Statement:
The remedy at CC-001/SSA-72 is protective of human health and the environment. Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA Corrective Action Permit and RFAAP Management Manual, and installation of signage to prevent residential use and intrusive activities.

Operable Unit: CC-002/SSA-77	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):* Click here to enter date.

Protectiveness Statement:
The remedy at CC-002/SSA-77 is protective of human health and the environment. Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA Corrective Action Permit and RFAAP Management Manual, and installation of signage to prevent residential use and intrusive activities.

Operable Unit: CC-003/SSA-30/79	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):* Click here to enter date.

Protectiveness Statement:
The remedy at CC-003/SSA-30/79 is protective of human health and the environment. A soil cover has been installed to contain the ACM within CC-003/SSA-30/79 and prevent adverse exposures, administrative components of the remedy have been installed in the RFAAP RCRA CA Permit and RFAAP Maintenance Manual, and signage has been installed to prevent residential use and intrusive activities.

Periodic Review Summary Form (continued)

Operable Unit: RAAP-001/SWMU 51	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):* Click here to enter date.

Protectiveness Statement:
The remedy at RAAP-001/SWMU 51 is protective of human health and the environment. Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use and intrusive activities at depths greater than 15 feet.

Operable Unit: RAAP-005/SWMU 13	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):* Click here to enter date.

Protectiveness Statement:
The remedy at RAAP-005/SWMU 13 is protective of human health and the environment. Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use and intrusive activities.

Operable Unit: RAAP-009/SWMU 40	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):* Click here to enter date.

Protectiveness Statement:
The remedy at RAAP-009/SWMU 40 is protective of human health and the environment. Institutional and engineering controls have been implemented as required including administrative components, signage, and maintenance activities.

Operable Unit: RAAP-011/SWMU 41B	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):* Click here to enter date.

Protectiveness Statement:
The remedy at RAAP-011/SWMU 41B is protective of human health and the environment. Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use and intrusive activities.

Periodic Review Summary Form (continued)

Operable Unit: RAAP-013/SWMU 49	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):* Click here to enter date.

Protectiveness Statement:
The remedy at RAAP-013/SWMU 49 and RAAP-018/SWMU 48 is protective of human health and the environment. Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use and intrusive activities. Decreases in groundwater contaminant concentrations have been documented via MNA.

Operable Unit: RAAP-014/SWMU 54	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):* Click here to enter date.

Protectiveness Statement:
The remedy at RAAP-014/SWMU 54 is protective of human health and the environment. Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use and intrusive activities. MNA is expected to decrease groundwater concentrations of 2,4,6-TNT and RDX to RGs.

Operable Unit: RAAP-023/SWMU 43	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):* Click here to enter date.

Protectiveness Statement:
The remedy at RAAP-023/SWMU 43 is protective of human health and the environment. Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use and intrusive activities.

Operable Unit: RAAP-024/SWMU 45	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):* Click here to enter date.

Protectiveness Statement:
The remedy at RAAP-024/SWMU 45 is protective of human health and the environment. Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use and earth moving.

Periodic Review Summary Form (continued)

Operable Unit: RAAP-039/HWMU 16	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):* Click here to enter date.

Protectiveness Statement:
The remedy at RAAP-039/HWMU 16 is protective of human health and the environment. Groundwater monitoring is performed as required, land use controls are enforced, quarterly site inspections are performed, and site maintenance is performed on an as-needed basis.

Operable Unit: RAAP-042/HWMU 5	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):* Click here to enter date.

Protectiveness Statement:
The remedy at RAAP-042/HWMU 5 is protective of human health and the environment. Groundwater impacts addressed under a corrective action program have detected decreasing concentrations of TCE to below the GPS, and no TCE daughter products above their respective GPSs across the monitoring network. Land use controls are enforced including restrictions on site use and access controls. Quarterly inspections of the site are currently performed and maintenance is performed on an as-needed basis.

Operable Unit: RAAP-001-R-01	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):* Click here to enter date.

Protectiveness Statement:
The remedy at RAAP-001-R-01 is protective of human health and the environment. Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use. These remedy components prevent current and future residential use of the Southeast Hillside Area.

1.0 INTRODUCTION

Radford Army Ammunition Plan (RFAAP) is a government owned/contractor operated (GO/CO) installation located in Pulaski and Montgomery counties in Virginia. This periodic review was conducted to determine whether previous remedial actions at fifteen (15) sites at RFAAP are protective of human health and the environment. The methods, findings, and conclusions of the review are documented in this report, as well as any issues found during the review and recommendations to address them.

The remedial work at RFAAP subject to this periodic review was completed within the Resource Conservation and Recovery Act (RCRA) framework. Sites governed by an environmental restoration authority other than the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) do not require periodic reviews; however, the United States Army has chosen to evaluate the selected site-specific remedies under the Army Cleanup Program. The Army conducted a review of remedial actions implemented at RFAAP from April 2017 to September 2018 for the following sites:

Sites subject to RCRA Corrective Action Permit:

- CC001/SSA-72, Oleum Plant Acidic Wastewater Sump
- CC002/SSA-77, Garbage Incinerator (Building 7219)
- CC003/SSA-30/79, Asbestos Disposal Trenches 1 and 2
- RAAP-001/SWMU 51, TNT Waste Acid Neutralization Pits
- RAAP-005/SWMU 13, Waste Propellant Burning Ground
- RAAP-009/SWMU 40, Landfill Nitro Area
- RAAP-011/SWMU 41B, Red Water Ash Burial Ground
- RAAP-013/SWMU 49, Red Water Ash Burial #2 and RAAP-018/SWMU 48, Oily Water Burial Area
- RAAP-014/SWMU 54, Propellant Burning Ash Disposal
- RAAP-023/SWMU 43, Sanitary Landfill No. 2
- RAAP-024/SWMU 45, Landfill No. 3
- RAAP-001-R-01, Southeast Hillside Area of Army Reserve Small Arms Range (ARSAR)

Sites subject to RCRA Post-Closure Care Permit

- RAAP-039/HWMU 16, Hazardous Waste Landfill
- RAAP-042/HWMU 5, Surface Impoundment #5

The following sites were omitted from this review for the reasons noted below:

- RAAP-044, the New River Unit: the New River Unit remedial actions were completed in accordance with CERCLA and are therefore subject to a statutory five-year review prepared concurrently under separate cover.

- Former Mortar and Gun Range: Although included in the RCRA Corrective Action Permit, this site is currently under active investigation and a remedy has not yet been selected.

This is the second periodic review for RFAAP. This periodic review was completed due to hazardous substances, pollutants or contaminants remaining at RFAAP above levels that allow for unlimited use and unrestricted exposure. Due to the regulatory status of the sites included in this review, this periodic review is voluntary.

2.0 INSTALLATION-WIDE CHRONOLOGY

The following table lists the dates of important events for RFAAP. Site specific chronologies are provided in Section 5.0.

Table 1 – Chronology of Installation-Wide Events

Event	Date
Preliminary Environmental Survey, Edgewood Arsenal Biomedical Laboratory	December 1975
Installation Assessment of RFAAP by the Army Toxic and Hazardous Materials Agency	October 1976
Hazardous Waste Management Survey of RFAAP completed by the Army	1980
Part A RCRA application submitted, granted interim status	November 19, 1980
Part B RCRA application submitted	1985
RCRA Facility Assessment (RFA) completed by USEPA	June 1987
RCRA Corrective Action Permit VA1210020730 issued by USEPA	1989
Installation assessment aerial photographic survey	June 1992
RCRA Facility Investigation (RFI) completed	November 1992
RCRA Corrective Action Permit VA1210020730 reissued by USEPA	October 31, 2000
Final Facility Wide Background Report completed assessing naturally-occurring background soil inorganic concentrations	December 2001
Statement of Basis prepared by USEPA detailing proposed remedies	May 2011 and June 2014
Final Decision for Corrective Action Sites issued by USEPA	April 2012 and August 2014
First Periodic Review prepared by USACE Omaha District	March 2014
USEPA transferred permit renewal responsibility to the VDEQ	Exact date unknown
RCRA Corrective Action Permit renewed by the VDEQ	April 1, 2016

3.0 BACKGROUND

The following sections detail the background details for RFAAP in large part as initially presented in the first periodic review (USACE 2014). Background information for individual sites is presented in Section 5.0.

3.1 PHYSICAL CHARACTERISTICS

RFAAP occupies 6,900 acres in the mountains of southwest Virginia in Pulaski and Montgomery Counties. RFAAP consists of two noncontiguous units: the main plant and the new river unit. The main plant is located approximately 8 kilometers (5 miles) northeast of the city of Radford. The new river unit is located approximately 10 kilometers (6 miles) west of the main plant near the town of Dublin. All units included in this periodic review are located within the main plant.

RFAAP lies in one of a series of narrow valleys typical of the eastern range of the Appalachian Mountains. Oriented in a northeast-southwest direction, the valley is approximately 40 kilometers (25 miles) long, 13 kilometers (8 miles) in width at the southeast end, and narrows to 3 kilometers (2 miles) at the northeast end. RFAAP lies along the New River in the northeast corner of the valley. The New River flows through the main plant and divides it into two nearly equal sections: the horseshoe area north of the river and the main manufacturing area south of the river. The New River is the boundary between Pulaski and Montgomery Counties. The main manufacturing area falls within Montgomery County and the horseshoe area falls within Pulaski County.

3.1.1 Topography

The topography within the installation varies from a relatively flat floodplain to elevated uplands in extreme southeast section of the main manufacturing area. The New River forms the RFAAP boundary to the north, with an elevation of approximately 510 meters (1,675 feet) above mean sea level. The eastern boundary represents a transition from the floodplain elevation of 512 meters (1,680 feet) above mean sea level to an upland elevation of 579 meters (1,900 feet) above mean sea level. The southern boundary traverses terrain consisting of creek bottoms and sharply rising summits. The western boundary follows the bluff line overlooking the New River to a point where the Norfolk and Western Railroad cross the lower arm of the horseshoe area. The facility displays an overall relief of 104 meters (342 feet). In the horseshoe area to the north and east the New River has a narrow floodplain. The horseshoe area exhibits rolling karst terrain, with three prominent terraces and escarpments, which are remnants of ancient New River floodplains.

RFAAP contains prominent karstic features, including sinkholes, caves, and caverns, that may cause surface expressions. Numerous sinkholes are apparent along the western and southern boundaries of the facility.

3.1.2 Geology

RFAAP is located in the New River Valley, which crosses the Valley and Ridge Province approximately perpendicular to the regional strike of bedrock. The New River Valley cross cuts Cambrian and Ordovician limestone or dolostone. Deep clay-rich residuum is prevalent in areas underlain by carbonate rocks. The valley floor is covered by river floodplain and terrace deposits; karst geology (highly fractured and channelized limestone) is dominant throughout the area.

Karst features at RFAAP include sinkholes, bedrock voids, pinnacled bedrock, and springs formed by the dissolution of calcium carbonate by naturally occurring carbonic acid in rainwater. The greatest areas of karst features are controlled by bedrock stratigraphy and structure, and by the presence of major drainages. RFAAP occupies the central portion of the Pulaski Fault thrust sheet. Four major rock units underlie RFAAP including the Cambrian Elbrook Formation, the Cambrian Rome Formation, the Cambrian Conococheague Formation, and the Mississippian McCrady/Price Formation. The Elbrook and McCrady/Price Formations outcrop at RFAAP. Unconsolidated sediments of Quaternary age overlie the rock units; this sediment includes alluvial, residual, and colluvial deposits.

The subsurface geology consists of alluvium and residual deposits comprised of clay and silt with some sand and gravel overlying bedrock. Depth to bedrock ranges from approximately 17 to 20 meters (55 to 65 feet) below ground surface. Bedrock consists of highly fractured interbedded siltstone, limestone, and dolostone. The Max Meadows Breccia of the Elbrook Formation is evident in outcrops along the slope leading to the New River. In the outcrop along the slope, the tectonic breccia and the limestone and dolostone are highly weathered and include many solution cavities.

3.1.3 Hydrogeology

An alluvial water table occurs primarily within the floodplain areas adjacent to the New River. In these areas, groundwater flow may occur within the alluvium present above bedrock. A water table within alluvium has been identified in the main manufacturing area and the horseshoe area. Investigations indicate the water table within the floodplain alluvium is at a relatively shallow depth of 5 to 8 meters (15 to 25 feet) below ground surface at an elevation similar to the New River. In general, the observed saturated thickness of this water table ranges from “featheredge” to several feet. Unconsolidated sediments generally fine upward and may include basal river jack deposits consisting of sand, gravel, and cobbles. Groundwater flow within the alluvium water table is toward the New River. Upland terrace deposits at RFAAP may also contain groundwater, which is generally localized or in discontinuous perched zones.

Hydrogeological conditions of the bedrock aquifer at RFAAP are complex because of the intense structural deformation of the bedrock units and the karst nature of the aquifer contained within limestone and dolostone. Groundwater within carbonate bedrock may be found within the epikarst zone (where present) and in underlying bedrock within fissures, bedding planes, and karst conduits. Geologic mapping and photolineament studies at RFAAP have shown that there is a significant potential for movement of water through solution features such as sinkholes and for preferential movement of water within karst conduits and along fractures or faults.

In general, groundwater elevation data within the bedrock aquifer also indicate a groundwater gradient toward the New River and away from areas of higher elevation. Some wells display unusually shallow or deep water levels compared with other nearby wells. These differences may be the result of intercepted perched groundwater zones or influence by karst features, such as sinkholes or conduits, which exert a strong local influence and are not reflective of the overall unconfined water table. Groundwater levels in the bedrock aquifer can be very responsive to heavy precipitation within a short time (less than 24 hours) and may rise several feet. This situation demonstrates that the karst aquifer underlying RFAAP can be characterized by conduit flow and illustrates the direct connection between groundwater and surface water that could impact the quality of groundwater for domestic use.

It is not completely understood how the Pulaski Fault affects groundwater movement at RFAAP. The fault is not a simple planar feature, but rather a zone of regional deformation. At some areas, the location of the fault surface can be identified by the presence of lithologic unconformities. However, at RFAAP, the proximity of this fault surface is generally indicated by the abundance of Max Meadows tectonic breccia. This breccia displays distinct weathering characteristics that appear to be the result of intergranular dissolution. The breccia develops extensive solution cavities, which can allow for rapid conduit flow of the groundwater.

3.1.4 Surface Water Hydrology

The New River is the most significant surface water feature within RFAAP. The headwaters of the New River are in northwest North Carolina, near the Tennessee state border. In the RFAAP area, the New River flows northwesterly cutting cliffs through the bedrock. RFAAP is built within an adjacent to a prominent meander loop of the New River. Within RFAAP, the New River width varies from 60 to 300 meters (200 to 1,000 feet), but averages approximately 120 meters (400 feet). The river flow varies due to water management at Claytor Dam, approximately 14 kilometers (9 miles) upgradient (south) from RFAAP. Downstream from the Claytor Dam, typical flows of the New River range between 12,100 and 303,000 million liters (3,200 and 8,000 million gallons) per day. During typical flow conditions, the depth is approximately 1 to 2 meters (4 to 6 feet); however, pools may be 3 meters (10 feet) deep. There are 21 kilometers (13 miles) of river shoreline within the RFAAP main plant boundaries.

Stroubles Creek is the largest local tributary of the New River and flows through the southeast sector of RFAAP. Several branches that originate on and off the RFAAP feed this creek. Flow within Stroubles Creek and its tributaries consist primarily of storm water runoff. Groundwater discharging from the karst bedrock may also supply significant stream flow. Prior to entering the RFAAP, branches of Stroubles Creek flow through rural areas and through the town of Blacksburg.

Numerous springs have been identified within the horseshoe area with the majority of the springs located along the New River. Most of these springs are near the water level of the New River during low flow periods, making them difficult to find other than during low river stage. The springs within the main plant area represent discrete local groundwater discharge points from the carbonate bedrock aquifer. These springs are interpreted to be associated with the complex tectonic history of this area.

The Blacksburg municipal wastewater treatment plant discharges approximately 20 million liters (5.4 million gallons) per day of treated wastewater into the New River upstream of where Stroubles Creek empties into the river. Industrial and domestic treated wastewater is discharged into the New River from the Peppers Ferry wastewater treatment plant. This discharge is located within RFAAP. Currently this plant discharges 17 million liters (4.5 million gallons) per day of water into the New River. RFAAP operates under Virginia Pollutant Discharge Elimination System permit number VA0000248, and discharges approximately 72 million liters (19 million gallons) per day into the New River.

3.1.5 Ecology

In 1999, the Virginia Department of Game and Inland Fisheries conducted an installation-wide biological survey at RFAAP (VDGIF 1999). The survey assessed six natural communities (upland forest, linestone barren, xeric calcareous cliff, calcareous fen, piedmont/mountain bottomland forest, and sand/gravel/mud bar and shore) and four artificial communities (grassland, successional woodland/forest, pine plantation, and wet meadow/marsh and ponds). Endangered plants or animals were not observed at RFAAP during the biological survey. Several rare and unique plants were identified as well as the invertebrate *Speyeria idalia*, and the birds *SAmmodramus henslowii* and *Lanus ludovicianus*.

3.2 LAND AND RESOURCE USE

RFAAP is an industrial, government-owned, contractor-operated facility (currently operated by BAE Systems). Propellants have been manufactured at RFAAP since 1941 and trinitrotoluene (TNT) on an intermittent basis since 1968. The main manufacturing area is moderately to heavily industrialized, while the horseshoe area is slightly less so, particularly in the eastern portion. The working population at RFAAP varies greatly with the mission requirements. There are a number of small tenants.

The areas surrounding RFAAP are chiefly rural and agricultural communities.

The potable water at RFAAP is taken from the New River for consumption and production uses. The New River also supplies process and fire water for plant use. A portion of the water processed at the two water treatment plants is sold to the Montgomery and Pulaski County water authorities. Two supply wells are located on RFAAP, one in the southeast corner of the main manufacturing area and the other in the center of the horseshoe area. The southeast supply well is also used to supply two nearby communities. Several private wells are located to the immediate north of RFAAP, just across the New River from the horseshoe area.

3.3 REGULATORY HISTORY

The environmental program at RFAAP included input from both the USEPA Region III and VDEQ. The Commonwealth of Virginia was authorized to carry out RCRA actions by rule (49 Federal Registrar [FR] 47,391, 04 December 1984, effective 18 December 1984 (USEPA 2017)). However, due to the magnitude and extensive operating history of RFAAP, RFAAP maintains areas potentially subject to cleanup via the Superfund program. While clean-up of Federal Facilities is typically completed under CERCLA authority, there were concerns that an NPL listing would decrease the economic development potential for RFAAP (USEPA 2016). The USEPA, VDEQ, and RFAAP worked collaboratively to develop a unique RCRA Corrective Action Permit that addressed both RCRA and CERCLA concerns yet allowed economic development to continue at RFAAP. A RCRA Corrective Action Permit (VA1210020730) was issued by the USEPA in 1989 and renewed in 2000. The remedy selections for the sites subject to this review were first established in two Statement of Basis documents (USEPA 2011, 2014a). These documents were also drafted by the USEPA. Final Decisions were also issued by the USEPA (USEPA 2012, 2014b). The remedial program was subsequently transferred to the VDEQ whom renewed the Corrective Action Permit in 2016. A RCRA Post-Closure Care Permit was also reissued to RFAAP under the same identifier in 2014 via the VDEQ.

4.0 PERIODIC REVIEW PROCESS

4.1 ADMINISTRATIVE COMPONENTS

The following activities were performed for this periodic review:

- Documents and site data were reviewed.
- Site inspections were performed.
- An interview was conducted with RFAAP staff with insight on decisions made and activities completed at the sites.

This periodic review was conducted and written by staff of the USACE Buffalo District:

- Holly Akers, PE, Project Engineer
- Laura Allen, Project Engineer
- Michelle Barker, FE, PMP, HTRW Regional Technical Specialist
- Karen Keil, PhD, Environmental Toxicologist
- Mick Senus, Project Manager

Staff from RFAAP also provided assistance.

4.2 COMMUNITY NOTIFICATION AND INVOLVEMENT

Based on the status of this report (internal Army), no public notices or interviews with the public were completed. RFAAP has a restoration and advisory board (RAB). The RAB meets twice annually in March and September and is provided information (briefings, presentations, fact sheets, newsletters, and notifications) on restoration efforts. Meeting minutes and information are maintained at: http://www.radfordaapirp.org

A document repository and administrative record are maintained at: http://www.radfordaapirp.org/inforepo/online-index-site.htm

Hard copies are also available at the Montgomery-Floyd Regional Library, Christiansburg Branch, 125 Sheltman Road, Christiansburg, Virginia.

4.3 DOCUMENT REVIEW

Relevant, site-related documents were reviewed including RCRA permit documents, previous site-specific periodic reviews, and recent monitoring/sampling data. A complete list of documents reviewed is provided in Attachment 2.

4.4 INTERVIEWS

An interview with the RFAAP Installation Restoration Program Manager, James McKenna, was performed in support of this review. No information affecting the protectiveness of the remedies at RFAAP was identified in the interview. A copy of the complete interview record is included in Attachment 6.

5.0 SITE-SPECIFIC DISCUSSIONS

5.1 CC-001/SSA-72, OLEUM PLANT ACIDIC WASTEWATER SUMP

5.1.1 Site-Specific Chronology

The following table provides important events and dates for CC-001/SSA-72.

Table 2 – Chronology of Events at CC-001/SSA-72

Event	Date
The sulfuric acid recovery plant (Oleum Plant) acidic wastewater treatment facility was operated in Building 4434 in conjunction with TNT manufacturing operations	1976-1987
TNT manufacturing operations ceased at RFAAP	1986
USEPA completed the RCRA Facility Assessment identifying CC-001/SSA-72 as Unit 72	1987
Draper Aden Associates performed a site screening investigation at the Oleum Plant	2004
Ecology and Environment, Inc. performed an Environmental Baseline Study including CC-001/SSA-72	2007
Site Screening Process Report	2010
USEPA issued a Statement of Basis	25 May 2011
Final Decision for Corrective Action Sites issued by USEPA	April 2012
Annual inspections were performed	26 August 2013 16 July 2014 30 November 2015 22 September 2016 22 May 2017
A remedy for CC-001/SSA-72 was included in the RCRA Corrective Action Permit	April 2016
IC sign posted	2017
The remedy requirements were recorded in a Management Manual for RFAAP.	Unknown

5.1.2 Background

5.1.2.1 Physical Characteristics

The CC-001/SSA-72 site consists of a below grade acid-brick lined sump constructed with reinforced concrete and covered with a grate. The surface level of the sump is constructed on a concrete form sitting several inches off the ground surface. The sump is located in a grassy area adjacent to Building 4429 (former Oleum Plant, see Figure 4 in Attachment 1). The sump is connected to a six-inch plastic subsurface pipe that discharges north to SSA-18. Although stormwater does not drain from the surrounding area into the sump, rainwater does accumulate in the sump during storm events.

The Oleum Plant and CC-001/SSA-72 are located 400-600 feet east of the New River. Historical investigations have identified 25 to 30 feet of alluvial terrace deposits consisting of low plasticity silt/clay to 19 feet underlain by sandy silt. Limestone/dolomite bedrock of the Elbrook Formation is present at approximately 25 to 30 feet below ground surface. Static groundwater elevations measured at 24 to 26 feet below ground surface in the vicinity of SSA-18 (just north of CC-001/SSA-72) and within bedrock at depths greater than 30 feet below ground surface south of SSA-18. Groundwater flow is northwest towards the New River (URS 2010). The depth of the acid sewer line is approximately five feet below grade at the sump. The line remains at or within ten feet below the ground surface between CC-001/SSA-72 and SSA-18 where it terminates.

CC-001/SSA-72 is not located in or adjacent to environmentally sensitive areas.

5.1.2.2 Land and Resource Use

The CC-001/SSA-72 site was operated as part of TNT manufacturing operations from 1976 to 1987 (URS 2010). The sump is connected to drains throughout the Oleum Plant secondary containment areas that collected runoff and processed acidic wastewater. Sulfuric acid wastewater from the Oleum Plant historically discharged to either the sulfuric acid recovery plant waste acid treatment or the C-line acidic wastewater treatment plant. The sump and associated piping are not currently used, but do collect stormwater during precipitation events. The sump is raised several inches above the ground surface and does not collect stormwater sheet flow.

CC-001/SSA-72 and the surrounding area is currently industrial use. The projected future use of the site is also industrial.

5.1.2.3 History of Contamination

Impacts to subsurface soil at CC-001/SSA-72 in the vicinity of the sump may have been caused by deteriorated or broken sections of sewer lines. Attempts were made to assess the integrity of the piping, but were unsuccessful due to a block in the line. Contamination was first confirmed at CC-001/SSA-72 in 2004 during the completion of a site screening investigation (Draper Aden Associates 2004) with supplemental data collected in a subsequent Environmental Baseline Study (E&E 2007) and a Site Screening Process investigation (URS 2010). The investigations identified VOCs, SVOCs, and metals in soil (see Tables 5-1 and 5-3 in Attachment 9), and VOCs, SVOCs, pesticides, explosives, and metals in water samples collected from the sump (see Table 5-2 in Attachment 9).

5.1.2.4 Initial Response

No initial response actions were documented for CC-001/SSA-72.

5.1.2.5 Basis for Taking Action

The basis for taking action at CC-001/SSA-72 was established in the *Final Site Screening Process Report for Site Screening Areas 18, 72, 79, 60 and 77* (URS 2010) with the completion of human health and ecological risk screenings. Elevated surface soil concentrations of benzo(a)pyrene were determined to post unacceptable risk to a residential land use scenario. The potential for ecological risk was considered negligible based on the small size of the site and the nature of previous activities at the site (acid conveyance via subsurface sump and subsurface sewer line).

Groundwater was assessed by evaluating and comparing laboratory results of subsurface soil data to the USEPA Region III soil-to-groundwater site screening levels. In addition, groundwater samples were collected from the Oleum Plant area in conjunction with the Environmental Baseline Study at SSA-18 (E&E, 2007). No remedy was required for groundwater.

5.1.3 Remedial Actions

5.1.3.1 Remedy Selection

Based on the basis for taking action at CC-001/SSA-72, a Corrective Measures Study (CMS) was not performed for CC-001/SSA-72, and no Corrective Measure Objectives (CMOs) were formally established.

The remedy for CC-001/SSA-72 was selected in a Statement of Basis (USEPA 2011) and a subsequent Final Decision (USEPA 2012). The selected remedy is institutional controls to prevent future residential use and to restrict future earth moving. The remedy components are described as follows in the Final Decision:

- Restrict future residential use: Certain units shall not be used for residential purposes unless it is demonstrated to EPA that such use will not pose a threat to human health or the environment or adversely affect or interfere with the selected remedy and EPA provides prior written approval for such use.
- Restrict future earth moving activities: No earth moving activities, including digging, construction and drilling, may be done unless such activities are conducted in accordance with a Health & Safety Plan that was approved by EPA, and that was prepared by an appropriately qualified person familiar with the environmental conditions at the Facility.

The Final Decision also requires the installation of signs at each unit where ICs are being implemented.

5.1.3.2 Remedy Implementation

The remedy at CC-001/SSA-72 was incorporated into the RCRA Corrective Action (CA) Permit in April 2016 (VDEQ 2016). According to installation personnel, the remedy requirements have also been incorporated into an internal Management Manual prepared by the operating contractor. A copy of the manual was not available for inclusion in this Periodic Review due to proprietary content; however, installation personnel indicate that the manual contains requirements consistent with those listed on inspection forms. For CC-001/SSA-72, the requirements are: “Maintain the information sign, and existing soil, vegetation cover, and existing drainage channels, and prevent residential use.”

According to installation personnel, IC signs were installed from 2014-2017. The CC-001/SSA-72 sign reads:

“UNAUTHORIZED PERSONNEL KEEP OUT

THIS SITE IS SUBJECT TO LAND USE CONTROLS

MAINTAIN THIS SITE IN ITS CURRENT INDUSTRIAL/COMMERCIAL STATE

MAINTAIN THE VEGETATIVE COVER AND PREVENT FUTURE RESIDENTIAL USE OF THIS SITE

CONTACT THE ENVIRONMENTAL DEPARTMENT WITH QUESTIONS”

Annual inspections of the site were performed as discussed in Section 5.1.3.3.

5.1.3.3 Operation, Maintenance, and Monitoring

Annual inspections were performed at CC-001/SSA-72 by BAE Systems personnel on behalf of the Army on the following dates:

- 26 August 2013
- 16 July 2014
- 30 November 2015 (IC sign noted under contract, site identified as “SWMU 72”)
- 22 September 2016
- 22 May 2017

The existing soil, vegetative cover, erosion control measures, security, and restriction on residential use were evaluated. No deficiencies were noted and no remedial actions were required on any of the inspections. Copies of the inspection sheets are included in Attachment 10.

5.1.4 Progress Since the Last Review

The previous review included the following protectiveness statement for CC-001/SSA-72:

> “The remedy at CC-001/SSA-72 currently protects human health and the environment because no human exposure is occurring. However, in order for the remedy to be protective in the long-term, the institutional controls need to be implemented to ensure protectiveness.”

The following table documents the issues and recommendations and follow-up actions identified for CC-001/SSA-72 in the previous review:

Table 3 – Actions Taken Since the Last Periodic Review, CC-001/SSA-72

Issue from Previous Review	Recommendation/ Follow-Up Action	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
The institutional controls have not been incorporated into the Permit by modification.	Finalize the RCRA Permit Modification that will, in effect, finalize the remedies selected in the Decision Document.	Army/VDEQ	None indicated	The institutional controls were incorporated into the Permit with the issuance of the Permit renewal.	01 April 2016
The signage required as part of the institutional controls has not been posted.	Post signage as required.	Army	None indicated	The institutional control signage was posted.	2017

5.1.5 Data Review

No environmental data was collected for CC-001/SSA-72 over the past five-year period.

5.1.6 Site Inspection

Site inspections were conducted by USACE on 31 July 2017. They were attended by USACE staff Laura Allen and Mick Senus and led by the RFAAP Installation Restoration Program Manager, James McKenna. CC-001/SSA-72 is located just southeast of the New River adjacent to Building 4429 (the Oleum Plant). The IC sign is posted at the northwest corner of Building 4429 as depicted on Photograph 1 and Figure 1 in Attachment 5. The wastewater sump remains on site as depicted on Photograph 2 in Attachment 5. At the time of the site inspection, CC-001/SSA-72 was vegetated with grass. No evidence of residential use, intrusive activities, or issues affecting protectiveness was observed at the time of the site inspection.

5.1.7 Technical Assessment

5.1.7.1 Question A: Is the Remedy Functioning as Intended by the Decision Document?

Yes, the remedy is functioning as intended by the decision document. The remedy has been incorporated into the RCRA CA permit and a Management Manual for RFAAP. A sign has been posted at the site communicating the requirements of the remedy, and annual inspections were conducted from 2013 through 2017. No evidence of intrusive activities or residential site use has been observed during the annual site inspections or during the site inspection performed in conjunction with this review.

No early indicators of potential issues or opportunities for optimization were identified.

5.1.7.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?

No. There are no newly promulgated or modified requirements of federal or state environmental laws (see Attachment 7) that would change the protectiveness of the SSA-72 remedy. The exposures associated with current land use are comparable to what was assessed at the time the remedy was selected. However, recent toxicity criteria updates to the main constituent driving the previous need for remedial action at the site [benzo(a)pyrene] indicated that this compound is a weaker carcinogen now than previously thought (see Attachment 8). Due to the decreased toxicity of the main constituent driving the previous need for remedial action at CC-001/SSA-72 [benzo(a)pyrene], institutional controls to prohibit residential use may no longer be warranted.

5.1.7.3 Question C: Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No, no other information has come to light that could call into question the protectiveness of the remedy.

5.1.8 Issues

No issues affecting the protectiveness of the remedy at CC-001/SSA-72 were identified.

5.1.9 Recommendations and Follow-Up Actions

No recommendations or follow-up actions were identified affecting the protectiveness of the remedy at CC-001/SSA-72.

The following recommendation is made not affecting the protectiveness of the CC-001/SSA-72 remedy:

Due to the decreased toxicity of the main constituent driving the previous need for remedial action at CC-001/SSA-72 [benzo(a)pyrene], and the possibility that institutional controls to prohibit residential use may no longer be warranted. Evaluate CC-001/SSA-72 for clean closure.

5.1.10 Protectiveness Statement

The remedy at CC-001/SSA-72 is protective of human health and the environment.

Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use and intrusive activities.

5.2 CC-002/SSA-77, GARBAGE INCINERATOR (BUILDING 7219)

5.2.1 Site-Specific Chronology

The following table provides important events and dates for CC-002/SSA-77.

Table 4 – Chronology of Events, CC-002/SSA-77

Event	Date
Site was operated as a garbage incinerator	1940s-1974
Dames and Moore conducted an RFI including the installation and gauging of water levels in piezometers at CC-002/SSA-77	1992
Parsons Engineering Science conducted an RFI at an adjacent site including the collection of groundwater samples from CC-002/SSA-77	1996
Shaw performed an RFI/CMS at an adjacent site including the collection of groundwater samples from CC-002/SSA-77	2008
Additional soil and groundwater characterization was completed and documented in the Site Screening Process Report including human health and ecological risk screenings for CC-002/SSA-77	2010
USEPA issued a Statement of Basis	25 May 2011
USEPA issued a Final Decision	April 2012
Annual inspections were performed	26 August 2013 16 July 2014 30 November 2015 22 September 2016 22 May 2017
A remedy for CC-001/SSA-72 was included in the RCRA CA Permit	April 2016
IC sign posted	2017
The remedy requirements were recorded in a Management Manual for RFAAP.	Unknown

5.2.2 Background

5.2.2.1 Physical Characteristics

The CC-002/SSA-77 site is located in the immediate vicinity of Building 7219, next to shipping and receiving (Building 534) and SWMU 17, Contaminated Scrap Burning Area, in the south-central part of the main manufacturing area (see Figure 5 in Attachment 1). The site consists of a 29-foot by 25-foot concrete block/brick building with a 52-foot tall brick chimney. Building 7219 is built into a hillside and has a basement and a first floor. Paved asphalt roads encircle the building area. The first floor of the building is at grade with the asphalt road to the south of the building. The basement is at grade with the asphalt road to the north of the building. Grass covers the hillside area around Building 7219 between the asphalt pavement areas. The building is serviced by a septic tank located partially above ground approximately 30 feet to the north.

CC-002/SSA-77 is not located in or adjacent to environmentally sensitive areas.

5.2.2.2 Land and Resource Use

The unit is a garbage incinerator formerly used for the incineration of cardboard, wood, paper, and other unidentified trash from the facility from the 1940s until 1974. All equipment has been removed from the building. Building 7219 was used to store rat bait and bee spray pesticides from 1974 until 1987 when the roof began to leak. The roof has since collapsed onto the first floor of the building (URS 2010). The site is currently inactive with no plans to reactivate (USEPA 2012).

The site does include a small grassland vegetative community that could support some ecological use (i.e., shelter and foraging) by some smaller common species in the area.

5.2.2.3 History of Contamination

Contamination was caused by site operations as an incinerator from the 1940s until 1974. Impacts were identified in groundwater during the completion of RFIs in 1996 and 2008. These early investigations identified barium and beryllium, VOCs, and dioxins as COPCs in groundwater, and lead and dioxins/furans in soil (URS 2010).

5.2.2.4 Initial Response

No initial response actions were documented for CC-002/SSA-77.

5.2.2.5 Basis for Taking Action

The basis for taking action at CC-002/SSA-77 was elevated concentrations of 2,3,7,8-tetrachlorodibenzodioxin (TCDD) toxicity equivalency (TEQ) (dioxins) in surface and total soil that pose a risk under a residential site use scenario.

No remedy was deemed necessary for groundwater based on groundwater quality data and an assessment of soil data against soil-to-groundwater screening levels. The screening level ecological risk assessment (SLERA) determined that ecological risks are negligible (URS 2010).

5.2.3 Remedial Actions

5.2.3.1 Remedy Selection

Based on the basis for taking action at CC-002/SSA-77, a CMS was not performed for CC-002/SSA-77, and no CMOs were formally established.

The remedy for CC-002/SSA-77 was selected in a Statement of Basis (USEPA 2011) and a subsequent Final Decision (USEPA 2012). The selected remedy is institutional controls to prevent future residential use and to restrict future earth moving. The remedy components are described as follows in the Final Decision:

- Restrict future residential use: Certain units shall not be used for residential purposes unless it is demonstrated to EPA that such use will not pose a threat to human health or the environment or adversely affect or interfere with the selected remedy and EPA provides prior written approval for such use.

- Restrict future earth moving activities: No earth moving activities, including digging, construction and drilling, may be done unless such activities are conducted in accordance with a Health & Safety Plan that was approved by EPA, and that was prepared by an appropriately qualified person familiar with the environmental conditions at the Facility.

The Final Decision also requires the installation of signs at each unit where ICs are being implemented.

5.2.3.2 Remedy Implementation

The remedy at CC-002/SSA-77 was incorporated into the RCRA CA Permit in April 2016 (VDEQ 2016). According to installation personnel, the remedy requirements have also been incorporated into an internal Management Manual prepared by the operating contractor. A copy of the manual was not available for inclusion in this Periodic Review due to proprietary content; however, installation personnel indicate that the manual contains requirements consistent with those listed on inspection forms. For CC-002/SSA-77, the requirements are: “Maintain the information sign, and existing soil, vegetation cover, and existing drainage channels, and prevent residential use.”

According to installation personnel, IC signs were installed by 2017. The CC-002/SSA-77 sign reads:

“UNAUTHORIZED PERSONNEL KEEP OUT

THIS SITE IS SUBJECT TO LAND USE CONTROLS

MAINTAIN THIS SITE IN ITS CURRENT INDUSTRIAL/COMMERCIAL STATE

MAINTAIN THE VEGETATIVE COVER AND PREVENT FUTURE RESIDENTIAL USE OF THIS SITE

CONTACT THE ENVIRONMENTAL DEPARTMENT WITH QUESTIONS”

Annual inspections of the site were performed as discussed in Section 5.2.3.3.

5.2.3.3 Operation, Maintenance, and Monitoring

Annual inspections were performed at CC-002/SSA-77 by BAE Systems personnel on behalf of the Army on the following dates:

- 26 August 2013
- 16 July 2014
- 30 November 2015 (IC sign noted under contract, site identified as “SWMU 77”)
- 22 September 2016
- 22 May 2017

The existing soil, vegetative cover, erosion control measures, security, and restriction on residential use were evaluated. The 22 September 2016 inspection noted “need to cut grass and spray woody plants”. Copies of the inspection sheets are included in Attachment 10. According to installation personnel, site maintenance activities are performed as suggested during site inspections.

5.2.4 Progress Since the Last Review

The previous review included the following protectiveness statement for CC-002/SSA-77:

> "The remedy at CC-002/SSA-77 currently protects human health and the environment because no human exposure is occurring. However, in order for the remedy to be protective in the long-term, the institutional controls need to be implemented to ensure protectiveness."

The following table documents the issues and recommendations and follow-up actions identified for CC-002/SSA-77 in the previous review:

Table 5 – Actions Taken Since the Last Periodic Review, CC-002/SSA-77

Issue from Previous Review	Recommendation/ Follow-Up Action	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
The institutional controls have not been incorporated into the Permit by modification.	Finalize the RCRA Permit Modification that will, in effect, finalize the remedies selected in the Decision Document.	Army/VDEQ	None indicated	The institutional controls were incorporated into the Permit with the issuance of the Permit renewal.	01 April 2016
The signage required as part of the institutional controls has not been posted.	Post signage as required.	Army	None indicated	The institutional control signage was posted.	2017

5.2.5 Data Review

No environmental data was collected for CC-002/SSA-77 over the past five-year period.

5.2.6 Site Inspection

Site inspections were conducted by USACE on 31 July 2017. They were attended by USACE staff Laura Allen and Mick Senus and led by the RFAAP Installation Restoration Program Manager, James McKenna. CC-002/SSA-77 consists of Building 7219 (former garbage incinerator) and the immediate vicinity. The IC sign is posted at the west side of Building 7219 as depicted on Photographs 3 and 4, and Figure 2 in Attachment 5. At the time of the site inspection, Building 7219 and the associated brick chimney were observed in a deteriorating condition. The surrounding area was vegetated. No evidence of use, intrusive activities, or issues affecting protectiveness was observed at the time of the site inspection.

5.2.7 Technical Assessment

5.2.7.1 Question A: Is the Remedy Functioning as Intended by the Decision Document?

Yes, the remedy is functioning as intended by the decision document. The remedy has been incorporated into the RCRA CA permit and a Management Manual for RFAAP. A sign has been posted at the site communicating the requirements of the remedy, and annual inspections were conducted from 2013 through 2017. No evidence of intrusive activities or residential site use has been observed during the annual site inspections or during the site inspection performed in conjunction with this review.

No early indicators of potential issues or opportunities for optimization were identified.

5.2.7.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?

Yes. There are no newly promulgated or modified requirements of federal or state environmental laws (see Attachment 7) that would change the protectiveness of the SSA-77 remedy. The exposures associated with current land use are comparable to what was assessed at the time the remedy was selected. The main constituent driving potential risks to human health is dioxin toxicity equivalents (2,3,7,8-TCDD). Although the oral reference dose was updated in 2012, the maximum concentration of 2,3,7,8-TCDD is still within an acceptable risk range for industrial use of the site (see Attachment 8). Therefore, the remedy still remains protective.

5.2.7.3 Question C: Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No, no other information has come to light that could call into question the protectiveness of the remedy.

5.2.8 Issues

No issues were identified for the remedy at CC-002/SSA-77.

5.2.9 Recommendations and Follow-Up Actions

No recommendations or follow-up actions were identified for the remedy at CC-002/SSA-77.

5.2.10 Protectiveness Statement

The remedy at CC-002/SSA-77 is protective of human health and the environment.

Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use and intrusive activities.

5.3 CC-003/SSA-30/79, ASBESTOS DISPOSAL TRENCHES 1 AND 2

5.3.1 Site-Specific Chronology

The following table provides important events and dates for CC-003/SSA-30/79.

Table 6 – Chronology of Events at CC-003/SSA-30/79

Event	Date
The disposal of asbestos-containing materials was performed	1982-1987
The USEPA completed an RFA identifying both trenches	1987
Groundwater quality in the vicinity of the trenches was assessed with the completion of an RFI focusing on SWMU 51	1992
A geophysical survey was conducted also focused on SWMU 51	2002
An area-wide groundwater sampling event was completed in the eastern horseshoe area	2006
Site Screening Process Report including human health and ecological risk screenings	2010
USEPA issued a Statement of Basis	May 25, 2011
USEPA issued a Final Decision	April 2, 2012
Annual inspections were performed	26 August 2013 16 July 2014 30 November 2015 22 September 2016 22 May 2017
A remedy for CC-001/SSA-72 was included in the RCRA CA Permit	April 2016
IC sign posted	2017
The remedy requirements were recorded in a Management Manual for RFAAP.	Unknown

5.3.2 Background

5.3.2.1 Physical Characteristics

CC-003/SSA-30/79 consists of two closed asbestos disposal trenches (historically identified as Trenches 1 and 2) within the southeastern section of the horseshoe area and adjacent to RAAP-001/SWMU 51 (see Figure 6 in Attachment 1). The trenches are located within an elevated plateau. Ground surface in the site area slopes from east to west. A local topographic high exists between the land area and landfill areas east of the site. Each trench was estimated to be 15 feet wide by 300 feet long and 15 feet deep at the deepest point. The boundaries between Trench 1 and Trench 2 are indistinguishable. The trenches have been filled to grade and vegetated. A fence surrounds the site area and aboveground power lines cross the middle of the site. The closest structures are storage magazine buildings located north (building 4601-13), east (Building 4601-13), and west (Building 4601-12).

5.3.2.2 Land and Resource Use

The disposal of double-bagged asbestos-containing material was documented from 1982 to 1987 at CC-003/SSA-30/79. In 1987, the site was permitted by the Virginia Department of Waste Management. An estimated 0.25 tons per day of asbestos-containing material were disposed of in Trench 1 and 250 to 300 pounds per day of asbestos-containing material were disposed of in Trench 2 three to five days a week. Daily soil cover was placed over the disposed material (URS 2010). A minimum of one foot of soil cover is present over the asbestos-containing material within the trenches.

CC-003/SSA-30/79 is located in an upland habitat that lacks wetland and significant onsite drainage features.

5.3.2.3 History of Contamination

Impacts to CC-003/SSA-30/79 were directly related to the disposal of the asbestos-containing material from 1982 to 1987. The asbestos-containing material remains on site within the two trenches.

5.3.2.4 Initial Response

No initial response actions were documented for CC-003/SSA-30/79.

5.3.2.5 Basis for Taking Action

The basis for taking action at CC-003/SSA-30/79 is asbestos-containing material remaining within the trenches that may pose a risk to human receptors during construction activities, if exposed to the surface via erosion processes, or if the site is used as a residential property (URS 2010). Site contaminants were not detected in soil or groundwater at concentrations that pose a risk to residential or industrial use. Asbestos was not detected in groundwater (USEPA 2012). Ecological risks were assessed and deemed negligible.

5.3.3 Remedial Actions

5.3.3.1 Remedy Selection

Based on the basis for taking action at CC-003/SSA-30/79, a CMS was not performed for CC-003/SSA-30/79, and no CMOs were formally established.

The remedy for CC-003/SSA-30/79 was selected in a Statement of Basis (USEPA 2011) and a subsequent Final Decision (USEPA 2012). The selected remedy is institutional and engineering controls. The institutional controls prevent future residential use and to restrict future earth moving. The engineering controls consist of a clay cover over the buried waste. The remedy components are described as follows in the Final Decision:

- Engineering controls: Engineering controls will include a clear marking of the area and maintenance of soil cover to prevent erosion and potential exposure to asbestos.
- Restrict future residential use: Certain units shall not be used for residential purposes unless it is demonstrated to EPA that such use will not pose a threat to human health or the environment or adversely affect or interfere with the selected remedy and EPA provides prior written approval for such use.

- Restrict future earth moving activities: No earth moving activities, including digging, construction and drilling, may be done unless such activities are conducted in accordance with a Health & Safety Plan that was approved by EPA, and that was prepared by an appropriately qualified person familiar with the environmental conditions at the Facility.

The Final Decision also requires the installation of signs at each unit where ICs are being implemented.

5.3.3.2 Remedy Implementation

The remedy at CC-003/SSA-30/79 was incorporated into the RCRA CA Permit in April 2016 (VDEQ 2016). According to installation personnel, the remedy requirements have also been incorporated into an internal Management Manual prepared by the operating contractor. A copy of the manual was not available for inclusion in this Periodic Review due to proprietary content; however, installation personnel indicate that the manual contains requirements consistent with those listed on inspection forms. For CC-003/SSA-30/79, the requirements are: “Maintain the information sign, and existing soil, vegetation cover, and existing drainage channels, and prevent residential use.”

According to installation personnel, IC signs were installed by 2017. The CC-003/SSA-30/79 sign reads:

“UNAUTHORIZED PERSONNEL KEEP OUT

THIS SITE IS SUBJECT TO LAND USE CONTROLS

MAINTAIN THIS SITE IN ITS CURRENT INDUSTRIAL/COMMERCIAL STATE

MAINTAIN THE VEGETATIVE COVER AND PREVENT FUTURE RESIDENTIAL USE OF THIS SITE

CONTACT THE ENVIRONMENTAL DEPARTMENT WITH QUESTIONS”

An additional sign is also posted at CC-003/SSA-30/79 that reads:

“CAUTION

ASBESTOS WASTE DISPOSAL SITE

DO NOT CREATE DUST

BREATHING ASBESTOS IS HAZARDOUS TO YOUR HEALTH”

Annual inspections are performed (see Section 5.3.3.3).

5.3.3.3 Operation, Maintenance, and Monitoring

Annual inspections were performed at CC-003/SSA-30/79 by BAE Systems personnel on behalf of the Army on the following dates:

- 26 August 2013
- 16 July 2014
- 30 November 2015 (IC sign noted under contract)
- 22 September 2016
- 22 May 2017

The existing soil, vegetative cover, erosion control measures, security, and restriction on residential use were evaluated. The 22 September 2016 inspection noted "need to cut grass". Copies of the inspection sheets are included in Attachment 10.

5.3.4 Progress Since the Last Review

The previous review included the following protectiveness statement for CC-003/SSA-30/79:

> "The remedy at CC-003/SSA-30/79 currently protects human health and the environment because no human exposure is occurring. However, in order for the remedy to be protective in the long-term, the institutional and engineering controls need to be implemented to ensure protectiveness."

The following table documents the issues and recommendations and follow-up actions identified for CC-003/SSA-30/79 in the previous review:

Table 7 – Actions Taken Since the Last Periodic Review, CC-003/SSA-30/79

Issue from Previous Review	Recommendation/ Follow-Up Action	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
The institutional controls have not been incorporated into the Permit by modification.	Finalize the RCRA Permit Modification that will, in effect, finalize the remedies selected in the Decision Document.	Army/VDEQ	None indicated	The institutional controls were incorporated into the Permit with the issuance of the Permit renewal.	01 April 2016
The engineering controls have not been incorporated into the Permit by modification.	Finalize the RCRA Permit Modification that will, in effect, finalize the remedies selected in the Decision Document.	Army/VDEQ	None indicated	The engineering controls were incorporated into the Permit with the issuance of the Permit renewal.	01 April 2016
The signage required as part of the institutional controls has not been posted.	Post signage as required.	Army	None indicated	Signage was posted as required.	2017
As required by the engineering	Clearly mark the landfill cap or soil	Army	None indicated	Considered but not implemented	N/A

Issue from Previous Review	Recommendation/ Follow-Up Action	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
controls, the landfill cap or soil cover has not been clearly marked.	cover areas as required.				

Additional information was requested from the installation regarding the marking of the landfill cap. The installation indicated the following response:

> "RFAAP is not aware of any requirement in Virginia to physically mark landfill boundaries and also is not aware of any other landfill in Virginia where landfill boundaries are so marked and boundary markers have never been a compliance issue with the Virginia Department of Environmental Quality with respect to RFAAP's closed or active SWMUs, solid waste landfills and/or hazardous waste management units. Also these sites are located in the safety buffer area in the vicinity of energetic (explosive) containing buildings which are basically large open grassy areas. Thus any physical boundary marker in this safety buffer area would impede or otherwise interfere with the operating contractor's grass cutting effort which is performed for safety reasons."

Based on this information, this recommendation has not been carried forward.

5.3.5 Data Review

No environmental data was collected at CC-003/SSA-30/79 over the previous five-year period.

5.3.6 Site Inspection

Site inspections were conducted by USACE on 31 July 2017. They were attended by USACE staff Laura Allen and Mick Senus and led by the RFAAP Installation Restoration Program Manager, James McKenna. CC-003/SSA-30/79 is an open, vegetated field as depicted on Photographs 5 and 6, and Figure 3 in Attachment 5. No evidence of use, intrusive activities, or disturbance of the landfill was observed at the time of the site inspection.

5.3.7 Technical Assessment

5.3.7.1 Question A: Is the Remedy Functioning as Intended by the Decision Document?

Yes, the remedy is functioning as intended by the decision document. The remedy has been incorporated into the RCRA CA permit and a Management Manual for RFAAP. Two signs are posted at the site communicating caution and the requirements of the remedy, and annual inspections were conducted from 2013 through 2017. No evidence of intrusive activities or residential site use has been observed during the annual site inspections or during the site inspection performed in conjunction with this review.

No early indicators of potential issues or opportunities for optimization were identified.

5.3.7.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?

Yes. There are no newly promulgated or modified requirements of federal or state environmental laws (see Attachment 7) that would change the protectiveness of the CC-003/SSA-30/79 remedy. At this site, institutional and engineering controls have been implemented to prevent exposure to asbestos-containing material in the trenches. The site-specific risk-based screening did not indicate any other constituents of concern in soil or groundwater.

5.3.7.3 Question C: Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No, no new information has come to light that could call into question the protectiveness of the remedy.

5.3.8 Issues

No issues were identified affective the protectiveness of the remedy at CC-003/SSA-30/79.

5.3.9 Recommendations and Follow-Up Actions

No recommendations or follow-up actions were identified affecting the protectiveness of the remedy for CC-003/SSA-30/79.

5.3.10 Protectiveness Statement

The remedy at CC-003/SSA-30/79 is protective of human health and the environment.

A soil cover has been installed to contain the ACM within CC-003/SSA-30/79 and prevent adverse exposures, administrative components of the remedy have been installed in the RFAAP RCRA CA Permit and RFAAP Maintenance Manual, and signage has been installed to prevent residential use and intrusive activities.

5.4 RAAP-001/SWMU 51, TNT WASTE ACID NEUTRALIZATION PITS

5.4.1 Site-Specific Chronology

The following table provides important events and dates for RAAP-001/SWMU 51.

Table 8 – Chronology of Events, RAAP-001/SWMU 51

Event	Date
Red water ash and TNT neutralization sludge from the treatment of red water were disposed of at RAAP-001/SWMU 51	1968-1972
USEPA completed an RFA identifying SWMU 51	1989
Installation Assessment identified aerial photographs depicting a trench at RAAP-001/SWMU 51 in 1975	1992
RFI completed	1992
RCRA CA Permit VA1210020730 issued by USEPA	November 8, 1989 (effective date)
RCRA Permit VA1210020730 renewed by USEPA	September 26, 2000 (signature date)
Groundwater samples collected	2006
Site specific RFI/CMS completed	2008
Interim Measure completed	2010
USEPA issued a Statement of Basis	May 25, 2011
USEPA issued a Final Decision	April 2, 2012
Annual inspections were performed	26 August 2013 16 July 2014 30 November 2015 22 September 2016 22 May 2017
RCRA Permit VA1210020730 renewed by VDEQ	April 1, 2016
IC sign posted	2017
The remedy requirements were recorded in a Management Manual for RFAAP.	Unknown

5.4.2 Background

5.4.2.1 Physical Characteristics

The RAAP-001/SWMU 51 site is located on a plateau in the southeastern section of the horseshoe area and consisted of one unlined trench (see Figure 6 in Attachment 1). The plateau is generally flat to slightly sloping and is surrounded by a horseshoe bend of the New River. RAAP-001/SWMU 51 consists of a single trench located within the footprint of an area identified as SWMU 30. The trench measured 23 feet wide, 140 feet long, and 14 feet deep. RAAP-001/SWMU 51 is located approximately 200 feet west of HWMU 16 and SWMU 52 (Closed Hazardous Waste Landfill and Closed Sanitary Landfill). The trench has been backfilled to grade with soil and is covered by grass and weeds. RAAP-001/SWMU 51 is enclosed by a barbed-wire fence.

5.4.2.2 Land and Resource Use

RAAP-001/SWMU 51 was used in the late 1960s and 1970s for the disposal of wastes generated from the production of TNT. During the production of TNT, an alkaline, red-colored aqueous waste is generated (red water). The waste stream is composed of TNT purification filtrate, air pollution control scrubber effluent, wastewater from cleaning equipment and facilities, and washwater from product washdown operations. TNT neutralization sludge is the result of deliquidification (settling/evaporation) of the red water. There are no records of site activities at RAAP-001/SWMU 51 after 1972. Aerial photographs indicate that there was an open trench at the site in 1975. In 1981, aerial photographs show the trench filled with a revegetating ground scar. (Shaw 2008)

The area surrounding RAAP-001/SWMU 51 is developed with storage magazines.

5.4.2.3 History of Contamination

An estimated 550-650 tons of TNT neutralization sludge was disposed of at RAAP-001/SWMU 51. The sludge was also burned in rotary kilns located in the TNT manufacturing area. Approximately 10 tons of red water ash was disposed of at RAAP-001/SWMU 51 from 1968 to 1972.

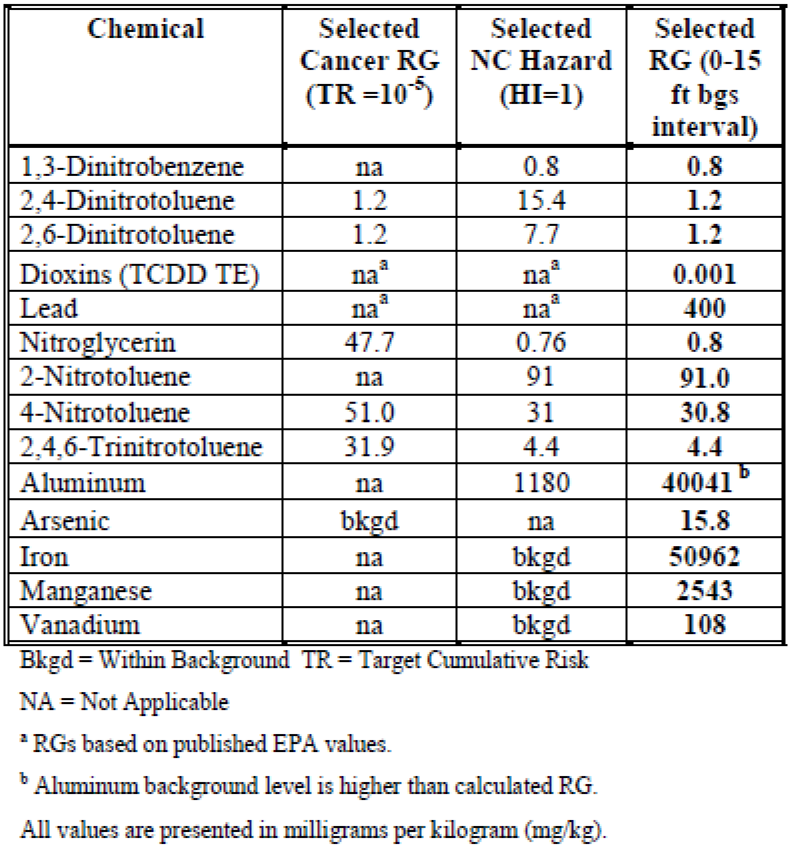
RAAP-001/SWMU 51 was included in the 1992 installation-wide RFI (Dames and Moore 1992) and was the subject of a 2008 site-specific RFI (Shaw 2008). The RFIs determined that a remedy was required for the trench sludge material and grossly contaminated sludge material beneath the trench based on calculated risks posed to theoretical human receptors. Specific contaminants requiring action included 1,3-DNB, 2,4-DNT, 2,6-DNT, NG, 2- and 4-nitrotoluene, 2,4,6-TNT, dioxins/furans, aluminum, and lead. These contaminants were addressed in an interim measure discussed in Section 5.4.2.4, below.

5.4.2.4 Initial Response

An RFI/CMS was completed for RAAP-001/SWMU 51 in 2008 (Shaw 2008). The CMS identified the following CMO: “eliminate the potential threats to human health and the environment that exist from the sludge material and/or grossly contaminated soil under the sludge material, as well as eliminate the threat for a potential future release of contaminants from the sludge material to groundwater.”

An interim measure was performed at RAAP-001/SWMU 51 to address contaminated sludge and grossly impacted soil located in and immediately beneath the disposal trench. In early 2009, 1,867 tons (1,245 cubic yards) of impacted material was excavated from the trench and disposed of at an approved off-site disposal facility. Remedial goals were established based on the depth of the excavation. Remedial goals for soil located at depths less than 15 feet below ground surface were risk-based. Specifically, the shallow remedial goals were based on the lower of a carcinogenic risk of 10^{-5} or an apportioned total Hazard Index (HI) of 1. The following table of shallow remedial goals was provided in the work plan (Shaw 2008):

Table 9 – Shallow Soil Remedial Goals, Interim Measures, RAAP-001/SWMU 51



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

Bkgd = Within Background TR = Target Cumulative Risk

NA = Not Applicable

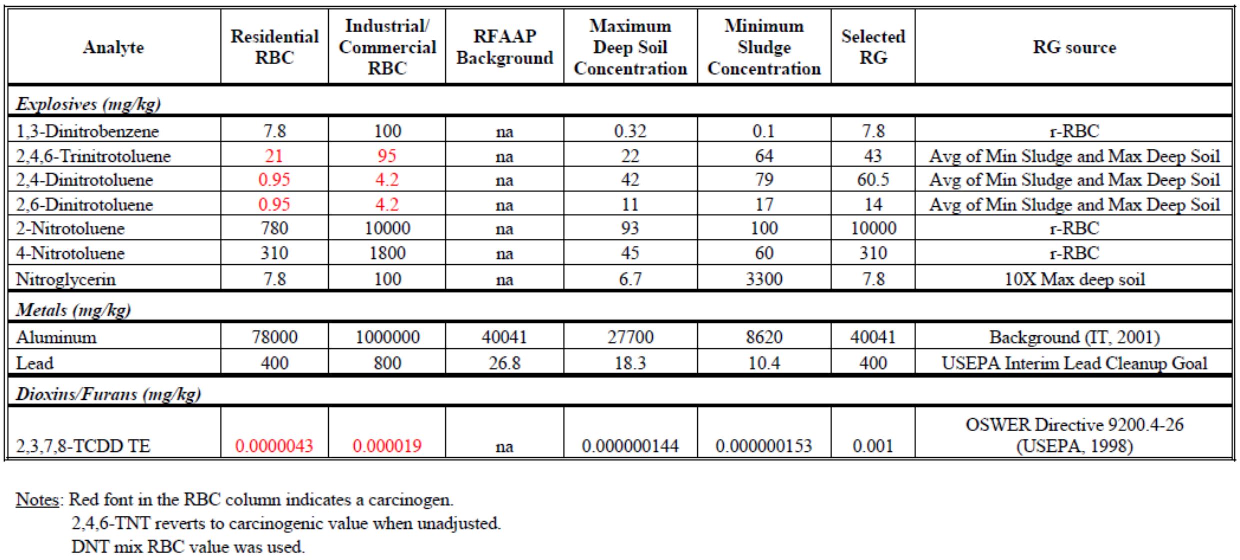
[a] RGs based on published EPA values.

[b] Aluminum background level is higher than calculated RG.

All values are presented in milligrams per kilogram (mg/kg).

Remedial goals for soil located at depths greater than 15 feet were selected to demonstrate the removal of gross contamination. The following table of deep soil remedial goals was provided in the work plan (Shaw 2008):

Table 10 – Deep Soil Remedial Goals, Interim Action, RAAP-001/SWMU 51



Analyte	Residential RBC	Industrial/ Commercial RBC	RFAAP Background	Maximum Deep Soil Concentration	Minimum Sludge Concentration	Selected RG	RG source
Explosives (mg/kg)							
1,3-Dinitrobenzene	7.8	100	na	0.32	0.1	7.8	r-RBC
2,4,6-Trinitrotoluene	21	95	na	22	64	43	Avg of Min Sludge and Max Deep Soil
2,4-Dinitrotoluene	0.95	4.2	na	42	79	60.5	Avg of Min Sludge and Max Deep Soil
2,6-Dinitrotoluene	0.95	4.2	na	11	17	14	Avg of Min Sludge and Max Deep Soil
2-Nitrotoluene	780	10000	na	93	100	10000	r-RBC
4-Nitrotoluene	310	1800	na	45	60	310	r-RBC
Nitroglycerin	7.8	100	na	6.7	3300	7.8	10X Max deep soil
Metals (mg/kg)							
Aluminum	78000	1000000	40041	27700	8620	40041	Background (IT, 2001)
Lead	400	800	26.8	18.3	10.4	400	USEPA Interim Lead Cleanup Goal
Dioxins/Furans (mg/kg)							
2,3,7,8-TCDD TE	0.0000043	0.000019	na	0.000000144	0.000000153	0.001	OSWER Directive 9200.4-26 (USEPA, 1998)

Notes: Red font in the RBC column indicates a carcinogen.
2,4,6-TNT reverts to carcinogenic value when unadjusted.
DNT mix RBC value was used.

Final post-remedial confirmatory sample results are presented in Tables 3-1 through 3-4 in Attachment 9.

The excavation was advanced until both shallow and deep remedial goals were achieved. The final dimensions of the excavation were 170 feet long, 36 feet wide, and 25 feet deep. Native/cover soil from the top of the excavation was sampled separately and was used as backfill at the bottom of the excavation.

5.4.2.5 Basis for Taking Action

The basis for taking final action at RAAP-001/SWMU 51 was established in an Interim Measures Completion Report (Shaw 2010). Although the interim measure achieved remedial goals established for shallow soil (less than 15 feet below ground surface) that would allow for clean closure, the remedial goals achieved for deep soil (greater than 15 feet below ground surface) were site specific as described in Section 5.4.2.4, and would not allow for clean closure. Residual soil contaminant concentrations were identified in confirmatory soil samples collected in conjunction with the interim measure excavation. Exceedances of residential use exposure scenarios remain present at depths greater than 15 feet below ground surface for 2,4,6-trinitrotoluene, 2,4-dinitrotoluene, 2,6-dinitrotoluene, and nitroglycerine (see Table 3-2 in Attachment 9).

5.4.3 Remedial Actions

5.4.3.1 Remedy Selection

The remedy for RAAP-001/SWMU 51 was selected in a Statement of Basis (USEPA 2011) and a subsequent Final Decision (USEPA 2012). The selected remedy is institutional controls to prevent future residential use and to restrict earth moving below 15 feet below ground surface. The remedy components are described as follows in the Final Decision:

- Restrict future residential use: Certain units shall not be used for residential purposes unless it is demonstrated to EPA that such use will not pose a threat to human health or the environment or adversely affect or interfere with the selected remedy and EPA provides prior written approval for such use.

- Restrict future earth moving activities below 15 feet: No earth moving activities, including digging, construction and drilling, may be done unless such activities are conducted in accordance with a Health & Safety Plan that was approved by EPA, and that was prepared by an appropriately qualified person familiar with the environmental conditions at the Facility.

The Final Decision also requires the installation of signs at each unit where ICs are being implemented.

5.4.3.2 Remedy Implementation

The remedy at RAAP-001/SWMU 51 was incorporated into the RCRA CA Permit in April 2016 (VDEQ 2016). According to installation personnel, the remedy requirements have also been incorporated into an internal Management Manual prepared by the operating contractor. A copy of the manual was not available for inclusion in this Periodic Review due to proprietary content; however, installation personnel indicate that the manual contains requirements consistent with those listed on inspection forms. For RAAP-001/SWMU 51, the requirements are: "Maintain the information sign, and existing soil, vegetation cover, and existing drainage channels, and prevent residential use."

According to installation personnel, IC signs were installed by 2017. The RAAP-001/SWMU 51 sign reads:

"UNAUTHORIZED PERSONNEL KEEP OUT

THIS SITE IS SUBJECT TO LAND USE CONTROLS

MAINTAIN THIS SITE IN ITS CURRENT INDUSTRIAL/COMMERCIAL STATE

MAINTAIN THE VEGETATIVE COVER AND PREVENT FUTURE RESIDENTIAL USE OF THIS SITE

CONTACT THE ENVIRONMENTAL DEPARTMENT WITH QUESTIONS"

Annual inspections are performed of RAAP-001/SWMU 51 (see Section 5.4.3.3).

5.4.3.3 Operation, Maintenance, and Monitoring

Annual inspections were performed at RAAP-001/SWMU 51 by BAE Systems personnel on behalf of the Army on the following dates:

- 26 August 2013
- 16 July 2014
- 30 November 2015
- 22 September 2016
- 22 May 2017

The existing soil, vegetative cover, erosion control measures, security, and restriction on residential use were evaluated. The 22 May 2017 inspection noted "need to cut grass". Copies of the inspection sheets are included in Attachment 10.

5.4.4 Progress Since the Last Review

The previous review included the following protectiveness statement for RAAP-001/SWMU 51:

> "The remedy at RAAP-001/SWMU 51 currently protects human health and the environment because no human exposure is occurring. However, in order for the remedy to be protective in the long-term, the institutional controls need to be implemented to ensure protectiveness."

The following table documents the issues and recommendations and follow-up actions identified for RAAP-001/SWMU 51 in the previous review:

Table 11 – Actions Taken Since the Last Periodic Review for RAAP-001/SWMU 51

Issue from Previous Review	Recommendation/ Follow-Up Action	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
The institutional controls have not been incorporated into the Permit by modification.	Finalize the RCRA Permit Modification that will, in effect, finalize the remedies selected in the Decision Document.	Army/VDEQ	None indicated	The institutional controls were incorporated into the Permit with the issuance of the Permit renewal.	01 April 2016
The signage required as part of the institutional controls has not been posted.	Post signage as required.	Army	None indicated	Signage was posted as required.	2017

5.4.5 Data Review

No new environmental data has been collected at RAAP-001/SWMU 51 in the last five years.

5.4.6 Site Inspection

Site inspections were conducted by USACE on 31 July 2017. They were attended by USACE staff Laura Allen and Mick Senus and led by the RFAAP Installation Restoration Program Manager, James McKenna. RAAP-001/SWMU 51 is an open, vegetated field as depicted on Photographs 7 and 8, and Figure 4 in Attachment 5. Monitoring wells in the vicinity of the site were observed locked and in good condition. No evidence of residential use, intrusive activities, or issues affecting protectiveness was observed at the time of the site inspection.

5.4.7 Technical Assessment

5.4.7.1 Question A: Is the Remedy Functioning as Intended by the Decision Document?

Yes, the remedy is functioning as intended by the decision document. The remedy has been incorporated into the RCRA CA permit and a Management Manual for RFAAP. A sign is posted at the site communicating the restrictions on site use and maintenance, and annual inspections were conducted from 2013 through 2017. No evidence of intrusive activities or residential site use has been observed during the annual site inspections or during the site inspection performed in conjunction with this review.

No early indicators of potential issues or opportunities for optimization were identified.

5.4.7.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?

Yes. There are no newly promulgated or modified requirements of federal or state environmental laws (see Attachment 7) that would change the protectiveness of the RAAP-001/SWMU 51 remedy. Remedial action was performed to remove constituents of concern above residential cleanup goals within the top 15 feet of soil. Below that depth, cleanup goals were chosen to ensure that trench sludge and grossly contaminated soil immediately below the sludge have been removed. Although the toxicity criteria have been updated for 4 constituents targeted for cleanup (2,4- and 2,6-dinitrotoluene, 2,3,7,8-TCDD, and vanadium), the current restrictions on exposure, which limit exposure to that commensurate with industrial land-use, remains protective (see Attachment 8).

5.4.7.3 Question C: Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No, no other information has come to light that could call into question the protectiveness of the RAAP-001/SWMU 51 remedy.

5.4.8 Issues

No issues were identified that affect the protectiveness of the remedy at RAAP-001/SWMU 51.

5.4.9 Recommendations and Follow-Up Actions

No recommendations or follow-up actions were identified that would affect the protectiveness of the RAAP-001/SWMU 51 remedy.

5.4.10 Protectiveness Statement

The remedy at RAAP-001/SWMU 51 is protective of human health and the environment.

Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use and intrusive activities at depths greater than 15 feet.

5.5 RAAP-005/SWMU 13, WASTE PROPELLANT BURNING GROUND

5.5.1 Site-Specific Chronology

The following table provides important events and dates for RAAP-005/SWMU 13.

Table 12 – Chronology of Events, RAAP-005/SWMU 13

Event	Date
Explosives, propellants, and laboratory wastes were burned on the Open Burning Ground located upgradient from RAAP-005/SWMU 13.	1941-1985
A visual site inspection was performed at the upgradient Open Burning Ground. Incompletely combusted propellant were observed.	1987
New River and Tributaries Study	1997
Open Burning Ground soil and groundwater monitoring conducted as part of RCRA Subpart X permit.	2005-2008
URS performed a Site Screening Process Investigation	2007
SWMU 54 RCRA Facility Investigation included the collection of samples along the New River adjacent to RAAP-005/SWMU 13	2008
RCRA Facility Investigation performed for RAAP-005/SWMU 13	2010
USEPA issued a Statement of Basis	May 25, 2011
USEPA issued a Final Decision	April 2, 2012
Annual inspections were performed	26 August 2013 16 July 2014 30 November 2015 22 September 2016 22 May 2017
RCRA Permit VA1210020730 renewed by VDEQ	April 1, 2016
IC sign posted	2017
The remedy requirements were recorded in a Management Manual for RFAAP.	Unknown

5.5.2 Background

5.5.2.1 Physical Characteristics

RAAP-005/SWMU 13 consists of approximately 1.6 acres located between an Open Burning Ground and the north bank of the New River in the eastern section of the horseshoe area (see Figure 7 in Attachment 1). The site is located outside of installation fencing within the 100-year flood plain. RAAP-005/SWMU 13 is vegetated and undeveloped.

5.5.2.2 Land and Resource Use

Since manufacturing operations began at RFAAP in 1941, an Open Burning Ground located upgradient from RAAP-005/SWMU 13 has been used for the burning of waste explosives, propellants, and laboratory wastes (propellant and explosives residues, samples, and analytical residues). RAAP-005/SWMU 13 is undeveloped.

5.5.2.3 History of Contamination

RAAP-005/SWMU 13 is located downgradient from the Open Burning Ground, an area subject to RCRA Subpart X Permit VA1210020730. Until 1985, the Open Burning Ground was used for the burning of waste explosives, propellants, and laboratory wastes sometimes outside of burn pans directly on site soil.

Impacts were first identified at RAAP-005/SWMU 13 during the collection of soil and groundwater samples as required for the Open Burning Ground RCRA Subpart X permit from 2005 to 2008. Elevated concentrations of metals were detected in soil at concentrations exceeding residential risk screening levels.

5.5.2.4 Initial Response

No initial response actions were performed at RAAP-005/SWMU 13.

5.5.2.5 Basis for Taking Action

The basis for taking action at RAAP-005/SWMU 13 is the presence of an elevated lead concentration in soil. The results of lead modeling predicting the probability of receptors (including theoretical future residential receptors) expected to have blood levels of 10 micrograms per deciliter (µg/dL) or greater were below the established threshold of 5%. Comment from the regulators on this conclusion was as follows:

> “EPA and VADEQ disagree that no hot spots for lead are present at SWMU 13. Two sample locations show lead concentrations that are substantially higher than lead levels reported in the remaining SWMU 13 samples. Acute risks associated with hot spot exposure should be evaluated, and to this end, EPA performed a risk analysis of these two areas. The Agency concludes that contact with conservatively drawn exposure areas of SWMU 13 is not expected to pose short term risks. However, in consideration of the substantially elevated lead result of 26,500 mg/kg for sample 13SB11B, institutional controls will be required to prevent future digging at this SWMU.”

No remedy was required for site groundwater. No ecological risks were identified at RAAP-005/SWMU 13. A soil loss assessment was conducted as part of the RFI due to the site proximity to the New River. As a result of the assessment, no further action was required to address erosion.

5.5.3 Remedial Actions

5.5.3.1 Remedy Selection

Based on the basis for taking action at RAAP-005/SWMU 13, a CMS was not performed for RAAP-005/SWMU 13, and no CMOs were formally established.

The remedy for RAAP-005/SWMU 13 was selected in a Statement of Basis (USEPA 2011) and a subsequent Final Decision (USEPA 2012). The selected remedy is institutional controls to prevent future residential use and to restrict future earth moving. The remedy components are described as follows in the Final Decision:

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

The Final Decision also requires the installation of signs at each unit where ICs are being implemented.

5.5.3.2 Remedy Implementation

Although the remedy for RAAP-005/SWMU 13 was selected in 2012, implementation was delayed due to the renewal cycle for the RCRA CA Permit. The remedy at RAAP-005/SWMU 13 was incorporated into the RCRA CA Permit in April 2016 (VDEQ 2016). According to installation personnel, the remedy requirements have also been incorporated into an internal Management Manual prepared by the operating contractor. A copy of the manual was not available for inclusion in this Periodic Review due to proprietary content; however, installation personnel indicate that the manual contains requirements consistent with those listed on inspection forms. For RAAP-005/SWMU 13, the requirements are: "Maintain the information sign, and existing soil, vegetation cover, and existing drainage channels, and prevent residential use."

According to installation personnel, IC signs were installed by 2017. The RAAP-005/SWMU 13 sign reads:

"UNAUTHORIZED PERSONNEL KEEP OUT

THIS SITE IS SUBJECT TO LAND USE CONTROLS

MAINTAIN THIS SITE IN ITS CURRENT INDUSTRIAL/COMMERCIAL STATE

MAINTAIN THE VEGETATIVE COVER AND PREVENT FUTURE RESIDENTIAL USE OF THIS SITE

CONTACT THE ENVIRONMENTAL DEPARTMENT WITH QUESTIONS"

Annual inspections are performed of RAAP-005/SWMU 13 (see Section 5.5.3.3).

5.5.3.3 Operation, Maintenance, and Monitoring

Annual inspections were performed at RAAP-005/SWMU 13 by BAE Systems personnel on behalf of the Army on the following dates:

- 26 August 2013
- 16 July 2014
- 30 November 2015 (institutional controls sign noted as under contract)
- 22 September 2016
- 22 May 2017

The existing soil, vegetative cover, erosion control measures, security, and restriction on residential use were evaluated. No deficiencies were identified. Copies of the inspection sheets are included in Attachment 10.

5.5.4 Progress Since the Last Review

The previous review included the following protectiveness statement for RAAP-005/SWMU 13:

> "The remedy at RAAP-005/SWMU 13 currently protects human health and the environment because no human exposure is occurring. However, in order for the remedy to be protective in the long-term, the institutional controls need to be implemented to ensure protectiveness."

The following table documents the issues and recommendations and follow-up actions identified for RAAP-005/SWMU 13 in the previous review:

Table 13 – Actions Taken Since the Last Periodic Review, RAAP-005/SWMU 13

Issue from Previous Review	Recommendation/ Follow-Up Action	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
The institutional controls have not been incorporated into the Permit by modification.	Finalize the RCRA Permit Modification that will, in effect, finalize the remedies selected in the Decision Document.	Army/VDEQ	None indicated	The institutional controls were incorporated into the Permit with the issuance of the Permit renewal.	01 April 2016
The signage required as part of the institutional controls has not been posted.	Post signage as required.	Army	None indicated	The required signage was posted by the Army.	2017

5.5.5 Data Review

No new environmental data has been collected at RAAP-005/SWMU 13 in the last five years.

5.5.6 Site Inspection

Site inspections were conducted by USACE on 31 July 2017. They were attended by USACE staff Laura Allen and Mick Senus and led by the RFAAP Installation Restoration Program Manager, James McKenna. RAAP-005/SWMU 13 is located between installation fencing and the New River. The IC sign is posted just inside the installation fence as depicted on Photograph 9 and Figure 5 in Attachment 5. At the time of the site inspection, RAAP-005/SWMU 13 was vegetated with grass and lightly wooded. No evidence of residential use, intrusive activities, or issues affecting protectiveness was observed at the time of the site inspection.

5.5.7 Technical Assessment

5.5.7.1 Question A: Is the Remedy Functioning as Intended by the Decision Document?

Yes, the remedy is functioning as intended by the decision document. The remedy has been incorporated into the RCRA CA permit and a Management Manual for RFAAP. A sign is posted at the site communicating the restrictions on site use and maintenance, and annual inspections were conducted from 2013 through 2017. No evidence of intrusive activities or residential site use has been observed during the annual site inspections or during the site inspection performed in conjunction with this review.

No early indicators of potential issues or opportunities for optimization were identified.

5.5.7.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?

Yes. There are no newly promulgated or modified requirements of federal or state environmental laws (see Attachment 7) that would change the protectiveness of the RAAP-005/SWMU 13 remedy. The remedy includes institutional controls to prevent exposure to lead hot spots in the soil. Although the USEPA updated some of the exposure factor values for use in its Adult Lead Model in 2017, these recent model updates do not affect the protectiveness of the remedy (see Attachment 8).

5.5.7.3 Question C: Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No, no new information has come to light that could call into question the protectiveness of the remedy.

5.5.8 Issues

No issues were identified that affect the protectiveness of the remedy at RAAP-005/SWMU 13.

5.5.9 Recommendations and Follow-Up Actions

No recommendations or follow-up actions were identified that affect the protectiveness of the remedy at RAAP-005/SWMU 13.

5.5.10 Protectiveness Statement

The remedy at RAAP-005/SWMU 13 is protective of human health and the environment.

Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use and intrusive activities.

5.6 RAAP-009/SWMU 40, LANDFILL NITRO AREA

5.6.1 Site-Specific Chronology

The following table provides important events and dates for RAAP-009/SWMU 40.

Table 14 – Chronology of Events at RAAP-009/SWMU 40

Event	Date
Burial of paper, office trash, concrete, and rubber tires	Early 1970s-Late 1980s
An asbestos accumulation area constructed adjacent to the landfill	1991
Verification investigation	1992
RCRA Facility Investigation/Corrective Measures Study	2009
USEPA issued a Statement of Basis	May 25, 2011
USEPA issued a Final Decision	April 2, 2012
Interim Measures Completion Report issued	May 2012
Groundwater monitoring and annual inspections were performed, reviewed in first periodic review	November 2011 March 2012 June 2012 September 2012
Groundwater monitoring performed, reviewed in this (second) periodic review	August 2013 July 2014 December 2014 November 2015
Annual inspections performed, reviewed in this (second) periodic review	August 2013 July 2014 November 2015 September 2016 May 2017
IC sign posted	2014
Remedy Review	2015
Agency for Toxic Substances and Disease Registry (ATSDR) performed a health consultation	2015
RCRA Permit VA1210020730 renewed by VDEQ	April 1, 2016
The remedy requirements were recorded in a Management Manual for RFAAP.	Unknown

5.6.2 Background

5.6.2.1 Physical Characteristics

RAAP-009/SWMU 40 consists of 2 acres located within the south-central portion of the main manufacturing area (see Figure 8 in Attachment 1). The site is an undeveloped open grass-covered area with the exception of a gravel covered area historically used for temporary storage of asbestos located adjacent to the eastern edge of the unit. The asbestos accumulation area measures approximately 80 feet by 80 feet and is surrounded by a fence and locked enclosure. A commercial, covered roll off box is staged within the storage area. The roll off box is an active unit to handle regulated asbestos containing material. A paved road is located south of the landfill and undeveloped land borders the landfill to the north (field) and the west (wooded area).

5.6.2.2 Land and Resource Use

Based on aerial photographs, RAAP-009/SWMU 40 was used for the disposal of paper, office trash, concrete, and rubber tires from at least 1971 through 1986. The unit was not permitted as a solid waste landfill by the Commonwealth of Virginia. The total landfill encompasses approximately 1.2 acres and contains approximately 18,700 bank cubic yards of landfill material.

5.6.2.3 History of Contamination

Subsurface investigations were performed at RAAP-009/SWMU 40 in 1992 to evaluate the potential for the leaching of hazardous constituents from the closed landfill and in 2009 to determine whether a remedy was required (RFI/CMS). Metals and PCBs were identified as the primary COPCs in soil at RAAP-009/SWMU 40. Impacts to soil are primarily limited to the landfill material itself with the exception of a surficial area of soil containing PCBs located adjacent to the northern escarpment of the landfill (URS 2009).

5.6.2.4 Initial Response

No initial response actions were completed for RAAP-009/SWMU 40.

5.6.2.5 Basis for Taking Action

The basis for taking action at RAAP-009/SWMU 40 was elevated risks posed to a future hypothetical construction worker by aluminum in soil (via inhalation), and a hypothetical future lifetime resident by arsenic and PCBs in soil and chloroform in groundwater (URS 2009, USEPA 2012).

No unacceptable risks were identified for potential ecological receptors.

5.6.3 Remedial Actions

5.6.3.1 Remedy Selection

The CMOs for RAAP-009/SWMU 40 were to:

- Maintain containment of the landfill material at the site and implement necessary controls to prevent future uncontrolled human exposure to this landfill material.
- Implement any necessary measures to stabilize and repair the landfill cover at the northern edge of the landfill area to prevent any further mass transport of soil material in this area.

The remedy for RAAP-009/SWMU 40 was selected in a Statement of Basis (USEPA 2011) and a subsequent Final Decision (USEPA 2012). The selected remedy is institutional/engineering controls and long-term monitoring with the following components:

- Institutional controls consisted of:
  - Prevention of residential use
  - An earth-moving restriction
  - A restriction on potable use of groundwater
- Engineering controls consisted of:
  - Repairs to the existing landfill cap
  - Long-term inspection and maintenance of the cap
  - A clear marking of the capped area
- Long-term monitoring is proposed for 30 years and included the following:
  - Installation of an additional downgradient monitoring well
  - Quarterly groundwater sampling of four groundwater monitoring wells for one year
  - Seasonal sampling (every 9 months) for 2-5 years
  - Annual sampling for years 6-25
  - Preparation of annual long-term monitoring reports

One remedial goal was selected for chloroform in groundwater equal to the MCL of 80 µg/L.

5.6.3.2 Remedy Implementation

Interim measures were selected as a means to accelerate closure of the site and begin long-term maintenance and monitoring. The scope of interim measures were outlined in an Interim Measures Work Plan (UXB KEMRON 2011), including an exit strategy for the groundwater monitoring. The interim measures scope included:

- Engineering controls and landfill cap repairs
- Monitoring well installation (40MW7)
- Interim measures completion report
- Long term monitoring and maintenance

Interim remedy completion at RAAP-009/SWMU 40 was detailed in an Interim Measure Completion Report (UBX KEMRON 2012) and a Remedy Review document (UBX KEMRON 2015b). The reports outlined the following activities:

- Engineering controls:
  - Landfill cap repair (October-November 2011) on the north face of the landfill slope and construction of a drainage swale to mitigate future stormwater erosion
  - Construction of a two-foot thick clay cap (October-November 2011) over a location identified as 40SS1 during the RFI to address exposed PCBs
  - Installation of a sign (March 2014) stating the following:

“UNAUTHORIZED PERSONNEL KEEP OUT

THIS SITE IS SUBJECT TO LAND USE CONTROLS

MAINTAIN THIS SITE IN ITS CURRENT INDUSTRIAL/COMMERCIAL STATE

MAINTAIN THE VEGETATIVE COVER AND PREVENT FUTURE RESIDENTIAL USE OF THIS SITE

CONTACT THE ENVIRONMENTAL DEPARTMENT WITH QUESTIONS”

- Long-term monitoring:
  - Bedford Well Drilling installed a new groundwater monitoring well (14 November 2011), 40MW7, approximately 135 feet west-northwest of the landfill area
  - Groundwater monitoring and reporting was performed as detailed in Section 5.6.3.3
  - Landfill inspections were performed as detailed in Section 5.6.3.3

Although institutional controls were also selected as a component of the remedy for RAAP-009/SWMU 40 in 2012, implementation of ICs was delayed due to the renewal cycle for the RCRA CA Permit. The remedy at RAAP-009/SWMU 40 was incorporated into the RCRA CA Permit in April 2016 (VDEQ 2016). According to installation personnel, the remedy requirements have also been incorporated into an internal Management Manual prepared by the operating contractor. A copy of the manual was not available for inclusion in this Periodic Review due to proprietary content; however, installation personnel indicate that the manual contains requirements consistent with those listed on inspection forms. For RAAP-009/SWMU 40, the requirements are: “Maintain the information sign, and existing soil, vegetation cover, and existing drainage channels, and prevent residential use.”

Annual inspections are performed of RAAP-009/SWMU 40 (see Section 5.6.3.3).

5.6.3.3 Operation, Maintenance, and Monitoring

Operation, maintenance, and monitoring activities at RAAP-009/SWMU 40 were documented in annual long-term monitoring reports submitted for review and approval from the USEPA and VDEQ. Seasonal groundwater monitoring and annual inspection annual reports were prepared from 2013-2015 as follows:

- October 2013 (Year 2, UXB 2013b)

  This report covered a site inspection dated 18 June 2013 and groundwater monitoring performed on 19 June 2013.

- July 2014 (Year 3, UXB 2014)

  This report covered a site inspection (site photographs, no inspection form included) and groundwater monitoring from 26-27 March 2014.

- March 2015 (Year 4, KEMRON 2015a)

  This report covered a site inspection on 01 December 2014 and groundwater monitoring on 02 December 2014.

BAE Systems also performed inspections on the following dates:

- 26 August 2013
- 16 July 2014
- 30 November 2015

- 22 September 2016
- 22 May 2017

In addition, a remedy review was completed in 2015 (KEMRON 2015b).

Summaries of the data presented in these reports is divided into groundwater monitoring and site inspections in the following sections.

5.6.3.3.1 Groundwater Monitoring

Groundwater monitoring requirements were initially outlined in the CMS (URS 2009) and Interim Measures Work Plan (IMWP, UXB 2011) as follows:

Table 15 – Groundwater Monitoring Requirements, RAAP-009/SWMU 40

Monitoring Well	Position Relative to Landfill	Monitoring Frequency	Analytical Parameters
LFMW01	Upgradient	Year 1: Quarterly Years 2-5: Every 9 Months Years 6-30: Annual	Field Water Quality: pH, turbidity, specific conductance, temperature, dissolved oxygen, oxidation/reduction potential TCL VOCs, SW846 Method 8260B TCL SVOCs, SW846 Method 8270C SIM TCL Pesticides, SW846 Method 8081A TAL Metals, SW846 Method 6000/7000 Perchlorate, SW846 Method 6850 Dioxins/furans, SW846 Method 8290 included in initial sampling event only
40MW05	Detection Well at Edge of Landfill Boundary		
40MW06	Detection Well at Edge of Landfill Boundary		
40MW07	Downgradient		

The groundwater monitoring included four quarterly events (reviewed in the first Periodic Review) followed by three seasonal monitoring events:

- Seasonal sampling (every 9 months) for 2-4 years
    - 19 June 2013
    - 26-27 March 2014
    - 02 December 2014

As noted in Table 15, above, the Final Decision included a total of 30 years of monitoring requirements; however, the installation and regulators agreed to the following criteria for the monitoring optimization plan/exit strategy included in the IMWP (KEMRON 2015b):

- Analytes that did not exceed the laboratory limits of detection (LOD) during three consecutive monitoring events or exceed the limits of quantitation (LOQ) during the first four monitoring events will not require further sampling and analysis
- Analyte detections that did not exceed the established background concentration for three successive sampling events will not require further sampling and analysis
- Analyte detections that did not exceed half the relevant maximum contaminant level (MCL) or half the relevant regional screening level (RSL) for three successive sampling events and the results displayed a static or downward trend will not require further sampling and analysis.

Based on these criteria, analytes were evaluated each year and removed from the sampling program as warranted. The Year 4 monitoring report indicated that remaining analytes showed a downward trend, did not exceed background concentrations, and/or did not exceed an established MCL or RSL. The Year 4 long-term monitoring report and 2015 remedy review recommended discontinuing groundwater monitoring. This recommendation was approved by regulators and groundwater monitoring was discontinued.

5.6.3.3.2 Site Inspections

UXB-KEMRON Remediation Services (referred to as KEMRON Remediation Services after 2014) performed landfill cap inspections to assess for:

- Precipitation run-on and runoff
- Water and/or wind erosion
- Rodent and/or vector activity
- Deep root vegetation
- Vegetative stress and other cover condition
- Subsidence or cracks in cap
- Excavation or other manmade intrusive work conducted within the landfill footprint

UXB-KEMRON Remediation Services performed inspections in Years 2-4:

- 18 June 2013
- 27 March 2014
- 01 December 2014

No deficiencies were noted during the landfill cap inspections except for the following:

- Signage for the landfill was noted as absent until installation in March 2014 following approval of the final language in the RCRA Permit.

In addition to the inspections performed in conjunction with seasonal groundwater monitoring from 2013-2014, annual inspections were also performed by BAE Systems on behalf of the Army on the following dates:

- 26 August 2013
- 16 July 2014
- 30 November 2015
- 22 September 2016
- 22 May 2017

These inspections assessed the site for compliance with the following requirements:

> “Maintain the information sign, and existing soil, vegetation cover, and existing drainage channels, and prevent residential use.”

The following deficiency was noted on the 22 May 2017 inspection form: need to cut grass and spray woody plants. Installation personnel indicated that site maintenance was scheduled as a result of these inspection findings. Mowing is routinely performed as necessary to control vegetative growth.

5.6.4 Progress Since the Last Review

The previous review included the following protectiveness statement for RAAP-009/SWMU 40:

> "The remedy at RAAP-009/SWMU 40 currently protects human health and the environment because no human exposure is occurring and groundwater is being monitored to assure potential groundwater contamination is detected and does not migrate off-site. However, in order for the remedy to be protective in the long-term, the institutional and engineering controls need to be implemented to ensure protectiveness."

The following table documents the issues and recommendations and follow-up actions identified for RAAP-009/SWMU 40 in the previous review:

Table 16 – Actions Taken Since the Last Periodic Review, RAAP-009/SWMU 40

Issue from Previous Review	Recommendation/ Follow-Up Action	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
The institutional controls have not been incorporated into the Permit by modification.	Finalize the RCRA Permit Modification that will, in effect, finalize the remedies selected in the Decision Document.	Army/VDEQ	None indicated	The institutional controls were incorporated into the Permit with the issuance of the Permit renewal.	01 April 2016
The engineering controls have not been incorporated into the Permit by modification.	Finalize the RCRA Permit Modification that will, in effect, finalize the remedies selected in the Decision Document.	Army/VDEQ	None indicated	The engineering controls were incorporated into the Permit with the issuance of the Permit renewal.	01 April 2016
The signage required as part of the institutional controls has not been posted.	Post signage as required.	Army	None indicated	Signage was posted as required.	March 2014
As required by the engineering	Clearly mark the landfill cap or soil	Army	None indicated		Not Applicable

Issue from Previous Review	Recommendation/ Follow-Up Action	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
controls, the landfill cap or soil cover has not been clearly marked.	cover areas as required.			Considered but not implemented	

Additional information was requested from the installation regarding the marking of the landfill cap. The installation indicated the following response:

"RFAAP is not aware of any requirement in Virginia to physically mark landfill boundaries and also is not aware of any other landfill in Virginia where landfill boundaries are so marked and boundary markers have never been a compliance issue with the Virginia Department of Environmental Quality with respect to RFAAP's closed or active SWMUs, solid waste landfills and/or hazardous waste management units. Also these sites are located in the safety buffer area in the vicinity of energetic (explosive) containing buildings which are basically large open grassy areas. Thus any physical boundary marker in this safety buffer area would impede or otherwise interfere with the operating contractor's grass cutting effort which is performed for safety reasons."

Based on this information, this recommendation was not carried forward.

5.6.5 Data Review

5.6.5.1 Groundwater Monitoring

Copies of the groundwater monitoring data and figures including a potentiometric map are included in Appendix 9. In accordance with the RCRA permit, a vast array of groundwater parameters were analyzed for in each sampling event. As discussed in Section 5.6.2.5, the basis for taking action included only one dissolved-phase constituent (chloroform) posing an unacceptable risk to a future hypothetical resident. Chloroform data was collected during the first four quarters of groundwater monitoring before being discontinued. The results were reviewed in the first Periodic Review.

For several reasons, monitoring of chloroform at RAAP-009/SWMU 40 was discontinued:

- The CMS indicated that chloroform was not detected in any soil samples collected as part of the RFI.
- Groundwater investigations have shown chloroform present in most groundwater samples collected at RFAAP, regardless of location.
- No other VOCs, which could be collocated with chloroform were a source present at RAAP-009/SWMU 40, were detected in groundwater at concentrations posing an unacceptable risk to the hypothetical future resident in 2011 or 2012.
- The landfill area is located downgradient of developed areas containing water lines which are considered a potential source for the chloroform detected at RAAP-009/SWMU 40. The concentrations of chloroform detected in drinking water samples collected during the

same period of time (from February 2011 through August 2012) ranged from 4.5 µg/L to 80 µg/L. The specific source area of the water lines resulting in chloroform in groundwater was not provided.

- Chloroform was detected in the upgradient monitoring well, LFMW01, as well as in downgradient locations.

The USEPA and VDEQ approved the recommendation to discontinue monitoring chloroform at RAAP-009/SWMU 40.

5.6.5.2 Agency for Toxic Substances and Disease Registry Assessment

In response to a request from the public, groundwater and surface water data collected at RFAAP was reviewed by the ATSDR relative to potential impacts on public health. The ATSDR findings were summarized in a health consultation (ATSDR 2015). The report concluded that because water systems in the area (both public and private) are unlikely to be impacted by contaminants present at RFAAP, public health is unlikely to be affected by environmental conditions at RFAAP.

5.6.6 Site Inspection

Site inspections were conducted by USACE on 31 July 2017. They were attended by USACE staff Laura Allen and Mick Senus and led by the RFAAP Installation Restoration Program Manager, James McKenna. RAAP-009/SWMU 40 is an open, vegetated field as depicted on Photographs 10 and 11, and Figure 6 in Attachment 5. No evidence of residential use, intrusive activities, or issues affecting protectiveness was observed at the time of the site inspection.

5.6.7 Technical Assessment

5.6.7.1 Question A: Is the Remedy Functioning as Intended by the Decision Document?

Yes, the remedy is functioning as intended by the decision document.

The CMOs and associated remedy performance are as follows:

- Maintain containment of the landfill material at the site and implement necessary controls to prevent future uncontrolled human exposure to this landfill material.

  Institutional and engineering controls have been implemented including the recording of administrative components in the RFAAP Management Manual; implementation of access controls including signage to prevent residential use, potable groundwater use, and earth moving; and landfill maintenance to ensure containment. The landfill is inspected on an annual basis and maintained as needed to ensure integrity of the cap.

- Implement any necessary measures to stabilize and repair the landfill cover at the northern edge of the landfill area to prevent any further mass transport of soil material in this area.

  Landfill maintenance was performed in 2011 including the repair of the northern portion of the existing landfill cap, installation of a drainage swale, and the installation of an additional cap in the vicinity of 40SS01 to ensure containment of all soil with elevated concentrations of PCBs (this information was reviewed in the first Periodic Review). In addition, the landfill is inspected and maintained on an annual basis to ensure integrity of the cap.

No early indicators of potential issues or opportunities for optimization were identified.

5.6.7.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?

Yes. There are no newly promulgated or modified requirements of federal or state environmental laws (see Attachment 7) that would change the protectiveness of the SWMU 40 remedy. The exposures associated with current land use are comparable to what was assessed at the time the remedy was selected. No updated toxicity criteria are available for any of the constituents driving the need for exposure restrictions at the site (see Attachment 8).

5.6.7.3 Question C: Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No, no other information has come to light that could call into question the protectiveness of the remedy.

5.6.8 Issues

No issues affecting the protectiveness of the RAAP-009/SWMU 40 remedy were identified.

5.6.9 Recommendations and Follow-Up Actions

No recommendations or follow-up actions were identified affecting the protectiveness of the RAAP-009/SWMU 40 remedy.

5.6.10 Protectiveness Statement

The remedy at RAAP-009/SWMU 40 is protective of human health and the environment.

Institutional and engineering controls have been implemented as required including administrative components, signage, and maintenance activities.

5.7 RAAP-011/SWMU 41B, RED WATER ASH BURIAL GROUND

5.7.1 Site-Specific Chronology

The following table provides important events and dates for RAAP-011/SWMU 41B.

Table 17 – Chronology of Events, RAAP-011/SWMU 41B

Event	Date
Red water ash was disposed of in RAAP-011/SWMU 41B	1967-1971
RAAP-011/SWMU 41B was deactivated.	1971
Based on historical photographs, RAAP-011/SWMU 41B received considerable amounts of fill	1981-1986
Dames and Moore conducted a Verification Investigation	1992
Argonne National Laboratory performed a geophysical survey	2002
Shaw Environmental performed a RCRA Facility Investigation	2010
USEPA issued a Statement of Basis	May 25, 2011
USEPA issued a Final Decision	April 2012
Annual inspections were performed	26 August 2013 16 July 2014 30 November 2015 22 September 2016 22 May 2017
RCRA Permit VA1210020730 renewed by VDEQ	April 1, 2016
IC sign posted	2017
The remedy requirements were recorded in a Management Manual for RFAAP.	Unknown

5.7.2 Background

5.7.2.1 Physical Characteristics

RAAP-011/SWMU 41B is located in the southeastern portion of the main manufacturing area and consists of a 0.36 acre natural clay-lined landfill (see Figure 9 in Attachment 1). The landfill measures approximately 225 feet by 70 feet and is located 70-100 feet west of an unnamed tributary of Stroubles Creek. The ground surface slopes toward the north, northeast, and northwest from an elevation of 1,800 feet above mean sea level to 1,776 feet above mean sea level. The land east and northwest of RAAP-011/SWMU 41B slopes steeply toward a drainage ditch and the unnamed tributary of Stroubles Creek, respectively.

5.7.2.2 Land and Resource Use

From approximately 1967 to 1974 and again from 1983 to 1986, RFAAP manufactured TNT by a “continuous-type” process that employed chemical recycling and resulted in a smaller quantity of more concentrated waste than older “batch-type” operations. Red water, produced from the manufacture of TNT, was concentrated via evaporation and burned in rotary kilns located in the former TNT manufacturing area. The ash generated from the rotary kilns was disposed of in RAAP-011/SWMU 41B from 1967 to 1971.

5.7.2.3 History of Contamination

According to the RFI, the waste at RAAP-011/SWMU 41B was placed on natural clay, and clayey fill was placed on top of the waste material. The thickness of fill ranges from 7 to approximately 20 feet. Disposal ceased in 1971 when RAAP-011/SWMU 41B was deactivated. Impacts were characterized with the completion of the RFI sampling program in 2008. Elevated concentrations of one VOC (1,2-dibromo-3-chloropropane), one SVOC [indeno (1,2,3-cd) pyrene], one PCB (PCB-1254), five metals (aluminum, arsenic, iron, manganese, and mercury), and 2,3,7,8-TCDD TE were detected in soil. One PCB (PCB- 1254) and two metals (arsenic and manganese) were identified as COPCs in sediment. VOCs, PAHs, metals, and one pesticide were identified as COPCs in groundwater (Shaw 2011a).

5.7.2.4 Initial Response

No initial response actions were identified for RAAP-011/SWMU 41B.

5.7.2.5 Basis for Taking Action

Red water ash is identified as a USEPA hazardous waste (K047) for its reactivity (40 CFR 261.32). An HHRA and SLERA were performed to evaluate the risks posed by soil, groundwater, sediment, and surface water. The results of the HHRA determined that the calculated cancer risks are within USEPA acceptable ranges for all media and all hypothetical receptors except the lifetime resident exposures to groundwater. The total cancer risk associated with groundwater was 2E-04, primarily due to PCE and arsenic. The total hazard indices were below 1.0 for all receptors except for the future child resident. Elevated risk due to arsenic and manganese concentrations in soil were identified for the future child resident. The SLERA required no action to protect ecological receptors.

5.7.3 Remedial Actions

5.7.3.1 Remedy Selection

Based on the basis for taking action at RAAP-011/SWMU 41B, a CMS was not performed for RAAP-011/SWMU 41B, and no CMOs were formally established.

The remedy for RAAP-011/SWMU 41B was selected in a Statement of Basis (USEPA 2011) and a subsequent Final Decision (USEPA 2012). The selected remedy is institutional controls to prevent future residential use and to restrict future earth moving. The remedy components are described as follows in the Final Decision:

- Restrict future residential use: Certain units shall not be used for residential purposes unless it is demonstrated to EPA that such use will not pose a threat to human health or the environment or adversely affect or interfere with the selected remedy and EPA provides prior written approval for such use.
- Restrict future earth moving activities: For certain units, no earth moving activities, including digging, construction and drilling, may be done unless such activities are conducted in accordance with a Health & Safety Plan that was approved by EPA, and that

was prepared by an appropriately qualified person familiar with the environmental conditions at the Facility.

The Final Decision also requires the installation of signs at each unit where ICs are being implemented.

5.7.3.2 Remedy Implementation

The remedy at RAAP-011/SWMU 41B was incorporated into the RCRA CA Permit in April 2016 (VDEQ 2016). According to installation personnel, the remedy requirements have also been incorporated into an internal Management Manual prepared by the operating contractor. A copy of the manual was not available for inclusion in this Periodic Review due to proprietary content; however, installation personnel indicate that the manual contains requirements consistent with those listed on inspection forms. For RAAP-011/SWMU41B, the requirements are: "Maintain the information sign, and existing soil, vegetation cover, and existing drainage channels, and prevent residential use."

According to installation personnel, IC signs were installed by 2017. The RAAP-011/SWMU 41B sign reads:

"UNAUTHORIZED PERSONNEL KEEP OUT

THIS SITE IS SUBJECT TO LAND USE CONTROLS

MAINTAIN THIS SITE IN ITS CURRENT INDUSTRIAL/COMMERCIAL STATE

MAINTAIN THE VEGETATIVE COVER AND PREVENT FUTURE RESIDENTIAL USE OF THIS SITE

CONTACT THE ENVIRONMENTAL DEPARTMENT WITH QUESTIONS"

Annual inspections are performed of RAAP-011/SWMU 41B (see Section 5.7.3.3).

5.7.3.3 Operation, Maintenance, and Monitoring

Annual inspections were performed at RAAP-011/SWMU 41B by BAE Systems personnel on behalf of the Army on the following dates:

- 26 August 2013
- 16 July 2014
- 30 November 2015
- 22 September 2016
- 22 May 2017

The existing soil, vegetative cover, erosion control measures, security, and restriction on residential use were evaluated. The 22 May 2017 inspection form noted: "need grass cut". Installation personnel indicated that site maintenance was scheduled as a result of these inspection findings. Mowing is routinely performed as necessary to control vegetative growth. Copies of the inspection sheets are included in Attachment 10.

5.7.4 Progress Since the Last Review

The previous review included the following protectiveness statement for RAAP-011/SWMU 41B:

> "The remedy at RAAP-011/SWMU 41B currently protects human health and the environment because no human exposure is occurring. However, in order for the remedy to be protective in the long-term, the institutional controls need to be implemented to ensure protectiveness."

The following table documents the issues and recommendations and follow-up actions identified for RAAP-011/SWMU 41B in the previous review:

Table 18 – Actions Taken Since the Last Periodic Review, RAAP-011/SWMU 41B

Issue from Previous Review	Recommendation/ Follow-Up Action	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
The institutional controls have not been incorporated into the Permit by modification.	Finalize the RCRA Permit Modification that will, in effect, finalize the remedies selected in the Decision Document.	Army/VDEQ	None indicated	The institutional controls were incorporated into the Permit with the issuance of the Permit renewal.	01 April 2016
The signage required as part of the institutional controls has not been posted.	Post signage as required.	Army	None indicated	Signage was posted as required.	2017

5.7.5 Data Review

No environmental data has been collected from the RAAP-011/SWMU 41B site since remedy selection.

5.7.6 Site Inspection

Site inspections were conducted by USACE on 31 July 2017. They were attended by USACE staff Laura Allen and Mick Senus and led by the RFAAP Installation Restoration Program Manager, James McKenna. RAAP-011/SWMU 41B is an open, vegetated field as depicted on Photographs 12 and 13, and Figure 7 in Attachment 5. No evidence of residential use, intrusive activities, or issues affecting protectiveness was observed at the time of the site inspection.

5.7.7 Technical Assessment

5.7.7.1 Question A: Is the Remedy Functioning as Intended by the Decision Document?

Yes, the remedy is functioning as intended by the decision document. The remedy has been incorporated into the RCRA CA permit and a Management Manual for RFAAP. A sign is posted at the site communicating the restrictions on site use and maintenance, and annual inspections were conducted from 2013 through 2017. No evidence of intrusive activities or residential site use has been observed during the annual site inspections or during the site inspection performed in conjunction with this review.

No early indicators of potential issues or opportunities for optimization were identified.

5.7.7.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?

Yes. There are no newly promulgated or modified requirements of federal or state environmental laws (see Attachment 7) that would change the protectiveness of the SWMU 41B remedy. The exposures associated with current land use are comparable to what was assessed at the time the remedy was selected. Although the toxicity criteria for PCE (a groundwater contaminant) has been updated since the risk assessment for this site was performed, the risk-based screening level used at the time of the assessment remains a protective indicator of the need for exposure restrictions at the site. No updated toxicity criteria are available for any of the other constituents driving the need for exposure restrictions at the site (see Attachment 8).

5.7.7.3 Question C: Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No, no new information has come to light that could call into question the protectiveness of the remedy.

5.7.8 Issues

No issues were identified that affect the protectiveness of the remedy at RAAP-011/SWMU 41B.

5.7.9 Recommendations and Follow-Up Actions

No recommendations or follow-up actions were identified associated with the protectiveness of the remedy at RAAP-011/SWMU 41B.

5.7.10 Protectiveness Statement

The remedy at RAAP-011/SWMU 41B is protective of human health and the environment.

Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use and intrusive activities.

5.8 RAAP-013/SWMU 49, RED WATER ASH BURIAL #2 AND RAAP-018/SWMU 48, OILY WATER BURIAL AREA

5.8.1 Site-Specific Chronology

The following table provides important events and dates for RAAP-013/SWMU 49 and RAAP-018/SWMU 48.

Table 19 – Chronology of Events at RAAP-013/SWMU 49 and RAAP-018/SWMU 48

Event	Date
RCRA Facility Assessment	1987
Verification Investigation	1992
Site Characterization (RCRA Facility Investigations)	1996-2014
Interim Measure completed at RAAP-18/SWMU 48	2011
USEPA issued a Statement of Basis	04 June 2014
USEPA issued a Final Decision	18 August 2014 (signature date)
RCRA Permit VA1210020730 renewed by VDEQ	01 April 2016 (signature date)
A shared IC sign posted between RAAP-013/SWMU 49 and RAAP-018/SWMU 48	2017
The remedy requirements were recorded in a Management Manual for RFAAP.	Unknown

5.8.2 Background

5.8.2.1 Physical Characteristics

RAAP-013/SWMU 49 and RAAP-018/SWMU 48 were combined into one study area in the RCRA permit (VDEQ 2016) because in previous reports their descriptive titles were used interchangeably and because of their close proximity to each other. RAAP-013/SWMU 49 and RAAP-018/SWMU 48 are located in the Horseshoe Area, east of the main bridge over the New River (see Figure 10 in Attachment 1). The two sites are located on a bluff approximately 120 feet above the New River. RAAP-013/SWMU 49 measures approximately 75 feet by 83 feet while RAAP-018/SWMU 48 measures approximately 380 feet by 120 feet. RAAP-013/SWMU 49 is known as Red Water Ash Burial Burial No. 2 and is 0.111 acres. The exact location of SWMU 49 has been unclear. RAAP-018/SWMU 48 is 1.009 acres in size and is known as the Oily Water Burial Area. The site consists of two unlined trenches, identified as the northern and southern trenches. The overall area is grassy with wooded areas to the south, east, and west. Dirt and gravel roads provide access to the sites. There are no structures in the combined study area and no stormwater collection system in the immediate vicinity of the area.

5.8.2.2 Land and Resource Use

From approximately 1967 to 1974 and again from 1983 to 1986, RFAAP manufactured TNT by a “continuous-type” process that employed chemical recycling and resulted in a smaller quantity of more concentrated waste than older “batch-type” operations. Red water, produced from the manufacture of TNT, was concentrated via evaporation and burned in rotary kilns located in the former TNT manufacturing area. The red ash from these kilns was reportedly disposed of at RAAP-013/SWMU 49 from 1967 to 1971. In 1972, the red water concentrate was sold to the paper industry and the disposal area was deactivated. Prior to off-post waste oil reclamation, approximately 200,000 gallons of oily wastewater removed from oil/water separators throughout RFAAP was reportedly disposed of in two trenches at RAAP-018/SWMU 48. However, the results of environmental sampling indicate that these historical reports may have inadvertently switched these sites. Evidence of red water ash disposal was found at RAAP-018/SWMU 48 and evidence of oily wastewater disposal was found at RAAP-013/SWMU 49 (Shaw 2014a). The area is currently vegetated but not in use. The surrounding area, the Horseshoe Area, contains numerous buildings and facilities, and is likely to remain industrial in nature.

5.8.2.3 History of Contamination

The disposal of red ash generated from the manufacturing of TNT resulted in groundwater impacts. RAAP-013/SWMU 49 and RAAP-018/SWMU 48 share unlined trenches where oily wastewater and red water ash were disposed. RAAP-013/SWMU 49 and RAAP-018/SWMU 48 were first identified as areas of interest during the USEPA’s 1987 RCRA Facility Assessment. Environmental samples were first collected during a 1992 Dames and Moore Verification Investigation prepared for USATHAMA. Elevated concentrations of mercury and SVOCs (2,4-dinitrotoluene, naphthalene) were identified in soil samples. Subsequent investigations were completed from 1996 to 2014 to characterize the sites. These investigations ultimately identified a broad range of organic and inorganic COPCs in soil and groundwater across both sites (Shaw 2014a).

5.8.2.4 Initial Response

No initial response actions were performed for RAAP-013/SWMU 49.

An interim measure was performed for RAAP-018/SWMU 48 in 2011 to address impacted soil, an ash layer, debris, and clayey substance containing high concentrations of metals. A total of 3,393 tons of nonhazardous soil and 101.6 tons of hazardous soil were excavated from the southern trench (VDEQ 2016). The interim action reduced contaminant concentrations in soil to below the USEPA’s residential risk-based screening levels. Based on this information, no further action was deemed necessary for RAAP-018/SWMU 48 soil.

5.8.2.5 Basis for Taking Action

Based on the results of the interim measure performed at RAAP-018/SWMU 48 and the HHRA in the 2014 RFI (Shaw 2014a), no further action is necessary for soil at either RAAP-013/SWMU 49 or RAAP-018/SWMU 48. Carbon tetrachloride (CT) and trichloroethylene (TCE) were identified in groundwater as the COCs contributing to potential future industrial and residential risk at RAAP-013/SWMU 49.

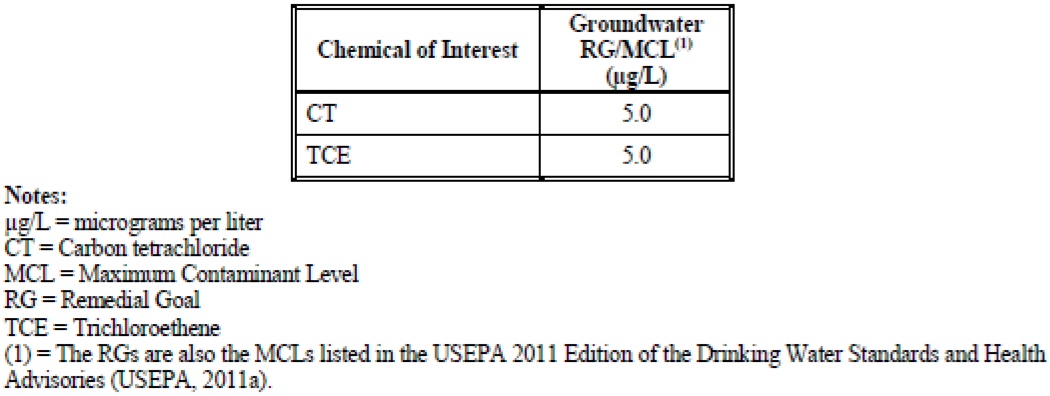
5.8.3 Remedial Actions

5.8.3.1 Remedy Selection

The remedy for RAAP-013/SWMU 49 and RAAP-018/SWMU 48 was selected in the 2014 Statement of Basis and Final Decision (USEPA 2014a, 2014b).

The following remedial goals were selected for CT and TCE concentrations in groundwater:

Table 20 - Remedial Goals, RAAP-013/SWMU 49 and RAAP-018/SWMU 48



Chemical of Interest	Groundwater RG/MCL[1] (µg/L)
CT	5.0
TCE	5.0

Notes:
µg/L = micrograms per liter
CT = Carbon tetrachloride
MCL = Maximum Contaminant Level
RG = Remedial Goal
TCE = Trichloroethene
(1) = The RGs are also the MCLs listed in the USEPA 2011 Edition of the Drinking Water Standards and Health Advisories (USEPA, 2011a).

Note: this table was extracted from the MNA work plan (Shaw 2014b) Table 1-5, SWMU 49 Remedial Goals.

The following CAO for groundwater was identified:

> "…to restore groundwater to drinking water standards; control exposure to the hazardous constituents remaining in the groundwater until such time that MCLs are achieved; protect the current existing receptors (the New River) from unacceptable concentrations for COC impacts; and ensure that all dissolved groundwater plumes are contained and will not migrate."

The selected remedy for RAAP-013/SWMU 49 and RAAP-018/SWMU 48 consists of monitored natural attenuation until drinking water standards are met, and compliance with and maintenance of groundwater use restrictions to prevent exposure to contaminants while levels remain above MCLs. The mechanisms for natural attenuation include dispersion, diffusion, dilution, sorption, volatilization, biological degradation, and chemical decomposition. Along with the COCs, the daughter products of the COCs are monitored and evaluated to determine the progress (effectiveness and timeliness) of the degradation process.

The groundwater use restrictions are detailed as follows:

- Groundwater at RAAP-013/SWMU 49 and RAAP-018/SWMU 48 shall not be used for any purpose including, but not limited to, use as a potable water source, other than to conduct the maintenance and monitoring activities required by VADEQ and/or USEPA.
- RAAP-013/SWMU 49 and RAAP-018/SWMU 48 shall not be used in a way that will adversely affect or interfere with the integrity and protectiveness of the final remedies implemented at the Facility.
- Any owner of the Facility property or any portion thereof shall provide USEPA and VADEQ with a "Certified, True and Correct Copy" of any instrument that conveys any interest in the Facility property or any portion thereof. Any such conveyance must provide for the continuation of the ICs until the USEPA, in consultation with VADEQ, determines the ICs are no longer necessary.

The USEPA proposed the implementation of the groundwater use restrictions through an enforceable Permit. No specific timeframe for the achievement of the remedy completion were outlined in the Basis for Taking Action or Final Decision. The MNA groundwater monitoring work plan specified that the remedy should be achieved within a "reasonable period of time."

5.8.3.2 Remedy Implementation

The remedy at RAAP-013/SWMU 49 and RAAP-018/SWMU 48 was incorporated into the RCRA CA Permit in April 2016 (VDEQ 2016). The permit repeats the COCs and remedial goals outlined in Section 5.8.3.1, above, and outlined an exit strategy (discussed in detail in Section 5.8.3.3, below).

According to installation personnel, an IC sign was installed in May 2017. The RAAP-013/SWMU 49 and RAAP-018/SWMU 48 sign reads:

"UNAUTHORIZED PERSONNEL KEEP OUT

THIS SITE IS SUBJECT TO LAND USE CONTROLS

MAINTAIN THIS SITE IN ITS CURRENT INDUSTRIAL/COMMERCIAL STATE

MAINTAIN THE VEGETATIVE COVER AND PREVENT FUTURE RESIDENTIAL USE OF THIS SITE

CONTACT THE ENVIRONMENTAL DEPARTMENT WITH QUESTIONS"

The MNA implementation was outlined in a work plan (Shaw 2014b) discussed in detail in Section 5.8.3.3, below.

According to installation personnel, the remedy requirements have also been incorporated into an internal Management Manual prepared by the operating contractor. A copy of the manual was not available for inclusion in this Periodic Review due to proprietary content.

5.8.3.3 Operation, Maintenance, and Monitoring

The operation, maintenance, and monitoring for RAAP-013/SWMU 49 and RAAP-018/SWMU 48 currently includes annual inspections (not mandated by the remedy), MNA groundwater monitoring, and routine maintenance including mowing. The details of the inspections and monitoring are provided in the following sections.

5.8.3.3.1 Site Inspections

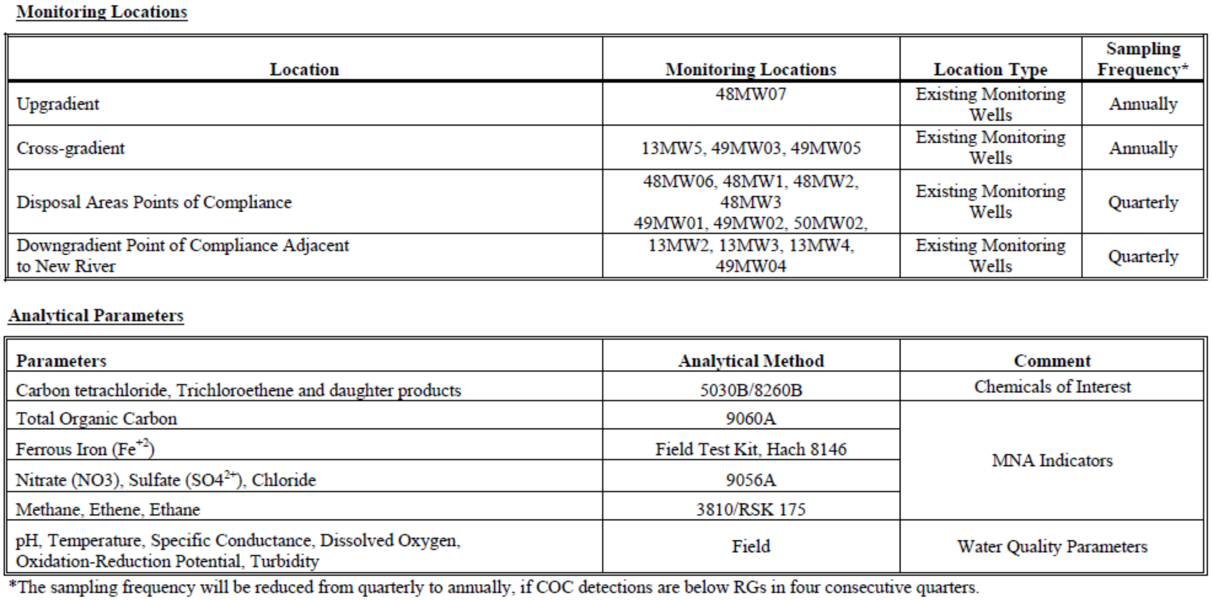
Although not mandated by the Statement of Basis and Final Decision, installation personnel indicate that annual inspections are performed for RAAP-013/SWMU 49 and RAAP-018/SWMU 48. Documentation was not available for review for inspections completed to date. Installation personnel indicated that documentation will be prepared for future inspections.

5.8.3.3.2 MNA Groundwater Monitoring

The MNA program for RAAP-013/SWMU 49 and RAAP-018/SWMU 48 includes the monitoring of 15 locations identified on CB&I Figure 1-2, SWMU 49 Site Map included in Attachment 9. The monitoring wells located within and downgradient of the CT and TCE plumes are sampled quarterly. The upgradient well and cross-gradient wells are sampled annually. The sampling frequency for the monitoring wells will be reduced from quarterly to annually, if VOC concentrations in the well are below the RGs in four consecutive quarters. In addition, groundwater samples collected during the first year of monitoring were analyzed for MNA indicators (total organic carbon [TOC], ferrous iron, methane, ethane, ethane, chloride, nitrate, and sulfate). TOC is used as an indicator of organic carbon available as a food source for the bacteria to perform reductive dechlorination of the chlorinated solvents. For wells that exhibit good degradation, *Dehalococcoides ethenogenes* analysis would also be performed. Static groundwater elevations and total depths will be measured at all wells during each sampling event. Hydrogeologic and physical parameters pH, temperature, turbidity, specific conductivity, dissolved oxygen (DO), and oxidation-reduction potential (ORP) are measured in the field at each well sampled.

These sampling locations, frequency, and analysis requirements are outlined in Table 21:

Table 21 - MNA Sampling Program Details, RAAP-013/SWMU 49 and RAAP-018/SWMU 48



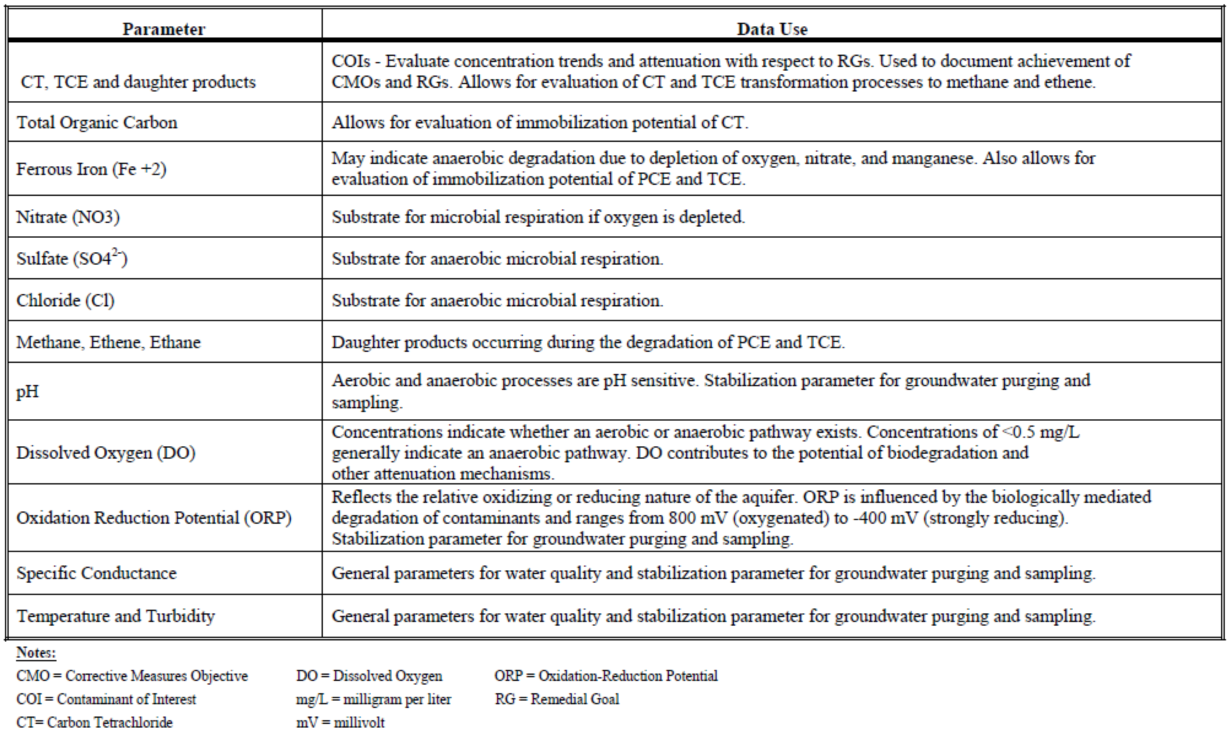
Monitoring Locations

Location	Monitoring Locations	Location Type	Sampling Frequency*
Upgradient	48MW07	Existing Monitoring Wells	Annually
Cross-gradient	13MW5, 49MW03, 49MW05	Existing Monitoring Wells	Annually
Disposal Areas Points of Compliance	48MW06, 48MW1, 48MW2, 48MW3 49MW01, 49MW02, 50MW02,	Existing Monitoring Wells	Quarterly
Downgradient Point of Compliance Adjacent to New River	13MW2, 13MW3, 13MW4, 49MW04	Existing Monitoring Wells	Quarterly

Analytical Parameters

Parameters	Analytical Method	Comment
Carbon tetrachloride, Trichloroethene and daughter products	5030B/8260B	Chemicals of Interest
Total Organic Carbon	9060A	MNA Indicators
Ferrous Iron (Fe^{+2})	Field Test Kit, Hach 8146	
Nitrate (NO3), Sulfate ($SO4^{2+}$), Chloride	9056A	
Methane, Ethene, Ethane	3810/RSK 175	
pH, Temperature, Specific Conductance, Dissolved Oxygen, Oxidation-Reduction Potential, Turbidity	Field	Water Quality Parameters

*The sampling frequency will be reduced from quarterly to annually, if COC detections are below RGs in four consecutive quarters.



Parameter	Data Use
CT, TCE and daughter products	COIs - Evaluate concentration trends and attenuation with respect to RGs. Used to document achievement of CMOs and RGs. Allows for evaluation of CT and TCE transformation processes to methane and ethene.
Total Organic Carbon	Allows for evaluation of immobilization potential of CT.
Ferrous Iron (Fe +2)	May indicate anaerobic degradation due to depletion of oxygen, nitrate, and manganese. Also allows for evaluation of immobilization potential of PCE and TCE.
Nitrate (NO3)	Substrate for microbial respiration if oxygen is depleted.
Sulfate ($SO4^{2-}$)	Substrate for anaerobic microbial respiration.
Chloride (Cl)	Substrate for anaerobic microbial respiration.
Methane, Ethene, Ethane	Daughter products occurring during the degradation of PCE and TCE.
pH	Aerobic and anaerobic processes are pH sensitive. Stabilization parameter for groundwater purging and sampling.
Dissolved Oxygen (DO)	Concentrations indicate whether an aerobic or anaerobic pathway exists. Concentrations of <0.5 mg/L generally indicate an anaerobic pathway. DO contributes to the potential of biodegradation and other attenuation mechanisms.
Oxidation Reduction Potential (ORP)	Reflects the relative oxidizing or reducing nature of the aquifer. ORP is influenced by the biologically mediated degradation of contaminants and ranges from 800 mV (oxygenated) to -400 mV (strongly reducing). Stabilization parameter for groundwater purging and sampling.
Specific Conductance	General parameters for water quality and stabilization parameter for groundwater purging and sampling.
Temperature and Turbidity	General parameters for water quality and stabilization parameter for groundwater purging and sampling.

Notes:
CMO = Corrective Measures Objective
COI = Contaminant of Interest
CT= Carbon Tetrachloride
DO = Dissolved Oxygen
mg/L = milligram per liter
mV = millivolt
ORP = Oxidation-Reduction Potential
RG = Remedial Goal

Note: the above tables were extracted from Table 2-2, Monitored Natural Attenuation – Performance Monitoring Locations and Table 2-3, Monitored Natural Attenuation – Performance Monitoring Parameters included in the work plan (Shaw 2014b).

The exit strategy for the MNA program includes the following steps to ensure the remedy objectives have been met (Shaw 2014b, VDEQ 2016):

- Termination of the use of MNA as a remedy shall be based on the interpretation and evaluation of the data (concentrations, parameters, and indicators). The data from the following groundwater monitoring wells (13MW3, 13MW4, 48MW1, 48MW2, 48MW3, 48MW06, 49MW01, 49MW02, and 50MW02) must be at or below the RGs to demonstrate that the objectives have been met.
- Notification to terminate the MNA program will be provided to USEPA/VDEQ 60 days in advance together with the pertinent supporting data and evaluations.
- Existing groundwater monitoring wells will be abandoned in accordance with VDEQ Memorandum dated January 8, 2008 (VDEQ 2008).

The data collected during the MNA monitoring is reviewed in Section 5.8.5, below.

5.8.4 Progress Since the Last Review

A final remedy had not yet been selected for RAAP-13/SWMU 49 or RAAP-18/SWMU 48 at the time of the last review.

5.8.5 Data Review

In accordance with the CA Permit (VDEQ 2016) and the MNA work plan (Shaw 2014b), five MNA groundwater sampling events have been completed since remedy selection in 2014. These events were summarized in two reports titled the baseline sampling event (CB&I 2015) and the year one sampling event (Bering 2017). The groundwater elevations, groundwater contour maps, field parameter results, groundwater contaminant concentrations, and CT and TCE isopleths extracted from each monitoring report are included in Attachment 9. Across all five monitoring events and consistent with historical characterizations, the groundwater flow is generally in a south-southeasterly direction towards the New River. The groundwater chemistry is generally aerobic and oxidizing.

Both the CT and TCE plumes are generally focused in the vicinity of monitoring wells 48MW2 and 48MW3 located south and southeast of RAAP-013/SWMU 49. The concentrations of CT and TCE over the last five monitoring events at these locations are summarized in Table 22:

Table 22 –CT and TCE Groundwater Concentrations (µg/L), RAAP-13/SWMU 49 and RAAP-18/SWMU 48

Contaminant	Sampling Date				
	01/27/2015	10/01/2015	1/14/2016	4/12/2016	7/13/2016
Carbon Tetrachloride (RG 5.0 µg/L)					
48MW2	118	48	66	42	38
48MW3	77.4	71	62	73	64
Trichloroethene (RG 5.0 µg/L)					
48MW2	10.5	3.8	7.9	2.3	3.9
48MW3	12.4	10	9.7	10	10

Although the data set is small, the Mann-Kendall Trend Test (USACE 2013) was performed to assess for trends in the CT and TCE data sets. An assessment could not be made for the TCE concentrations detected at monitoring well 48MW3 due to the number of tied observations that degraded the statistical power too significantly. At the 90% level of confidence, no trend could be assessed for the TCE concentrations detected at 48MW2 nor for the CT concentrations detected at 48MW3. A decreasing trend was assessed for the CT concentrations detected at 48MW2. The supporting calculations for these findings and trend charts are included in Attachment 9.

Two TCE exceedances were detected at monitoring well 48MW06 located hydraulically upgradient of RAAP-013/SWMU 49 and just downgradient of RAAP-018/SWMU 48. The exceedances were detected during the January and April 2016 sampling events and the detected TCE concentration was 5.9 µg/L during both events. One exceedance of CT was also detected at monitoring well 13MW3 located adjacent to the New River and downgradient of both sites. The exceedance was detected during the April 2016 sampling event and the detected concentration was 5.5 µg/L.

The analyses performed on groundwater at RAAP-013/SWMU 49 differs somewhat from the requirements outlined in the work plan (see Table 21, above). Several VOCs are monitored for that are not required including ethylbenzene, o-xylene, p-xylene, m-xylene, bromoform, bromomethane, dibromochloromethane, acetone, 1,1,1-trichloroethane (TCA), 1,1-dichloroethane (DCA), and PCE. In addition, some degradation products are not monitored for (vinyl chloride, trans-1,2-dichloroethylene (DCE), methylene chloride, and chloromethane. The evaluation of the existing data found that since the geochemical environment is largely aerobic and the COCs are preferentially degraded via anaerobic biodegradation, significant evidence of biodegradation was not expected or found. Low concentrations of some degradation products (chloroform and cis-1,2-dichloroethene) were present but did not correlate strongly with fluctuations in COC concentrations.

5.8.6 Site Inspection

Site inspections were conducted by USACE on 31 July 2017. They were attended by USACE staff Laura Allen and Mick Senus and led by the RFAAP Installation Restoration Program Manager, James McKenna. RAAP-013/SWMU 49 is wooded area located north of Belcher Mountain Road as depicted on Photograph 14, and Figure 8 in Attachment 5. RAAP-18/SWMU 48 is an open, vegetated field. No evidence of residential use, intrusive activities, or issues affecting protectiveness was observed at the time of the site inspection. Monitoring wells associated with the site were observed locked and in good condition.

5.8.7 Technical Assessment

5.8.7.1 Question A: Is the Remedy Functioning as Intended by the Decision Document?

Yes, the remedy is functioning as intended by the decision document. Although the CAO to restore groundwater to drinking water standards has not yet been achieved, a decreasing trend in CT concentrations has been identified in the monitoring well containing the highest concentrations on site (48MW2). The presence of the biodegradation products chloroform (daughter product of carbon tetrachloride) and cis-1,2-DCE (daughter product of TCE) indicate biodegradation is occurring, although the generally oxidative conditions are expected to limit the biodegradation. Several other mechanisms, e.g. dispersion, diffusion, dilution, sorption, are expected to contribute to the remedy. Additional groundwater sampling data is required to fully assess the effectiveness of these mechanisms at reducing the groundwater COC concentrations (additional rounds of data will improve the effectiveness of the evaluation). The remedy for RAAP-013/SWMU 49 and RAAP-018/SWMU 48 has been incorporated into the RCRA CA permit. An IC sign has been posted at the site and annual inspections are ongoing. According to installation personnel, the remedy has also been incorporated into a Maintenance Manual for RFAAP. These activities effectively control exposure to the hazardous constituents remaining in the groundwater. Groundwater monitoring and regular data evaluation ensures that the plume is monitored, remains controlled, and is not adversely impacting the New River.

No early indicators of potential issues were identified. The following opportunities for optimization were identified:

- The remedy allows for the modification of the monitoring frequency of monitoring wells from quarterly to annually following four consecutive quarters of results below the RGs. Based on this criteria, the following monitoring wells could be sampled annually: 48MW01, 49MW01, 49MW02, 90MW04, 50MW02, 13MW02, and 13MW04.
- The monitoring program includes several VOCs that are not identified as COCs or associated degradation products or attenuation parameters. The Army may discuss streamlining the monitoring program with regulators to remove all parameters not identified as COCs, degradation products, or attenuation parameters as a potential cost saving measure.

5.8.7.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?

Yes. There are no newly promulgated or modified requirements of federal or state environmental laws (see Attachment 7) that would change the protectiveness of the SWMU 48 and 49 remedy. The toxicity criteria for the 2 groundwater COCs (CT and TCE) have not changed since 2011 and the MCLs in drinking water have not changed since 2016. The groundwater monitoring parameters include indicators for reductive dehalogenation of the COCs; however, no substantial evidence of biodegradation has been identified in routine monitoring.

5.8.7.3 Question C: Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No, no new information has come to light that could call into question the protectiveness of the remedy.

5.8.8 Issues

No issues were identified that affect the protectiveness of the RAAP-013/SWMU 49 and RAAP-018/SWMU 48 remedy.

5.8.9 Recommendations and Follow-Up Actions

No recommendation or follow-up actions were identified that affect the protectiveness of the remedy.

5.8.10 SWMU Protectiveness Statement

The remedy at RAAP-013/SWMU 49 and RAAP-018/SWMU 48 is protective of human health and the environment.

Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use and intrusive activities. Decreases in groundwater contaminant concentrations have been documented via MNA.

5.9 RAAP-014/SWMU 54, PROPELLANT BURNING ASH DISPOSAL

5.9.1 Site-Specific Chronology

The following table provides important events and dates for RAAP-014/SWMU 54.

Table 23 – Chronology of Events, RAAP-014/SWMU 54

Event	Date
RCRA Facility Assessment	1987
Verification Investigation	1992
Site Characterization (RCRA Facility Investigations and Corrective Measures Study)	1996-2008
Interim Measure completed at RAAP-014/SWMU 54	1999
Second Interim Measure completed at RAAP-014/SWMU 54	2010-2011
USEPA issued a Statement of Basis	04 June 2014
USEPA issued a Final Decision	18 August 2014 (signature date)
RCRA Permit VA1210020730 renewed by VDEQ	01 April 2016 (signature date)
IC sign posted	2017
The remedy requirements were recorded in a Management Manual for RFAAP.	Unknown

5.9.2 Background

5.9.2.1 Physical Characteristics

RAAP-014/SWMU 54 is identified as the Propellant Burning Ash Disposal Area and is located within the eastern portion of the Horseshoe Area of RFAAP (see Figure 11 in Attachment 1). RAAP-014/SWMU 54 consists of two non-contiguous disposal areas; Area A is a 0.58-acre triangle shaped area in the southern portion of RAAP-014/SWMU 54, and Area B is a one-acre area in the northern portion of RAAP-014/SWMU 54. The site is located on a terrace feature of the New River. The RFAAP installation security fencing encompasses both areas.

5.9.2.2 Land and Resource Use

RAAP-014/SWMU 54 is a partially wooded, undeveloped field. In the late 1970s, RAAP-014/SWMU 54 was used for disposal activities.

5.9.2.3 History of Contamination

Historical disposal activities took place at RAAP-014/SWMU 54 in the late 1970s. Propellant ash, consisting of a residue resulting from the burning of waste explosives, propellants, and laboratory waste, was disposed of at RAAP-014/SWMU 54. There are conflicting accounts of disposal practices including surface applications of ash, and excavation and burial up to 17 feet below ground surface. The quantity of ash disposed of at RAAP-014/SWMU 54 is estimated at 10 tons. Impacted soil was first confirmed at Area A during a 1992 RCRA Verification

Investigation and subsequent 1996 RCRA Facility Investigation. Impacts to Area B were confirmed and delineated during a subsequent Supplemental RFI and CMS in 1998. Initial COPCs included (USEPA 2014b):

Table 24 - Initial COPCs, RAAP-014/SWMU 54

Area	Medium	COPCs
A	Soil	Lead 2,4,6-trinitrotoluene (TNT) Dinitrotoluene (DNT) Cyclotrimethylenetrinitramine (RDX) Amino DNTs Nitroglycerine (NG) Heptachlor epoxide Dioxins/furans
	Groundwater	Lead 2,4,6-trinitrotoluene (TNT) Dinitrotoluene (DNT) RDX Amino DNTs Nitroglycerine (NG) Heptachlor epoxide Dioxins/furans perchlorate
B	Soil	Lead DNT Amino DNT NG RDX Dieldrin Aroclor 1254 Heptachlor epoxide Dioxins/furans
	Groundwater	None

5.9.2.4 Initial Response

Two initial response actions were completed at RAAP-014/SWMU 54 to address hot spots in soil. The first was completed circa 1999 by Parallax, Inc. including the excavation and off-site disposal of 1,827 tons of soil across both Area A and Area B of RAAP-014/SWMU 54 (URS 2002). In 2008, an RFI/CMS was completed across Area A and Area B to confirm the effectiveness of the hotspot removal. Based on the results of the RFI/CMS, additional interim measures were recommended (URS 2008). From 2010 to 2011, additional removal actions were completed (Shaw 2011b). Approximately 870 tons of hazardous soil and 4,921 tons of nonhazardous soil were removed from Area A and 2,200 tons of hazardous soil and 2,288 tons of nonhazardous soil were removed from Area B. Following the completion of the interim response action, remedial goals were achieved in soil and the medium was released to clean closure at RAAP-014/SWMU 54.

Interim measures at RAAP-014/SWMU 54 also included groundwater monitoring on a quarterly basis for two years (July 2011, October 2011, January 2012, April 2012, August 2012, November 2012, February 2013, and May 2013). The monitoring network included 14 wells sampled for explosives, perchlorate, and MNA indicators (Shaw 2013a, 2013b). The results indicated that MNA processes were occurring (biodegradation, sorption, dilution, dispersion, and chemical stabilization), but that biodegradation was only occurring for 2,4,6-TNT, and not 2,4-DNT, amino DNT, RDX, or perchlorate (USEPA 2014).

MNA data collection was conducted quarterly on a continuous basis following the Interim Measures MNA with the following monitoring event dates predating 2014 Final Decision and Statement of Basis: August 2013, November 2013, February 2014, and May 2014.

5.9.2.5 Basis for Taking Action

The basis for taking action at RAAP-014/SWMU 54 was established in 2014 (USEPA 2014) following the review of the interim measures groundwater monitoring discussed in Section 5.9.2.4. Groundwater constituents (specifically 2,4,6-TNT, DNT mixture, RDX, and perchlorate) exceeded risk-based screening levels selected based on the lower of a target risk of 1.0E-05 for the lifetime resident or a target hazard of 1 for the adult and child resident in at least one monitoring location.

5.9.3 Remedial Actions

5.9.3.1 Remedy Selection

The following COCs and remedial goals were selected for RAAP-014/SWMU 54:

Table 25 – RAAP-014/SWMU 54 Groundwater COCs and RGs

COC	RG (mg/L)
2,4,6-TNT	0.00782
DNT Mixture	0.000932
RDX	0.0061
Perchlorate	0.0109

Note: RGs were calculated using target risk 1.0E-05 for the lifetime resident and a target hazard of 1 for the adult and child resident.

The CAOs for the RAAP-014/SWMU 54's groundwater remedy were (USEPA 2014):

> "to restore groundwater to drinking water standards; control exposure to the hazardous constituents remaining in the groundwater until such time that MCLs are achieved; protect the current existing receptors (the New River) from unacceptable concentrations from COC impacts; and ensure that all dissolved groundwater plumes are contained and will not migrate."

The remedy for RAAP-014/SWMU 54 was selected in a 2014 Final Decision (USEPA 2014) including two components:

- Monitored natural attenuation: MNA was proposed on a quarterly basis at three monitoring well locations until RGs are met.

The Interim Measures Work Plan (Shaw 2011b) was referenced for MNA requirements as modified by the conclusion of the Year Two Interim Measures Report (Shaw 2013). The requirements include quarterly sampling at monitoring wells 54MW10, 54MW12, and 54MW13 located in Area A, and monitoring well 54MW1 located upgradient. The groundwater samples are to be analyzed for explosives, perchlorate, and MNA indicators (see Section 5.9.5 for more information). Monitoring locations and COCs may be removed from the MNA program after achieving compliance with the RGs for a period of two years. If after two years of monitoring, the MNA plan is not shown to be working, a contingency plan will be developed.

- Land and groundwater use restrictions:
    - Groundwater at RAAP-014/SWMU 54 shall not be used for any purpose including, but not limited to, use as a potable water source, other than to conduct the maintenance and monitoring activities required by VDEQ and/or EPA
    - RAAP-014/SWMU 54 shall not be used in a way that will adversely affect or interfere with the integrity and protectiveness of the final remedies implemented at the facility.
    - Any owner of the facility property or any portion thereof shall provide EPA and VDEQ with a "Certified, True and Correct Copy" of any instrument that conveys any interest in the facility property or any portion thereof. Any such conveyance must provide for the continuation of the ICs until EPA, in consultation with VDEQ, determines the ICs are no longer necessary.

5.9.3.2 Remedy Implementation

The EPA proposed that the land and groundwater use restrictions be implemented through an enforceable permit. The RFAAP RCRA CA permit was modified to include the requirements of the RAAP-014/SWMU 54 remedy in 2016 (VDEQ 2016). The permit repeats the COCs and remedial goals outlined in Section 5.9.3.1, above, with one exception: the exit strategy incorporated into the permit requires that RGs in groundwater be met for a period of three years prior to remedy completion.

According to installation personnel, an IC sign was installed in May 2017. The RAAP-014/SWMU 54 sign reads:

"UNAUTHORIZED PERSONNEL KEEP OUT

THIS SITE IS SUBJECT TO LAND USE CONTROLS

MAINTAIN THIS SITE IN ITS CURRENT INDUSTRIAL/COMMERCIAL STATE

MAINTAIN THE VEGETATIVE COVER AND PREVENT FUTURE RESIDENTIAL USE OF THIS SITE

CONTACT THE ENVIRONMENTAL DEPARTMENT WITH QUESTIONS"

Groundwater monitoring was resumed after the Final Decision was issued and four additional sampling events were completed in September 2015, January 2016, April 2016, and July 2016. The results of these monitoring events are discussed in Section 5.9.5, below.

According to installation personnel, the remedy requirements have also been incorporated into an internal Management Manual prepared by the operating contractor. A copy of the manual was not available for inclusion in this Periodic Review due to proprietary content.

5.9.3.3 Operation, Maintenance, and Monitoring

The operation, maintenance, and monitoring for RAAP-014/SWMU 54 currently includes annual inspections (not mandated by the remedy), MNA groundwater monitoring, and routine maintenance including mowing. Since the Final Decision and Statement of Basis issued in 2014, four quarters of MNA data have been collected. The data were collected over the following periods:

- 29-30 September 2015
- 11-16 January 2016
- 11-14 April 2016
- 11-14 July 2016

In general, MNA events included the collection of the following data:

- Field Parameters
    - Photoionization detector (PID) readings at the wellhead
    - Temperature
    - pH
    - DO
    - ORP
    - Turbidity
    - Conductivity
- Water Level
    - Depth to water
    - Total monitoring well depth
- Laboratory analyses
    - Explosives
    - Perchlorate
    - RDX breakdown intermediates hexahydro-1,3,5-dinitroso-5-nitro-1,3,5-triazine (DNX), hexahydro-1-nitroso-3,5- dinitro-1,2,5-triazine (MNX), and hexhydro-1,3,5-trinitroso- 1,3,5-triazine (TNX)
    - MNA indicator parameters TOC, total inorganic carbon (TIC), dissolved ferrous iron, dissolved manganese, chlorate, chlorite, nitrate, and sulfate

This data is discussed in Section 5.9.5, below. MNA groundwater monitoring is ongoing, however, documentation of sampling conducted following the July 2016 sampling event was not available for inclusion in this review.

Although not mandated by the Statement of Basis and Final Decision, installation personnel indicate that annual inspections are performed for RAAP-014/SWMU 54. Documentation was provided for the 22 May 2017 inspection, which noted some maintenance and administrative tasks to update for the site, but identified no issues affecting protectiveness.

5.9.4 Progress Since the Last Review

A final remedy had not yet been selected for RAAP-014/SWMU 54 at the time of the last review.

5.9.5 Data Review

In accordance with the CA Permit (VDEQ 2016), four MNA groundwater sampling events have been completed since remedy selection in 2014. These events were summarized in one report titled the Attenuation Sampling Year Four Report (BSEn 2016). The groundwater elevations, groundwater contour maps, field parameter results, and groundwater contaminant concentrations extracted from each monitoring report are included in Attachment 9. Across all four monitoring events and consistent with historical characterizations, the groundwater flow is generally in an easterly direction towards the New River. The groundwater redox conditions fluctuate but are predominantly aerobic and oxidizing.

Only two of the COCs identified in the Final Decision were detected in groundwater above the RGs during the MNA groundwater sampling events: 2,4,6-TNT and RDX. The locations of these contaminants indicate a shared groundwater contaminant plume. The groundwater plume’s magnitude and locus over the last four quarters appear consistent with historical characterizations. Both the 2,4,6-TNT and RDX RG exceedances are generally focused downgradient of Area A in the vicinity of monitoring wells 54MW12 (typically where highest concentrations are detected) and 54MW10. An unusually high concentration of 2,4,6-TNT (110 µg/L) was detected at this location in January 2016. This is the highest concentration of 2,4,6-TNT detected at RAAP-014/SWMU 54 since 2011. An elevated concentration of 2,4,6-TNT was also detected at monitoring well 54MW13, located south-southeast of Area A once in the last four monitoring events. The exceedance occurred in July 2016 when the plume shifted from the typical center at 54MW12 to 54MW10. Historical data includes a few other instances of similar shifts in the plume in August 2012 and November 2013. These shifts are likely associated with the monitoring network proximity to the New River and associated fluctuations in contaminant dispersion.

Although concentrations of 2,4,6-TNT are routinely detected above the RG at monitoring well 54MW12, only occasional exceedances of the RDX RG are detected across the RAAP-014/SWMU 54 plume. The rate at which RDX exceedances of the RG are detected appears to be decreasing over time. The concentration of RDX exceeded the RG only once during the January 2016 sampling event at monitoring well 54MW12, and only once during the July 2016 sampling event at monitoring well 54MW13. No other exceedances of the RDX RG were detected over the last four quarters.

Due to the size of the post-remedy data set and the plume fluctuations observed in July 2016, statistical trends of the 2,4,6-TNT and RDX concentrations are unlikely to be apparent. A Mann-Kendall trend evaluation was performed to assess long-term trends in 2,4,6-TNT concentrations at monitoring well 54MW12 (see Attachment 9). No trends were identified in the 2011 through 2016 data.

Monitoring includes 2,4,6-TNT degradation products 2ADNT and 4ADNT. The biodegradation of 2,4,6-TNT occurs under both aerobic and anaerobic conditions, though microorganism growth is typically slower under anaerobic conditions resulting in relatively lower degradation rates. Low levels of 2ADNT and 4ADNT are detected routinely within the plume. The presence of these compounds at low concentrations suggests aerobic degradation of 2,4,6-TNT.

The MNA program at RAAP-014/SWMU 54 also includes RDX degradation products DNX, MNX, and TNX. These compounds were typically not identified in groundwater at RAAP-014/SWMU 54 in the last four quarters of monitoring. This may be due in part to the limited presence of RDX in the plume and in part due to the generally aerobic nature of the plume.

The concentrations of 2,4,6-TNT and RDX over the last four monitoring events are depicted on Table 6-1 in Attachment 9.

5.9.6 Site Inspection

Site inspections were conducted by USACE on 31 July 2017. They were attended by USACE staff Laura Allen and Mick Senus and led by the RFAAP Installation Restoration Program Manager, James McKenna. RAAP-014/SWMU 54 is an open field with a wooded area located east of Transport Research Drive as depicted on Photograph 15, and Figure 9 in Attachment 5. No evidence of residential use, intrusive activities, or issues affecting protectiveness was observed at the time of the site inspection. Monitoring wells associated with the site were observed locked and in good condition.

5.9.7 Technical Assessment

5.9.7.1 Question A: Is the Remedy Functioning as Intended by the Decision Document?

Yes, the remedy is functioning as intended by the decision document.

The CAOs selected for the RAAP-014/SWMU 54 remedy and status to date are:

- To restore groundwater to drinking water standards

  This CAO has not yet been achieved for RDX or 2,4,6-TNT. Due to the limited period of time since the RAAP-014/SWMU 54 remedy was selected, statistical trends in groundwater quality are not available. The magnitude of remaining impacts are limited in area and magnitude. The detections of concentrations of RDX above the RG appear to be decreasing in frequency over time. Degradation products of 2,4,6-TNT are also detected within the groundwater plume indicating that biodegradation is occurring.

- Control exposure to the hazardous constituents remaining in the groundwater until such time that MCLs are achieved

  The RAAP-014/SWMU 54 remedy effectively controls exposure to the hazardous constituents remaining in groundwater with the implementation of land and groundwater use restrictions. This remedy component, including the administrative and physical features, will remain in place until MCLs are achieved.

- Protect the current existing receptors (the New River) from unacceptable concentrations from COC impacts

  The New River is protected from unacceptable concentrations for COC impacts at RAAP-014/SWMU 54 via the MNA component of the remedy. River sediments and pore water were historically monitored. These sample collections were discontinued after no significant adverse impacts were identified. On-going monitoring at the site ensures that site conditions remain consistent or improve over time.

- Ensure that all dissolved groundwater plumes are contained and will not migrate

  The RAAP-014/SWMU 54 remedy ensures that the dissolved groundwater plume is contained and does not migrate via MNA. The impacts to groundwater are limited in area and magnitude. On-going monitoring at the site ensures that the site conditions remain consistent or improve over time.

No early indicators of potential issues or opportunities for optimization were identified.

5.9.7.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?

There are no newly promulgated or modified requirements of federal or state environmental laws (See Attachment 7) that would change the protectiveness of the RAAP-14/SWMU 54 remedy. Risk-based RGs were developed for soil to remove the source of groundwater contamination, and groundwater monitoring goals were also developed based on the assumption that the groundwater would be used for drinking water purposes. These exposure assumptions are still protective. Toxicity criteria have been updated for two COCs (TCDD and 2,4-DNT) since the risk-based goals were developed. However, considering these toxicity criteria updates, the groundwater RGs would still be within the USEPA’s acceptable risk range of cancer risks, and approximately equal to a hazard index of 1 (for non-cancer health effects, within the level of uncertainty associated with development of an oral reference dose) (please see attachment 8). Therefore, the cleanup levels for both soil and groundwater remain protective.

5.9.7.3 Question C: Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No, no other information has come to light that could call into question the protectiveness of the remedy.

5.9.8 Issues

No issues were identified that affect the protectiveness of the RAAP-014/SWMU 54 remedy.

5.9.9 Recommendations and Follow-Up Actions

No recommendations or follow-up actions were identified that affect the protectiveness of the RAAP-014/SWMU 54 remedy.

5.9.10 Protectiveness Statement

The remedy at RAAP-014/SWMU 54 is protective of human health and the environment.

Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use and intrusive activities. MNA is expected to decrease groundwater concentrations of 2,4,6-TNT and RDX to RGs.

5.10 RAAP-023/SWMU 43, SANITARY LANDFILL NO. 2

5.10.1 Site-Specific Chronology

The following table provides important events and dates for RAAP-023/SWMU 43.

Table 26 – Chronology of Events, RAAP-023/SWMU 43

Event	Date
RCRA Facility Assessment	1987
Verification Investigation	1992
RCRA Facility Investigation	2007-2011
USEPA issued a Statement of Basis	May 2011
USEPA issued a Final Decision	02 April 2012 (signature date)
Site inspections performed	26 August 2013 16 July 2014 30 November 2015 22 September 2016 22 May 2017
RCRA Permit VA1210020730 renewed by VDEQ	01 April 2016 (signature date)
IC sign posted	2017
The remedy requirements were recorded in a Management Manual for RFAAP.	Unknown

5.10.2 Background

5.10.2.1 Physical Characteristics

RAAP-023/SWMU 43 consists of an unlined, inactive sanitary landfill located adjacent to the New River in the northeast section of the main manufacturing area (see Figure 12 in Attachment 1). The landfill, identified as Sanitary Landfill #2, consisted of two 1.5-acre cells divided by a central drainage ditch. Based on geophysics and aerial photography, the landfill extends east-west approximately 700 feet on either side of the drainage ditch. The north and south boundaries are the New River bank and a paved road, respectively. Installation fencing is present along the New River and northern boundary of RAAP-023/SWMU 43. The landfill has a north-south dimension of approximately 150 feet.

5.10.2.2 Land and Resource Use

The former sanitary landfill at RAAP-023/SWMU 43 operated from 1958 to the early 1970s. The former trench fill operation received at least 300 tons of paper and refuse. The landfill was graded in association with the Verification Investigation completed in 1992. RAAP-023/SWMU 43 is now largely open field with a small portion of the western cell footprint used for staging. The drainage ditch remains in place between the two landfill cells.

5.10.2.3 History of Contamination

Impacts associated with RAAP-023/SWMU 43 were first identified during the completion of the 1992 Verification Investigation. Metals were detected in surface water and groundwater at concentrations exceeding USEPA MCLs. Benzene was detected in groundwater exceeding the tap water risk-based screening level. Additional groundwater samples and soil samples were collected in 2007. The groundwater contained elevated concentrations of PCE and metals above the tap water screening level and USEPA MCLs, respectively.

Residential risk-based screening levels were exceeded in soil for benzo(a)pyrene, PCBs, dioxin/furans (as TCDD TE), and 2,4,6-TNT. Mercury and arsenic were also detected in soil above the residential and industrial risk-based screening levels, respectively.

5.10.2.4 Initial Response

No initial response actions were taken at RAAP-023/SWMU 43.

5.10.2.5 Basis for Taking Action

The basis for taking action at RAAP-023/SWMU 43 was established in the 2011 RFI HHRA. Although risks (and non-carcinogenic hazards) from exposure to site-related constituents in soil were found to be acceptable for all receptors, a remedy was required to prevent residential use of the site and direct exposure to buried materials.

The groundwater evaluation, based on data collected in 2007, identified arsenic and PCE as the main risk-drivers in surface water and groundwater. An additional sampling event was conducted in 2010 to further evaluate the need for a groundwater remedy. No elevated concentrations of PCE were identified above the tap water screening levels. Based on the 2010 sampling results, the Army determined that no remedy was required for groundwater.

An SLERA was performed to evaluate ecological risk and determined that no measures solely to address ecological concerns were warranted for any media because:

- no rare, threatened, or endangered wildlife species have been confirmed at the site.
- the relatively small size of the site.
- groundwater migration to the New River was determined not to be a significant ecological concern.

5.10.3 Remedial Actions

5.10.3.1 Remedy Selection

Based on the basis for taking action at RAAP-023/SWMU 43, a CMS was not performed for RAAP-023/SWMU 43, and no CMOs were formally established.

The remedy for RAAP-023/SWMU 43 was selected in a Statement of Basis (USEPA 2011) and a subsequent Final Decision (USEPA 2012). The selected remedy is institutional controls to prevent future residential use and to restrict future earth moving. The remedy components are described as follows in the Final Decision:

- Restrict future residential use: Certain units shall not be used for residential purposes unless it is demonstrated to EPA that such use will not pose a threat to human health or the environment or adversely affect or interfere with the selected remedy and EPA provides prior written approval for such use.

- Restrict future earth moving activities: For certain units, no earth moving activities, including digging, construction and drilling, may be done unless such activities are conducted in accordance with a Health & Safety Plan that was approved by EPA, and that was prepared by an appropriately qualified person familiar with the environmental conditions at the Facility.

The Final Decision also requires the installation of signs at each unit where ICs are being implemented.

5.10.3.2 Remedy Implementation

The remedy at RAAP-023/SWMU 43 was incorporated into the RCRA CA Permit in April 2016 (VDEQ 2016). According to installation personnel, the remedy requirements have also been incorporated into an internal Management Manual prepared by the operating contractor. A copy of the manual was not available for inclusion in this Periodic Review due to proprietary content; however, installation personnel indicate that the manual contains requirements consistent with those listed on inspection forms. For RAAP-023/SWMU 43, the requirements are: “Maintain the information sign, and existing soil, vegetation cover, and existing drainage channels, and prevent residential use.”

According to installation personnel, IC signs were installed by 2017. The RAAP-023/SWMU 43 sign reads:

“UNAUTHORIZED PERSONNEL KEEP OUT

THIS SITE IS SUBJECT TO LAND USE CONTROLS

MAINTAIN THIS SITE IN ITS CURRENT INDUSTRIAL/COMMERCIAL STATE

MAINTAIN THE VEGETATIVE COVER AND PREVENT FUTURE RESIDENTIAL USE OF THIS SITE

CONTACT THE ENVIRONMENTAL DEPARTMENT WITH QUESTIONS”

5.10.3.3 Operation, Maintenance, and Monitoring

Annual inspections were performed at RAAP-023/SWMU 43 by BAE Systems personnel on behalf of the Army on the following dates:

- 26 August 2013
- 16 July 2014
- 30 November 2015
- 22 September 2016
- 22 May 2017

The existing soil, vegetative cover, erosion control measures, security, and restriction on residential use were evaluated. No issues were identified during the inspections. Copies of the inspection sheets are included in Attachment 10.

5.10.4 Progress Since the Last Review

The previous review included the following protectiveness statement for RAAP-023/SWMU 43:

> "The remedy at RAAP-023/SWMU 43 currently protects human health and the environment because no human exposure is occurring. However, in order for the remedy to be protective in the long-term, the institutional controls need to be implemented to ensure protectiveness."

The following table documents the issues and recommendations and follow-up actions identified for RAAP-023/SWMU 43 in the previous review:

Table 27 – Actions Taken Since the Last Periodic Review, RAAP-023/SWMU 43

Issue from Previous Review	Recommendation/ Follow-Up Action	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
The institutional controls have not been incorporated into the Permit by modification.	Finalize the RCRA Permit Modification that will, in effect, finalize the remedies selected in the Decision Document.	Army/VDEQ	None indicated	The institutional controls were incorporated into the Permit with the issuance of the Permit renewal.	01 April 2016
The signage required as part of the institutional controls has not been posted.	Post signage as required.	Army	None indicated	Signage was posted as required.	2017

5.10.5 Data Review

No data has been collected at RAAP-23/SWMU 43 since the remedy was selected in 2011.

5.10.6 Site Inspection

Site inspections were conducted by USACE on 31 July 2017. They were attended by USACE staff Laura Allen and Mick Senus and led by the RFAAP Installation Restoration Program Manager, James McKenna. RAAP-023/SWMU 43 is an open field with a staging area located at the west end of the western landfill cell as depicted on Photographs 16, 17 and 18, and Figure 10 in Attachment 5. No evidence of residential use, intrusive activities, or issues affecting protectiveness was observed at the time of the site inspection.

5.10.7 Technical Assessment

5.10.7.1 Question A: Is the Remedy Functioning as Intended by the Decision Document?

Yes, the remedy is functioning as intended by the decision document. The remedy has been incorporated into the RCRA CA permit and a Management Manual for RFAAP. A sign is posted at the site communicating the restrictions on site use and maintenance, and annual inspections were conducted from 2013 through 2017. No evidence of intrusive activities or residential site use has been observed during the annual site inspections or during the site inspection performed in conjunction with this review.

No early indicators of potential issues or opportunities for optimization were identified.

5.10.7.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?

Yes. There are no newly promulgated or modified requirements of federal or state environmental laws (see Attachment 7) that would change the protectiveness of the RAAP-23/SWMU 43 remedy. The RFI evaluated both current and future potential human health risks and also potential ecological risks from exposure to site media, including soils, groundwater, and groundwater seepage to surface water and sediment. Risks (and non-carcinogenic hazards) from exposure to site-related constituents in soil were found to be acceptable for all receptors.

5.10.7.3 Question C: Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No, no other information has come to light that could call into question the protectiveness of the remedy.

5.10.8 Issues

No issues were identified affecting the protectiveness of the RAAP-023/SWMU 43 remedy.

5.10.9 Recommendations and Follow-Up Actions

No recommendations and follow-up actions were identified affecting the protectiveness of the RAAP-023/SWMU 43 remedy.

5.10.10 Protectiveness Statement

The remedy at RAAP-023/SWMU 43 is protective of human health and the environment.

Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use and intrusive activities.

5.11 RAAP-024/SWMU 45, LANDFILL NO. 3

5.11.1 Site-Specific Chronology

The following table provides important events and dates for RAAP-024/SWMU 45.

Table 28 – Chronology of Events, RAAP-024/SWMU 45

Event	Date
RCRA Facility Assessment	1987
Verification Investigation	1992
Installation Assessment	1992
Geophysical Investigation	2007
Site Screening Process	2010
USEPA issued a Statement of Basis	May 2011
USEPA issued a Final Decision	02 April 2012 (signature date)
Site inspections performed	16 July 2014 30 November 2015 22 September 2016 22 May 2017
RCRA Permit VA1210020730 renewed by VDEQ	01 April 2016 (signature date)
IC sign posted	2017
The remedy requirements were recorded in a Management Manual for RFAAP.	Unknown

5.11.2 Background

5.11.2.1 Physical Characteristics

RAAP-024/SWMU 45 is identified as the Inactive Sanitary Landfill #3, and consists of a 3.4-acre area in the northwest section of the Main Manufacturing Area (see Figure 13 in Attachment 1). The New River is located approximately 200 feet north-northwest of the unit.

5.11.2.2 Land and Resource Use

Historical records indicate that RAAP-024/SWMU 45 was used as a landfill from 1957 to 1961. At the time of the 1987 RCRA Facility Assessment, the area was graded and vegetated to the extent that the landfill had become indistinguishable from the surrounding area as a landfill site. As depicted on Figure 13, the site remains undeveloped and is now wooded. Evaluation of the landfill contents identified a variety of waste including scrap metal.

5.11.2.3 History of Contamination

Impacts to RAAP-024/SWMU 45 were first identified during the 1992 Verification Investigation. Three groundwater monitoring wells were installed and sampled for VOCs, SVOCs, explosives, TAL metals, total organic carbon, total organic halogens, and pH. Elevated concentrations of VOCs and metals were identified above risk-based screening levels. Soil analyses for contaminants were first completed in 2008 for inclusion in the 2010 SSP report. Metals, PCBs, SVOCs, and one explosive (nitroglycerine) were identified as COPCs based on comparisons with USEPA Region III residential and industrial risk-based concentrations.

5.11.2.4 Initial Response

No initial response actions were taken for RAAP-024/SWMU 45.

5.11.2.5 Basis for Taking Action

The basis for taking action at RAAP-024/SWMU 45 was established in the 2010 Site Screening Process (SSP).

Both a screening level and quantitative human health risk assessment were completed in conjunction with the SSP. Although further assessment was warranted for the residential use scenario based on risk and hazard levels exceeding the 1.0E-05 and 1.0 thresholds, respectively, no remedy was ultimately required for soil. Elevated risk and hazard levels were largely associated with concentrations of metals below background.

The groundwater cumulative human health risk screens were below the risk and hazard levels of 1.0E-05 and 1.0, respectively.

An SLERA was completed in conjunction with the SSP and determined that ecological risks were negligible at RAAP-024/SWMU 45.

5.11.3 Remedial Actions

5.11.3.1 Remedy Selection

Based on the basis for taking action at RAAP-024/SWMU 45, a CMS was not performed for RAAP-024/SWMU 45, and no CMOs were formally established.

The remedy for RAAP-024/SWMU 45 was selected in a Statement of Basis (USEPA 2011) and a subsequent Final Decision (USEPA 2012). The selected remedy is institutional controls to prevent future residential use and to restrict future earth moving. The remedy components are described as follows in the Final Decision:

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

The Final Decision also requires the installation of signs at each unit where ICs are being implemented.

5.11.3.2 Remedy Implementation

The remedy at RAAP-024/SWMU 45 was incorporated into the RCRA CA Permit in April 2016 (VDEQ 2016). According to installation personnel, the remedy requirements have also been incorporated into an internal Management Manual prepared by the operating contractor. A copy of the manual was not available for inclusion in this Periodic Review due to proprietary content; however, installation personnel indicate that the manual contains requirements consistent with those listed on inspection forms. For RAAP-024/SWMU 45, the requirements are: "Maintain the information sign, and existing soil, vegetation cover, and existing drainage channels, and prevent residential use."

According to installation personnel, IC signs were installed by 2017. The RAAP-024/SWMU 45 sign reads:

"UNAUTHORIZED PERSONNEL KEEP OUT

THIS SITE IS SUBJECT TO LAND USE CONTROLS

MAINTAIN THIS SITE IN ITS CURRENT INDUSTRIAL/COMMERCIAL STATE

MAINTAIN THE VEGETATIVE COVER AND PREVENT FUTURE RESIDENTIAL USE OF THIS SITE

CONTACT THE ENVIRONMENTAL DEPARTMENT WITH QUESTIONS"

5.11.3.3 Operation, Maintenance, and Monitoring

Annual inspections were performed at RAAP-024/SWMU 45 by BAE Systems personnel on behalf of the Army on the following dates:

- 16 July 2014
- 30 November 2015 (notes that the IC sign is under contract to be installed)
- 22 September 2016
- 22 May 2017

The 26 August 2013 set of inspection forms is missing a sheet for RAAP-024/SWMU 45.

The existing soil, vegetative cover, erosion control measures, security, and restriction on residential use were evaluated. No issues were identified during the inspections. Copies of the inspection sheets are included in Attachment 10.

5.11.4 Progress Since the Last Review

The previous review included the following protectiveness statement for RAAP-024/SWMU 45:

> "The remedy at RAAP-024/SWMU 45 currently protects human health and the environment because no human exposure is occurring. However, in order for the remedy to be protective in the long-term, the institutional controls need to be implemented to ensure protectiveness."

The following table documents the issues and recommendations and follow-up actions identified for RAAP-024/SWMU 45 in the previous review:

Table 29 – Actions Taken Since the Last Periodic Review, RAAP-024/SWMU 45

Issue from Previous Review	Recommendation/ Follow-Up Action	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
The institutional controls have not been incorporated into the Permit by modification.	Finalize the RCRA Permit Modification that will, in effect, finalize the remedies selected in the Decision Document.	Army/VDEQ	None indicated	The institutional controls were incorporated into the Permit with the issuance of the Permit renewal.	01 April 2016
The signage required as part of the institutional controls has not been posted.	Post signage as required.	Army	None indicated	Signage was posted as required.	2017

5.11.5 Data Review

No data has been collected at RAAP-024/SWMU 45 since the remedy was selected in 2011.

5.11.6 Site Inspection

Site inspections were conducted by USACE on 31 July 2017. They were attended by USACE staff Laura Allen and Mick Senus and led by the RFAAP Installation Restoration Program Manager, James McKenna. RAAP-024/SWMU 45 is a wooded area as depicted on Photographs 19 and 20, and Figure 10 in Attachment 5. No evidence of residential use, intrusive activities, or issues affecting protectiveness was observed at the time of the site inspection. Monitoring wells associated with the site were observed locked and in good condition.

5.11.7 Technical Assessment

5.11.7.1 Question A: Is the Remedy Functioning as Intended by the Decision Document?

Yes, the remedy is functioning as intended by the decision document. The remedy has been incorporated into the RCRA CA permit and a Management Manual for RFAAP. A sign is posted at the site communicating the restrictions on site use and maintenance, and annual inspections were conducted from 2014 through 2017. No evidence of intrusive activities or residential site use has been observed during the annual site inspections or during the site inspection performed in conjunction with this review.

No early indicators of potential issues or opportunities for optimization were identified.

5.11.7.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?

Yes. There are no newly promulgated or modified requirements of federal or state environmental laws (see Attachment 7) that would change the protectiveness of the RAAP-024/SWMU 45 remedy. The exposures associated with current land use are comparable to what was assessed at the time the remedy was selected. The site-specific screening and subsequent human health and ecological risk assessments for this site indicated there are no unacceptable risks from exposure to site media. Active remedial actions were not warranted for protection of either ecological receptors or human health, so no constituents driving risk were identified for this site (see Attachment 8).

5.11.7.3 Question C: Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No, no other information has come to light that could call into question the protectiveness of the RAAP-024/SWMU 45 remedy.

5.11.8 Issues

No issues were identified that would affect the protectiveness of the RAAP-024/SWMU 45 remedy.

5.11.9 Recommendations and Follow-Up Actions

No recommendations and follow-up actions were identified that would affect the protectiveness of the RAAP-024/SWMU 45 remedy.

5.11.10 Protectiveness Statement

The remedy at RAAP-024/SWMU 45 is protective of human health and the environment.

Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use and earth moving.

5.12 RAAP-039/HWMU 16, HAZARDOUS WASTE LANDFILL

5.12.1 Site-Specific Chronology

The following table provides important events and dates for RAAP-039/HWMU 16.

Table 30 – Chronology of Events, RAAP-039/HWMU 16

Event	Date
Landfill was active	1980-1988
Landfill cover system installed	19 September 1988 – 14 October 1988
Closure Certification	10 August 1993
RCRA Post-Closure Care Permit Issued	04 October 2002
Class I Permit Modification approved	14 June 2007
Class 3 Permit Modification approved	27 September 2011
First Periodic Review	March 2014
RCRA Post-Closure Care Permit VA1210020730 renewed	17 July 2014 (signature date) 16 August 2014 (effective date)
Class 1 Permit Modification approved	12 September 2014
Initial groundwater compliance period (13 years) ends	04 October 2015
Class 1 Permit Modification approved	01 December 2016
Post-Closure Care Period Ends (30 years from closure date)	10 August 2023

5.12.2 Background

5.12.2.1 Physical Characteristics

RAAP-039/HWMU 16 is identified as the Hazardous Waste Landfill and encompasses approximately two acres within the Horseshoe Area (see Figure 14 in Attachment 1). The landfill consisted of a trench without a liner or leachate collection system. The trench measured approximately 60 feet wide, 400 feet long, and 10 to 14 feet in depth. The monitoring wells at RAAP-039/HWMU 16 are screened either within the carbonate bedrock or weathered carbonate bedrock residuum. With the exception of monitoring well 16-5 (located at a much lower elevation than the landfill and other monitoring wells), the depth to groundwater is generally 45-65 feet below the top of the monitoring well casings. Groundwater flow across RAAP-039/HWMU 16 is west to east.

5.12.2.2 Land and Resource Use

RAAP-039/HWMU 16 was used beginning in 1980 for the disposal of hazardous waste. The waste was disposed of in a trench with an estimated capacity of 6,000 cubic yards. Historical records document that 80% of the trench capacity was utilized by 1988. RAAP-039/HWMU 16 is currently an undeveloped vegetated field.

5.12.2.3 History of Contamination

RAAP-039/HWMU 16 was used for the disposal of lab chemicals and incinerator residue, and was used as a burning ground until the early 1980s. The estimated quantities of hazardous wastes disposed of at RAAP-039/HWMU 16 included:

- 3,898 tons of ash from the burning of waste explosives and explosives-contaminated material
- 545 tons of wastewater treatment sludges
- 6 tons of asbestos and various laboratory chemicals
- Unknown quantities of ash from a waste propellant incinerator
- Unknown quantities of residue from waste propellant burning
- Unknown quantities of residue from explosive contaminated waste burning
- Unknown quantities of sulfur acid regeneration area fume burner ash
- Unknown quantities of sludges from Bioplant Building 470
- Unknown quantities of NG 2 Pretreatment Building 9410

Groundwater has been monitored at RAAP-039/HWMU 16 since 1981 in accordance with Virginia Hazardous Waste Management Regulations. Historical monitoring documented the presence of at least 43 hazardous constituents in downgradient groundwater including metals, VOCs, and explosives/propellants (VDEQ 2014).

5.12.2.4 Initial Response

The RCRA Post-Closure Care included the installation of a leachate drain and cover system. The cover consisted of one foot of top soil with grass cover, one foot of cover soil, one foot of a drainage sand layer, a 30-mil PVC membrane cap, and a two foot thick clay cap. The final cover system was installed on September 19 – October 14, 1988.

5.12.2.5 Basis for Taking Action

The basis for taking action at RAAP-039/HWMU 16 was the closing of the once permitted hazardous waste management unit (RAAP-039/HWMU 16 was certified closed on 10 August 1993). No corrective actions have been required for RAAP-039/HWMU 16 to date. Groundwater samples have been collected at RAAP-039/HWMU 16 since 1981. No soil data were assessed for this Periodic Review based on the containment of impacted material via the constructed leachate drain and cover system.

5.12.3 Remedial Actions

5.12.3.1 Remedy Selection

The Hazardous Waste Management Post-Closure Care Permit (VDEQ 2014) serves as the remedy selection document for RAAP-039/HWMU 16. No Statement of Basis or Final Decision documents were drafted for HWMUs. The permit requires groundwater monitoring and reporting, inspections, maintenance, and use restrictions. The Post-Closure Care Permit does not include a groundwater corrective action and monitoring program for RAAP-039/HWMU 16.

5.12.3.1.1 Groundwater Monitoring

Groundwater Protection Standards (GPSs) for comparison to groundwater data were selected for a broad range of constituents. The GPSs were assigned based on background concentrations from the upgradient monitoring well, EPA Safe Drinking Water Act Maximum Contaminant Levels (SDWA MCLs), or an Alternate Concentration Limit (health-based risk assessment levels generated by the REAMS model or an equivalent method). The GPSs are summarized in Table 31, below:

Table 31 –Groundwater Protection Standards (µg/L), RAAP-039/HWMU 16

Constituent	**PQL**	**Back-Ground**	**USEPA MCL**	**ACL RSL**	**GPS**
Arsenic, total	10	1	10		10
Barium, total	10	175.4	2,000		2,000
Beryllium, total	1	0.7	4		4
Cadmium, total	1	0.2	5		5
Chromium, total	5	6.2	100		100
Cobalt, total	5	5		4.7	5
Copper, total	5	13	1,300		1,300
Lead, total	2	10	15		15
Mercury, total	2	0.2	2		2
Nickel, total	10	16		300	300
Vanadium, total	10	151		63	151
Zinc, total	30	51		4,700	4,700
Benzene	1	1	5		5
2-Butanone; Methyl ethyl kentone (MEK)	10	1.1		4,900	4,900
Carbon tetrachloride	1	0.2	5		5
Chloroethane	1	20.7		21,000	21,000
Dichlorodifluoromethane	1	46.5		190	190
1,1-Dichloroethane	1	9.5		0.15	9.5
1,1-Dichloroethene	1	1	7		7
Diethyl ether	12.5	75.5		7,300/RSL	7,300
Dimethyl ether	12.5	17			17
Ethylbenzene; Phenylethane	1	0.1	700		700
Methylene chloride	1	13.95	5		13.95
Tetrachloroethene (PCE)	1	0.7	5		5
Tetrahydrofuran		25		3,400/RSL	3,400
Chloromethane	1	0.3		190	190
Toluene	1	0.1	1,000		1,000
1,1,1-Trichloroethane; Methylchloroform	1	9.2	200		200
Trichloroethene (TCE)	1	0.1	5		5
Trichloroflurомethane	1	11.3		1,000	1,000
Trifluorotrichloroethane; 1,1,2-Trichloro-1,2,2-Trifhloroethane	1	1.2		59,000/RSL	59,000
Xylenes, total	3	0.2	10,000		10,000

Constituent	PQL	Back-Ground	USEPA MCL	ACL RSL	GPS
Diethyl phthalate	5	5		11,000	11,000
2,4-Dinitrotoluene	10	10		0.2	10
2,6-Dinitrotoluene	10	10		0.042	10

Notes:

USEPA MCL: Maximum contaminant level of USEPA National Primary Drinking Water Regulations (April 2002). Subject to change without notice as directed by VDEQ.

Background: Calculated using analytical data from 1996 through 1998 for upgradient well 16C1.

VDEQ ACL: VDEQ Alternate Concentration Limit, Dec – 2013. Subject to change without notice as directed by VDEQ.

RSL: RSL are developed by Oak Ridge National Laboratory under an Interagency Agreement with USEPA (June 2011). Subject to change without notice as directed by VDEQ.

For any monitoring event, if a GPS for a constituent in the table above is based on PQL, the Permittee will perform verification of a detection (i.e. value greater than the Detection Limit) of such a constituent using low-level analytical methods, if such methods are standard methods that are routinely available from commercial laboratories. Furthermore, the low-level analytical method will be used only if the PQL achievable by that method is less than, or equal to, the ACL or RBC for the subject constituent. If the verification event confirms a quantifiable detection (i.e. value greater than the PQL) above the applicable ACL or RBC, a revised background concentration will be established using low-level analytical methods, if appropriate, and the GPS will be updated based on the new background concentration if warranted. The post-closure permit indicates that the GPSs are applied for a period of 13 years from the effective date of the original permit and continues until 2015, or until the Director approves clean closure of the unit.

Modified 12 September 2014 to add 1,1-DCE and 01 December 2016 to add tetrahydrofuran

The compliance period for the permit was initially through 04 October 2015; however, the 2015 monitoring report (DAA 2016) noted that monitoring would continue biannually due to the ongoing evaluation of elevated cobalt concentrations first detected in 2013.

The Post-Closure Care Permit includes a Post Closure Care and Groundwater Monitoring plan in Appendix C.2 of Attachment 1. The major components of post-closure care include groundwater monitoring, inspection, and maintenance. The monitoring program requires a minimum of four monitoring wells, one upgradient and three downgradient. These wells are identified as the upgradient well (16C1) and point of compliance wells (16WC1A, 16WC1B, 16MW8, and 16MW9). In addition to these wells, the monitoring program includes four plume monitoring wells and one spring (16-2, 16-3, 16-5, 16WC2B, and 16SPRING) for use in evaluating whether the plume has migrated, and four observation wells (16-1, 16WC2A, 16C3, and 16CDH3) for use as piezometers. Groundwater monitoring is required on a semi-annual basis. Note that the post-closure care plan (Attachment 1 Appendix C) discusses quarterly monitoring; however, the monitoring frequency was changed from quarterly to semiannual in the VDEQ-approved Class 1 Permit Modification dated June 14, 2007. Groundwater elevations are also measured and the direction and rate of groundwater flow are determined on an at least annual basis.

5.12.3.1.2 Land Use Restrictions

Post-closure site use at RAAP-039/HWMU 16 is restricted from actions that would "…disturb the integrity or the function of the facility's monitoring systems and cover…" Specific restrictions include:

- On-site construction
- Excavation (except as necessary for major maintenance activities)
- Well construction on or near the site
- Agricultural use
- Silvicultural use
- Water infiltration (run-on, ponding, irrigation)
- Recreational use
- Disposal operations
- Vehicular traffic (except as necessary for major maintenance activities)
- Housing on or near the site.

Surveys of the site were also required to be submitted to the local land authority showing the footprint of the sites with respect to permanently surveyed benchmarks and a note that there will be no disturbance of the disposal areas by RFAAP. A notation was also required on the deed to the facility property notifying in perpetuity any potential purchaser of the property that (1) the land has been used to manage hazardous waste (2) its use is restricted to that of open space and (3) the survey plan and record of the type, location, and quantity of hazardous wastes disposed on site has been filed with the Executive Director and local land authority. The required information was submitted to the local zoning authorities by the Army in correspondence dated 15 September 1998.

Security measures include warning signs indicating that only authorized personnel are allowed to enter the restricted portion of RFAAP.

5.12.3.1.3 Inspections

Post closure inspections are required on a minimum of a semi-annual basis within the Inspection and Maintenance Plan (Attachment 1 Appendix F). The Plan requires an inspection of the final soil cover, vegetative cover, peripheral drainage swales, PVC liner, stormwater drainage areas, fence, warning signs, access road, monitoring wells, and benchmarks. Note that the Post-Closure Plan (Attachment 1 Appendix C) discusses monthly inspections, but is governed by the Inspection and Maintenance Plan.

5.12.3.1.4 Maintenance

Maintenance requirements are specified on an as-needed basis for the cover, drainage slopes and vegetation:

- Damage due to erosion and subsidence will be corrected by adding soil and regrading the site.
- Maintenance of vegetation necessary to control erosion will include removing deep-rooted plants and adding fertilizer to enhance growth as necessary.
- Overgrowth into drainage swales and access roads will be controlled.
- Swales will be cleared of any accumulated material.
- These precipitation run-off pathways will be tested annually for the constituents of which were disposed in the units to determine if precipitation run-off is becoming contaminated.

- Security will be maintained by immediately repairing or replacing any damaged signs or access roads.
- Damaged monitoring wells will be repaired if possible. If it is determined that the integrity of the well has been destroyed, the well will be replaced.
- Surveyed benchmarks used to indicate the location of the site will be protected and maintained as necessary.
- The general perimeter of the surface impoundment will be easily recognizable due to the presence of riprap for slope protection.

In addition to the above maintenance activities, contingency activities are specified in the event of major damage:

- Replacement of cover or fill soil, restoration of original grade design or replacement with new grade design, and/or installation of riprap.
- Any other cover deterioration due to deep-rooted plants, cracking, cold weather, or slope instability will be promptly corrected by filling, regarding and reseeding, as appropriate.
- Damage to vegetation will be controlled by the addition of nutrients, manual watering (in the event of drought), and/or pest control as appropriate.

5.12.3.2 Remedy Implementation

Since issuance of the RCRA post-closure care permit in 2002, the Army has undertaken remedy implementation including routine groundwater monitoring, annual groundwater monitoring reports, site inspections, site maintenance, and land use restrictions. This review evaluated the period of 2013 through 2016 based on the last periodic review (which covered data collected through 2012) and data availability (no data for 2017 was available for review). Groundwater monitoring was performed on a semi-annual basis with additional verification samples collected as necessary. Inspections were performed on a quarterly basis. Land use restrictions are enforced via a warning sign and the remedy requirements have been incorporated into an internal Management Manual prepared by the operating contractor. A copy of the manual was not available for inclusion in this Periodic Review due to proprietary content.

The warning sign posted at RAAP-039/HWMU 16 reads:

“WARNING!

THIS IS A CLOSED HAZARDOUS WASTE FACILITY. ENTRY OF UNAUTHORIZED PERSONNEL AND VEHICLES IS PROHIBITED. CONTACT RAAP SECURITY POLICE (639-7163) TO REPORT DAMAGE OR ACCIDENTS”

5.12.3.3 Operation, Maintenance, and Monitoring

Quarterly inspections were performed at RAAP-039/HWMU 16 by BAE Systems personnel on behalf of the Army. Available inspection forms for the review period (2013-2017) documented inspections on the following dates:

- 21 March 2013
- 10 June 2013
- 8 August 2013
- 2 December 2013

- 27 March 2014
- 24 June 2014
- 18 September 2014
- 22 December 2014
- 18 March 2015
- 26 June 2015
- 18 September 2015
- 30 November 2015
- 22 March 2016 (noted two groundhogs trapped 16 May 2016)
- 30 June 2016 (noted that the grass required cutting, documented a request made for maintenance on 30 June 2016)
- 29 September 2016 (noted that the grass required cutting, documented mowing on 11 October 2016)
- 21 December 2016 (noted groundhog traps in place)
- 24 March 2017
- 29 June 2017 (noted that the grass required cutting, documented mowing on 07 July 2017; indicated that the survey benchmark would be verified)
- 22 September 2017

The final soil cover, vegetative cover, PVC liner, peripheral drainage swales, stormwater drainage areas, security, monitoring wells, and survey benchmarks were evaluated. No issues were identified during the inspections other than those noted above. Copies of the inspection sheets are included in Attachment 10.

Groundwater monitoring was conducted during the second and fourth quarters from 2013 through 2016. The data were documented in annual monitoring reports as discussed in Section 5.12.5.

5.12.4 Progress Since the Last Review

The previous review included the following protectiveness statement for RAAP-039/HWMU-16:

> “The remedy at RAAP-039/HWMU-16 is protective of human health and the environment.”

No issues or recommendations and follow-up actions were identified for RAAP-039/HWMU-16 in the previous review.

5.12.5 Data Review

The 2014 Periodic Review included a data review through 2012. For the purposes of this review, the annual reports for 2013 through 2016 were reviewed. The tabulated data and figures extracted from the monitoring reports are included in Attachment 9. The 2017 groundwater monitoring data were not yet available. Monitoring was performed during the second and fourth quarters each year and intermittently as required for data verification purposes. Quarterly data were collected on the following dates:

- Second quarter 2013: 23-24 April 2013
- Fourth quarter 2013: 21-23 October 2013
- Second quarter 2014: 23-24 April 2014
- Fourth quarter 2014: 20-22 October 2014
- Second quarter 2015: 21-22 April 2015
- Fourth quarter 2015: 13-14 October 2015
- Second quarter 2016: 26-27 April 2016
- Fourth quarter 2016: 24-25 October 2016

Data collected during routine monitoring was compared to the GPSs. Exceedances of the GPSs were reported to the VDEQ and often verification samples were collected to evaluate the exceedance. In general, discussion has been omitted from this data review for instances where the verification samples did not confirm the exceedance or where analysis resulted in no further action for identified exceedances.

The concentration of total cobalt exceeded the GPS of 5 µg/L several times in point of compliance monitoring wells 16MW9, 16WC1A, and 16WC1B since 2013:

Table 32 – Cobalt GPS Exceedances, RAAP-039/HWMU 16

Sample Date	**2Q13**	**4Q13**	**2Q14**	**4Q13**	**2Q15**	**4Q15**	**2Q16**	**4Q16**	**GPS**
16MW9	3.59 J	<5	4.49 J	<5	4.84 J	<5	**5.5**	<5	5
16WC1A	4.5 J	<5	4.7 J	<5	4.3 J	**5.38**	4.9 J	**6**	
16WC1B	<5	**33.4**	**46.8**	**13.4**	**22.3**	**17**	**35**	**15**	

Table Notes:
GPS = Groundwater Protection Standard
All results expressed in micrograms per liter (µg/L).
<5 = no concentration of cobalt detected above the laboratory quantitation limit of 5 µg/L.
J = laboratory result is estimated
Bold result indicates an exceedance of the GPS.
Verification sampling was performed as follows:

- 16WC1B 4Q13 result verified at 36 µg/L.
- 16WC1A 4Q15 result verified at 6.78 µg/L.
- 16MW9 2Q16 verified as follows: The verification sampling event consisted of the collection of split samples submitted for analyses at two laboratories, Test America and Eurofins. The split samples submitted to Test America contained concentrations of 4.7 and 4.8 µg/L. The split samples submitted to Eurofins contained concentrations of 5.6 and 6.0 µg/L.

These wells are located at the east and downgradient edge of the landfill. The source of the cobalt is currently unknown.

In correspondence dated 21 January 2014, the VDEQ requested the completion of an Alternate Source Demonstration (ASD) to evaluate whether the elevated cobalt concentrations at 16WC1B were due to 1) a source other than the Unit; 2) errors in sampling, analysis, and evaluation; or 3) natural variation in groundwater. The ASD was expanded to include cobalt concentrations at monitoring wells 16WC1A and 16MW9 and has been extended through 2017.

No other exceedances of the GPSs were identified in the compliance well network.

The permit requires evaluation of detections other than those constituents listed and subsequent verification sampling. In the event that the detection is confirmed in the verification samples, the constituent is added to the Compliance Monitoring List via Permit modification. In accordance with this process, the following class 1 minor permit modifications were approved for the addition of the referenced constituents to the Compliance Monitoring List since 2013:

- 1,1-DCE added 12 September 2014
- tetrahydrofuran added 01 December 2016

The detected concentrations of these constituents do not exceed the respective GPSs.

5.12.6 Site Inspection

Site inspections were conducted by USACE on 31 July 2017. They were attended by USACE staff Laura Allen and Mick Senus and led by the RFAAP Installation Restoration Program Manager, James McKenna. RAAP-039/HWMU 16 is a vegetated undeveloped field as depicted on Photographs 21 and 22, and Figure 11 in Attachment 5. No evidence of residential use, intrusive activities, or issues affecting protectiveness was observed at the time of the site inspection. Monitoring wells associated with the site were observed locked and in good condition.

5.12.7 Technical Assessment

5.12.7.1 Question A: Is the Remedy Functioning as Intended by the Decision Document?

Yes, the remedy at RAAP-039/HWMU 16 is functioning as intended. Groundwater monitoring is performed on a semi-annual basis with verification samples collected as needed. Elevated concentrations of cobalt have been detected in three compliance monitoring wells located at the eastern edge of the landfill. In accordance with the permit, an ASD is in progress to evaluate the source of the cobalt detections. It is expected that the results of the ASD will indicate that corrective actions at RAAP-039/HWMU 16 are not required to address the elevated cobalt detections. In the event that corrective actions are required, the permit contains contingencies to address these requirements. Inspections of the landfill are occurring on a quarterly basis as documented in Section 5.12.3.3. The inspections and as-needed site maintenance are planned to continue as required by the permit for a minimum period of 30 years from closure. A sign is posted at the site as an access control and site use will remain restricted from several specified uses including earth moving and residential use.

No early indicators of potential issues or opportunities for optimization were identified.

5.12.7.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?

Yes. There are no newly promulgated or modified requirements of federal or state environmental laws (see Attachment 7) that would change the protectiveness of the RAAP-039/HWMU 16 remedy. The toxicity criterion for one of the constituents with a risk-based groundwater protection standard (1,1,2-trichloro-1,2,2-trifluoroethane) has been updated, resulting in a lower USEPA tapwater screening level (see Attachment 8). This compound was detected during the review period at RAAP-039/HWMU 16 below the updated screening level. The historical monitoring results for RAAP-039/HWMU 16 were reviewed and 1,1,2-trichloro-1,2,2-trifluoroethane is noted as detected in an upgradient well. Since this compound is not a site-specific contaminant, no changes to the screening level are required.

5.12.7.3 Question C: Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No, no other information has come to light that could call into question the protectiveness of the RAAP-039/HWMU 16 remedy.

5.12.8 Issues

No issues were identified affecting the protectiveness of RAAP-039/HWMU 16.

5.12.9 Recommendations and Follow-Up Actions

No recommendations or follow-up actions were identified affecting the protectiveness of the remedy at RAAP-039/HWMU 16.

5.12.10 Protectiveness Statement

The remedy at RAAP-039/HWMU 16 is protective of human health and the environment.

Groundwater monitoring is performed as required, land use controls are enforced, quarterly site inspections are performed, and site maintenance is performed on an as-needed basis.

5.13 RAAP-042/HWMU 5, SURFACE IMPOUNDMENT #5

5.13.1 Site-Specific Chronology

The following table provides important events and dates for RAAP-042/HWMU 5.

Table 33 – Chronology of Events, RAAP-042/HWMU 5

Event	Date
The neutralization pond was active	1970-1986
The neutralization pond was retrofitted with a liner	1981
Final closure of unsaturated soils including capping	1989
RCRA Post-Closure Care Permit Issued	28 September 2001
Field Investigation Report and Risk Assessment determined that material buried in place at HWMU 5 is not hazardous	January 2003
Corrective Action Program approved	05 November 2009
Total cobalt added to the corrective action program	04 May 2011
First Periodic Review	March 2014
RCRA Post-Closure Care Permit VA1210020730 renewed	17 July 2014 (signature date) 16 August 2014 (effective date)
Corrective Action project remedial timeframe completion	2019
Initial groundwater compliance period (19 years) ends	28 September 2020
Post-Closure Care Period Ends (30 years from closure date)	10 August 2023

5.13.2 Background

5.13.2.1 Physical Characteristics

RAAP-042/HWMU 5 is identified as a closed lined neutralization pond. The pond measured approximately 150 feet by 100 feet including a berm located approximately 10 feet above the base of the impoundment (see Figure 15 in Attachment 1). RAAP-042/HWMU 5 is located on a river terrace. The terrace slopes to the north towards the New River. The hydrogeology and groundwater movement data presented in the following two subsections is as presented in the RCRA Post-Closure Care Permit (USEPA 2014b).

5.13.2.1.1 Hydrogeology

Bedrock below RAAP-042/HWMU 5 is generally encountered at a depth ranging from 28 to over 56 feet below ground level, with alluvial sediments and weathered bedrock residuum overlying the bedrock. It is characterized by “floaters”, depressions and pinnacles resulting from differential physical and chemical weathering influenced primarily by the structural, depositional, and mineralogical nature of the uppermost lithologic unit (i.e., predominantly brecciated, shaley, or crystalline carbonate). The shaley units of the Elbrook Formation tend to be more resistant, resulting in pinnacles or bedrock highs. In general, the bedrock below the southern portion of the unit slopes downward to the north-northeast, while the bedrock to the north of the unit slopes downward to the south-southwest. This appears to indicate the development of a sinkhole in the vicinity of monitoring well cluster 5WC21, 5WC22, and 5WC23. The area around RAAP-042/HWMU 5 is characterized by the development of sinkholes without any apparent alignment or preferred orientation. The fracture lineations identified during the fracture trace analysis, however, appear to be oriented radially, trending northeast-southwest to northwest-southeast in the area of RAAP-042/HWMU 5. It is probable that there are well developed karst conduits which convey aerated surface water during precipitation events from the upland sinkholes through these solution-enhanced fractures and joints towards the New River at relatively rapid velocities.

5.13.2.1.2 Groundwater

Groundwater is encountered at depths ranging from nine feet to 18 feet below ground surface with the water table generally located at or just above alluvium/weathered residuum interface. Groundwater level fluctuations in this zone do not appear to exceed two to five feet annually over most of the site; however, groundwater levels fluctuated by as much as eight feet in the farthest downgradient locations (wells 5W10A and 5W11A) in 1994. These farthest downgradient wells are the only monitoring wells that appear to be screened across the bedrock/weathered residuum interface. Groundwater movement beneath the unit is generally to the north-northeast towards the New River. The groundwater contours and the topography in this unit suggest that the unit is located on a river terrace that contains several sinkholes and drains north toward the New River.

5.13.2.2 Land and Resource Use

RAAP-042/HWMU 5 operated as a surface impoundment from 1970 through 1986. As noted above the unit was unlined from 1970 through 1981. The unit is currently an undeveloped vegetated field.

5.13.2.3 History of Contamination

RAAP-042/HWMU 5 operated as a collection impoundment for an acid tank farm operated from 1970 until 1986 with final closure of the unsaturated soils occurring in 1989. Of this period, from 1970 through 1981 the pond was unlined. Operation of the unit unlined may have resulted in leakage from the unit. The unit received stormwater runoff, spilled liquids, and washdown waters from an acid tank farm. The effluent from RAAP-042/HWMU 5 discharged to an equalization basin. The wastes deposited at RAAP-042/HWMU 5 were characteristically hazardous as corrosive and were both nitric and surfuric in composition. Historical groundwater monitoring detected inorganics, VOCs, and explosives/propellants in groundwater.

5.13.2.4 Initial Response

The neutralization pond was retrofitted with a 60-mil Hypalon liner in 1981. RAAP-042/HWMU 5 was closed in 1989. Closure including the draining of the basin, soil treatment in place with fly ash and cement kiln dust, and the basin was filled with soil and stone (DAA 2003). The basin was also capped in 1989 with the following construction (from ground surface to the base of the cap):

- Vegetative cover
- Two feet of topsoil

- One foot of drainage layer (10^{-3} cm/sec permeability)
- 30 mil PVC membrane liner
- Two feet of clay (10^{-7} cm/sec permeability)

5.13.2.5 Basis for Taking Action

The basis for taking action at RAAP-042/HWMU 5 was initially the closing of the once permitted hazardous waste management unit, and subsequently the identification of groundwater contamination at RAAP-042/HWMU 5. Groundwater samples have been collected at RAAP-042/HWMU 5 since 1987. Elevated concentrations of VOCs have been detected. The corrective action was deemed necessary for groundwater concentrations of TCE in excess of the USEPA MCL. The remedy was therefore required for TCE and TCE daughter products 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride. Elevated concentrations of total cobalt were also detected at RAAP-042/HWMU 5 above the background concentration.

No soil data was assessed for this Periodic Review based on the containment of impacted material via the liner system.

5.13.3 Remedial Actions

5.13.3.1 Remedy Selection

The Hazardous Waste Management Post-Closure Care Permit (VDEQ 2014) that includes a Groundwater Corrective Action and Monitoring Program for Unit 5 (Permit Module VI) serves as the remedy selection document for RAAP-042/HWMU 5. No Statement of Basis or Final Decision documents were drafted for HWMUs. The permit requires groundwater monitoring, MNA, reporting, inspections, maintenance, and use restrictions.

The remedial objective for the RAAP-042/HWMU 5 MNA corrective action program is to reduce or eliminate the chlorinated VOCs of concern to levels below the GPSs within a reasonable period of time.

5.13.3.1.1 Groundwater Monitoring

Groundwater monitoring includes one upgradient well (5W8B) and five downgradient point of compliance wells (5W5B, 5W7B, 5WC21, 5WC22, and 5WC23). One additional well located further downgradient (5W12A) is used to assess whether the plume has migrated and ten additional wells (S5W5, S5W7, 5W9A, 5W10A, 5W11A, 5WCA, S5W6, S5W8, 5WC11, and 5WC12) are used as piezometers for static groundwater elevation measurements. Groundwater samples are collected on a semi-annual basis.

GPSs for comparison to groundwater data were selected for a broad range of constituents. The GPSs were assigned based on background concentrations from the upgradient monitoring well, EPA Safe Drinking Water Act Maximum Contaminant Levels (SDWA MCLs), or an Alternate Concentration Limit (health-based risk assessment levels generated by the REAMS model or an equivalent method). The GPSs are summarized in Table 34, below:

Table 34 –Groundwater Protection Standards (µg/L), RAAP-042/HWMU 5

Constituent	PQL	Back-Ground	USEPA MCL	VDEQ ACL	USEPA RSL	GPS
Antimony, total	2	3	6			6
Arsenic, total	10	1	10			10
Barium, total	10	172.87	2,000			2,000
Beryllium, total	1	0.7	4			4
Cadmium, total	0.1	1.45	5			5
Chromium, total	5	5	100			100
Cobalt, total	5	7		4.7	11	7
Copper, total	5	18	1,300			1,300
Lead, total	2	10	15			15
Mercury, total	2	0.9	2			2
Nickel, total	10	106		300		300
Selenium, total	10	1	50			50
Silver, total	2	2.3		71		71
Thallium, total	1	2	2	63		2
Vanadium, total	10	17		4,700		63
Zinc, total	30	75		12,000		4,700
Acetone	10	89				12,000
Chloroform	1	0.5	80	190		80
Dichlorodifluoromethane	1	1				190
1,2-Dichloroethane	1	0.1	5			5
1,1-Dichloroethene	1		7	260	340	7
cis-1,2-Dichloroethene	1		70	28	73	70
trans-1,2-Dichloroethene	1		100	86	110	100
Diethyl ether	12	12			7,300	7,300
Methylene Chloride	1	0.7	5			5
Methyl ethyl ketone	100	21.3		4,900		4,900
Toluene	5	0.1	1,000			1,000
Trichloroethene	1	0.8	5	0.44	2	5
Xylenes, total	1	0.1	10,000			10,000
Vinyl Chloride	0.1		2	0.015	0.016	2
Bis(2-ethylhexyl)phthalate	10	10		4.8		10
Diethyl phthalate	10	0.2		11,000		11,000
2,4-Dinitrotoluene	10	0.18		0.2		10
2,6-Dinitrotoluene	10	0.08		0.042		10
o-Nitrotoluene; 2-	10	10		150		150
p-Nitrotoluene; 4-	20	20		3.3		20
Nitrobenzene	10	10		0.12		10

Notes:

USEPA MCL: Maximum contaminant level of USEPA National Primary Drinking Water Regulations (April 2002). Subject to change without notice as directed by VDEQ.

Background: Calculated using analytical data from First Quarter 1996 through First Quarter 1999 for upgradient well 5W8B.

VDEQ ACL: VDEQ Alternate Concentration Limit, Dec – 2013. Subject to change without notice as directed by VDEQ.

RSL: RSL are developed by Oak Ridge National Laboratory under an Interagency Agreement with USEPA (June 2011). Subject to change without notice as directed by VDEQ.

For any monitoring event, if a GPS for a constituent in the table above is based on PQL, the Permittee will perform verification of a detection (i.e. value greater than the Detection Limit) of such a constituent using low-level analytical methods, if such methods are standard methods that are routinely available from commercial laboratories. Furthermore, the low-level analytical method will be used only if the PQL achievable by that method is less than, or equal to, the ACL or RBC for the subject constituent. If the verification event confirms a quantifiable detection (i.e. value greater than the PQL) above the applicable ACL or RBC, a revised background concentration will be established using low-level analytical methods, if appropriate, and the GPS will be updated based on the new background concentration if warranted. The post-closure permit indicates that the GPSs are applied for a period of 13 years from the effective date of the original permit and continues until 2015, or until the Director approves clean closure of the unit.

Both direct comparison to the GPSs and statistical calculation of variation between the detected concentrations and GPSs are allowable within the permit.

The compliance period for RAAP-042/HWMU 5, based on the total operational term of the unit, is 19 years beginning from the original permit date of 28 September 2001. The compliance period extends through 28 September 2020 or until the Director approves clean closure of the unit. If at the end of the compliance period the unit is engaged in a corrective action program, the compliance period will be extended until the Permittees can demonstrate that the GPSs have not been exceeded at the point of compliance for a period of three consecutive years.

5.13.3.1.2 Monitored Natural Attenuation

The Post-Closure Care Permit also includes a groundwater corrective action and monitoring program for RAAP-042/HWMU 5. The selected corrective action for RAAP-042/HWMU 5 is MNA. The targeted corrective action contaminants are TCE, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, vinyl chloride, and total cobalt (note total cobalt was added to the corrective action program on 04 May 2011). MNA is expected to reduce the COCs within a reasonable period of time (defined as 12 years) to below the GPSs via multiple processes including dispersion, diffusion, dilution, sorption, volatilization, biological degradation, and chemical decomposition.

The permit includes contingency measures in the event that the estimated remedial timeframe (determined on an annual basis) exceeds the project remedial timeframe of 12 years for three consecutive years. The alternative groundwater remedial measure to be implemented as a contingency is enhanced in situ anaerobic bioremediation or a similar in situ technology. Annual reports are required to evaluate the remedy progress.

In addition to the monitoring parameters outlined in Section 5.13.3.1.1, the following field parameters are required: pH, temperature, ORP, specific conductivity, and DO. The first year of corrective action monitoring included MNA indicators (ethane, ethane, methane, sulfate/sulfide, nitrate/nitrite, and TOC).

5.13.3.1.3 Land Use Restrictions

Post-closure site use at RAAP-042/HWMU 5 is restricted from actions that would "…disturb the integrity or the function of the facility's monitoring systems and cover…" Specific restrictions include:

- On-site construction
- Excavation (except as necessary for major maintenance activities)
- Well construction on or near the site
- Agricultural use
- Silvicultural use
- Water infiltration (run-on, ponding, irrigation)
- Recreational use
- Disposal operations
- Vehicular traffic (except as necessary for major maintenance activities)
- Housing on or near the site.

Surveys of the site were also required to be submitted to the local land authority showing the footprint of the sites with respect to permanently surveyed benchmarks and a note that there will be no disturbance of the disposal areas by RFAAP. A notation was also required on the deed to the facility property notifying in perpetuity any potential purchaser of the property that (1) the land has been used to manage hazardous waste (2) its use is restricted to that of open space and (3) the survey plan and record of the type, location, and quantity of hazardous wastes disposed on site has been filed with the Executive Director and local land authority. The required information was submitted to the local zoning authorities by the Army in correspondence dated 15 September 1998.

Security measures included the installation of warning signs indicating that only authorized personnel are allowed to enter the restricted portion of RFAAP.

5.13.3.1.4 Inspections

Post closure inspections are required on a minimum of a semi-annual basis within the Inspection and Maintenance Plan (Attachment 1 Appendix F of the post-closure care permit). The Plan requires an inspection of the final soil cover, vegetative cover, peripheral drainage swales, PVC liner, stormwater drainage areas, fence, warning signs, access road, monitoring wells, and benchmarks. Note that the Post-Closure Plan (Attachment 1 Appendix C) discusses monthly inspections, and is governed by the Inspection and Maintenance Plan.

5.13.3.1.5 Maintenance

Maintenance requirements are specified on an as-needed basis for the cover, drainage slopes and vegetation:

- Damage due to erosion and subsidence will be corrected by adding soil and regrading the site.
- Maintenance of vegetation necessary to control erosion will include removing deep-rooted plants and adding fertilizer to enhance growth as necessary.

- Overgrowth into drainage swales and access roads will be controlled.
- Swales will be cleared of any accumulated material.
- These precipitation run-off pathways will be tested annually for the constituents of which were disposed in the units to determine if precipitation run-off is becoming contaminated.
- Security will be maintained by immediately repairing or replacing any damaged signs or access roads.
- Damaged monitoring wells will be repaired if possible. If it is determined that the integrity of the well has been destroyed, the well will be replaced.
- Surveyed benchmarks used to indicate the location of the site will be protected and maintained as necessary.
- The general perimeter of the surface impoundment will be easily recognizable due to the presence of riprap for slope protection.

In addition to the above maintenance activities, contingency activities are specified in the event of major damage:

- Replacement of cover or fill soil, restoration of original grade design or replacement with new grade design, and/or installation of riprap.
- Any other cover deterioration due to deep-rooted plants, cracking, cold weather, or slope instability will be promptly corrected by filling, regarding and reseeding, as appropriate.
- Damage to vegetation will be controlled by the addition of nutrients, manual watering (in the event of drought), and/or pest control as appropriate.

5.13.3.2 Remedy Implementation

Since issuance of the RCRA post-closure care permit in 2002, the Army has undertaken remedy implementation including routine groundwater monitoring, annual groundwater monitoring reports, site inspections, site maintenance, and land use restrictions. In addition, since the corrective action program was selected for RAAP-042/HWMU 5 in 2009, MNA has been implemented via monitoring and reporting requirements (beginning in 2010). This review evaluated the period of 2013 through 2016 based on the last periodic review (which covered data collected through 2012) and data availability (no data for 2017 was available for review). Groundwater monitoring was performed on a semi-annual basis with additional verification samples collected as necessary. Inspections were performed on a quarterly basis. Land use restrictions are enforced via a warning sign and the remedy requirements have been incorporated into an internal Management Manual prepared by the operating contractor. A copy of the manual was not available for inclusion in this Periodic Review due to proprietary content.

The warning sign posted at RAAP-042/HWMU 5 reads:

“WARNING!

THIS IS A CLOSED HAZARDOUS WASTE FACILITY. ENTRY OF UNAUTHORIZED PERSONNEL AND VEHICLES IS PROHIBITED. CONTACT RAAP SECURITY POLICE (639-7163) TO REPORT DAMAGE OR ACCIDENTS”

5.13.3.3 Operation, Maintenance, and Monitoring

Quarterly inspections were performed at RAAP-042/HWMU 5 by BAE Systems personnel on behalf of the Army. Available inspection forms for the review period (2013-2017) documented inspections on the following dates:

- 21 March 2013
- 10 June 2013
- 8 August 2013
- 2 December 2013
- 27 March 2014
- 24 June 2014
- 18 September 2014
- 22 December 2014
- 18 March 2015
- 26 June 2015
- 18 September 2015
- 30 November 2015
- 22 March 2016
- 30 June 2016
- 29 September 2016 (groundhog holes observed, work ordered to trap groundhogs and fill holes, work completed 17 October 2016)
- 21 December 2016 (noted groundhog traps in place)
- 24 March 2017 (noted evidence of one trapped groundhog)
- 29 June 2017 (indicated that the survey benchmark would be verified)
- 22 September 2017 (no deficiencies noted but trapping of groundhogs recommended)

The final soil cover, vegetative cover, PVC liner, peripheral drainage swales, stormwater drainage areas, security, monitoring wells, and survey benchmarks were evaluated. No issues were identified during the inspections other than those noted above. Copies of the inspection sheets are included in Attachment 10.

Groundwater monitoring was conducted during the second and fourth quarters from 2013 through 2016. The data was documented in annual monitoring reports as discussed in Section 5.13.5.

5.13.4 Progress Since the Last Review

The previous review included the following protectiveness statement for RAAP-042/HWMU 5:

> "The remedy at RAAP-042/HWMU 5 is protective of human health and the environment."

No issues or recommendations and follow-up actions were identified for RAAP-042/HWMU-5 in the previous review.

5.13.5 Data Review

The 2014 Periodic Review included a data review through 2012. For the purposes of this review, the annual reports for 2013 through 2016 were reviewed. The data and figures extracted from the monitoring reports are included in Attachment 9. The 2017 groundwater monitoring data was not yet available. Monitoring was performed during the second and fourth quarters each year and intermittently as required for data verification purposes. Specifically, data was collected on the following dates:

- Second quarter 2013: 29-30 April 2013
- Fourth quarter 2013: 28-29 October 2013
- Second quarter 2014: 21-22 April 2014
- Fourth quarter 2014: 14-15 October 2014
- Second quarter 2015: 20-21 April 2015
- Fourth quarter 2015: 19-20 October 2015
- Second quarter 2016: 25-26 April 2016
- Fourth quarter 2016: 19-20 October 2016

Data collected during routine monitoring was compared to the GPSs. Exceedances of the GPSs were reported to the VDEQ and often verification samples were collected to evaluate the exceedance. In general, discussion has been omitted from this data review for instances where the verification samples did not confirm the exceedance or where analysis resulted in no further action for identified exceedances.

Field logs were reviewed. With the exception of monitoring well 5WC21 and 5WC21, DO concentrations and ORP values are consistent with aerobic conditions. Elevated concentrations of TCE were detected slightly above the GPS of 5 µg/L at compliance monitoring wells 5WC21 and 5WC23 during some of the 2013-2014 monitoring events. Concentrations remained relatively low (less than 10 µg/L) and decreased to below the GPS by 2015. No exceedances of the GPS for TCE were detected for the last four sampling events (both 2015 and 2016 events). TCE daughter products were not detected in any of the compliance wells at RAAP-042/HWMU 5 from 2013-2016. The corrective action monitoring is required to continue until the concentration of TCE remains below the GPS for a period of three consecutive years. After three consecutive years below the GPS, RFAAP may request to end corrective action and return to compliance monitoring through 28 October 2020.

Elevated total cobalt concentrations were detected above the GPS of 7 µg/L at compliance monitoring wells 5WC21 and 5WC22 from 2013-2016. Concentrations generally remained less than 100 µg/L at 5WC21 and less than 10 µg/L at 5WC22. In October 2010, RFAAP submitted an ASD for cobalt to the VDEQ for concentrations detected in compliance monitoring well 5WC21. The VDEQ did not believe the ASD conclusively demonstrated that the cobalt concentrations were caused by natural variation in the groundwater; therefore, the VDEQ added total cobalt to the list of CA Targeted Constituents during a meeting with RFAAP on May 4, 2011.

5.13.6 Site Inspection

Site inspections were conducted by USACE on 31 July 2017. They were attended by USACE staff Laura Allen and Mick Senus and led by the RFAAP Installation Restoration Program Manager, James McKenna. RAAP-042/HWMU 5 is a vegetated undeveloped field as depicted on Photographs 23 and 24, and Figure 12 in Attachment 5. No evidence of residential use or issues affecting protectiveness was observed at the time of the site inspection. Monitoring wells associated with the site were observed locked and in good condition.

5.13.7 Technical Assessment

5.13.7.1 Question A: Is the Remedy Functioning as Intended by the Decision Document?

Yes, the remedy is functioning as intended by the decision document. Concentrations of TCE currently monitored under the corrective action program have decreased to below the GPS for two consecutive years of monitoring (four total monitoring events), and no TCE daughter products have been detected in the monitoring network above their respective GPSs. Elevated concentrations of cobalt have been detected and continue to be monitored as directed by VDEQ.

Inspections of the landfill are occurring on a quarterly basis as documented in Section 5.13.3.3. The inspections and as-needed site maintenance are planned to continue as required by the permit for a minimum period of 30 years from closure. A sign is posted at the site as an access control and site use will remain restricted from several specified uses including earth moving and residential use.

No early indicators of potential issues or opportunities for optimization were identified.

5.13.7.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?

Yes. There are no newly promulgated or modified requirements of federal or state environmental laws (see Attachment 7) that would change the protectiveness of the RAAP-042/HWMU-5 remedy. There are no toxicity criteria updates for any of the groundwater constituents with risk-based groundwater protection standards (see Attachment 8).

5.13.7.3 Question C: Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No, no other information has come to light that could call into question the protectiveness of the RAAP-042/HWMU 5 remedy.

5.13.8 Issues

No issues affecting the protectiveness of the RAAP-042/HWMU 5 remedy have been identified.

5.13.9 Recommendations and Follow-Up Actions

No recommendations or follow-up actions affecting the protectiveness of the RAAP-042/HWMU 5 remedy have been identified.

5.13.10 Protectiveness Statement

The remedy at RAAP-042/HWMU 5 is protective of human health and the environment.

Groundwater impacts addressed under a corrective action program have detected decreasing concentrations of TCE to below the GPS, and no TCE daughter products above their respective

GPSs across the monitoring network. Land use controls are enforced including restrictions on site use and access controls. Quarterly inspections of the site are currently performed and maintenance is performed on an as-needed basis.

5.14 RAAP-001-R-01, SOUTHEAST HILLSIDE AREA OF ARMY RESERVE SMALL ARMS RANGE

5.14.1 Site-Specific Chronology

The following table provides important events and dates for RAAP-001-R-01.

Table 35 – Chronology of Events, RAAP-001-R-01

Event	Date
The site was used as a .30-caliber small arms firing range	1941-1968
Site Screening Process	2008
RCRA Facility Investigation completed	2011
Statement of Basis	04 June 2014
Final Decision	18 August 2014
Site inspections performed	30 November 2015 22 September 2016 22 May 2017
The remedy for RAAP-001-R-01 was incorporated into the RFAAP RCRA CA Permit	April 1, 2016 (Signature Date) May 1, 2016 (Effective Date)
IC sign posted at RAAP-001-R-01	2017
IC requirements integrated into the RFAAP Management Manual	Unknown

5.14.2 Background

5.14.2.1 Physical Characteristics

RAAP-001-R-01, also known as the Army Reserve Small Arms Range (ARSAR), is a munitions response site investigated under the Military Munitions Response Program (MMRP). Although RAAP-001-R-01 encompasses approximately 7.6 acres located along the southeastern boundary of the main manufacturing area, the portion of the unit subject to this review is limited to only the Southeast Hillside Area (comprised of 1.08 acres, see Figure 3 in Attachment 1). The Southeast Hillside Area is a steep, rocky hillside historically used as a backstop prior to the construction of a target berm for a firing range. A fence is located at the top of the southeast hillside area, which prevents access to the area. The remainder of the ARSAR, a former range in a condition suitable for clean closure, is now a grass field surrounded by a fence that is occasionally used as a helicopter landing pad and a baseball field (VDEQ 2016).

5.14.2.2 Land and Resource Use

RAAP-001-R-01 was historically used as a .30-caliber small arms firing range from approximately 1941 to 1968. The site is currently an undeveloped vegetated hillside.

5.14.2.3 History of Contamination

A 2008 SSP identified the RAAP-001-R-01 former site use as a small arms and pistol firing range. These activities resulted in impacts to site soil. No visual evidence of detections (with a metal detector) were documented at the Southeast Hillside Area in the SSP. Composite soil samples were collected from a depth of 0 to 6 inches below the ground surface within the Southeast Hillside Area. Initial COPCs in surface soil included metals aluminum, antimony, arsenic, chromium, cobalt, iron, lead, manganese, thallium, and vanadium.

5.14.2.4 Initial Response

No initial response actions were completed at the Southeast Hillside Area.

5.14.2.5 Basis for Taking Action

The basis for taking action was elevated concentrations of lead in surface soil at the Southeast Hillside Area of RAAP-001-R-01 posting risk to theoretical future residents. The lead concentrations and methods used to assess the need for the remedy are reviewed in detail in Attachment 8. No remedy was deemed necessary for industrial or commercial site use.

5.14.3 Remedial Actions

5.14.3.1 Remedy Selection

Based on the basis for taking action at RAAP-001-R-01, a CMS was not performed for the Southeast Hillside Area at RAAP-001-R-01, and no CMOs were formally established. The remedy for RAAP-001-R-01 was selected in a 2014 Statement of Basis (USEPA 2014a) and Final Decision (USEPA 2014b)

The remedy selected for the Southeast Hillside Area of the RAAP-001-R-01 is institutional controls consisting of land use restrictions to prevent residential use. The remedy is described as follows in the Final Decision:

- Restrict future residential use: Certain units shall not be used for residential purposes unless it is demonstrated to EPA that such use will not pose a threat to human health or the environment or adversely affect or interfere with the selected remedy and EPA provides prior written approval for such use.

The Final Decision also requires the installation of signs at each unit where ICs are being implemented.

5.14.3.2 Remedy Implementation

The remedy at the Southeast Hillside Area at RAAP-001-R-01 was incorporated into the RCRA CA Permit in April 2016 (VDEQ 2016). According to installation personnel, the remedy requirements have also been incorporated into an internal Management Manual prepared by the operating contractor. A copy of the manual was not available for inclusion in this Periodic Review due to proprietary content. According to installation personnel, IC signs were installed by 2017. The RAAP-001-R-01 sign reads:

“UNAUTHORIZED PERSONNEL KEEP OUT

THIS SITE IS SUBJECT TO LAND USE CONTROLS

MAINTAIN THIS SITE IN ITS CURRENT INDUSTRIAL/COMMERCIAL STATE

MAINTAIN THE VEGETATIVE COVER AND PREVENT FUTURE RESIDENTIAL USE OF THIS SITE

CONTACT THE ENVIRONMENTAL DEPARTMENT WITH QUESTIONS"

Annual site inspections were performed following the remedy selection (2015-2017) as discussed in Section 5.14.3.3.

5.14.3.3 Operation, Maintenance, and Monitoring

BAE Systems performed inspections on the following dates:

- 30 November 2015
- 22 September 2016
- 22 May 2017

No issues were identified in the inspection reports.

5.14.4 Progress Since the Last Review

The remedy for RAAP-001-R-01 was incorporated into the RCRA CA Permit during the permit renewal dated 01 April 2016 and was not included in the last review.

5.14.5 Data Review

No data has been collected for RAAP-001-R-01 since the remedy was selected in 2014.

5.14.6 Site Inspection

Site inspections were conducted by USACE on 31 July 2017. They were attended by USACE staff Laura Allen and Mick Senus and led by the RFAAP Installation Restoration Program Manager, James McKenna. RAAP-001-R-01 is a vegetated undeveloped hillside as depicted on Photographs 25 and 26, and Figure 13 in Attachment 5. No evidence of residential use or issues affecting protectiveness was observed at the time of the site inspection.

5.14.7 Technical Assessment

5.14.7.1 Question A: Is the Remedy Functioning as Intended by the Decision Document?

Yes, the remedy is functioning as intended by the decision document. The remedy has been incorporated into the RCRA CA permit and a Management Manual for RFAAP. A sign is posted at the site communicating the restrictions on site use and maintenance, and annual inspections were conducted from 2015 through 2017. No evidence of residential site use has been observed during the annual site inspections or during the site inspection performed in conjunction with this review.

No early indicators of potential issues or opportunities for optimization were identified.

5.14.7.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Still Valid?

Yes. There are no newly promulgated or modified requirements of federal or state environmental laws (see Attachment 7) that would change the protectiveness of the ARSAR remedy. The characterization of lead risks to residential receptors at this site was performed in the 2014 RFI using the USEPA's Integrated Exposure Uptake Biokinetic Model for lead in children, which was last updated by USEPA in 2010. Because no recent updates to that model have occurred, and the blood level target remains unchanged, the conclusions regarding need for institutional controls to prevent residential exposure at the site remain valid (see Attachment 8).

5.14.7.3 Question C: Has any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No, no other information has come to light that could call into question the protectiveness of the RAAP-001-R-01 remedy.

5.14.8 Issues

No issues were identified that could affect the protectiveness of the RAAP-001-R-01 remedy.

5.14.9 Recommendations and Follow-Up Actions

No recommendations or follow-up actions were identified that could affect the protectiveness of the RAAP-001-R-01 remedy.

5.14.10 Protectiveness Statement

The remedy at RAAP-001-R-01 is protective of human health and the environment.

Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use. These remedy components prevent current and future residential use of the Southeast Hillside Area.

6.0 SUMMARY

6.1 ISSUES/RECOMMENDATIONS AND FOLLOW-UP ACTIONS

No issues/recommendations or follow-up actions were identified affecting the protectiveness of the remedies reviewed.

6.2 PROTECTIVENESS STATEMENTS

CC-001/SSA-72

The remedy at CC-001/SSA-72 is protective of human health and the environment.

Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use and intrusive activities.

CC-002/SSA-77

The remedy at CC-002/SSA-77 is protective of human health and the environment.

Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use and intrusive activities.

CC-003/SSA-30/79

The remedy at CC-003/SSA-30/79 is protective of human health and the environment.

A soil cover has been installed to contain the ACM within CC-003/SSA-30/79 and prevent adverse exposures, administrative components of the remedy have been installed in the RFAAP RCRA CA Permit and RFAAP Maintenance Manual, and signage has been installed to prevent residential use and intrusive activities.

RAAP-001/SWMU 51

The remedy at RAAP-001/SWMU 51 is protective of human health and the environment.

Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use and intrusive activities at depths greater than 15 feet.

RAAP-005/SWMU 13

The remedy at RAAP-005/SWMU 13 is protective of human health and the environment.

Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use and intrusive activities.

RAAP-009/SWMU 40

The remedy at RAAP-009/SWMU 40 is protective of human health and the environment.

Institutional and engineering controls have been implemented as required including administrative components, signage, and maintenance activities.

RAAP-011/SWMU 41B

The remedy at RAAP-011/SWMU 41B is protective of human health and the environment.

Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use and intrusive activities.

RAAP-013/SWMU 49

The remedy at RAAP-013/SWMU 49 and RAAP-018/SWMU 48 is protective of human health and the environment.

Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use and intrusive activities. Decreases in groundwater contaminant concentrations have been documented via MNA.

RAAP-014/SWMU 54

The remedy at RAAP-014/SWMU 54 is protective of human health and the environment.

Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use and intrusive activities. MNA is expected to decrease groundwater concentrations of 2,4,6-TNT and RDX to RGs.

RAAP-023/SWMU 43

The remedy at RAAP-023/SWMU 43 is protective of human health and the environment.

Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use and intrusive activities.

RAAP-024/SWMU 45

The remedy at RAAP-024/SWMU 45 is protective of human health and the environment.

Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use and earth moving.

RAAP-039/HWMU 16

The remedy at RAAP-039/HWMU 16 is protective of human health and the environment.

Groundwater monitoring is performed as required, land use controls are enforced, quarterly site inspections are performed, and site maintenance is performed on an as-needed basis.

RAAP-042/HWMU 5

The remedy at RAAP-042/HWMU 5 is protective of human health and the environment.

Groundwater impacts addressed under a corrective action program have detected decreasing concentrations of TCE to below the GPS, and no TCE daughter products above their respective GPSs across the monitoring network. Land use controls are enforced including restrictions on site use and access controls. Quarterly inspections of the site are currently performed and maintenance is performed on an as-needed basis.

RAAP-001-R-01

The remedy at RAAP-001-R-01 is protective of human health and the environment.

Institutional controls have been implemented as required including the recording of administrative components in the RFAAP RCRA CA Permit and RFAAP Management Manual, and installation of signage to prevent residential use. These remedy components prevent current and future residential use of the Southeast Hillside Area.

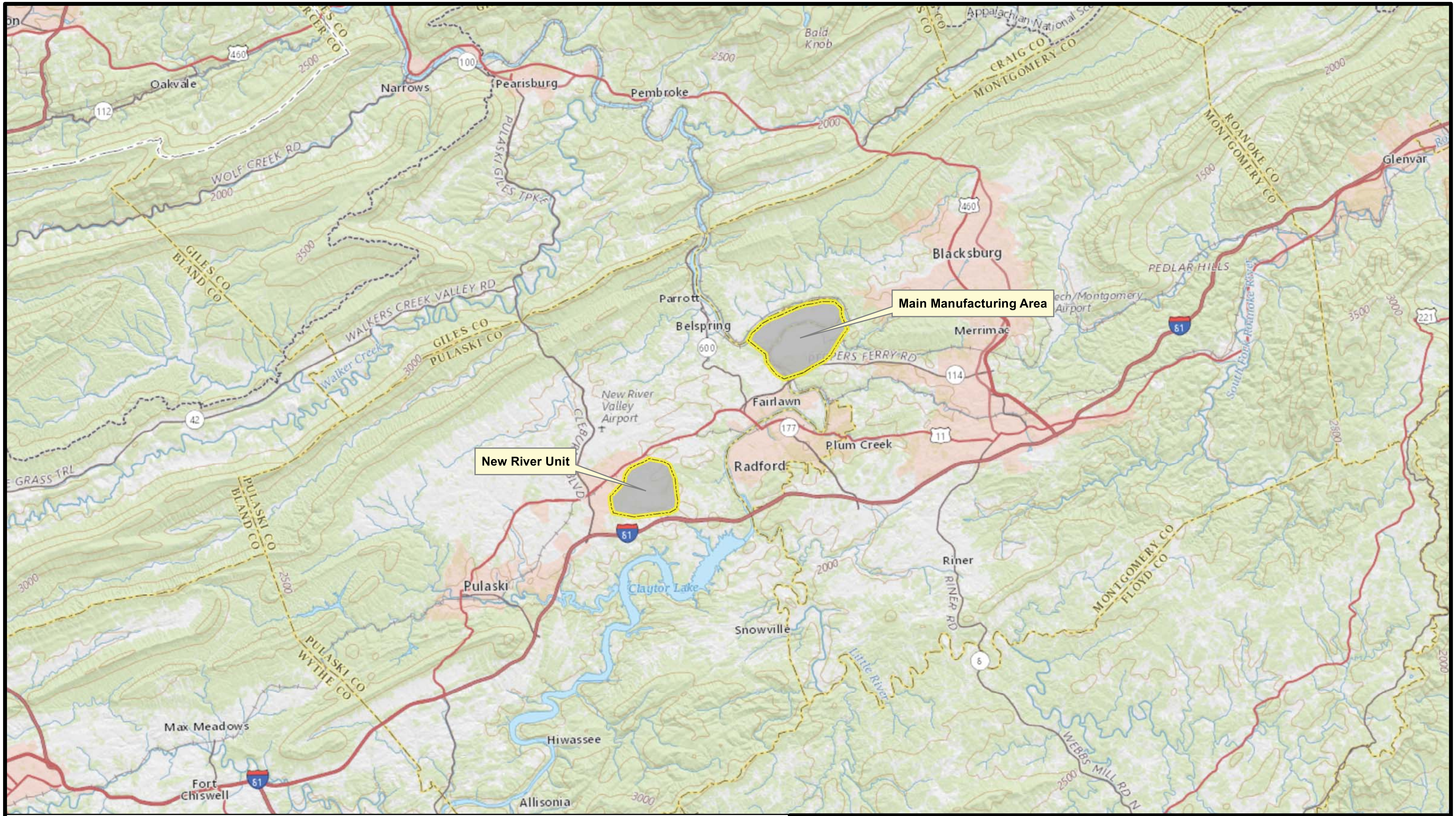
6.3 NEXT REVIEW

The next review for RFAAP will be conducted by 10 March 2023.

ATTACHMENT 1

Figures

[This Page Intentionally Left Blank]



Installation Boundary

N
W E
S

0 0.5 1 2 3 4 5
Miles

US Army Corps of Engineers
Buffalo District

U.S. Army Corps of Engineers
Buffalo, New York

Radford Army Ammuntiion Plant
Facility Location

Document Name: Fig_1.mxd
Drawn By: H5TDEEMP
Date Saved: 20 Nov 2017
Time Saved: 10:45:11 AM

Radford Army Ammuntion Plant
Radford, VA

Figure 1

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

○ Installation Boundary

○ Site Boundary

U.S. Army Corps of Engineers

US Army Corps of Engineers
Buffalo District

Buffalo, New York

RFAAP - Main Manufacturing Area Site Locations

Document Name: FIG_2.mxd
Drawn By: H5TDEEMP
Date Saved: 20 Nov 2017
Time Saved: 11:11:46 AM

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 2

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

—✳— Fence
— Roads
- - - Trenches
— Water Features
🟩 Army Reserve Small Arms Range

N
W E
S

0 150 300
Feet

U.S. Army Corps of Engineers
Buffalo, New York

Document Name: RAAP_001_R_01.mxd
Drawn By: H5TDEEMP
Date Saved: 20 Nov 2017
Time Saved: 11:12:13 AM

Southeast Hillside of Army Reserve Small Arms Range (ARSAR) RAAP-001-R-01

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 3

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

● Oleum Plant Acidic Wastewater Sump

N
W E
S

0 50 100
Feet

US Army Corps of Engineers
Buffalo District

U.S. Army Corps of Engineers

Buffalo, New York

Document Name: CC001_SSA72.mxd
Drawn By: H5TDEEMP
Date Saved: 20 Nov 2017
Time Saved: 11:43:19 AM

Oleum Plant Acidic Wastewater Sump
CC001 / SSA72

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 4

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Fence

Garbage Incinerator (BLDG 7219)

Structure Outline

Roads

N
W E
S

0 50 100
Feet

U.S. Army Corps of Engineers

US Army Corps of Engineers
Buffalo District

Buffalo, New York

Document Name: CC002_SSA77.mxd
Drawn By: H5TDEEMP
Date Saved: 20 Nov 2017
Time Saved: 11:45:55 AM

Garbage Incinerator (Building 7219)
CC002 / SSA77

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 5

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

● Wells
—✳— Fence
— Roads
🟧 Trench
▨ Excavation Area
🟩 Asbestos Disposal Trench 1
🟪 TNT Waste Acid Neutralization Pits

N
W E
S

0 100 200
Feet

U.S. Army Corps of Engineers
US Army Corps of Engineers
Buffalo District
Buffalo, New York

Document Name: SSA30_SWMU51.mxd
Drawn By: H5TDEEMP
Date Saved: 20 Nov 2017
Time Saved: 11:50:22 AM

Asbestos Disposal Trench 1 (CC003/SSA30) & TNT Waste Acid Neutralization Pits (RAAP-001/SWMU 51)

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 6

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

● Well

🟪 Waste Propellant Burning Ground

—*— Fence

— Roads

U.S. Army Corps of Engineers

US Army Corps of Engineers®
Buffalo District

Buffalo, New York

Document Name: RAAP005_SWMU13.mxd
Drawn By: H5TDEEMP
Date Saved: 20 Nov 2017
Time Saved: 11:52:23 AM

Waste Propellant Burning Ground
RAAP-005 / SWMU 13

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 7

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

●	Well	—	Roads
-✳-	Fence	🟩	Landfill Nitro Area
—	Structure Outline		

N
W E
S

0 50 100
Feet

U.S. Army Corps of Engineers
Buffalo, New York

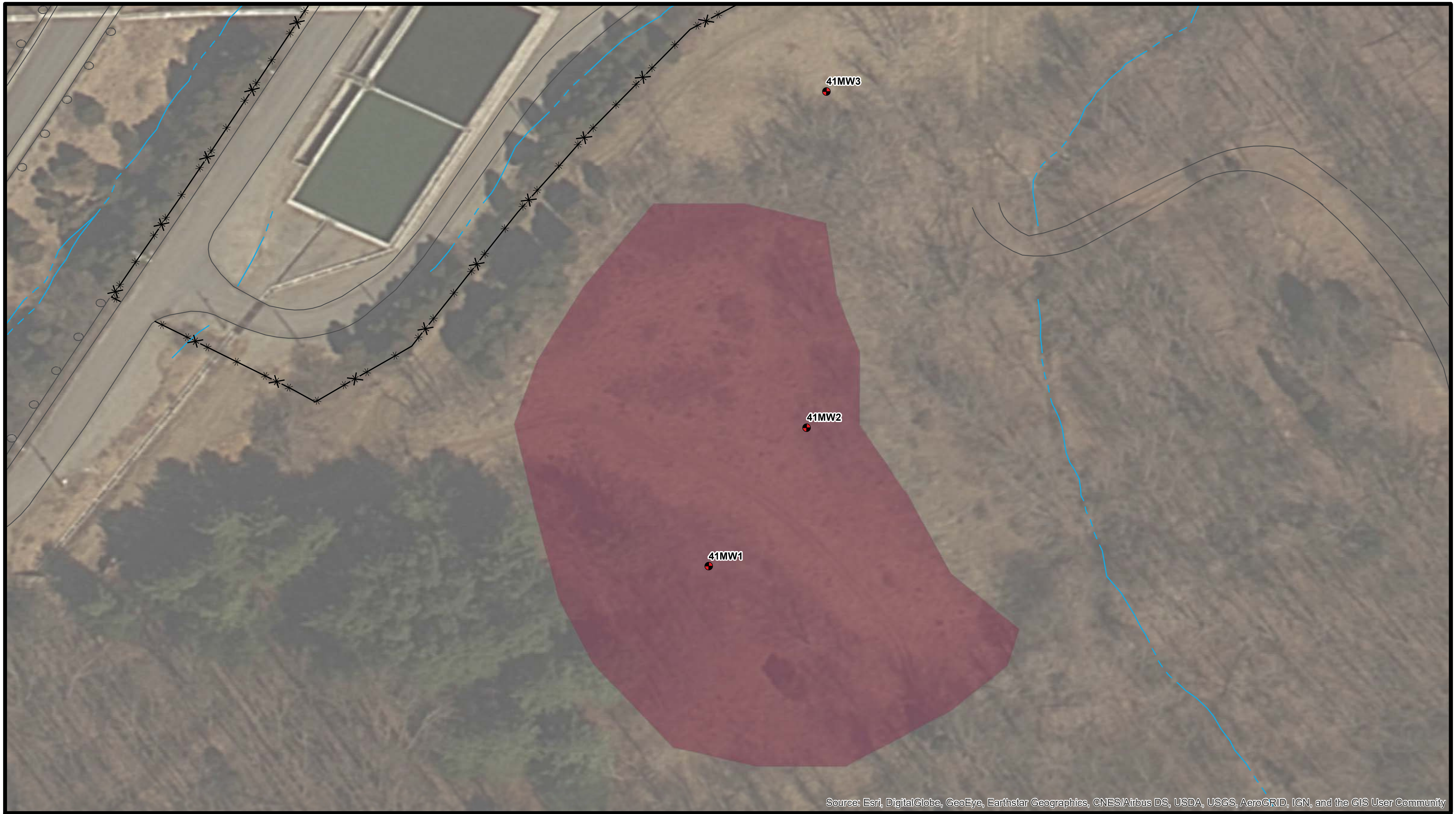
US Army Corps of Engineers
Buffalo District

Document Name: RAAP009_SWMU40.mxd
Drawn By: H5TDEEMP
Date Saved: 20 Nov 2017
Time Saved: 11:55:28 AM

Landfill Nitro Area
RAAP-009 / SWMU 40

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 8



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

● Well	Water Features
Fence	Red Water Ash Burial Ground
Roads	

N
W E
S

0 50 100
Feet

U.S. Army Corps of Engineers

US Army Corps of Engineers
Buffalo District

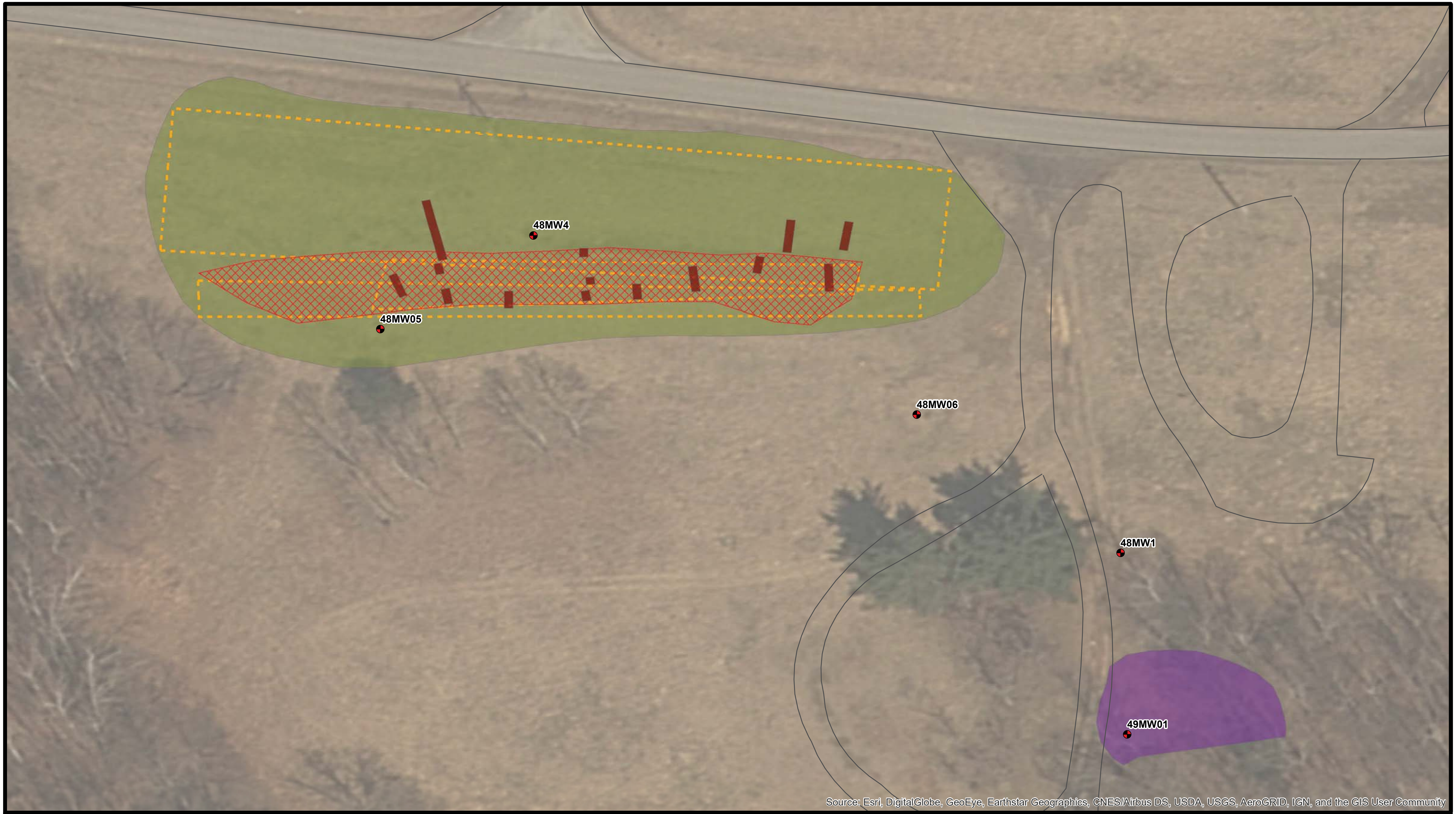
Buffalo, New York

Document Name: RAAP011_SWMU41B.mxd
Drawn By: H5TDEEMP
Date Saved: 20 Nov 2017
Time Saved: 11:57:21 AM

Red Water Ash Burial Grounds
RAAP-011 / SWMU 41B

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 9



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

● Well
— Roads
● Test Pits
▨ Excavation Area
⬭ Trenches
● Oily Water Burial Area
● Red Water Ash Burial #2

N
W E
S

0 50 100 Feet

U.S. Army Corps of Engineers
Buffalo, New York

US Army Corps of Engineers®
Buffalo District

Document Name: RAAP013_RAAP018.mxd
Drawn By: H5TDEEMP
Date Saved: 20 Nov 2017
Time Saved: 12:00:19 PM

Red Water Ash Burial #2 (RAAP-013 / SWMU 49) & Oily Water Burial Area (RAAP-018 / SWMU 48)

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 10

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

● Wells	▨ Excavation Area
—✳— Fence	⬭ Hazardous Areas
—— Roads	🟩 Propellant Burning Ash Disposal

U.S. Army Corps of Engineers
US Army Corps of Engineers
Buffalo District
Buffalo, New York

Document Name: RAAP014_SWMU054.mxd
Drawn By: H5TDEEMP
Date Saved: 20 Nov 2017
Time Saved: 12:03:34 PM

Propellant Burning Ash Disposal
RAAP-014 / SWMU 54

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 11

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

U.S. Army Corps of Engineers

Buffalo, New York

US Army Corps of Engineers
Buffalo District

Document Name: RAAP023_SWMU43.mxd
Drawn By: H5TDEEMP
Date Saved: 20 Nov 2017
Time Saved: 12:07:01 PM

Sanitry Landfill No. 2
RAAP-023 / SWMU 43

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 12

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

● Landfill No. 3

N
W E
S

0 100 200
Feet

U.S. Army Corps of Engineers

US Army Corps of Engineers
Buffalo District

Buffalo, New York

Document Name: RAAP024_SWMU45.mxd
Drawn By: H5TDEEMP
Date Saved: 20 Nov 2017
Time Saved: 12:09:42 PM

Landfill No. 3
RAAP-024 / SWMU 45

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 13

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

— Roads

⬬ Hazardous Waste Landfill

N
W E
S

0 50 100
Feet

US Army Corps of Engineers
Buffalo District

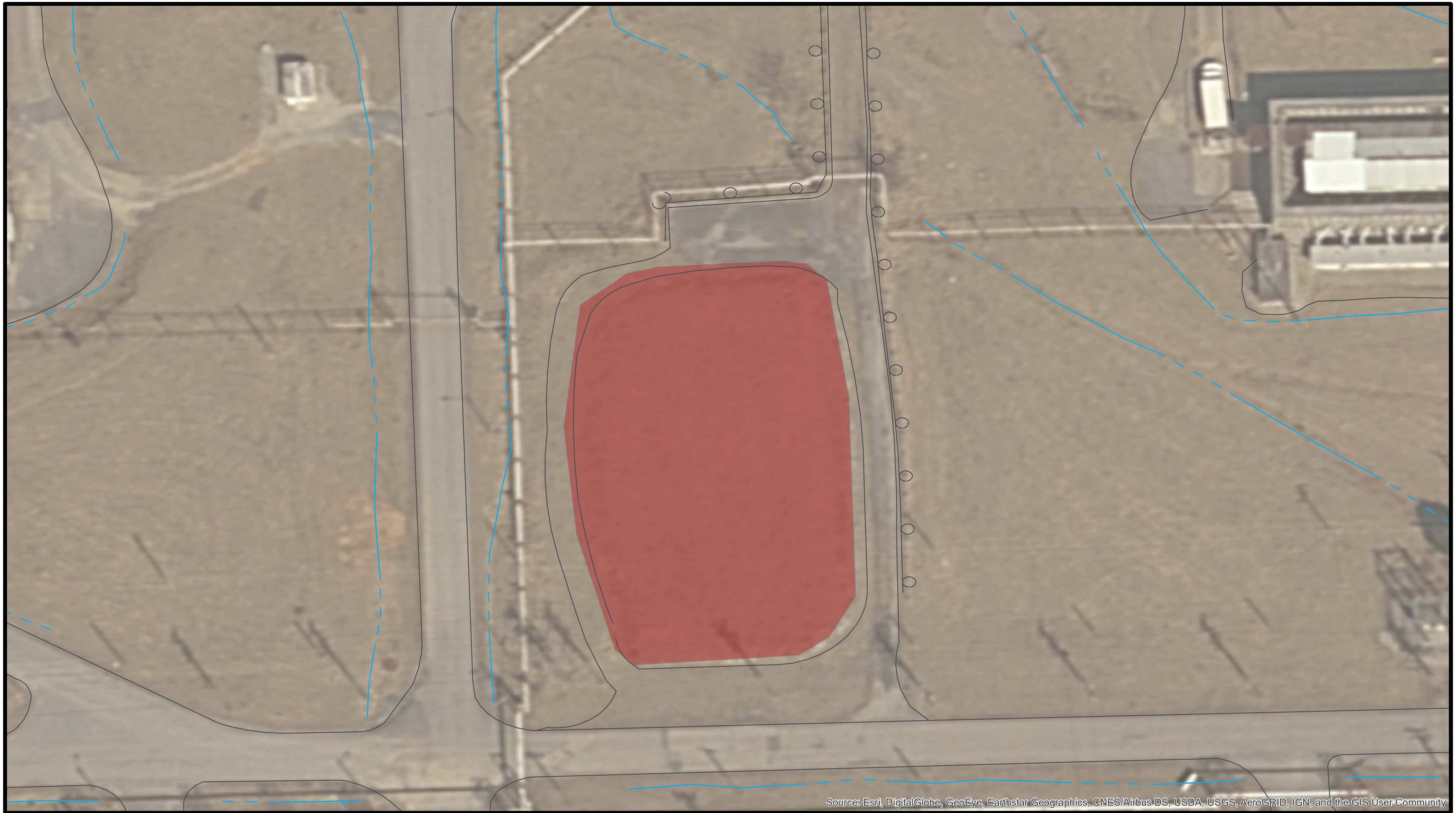
U.S. Army Corps of Engineers
Buffalo, New York

Document Name: RAAP039_HWMU16.mxd
Drawn By: H5TDEEMP
Date Saved: 20 Nov 2017
Time Saved: 12:12:42 PM

Hazardous Waste Landfill
RAAP-039 / HWMU 16

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 14



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

— Roads

— Water Features

● Surface Impoundment #5

U.S. Army Corps of Engineers
Buffalo, New York

Document Name: RAAP042_HWMU5.mxd
Drawn By: H5TDEEMP
Date Saved: 20 Nov 2017
Time Saved: 12:16:16 PM

Surface Impoundment #5
RAAP-042 / HWMU 5

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 15

ATTACHMENT 2

List of Documents Reviewed

[This Page Intentionally Left Blank]

Bering Sea Environmental, LLC (BSEn) 2016. Draft Final, SWMU 54 Monitored Natural Attenuation Sampling Year Four Report, Radford Army Ammunition Plant, Virginia. Prepared for USACE Baltimore District. December.

BSEn 2017. Final SWMU 49 Monitored Natural Attenuation Sampling Year One Report, Radford Army Ammunition Plant, Virginia. Prepared for USACE Baltimore District. May.

CB&I Federal Services LLC (CB&I) 2015. Monitored Natural Attenuation Sampling Baseline Report, SWMU 49, Radford Army Ammunition Plant, Virginia. Prepared for USACE Baltimore District. July.

Commonwealth of Virginia, Department of Environmental Quality (VDEQ) 2014. Hazardous Waste Management Post-Closure Care Permit VA1210020730, Radford Army Ammunition Plant, Virginia. Signed July 17. Effective August 16.

Commonwealth of Virginia, Department of Game & Inland Fisheries (VDGIF) 1999. Final Biological Survey of the Radford Army Ammunition Plant; Including Threatened, Endangered, and Species of Concern. May.

Draper Aden Associates (DAA) 2004. Oleum Plant Site Screening Investigation.

DAA 2014. Annual Groundwater Monitoring Report, Hazardous Waste Management Units 5, 10, and 16, Calendar Year 2013. Prepared for BAE Systems, Ordnance Systems Inc, Radford Army Ammunition Plant. April.

DAA 2015. Annual Groundwater Monitoring Report, Hazardous Waste Management Units 5 and 16, Calendar Year 2014. Prepared for BAE Systems, Ordnance Systems Inc, Radford Army Ammunition Plant. February.

DAA 2016. Annual Groundwater Monitoring Report, Hazardous Waste Management Units 5 and 16, Calendar Year 2015. Prepared for BAE Systems, Ordnance Systems Inc, Radford Army Ammunition Plant. March.

DAA 2017. Annual Groundwater Monitoring Report, Hazardous Waste Management Units 5 and 16, Calendar Year 2016. Prepared for BAE Systems, Ordnance Systems Inc, Radford Army Ammunition Plant. February.

Ecology & Environment, Inc. (E&E) 2007. Oleum Plant Environmental Baseline Study

IT 2001. Facility-Wide Background Study Report

KEMRON Remediation Services, Inc. (KEMRON) 2015a. Performance Based Acquisition, Solid Waste Management Unit 40 (RAAP-009), Landfill Nitro area, Annual Long Term Monitoring Report: LTM Year 4. March.

KEMRON 2015b. Performance Based Acquisition, Solid Waste Management Unit 40 (RAAP-009), Landfill Nitro area, Remedy Review. May.

Parsons Engineering Science, Inc. (Parsons) 1996. Draft RCRA Facility Investigation for Solid Waste Management Units 17, 31, 48 and 54 at Radford Army Ammunition Plant, Virginia. Prepared for U.S. Army Environmental Center. January.

Shaw Environmental, Inc. (Shaw) 2006. Eastern Horseshoe Area, HWMU 16 and SWMUs 13, 48, 49, 50, 51, and 59, April 2006 Sampling Event, Groundwater Data Summary Report, Radford Army Ammunition Plant, Virginia. Prepared for USACE Baltimore District. June.

Shaw 2008. SWMU 51 RCRA Facility Investigation/Corrective Measures Study Report, Radford Army Ammunition Plant, Virginia. Prepared for USACE Baltimore District. July.

Shaw 2010. Interim Measures Completion Reports: SWMU 51, SWMU 39, and FLFA, Radford Army Ammunition Plant, Virginia. Prepared for USACE Baltimore District. February.

Shaw 2011. Interim Measures Completion Report, SWMU 54 (RAAP-14), Radford Army Ammunition Plant, Virginia. Prepared for USACE, Baltimore District. April.

Shaw 2013a. Monitored Natural Attenuation Sampling, Year One Report, SWMU 54, Radford Army Ammunition Plant, Virginia. Prepared for USACE Baltimore District. February.

Shaw 2013b. Monitored Natural Attenuation Sampling, Year Two Report, SWMU 54, Radford Army Ammunition Plant, Virginia. Prepared for USACE Baltimore District. December.

Shaw 2014a. RCRA Facility Investigation Report, SWMUs 48 and 49, Radford Army Ammunition Plant, Virginia. Prepared for USACE Baltimore District. January.

Shaw 2014b. SWMU 49 Monitored Natural Attenuation Groundwater Monitoring Work Plan, Radford Army Ammunition Plant, Virginia. Prepared for USACE Baltimore District. October.

United States Army Corps of Engineers (USACE), Omaha District 2014. Final First Periodic Review for Radford Army Ammunition Plant, Virginia. March.

United States Environmental Protection Agency, Region III (USEPA) 2011. Statement of Basis, Radford Army Ammunition Plant, EPA ID No. VA1210020730. May.

USEPA 2012. Final Decision and Response to Comments, Radford Army Ammunition Plant, EPA ID No. VA1210020730. April.

USEPA 2014a. Statement of Basis, Radford Army Ammunition Plant, Radford, Virginia, EPA ID No. VA1210020730. June 4.

USEPA 2014b. Final Decision and Response to Comments, Radford Army Arsenal. August 18.

USEPA 2016. Region 3 Develops a Unique Corrective Action Permit for the Radford Army Ammunition Plant in Virginia. https://archive.epa.gov/epawaste/hazard/web/html/r3radford.html. Visited 14 February 2018. Last updated 04 April.

USEPA 2017. State Authorization Tracking System (StATS), Authorization Status of All RCRA and HSWA Rules. https://www.epa.gov/sites/production/files/2017-10/documents/authall_v4_508.pdf. Accessed 14 February 2018. Data as of 30 June.

URS 2007. Solid Waste Management Unit 40 (Nitro Landfill), Geophysical Investigation Report, Radford Army Ammunition Plant, Radford, Virginia. March.

URS 2009. Solid Waste Management Units 40 (RAAP-009) and 71 (RAAP-002), RCRA Facility Investigation/Corrective Measures Study Report, Radford Army Ammunition Plant, Radford, Virginia. April.

URS 2010. Final Site Screening Process Report for Site Screening Areas 18, 72, 79, 60 and 77, Radford Army Ammunition Plant, Radford, Virginia. December.

United States Army Corps of Engineers (USACE) 2013. Environmental Statistics, Environmental Quality, Engineer Manual, EM 200-1-16. May 31.

URS 2002. Work Plan Addendum No. 13, RCRA Facility Investigation at Soil Waste Management Unit 54, Radford Army Ammunition Plant, Radford, Virginia. September.

URS 2008. RCRA Facility Investigation/Corrective Measures Study Report, Solid Waste Management Unit 54, Radford Army Ammunition Plant, Radford, Virginia. September.

UXB-KEMRON Remediation Services, LLC (UXB) 2011. Performance Based Acquisition, Solid Waste Management Unit 40 (RAAP-009), Landfill Nitro area, Interim Measures Work Plan. August.

UXB 2012. Performance Based Acquisition, Solid Waste Management Unit 40 (RAAP-009), Landfill Nitro area, Interim Measures Completion Report. May.

UXB 2013a. Performance Based Acquisition, Solid Waste Management Unit 40 (RAAP-009), Landfill Nitro area, Annual Long Term Monitoring Report. April.

UXB 2013b. Performance Based Acquisition, Solid Waste Management Unit 40 (RAAP-009), Landfill Nitro area, Annual Long Term Monitoring Report. October.

UXB 2014. Performance Based Acquisition, Solid Waste Management Unit 40 (RAAP-009), Landfill Nitro area, Annual Long Term Monitoring Report: LTM Year 3. July.

Virginia Department of Environmental Quality (VDEQ) 2008. Hazardous Waste Management Unit 4, Well Abandonment – Review, Radford Army Ammunition Plant, Radford, VA, EPA ID No. VA1210020730. January 8.

VDEQ 2016. Hazardous Waste Management Permit for Corrective Action, Radford Army Ammunition Plant, Radford, Virginia, EPA ID No. VA1210020730. April 1.

ATTACHMENT 3

Decision Document Summary

[This Page Intentionally Left Blank]

Table A3-1 Decision Document Summary
Component: Background/Basis for Taking Action
CC-001/SSA-72, CC-002/SSA-77, CC-003/SSA 30/79, RAAP-005/SWMU 13, RAAP-009/SWMU 40, RAAP-011/SWMU 41B, RAAP-023/SWMU 43, RAAP-024/SWMU 45, RAAP-001/SWMU 51
Sheet 1 of 2

Decision Document Title:	Final Decision and Response to Comments, Radford Army Ammunition Plant, EPA ID No. VA1210020730, USEPA Region III, April 2012
Regulatory Framework:	RCRA
Remedy Chosen:	Institutional Controls (All sites), Engineering Controls (CC-003/SSA 30/79 and RAAP-009/SWMU 40), Long Term Monitoring (RAAP-009/SWMU 40)
Media of Concern:	Soil and/or Groundwater
Chemicals of Concern:	Only one COC was selected (chloroform) for one site, RAAP-009/SWMU 40
Land Use:	Military/Industrial
Receptors:	All sites: remedy required to protect the hypothetical residential user
Exposure Pathway:	Inhalation, dermal, and/or ingestion
Ecological Risk:	None

Table A3-2 Decision Document Summary
Component: Remedial Action
CC-001/SSA-72, CC-002/SSA-77, CC-003/SSA 30/79, RAAP-005/SWMU 13, RAAP-009/SWMU 40, RAAP-011/SWMU 41B, RAAP-023/SWMU 43, RAAP-024/SWMU 45, RAAP-001/SWMU 51

Sheet 2 of 2

Decision Document Title:	Final Decision and Response to Comments, Radford Army Ammunition Plant, EPA ID No. VA1210020730, USEPA Region III, April 2012
Remedy Chosen:	Institutional Controls (All sites), Engineering Controls (CC-003/SSA 30/79 and RAAP-009/SWMU 40), Long Term Monitoring (RAAP-009/SWMU 40)
Remedial Action Objectives:	The CMOs for RAAP-009/SWMU 40 were to: • Maintain containment of the landfill material at the site and implement necessary controls to prevent future uncontrolled human exposure to this landfill material. • Implement any necessary measures to stabilize and repair the landfill cover at the northern edge of the landfill area to prevent any further mass transport of soil material in this area. All other sites: None Selected
Clean-Up Goals:	RAAP-009/SWMU 40: Chloroform 80 µg/L All other sites: None Selected
Applicable or Relevant and Appropriate Requirements:	See Attachment 7

Components of the Remedy:	Engineering Controls: ECs are physical designs or structures used to manage environmental or health risks by placing a barrier between the contamination and the rest of the site, to limit exposure pathways. Institutional Controls: ICs are non-engineered instruments that help to minimize the potential for human exposure to contamination and/or protect the integrity of the selected remedy. Long Term Monitoring: • Long-term monitoring is proposed for 30 years and included the following: o Installation of an additional downgradient monitoring well o Quarterly groundwater sampling of four groundwater monitoring wells for one year o Seasonal sampling (every 9 months) for 2-5 years o Annual sampling for years 6-25 o Preparation of annual long-term monitoring reports

Table A3-3 Decision Document Summary
Component: Background/Basis for Taking Action
RAAP-014/SWMU 54, RAAP-018/SWMU 48, RAAP-013/SWMU 49, RAAP-001-R-01
Sheet 1 of 2

Decision Document Title:	Final Decision and Response to Comments, Radford Army Ammunition Plant, EPA ID No. VA1210020730, USEPA Region III, August 2014
Regulatory Framework:	RCRA
Remedy Chosen:	MNA including groundwater monitoring Institutional controls
Media of Concern:	Soil and/or Groundwater
Chemicals of Concern:	RAAP-014/SWMU 54: (Groundwater) 2,4,6-TNT, DNT mixture, RDX, perchlorate RAAP-013/SWMU 49 and RAAP-018/SWMU 48: (groundwater) CT and TCE
Land Use:	Military/Industrial
Receptors:	All sites: remedy required to protect the hypothetical residential user
Exposure Pathway:	Inhalation, dermal, and/or ingestion
Ecological Risk:	None

Table A3-4 Decision Document Summary
Component: Remedial Action
RAAP-014/SWMU 54, RAAP-018/SWMU 48, RAAP-013/SWMU 49, RAAP-001-R-01
Sheet 2 of 2

Decision Document Title:	Final Decision and Response to Comments, Radford Army Ammunition Plant, EPA ID No. VA1210020730, USEPA Region III, August 2014
Remedy Chosen:	MNA including groundwater monitoring Institutional controls
Remedial Action Objectives:	All sites: “to restore groundwater to drinking water standards; control exposure to the hazardous constituents remaining in the groundwater until such time that MCLs are achieved; protect the current existing receptors (the New River) from unacceptable concentrations from COC impacts; and ensure that all dissolved groundwater plumes are contained and will not migrate.”
Clean-Up Goals:	RAAP-014/SWMU 54 Groundwater COCs and RGs: (see table below) RAAP-013/SWMU 49 and RAAP-018/SWMU 48: 5µg/L for both CT and TCE
Applicable or Relevant and Appropriate Requirements:	See Attachment 7

COC	**RG (mg/L)**
2,4,6-TNT	0.00782
DNT Mixture	0.000932
RDX	0.0061
Perchlorate	0.0109

Components of the Remedy:	**All sites:** Monitored natural attenuation until drinking water standards are met, and compliance with and maintenance of groundwater use restrictions to prevent exposure to contaminants while levels remain above MCLs. The mechanisms for natural attenuation include dispersion, diffusion, dilution, sorption, volatilization, biological degradation, and chemical decomposition. Along with the COCs, the daughter products of the COCs are monitored and evaluated to determine the progress (effectiveness and timeliness) of the degradation process. The groundwater use restrictions are detailed as follows: • Groundwater shall not be used for any purpose including, but not limited to, use as a potable water source, other than to conduct the maintenance and monitoring activities required by VADEQ and/or USEPA. • Sites shall not be used in a way that will adversely affect or interfere with the integrity and protectiveness of the final remedies implemented at the Facility. • Any owner of the Facility property or any portion thereof shall provide USEPA and VADEQ with a “Certified, True and Correct Copy” of any instrument that conveys any interest in the Facility property or any portion thereof. Any such conveyance must provide for the continuation of the ICs until the USEPA, in consultation with VADEQ, determines the ICs are no longer necessary.”

ATTACHMENT 4

Site Inspection Checklist

[This Page Intentionally Left Blank]

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – CC-001/SSA-72

I. SITE INFORMATION

Site name: *Radford Army Ammunition Plant, CC-001/SSA-72 Oleum Plant Acidic Wastewater Sump*

Date of inspection: *July 31, 2017*

Location and Region: *Radford, VA*

EPA ID:

Agency, office, or company leading the five-year review: *US Army Corps of Engineers, Buffalo District*

Weather/temperature: Low 80s F, clear

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
☐ Access controls
☒ Institutional controls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☐ Other
☐ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐ O&M manual ☐ Readily available ☐ Up to date ☒ N/A
☐ As-built drawings ☐ Readily available ☐ Up to date ☒ N/A
☐ Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

2. **Site-Specific Health and Safety Plan** ☒ Readily available ☐ Up to date ☐ N/A

☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks:

4. **Permits and Service Agreements**

☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A
☐ Effluent discharge ☐ Readily available ☐ Up to date ☒ N/A
☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☒ N/A
☐ Other permits ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks:

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – CC-001/SSA-72

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ☒ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – CC-001/SSA-72

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house
☐ PRP in-house
☐ Federal Facility in-house
☐ Other: ____________________

☐ Contractor for State
☐ Contractor for PRP
☒ Contractor for Federal Facility

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate: ____________________ ☐ Breakdown attached

Total annual cost by year for review period if available (not available)

From__________ to__________ (Date / Date)	____________ Total cost	☐ Breakdown attached
From__________ to__________ (Date / Date)	____________ Total cost	☐ Breakdown attached
From__________ to__________ (Date / Date)	____________ Total cost	☐ Breakdown attached
From__________ to__________ (Date / Date)	____________ Total cost	☐ Breakdown attached
From__________ to__________ (Date / Date)	____________ Total cost	☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Monitoring/inspection costs not available.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A

Remarks: The CC-001/SSA-72 is located within a secure U.S. Army Facility that is surrounded by a fence. Access to the installation is controlled.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – CC-001/SSA-72

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks: A sign indicating the ICs at CC-001/SSA-72 is present and in good condition. Photographs of signage from the site visit are provided in Attachment 5.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Self-reporting
Frequency Annual
Responsible party/agency Installation
Name: Jim Mckenna
Title: Radford AAP Restoration Program Manager
Phone no.: 540-731-5782

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☒ No ☐ N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks:

2. **Land use changes on site** ☒ N/A
Remarks:

3. **Land use changes off site** ☒ N/A
Remarks:

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks: Roads are adequate for site access and inspection.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – CC-001/SSA-72

B. Other Site Conditions

Remarks: N/A

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Remarks: N/A

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy at CC-001/SSA-72 was intended to maintain the site in its current industrial/commercial state as a closed SWMU and to prevent future residential use and earth moving. The institutional controls were implemented through permit conditions and incorporated into the Facility Master Plan. No issues have been observed with the remedy. No evidence of residential use or earth moving were observed during the site visit. No land use changes on-site have been noted. Signage indicating the ICs has been posted.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

No issues have been observed related to the implementation and scope of O&M procedures.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

No issues have been observed that suggest that the protectiveness of the remedy may be compromised in the future.

D. **Opportunities for Optimization**

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

No opportunities for optimization have been noted.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – CC-002/SSA-77

I. SITE INFORMATION

Site name: *Radford Army Ammunition Plant, CC-002/SSA-77, Garbage Incinerator (Building 7219)*

Date of inspection: *July 31, 2017*

Location and Region: *Radford, VA*

EPA ID:

Agency, office, or company leading the five-year review: *US Army Corps of Engineers, Buffalo District*

Weather/temperature: *Low 80s F, clear*

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls
- ☐ Other ______

Attachments: ☐ Inspection team roster attached ☐ Site map attached

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______

2.

Site-Specific Health and Safety Plan	☒ Readily available	☐ Up to date	☐ N/A
☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______

3.

O&M and OSHA Training Records	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits______	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______

5.

Gas Generation Records	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – CC-002/SSA-77

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ____

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ____

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ____

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ☒ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ____

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ____

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – CC-002/SSA-77

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house
☐ PRP in-house
☐ Federal Facility in-house
☐ Other: ______________________________

☐ Contractor for State
☐ Contractor for PRP
☒ Contractor for Federal Facility

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate: ____________________ ☐ Breakdown attached

Total annual cost by year for review period if available (not available)

From__________to__________ __________ ☐ Breakdown attached
Date Date Total cost
From__________to__________ __________ ☐ Breakdown attached
Date Date Total cost
From__________to__________ __________ ☐ Breakdown attached
Date Date Total cost
From__________to__________ __________ ☐ Breakdown attached
Date Date Total cost
From__________to__________ __________ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Monitoring/inspection costs not available.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A

Remarks: CC-002/SSA-77 is located within a secure U.S. Army Facility that is surrounded by a fence. Access to the installation is controlled.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – CC-002/SSA-77

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks: A sign indicating the ICs in place at CC-002/SSA-77 is present and in good condition. Photographs of signage from the site visit are provided in Attachment 5.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Self-reporting
Frequency Annual
Responsible party/agency Installation

Name	Title	Phone no.
Jim Mckenna	Radford AAP Restoration Program Manager	540-731-5782

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☒ No ☐ N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks:

2. **Land use changes on site** ☒ N/A
Remarks:

3. **Land use changes off site** ☒ N/A
Remarks:

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks: Roads are adequate for site access and inspection.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – CC-002/SSA-77

B. Other Site Conditions

Remarks: N/A

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Remarks: N/A

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy at CC-002/SSA-77 was intended to maintain the site in its current industrial/commercial state as a closed SWMU and to prevent future residential use and earth moving. The institutional controls were implemented through permit conditions and incorporated into the Facility Master Plan. No issues have been observed with the remedy. No evidence of residential use or earth moving were observed during the site visit. No land use changes on-site have been noted. Signage indicating the ICS has been posted.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

No issues have been observed related to the implementation and scope of O&M procedures.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

No issues have been observed that suggest that the protectiveness of the remedy may be compromised in the future.

D. **Opportunities for Optimization**

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

No opportunities for optimization have been noted.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – CC-003/SSA-30/79

I. SITE INFORMATION

Site name: *Radford Army Ammunition Plant, CC-003/SSA-30/79, Asbestos Disposal Trenches 1&2*	**Date of inspection:** *July 31, 2017*
Location and Region: *Radford, VA*	**EPA ID:**
Agency, office, or company leading the five-year review: *US Army Corps of Engineers, Buffalo District*	**Weather/temperature:** *Low 80s F, clear*

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
☐ Access controls
☒ Institutional controls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☒ Other Engineering controls consisting of a clay cover over the buried waste.

☐ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
☐ O&M manual ☐ Readily available ☐ Up to date ☒ N/A
☐ As-built drawings ☐ Readily available ☐ Up to date ☒ N/A
☐ Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

2. **Site-Specific Health and Safety Plan** ☒ Readily available ☐ Up to date ☐ N/A
☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

4. **Permits and Service Agreements**
☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A
☐ Effluent discharge ☐ Readily available ☐ Up to date ☒ N/A
☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☒ N/A
☐ Other permits__________ ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – CC-003/SSA-30/79

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ☒ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – CC-003/SSA-30/79

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house
☐ PRP in-house
☐ Federal Facility in-house
☐ Other: ______

☐ Contractor for State
☐ Contractor for PRP
☒ Contractor for Federal Facility

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place

Original O&M cost estimate: ______ ☐ Breakdown attached

Total annual cost by year for review period if available (not available)

From ______ to ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ to ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ to ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ to ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ to ______ ______ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Monitoring/inspection costs not available.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A

Remarks: CC-003/SSA-30/79 is located within a secure U.S. Army Facility that is surrounded by a fence. Access to the installation is controlled.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – CC-003/SSA-30/79

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks: A sign indicating the ICs and engineering controls in place at CC-003/SSA-30/79 is present and in good condition. Photographs of signage from the site visit are provided in Attachment 5.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Self-reporting
Frequency Annual
Responsible party/agency Installation

Jim Mckenna	Radford AAP Restoration Program Manager	540-731-5782
Name	Title	Phone no.

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☒ No ☐ N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks:

2. **Land use changes on site** ☒ N/A
Remarks:

3. **Land use changes off site** ☒ N/A
Remarks:

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks: Roads are adequate for site access and inspection.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – CC-003/SSA-30/79

B. Other Site Conditions

Remarks: N/A

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Remarks: No issues were observed with the clay cover over the buried waste at CC-003/SSA-30/79.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy at CC-003/SSA-30/79 was intended to limit human exposure to asbestos-containing material remaining on site during construction activities or use as a residential property. The selected remedy is institutional and engineering controls. The institutional controls and engineering controls were implemented through permit conditions. No issues have been observed with the remedy. No evidence of residential use or earth moving were observed during the site visit. No land use changes on-site have been noted. Signs indicating the ICs and engineering controls have been posted.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

No issues have been observed related to the implementation and scope of O&M procedures.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

No issues have been observed that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

No opportunities for optimization have been noted.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-001/SWMU-51

I. SITE INFORMATION

Site name: *Radford Army Ammunition Plant, RAAP-001/SWMU-51, TNT Waste Acid Neutralization Pits*	**Date of inspection:** *July 31, 2017*
Location and Region: *Radford, VA*	**EPA ID:**
Agency, office, or company leading the five-year review: *US Army Corps of Engineers, Buffalo District*	**Weather/temperature:** *Low 80s F, clear*

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
☐ Access controls
☒ Institutional controls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☐ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls
☒ Other Interim measure performed in 2009 consisted of excavation and off-site disposal of 1,867 tons (1,245 cubic yards) of impacted material from the trench.

Attachments: ☐ Inspection team roster attached ☐ Site map attached

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A

Remarks:

2. **Site-Specific Health and Safety Plan**

Site-Specific Health and Safety Plan	☒ Readily available	☐ Up to date	☐ N/A
☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A

Remarks:

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks:

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits	☐ Readily available	☐ Up to date	☒ N/A

Remarks:

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks:

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-001/SWMU-51

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ☒ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-001/SWMU-51

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house
☐ PRP in-house
☐ Federal Facility in-house
☐ Other: ______

☐ Contractor for State
☐ Contractor for PRP
☒ Contractor for Federal Facility

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place

Original O&M cost estimate: ______ ☐ Breakdown attached

Total annual cost by year for review period if available (not available)

From ______ (Date) to ______ (Date) ______ (Total cost) ☐ Breakdown attached
From ______ (Date) to ______ (Date) ______ (Total cost) ☐ Breakdown attached
From ______ (Date) to ______ (Date) ______ (Total cost) ☐ Breakdown attached
From ______ (Date) to ______ (Date) ______ (Total cost) ☐ Breakdown attached
From ______ (Date) to ______ (Date) ______ (Total cost) ☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Monitoring/inspection costs not available.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A

Remarks: RAAP-001/SWMU-51 is located within a secure U.S. Army Facility that is surrounded by a fence. Access to the installation is controlled.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks: A sign indicating the ICs in place at RAAP-001/SWMU-51 is present and in good condition. Photographs of signage from the site visit are provided in Attachment 5.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Self-reporting
Frequency Annual
Responsible party/agency Installation

Name	Title	Phone no.
Jim Mckenna	Radford AAP Restoration Program Manager	540-731-5782

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☒ No ☐ N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks:

2. **Land use changes on site** ☒ N/A
Remarks:

3. **Land use changes off site** ☒ N/A
Remarks:

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks: Roads are adequate for site access and inspection.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-001/SWMU-51

B. Other Site Conditions

Remarks: N/A

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Remarks:

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy at RAAP-001/SWMU-51 was intended to maintain the site in its current to prevent future residential use and earth moving to prevent exposure to residual soil contamination. The institutional controls were implemented through permit conditions and incorporated into the Facility Master Plan. No issues have been observed with the remedy. No evidence of residential use or earth moving were observed during the site visit. No land use changes on-site have been noted. Signage indicating the ICs has been posted.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

No issues have been observed related to the implementation and scope of O&M procedures.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

No issues have been observed that suggest that the protectiveness of the remedy may be compromised in the future.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-001/SWMU-51

D. **Opportunities for Optimization**

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

No opportunities for optimization have been noted.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-001-R-01

I. SITE INFORMATION

Site name: *Radford Army Ammunition Plant, RAAP-001-R-01, Southeast Hillside Area of Army Reserve*

Date of inspection: *July 31, 2017*

Location and Region: *Radford, VA*

EPA ID:

Agency, office, or company leading the five-year review: *US Army Corps of Engineers, Buffalo District*

Weather/temperature: *Low 80s F, clear*

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
☐ Access controls
☒ Institutional controls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☐ Other ______________________________

☐ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______________________________

2. **Site-Specific Health and Safety Plan**

Site-Specific Health and Safety Plan	☒ Readily available	☐ Up to date	☐ N/A
☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______________________________

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: ______________________________

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits____________	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______________________________

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: ______________________________

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-001-R-01

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ☒ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-001-R-01

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house
☐ PRP in-house
☐ Federal Facility in-house
☐ Other: ____________________

☐ Contractor for State
☐ Contractor for PRP
☒ Contractor for Federal Facility

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate: ____________________ ☐ Breakdown attached

Total annual cost by year for review period if available (not available)

From__________ Date	to__________ Date	__________ Total cost	☐ Breakdown attached
From__________ Date	to__________ Date	__________ Total cost	☐ Breakdown attached
From__________ Date	to__________ Date	__________ Total cost	☐ Breakdown attached
From__________ Date	to__________ Date	__________ Total cost	☐ Breakdown attached
From__________ Date	to__________ Date	__________ Total cost	☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Monitoring/inspection costs not available.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A

Remarks: RAAP-001-R-01 is located within a secure U.S. Army Facility that is surrounded by a fence. Access to the installation is controlled.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-001-R-01

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks: A sign indicating the ICs in place at RAAP-001-R-01 is present and in good condition. Photographs of signage from the site visit are provided in Attachment 5.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Self-reporting
Frequency Annual
Responsible party/agency Installation

Jim Mckenna	Radford AAP Restoration Program Manager	540-731-5782
Name	Title	Phone no.

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☒ No ☐ N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks:

2. **Land use changes on site** ☒ N/A
Remarks:

3. **Land use changes off site** ☒ N/A
Remarks:

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks: Roads are adequate for site access and inspection.

B. Other Site Conditions

Remarks: N/A

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-001-R-01

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Remarks: N/A

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy at RAAP-001-R-01 was intended to prevent future residential land use of the Southeast Hillside Area. ICs restrict land use at the site. No issues were observed relating to the effectiveness or function of the remedy. There has been no change in land use at the site and signage indicating the ICs has been posted.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

No issues have been observed related to the implementation and scope of O&M procedures.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

No issues have been observed that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

No opportunities for optimization have been noted.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-001-R-01

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-005/SWMU-13

I. SITE INFORMATION

Site name: *Radford Army Ammunition Plant, RAAP-005/SWMU-13, Waste Propellant Burning Ground*

Date of inspection: *July 31, 2017*

Location and Region: *Radford, VA*

EPA ID:

Agency, office, or company leading the five-year review: *US Army Corps of Engineers, Buffalo District*

Weather/temperature: *Low 80s F, clear*

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
☐ Access controls
☒ Institutional controls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☐ Other

☐ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐ O&M manual ☐ Readily available ☐ Up to date ☒ N/A
☐ As-built drawings ☐ Readily available ☐ Up to date ☒ N/A
☐ Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

2. **Site-Specific Health and Safety Plan** ☒ Readily available ☐ Up to date ☐ N/A

☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks:

4. **Permits and Service Agreements**

☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A
☐ Effluent discharge ☐ Readily available ☐ Up to date ☒ N/A
☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☒ N/A
☐ Other permits____________________ ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks:

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-005/SWMU-13

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ☒ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-005/SWMU-13

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house
☐ PRP in-house
☐ Federal Facility in-house
☐ Other: ______

☐ Contractor for State
☐ Contractor for PRP
☒ Contractor for Federal Facility

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate: ______ ☐ Breakdown attached

Total annual cost by year for review period if available (not available)

From______to______ ______ ☐ Breakdown attached
Date Date Total cost
From______to______ ______ ☐ Breakdown attached
Date Date Total cost
From______to______ ______ ☐ Breakdown attached
Date Date Total cost
From______to______ ______ ☐ Breakdown attached
Date Date Total cost
From______to______ ______ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Monitoring/inspection costs not available.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A

Remarks: ______

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-005/SWMU-13

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks: A sign indicating the ICs in place at RAAP-005/SWMU-13 is present and in good condition. Photographs of signage from the site visit are provided in Attachment 5.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Self-reporting
Frequency Annual
Responsible party/agency Installation

Name	Title	Phone no.
Jim Mckenna	Radford AAP Restoration Program Manager	540-731-5782

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☒ No ☐ N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks:

2. **Land use changes on site** ☒ N/A
Remarks:

3. **Land use changes off site** ☒ N/A
Remarks:

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks: Roads are adequate for site access and inspection.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-005/SWMU-13

B. Other Site Conditions

Remarks: N/A

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Remarks: N/A

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy at RAAP-005/SWMU-13 was intended to maintain the site in its current to prevent future residential use and earth moving. The institutional controls were implemented through permit conditions and incorporated into the Facility Master Plan. No issues have been observed with the remedy. No evidence of residential use or earth moving were observed during the site visit. No land use changes on-site have been noted. Signage indicating the ICs has been posted.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

No issues have been observed related to the implementation and scope of O&M procedures.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

No issues have been observed that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

No opportunities for optimization have been noted.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-009/SWMU-40

I. SITE INFORMATION

Site name: *Radford Army Ammunition Plant, RAAP-009/SWMU-40, Landfill Nitro Area*	**Date of inspection:** *July 31, 2017*
Location and Region: *Radford, VA*	**EPA ID:**
Agency, office, or company leading the five-year review: *US Army Corps of Engineers, Buffalo District*	**Weather/temperature:** *Low 80s F, clear*

Remedy Includes: (Check all that apply)

☒ Landfill cover/containment
☐ Access controls
☒ Institutional controls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☒ Other Engineering controls consisting of repairs to existing landfill cap, long-term inspection of the cap, and a clear marking of the capped area. Note: groundwater monitoring was discontinued based on the Year 4 long-term monitoring report and 2015 remedy review.

☒ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐ O&M manual ☐ Readily available ☐ Up to date ☒ N/A
☐ As-built drawings ☐ Readily available ☐ Up to date ☒ N/A
☐ Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

2. **Site-Specific Health and Safety Plan** ☒ Readily available ☐ Up to date ☐ N/A

☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks:

4. **Permits and Service Agreements**

☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A
☐ Effluent discharge ☐ Readily available ☐ Up to date ☒ N/A
☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☒ N/A
☐ Other permits__________ ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks:

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-009/SWMU-40

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ☒ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-009/SWMU-40

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house
☐ PRP in-house
☐ Federal Facility in-house
☐ Other: ______

☐ Contractor for State
☐ Contractor for PRP
☒ Contractor for Federal Facility

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate: ______ ☐ Breakdown attached

Total annual cost by year for review period if available (not available)

From ______ to ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ to ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ to ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ to ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ to ______ ______ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Monitoring/inspection costs not available.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A

Remarks: RAAP-009/SWMU-40 is located within a secure U.S. Army Facility that is surrounded by a fence. Access to the installation is controlled.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-009/SWMU-40

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks: A sign indicating the ICs in place at RAAP-009/SWMU-40 is present and in good condition. Photographs of signage from the site visit are provided in Attachment 5.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Self-reporting
Frequency Annual
Responsible party/agency Installation

Jim Mckenna	Radford AAP Restoration Program Manager	540-731-5782
Name	Title	Phone no.

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☒ No ☐ N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks:

2. **Land use changes on site** ☒ N/A

Remarks:

3. **Land use changes off site** ☒ N/A

Remarks:

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks: Roads are adequate for site access and inspection.

B. Other Site Conditions

Remarks: N/A

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-009/SWMU-40

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

A. Landfill Surface ☒ Applicable ☐ N/A

1. **Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident
Areal extent_______________ Depth _______________
Remarks: ____

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident
Lengths_________________ Widths_______________ Depths___________
Remarks: ____

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident
Areal extent_______________ Depth _______________
Remarks: ____

4. **Holes** ☐ Location shown on site map ☒ Holes not evident
Areal extent_______________ Depth _______________
Remarks: ____

5. **Vegetative Cover** ☒ Grass ☐ Cover properly established ☐ No signs of stress
☒ Trees/Shrubs (indicate size and locations on a diagram)
Remarks: Small shrubs

6. **Alternative Cover (armored rock, concrete, etc.)** ☒ N/A
Remarks: ____

7. **Bulges** ☐ Location shown on site map ☒ Bulges not evident
Areal extent_______________ Height _______________
Remarks: ____

8. **Wet Areas/Water Damage** ☒ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent _______________
☐ Ponding ☐ Location shown on site map Areal extent _______________
☐ Seeps ☐ Location shown on site map Areal extent _______________
☐ Soft subgrade ☐ Location shown on site map Areal extent _______________
Remarks: ____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability
Areal extent____________
Remarks: ____

B. Benches ☐ Applicable ☒ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

C. Letdown Channels ☐ Applicable ☒ N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

D. Cover Penetrations ☐ Applicable ☒ N/A

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

F. Cover Drainage Layer ☐ Applicable ☒ N/A

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

H. Retaining Walls ☐ Applicable ☒ N/A

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Remarks: N/A

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy at RAAP-009/SWMU-40 was intended to maintain containment of the landfill material at the site and implement necessary controls to prevent future uncontrolled human exposure to this landfill material and to implement measures to stabilize and repair the landfill cover to prevent any further mass transport of soil material in this area. The remedy included ICs consisting of prevention of residential use, and earth-moving restriction, and a restriction on potable use of groundwater. Engineering controls included repairs to the existing landfill cap, long-term inspection and maintenance of the cap, and a clear marking of the capped area. No issues were observed relating to the remedy's effectiveness and function. The landfill cap appears to be well maintained. ICs were implemented through permit restrictions and signage indicates the ICs at the site.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

No issues have been observed related to the implementation and scope of O&M procedures.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

No issues have been observed that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

No opportunities for optimization have been noted.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-0011/SWMU-41B

I. SITE INFORMATION

Site name: *Radford Army Ammunition Plant, RAAP-011/SWMU-41B, Red Water Ash Burial Ground*

Date of inspection: *July 31, 2017*

Location and Region: *Radford, VA*

EPA ID:

Agency, office, or company leading the five-year review: *US Army Corps of Engineers, Buffalo District*

Weather/temperature: *Low 80s F, clear*

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
☐ Access controls
☒ Institutional controls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☐ Other ______________________________

☐ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______________________________

2. **Site-Specific Health and Safety Plan**

Site-Specific Health and Safety Plan	☒ Readily available	☐ Up to date	☐ N/A
☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______________________________

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: ______________________________

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits______________	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______________________________

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: ______________________________

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-0011/SWMU-41B

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ☒ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house
☐ PRP in-house
☐ Federal Facility in-house
☐ Other: ____________________

☐ Contractor for State
☐ Contractor for PRP
☒ Contractor for Federal Facility

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate: ____________________ ☐ Breakdown attached

Total annual cost by year for review period if available (not available)

From__________to__________ __________ ☐ Breakdown attached
Date Date Total cost
From__________to__________ __________ ☐ Breakdown attached
Date Date Total cost
From__________to__________ __________ ☐ Breakdown attached
Date Date Total cost
From__________to__________ __________ ☐ Breakdown attached
Date Date Total cost
From__________to__________ __________ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Monitoring/inspection costs not available.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A

Remarks: RAAP-011/SWMU-41B is located within a secure U.S. Army Facility that is surrounded by a fence. Access to the installation is controlled.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-0011/SWMU-41B

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks: A sign indicating the ICs in place at RAAP-011/SWMU-41B is present and in good condition. Photographs of signage from the site visit are provided in Attachment 5.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Self-reporting
Frequency Annual
Responsible party/agency Installation

Jim Mckenna	Radford AAP Restoration Program Manager	540-731-5782
Name	Title	Phone no.

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☒ No ☐ N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks:

2. **Land use changes on site** ☒ N/A
Remarks:

3. **Land use changes off site** ☒ N/A
Remarks:

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks: Roads are adequate for site access and inspection.

B. Other Site Conditions

Remarks: N/A

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-0011/SWMU-41B

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Remarks: N/A

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy at RAAP-011/SWMU-41B was intended to maintain the site in its current state as a closed SWMU and to prevent future residential use and earth moving. The institutional controls were implemented through permit conditions and incorporated into the Facility Master Plan. No issues have been observed with the remedy. No evidence of residential use or earth moving were observed during the site visit. No land use changes on-site have been noted. Signage indicating the ICS has been posted.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

No issues have been observed related to the implementation and scope of O&M procedures.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

No issues have been observed that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

No opportunities for optimization have been noted.

This page intentionally left blank

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-013/SWMU-49

I. SITE INFORMATION

Site name: *Radford Army Ammunition Plant, RAAP-013/SWMU-49, Red Water Ash Burial #2*

Date of inspection: *July 31, 2017*

Location and Region: *Radford, VA*

EPA ID:

Agency, office, or company leading the five-year review: *US Army Corps of Engineers, Buffalo District*

Weather/temperature: *Low 80s F, clear*

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
☐ Access controls
☒ Institutional controls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☐ Other ______________________________

☒ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______________________________

2. **Site-Specific Health and Safety Plan**

Site-Specific Health and Safety Plan	☒ Readily available	☐ Up to date	☐ N/A
☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______________________________

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: ______________________________

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits______________________	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______________________________

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: ______________________________

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ☒ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-013/SWMU-49

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house
☐ PRP in-house
☐ Federal Facility in-house
☐ Other: ______________________________

☐ Contractor for State
☐ Contractor for PRP
☒ Contractor for Federal Facility

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate: ____________________ ☐ Breakdown attached

Total annual cost by year for review period if available (not available)

From__________to_____________ _____________ ☐ Breakdown attached
Date Date Total cost
From__________to_____________ _____________ ☐ Breakdown attached
Date Date Total cost
From__________to_____________ _____________ ☐ Breakdown attached
Date Date Total cost
From__________to_____________ _____________ ☐ Breakdown attached
Date Date Total cost
From__________to_____________ _____________ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Monitoring/inspection costs not available.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A

Remarks: RAAP-013/SWMU-49 is located within a secure U.S. Army Facility that is surrounded by a fence. Access to the installation is controlled.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-013/SWMU-49

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks: A sign indicating the ICs in place at RAAP-013/SWMU-49 is present and in good condition. Photographs of signage from the site visit are provided in Attachment 5.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Self-reporting
Frequency Annual
Responsible party/agency Installation

Jim Mckenna	Radford AAP Restoration Program Manager	540-731-5782
Name	Title	Phone no.

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☒ No ☐ N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks:

2. **Land use changes on site** ☒ N/A
Remarks:

3. **Land use changes off site** ☒ N/A
Remarks:

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks: Roads are adequate for site access and inspection.

B. Other Site Conditions

Remarks: N/A

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-013/SWMU-49

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

C. Treatment System ☐ Applicable ☒ N/A

D. Monitoring Data ☒ Applicable ☐ N/A

1. Monitoring Data
☒ Is routinely submitted on time ☒ Is of acceptable quality

2. Monitoring Data Suggests:
☒ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

E. Monitored Natural Attenuation ☒ Applicable ☐ N/A

1. **Monitoring Wells** (natural attenuation remedy)
☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☐ All required wells located ☐ Needs maintenance ☐ N/A
Remarks:

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Remarks: N/A

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy at RAAP-013/SWMU-49 was intended to reduce contaminant concentrations in groundwater and prevent exposure to contaminants. ICs including limiting groundwater use to maintenance and monitoring and land use restrictions ensure the short-term protectiveness of the remedy. No issues were observed with the remedy. Evidence of ICs not being fully enforced was not discovered. Signage describing the ICs has been posted. Groundwater monitoring ensures the continued effectiveness of the MNA remedy to contain the groundwater plumes and reduce contaminant concentrations.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

No issues have been observed related to the implementation and scope of O&M procedures.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-013/SWMU-49

C. **Early Indicators of Potential Remedy Problems**

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

No issues have been observed that suggest that the protectiveness of the remedy may be compromised in the future.

D. **Opportunities for Optimization**

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

No opportunities for optimization have been noted.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-014/SWMU-54

I. SITE INFORMATION

Site name: *Radford Army Ammunition Plant, RAAP-014/SWMU-54, Propellant Burning Ash Disposal*	**Date of inspection:** *July 31, 2017*
Location and Region: *Radford, VA*	**EPA ID:**
Agency, office, or company leading the five-year review: *US Army Corps of Engineers, Buffalo District*	**Weather/temperature:** *Low 80s F, clear*

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
☐ Access controls
☒ Institutional controls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☐ Other ______________________________

☒ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
☐ O&M manual ☐ Readily available ☐ Up to date ☒ N/A
☐ As-built drawings ☐ Readily available ☐ Up to date ☒ N/A
☐ Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

2. **Site-Specific Health and Safety Plan** ☒ Readily available ☐ Up to date ☐ N/A
☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

4. **Permits and Service Agreements**
☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A
☐ Effluent discharge ☐ Readily available ☐ Up to date ☒ N/A
☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☒ N/A
☐ Other permits______________________ ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-014/SWMU-54

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ☒ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-014/SWMU-54

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☒ Contractor for Federal Facility
☐ Other: ____________________

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate: ____________ ☐ Breakdown attached

Total annual cost by year for review period if available (not available)

From ______ Date	to ______ Date	______ Total cost	☐ Breakdown attached
From ______ Date	to ______ Date	______ Total cost	☐ Breakdown attached
From ______ Date	to ______ Date	______ Total cost	☐ Breakdown attached
From ______ Date	to ______ Date	______ Total cost	☐ Breakdown attached
From ______ Date	to ______ Date	______ Total cost	☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Monitoring/inspection costs not available.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A

Remarks: RAAP-014/SWMU-54 is located within a secure U.S. Army Facility that is surrounded by a fence. Access to the installation is controlled.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-014/SWMU-54

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks: A sign indicating the ICs in place at RAAP-014/SWMU-54 is present and in good condition. Photographs of signage from the site visit are provided in Attachment 5.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Self-reporting
Frequency Annual
Responsible party/agency Installation

Jim Mckenna	Radford AAP Restoration Program Manager	540-731-5782
Name	Title	Phone no.

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☒ No ☐ N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks:

2. **Land use changes on site** ☒ N/A
Remarks:

3. **Land use changes off site** ☒ N/A
Remarks:

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks: Roads are adequate for site access and inspection.

B. Other Site Conditions

Remarks: N/A

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-014/SWMU-54

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

C. Treatment System ☐ Applicable ☒ N/A

D. Monitoring Data ☒ Applicable ☐ N/A

1. Monitoring Data
☒ Is routinely submitted on time ☒ Is of acceptable quality

2. Monitoring Data Suggests:
☒ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining

E. Monitored Natural Attenuation ☒ Applicable ☐ N/A

1. **Monitoring Wells** (natural attenuation remedy)
☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☐ All required wells located ☐ Needs maintenance ☐ N/A
Remarks: ______

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Remarks: N/A

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy at RAAP-014/SWMU-54 was intended to reduce contaminant concentrations in groundwater and prevent exposure to contaminants. ICs including limiting groundwater use to maintenance and monitoring and land use restrictions ensure the short-term protectiveness of the remedy. No issues were observed with the remedy. Evidence of ICs not being fully enforced was not discovered. Signage describing the ICs has been posted. Groundwater monitoring ensures the continued effectiveness of the MNA remedy to contain the groundwater plumes and reduce contaminant concentrations.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

No issues have been observed related to the implementation and scope of O&M procedures.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-014/SWMU-54

C. **Early Indicators of Potential Remedy Problems**

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

No issues have been observed that suggest that the protectiveness of the remedy may be compromised in the future.

D. **Opportunities for Optimization**

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

No opportunities for optimization have been noted.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-018/SWMU-48

I. SITE INFORMATION

Site name: *Radford Army Ammunition Plant, RAAP-018/SWMU-48, Oily Water Burial Area*

Date of inspection: *July 31, 2017*

Location and Region: *Radford, VA*

EPA ID:

Agency, office, or company leading the five-year review: *US Army Corps of Engineers, Buffalo District*

Weather/temperature: *Low 80s F, clear*

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
☐ Access controls
☒ Institutional controls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☐ Other ______

☒ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______

2. **Site-Specific Health and Safety Plan**

Site-Specific Health and Safety Plan	☒ Readily available	☐ Up to date	☐ N/A
☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: ______

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits______	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: ______

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-018/SWMU-48

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ☒ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-018/SWMU-48

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house
☐ PRP in-house
☐ Federal Facility in-house
☐ Other: ______________________

☐ Contractor for State
☐ Contractor for PRP
☒ Contractor for Federal Facility

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate: ____________________ ☐ Breakdown attached

Total annual cost by year for review period if available (not available)

From__________to_____________ (Date, Date) _____________ Total cost ☐ Breakdown attached
From__________to_____________ (Date, Date) _____________ Total cost ☐ Breakdown attached
From__________to_____________ (Date, Date) _____________ Total cost ☐ Breakdown attached
From__________to_____________ (Date, Date) _____________ Total cost ☐ Breakdown attached
From__________to_____________ (Date, Date) _____________ Total cost ☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Monitoring/inspection costs not available.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A

Remarks: RAAP-018/SWMU-48 is located within a secure U.S. Army Facility that is surrounded by a fence. Access to the installation is controlled.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks: A sign indicating the ICs in place at RAAP-018/SWMU-48 is present and in good condition. Photographs of signage from the site visit are provided in Attachment 5.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Self-reporting
Frequency Annual
Responsible party/agency Installation

Name	Title	Phone no.
Jim Mckenna	Radford AAP Restoration Program Manager	540-731-5782

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☒ No ☐ N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks:

2. **Land use changes on site** ☒ N/A

Remarks:

3. **Land use changes off site** ☒ N/A

Remarks:

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks: Roads are adequate for site access and inspection.

B. Other Site Conditions

Remarks: N/A

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-018/SWMU-48

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

C. Treatment System ☐ Applicable ☒ N/A

D. Monitoring Data ☒ Applicable ☐ N/A

1. Monitoring Data
   ☒ Is routinely submitted on time ☒ Is of acceptable quality

2. Monitoring Data Suggests:
   ☒ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

E. Monitored Natural Attenuation ☒ Applicable ☐ N/A

1. **Monitoring Wells** (natural attenuation remedy)
   ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
   ☐ All required wells located ☐ Needs maintenance ☐ N/A
   Remarks: ______

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Remarks: N/A

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy at RAAP-018/SWMU-48 was intended to reduce contaminant concentrations in groundwater and prevent exposure to contaminants. ICs including limiting groundwater use to maintenance and monitoring and land use restrictions ensure the short-term protectiveness of the remedy. No issues were observed with the remedy. Evidence of ICs not being fully enforced was not discovered. Signage describing the ICs has been posted. Groundwater monitoring ensures the continued effectiveness of the MNA remedy to contain the groundwater plumes and reduce contaminant concentrations.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

No issues have been observed related to the implementation and scope of O&M procedures.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-018/SWMU-48

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

No issues have been observed that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

No opportunities for optimization have been noted.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-0023/SWMU-43

I. SITE INFORMATION

Site name: *Radford Army Ammunition Plant, RAAP-023/SWMU-43, Sanitary Landfill No. 2*

Date of inspection: *July 31, 2017*

Location and Region: *Radford, VA*

EPA ID:

Agency, office, or company leading the five-year review: *US Army Corps of Engineers, Buffalo District*

Weather/temperature: *Low 80s F, clear*

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
☐ Access controls
☒ Institutional controls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☐ Other ______________________________

☐ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______________________________

2. **Site-Specific Health and Safety Plan**

Site-Specific Health and Safety Plan	☒ Readily available	☐ Up to date	☐ N/A
☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______________________________

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: ______________________________

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits______________________	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______________________________

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: ______________________________

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-0023/SWMU-43

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ☒ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-0023/SWMU-43

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house
☐ PRP in-house
☐ Federal Facility in-house
☐ Other: ____________________

☐ Contractor for State
☐ Contractor for PRP
☒ Contractor for Federal Facility

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate: ____________ ☐ Breakdown attached

Total annual cost by year for review period if available (not available)

From ______ to ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ to ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ to ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ to ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ to ______ ______ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Monitoring/inspection costs not available.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A

Remarks: RAAP-023/SWMU-43 is located within a secure U.S. Army Facility that is surrounded by a fence. Access to the installation is controlled.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-0023/SWMU-43

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks: A sign indicating the ICs in place at RAAP-023/SWMU-43 is present and in good condition. Photographs of signage from the site visit are provided in Attachment 5.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Self-reporting
Frequency Annual
Responsible party/agency Installation

Name	Title	Phone no.
Jim Mckenna	Radford AAP Restoration Program Manager	540-731-5782

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☒ No ☐ N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks:

2. **Land use changes on site** ☒ N/A

Remarks:

3. **Land use changes off site** ☒ N/A

Remarks:

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks: Roads are adequate for site access and inspection.

B. Other Site Conditions

Remarks: N/A

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-0023/SWMU-43

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Remarks: N/A

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy at RAAP-023/SWMU-43 was intended to maintain the site in its current state as a closed SWMU and to prevent future residential use and earth moving. The institutional controls were implemented through permit conditions and incorporated into the Facility Master Plan. No issues have been observed with the remedy. No evidence of residential use or earth moving were observed during the site visit. No land use changes on-site have been noted. Signage indicating the ICS has been posted.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

No issues have been observed related to the implementation and scope of O&M procedures.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

No issues have been observed that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

No opportunities for optimization have been noted.

This page intentionally left blank

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-0024/SWMU-45

I. SITE INFORMATION

Site name: *Radford Army Ammunition Plant, RAAP-024/SWMU-45, Landfill No. 3*	**Date of inspection:** *July 31, 2017*
Location and Region: *Radford, VA*	**EPA ID:**
Agency, office, or company leading the five-year review: *US Army Corps of Engineers, Buffalo District*	**Weather/temperature:** *Low 80s F, clear*

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
☐ Access controls
☒ Institutional controls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☐ Other ______________________________

☐ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______________________________

2. | | | | |
|---|---|---|---|
| **Site-Specific Health and Safety Plan** | ☒ Readily available | ☐ Up to date | ☐ N/A |
| ☐ Contingency plan/emergency response plan | ☐ Readily available | ☐ Up to date | ☒ N/A |

Remarks: ______________________________

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: ______________________________

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits______________________	☐ Readily available	☐ Up to date	☒ N/A

Remarks: ______________________________

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: ______________________________

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-0024/SWMU-45

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ☒ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-0024/SWMU-45

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house
☐ PRP in-house
☐ Federal Facility in-house
☐ Other: ______

☐ Contractor for State
☐ Contractor for PRP
☒ Contractor for Federal Facility

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place

Original O&M cost estimate: ______ ☐ Breakdown attached

Total annual cost by year for review period if available (not available)

From ______ (Date) to ______ (Date) ______ (Total cost) ☐ Breakdown attached
From ______ (Date) to ______ (Date) ______ (Total cost) ☐ Breakdown attached
From ______ (Date) to ______ (Date) ______ (Total cost) ☐ Breakdown attached
From ______ (Date) to ______ (Date) ______ (Total cost) ☐ Breakdown attached
From ______ (Date) to ______ (Date) ______ (Total cost) ☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Monitoring/inspection costs not available.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A

Remarks: RAAP-024/SWMU-45 is located within a secure U.S. Army Facility that is surrounded by a fence. Access to the installation is controlled.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks: A sign indicating the ICs in place at RAAP-024/SWMU-45 is present and in good condition. Photographs of signage from the site visit are provided in Attachment 5.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	☐ Yes	☒ No	☐ N/A
Site conditions imply ICs not being fully enforced	☐ Yes	☒ No	☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Self-reporting
Frequency Annual
Responsible party/agency Installation

Name	Title	Phone no.
Jim Mckenna	Radford AAP Restoration Program Manager	540-731-5782

Reporting is up-to-date	☒ Yes	☐ No	☐ N/A
Reports are verified by the lead agency	☐ Yes	☐ No	☒ N/A
Specific requirements in deed or decision documents have been met	☒ Yes	☐ No	☐ N/A
Violations have been reported	☐ Yes	☒ No	☐ N/A

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks:

2. **Land use changes on site** ☒ N/A

Remarks:

3. **Land use changes off site** ☒ N/A

Remarks:

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks: Roads are adequate for site access and inspection.

B. Other Site Conditions

Remarks: N/A

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-0024/SWMU-45

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Remarks: N/A

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy at RAAP-024/SWMU-45 was intended to maintain the site in its current state as a closed SWMU and to prevent future residential use and earth moving. The institutional controls were implemented through permit conditions and incorporated into the Facility Master Plan. No issues have been observed with the remedy. No evidence of residential use or earth moving were observed during the site visit. No land use changes on-site have been noted. Signage indicating the ICS has been posted.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

No issues have been observed related to the implementation and scope of O&M procedures.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

No issues have been observed that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

No opportunities for optimization have been noted.

This page intentionally left blank

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-039/HWMU-16

I. SITE INFORMATION

Site name: *Radford Army Ammunition Plant, RAAP-039/HWMU-16, Hazardous Waste Landfill*

Date of inspection: *July 31, 2017*

Location and Region: *Radford, VA*

EPA ID:

Agency, office, or company leading the five-year review: *US Army Corps of Engineers, Buffalo District*

Weather/temperature: *Low 80s F, clear*

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
☐ Access controls
☐ Institutional controls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☐ Other ______________________________

☒ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
☐ O&M manual ☐ Readily available ☐ Up to date ☒ N/A
☐ As-built drawings ☐ Readily available ☐ Up to date ☒ N/A
☐ Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

2. **Site-Specific Health and Safety Plan** ☒ Readily available ☐ Up to date ☐ N/A
☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

4. **Permits and Service Agreements**
☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A
☐ Effluent discharge ☐ Readily available ☐ Up to date ☒ N/A
☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☒ N/A
☐ Other permits______________________ ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-039/HWMU-16

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ☒ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-039/HWMU-16

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house
☐ PRP in-house
☐ Federal Facility in-house
☐ Other: ____________________

☐ Contractor for State
☐ Contractor for PRP
☒ Contractor for Federal Facility

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate: ____________ ☐ Breakdown attached

Total annual cost by year for review period if available (not available)

From______to______ (Date, Date) ______ Total cost ☐ Breakdown attached
From______to______ (Date, Date) ______ Total cost ☐ Breakdown attached
From______to______ (Date, Date) ______ Total cost ☐ Breakdown attached
From______to______ (Date, Date) ______ Total cost ☐ Breakdown attached
From______to______ (Date, Date) ______ Total cost ☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Monitoring/inspection costs not available.

V. ACCESS AND INSTITUTIONAL CONTROLS ☐ Applicable ☒ N/A

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks: Roads are adequate for site monitoring.

B. Other Site Conditions

Remarks: N/A

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-039/HWMU-16

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

C. Treatment System ☐ Applicable ☒ N/A

D. Monitoring Data ☒ Applicable ☐ N/A

1. Monitoring Data
☒ Is routinely submitted on time ☒ Is of acceptable quality

2. Monitoring Data Suggests:
☒ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

E. Monitored Natural Attenuation ☒ Applicable ☐ N/A

1. **Monitoring Wells** (natural attenuation remedy)
☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☐ All required wells located ☐ Needs maintenance ☐ N/A
Remarks:

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Remarks: N/A

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy at RAAP-039/HWMU-16 was intended to reduce contaminant concentrations in groundwater and prevent exposure to contaminants. No issues were observed with the remedy. Signage identifying the site as a closed hazardous waste facility and restricting entry is posted. Groundwater monitoring ensures the continued effectiveness of the MNA remedy to contain the groundwater plumes and reduce contaminant concentrations.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

No issues have been observed related to the implementation and scope of O&M procedures.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

No issues have been observed that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

No opportunities for optimization have been noted.

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-042/HWMU-5

I. SITE INFORMATION

Site name: *Radford Army Ammunition Plant, RAAP-042/HWMU-5, Surface Impoundment #5*

Date of inspection: *July 31, 2017*

Location and Region: *Radford, VA*

EPA ID:

Agency, office, or company leading the five-year review: *US Army Corps of Engineers, Buffalo District*

Weather/temperature: *Low 80s F, clear*

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment
☐ Access controls
☐ Institutional controls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☐ Other ______________________________
☒ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
☐ O&M manual ☐ Readily available ☐ Up to date ☒ N/A
☐ As-built drawings ☐ Readily available ☐ Up to date ☒ N/A
☐ Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

2. **Site-Specific Health and Safety Plan** ☒ Readily available ☐ Up to date ☐ N/A
☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

4. **Permits and Service Agreements**
☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A
☐ Effluent discharge ☐ Readily available ☐ Up to date ☒ N/A
☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☒ N/A
☐ Other permits______________________ ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______________________________

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-042/HWMU-5

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ☒ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: ______

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-042/HWMU-5

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house
☐ PRP in-house
☐ Federal Facility in-house
☐ Other: ____________________

☐ Contractor for State
☐ Contractor for PRP
☒ Contractor for Federal Facility

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate: ____________________ ☐ Breakdown attached

Total annual cost by year for review period if available (not available)

From__________to__________	__________	☐ Breakdown attached
Date Date	Total cost	
From__________to__________	__________	☐ Breakdown attached
Date Date	Total cost	
From__________to__________	__________	☐ Breakdown attached
Date Date	Total cost	
From__________to__________	__________	☐ Breakdown attached
Date Date	Total cost	
From__________to__________	__________	☐ Breakdown attached
Date Date	Total cost	

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Monitoring/inspection costs not available.

V. ACCESS AND INSTITUTIONAL CONTROLS ☐ Applicable ☒ N/A

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks: Roads are adequate for site monitoring.

B. Other Site Conditions

Remarks: N/A

Five-Year Review Site Inspection Checklist
Radford Army Ammunition Plant – RAAP-042/HWMU-5

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

C. Treatment System ☐ Applicable ☒ N/A

D. Monitoring Data ☒ Applicable ☐ N/A

1. Monitoring Data
☒ Is routinely submitted on time ☒ Is of acceptable quality

2. Monitoring Data Suggests:
☒ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

E. Monitored Natural Attenuation ☒ Applicable ☐ N/A

1. **Monitoring Wells** (natural attenuation remedy)
☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☐ All required wells located ☐ Needs maintenance ☐ N/A
Remarks:

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Remarks: N/A

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy at RAAP-042/HWMU-5 was intended to reduce contaminant concentrations in groundwater and prevent exposure to contaminants. No issues were observed with the remedy. Signage identifying the site as a closed hazardous waste facility and restricting entry is posted. Groundwater monitoring ensures the continued effectiveness of the MNA remedy to contain the groundwater plumes and reduce contaminant concentrations.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

No issues have been observed related to the implementation and scope of O&M procedures.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

No issues have been observed that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

No opportunities for optimization have been noted.

ATTACHMENT 5

Photographic Record

[This Page Intentionally Left Blank]

PHOTOGRAPHIC RECORD
Radford Army Ammunition Plant

CC-001/SSA-72 Oleum Plant Acidic Wastewater Sump	
Photo No. 1 (31-July-2017) <u>Description</u>: Wastewater sump area showing warning sign that describes LUCs at the site.	
Photo No. 2 (31-July-2017) <u>Description</u>: Wastewater sump at the Oleum Plant Acidic Wastewater Sump site.	

PHOTOGRAPHIC RECORD
Radford Army Ammunition Plant

CC-002/SSA-77 Garbage Incinerator (Building 7219)

Photo No. 3
(31-July-2017)

Description: Warning sign at Garbage Incinerator site that describes LUCs. Remnants of Building 7219 can be seen in background.

Photo No. 4
(31-July-2017)

Description: Remaining structure of former garbage incinerator (Building 7219).

PHOTOGRAPHIC RECORD
Radford Army Ammunition Plant

CC-003/SSA-30/79, Asbestos Disposal Trenches 1 and 2

Photo No. 5
(31-July-2017)

<u>Description</u>: Examples of the warning signs at the asbestos disposal trenches.

Photo No. 6
(31-July-2017)

<u>Description</u>: View along the disposal trench.

PHOTOGRAPHIC RECORD
Radford Army Ammunition Plant

RAAP-001/SWMU-51 TNT Waste Acid Neutralization Pits

Photo No. 7
(31-July-2017)

Description: Sign describing LUCs at the TNT Waste Acid Neutralization Pits site.

Photo No. 8
(31-July-2017)

Description: Monitoring well at TNT Waste Acid Neutralization Pits site.

PHOTOGRAPHIC RECORD
Radford Army Ammunition Plant

RAAP-005/SWMU-13 Waste Propellant Burning Ground

Photo No. 9
(31-July-2017)

Description: LUC signage at the waste propellant burning ground. Site is on the outside of the installation fence line located between the open burning ground and the north bank of the New River.

RAAP-009/SWMU-40 Landfill Nitro Area

Photo No. 10
(31-July-2017)

Description: Sign describing LUCs at the Landfill Nitro Area.

PHOTOGRAPHIC RECORD
Radford Army Ammunition Plant

RAAP-009/SWMU-40 Landfill Nitro Area

Photo No. 11
(31-July-2017)

Description: Vegetation on the landfill cover.

RAAP-011/SWMU-41 Red Water Ash Burial Ground

Photo No. 12
(31-July-2017)

Description: LUC sign at the Red Water Ash Burial Ground.

PHOTOGRAPHIC RECORD
Radford Army Ammunition Plant

RAAP-011/SWMU-41 Red Water Ash Burial Ground

Photo No. 13
(31-July-2017)

Description: Example of vegetation on the landfill cover at the Red Water Ash Burial Ground.

RAAP-013/SWMU-49 Red Water Ash Burial #2 and RAAP-018/SWMU-48 Oily Water Burial Area

Photo No. 14
(31-July-2017)

Description: SWMU-48 and SWMU-49 are located next to one another and share a sign describing LUCs at the site. Photo also shows an example of a monitoring well at the site.

PHOTOGRAPHIC RECORD
Radford Army Ammunition Plant

RAAP-014/SWMU-54 Propellant Burning Ash Disposal

Photo No. 15
(31-July-2017)

Description: View of LUC signage in front of the Propellant Burning Ash Disposal Area.

RAAP-023/SWMU-43 Sanitary Landfill No. 2

Photo No. 16
(31-July-2017)

Description: View of LUC signage and installation fencing at Sanitary Landfill No. 2.

PHOTOGRAPHIC RECORD
Radford Army Ammunition Plant

RAAP-023/SWMU-43 Sanitary Landfill No. 2

Photo No. 17
(31-July-2017)

<u>Description</u>: View of a drainage feature that bisects that landfill and goes to the New River.

Photo No. 18
(31-July-2017)

<u>Description</u>: View of the perimeter fence line and a monitoring well at Sanitary Landfill No. 2.

PHOTOGRAPHIC RECORD
Radford Army Ammunition Plant

RAAP-024/SWMU-45 Landfill No. 3

Photo No. 19
(31-July-2017)

Description: LUC signage and monitoring well at Landfill No. 3.

Photo No. 20
(31-July-2017)

Description: View of Landfill No. 3 site. Site is vacant and wooded.

PHOTOGRAPHIC RECORD
Radford Army Ammunition Plant

RAAP-039/HWMU-16 Hazardous Waste Landfill

Photo No. 21
(31-July-2017)

Description: Warning signage at the Hazardous Waste Landfill restricting entry of unauthorized personnel or vehicles to the closed hazardous waste facility.

Photo No. 22
(31-July-2017)

Description: Two monitoring wells that are part of the monitoring network at the Hazardous Waste Landfill.

PHOTOGRAPHIC RECORD
Radford Army Ammunition Plant

RAAP-042/HWMU-5 Surface Impoundment #5

Photo No. 23
(31-July-2017)

<u>Description</u>: Warning sign at Surface Impoundment #5 restricting entry of unauthorized personnel or vehicles.

Photo No. 24
(31-July-2017)

<u>Description</u>: View of gravel cover along sides of impoundment.

PHOTOGRAPHIC RECORD
Radford Army Ammunition Plant

RAAP-001-R-01 Southeast Hillside Area of Army Reserve Small Arms Range

Photo No. 25 (31-July-2017) <u>Description</u>: LUC warning sign on the hillside area of the army reserve small arms range.	
Photo No. 26 (31-July-2017) <u>Description</u>: View of lower hillside area at RAAP-001-R-01. Site is a vacant, forested hillside.	

[This page intentionally left blank]

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Photo Location & Direction

U.S. Army Corps of Engineers

US Army Corps of Engineers
Buffalo District

Buffalo, New York

C-001/SSA-72 Oleum Plant Acidic Wastewater Sump Photo Location

Document Name: Photo_Fig1.mxd
Drawn By: H5TDEEMP
Date Saved: 06 Oct 2017
Time Saved: 1:03:57 PM

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 1

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Photo Location & Direction

U.S. Army Corps of Engineers

Buffalo, New York

US Army Corps of Engineers
Buffalo District

CC-002/SSA-77 Garbage Incinerator (Building 7219)
Photo Location

Document Name: Photo_Fig2.mxd
Drawn By: H5TDEEMP
Date Saved: 11 Oct 2017
Time Saved: 7:03:43 AM

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 2

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Photo Location & Direction

N
W E
S

0 75 150
Feet

U.S. Army Corps of Engineers
US Army Corps of Engineers
Buffalo District
Buffalo, New York

CC-003/SSA-30/79 Asbestos Disposal Trenches 1 and 2
Photo Location

Document Name: Photo_Fig3.mxd
Drawn By: H5TDEEMP
Date Saved: 11 Oct 2017
Time Saved: 7:14:17 AM

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 3

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Photo Location & Direction

0 75 150 Feet

U.S. Army Corps of Engineers

US Army Corps of Engineers
Buffalo District

Buffalo, New York

RAAP-001/SWMU-51 TNT Waste Acid Neutralization Pits Photo Location

Document Name: Photo_Fig4.mxd
Drawn By: H5TDEEMP
Date Saved: 11 Oct 2017
Time Saved: 7:23:35 AM

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 4

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

↑ Photo Location & Direction

U.S. Army Corps of Engineers

US Army Corps of Engineers
Buffalo District

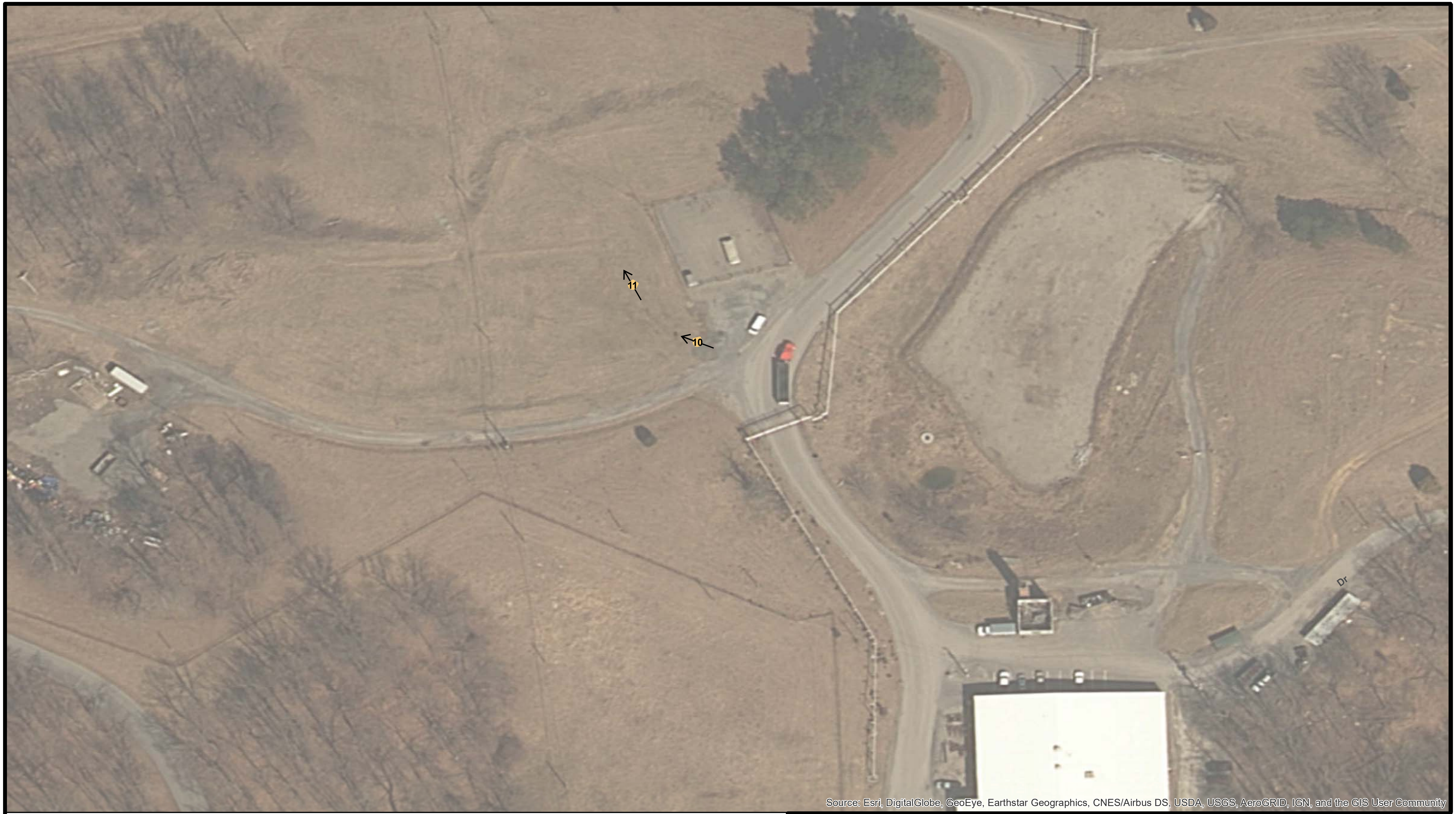
Buffalo, New York

RAAP-005/SWMU-13 Waste Propellant Burning Ground
Photo Location

Document Name: Photo_Fig5.mxd
Drawn By: H5TDEEMP
Date Saved: 11 Oct 2017
Time Saved: 7:32:41 AM

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 5



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Photo Location & Direction

N
W E
S

0 75 150
Feet

U.S. Army Corps of Engineers
US Army Corps of Engineers
Buffalo District
Buffalo, New York

RAAP-009/SWMU-40 Landfill Nitro Area
Photo Location

Document Name: Photo_Fig6.mxd
Drawn By: H5TDEEMP
Date Saved: 11 Oct 2017
Time Saved: 7:50:11 AM

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 6

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Photo Location & Direction

U.S. Army Corps of Engineers
Buffalo, New York

RAAP-011/SWMU-41B Red Water Ash Burial Ground
Photo Location

Document Name: Photo_Fig7.mxd
Drawn By: H5TDEEMP
Date Saved: 11 Oct 2017
Time Saved: 8:03:44 AM

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 7

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

Photo Location & Direction

Road Centerline

U.S. Army Corps of Engineers

US Army Corps of Engineers
Buffalo District

Buffalo, New York

Document Name: Photo_Fig8.mxd
Drawn By: H5TDEEMP
Date Saved: 11 Oct 2017
Time Saved: 8:15:37 AM

RAAP-013/SWMU-49 Red Water Ash Burial #2 &
RAAP-018/SWMU-48 Oily Water Burial Photo Location

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 8

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Photo Location & Direction

U.S. Army Corps of Engineers

US Army Corps of Engineers
Buffalo District

Buffalo, New York

RAAP-014/SWMU-54 Propellant Burning Ash Disposal Photo Location

Document Name: Photo_Fig9.mxd
Drawn By: H5TDEEMP
Date Saved: 11 Oct 2017
Time Saved: 8:48:43 AM

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 9

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Photo Location & Direction

N
W E
S

0 75 150
Feet

U.S. Army Corps of Engineers
US Army Corps of Engineers
Buffalo District
Buffalo, New York

RAAP-023/SWMU-43 Sanitary Landfill No. 2
Photo Location

Document Name: Photo_Fig10.mxd
Drawn By: H5TDEEMP
Date Saved: 11 Oct 2017
Time Saved: 8:55:55 AM

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 10

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Photo Location & Direction

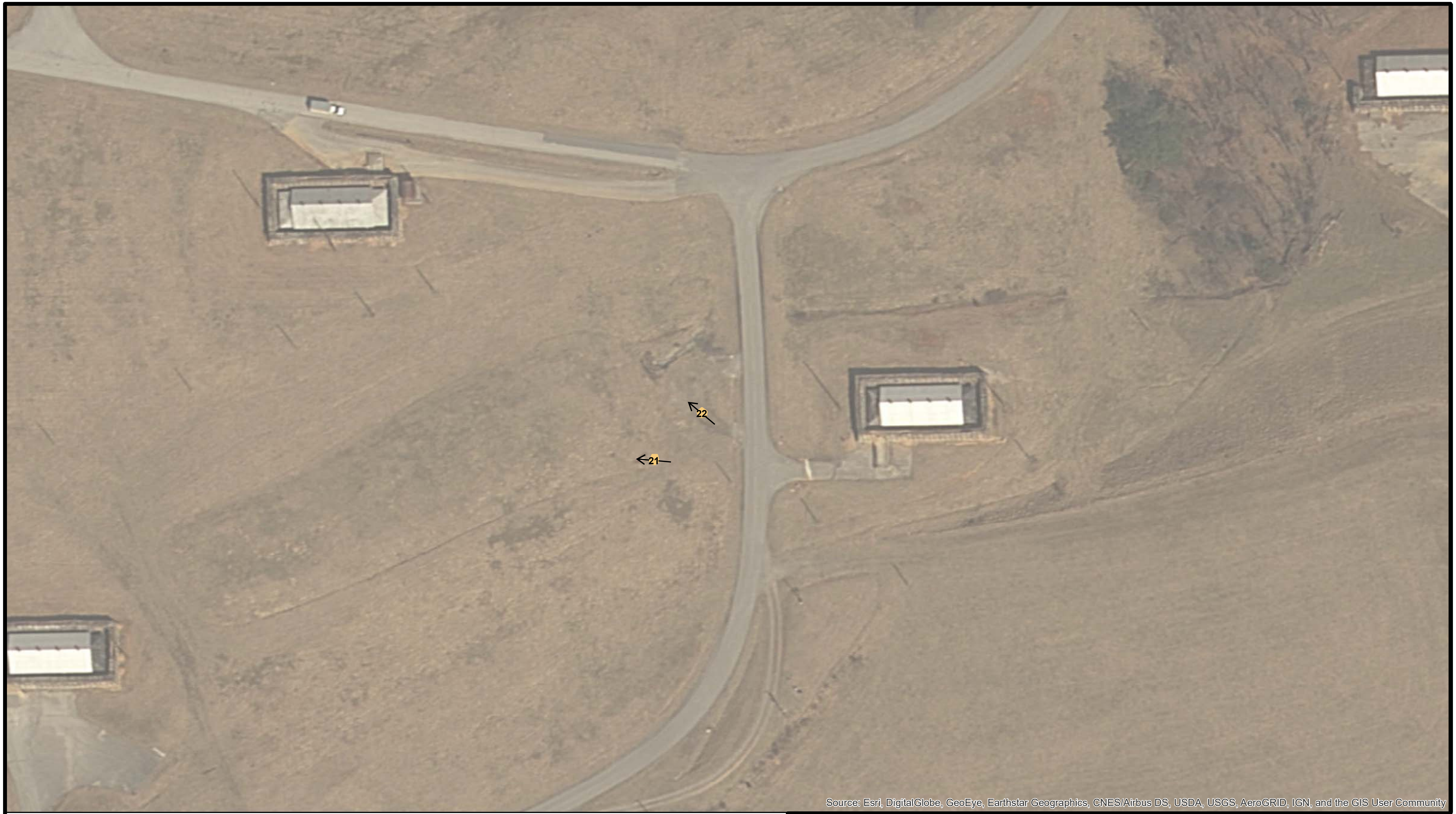
U.S. Army Corps of Engineers
Buffalo, New York

Document Name: Photo_Fig11.mxd
Drawn By: H5TDEEMP
Date Saved: 11 Oct 2017
Time Saved: 9:04:44 AM

RAAP-024/SWMU-45 Landfill No. 3
Photo Location

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 11



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

U.S. Army Corps of Engineers

US Army Corps of Engineers
Buffalo District

Buffalo, New York

RAAP-039/SWMU-16 Hazardous Waste Landfill
Photo Location

Document Name: Photo_Fig12.mxd
Drawn By: H5TDEEMP
Date Saved: 11 Oct 2017
Time Saved: 9:11:44 AM

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 12

Photo Location & Direction

U.S. Army Corps of Engineers

US Army Corps of Engineers
Buffalo District

Buffalo, New York

RAAP-042/HWMU-5 Surface Impoundment #5
Photo Location

Document Name: Photo_Fig13.mxd
Drawn By: H5TDEEMP
Date Saved: 11 Oct 2017
Time Saved: 9:21:50 AM

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 13

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Photo Location & Direction

U.S. Army Corps of Engineers
US Army Corps of Engineers
Buffalo District
Buffalo, New York

RAAP-001-R-01 Southeast Hillside Area of Army Reserve Small Arms Range Photo Location

Document Name: Photo_Fig14.mxd
Drawn By: H5TDEEMP
Date Saved: 11 Oct 2017
Time Saved: 9:29:01 AM

Radford Army Ammunition Plant
Periodic Review
Radford, Virginia

Figure 14

ATTACHMENT 6

Interview Form

[This Page Intentionally Left Blank]

INTERVIEW RECORD

Site Name: Radford Army Ammunition Plant (RFAAP)

EPA ID No.: VA1210020730

Subject: RCRA Sites

Time: *7:59AM*

Date: *October 27, 2017*

Type: ☐ Telephone ☐ Visit ☒ Other (e-mail)

☐ Incoming ☐ Outgoing

Location of Visit:

Contact Made By:

Name: Holly Akers

Title: Project Engineer

Organization: US Army Corps of Engineers, Buffalo District

Individual Contacted:

Name: James McKenna

Title: IRP Manager

Organization: RFAAP

Telephone No: (540) 731-5782
Fax No:
E-Mail Address: james.j.mckenna16.civ@mail.mil

Street Address: *Peppers Ferry Road*
City, State, Zip: *Radford, VA 24141*

Summary Of Conversation

1. How long and in what capacity have you been involved with the RCRA permitted environmental restoration?
   Since August 1998 as the Installation Restoration Manager

2. How are contracts for monitoring and inspections at the RCRA-permitted sites managed?
   They are executed by the operating contractor through the facility use contract.

3. Other than routine monitoring and inspections, are you aware of any other work completed at the RCRA-permitted sites in the last five years? If so, please explain.
   No

4. Are you aware of any changes in land use at the RCRA-permitted sites or in the surrounding area?
   No

5. When were the LUC signs installed for the RCRA-permitted sites?
   Sign installation was completed in May 20117

INTERVIEW RECORD

Site Name:	Radford Army Ammunition Plant (RFAAP)	**EPA ID No.:** VA1210020730	
Subject:	RCRA Sites	**Time:** *7:59AM*	**Date:** *October 27, 2017*

6. Are you aware of any trespassing or intrusive activities performed at the RCRA-permitted sites? If so, please explain.
   No

7. Have you received any complaints or comments from the community or other stakeholders? If so, please explain.
   No

8. Have the requirements of the RCRA-permitted LUCs been incorporated into a facility master plan or other administrative document?
   Yes

9. When was the administrative record for the RCRA-permitted sites last updated? Are the records up to date?
   October 2017 Yes

10. Are the SWMU-40, SSA-30/79, HWMU-5, and HWMU-16 soil covers performing as expected?
    Yes

11. Are the remaining remedies at the RCRA-permitted sites functioning as intended?
    Yes

12. Are inspection reports available for the SWMU-40, SSA-30/79, HWMU-5, and HWMU-16 sites since remedy implementation?
    Yes

13. Have there been any changes to the land use control implementation in the last five years (e.g., changes to the use of the NEPA process, etc.)
    No

14. Has any other information come to light that could call into question the protectiveness of the remedies?
    No

INTERVIEW RECORD

Site Name:	Radford Army Ammunition Plant (RFAAP)	**EPA ID No.:** VA1210020730	
Subject:	RCRA Sites	**Time:** *7:59AM*	**Date:** *October 27, 2017*

15. Do you have any comments, suggestions, or recommendations regarding the RCRA-permitted sites management or operation?
No

ATTACHMENT 7

Evaluation of RCRA Permit Requirements

[This Page Intentionally Left Blank]

EVALUATION OF RCRA PERMIT REQUIREMENTS

INTRODUCTION

This evaluation was prepared to address Question B of this periodic review, "Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy selection still valid?"

BACKGROUND

The Radford Army Ammunition Plant (RFAAP), located in Radford, Virginia, is an active manufacturer of explosives and propellants for the U.S. military and other uses. The installation's primary mission is to produce rocket and gun propellant to America's warfighters. RFAAP also produced TNT on an intermittent basis.

This RFAAP periodic review addresses the following fifteen (15) sites; completed within the Resource Conservation and Recovery Act (RCRA) framework:

***Sites subject to RCRA Corrective Action Permit (VDEQ 2016)*:**

- RAAP-001-R-01, Southeast Hillside Area of Army Reserve Small Arms Range (ARSAR)
- CC-001/Site Screening Area (SSA)72, Oleum Plant Acidic Wastewater Sump
- CC-002/SSA77, Garbage Incinerator (Bldg 7219)
- CC-03/SSA30/79, Asbestos Disposal Trenches 1 and 2
- RAAP-001/SWMU 51, TNT Waste Acid Neutralization Pits
- RAAP-005/SWMU 13, Waste Propellant Burning Ground
- RAAP-009/SWMU 40, Landfill Nitro Area
- RAAP-011/SWMU 41B, Red Water Ash Burial Ground
- RAAP-013/SWMU 49, Red Water Ash Burial #2
- RAAP-014/SWMU 54, Propellant Burning Ash Disposal
- RAAP-018/SWMU 48, Oily Water Burial Area
- RAAP-023/SWMU 43, Sanitary Landfill No. 2
- RAAP-024/SWMU 45, Landfill No. 3

RFAAP is not listed on the National Priorities List (NPL) and these sites operate under RCRA Corrective Action Permit Number VA 1210020730 [VDEQ 2016], issued by the state of Virginia on April 1, 2016. This permit was effective on May 1, 2016 and remains in effect until May 1, 2026. The requirements of this Permit provide for the operation and maintenance of the remedies for the corrective action units (CAUs) described in the decision documents [USEPA 2012 and USEPA 2014].

In the 2012 decision document [USEPA 2012], USEPA selected institutional controls as the final remedy for SWMUs 13, 41B, 43, 45, 51 and SSAs 72 and 77. USEPA also selected engineering controls and institutional controls as the final remedy for SWMU 40 and SSAs 30 and 79.

In the 2014 decision document [USEPA 2014], USEPA selected industrial controls (i.e., land and groundwater use restrictions) for the ARSAR and SWMUs 48, 49, and 54, and monitored natural attenuation and monitoring of groundwater underlying SWMUs 48, 49, and 54.

<u>Sites subject to RCRA Post-Closure Care Permit (VDEQ 2014)</u>**:**

- RAAP-039/HWMU 16, Hazardous Waste Landfill
- RAAP-042/HWMU 5, Surface Impoundment #5

These RFAAP sites operate under RCRA Post-Closure Care Permit Number VA 1210020730 [VDEQ 2014], issued by the state of Virginia on July 17, 2014. This permit was effective on August 16, 2014 and remains in effect until August 16, 2024. The requirements of this Permit provide for the post-closure care (i.e., maintenance and monitoring) of one closed hazardous waste surface impoundment (HWMU 5) and one hazardous waste landfill (HWMU 16).

This is the second periodic review of the RFAAP RCRA sites.

<u>EVALUATION</u>

RAAP-001-R-01, Southeast Hillside Area of Army Reserve Small Arms Range (ARSAR)
The ARSAR was a .30 caliber small arms firing range used by both the National Guard and the Army Reserve from approximately 1941 to 1968. The closed range consisted of an approximately 10-ft-high berm and four potential firing areas. Currently, public access to the RFAAP is controlled and includes the former range site although public access may have been possible in the past. The former range is now a grass field surrounded by a fence that is occasionally used as a helicopter landing pad and as a baseball field.

Although a geologic and geochemical analysis strongly suggests a natural source for elevated arsenic in the Southeast Hillside Area, concentrations of lead are above the health protective criterion for hypothetical future residents in surface soil at the Southeast Hillside Area. Although residential development of the Southeast Hillside Area is highly unlikely, the results of the lead evaluation indicate a need for land use controls (including a deed restriction) to prevent residential use. The ARSAR was added to RFAAP's RCRA Corrective Action Permit on July 15, 2005. A review of toxicity and risk assessment methodology changes to the risk-based remedial levels for the ARSAR is included in Attachment 8 of this Periodic Review Report.

CC-001/SSA72, Oleum Plant Acidic Wastewater Sump
The site is a below grade acid-brick lined sump constructed with reinforced concrete. The sump is connected to drains throughout the Oleum Plant secondary containment areas that collect runoff and process acidic wastewater. Sulfuric acid wastewater from the Oleum Plant discharged to either the Sulfuric Acid Recovery Plant-Waste Acid Treatment or C-line Acidic Wastewater Treatment Plant. CC-001/SSA-72 and the surrounding area is currently industrial use. The projected future use of the site is also industrial.

The USEPA issued the Final Decision and Response to Comments (FDRTC) [USEPA 2012] selecting the final remedy for the Oleum Plant Acidic Wastewater Sump on April 2, 2012. The USEPA selected institutional controls (ICs) [i.e. restrictions on earthmoving and residential use] as the final remedy to help minimize the potential for human exposure to contamination remaining in soil. The ICs were implemented through permit conditions [VDEQ 2016] and incorporated into the Management Manual, which is the equivalent to the Facility Master Plan.

As an added precaution, Section IV.D of Attachment A to the FDRTC [USEPA 2012] required that signs be posted to each unit where ICs are being implemented. At a minimum, the signs must be visible and legible from at least 25 feet and posted at access entrances to the individual units. This signage was present for the July 2017 site inspection associated with this periodic review.

CC-002/SSA77, Garbage Incinerator (Bldg 7219)

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

The USEPA issued the FDRTC [USEPA 2012] selecting the final remedy for the Garbage Incinerator (Bldg 7219) unit on April 2, 2012. The USEPA selected institutional controls [i.e. restrictions on earth moving and residential use] as the final remedy to help minimize the potential for human exposure to contamination remaining in soil. The ICs were implemented through permit conditions [VDEQ 2016] and incorporated into the Management Manual.

As an added precaution, Section IV.D of Attachment A to the FDRTC [USEPA 2012] required that signs be posted to each unit where ICs are being implemented. At a minimum, the signs must be visible and legible from at least 25 feet and posted at access entrances to the individual units. This signage was present for the July 2017 site inspection associated with this periodic review.

CC-003/SSA30/79, Asbestos Disposal Trenches 1 and 2

Asbestos Disposal Trench 1 (CC-003/SSA 30) is a closed asbestos disposal trench located within the southeastern section of the Horseshoe Area and adjacent to RAAP-001/SWMU 51 and Asbestos Disposal Trench 2. The trench was approximately 15 feet wide by 300 feet long and 15 feet deep at its deepest point.

Asbestos Disposal Trench 2 (CC-003/SSA 79) is located adjacent to RAAP-001/SWMU 51 in the southeastern section of the Horseshoe Area. The unit is approximately 15 feet wide by 300 feet long and is located adjacent to Asbestos Disposal Trench 1.

The USEPA issued the FDRTC [USEPA 2012] selecting the final remedy for Asbestos Disposal Trenches 1 and 2 on April 2, 2012. The USEPA selected Institutional [i.e. restrictions on earth moving and residential use] and Engineering Controls [i.e. clear marking of the area and maintenance of soil cover] as the final remedy to help minimize the potential for human exposure to asbestos remaining within the trenches. The ICs were implemented through permit conditions [VDEQ 2016] and incorporated into the Management Manual. However, it is not apparent from currently available documentation that the clay covers have been clearly marked (as shown in Photo 1).

Photo 1: SSA 30/79 Site Inspection (July 2017) for Second Periodic Review

As an added precaution, Section IV.D of Attachment A to the FDRTC [USEPA 2012] required that signs be posted to each unit where ICs are being implemented. At a minimum, the signs must be visible and legible from at least 25 feet and posted at access entrances to the individual units. This signage was present for the July 2017 site inspection associated with this periodic review.

RAAP-001/SWMU 51, TNT Waste Acid Neutralization Pits

The TNT Waste Acid Neutralization Pits unit is located on a plateau in the southeastern section of the Horseshoe Area and consists of one unlined trench, approximately 20 feet wide by 200 feet long. An estimated 10 tons of red water ash were reportedly disposed of in the trench from 1968-1972. Additionally, the trench was used for disposal of TNT neutralization sludge from the treatment of red water in the 1970s. The pits were backfilled and vegetated between 1975 and 1981. A barbed wire fence surrounds SWMU 51.

The USEPA issued the FDRTC [USEPA 2012] selecting the final remedy for the TNT Waste Acid Neutralization Pits on April 2, 2012. The USEPA selected institutional controls as the final remedy to prevent future residential use of the site. The institutional controls will also prevent future digging deeper than fifteen feet below the ground surface.

As an added precaution, Section IV.D of Attachment A to the FDRTC [USEPA 2012] required that signs be posted to each unit where ICs are being implemented. At a minimum, the signs must be visible and legible from at least 25 feet and posted at access entrances to the individual units. This signage was present for the July 2017 site inspection associated with this periodic review.

RAAP-005/SWMU 13, Waste Propellant Burning Ground

The Waste Propellant Burning Ground constitutes about 20 acres in the southeast section of the Horseshoe Area on the northern bank of the New River and is within the 100-year floodplain. Since manufacturing operations began at Radford AAP in 1941, the SWMU has been used to burn waste explosives, propellants, and laboratory wastes (propellant and explosive residues, samples and analytical residues). Prior to 1985, burning was conducted on the soil. Since then, burning has been performed in pans. A RCRA Subpart X Permit (VA1210020730) was issued by the VDEQ in October 2005 for open burning at the OBG.

The USEPA issued the FDRTC [USEPA 2012] selecting the final remedy for the Waste Propellant Burning Ground on April 2, 2012. The USEPA selected institutional controls [i.e. restrictions on earth moving and residential use] as the final remedy to help minimize the potential for human exposure to hot spots of lead in soil. A review of toxicity and risk assessment methodology changes to the risk-based remedial levels for SWMU 13 is included in Attachment 8 of this Periodic Review Report.

As an added precaution, Section IV.D of Attachment A to the FDRTC [USEPA 2012] required that signs be posted to each unit where ICs are being implemented. At a minimum, the signs must be visible and legible from at least 25 feet and posted at access entrances to the individual units. This signage was present for the July 2017 site inspection associated with this periodic review.

RAAP-009/SWMU 40, Landfill Nitro Area

In the 1970s and early 1980s, the Landfill Nitro Area, which is approximately 1.5 acres, was reportedly used as a sanitary landfill to dispose of uncontaminated paper, municipal refuse, cement, and rubber tires. Whether hazardous wastes or wastes containing hazardous constituents were ever disposed of in the landfill is not known. Between 1991 and 1992, a fenced enclosure for asbestos storage was constructed over the northeast corner of this SWMU. The unit was not permitted as a solid waste landfill by the Commonwealth of Virginia. Operation ceased and the unit was closed with a clay cap and grass cover. The current land use is undeveloped industrial, which is unlikely to change in the future due to the presence of a 2-acre closed landfill contained by a surface cap and cover.

A 2009 risk assessment of SWMU indicated elevated risk associated with aluminum in soils if the land changed to residential or if the impacted soil was not left in place. A review of toxicity and risk assessment methodology changes to the risk-based remedial levels for SWMU 40 is included in Attachment 8 of this Periodic Review Report.

An Interim Measures Work Plan [UXB-KEMRON 2011] provided the technical approach, data screening, evaluation and assessment criteria and exit strategy for the groundwater monitoring effort. Groundwater monitoring would be conducted quarterly (Year 1), every 9 months (Years 2-5), and annually (Years 6-30 if required).

The USEPA issued the FDRTC [USEPA 2012] selecting the final remedy for the Landfill Nitro Area on April 2, 2012. The USEPA selected Institutional (i.e. prevent residential use, earth moving, and restrict potable use of groundwater] and Engineering Controls [repairs to the landfill cap, long-term inspection and maintenance of the cap and clear marking of the capped area] and LTM of groundwater as the final remedy to help minimize the potential for human exposure to landfill waste remaining in place and contamination remaining in soil above levels appropriate for residential and domestic uses.

As discussed in Section 9.2 of the Interim Measures Work Plan [UXB-KEMRON 2011], inspections of the landfill cap to ensure landfill integrity is maintained would be conducted in conjunction with groundwater monitoring events and thus would follow the same schedule. The Remedy Review Report for SWMU 40 [KEMRON 2015a] recommended to maintain the cover and inspections, but to discontinue the long-term groundwater monitoring. Section 2.1 of the Remedy Review Report for SWMU 40 [KEMRON 2015a] indicates that a cap inspection was performed on December 1, 2014 along with the remedy review inspection and no issues or deficiencies were noted and that no corrective actions have been necessary since interim measure implementation. Section 3.1 of this report recommended continued enforcement of the LUCs, mowing to control vegetative growth, and annual inspections of the SWMU to verify on-going achievement of the corrective measure objectives for SWMU 40.

It does not appear from the July 2017 site inspection that the landfill cap has been clearly marked, as shown in Photo 2.

Photo 2: SWMU 40 Site Inspection (July 2017) for Second Periodic Review

As an added precaution, Section IV.D of Attachment A to the FDRTC [USEPA 2012] required that signs be posted to each unit where ICs are being implemented. At a minimum, the signs must be visible and legible from at least 25 feet and posted at access entrances to the individual units. This signage was present for the July 2017 site inspection associated with this periodic review.

RAAP-011/SWMU 41, Red Water Ash Burial Ground

The Red Water Ash Burial Ground is located in the southeastern portion of the Radford AAP Main Manufacturing Area. The unit consists of two non-contiguous disposal areas (SWMU 41A and SWMU 41B) for red water ash. In TNT manufacturing, a red colored wastewater, known as red water, is produced. Red water, generated from continuous-type process TNT manufacturing, was concentrated by evaporation and the residue was burned in rotary kilns located in the former TNT manufacturing area.

SWMU 41A is a former unlined lagoon area, which has been backfilled with up to 15 feet of clay fill. This lagoon received rinsate from ash-transport vehicle rinsing. SWMU 41B is a 0.36 acre natural clay-lined landfill containing red water ash. The ash produced from these kilns was disposed of in SWMU 41B from 1967 to 1971. Disposal ceased in 1971 and SWMU 41B was deactivated.

The 2005 RFI identified metals as COPCs in soil and groundwater at SWMU 41B. A review of toxicity and risk assessment methodology changes to the risk-based remedial levels for SWMU 41B is included in Attachment 8 of this Periodic Review Report.

The USEPA issued the FDRTC [USEPA 2012] selecting the final remedy for the Red Water Ash Burial Ground on April 2, 2012. The final remedy applies only to disposal area SWMU 41B; SWMU 41A was found to require no action. The USEPA selected institutional controls [i.e. prevent residential use and earth-moving] as the final remedy to help minimize the potential for human exposure to contamination remaining in groundwater and soil above levels appropriate for residential and domestic uses.

As an added precaution, Section IV.D of Attachment A to the FDRTC [USEPA 2012] required that signs be posted to each unit where ICs are being implemented. At a minimum, the signs must be visible and legible from at least 25 feet and posted at access entrances to the individual units. This signage was present for the July 2017 site inspection associated with this periodic review.

RAAP-013/SWMU 49, Red Water Ash Burial #2

The Red Water Ash Burial #2 unit is approximately 75 feet by 50 feet and is located in the Horseshoe Area, contiguous with RAAP-018/SWMU 48, SWMU 50 and SWMU 59. The four SWMUs were classified together during the 1980s because a distinction could not be made between the areas by visual observation. SWMU 48 was later divided into an upper and a lower disposal area, and SWMU 49 was determined to be part of the RAAP-018/SWMU 48 lower disposal unit. The primary concern in soil at SWMU 48 was 2,4,6-TNT and 2,4-DNT, located within a thin ash layer near the base of the southern trench. SWMUs 48 and 49 share unlined trenches where oily wastewater and red water ash were disposed starting around 1970. SWMU 49 reportedly received 10 tons of red water ash during its active life.

In 2011, an interim measure was conducted where 3,393 tons of nonhazardous soil and 101.6 tons of hazardous soil were removed and disposed off-site. No further action is necessary for SWMU 48 soils. A 2013 human health risk assessment (HHRA) [Shaw 2014] determined that the SWMU 48 and SWMU 49 soil cleanup effort achieved residential soil risk guidelines and is now available for unrestricted use.

Supplemental groundwater sampling, including the installation of additional monitoring wells, identified carbon tetrachloride (CT) and trichloroethene (TCE) in SWMU 48/49 groundwater exceeding USEPA's maximum contaminant levels (MCLs) The presence of daughter products (i.e., chloroform and cis-1,2-DCE) in groundwater in the combined study area and results from a monitored natural attenuation (MNA) analysis conducted for the combined study area groundwater indicated that MNA processes including biodegradation, sorption, dilution, dispersion, and chemical stabilization are occurring in groundwater at the combined study area. The groundwater remedy identified for SWMU 49 in the RFI Report [Shaw 2014] was monitored natural attenuation and LUCs (i.e. groundwater use restrictions) until the remedial goals [i.e. USEPA MCLs] are met.

As an added precaution, Section IV.D of Attachment A to the FDRTC [USEPA 2012] required that signs be posted to each unit where ICs are being implemented. At a minimum, the signs must be visible and legible from at least 25 feet and posted at access entrances to the individual units. This signage was present for the July 2017 site inspection associated with this periodic review.

Attachment C (Page 1) of the RCRA permit [VDEQ 2016] identifies the remedial goals (RGs) for CT and TCE in SWMU 49 groundwater. As summarized in Table A7-1, no groundwater standards have changed since the RCRA permit [VDEQ 2016] was issued.

RAAP-014/SWMU 54, Propellant Burning Ash Disposal

The Propellant Burning Ash Disposal unit is located within the easternmost portion of the Horseshoe Area at Radford AAP. The unit consists of two non-contiguous disposal areas; Area A is an approximately 0.58-acre triangular shaped area in the southern portion of the unit and Area B is an approximately 1.09-acre area in the northern portion of the unit. The site was reportedly used as a disposal area in the late 1970s for ash from propellant burning activities located at the Waste Propellant Burning Grounds (RAAP-005/SWMU 13). The SWMU is positioned within a 100-year floodplain on a terrace feature of the New River.

In the late 1970s, ash from propellant burning operations at nearby RAAP-005/SWMU 13 was reportedly disposed of at the unit. The propellant ash consists of a residue resulting from the burning of waste explosives, propellants, and laboratory waste. The actual disposal practices at the unit are unknown, as conflicting information describing the practices exists.

In 2010/2011 am interim corrective measure was conducted which involved soil excavation with off-site disposal and MNA for groundwater with LUCs (groundwater use restrictions) until remedial goals are met. Approximately 870 tons of hazardous soil and 4,921 tons of nonhazardous soil were removed from Area A and 2,200 tons of hazardous soil and 2,288 tons of non-hazardous soil are removed from Area B. This measure resulted in SWMU 54 soils available for unrestricted use.

The remedy identified for Area A groundwater underlying SWMU 54 in the RFI/CMS Report [URS 2008] was monitored natural attenuation with quarterly performance monitoring and LUCs (i.e. groundwater use restrictions) until the risk-based RGs identified in both Table 8-1 of the RFI/CMS Report [URS 2008] and Attachment C of the RCRA Permit [VDEQ 2016] are met. A review of toxicity and risk assessment methodology changes to the risk-based remedial levels for SWMU 54 is included in Attachment 8 of this Periodic Review Report.

As an added precaution, Section IV.D of Attachment A to the FDRTC [USEPA 2012] required that signs be posted to each unit where ICs are being implemented. At a minimum, the signs must be visible and legible from at least 25 feet and posted at access entrances to the individual units. This signage was present for the July 2017 site inspection associated with this periodic review.

RAAP-018/SWMU 48, Oily Water Burial Area

The Oily Water Burial Area is contiguous to RAAP-013/SWMU 49, SWMU 50, and SWMU 59. An estimated 200,000 gallons or more of oil-contaminated wastewater were disposed of in unlined trenches at this unit prior to the off-plant recycling of used oil. SWMU 48 is approximately 380 ft long by 120 ft wide.

In 2011, an interim measure was conducted where 3,393 tons of nonhazardous soil and 101.6 tons of hazardous soil were removed and disposed off-site. A 2013 human health risk assessment (HHRA) [Shaw 2014] determined that the SWMU 48 and SWMU 49 soil cleanup effort achieved residential soil risk guidelines and is now available for unrestricted use. No further action is necessary for SWMU 48 soils.

Supplemental groundwater sampling, including the installation of additional monitoring wells, identified carbon tetrachloride (CT) and trichloroethene (TCE) in SWMU 48/49 groundwater exceeding USEPA’s maximum contaminant levels (MCLs) The presence of daughter products (i.e., chloroform and cis-1,2-DCE) in groundwater in the combined study area and results from a monitored natural attenuation (MNA) analysis conducted for the combined study area groundwater indicated that MNA processes including biodegradation, sorption, dilution, dispersion, and chemical stabilization are occurring in groundwater at the combined study area.

The groundwater remedy identified for SWMUs 48/49 in the RFI Report [Shaw 2014] was monitored natural attenuation and LUCs (i.e. groundwater use restrictions) until the remedial goals [i.e. USEPA MCLs] are met. The RFI Report [Shaw 2014] also recommended that long-term monitoring of the combined study area groundwater (i.e., SWMUs 48 and 49) to further evaluate contaminant concentrations and MNA of contaminants in groundwater.

As an added precaution, Section IV.D of Attachment A to the FDRTC [USEPA 2012] required that signs be posted to each unit where ICs are being implemented. At a minimum, the signs must be visible and legible from at least 25 feet and posted at access entrances to the individual units. This signage was present for the July 2017 site inspection associated with this periodic review.

Attachment C (Page 1) of the RCRA permit [VDEQ 2016] identifies the remedial goals (RGs) for CT and TCE in SWMU 49 groundwater. However, no groundwater COCs or remedial goals for SWMU 48 groundwater are listed in the RCRA Permit [VDEQ 2016]. TCE has been detected in SWMU 48 groundwater which is hydraulically upgradient from SWMU 49 (e.g., See groundwater wells 48MW06 and 18MW1 in Figure 1 below) and therefore, the protectiveness of the SWMU 48 remedy (MNA) still relies on LUCs until groundwater RGs are met.

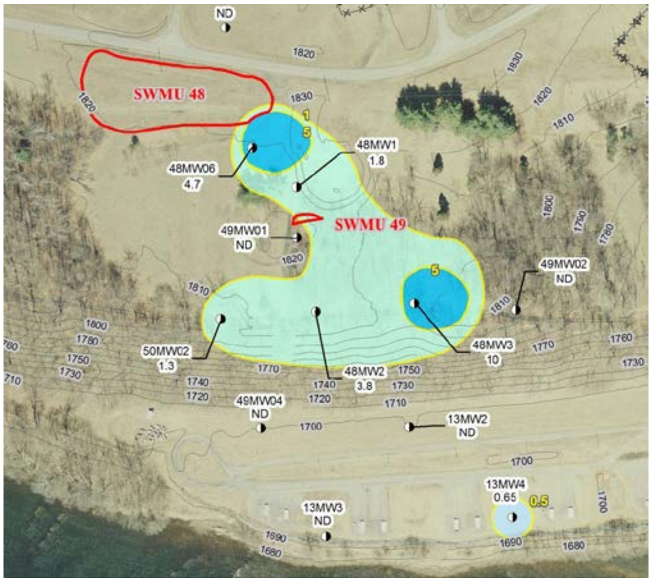


Figure 1: SWMU 49 TCE Isopleths – September 2015
Reference: Figure 5-2 of the SWMU 49 MNA Sampling Year One Report [BSEn 2017]

To address this issue and ensure that this MNA and LUC remedy for SWMU 48 remains long-term protective, a modification is required to the RCRA Permit [VDEQ 2016] to officially add TCE, CT, TCE degradation products (i.e., cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride) and CT degradation products (i.e., chloroform, methylene chloride (dichloromethane), and chloromethane) as potential future groundwater COCs or, at minimum, targeted corrective action contaminants (i.e., MNA performance monitoring indicators) for SWMU 48 groundwater.

As summarized in Table A7-1, no groundwater standards for SWMU 49 have changed since the RCRA permit [VDEQ 2016] was issued.

RAAP-023/SWMU 43, Sanitary Landfill No. 2

Sanitary Landfill NO.2 is a closed, unlined sanitary landfill of approximately two acres, located immediately adjacent to the New River in the northeast section of the Main Manufacturing Area. The unit consists of two adjacent approximately 1.5-acre cells divided by a central drainage ditch. Based on geophysics and aerial photography, the landfill extends east-west approximately 700 feet on either side of the drainage ditch. The north and south boundaries are the river bank and the paved roadway, respectively. The landfill has a north-south dimension of approximately 150 feet. The former trench-fill operation reportedly received at least 300 tons of paper and refuse over its active life. The landfill was reportedly operated from 1958 to the early 1970s.

The RFI Report for SWMU 43 [Shaw 2011] indicates that institutional controls to support the current industrial/commercial use of the site is the remedy to minimize exposure to arsenic, dioxins/furans (TCDD TE), and benzo(a)pyrene in soil, and arsenic, manganese, and PCE in surface water and groundwater at the site. A review of toxicity and risk assessment methodology changes to the risk-based remedial levels for SWMU 43 is included in Attachment 8 of this Periodic Review Report.

As an added precaution, Section IV.D of Attachment A to the FDRTC [USEPA 2012] required that signs be posted to each unit where ICs are being implemented. At a minimum, the signs must be visible and legible from at least 25 feet and posted at access entrances to the individual units. This signage was present for the July 2017 site inspection associated with this periodic review.

RAAP-024/SWMU 45, Landfill No. 3

Landfill NO. 3, consists of a 3.4 acre area in the northwest section of the Main Manufacturing Area. The New River is located approximately 200 feet north-northwest of the unit. Historical records indicate that the landfill was in operation from 1957 to 1961. Previous investigations determined that a variety of waste, including scrap metal, paper, and municipal refuse were the materials reportedly disposed of in the unit. Evidence of burning has been observed in the area. A description of all wastes and waste constituents that were ever known to have been discharged to the closed surface impoundment is provided in Appendix C of Permit Attachment 2 [VDEQ 2014].

The SSP Report for SWMU 45 [URS 2010b] indicates that institutional controls are required to support the current industrial/commercial use of the site as a closed SWMU, including the placement of a deed restriction. A review of toxicity and risk assessment methodology changes to the risk-based remedial levels for SWMU 43 is included in Attachment 8 of this Periodic Review Report.

As an added precaution, Section IV.D of Attachment A to the FDRTC [USEPA 2012] required that signs be posted to each unit where ICs are being implemented. At a minimum, the signs must be visible and legible from at least 25 feet and posted at access entrances to the individual units. This signage was present for the July 2017 site inspection associated with this periodic review.

RAAP-039/HWMU 16, Hazardous Waste Landfill

The Hazardous Waste Landfill covers about two acres and is located in the Horseshoe Area. The landfill was used for lab chemicals and incinerator residue and as a burning ground. A complete listing of the wastes contained in HWMU 16 is presented in Appendix C of Permit Attachment 3 [VDEQ 2014]. The landfill was closed on August 10, 1993. Therefore, the post-closure period for HWMU 16 shall extend to August 10, 2023, or until the Director approves clean closure of the unit.

The Post-Closure Care Plan for Units 5, 7, and 16 (Appendix C.2 to Attachment 1 of the VDEQ RCRA Post-Closure Care Permit [VDEQ 2014], lists groundwater monitoring, semi-annual post-closure inspections of the warning signage, groundwater monitoring wells, permanent survey benchmarks, leachate collection sump and cover systems [with additional inspections following inclement weather or catastrophic events], maintenance [as required based upon the inspections], and land use restrictions (including warning signage and a notice in the deed to the property) are required to maintain the protectiveness of the remedy.

The compliance period to achieve the groundwater protection standards (GPSs), listed in Appendix G of Permit Attachment 3 [VDEQ 2014], was 13 years from the effective date of the permit [VDEQ 2014] and continues until 2015, or the Director approves clean closure of the unit. This compliance period shall be extended until GPSs have not been exceeded at the point of compliance for three consecutive years.

Appendix E of Permit Attachment 3 [VDEQ 2014] lists the groundwater COCs and Appendix G of the Permit Attachment 3 [VDEQ 2014] lists groundwater protection standards (GPSs) for which semiannual compliance is required. The GPSs are based upon USEPA MCLs/maximum contaminant level goals (MCLGs), VDEQ default risk-based alternate concentration limits (ACLs) [based upon individual risk of 1 x 10^{-6}]/risk-based USEPA regional screening levels (RSLs], or compared to background levels (i.e., calculated using analytical data from 1996 through 1998 for upgradient well 16C1). A review of toxicity and risk assessment methodology changes to the risk-based GPSs for HWMU 16 is included in Attachment 8 of this Periodic Review Report. As shown in Table A7-2, no groundwater standards have changed since the RCRA permit [VDEQ 2014] was issued.

In addition to groundwater monitoring requirements, the RCRA permit [VDEQ 2014] requires semi-annual post-closure inspections of the warning signage, groundwater monitoring wells, permanent survey benchmarks, leachate collection sump and cover systems [with additional inspections following inclement weather or catastrophic events], maintenance [as required based upon the inspections], and land use restrictions (including warning signage and a notice in the deed to the property) to maintain the protectiveness of the remedy.

RAAP-042/HWMU 5, Surface Impoundment #5

Surface Impoundment #5 is located in the middle of the Main Manufacturing Area. The surface impoundment was used for acidic wastewaters. Sludge was removed, but contaminated soil below the sludge layer was left in place. The lagoon was filled and capped. It is a closed lined neutralization pond, however, leakage may have occurred prior to installation of the liner. The hazardous waste surface impoundment was closed on October 26, 1989. Therefore, the post-closure period for HWMU 5 shall extend to October 26, 2019, or until the Director approves clean closure of the unit.

The Post-Closure Care Plan for Units 5, 7, and 16 (Appendix C.2 to Attachment 1 of the VDEQ RCRA Post-Closure Care Permit [VDEQ 2014], list groundwater monitoring, semi-annual post-closure inspections of the warning signage, groundwater monitoring wells, permanent survey benchmarks, and cover systems [with additional inspections following inclement weather or catastrophic events], maintenance [as required based upon the inspections], and land use restrictions (including warning signage and a notice in the deed to the property) are required to maintain the protectiveness of the remedy.

The compliance period to achieve the groundwater protection standards (GPSs) through MNA, listed in Appendix G of Permit Attachment 2 [VDEQ 2014], is 19 years. The original permit for HWMU 5 was issued on September 28, 2001. There compliance period, therefore, continues until October 28, 2020, or until the Director approves clean closure of the unit. This compliance period shall be extended until GPSs have not been exceeded at the point of compliance for three consecutive years.

Appendix K of Permit Attachment 2 [VDEQ 2014] lists the groundwater COCs and their groundwater protection standards (GPSs) for which annual compliance with GPSs is required. Appendix J of the Permit Attachment 2 [VDEQ 2014] lists target analytes that are sampled semiannually, which consist of TCE and its daughter products. Each groundwater constituent is assigned a GPS, which is based upon the practical quantitation limits, VDEQ default risk-based alternate concentration limits (ACLs) [based upon individual risk of 1 x 10^{-6}]/risk-based USEPA regional screening levels (RSLs], or compared to background levels (i.e., calculated using analytical data from First Quarter 1996 through First Quarter 1999 for upgradient well 5W8B). A review of toxicity and risk assessment methodology changes to the risk-based GPSs for HWMU 5 is included in Attachment 8 of this Periodic Review Report. As shown in Table A7-3, no groundwater standards have changed since the RCRA permit [VDEQ 2014] was issued.

In addition to groundwater monitoring requirements, the RCRA permit [VDEQ 2014] requires semi-annual post-closure inspections of the warning signage, groundwater monitoring wells, permanent survey benchmarks, and cover systems [with additional inspections following inclement weather or catastrophic events], maintenance [as required based upon the inspections], and land use restrictions (including warning signage and a notice in the deed to the property) to maintain the protectiveness of the remedy.

CONCLUSIONS

There are no newly promulgated or modified requirements of federal or state environmental laws that would change the protectiveness of the remedies implemented at the Radford AAP.

However, the following issues, which that may impact the protectiveness of the remedies, were identified during the evaluation:

Issue		Affects Short-Term Protectiveness?	Affects Long-Term Protectiveness?
1	As required by the engineering controls, the landfill cap or cover soils has not been clearly marked. This issue applies to the following units: *CC-003/SSA 30/79; and RAAP-009/SWMU 40*	No	Yes
2	The protectiveness of the SWMU 48/49 remedy (MNA) relies on LUCs until groundwater RGs for TCE and CT are met. However, TCE and CT degradation products are neither identified as groundwater COCs nor target analytes in the RCRA Permit [VDEQ 2016]. This issue applies to the following units: RAAP-018/SWMU 48; and RAAP-013/SWMU 49	No	Yes

3	No COCs or remedial goals for SWMU 48 groundwater are listed in the RCRA Permit [VDEQ 2016] despite TCE detections in SWMU 48 groundwater approaching SWMU 49 groundwater remedial goals.	No	Yes

REFERENCES

KEMRON Remediation Services, Inc. (KEMRON) 2015a. *Radford Army Ammunition Plant Performance Based Acquisition Solid Waste Management Unit 40 (RAAP-009) Landfill Nitro Area Remedy Review*, May.

KEMRON 2015b. *Radford Army Ammunition Plant Performance Based Acquisition Solid Waste Management Unit 40 (RAAP-009) Landfill Nitro Area Annual Long Term Monitoring Report: LTM Year 4*, March.

Shaw Environmental, Inc. (Shaw) 2014. *SWMUs 48 and 49 RCRA Facility Investigation Report, Radford Army Ammunition Plant*, January.

Shaw 2011. *SWMU 43 RCRA Facility Investigation Report, Radford Army Ammunition Plant*, January.

UXB-KEMRON Remediation Services, LLC (UXB-KEMRON) 2011. *Radford Army Ammunition Plant Performance Based Acquisition Solid Waste Management Unit 40 (RAAP-009) Landfill Nitro Area Interim Measures Work Plan*, August.

URS 2010b. *Solid Waste Management Unit 45 (RAAP-24) Site Screening Process Report*, January.

URS 2008. *Solid Waste Management Unit 54 RCRA Facility Investigation/Corrective Measures Study Report*, September.

United States Army Corps of Engineers (USACE) 2014. *First Periodic Review Report, Radford Army Ammunition Plan*, March.

United States Environmental Protection Agency (USEPA) 2014. *Final Decision and Response to Comments, Radford Army Arsenal*, August 18.

USEPA 2012. *Final Decision and Response to Comments, Radford Army Arsenal*, April 2.

Virginia Department of Environmental Quality (VDEQ) 2016. *Hazardous Waste Management Permit for Corrective Action*, April 1.

VDEQ 2014. *Hazardous Waste Management Post-Closure Care Permit*, July 17, as modified.

Table A7-1: RCRA Corrective Action Permit Requirements for the SWMU 49 Red Water Ash Burial #2 at Radford AAP

Media of Concern	Chemical of Concern	RCRA Permit Requirements[a] / Current USEPA MCLs[b]	Units	Have USEPA MCLs changed since the RCRA permit[a] was issued?	Are USEPA MCLs more stringent than identified in the RCRA permit[a]?	Does this affect protectiveness of the remedy?
Groundwater	Carbon Tetrachloride	5 / 5	µg/L	No	-	-
	Trichloroethylene (TCE)	5 / 5		No	-	-

[a] Reference: VDEQ *Hazardous Waste Management Permit for Corrective Action, Attachment C (Page 1),* April 1, 2016.
[b] Reference: *National Primary Drinking Water Regulations* [40 CFR 141.61]

AAP	Ammunition Plant
MCL	Maximum Contaminant Level
µg/L	micrograms per liter
USEPA	United States Environmental Protection Agency
VDEQ	Virginia Department of Environmental Quality

Table A7-2: RCRA Corrective Action Permit Requirements for the HWMU 16 Hazardous Waste Landfill at Radford AAP

Media of Concern	Chemical of Concern	GPSs[a] / Current USEPA MCLs[b]/MCLGs[c]	Units	Have USEPA MCLs/MCLGs changed since the RCRA permit[a] was issued?	Are USEPA MCLs/MCLGs more stringent than GPSs identified in the RCRA permit[a]?	Does this affect protectiveness of the remedy?
Groundwater	Arsenic, Total	10/10	µg/L	No	-	-
	Barium, Total	2,000/2,000		No	-	-
	Beryllium, Total	4/4		No	-	-
	Cadmium, Total	5/5		No	-	-
	Chromium, Total	100/100		No	-	-
	Copper, Total	1,300/1,300 [c]		No	-	-
	Lead, Total	15/ 15[c]		No	-	-
	Mercury, Total	2/2		No	-	-
	Benzene	5/5		No	-	-
	Carbon Tetrachloride	5/5		No	-	-
	1,1-dichloroethene[d]	7/7		No	-	-

Groundwater	Ethylbenzene; phenylethane	700/700		No	-	-
	Tetrachloroethene (PCE)	5/5		No	-	-
	Toluene	1,000/1,000		No	-	-
	1,1,1-Trichloroethane; Methylchloroform	200/200		No	-	-
	Trichloroethylene (TCE)	5 / 5		No	-	-
	Xylenes, Total	10,000/10,000		No	-	-

[a] Reference: VDEQ *Hazardous Waste Management Post-Closure Care Permit, Appendix G to Attachment 3,* September 12, 2014.
[b] Reference: *National Primary Drinking Water Regulations* [40 CFR 141 Subpart G] Maximum Contaminant Level
[c] Reference: *National Primary Drinking Water Regulations* [40 CFR 141 Subpart I] Maximum Contaminant Level Goals
[d] Reference: VDEQ *Hazardous Waste Management Post-Closure Care Permit*, Class 1 Modification to *Appendix G to Attachment 3*, July 17, 2014.

AAP	Ammunition Plant
GPSs	groundwater protection standards
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
µg/L	micrograms per liter
USEPA	United States Environmental Protection Agency
VDEQ	Virginia Department of Environmental Quality

Table A7-3: RCRA Corrective Action Permit Requirements for the HWMU 5 Hazardous Waste Landfill at Radford AAP

Media of Concern	Chemical of Concern	GPSs[ad] / Current USEPA VDEQ MCLs[b]/MCLGs[c]	Units	Have USEPA MCLs/MCLGs changed since the RCRA permit[a] was issued?	Are USEPA MCLs/MCLGs/ more stringent than GPSs identified in the RCRA permit[a]?	Does this affect protectiveness of the remedy?
	Compliance Monitoring Constituents[a]					
Groundwater	Antimony, Total	6/6	µg/L	No	-	-
	Arsenic, Total	10/10		No	-	-
	Barium, Total	2,000/2,000		No	-	-
	Beryllium, Total	4/4		No	-	-
	Cadmium, Total	5/5		No	-	-
	Chromium, Total	100/100		No	-	-
	Copper, Total	1,300/1,300 [c]		No	-	-
	Lead, Total	15/ 15[c]		No	-	-
	Mercury, Total	2/2		No	-	-
	Selenium, Total	50/50		No	-	-
	Thallium Total	2/2		No	-	-

Groundwater	Chloroform	80/80		No	-	-
	1,2-dichloroethane	5/5		No	-	-
	Methylene Chloride (Dichloromethane)	5/5		No	-	-
	Toluene	1,000/1,000		No	-	-
	Xylenes, Total	10,000/10,000		No	-	-
	Target Analytes[d]					
	Trichloroethene (TCE)	5/5		No	-	-
	1,1-dichloroethene	7/7		No	-	-
	Cis-1,2-DCE	70/70		No	-	-
	Trans-1,2-DCE	100/100		No	-	-
	Vinyl chloride	2/2		No	-	-

[a] Reference: VDEQ *Hazardous Waste Management Post-Closure Care Permit*, *Appendix K to Attachment 2,* July 17, 2014/November 7, 2016 modification.

[b] Reference: *National Primary Drinking Water Regulations* [40 CFR 141 Subpart G] Maximum Contaminant Level

[c] Reference: *National Primary Drinking Water Regulations* [40 CFR 141 Subpart I] Maximum Contaminant Level Goals

[d] Reference: VDEQ *Hazardous Waste Management Post-Closure Care Permit*, *Appendix J to Attachment 2,* July 17, 2014.

AAP	Ammunition Plant
GPSs	groundwater protection standards
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
USEPA	United States Environmental Protection Agency
VDEQ	Virginia Department of Environmental Quality
µg/L	micrograms per liter

ATTACHMENT 8

Risk Assessment and Toxicology Evaluation

[This Page Intentionally Left Blank]

Risk Assessment and Toxicology Evaluation

This evaluation was prepared to address Question B, *"Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (RAOs) used at the time of the remedy selection still valid?"*

HUMAN HEALTH

The basis for remedial action for each of the sites, and the human health risk assessment and toxicity criteria which form the basis of these remedial actions, are reviewed for each of the areas separately. Since previous interim corrective actions were taken across the plant to address previous releases to the environment, the final RCRA permits for this site indicate restrictions to exposure, which may include groundwater monitoring, and/or prohibitions on residential development of the site. This risk assessment and toxicology review focuses on the main constituent(s) at each site that may be remaining after the previous interim action(s). For most of the solid waste management units (SWMU's) and all of site screening areas (SSA's) under the purview of the 2016 RCRA permit, a specific list of constituents of concern, and associated cleanup goals, was not provided in the permit which stipulates the restrictions on exposure which are warranted to ensure continued protection of human health (with the exceptions of SWMU's 49 and 54). For the rest of the sites under that permit, rather than review all constituents of potential concern which may have prompted a previous interim corrective action, this review focuses on toxicity criteria updates for human health risk drivers to assess current protectiveness of the remedy.

The current land use (industrial) and associated exposures remain the same as that assessed during site investigations and characterization of risk. Standard USEPA Risk Assessment Guidance for Superfund protocols were followed when characterizing site risks, which generally commenced with a screening step utilizing generic exposure assumptions and default exposure parameter values. The USEPA's generic risk-based screening levels (RSLs) were often used, as either groundwater monitoring goals, or justification for use of land-use controls to limit potentially unacceptable exposures. In this review, updates to these USEPA generic RSLs are used as they represent concentrations in environmental media determined to be protective of human health for either residential or generic worker exposure scenarios (at an incremental lifetime cancer risk of 1E-06 and hazard index of 1). These risk-based screening levels are updated approximately every 6 months, and use the latest toxicity criteria, default (conservative) exposure assumptions, and physical and chemical parameters. Therefore, comparing the most current RSLs to both the cleanup goals and also to residual concentrations for constituents of concern (COCs) currently in site environmental media (when warranted) supports the determination of effects of updates to toxicity criteria and risk methodology on the protectiveness of the remedy. This comparison technique was also used to evaluate any significant toxicity criteria changes which may have affected constituents of potential concern (COPCs), in order to ensure that chemicals were not missed at the RFI state that may pose an unacceptable risk now. (Sites which are subject to institutional controls and/or containment to limit exposure to all site contaminants were not reviewed for toxicity updates to COPCs, rather, the review of COPCs focused on sites subjected to partial cleanup where exposure to residual concentrations of contaminants may be occurring.)

Since updates to the USEPA's recommended default exposure assumptions (USEPA 2014) are generally less conservative (lower rates of exposures) than previously utilized, no detailed or separate review of specific exposure assessment parameters is provided here. (Although minor updates to the USEPA's risk-based screening levels may result from updates to recommended default exposure parameter values, greater changes in these screening values result from toxicity criteria changes. For constituents with recent toxicity criteria changes, updates to risk-based screening levels are included in this review.)

One exposure pathway for which recently updated risk assessment guidance is now available from the USEPA is the vapor intrusion pathway (USEPA 2015). At RFAAP, for sites which had detectable levels of volatile organic compounds (VOCs) in the subsurface, potential risks associated with vapor intrusion exposures were quantitatively assessed using models available at the time of the assessments (circa 2008 – 2011 for most sites). These include the ASTM Model for volatilization from groundwater to ambient air (ASTM 1995) the Johnson & Ettinger Model for migration of VOCs from groundwater into indoor air (Johnson & Ettinger 1991) the VDEQ Trench Model for volatilization of VOCs from groundwater into a construction/utility trench (VDEQ 2008), and the Foster-Chrostowski Shower Model for volatilization of VOCs from groundwater into shower air (Foster & Chrostowski 2003). Because extensive modeling was already performed to assess potential risks via this exposure pathway, no further evaluation of vapor intrusion risks at the site are required as part of this review.

SSA-72

At this site, institutional controls to restrict earth moving and residential use are in place. The main constituent driving potential risks to human health is benzo(a)pyrene. As indicated in Tables A.8-1 and A.8-2, the toxicity criteria for benzo(a)pyrene was updated in 2017 by USEPA in the Integrated Risk Information System (IRIS) (USEPA 2017a). The new toxicity assessment indicates that benzo(a)pyrene is a weaker carcinogen than previously assumed, by a factor of approximately 7. New oral and inhalation reference dose and concentration were also developed for benzo(a)pyrene (Table A.8-3). Given these updates to toxicity criteria, the maximum detected concentration of benzo(a)pyrene (as indicated in Table 5-1 of the 2010 SSP, URS 2010a) is now within the USEPA's acceptable cancer risk level (up to 1E-04) for residential exposure, as determined by comparing the site-related concentration to the current USEPA risk-based screening level (RSL) for residential use (Table A.8-4). The new non-cancer hazards for benzo(a)pyrene are also below the USEPA's acceptable threshold of a hazard index of 1 (Table A.8-4). Since the SSP also indicated that Aroclor-1254 was also detected on the site and contributed to potential risks (albeit less than the contribution from benzo(a)pyrene), the toxicity criteria and risk-based screening levels for Aroclor-1254 was also reviewed. These levels have not changed since the SSP, indicating that exposure to Aroclor-1254 at the site (in conjunction with the exposure to benzo(a)pyrene) should not result in unacceptable risk to a resident. Cumulative non-cancer hazard index (considering additivity of non-cancer hazards) for both Aroclor-1254 and benzo(a)pyrene is also below the threshold limit of 1. This indicates that institutional controls to prohibit residential use may no longer be warranted at this area of the site.

SSA-77

At this site, institutional controls to restrict earth moving and residential use are in place. The main constituent driving potential risks to human health are dioxin toxicity equivalents (2,3,7,8-

tetrachlorodibenzodioxin) (URS 2010a). Although the oral reference dose was updated in 2012 in EPA's IRIS (Table A.8-3), the maximum concentration of 2,3,7,8-TCDD is still within an acceptable risk range for industrial use of the site, as indicated by comparing maximum detected concentration with current USEPA risk screening levels (RSLs, USEPA 2017b) (Table A.8-4). Therefore, the remedy still remains protective.

SS30/79

At this site, institutional controls are being implemented to prevent exposure to asbestos-containing material in the trenches. The site-specific risk-based screening did not indicate any other constituents of concern in soil or groundwater; although metals are present at the site, they are not above background levels for the area (URS 2010a). Since asbestos was not detected in site soil or groundwater, the risk assessment did not quantify direct exposure to asbestos. Therefore, a review of toxicity criteria for constituents was not completed as part of this review for this site.

SWMU-51

This site was previously remediated by removing all areas of soil contaminated with concentrations of constituents exceeding residential based cleanup goals, down to 15' below ground surface. Below that depth, cleanup goals were chosen to ensure that trench sludge and grossly contaminated soil immediately below the sludge have been removed, but they were greater than (less restrictive than) the residential cleanup goals used for remediation of the top 15' of soils, which is the assumed exposure depth for a residential scenario (Shaw 2008). Table A.8-1 lists cleanup goals used for remediation of soil within the top 15', and indicates that since the development of those risk-based cleanup goals, the toxicity criteria have been updated for 4 constituents, 2,4- and 2,6-dinitrotoluene, 2,3,7,8-TCDD, and vanadium. Updated toxicity criteria for these constituents are provided in Tables A.8-2 (cancer risk factors) and A.8-3 (non-cancer reference doses and concentrations). Updated USEPA risk-based screening levels, which incorporate not only these toxicity criteria changes, but also updates to recommended default exposure factor values, are presented in Table A.8-4. This last table indicates that despite changes in toxicity criteria for these compounds, the current restrictions on exposure, which is limited to exposure commensurate with industrial land-use, remains protective. The maximum detected concentration of some constituents (2,4-DNT and 2,6-DNT) are slightly greater than the upper end of the acceptable cancer risk range, however, the average concentrations of these constituents across this site is much lower (Table 3-1 of Attachment 9 of this report), so the risk would fall within the acceptable risk range.

In addition to this review of toxicity criteria changes for COCs, the list of constituents of potential concern (COPCs) were reviewed from the 2008 RFI (Shaw 2008). Tables in Appendix E, including Tables E.1-2 through E.1-9 were scanned to determine if any COPCs existed at the site for which updated (or new) toxicity criteria may be available. This scan was performed by comparing maximum detected and exposure point concentrations in Tables E.1-2 and E.1-8 (surface soil COPCs), Tables E.1-4 and E.1-9 (total soil COPCs), and Tables E.1-6 and E.1-10 (groundwater COPCs) to current USEPA RSLs for these media. It was noted that soil COPCs with recent toxicity criteria increases (or new toxicity criteria for constituents previously lacking any) include chromium VI, pentaerythritol tetranitrate, tetrachloroethene, and trichloroethene. In soils, although the maximum and exposure point concentrations of CrVI are above the current RSL, site history and conditions at the site indicate that any chromium detected would likely not be in the hexavalent state (Section 6.3 of the RFI, Shaw 2008). Corresponding concentrations of trivalent chromium, the less toxic form of chromium, are all well below chromium RSLs. The other COPCs in soil listed above exist in concentrations well below current RSLs for soil, indicating that they would not be identified as COCs using current toxicity criteria. In groundwater, perchlorate and tetrachloroethene were listed as COPCs. Their maximum detected concentrations are well below both EPA tapwater RSLs, as well as current EPA maximum contaminant levels (MCL) for safe drinking water, indicating that they would not be identified as COCs using current toxicity criteria.

SWMU-13

Human health and ecological risk assessments for the site concluded no further action was necessary (URS 2010b). No unacceptable risks to current/future maintenance worker, current/future adolescent trespasser, hypothetical future construction worker, hypothetical future commercial worker, hypothetical future adult resident, hypothetical future child resident, and hypothetical future lifetime resident) or the environment (including soil invertebrates and microbes, plants, and terrestrial wildlife) were indicated. The need for institutional controls was predicated on the presence of some soil areas with concentrations that exceed the USEPA's regional screening levels for lead for residential and industrial settings of 400 and 800 mg/kg, respectively. Current site exposures are to a maintenance worker and adolescent trespasser. Since the USEPA updated its Adult Lead Model (ALM) in 2017, and the site's risk assessment for lead was conducted in 2009 (presumably using the previous 2009 update to the ALM), the current lead concentrations at the site were reviewed in conjunction with updated output from the Adult Lead Model, to ensure that the current concentrations of lead at the site do not pose unacceptable risks. In May 2017, USEPA updated geometric mean baseline blood lead levels (PbB_0) and geometric standard deviation of blood lead levels (GSD_i) based on the latest NHANES data (USEPA 2017c).

Table E.1-3.1 of the 2010 RFI for SWMU-13 indicates that the arithmetic mean of lead concentrations at the site is 314 mg/kg, with an 95th percentile upper confidence limit on the mean is 722 mg/kg (URS 2010b). The maintenance worker is assumed to be exposed 50 days/year (1 day/week with 2 week vacation), while construction and commercial workers are each assumed to be on-site 250 days/year. The trespasser is assumed to be on-site 6 days per month for 4 months a year. Since the construction worker's exposure is the most intensive, this was the receptor re-evaluated in the updated ALM. Table A.8-5 indicates that a PRG for construction worker exposure at the site would be 1090 mg/kg, indicating that the previous screening levels and current exposure restrictions remain protective. If, however, USEPA adopts the 2012 CDC guidelines (CDC 2012a, CDC 2012b) for childhood blood lead levels (5 µg dL^{-1}) within the Superfund or RCRA programs, then lead exposure risk at this site may warrant re-evaluation.

SWMU-40

The 2009 RFI for this site (URS 2009) indicated that risk drivers for exposure to surface and total soil are aluminum, arsenic, and PCBs, and therefore, institutional controls to restrict earth moving and residential use are in place. No updated toxicity criteria are available for any of these constituents (Table A.8-1). (California reviewed their non-cancer toxicity criteria in 2008; the inhalation reference concentration for arsenic has not changed from what was used previously.) However, because the previous 5YR indicated that there appears to be minimal risk associated with current and expected future use at the site, concentrations of these 3 constituents in SWMU-40 soils were compared to USEPA's RSLs in Table A.8-4. Although cancer risks from exposure to these 3 constituents would be within the USEPA's acceptable risk range for both residential and industrial exposures, the non-cancer hazard from exposure to PCBs would be unacceptable to a hypothetical resident. Therefore, continued land-use controls to prevent this exposure are warranted.

SWMU-41 and 41b

At this site, institutional controls to restrict earth moving and residential use are in place. Constituents driving this need for exposure restrictions (arsenic, manganese in soil, and arsenic, cobalt, and tetrachloroethylene – PCE in groundwater, Shaw 2011a) are listed in Table A.8-1. The toxicity criteria for the 2 soil constituents have not been updated recently. Although the toxicity criteria for PCE (a groundwater contaminant) has been updated since the risk assessment for this site was performed (Tables A.8-2 and A.8-3), the risk-based screening level used at the time of the assessment remains a protective indicator of the need for exposure restrictions at the site (Table A.8-4). This is because the previous RSL was based on cancer risk, and the oral cancer slope factor and inhalation unit risk have both decreased, indicating decreased carcinogenicity. Although the non-cancer oral reference dose and inhalation reference concentration also decreased, which indicates increased hazard potency, this increase in non-cancer hazard strength is not enough to lower the RSL below the cancer-based RSL. Therefore, there are no changes in toxicity criteria at this site which would affect the protectiveness of the remedy.

SWMU-48 and 49

Clean up goals for SWMU-49 are listed in the 2016 RCRA permit (VDEQ 2016), and are based on USEPA Safe Drinking Water Act values (Shaw 2014). These regulatory values are reviewed in Attachment 7. The toxicity criteria for these 2 constituents (carbon tetrachloride and PCE) have not changed since 2011, which is the date of the table used to identify these maximum contaminant levels (MCLs) in drinking water.

However, at SWMU-49 the groundwater monitoring parameters include indicators for reductive dehalogenation, including total organic carbon, anions, methane, ethane, ethane, and the presence of bacteria known to mediate the reductive dechlorination of PCE (e.g., *Dehalococcoides ethenogenes)*. Therefore, metabolic daughter products of carbon tetrachloride (chloroform, methylene chloride) and trichloroethene (dichloroethenes, vinyl chloride) are expected to be forming in site groundwater. These daughter products have differing environmental transport and toxicity properties and they may be present in the groundwater after the parent COCs (carbon tetrachloride and trichloroethene) have degraded to acceptable levels. Therefore, these daughter products need to be monitored as well to ensure long-term protectiveness.

In addition to this review of toxicity criteria changes for COCs, the list of constituents of potential concern (COPCs) were reviewed from the 2014 RFI (Shaw 2014). Tables 6-2 and 6-3 list COPCs for SWMU-48 and SWMU-49, respectively. The COPCs identified on these tables that were not found to pose an unacceptable risk include cis-1,2-dichloroethene and TCDD.

Since the risk assessment was performed (2014) after the most recent toxicity updates for these constituents (Tables A.8-2 and A.8-3), no further review of toxicity criteria is warranted for COPCs at this site.

SWMU-54

Risk-based remedial goals were developed for soil to remove the source of groundwater contamination, and groundwater monitoring goals were also developed based on the assumption that the groundwater would be used for drinking water purposes. Table A.8-1 lists both the soil and groundwater remediation targets. Tables A.8-2 and A.8-3 indicate the changes in toxicity criteria for the 2 constituents (TCDD and 2,4-DNT) for which toxicity criteria have been updated since the risk-based goals were developed. Table A.8-4 indicates how corresponding risk-based screening levels for tapwater may have been subsequently updated, which would then affect the soil-based remedial goals needed to protect groundwater. As indicated on Table A.8-4, although the tapwater risk-based screening levels for both these constituents have decreased since the soil cleanup goals were developed, the previous groundwater remedial goals would still be within the USEPA’s acceptable risk range of cancer risks, and approximately equal to a hazard index of 1 (for non-cancer health effects), within the level of uncertainty associated with development of an oral reference dose used to develop the risk-based screening level. The majority of soil samples obtained after soil excavation was completed to meet the soil remedial action goals were below method detection limits (Tables 3-1 and 3-2 of the 2011 Interim Measures Completion Report for SWMU-54, Shaw 2011b).

In addition to this review of toxicity criteria changes for COCs, the list of constituents of potential concern (COPCs) were reviewed from the 2008 RFI (Shaw 2008b). The only other COPCs identified at the site were benzo(a)pyrene and related polyaromatic hydrocarbons (PAHs). As indicated in Table A.8-2 and explained in the text regarding SSA-72, benzo(a)pyrene and related PAHs are now considered less toxic than previously determined. Therefore, recent toxicity criteria changes would not affect the protectiveness of the remedy at this site.

SWMU-43

This site is subject to institutional controls to maintain the site as a closed solid waste management unit, e.g., prevent earth moving and residential land use. The RFI for this Sanitary Landfill #2 (Shaw 2011c) evaluated both current and future potential human health risks and also potential ecological risks from exposure to site media, including soils, groundwater, and groundwater seepage to surface water. Risks (and non-carcinogenic hazards) from exposure to site-related constituents in soil were found to be acceptable for all receptors.

However, low levels of arsenic and tetracholoroethene (PCE) in groundwater could result in unacceptable risk to hypothetical future residents, if groundwater were to be used as a drinking water resource. Soil concentrations of arsenic were found to be comparable to background levels of arsenic in site soils, but ambient levels of naturally-occurring metals in groundwater were not determined. PCE was eliminated as a constituent of concern in groundwater after an additional round of groundwater sampling was performed in 2010 and did not detect PCE in site wells (Table ES-1, Shaw 2011c).

SWMU-45

The site-specific screening and subsequent human health risk assessment for Sanitary Landfill #3 indicated that the calculated site-related cancer risks and hazards (when taking target organs and background for metals into consideration) were within USEPA target ranges for Superfund sites (1E-06 to 1E-04 for risk and 1E+00 or less for HI) for the current receptor, maintenance worker, and for hypothetical future receptors evaluated under industrial and residential land use scenarios (URS 2010c). An evaluation of potential impacts to groundwater from soil constituents and from groundwater sampling results indicated that no groundwater constituents of concern are present at this site. Active remedial actions were not warranted for protection of either ecological receptors or human health, so no constituents driving risk were identified for this site. This site is subject to institutional controls to maintain the site as a closed solid waste management unit, e.g., prevent earth moving and residential land use.

HWMU-05 and HWMU-16

The Post-Closure Care Permit for HWMU-05 and HWMU-16 states in Module IV, E.3. (pdf page 82), “The Permittee shall use the most up-to-date USEPA MCL, the Department ACL, or EPA Region III RBC as the groundwater protection standards (GPS). If USEPA implements any changes to MCLs or RBCs, the GPS defined by that MCL or RBC will be updated to reflect the most current value established by USEPA” (VDEQ 2014). Table A.8-1 lists the basis for the GPS in the 2014 permit. Fourteen (14) of the constituents being monitored in the groundwater beneath these sites have had toxicity criteria updates since the GPS were identified. Although most of the GPS are based on Safe Drinking Water Maximum Contaminant Levels (MCLs), some are based on background levels, laboratory analytical detection limits (project quantification limits, PQL), or USEPA risk-based screening levels (RSL) for tapwater. The MCLs are reviewed in Attachment 7. The only risk-based GPS for which toxicity criteria have been updated is trifluorotrichloroethane (1,1,2-trichloro-1,2,2-trifluroethane). This compound is monitored for only HWMU 16. Toxicity criteria changes and subsequent updates to risk-based screening levels for tapwater for this compound are presented in Tables A.8-2, A.8-3, and A.8-4. As seen in Table A.8-3, a new inhalation reference concentration was developed as a provisional peer-reviewed toxicity value (PPRTV) for this compound which is 6 times lower than the previous inhalation reference concentration. This PPRTV inhalation reference concentration is a chronic value based on a cross-sectional occupational study which assessed a wide range of endpoints to develop a no observed adverse effect level (USEPA 2016). The previous toxicity criteria used to develop the risk-based screening level relied upon an inhalation reference concentration from the Health Effects Assessment Summary Tables (HEAST), which are considered to be a lower tier of toxicity value than the PPRTV (USEPA 2003b). Therefore, not only is this updated toxicity assessment value more recent, but it is considered to be more credible. This increase in non-cancer hazard potency results in a tapwater risk-based screening level that is approximately 6 times lower (Table A.8-4). The current GPS is no longer considered protective for this compound, as it is almost an order of magnitude lower than the USEPA’s updated tapwater RSL. Therefore, in order to ensure long-term protectiveness at this site, the GPS should be updated for trifluorotrichloroethane.

ARSAR

The main constituent driving the need for remedial action (institutional controls to prevent residential exposure) at the Army Reserve Small Arms Range (ARSAR) is lead. Average concentrations in soil at this site are 475 mg/kg, which is above USEPA's current soil screening level for residential use of 400 mg/kg, but below the soil screening level for industrial exposures (USEPA 2017b). The characterization of lead risks to residential receptors at this site was performed in 2014 (Shaw 2013) using the USEPA's Integrated Exposure Uptake Biokinetic Model for lead in children, which was last updated by USEPA in 2010 (USEPA 2017d). In November 2017, the USEPA recommended that the default age range in the IEUBK model be modified from 0 – 84 months to 12 – 72 months based on current science and the US Centers for Disease Control and Prevention's recommendation (USEPA 2017e). Making this change in the IEUBK model would likely result in higher blood lead levels in children exposed to site soils, and a lower residential soil preliminary remediation goal to achieve a given blood lead target level (Table A.8-6). (Technical difficulties prevented a full run of the IEUBK model to characterize site risks, therefore, the PRG development portion of the IEUBK was used instead to assist with the risk characterization. However, the "find soil lead concentration" at a given target blood level in the IEUBK program does not utilize the newly recommended age range.) The blood level target remains unchanged (DOD 2014). Therefore, the conclusions regarding need for institutional controls to prevent residential exposure at the site remain valid. As discussed previously for SWMU-13 and shown in Table A.8-5, recent updates to the USEPA's ALM do not indicate that more limited exposure to lead in site soils, such as in the current industrial use setting, would result in unacceptable risks.

ENVIRONMENTAL HEALTH

Guidance documents from the Department of Defense and the USEPA were followed at the SWMU's, SSA's, and the ARSAR in order to assess the potential for adverse effects to ecological receptors at each of the sites via a screening level ecological risk assessment (DOD 1996, USEPA 1997). (No ecological risk assessments were performed at the HWMU's, presumably because the controls needed for the hazardous waste management units would preclude presence of adequate ecological habitat at these areas of the site.) An installation-wide biological survey was performed by the Virginia Department of Game and Inland Fisheries in 1999 (VDGIF 1999). This survey identified 3 threatened wildlife species and 2 rare plant species associated with RFAAP grassland communities. They include:

- Regal Fritillary Butterfly (*Speyeria idalia*);
- Henslow's Sparrow (*Ammodramus henslowii*);
- Loggerhead Shrike (*Lanius ludovicianus*);
- Midland Sedge (*Carex mescochorea*); and
- Shaggy False Gromwell (*Onosmodium hispidissimum*).

Threatened wildlife observations in 1999 at RFAAP included the Regal Fritillary Butterfly (VDFIF 1999). The Regal Fritillary Butterfly was documented in the east-central and eastern edges of the main manufacturing area, but was not encountered at the sites included in this review, nor was any other threatened or endangered species encountered at any of these sites

(Shaw 2008; Shaw 2011a, b; Shaw 2013; Shaw 2014; URS 2009; URS 2010a, b, c;). Most of the sites consist of exclusively terrestrial grassland habitat or developed industrial areas, so that surface soil represents the main potential exposure medium to ecological receptors. (Some exceptions exist, such as for SWMU-43, for which other ecologically relevant exposure media were also assessed e.g., surface water and sediment from groundwater discharges.) Much of the meadow-grassed areas of the site are regularly maintained at the RFAAP. The screening level ecological risk assessments at each of the sites (with the exception of SWMU-54, discussed on the next page) concluded with one of the following 2 scientific-management decisions:

- There is adequate information to conclude that ecological risks are considered negligible and therefore there is no need for further action at the site on the basis of ecological risk (URS 2009; URS 2010a,b,c),
  or,
- Remedial measures solely to address potential ecological concerns are not warranted for soil (Shaw 2011a, c; Shaw 2013; Shaw 2014), nor for surface water, or groundwater (Shaw 2008a; Shaw 2011c).

The latter conclusion is made for distinct areas of the installation which are small enough (habitat areas on the order of 1 acre or less) to be considered to have only a *de minimus* effect on ecological populations (SWMU-49 is 0.1 acres, SWMU-51 is 0.3 acres, the ARSAR, SWMU-41/41b, and SWMU-48 are approximately 1 acre each, and SWMU-43 is approximately 3 acres).

These conclusions for ecological risk remain valid, as land use has not changed at the site.

At SWMU-54, the SLERA concluded with this scientific management decision point (URS 2008):
There is adequate information to conclude that the potential exists for an adverse ecological impact to plants due to lead, 2,4-DNT, and 2,4,6-TNT concentrations in soil, invertebrates due to the lead and 2,4,6-TNT concentration in soil, the meadow vole due to exposure to nitroglycerin in soil, the short-tailed shrew due to exposure to 2,3,7,8-TCDD TEQ (dioxin/furans,) and the American robin due to exposure to 2,3,7,8-TCDD TEQ, lead, 2,4,6-TNT, and 2,4-DNT in soil at the site. Hot spots for lead, explosives, and dioxins were identified in the immediate area of soil borings 54SB42, 54SB46, and 54SB49 in the same area identified for human health I-RBC exceedances for lead, explosives, and/or dioxins as presented on Figures 4-9, 4-11, and 4-12, respectively. No other significant potential impacts to ecological receptors due to site-related activities were identified. Significant uncertainty is associated with the potential impact to the meadow vole, short-tailed shrew and American robin. It is recommended that the need for remedial action to address this potential impact be evaluated along with the uncertainty associated with the derivation of the HQs, the location of HHRA COCs, the fate and transport evaluation, the "hot spot" locations, and other relevant factors, which would influence any decision to implement action.

Figures from the RFI showing soil hot spots with the potential to pose ecological risks (Figures 7-2 through 7-5, URS 2008) were compared to figures from the RFI presenting remedial boundaries based on achieving soil remedial goals based on protection of human health (RFI Figures 8-1 and 8-3) (remedial goals are listed in Table A.8-1 of this attachment). It is clear that remedial actions that are aimed at protecting human health will also ameliorate potential ecological risks at this site as well.

Significant Findings

Human health toxicity criteria changes were reviewed for all constituents driving remedial action. While toxicity decreased for benzo(a)pyrene (SSA-72), toxicity has increased for several other constituents at other sites. The only toxicity criterion increase affecting potential protectiveness of the remedy is for 1,1,2-trichloro-1,2,2-trifluroethane at HWMU-16, for which a revision to the risk-based groundwater protection standard is recommended.

References

American Society for Testing and Materials (ASTM) 1995. Standard Guide for Risk-Based Corrective Action at Petroleum Release Sites. ASTM Committee E-50 on Environmental Assessment. Report No. E1739-95. West Conshohocken, Pennsylvania.

CDC 2012a. CDC response to advisory committee on childhood lead poisoning prevention recommendations in “Low level lead exposure harms children: a renewed call for primary prevention.” Centers for Disease Control and Prevention. URL: http://www.cdc.gov/nceh/lead/ACCLPP/CDC_Response_Lead_Exposure_Recs.pdf.

CDC 2012b. Low level lead exposure harms children: a renewed call for primary prevention. Report of the Advisory Committee on Childhood Lead Poisoning and Prevention of the Centers for Disease Control and Prevention. URL: http://www.cdc.gov/nceh/lead/ACCLPP/Final_Document_010412.pdf.

Department of Defense (DOD) 1996. Tri-Service Procedural Guidelines for Ecological Risk Assessments. Wentsel, et al. U.S. Army ERDEC, Aberdeen Proving Ground, MD.

DOD 2014. Revised blood reference value for lead. Chemical & Material Risk Management Program. Department of Defense. Risk Alert # 01-14. URL: http://www.denix.osd.mil/cmrmp/ecmr/ecprogrambasics/resources/chemical-material-emerging-risk-alert-for-lead/. January.

Foster, S.A. and P.C. Chrostowski, 2003. Integrated Human Exposure Model, Version 2 (IHEM2) for Volatile Organic Compounds. Prepared for Syracuse Research Corporation, Syracuse, New York under EPA Grant No. CR-83109201-0. Prepared by CPF Associates, Inc., Takoma Park, Maryland. December 26, 2003.

Johnson, P.C. and R.A. Ettinger, 1991. Heuristic Model for Predicting the Intrusion Rate of Contaminant Vapors into Buildings. Environmental Science & Technology. 25:1445-1452.

Shaw 2008a (001). Radford Army Ammunition Plan, SWMU 51, RCRA Facility Investigation/Corrective Measures Study Report, Shaw Environmental, Inc., July 2008.

Shaw 2008b. Radford Army Ammunition Plan, SWMU 54, RCRA Facility Investigation/Corrective Measures Study Report, Shaw Environmental, Inc., September 2008.

Shaw 2011a (011). SWMU 41, RCRA Facility Investigation Report, Radford AAP, Final, Shaw Environmental, Inc., 2011.

Shaw 2011b (014). SWMU 54 (RAAP-14) Interim Measures Completion Report, Radford AAP, Shaw Environmental, Inc., April 2011.

Shaw 2011c (023). Radford Army Ammunition Plant, SWMU 43 RCRA Facility Investigation Final Report, Shaw Environmental, Inc., January 2011.

Shaw 2013. Radford Army Ammunition Plant, Army Reserve Small Arms Range (ARSAR) RCRA Facility Investigation/Interim Measures Completion Report. Final Report, Shaw Environmental, Inc., a CB&I Company, November 2013.

Shaw 2014. SWMUs 48 and 49. RCRA Facility Investigation Report, Radford AAP, Draft, Shaw Environmental, Inc., January 2014.

URS 2008 (014). Solid Waste Management Unit 54, RCRA Facility Investigation / Corrective Measures Study Report, URS, September 2008.

URS 2009 (009). Solid Waste Management Units 40 (RAAP-009) and 71 (RAAP-002) RCRA Facility Investigation/Corrective Measures Study Report, FINAL, URS, April 2009

URS 2010a (CC001&002&003). Radford Army Ammunition Plant, Final Site Screening Process Report for Site Screening Areas 18, 72, 30, 79, 60, and 77, Final, URS December 2010.

URS, 2010b (013). Study Area at Solid Waste Management Unit 13, RCRA Facility Investigation Report, FINAL, Radford AAP, URS, July 2010.

URS 2010 c (024). Final Solid Waste Management Unit 45 (RAAP-24) Site Screening Process Report, URS, January 2010.

United States Environmental Protection Agency (USEPA) 1997. Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. OSWER 9285.7-25

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. Technical Review Workgroup for Lead: Washington, DC. EPA-540-R-03-001.

USEPA 2003b. Human Health Toxicity Values in Superfund Risk Assessments. OSWER Directive 9285.7-53. December.

USEPA 2004, Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), Final, EPA/540/R/99/005, OSWER 9285.7-02EP, Office of Solid Waste and Emergency Response, Washington, DC (including 2007 updates on-line)

USEPA. 2005. Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK). December.

USEPA. 2007 Estimating the Soil Lead Concentration Term for the Integrated Exposure Uptake Biokinetic (IEUBK) Model [OSWER #9200.1-78] September.

USEPA 2012, *Provisional Peer-Reviewed Toxicity Values for Thallium and Compounds*. Superfund Health Risk Technical Support Center, National Center for Environmental Assessment, Office of Research and Development, EPA Cincinnati, OH.

USEPA 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120.

USEPA June 2015. OSWER Technical Guidance for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air. OSWER Publication 9200.2-154.

USEPA 2016. Provisional Peer-Reviewed Toxicity Values for 1,1,2-Trichloro-1,2,2-trifluoroethane. Superfund Health Risk Technical Support Center, National Center for Environmental Assessment, Office of Research and Development, EPA Cincinnati, OH.

USEPA 2017a. Toxicological Review of Benzo[a]pyrene. Integrated Risk Information System (IRIS), National Center for Environmental Assessment. EPA/635/R-17/003Fa. URL: https://www.epa.gov/iris/

USEPA 2017b. Regional Screening Levels (RSL) Summary Table, June 2017 (table last updated); available via EPA Region web sites, e.g. https://www.epa.gov/risk/regional-screening-levels-rsls

USEPA 2017c. Transmittal of update to the Adult Lead Methodology's default baseline blood lead concentration and geometric standard deviation parameters. OLEM Directive 9285.6-56. May.

USEPA 2017d. Lead at Superfund Sites: Software and Users' Manuals. https://www.epa.gov/superfund/lead-superfund-sites-software-and-users-manuals (website accessed on 10/25/2017)

USEPA 2017e. Recommendations for Default Age Range in the IEUBK model. Office of Land and Emergency Management Directive 9200.2-177, November 15, 2017. https://www.epa.gov/superfund/lead-superfund-sites-guidance#olem9200.2-1

Virginia Department of Environmental Quality (VDEQ), 2008. Voluntary Remediation Program Risk Assessment Guidance, Voluntary Remediation Program, Virginia Department of Environmental Quality. On-line: http://www.deq.state.va.us/vrprisk/raguide.html. Accessed: August 1, 2008.

VDEQ 2014. Hazardous Waste Management Post-Closure Care Permit Permit for the Radford Army Ammunition Plant Facility, Radford, Virginia.

VDEQ 2016. Final Hazardous Waste Management Correction Action Permit for the Radford Army Ammunition Plant Facility, Radford, Virginia.

Virginia Department of Game and Inland Fisheries (VDGIF) 1999. Biological Survey of the Radford Army Ammunition Plant; including Threatened, Endangered, and Species of Concern. Prepared for Radford Ammunition Plant.

[This Page Intentionally Left Blank]

Table A.8-1 Summary of RFAAP Constituents Driving Remedial Action

Constituent	Site-ID	Media	Remedial Goal (or risk-based screening level indicating IC's needed)	Remedial Goal units	Cleanup Goal Basis	Date of Remedial Goal (or screening level) Documentation	Source and Date of Screening Level / Remedial Goal Development	Toxicity Criteria Last Reviewed in IRIS	Current Toxicity Criteria Source (and date if not IRIS)	Change in Toxicity Criteria since Permit?
benzo(a)pyrene	SSA-72	soil	NA (residential, industrial SL - 0.015, 0.21)	mg/kg	IC (prevent residential exposure)	2010 (1)	USEPA RSL 2008	2017	IRIS	Yes
2,3,7,8-TCDD TEQ (dioxins)	SSA-77	soil	NA (residential, industrial SL - 4.5E-06, 1.8E-05)	mg/kg	IC (prevent residential exposure)	2010 (1)	USEPA RSL 2009	2012	IRIS (oral reference dose), CalEPA (cancer, 2011)	Yes
1,3-Dinitrobenzene	SWMU-51	surface soil (0-15')	8.00E-01	mg/kg	Risk - direct exposure - residential	2008 (10)	2008 (10)	1988 (non-cancer), 1991 (cancer)	IRIS	No
2,4,6-Trinitrotoluene	SWMU-51	surface soil (0-15')	4.40E+00	mg/kg	Risk - direct exposure - residential	2008 (10)	2008 (10)	1998	IRIS	No
2,4-Dinitrotoluene	SWMU-51	surface soil (0-15')	1.20E+00	mg/kg	Risk - direct exposure - residential	2008 (10)	2008 (10)	1992	IRIS (oral reference dose), CalEPA (cancer, 2011)	Yes
2,6-Dinitrotoluene	SWMU-51	surface soil (0-15')	1.20E+00	mg/kg	Risk - direct exposure - residential	2008 (10)	2008 (10)	NA	PPRTV (2013)	Yes
2-Nitrotoluene	SWMU-51	surface soil (0-15')	9.10E+01	mg/kg	Risk - direct exposure - residential	2008 (10)	2008 (10)	NA	PPRTV (2008)	No
4-Nitrotoluene	SWMU-51	surface soil (0-15')	3.08E+01	mg/kg	Risk - direct exposure - residential	2008 (10)	2008 (10)	NA	PPRTV (2007)	No
Aluminum	SWMU-51	surface soil (0-15')	4.00E+04	mg/kg	Risk - direct exposure - residential	2008 (10)	2008 (10)	1987	PPRTV (2006)	No
Arsenic	SWMU-51	surface soil (0-15')	1.58E+01	mg/kg	Risk - direct exposure - residential	2008 (10)	2008 (10)	1995	IRIS (cancer and oral reference dose), CalEPA (inhalation reference concentration, 2008)	No
Dioxins (TCDD TE)	SWMU-51	surface soil (0-15')	1.00E-03	mg/kg	Risk - direct exposure - residential	2008 (10)	2008 (10)	2012	IRIS (oral reference dose), CalEPA (cancer, 2011)	Yes
Iron	SWMU-51	surface soil (0-15')	5.10E+04	mg/kg	Risk - direct exposure - residential	2008 (10)	2008 (10)	NA	PPRTV (2006)	No
Lead	SWMU-51	surface soil (0-15')	4.00E+02	mg/kg	Risk - direct exposure - residential	2008 (10)	2008 (10)	2004	USEPA ALM 2017*	No (but change in exposure model)
Manganese	SWMU-51	surface soil (0-15')	2.54E+03	mg/kg	Risk - direct exposure - residential	2008 (10)	2008 (10)	1995	IRIS	No
Nitroglycerin	SWMU-51	surface soil (0-15')	8.00E-01	mg/kg	Risk - direct exposure - residential	2008 (10)	2008 (10)	NA	PPRTV (2006)	No
Vanadium	SWMU-51	surface soil (0-15')	1.08E+02	mg/kg	Risk - direct exposure - residential	2008 (10)	2008 (10)	1988	IRIS (oral reference dose), ATSDR (inhalation reference concentration, 2012)	Yes
lead	SWMU-13	Soil	NA (residential, industrial SL - 400, 800)	mg/kg	IC (prevent exposure to hot spots above screening level)	2010 (2)	USEPA ALM 2009	2004	USEPA ALM 2017*	No (but change in exposure model)
aluminum	SWMU-40	Soil	NA (residential, industrial SL - 7,821; 102,200)	mg/kg	IC (prevent residential and construction worker exposure)	2009 (3)	USEPA RSL 2007	1987	PPRTV (2006)	No
arsenic	SWMU-40	Soil	NA (residential, industrial SL - 0.426, 1.91)	mg/kg	IC (prevent residential exposure)	2009 (3)	USEPA RSL 2007	1995	IRIS (cancer and oral reference dose), CalEPA (inhalation reference concentration, 2008)	No
PCBs	SWMU-40	Soil	NA (residential, industrial SL - 0.16, 1.4)	mg/kg	IC (prevent residential exposure)	2009 (3)	USEPA RSL 2007	1994 (Arochlors), 1996 (PCBs)	IRIS	No
arsenic	SWMU-41	Soil	NA (residential SL -0.39)	mg/kg	IC (prevent residential exposure)	2011 (4)	USEPA RSL 2009	1995	IRIS (cancer and oral reference dose), CalEPA (inhalation reference concentration, 2008)	No
magnanese	SWMU-41	Soil	NA (residential SL - 1800)	mg/kg	IC (prevent residential exposure)	2011 (4)	USEPA RSL 2009	1995	IRIS	No
arsenic	SWMU-41b	Groundwater	NA (residential tapwater SL - 0.045)	µg/L	IC (prevent residential exposure)	2011 (4)	USEPA RSL 2009	1995	IRIS (cancer and oral reference dose), CalEPA (inhalation reference concentration, 2008)	No
cobalt	SWMU-41b	Groundwater	NA (residential tapwater SL - 11)	µg/L	IC (prevent residential exposure)	2011 (4)	USEPA RSL 2009	NA	PPRTV (2008)	No
Tetrachloroethene (PCE)	SWMU-41b	Groundwater	NA (residential tapwater SL - 0.11)	µg/L	IC (prevent residential exposure)	2011 (4)	USEPA RSL 2009	2012	IRIS	Yes
carbon tetrachloride	SWMU's-48 & -49	Groundwater	5	µg/L	ARAR (MCL)	2016 (5)	USEPA MCL 2011 table	2010	IRIS	No
Trichloroethene	SWMU's-48 & -49	Groundwater	5	µg/L	ARAR (MCL)	2016 (5)	USEPA MCL 2011 table	2011	IRIS	No
2,3,7,8-TCDD	SWMU-54	Soil	7.89E-06	mg/kg	Risk - indirect exposure - groundwater protection	2016 (5)	2008 (7)	2012	IRIS (oral reference dose), CalEPA (cancer, 2011)	Yes
2,4,6-trinitrotoluene	SWMU-54	Groundwater	7.82	µg/L	Risk - direct exposure - residential tapwater	2016 (5)	2008 (7)	1998	IRIS	No
2,4,6-trinitrotoluene	SWMU-54	Soil	1.7	mg/kg	Risk - indirect exposure - groundwater protection	2016 (5)	2008 (7)	1998	IRIS	No
dinitrotoluene mixture	SWMU-54	Groundwater	0.932	µg/L	Risk - direct exposure - residential tapwater	2016 (5)	2008 (7)	1990	IRIS	maybe (see 2,6-DNT)
dinitrotoluene mixture	SWMU-54	Soil	0.044	mg/kg	Risk - indirect exposure - groundwater protection	2016 (5)	2008 (7)	1990	IRIS	maybe (see 2,6-DNT)
amino DNTs	SWMU-54	Soil	1.095	mg/kg	Risk - indirect exposure - groundwater protection	2016 (5)	2008 (7)	1992	IRIS (2,4-DNT as surrogate)	Yes
heptachlor epoxide	SWMU-54	Soil	0.0047	mg/kg	Risk - indirect exposure - groundwater protection	2016 (5)	2008 (7)	1987	IRIS	No
nitroglycerin	SWMU-54	Soil	0.069	mg/kg	Risk - indirect exposure - groundwater protection	2016 (5)	2008 (7)	NA	PPRTV (2006)	No
perchlorate	SWMU-54	Groundwater	10.9	µg/L	Risk - direct exposure - residential tapwater	2016 (5)	2008 (7)	2005	IRIS	No
RDX	SWMU-54	Groundwater	6.1	µg/L	Risk - direct exposure - residential tapwater	2016 (5)	2008 (7)	1990	IRIS	No
RDX	SWMU-54	Soil	0.161	mg/kg	Risk - indirect exposure - groundwater protection	2016 (5)	2008 (7)	1990	IRIS	No
Arsenic	SWMU-43	Groundwater	NA (residential tapwater SL - 0.045)	µg/L	Risk - direct exposure - residential tapwater	2016 (5)	USEPA RSL 2008	1995	IRIS (cancer and oral reference dose), CalEPA (inhalation reference concentration, 2008)	No
Tetrachloroethene (PCE)	SWMU-43	Groundwater	NA (residential tapwater SL - 0.11)	µg/L	Risk - direct exposure - residential tapwater	2016 (5)	USEPA RSL 2008	2012	IRIS	Yes
1,1,1-Trichloroethane; Methylchloroform;	HWMU-16	Groundwater	200	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2010 table	2007	IRIS	No
1,1-Dichloroethane;	HWMU-16	Groundwater	9.5	µg/L	background	2014 (9)	calculated 1996-1998	1990	PPRTV (oral reference dose, 2006), CalEPA (cancer, 2011)	No
1,1-Dichloroethene	HWMU-16	Groundwater	7	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2010 table	2002	IRIS	No
2,4-Dinitrotoluene	HWMU-16	Groundwater	10	µg/L	background	2014 (9)	calculated 1996-1998	1992	IRIS (oral reference dose), CalEPA (cancer, 2011)	Yes
2,6-Dinitrotoluene	HWMU-16	Groundwater	10	µg/L	background	2014 (9)	calculated 1996-1998	NA	PPRTV (2013)	Yes
2-Butanone; Methyl ethyl ketone (MEK)	HWMU-16	Groundwater	4900	µg/L	VA DEQ ACL	2014 (9)	VA DEQ ACL 2013	2003	IRIS	No

Table A.8-1 Summary of RFAAP Constituents Driving Remedial Action

Constituent	Site-ID	Media	Remedial Goal (or risk-based screening level indicating IC's needed)	Remedial Goal units	Cleanup Goal Basis	Date of Remedial Goal (or screening level) Documentation	Source and Date of Screening Level / Remedial Goal Development	Toxicity Criteria Last Reviewed in IRIS	Current Toxicity Criteria Source (and date if not IRIS)	Change in Toxicity Criteria since Permit?
Arsenic, total	HWMU-16	Groundwater	10	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2010 table	1995	IRIS (cancer and oral reference dose), CalEPA (inhalation reference concentration, 2008)	No
Barium, total	HWMU-16	Groundwater	2,000	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2010 table	2005	IRIS (oral reference dose), HEAST (inhalation reference concentration)	No
Benzene	HWMU-16	Groundwater	5	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2010 table	2003	IRIS	No
Beryllium, total	HWMU-16	Groundwater	4	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2010 table	1998	IRIS	No
Cadmium, total	HWMU-16	Groundwater	5	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2010 table	1989	IRIS (inhalation unit risk and oral reference dose), ATSDR (inhalation reference concentration, 2012)	Yes
Carbon tetrachloride	HWMU-16	Groundwater	5	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2010 table	2010	IRIS	No
Chloroethane	HWMU-16	Groundwater	21,000	µg/L	VA DEQ ACL	2014 (9)	VA DEQ ACL 2013	1991	IRIS	No
Chloromethane	HWMU-16	Groundwater	190	µg/L	VA DEQ ACL	2014 (9)	VA DEQ ACL 2013	2001	IRIS	No
Chromium, total	HWMU-16	Groundwater	100	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2010 table	1998	IRIS (oral cancer slope factor and oral reference), CalEPA (inhalation unit cancer risk, 2011)	Yes
Cobalt, total	HWMU-16	Groundwater	5	µg/L	background/PQL	2014 (9)	calculated 1996-1998	NA	PPRTV (2008)	No
Copper, total	HWMU-16	Groundwater	1300*	µg/L	VA DEQ action level (secondary MCL)	2014 (9)	VA DEQ ACL 2013	1988	HEAST	No
Dichlorodifluoromethane	HWMU-16	Groundwater	190	µg/L	VA DEQ ACL	2014 (9)	VA DEQ ACL 2013	1987	IRIS (oral reference dose), PPRTV (inhalation reference concentration, 2010)	No
Diethyl ether	HWMU-16	Groundwater	7300	µg/L	Risk - direct exposure - residential tapwater	2014 (9)	USEPA RSL 2011	1990	IRIS	No
Diethyl phthalate	HWMU-16	Groundwater	11000	µg/L	VA DEQ ACL	2014 (9)	VA DEQ ACL 2013	1988	IRIS	No
Dimethyl ether;	HWMU-16	Groundwater	17	µg/L	background	2014 (9)	calculated 1996-1998	NA	NA	NA
Ethylbenzene; Phenylethane	HWMU-16	Groundwater	700	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2010 table	1991	IRIS (reference dose/concentration), CalEPA (cancer risk, 2011)	Yes
Lead, total	HWMU-16	Groundwater	15*	µg/L	VA DEQ action level (secondary MCL)	2014 (9)	VA DEQ ACL 2013	2004	USEPA ALM 2017*	No (but change in exposure model)
Mercury, total	HWMU-16	Groundwater	2	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2010 table	1995	IRIS	No
Methylene chloride	HWMU-16	Groundwater	13.95	µg/L	background	2014 (9)	calculated 1996-1998	2001	IRIS	No
Nickel, total	HWMU-16	Groundwater	300	µg/L	VA DEQ ACL	2014 (9)	VA DEQ ACL 2013	1994	IRIS (oral reference dose), CalEPA (inhalation unit risk, 2011), ATSDR (inhalation reference concentration, 2005)	No
Tetrachloroethene (PCE)	HWMU-16	Groundwater	5	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2010 table	2012	IRIS	Yes
Tetrahydrofuran	HWMU-16	Groundwater	3,400	µg/L	Risk - direct exposure - residential tapwater	2014 (9)	USEPA RSL 2016	2012	IRIS	No
Toluene	HWMU-16	Groundwater	1,000	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2010 table	2009	IRIS	No
Trichloroethene	HWMU-16	Groundwater	5	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2010 table	2011	IRIS	Yes
Trichlorofluoromethane	HWMU-16	Groundwater	1000	µg/L	VA DEQ ACL	2014 (9)	VA DEQ ACL 2013	1987	IRIS	No
Trifluorotrichloroethane (1,1,2-trichloro-1,2,2-trifluroethane)	HWMU-16	Groundwater	59000	µg/L	Risk - direct exposure - residential tapwater	2014 (9)	USEPA RSL 2011	1987	IRIS (oral reference dose), PPRTV (inhalation reference concentration, 2016)	Yes
Vanadium, total	HWMU-16	Groundwater	151	µg/L	background	2014 (9)	calculated 1996-1998	1988	IRIS (oral reference dose), ATSDR (inhalation reference concentration, 2012)	Yes
Xylenes (total); 1,3-, 1,2-, & 1,4-	HWMU-16	Groundwater	10,000	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2010 table	2003	IRIS	No
Zinc, total	HWMU-16	Groundwater	4700	µg/L	VA DEQ ACL	2014 (9)	VA DEQ ACL 2013	2005	IRIS	No
1,2-Dichloroethane	HWMU-5	Groundwater	5	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2002 table	1987	IRIS (reference dose/concentration), PPRTV (cancer, 2010)	No
2,4-Dinitrotoluene	HWMU-5	Groundwater	10	µg/L	PQL	2014 (9)	EPA method 8270	1992	IRIS (oral reference dose), CalEPA (cancer, 2011)	Yes
2,6-Dinitrotoluene	HWMU-5	Groundwater	10	µg/L	PQL	2014 (9)	EPA method 8270	NA	PPRTV (2013)	Yes
Acetone	HWMU-5	Groundwater	12000	µg/L	VA DEQ ACL	2014 (9)	VA DEQ ACL 2013	2003	IRIS (oral reference dose), ATSDR (inhalation reference concentration, 1994)	No
Antimony, total	HWMU-5	Groundwater	6	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2002 table	1987	IRIS	No
Arsenic, total	HWMU-5	Groundwater	10	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2002 table	1995	IRIS (cancer and oral reference dose), CalEPA (inhalation reference concentration, 2008)	Yes
Barium, total	HWMU-5	Groundwater	2,000	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2002 table	2005	IRIS (oral reference dose), HEAST (inhalation reference concentration)	No
Beryllium, total	HWMU-5	Groundwater	4	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2002 table	1998	IRIS	No
Bis (2-ethylhexyl)phthalate	HWMU-5	Groundwater	10	µg/L	background/PQL	2014 (9)	calculated 1996-1998	1988	IRIS (oral cancer slope factor and oral reference), CalEPA (inhalation unit cancer risk, 2011)	Yes
Cadmium, total	HWMU-5	Groundwater	5	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2002 table	1989	IRIS (inhalation unit risk and oral reference dose), ATSDR (inhalation reference concentration, 2012)	Yes
Chloroform	HWMU-5	Groundwater	80	µg/L	ARAR (MCL) (total trihalomethanes)	2014 (9)	USEPA MCL 2002 table	2001	IRIS (cancer and oral reference dose), ATSDR (inhalation reference concentration, 1997)	No
Chromium, total	HWMU-5	Groundwater	100	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2002 table	1998	IRIS (oral cancer slope factor and oral reference), CalEPA (inhalation unit cancer risk, 2011)	Yes
Cobalt, total	HWMU-5	Groundwater	7	µg/L	background	2014 (9)	calculated 1996-1998	NA	PPRTV (2008)	No
Copper, total	HWMU-5	Groundwater	1300	µg/L	VA DEQ action level (secondary MCL)	2014 (9)	USEPA MCL 2002 table	1988	HEAST	No
Dichlorodifluoromethane	HWMU-5	Groundwater	190	µg/L	VA DEQ ACL	2014 (9)	VA DEQ ACL 2013	1987	IRIS (oral reference dose), PPRTV (inhalation reference concentration, 2010)	No
Diethyl ether	HWMU-5	Groundwater	7300	µg/L	Risk - direct exposure - residential tapwater	2014 (9)	USEPA RSL 2011	1990	IRIS	No
Diethyl phthalate	HWMU-5	Groundwater	11,000	µg/L	VA DEQ ACL	2014 (9)	VA DEQ ACL 2013	1988	IRIS	No
Lead, total	HWMU-5	Groundwater	15	µg/L	VA DEQ action level (secondary MCL)	2014 (9)	USEPA MCL 2002 table	2004	USEPA ALM 2017*	No (but change in exposure model)
Mercury, total	HWMU-5	Groundwater	2	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2002 table	1995	IRIS	No
Methyl ethyl ketone	HWMU-5	Groundwater	4900	µg/L	VA DEQ ACL	2014 (9)	VA DEQ ACL 2013	2003	IRIS	No
Methylene chloride	HWMU-5	Groundwater	5	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2002 table	2001	IRIS	No
Nickel, total	HWMU-5	Groundwater	300	µg/L	VA DEQ ACL	2014 (9)	VA DEQ ACL 2013	1994	IRIS (oral reference dose), CalEPA (inhalation unit risk, 2011), ATSDR (inhalation reference concentration, 2005)	No
Nitrobenzene	HWMU-5	Groundwater	10	µg/L	background	2014 (9)	calculated 1996-1998	2009	IRIS	No
o-Nitroanilene; 2-	HWMU-5	Groundwater	150	µg/L	VA DEQ ACL	2014 (9)	VA DEQ ACL 2013	NA	PPRTV (2009)	No
p-Nitroanilene ; 4-	HWMU-5	Groundwater	20	µg/L	background	2014 (9)	calculated 1996-1998	NA	PPRTV (2009)	No
Selenium, total	HWMU-5	Groundwater	50	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2002 table	1991	IRIS (oral reference dose), CalEPA (inhalation reference concentration, 2008)	No
Silver, total	HWMU-5	Groundwater	71	µg/L	VA DEQ ACL	2014 (9)	VA DEQ ACL 2013	1991	IRIS	No
Thallim. total	HWMU-5	Groundwater	2	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2002 table	2009	PPRTV Appendix (2012)	No
Toluene	HWMU-5	Groundwater	1,000	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2002 table	2005	IRIS	Yes
Trichloroethene	HWMU-5	Groundwater	5	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2002 table	2011	IRIS	Yes
Vanadium, total	HWMU-5	Groundwater	63	µg/L	VA DEQ ACL	2014 (9)	VA DEQ ACL 2013	1988	IRIS (oral reference dose), ATSDR (inhalation reference concentration, 2012)	No
Xylenes (total)	HWMU-5	Groundwater	10,000	µg/L	ARAR (MCL)	2014 (9)	USEPA MCL 2002 table	2003	IRIS	Yes
Zinc, total	HWMU-5	Groundwater	4700	µg/L	VA DEQ ACL	2014 (9)	VA DEQ ACL 2013	2005	IRIS	No

Table A.8-1 Summary of RFAAP Constituents Driving Remedial Action

Constituent	Site-ID	Media	Remedial Goal (or risk-based screening level indicating IC's needed)	Remedial Goal units	Cleanup Goal Basis	Date of Remedial Goal (or screening level) Documentation	Source and Date of Screening Level / Remedial Goal Development	Toxicity Criteria Last Reviewed in IRIS	Current Toxicity Criteria Source (and date if not IRIS)	Change in Toxicity Criteria since Permit?
Lead	ARSAR	Soil	NA (residential, industrial SL - 400, 800)	mg/kg	IC (prevent residential exposure)	2014 (8)	USEPA ALM 2009	2004	USEPA ALM 2017*	No (but change in exposure model)

SL is risk-based Screening Level for protection of human health
IC is institutional controls
PQL is project quantification limit; i.e., a level which can be detected by laboratory analysis.

References for Site-Specific Documents:
1 Site Screening Process Report for Site Screening Areas 18. 72, 30, 79, 60, and 77. Radford Army Ammunition Plant, Radford, Virginia, December 2010
2 SWMU 13 RCRA Facility Investigation/Corrective Measures Study Report, Radford Army Ammunition Plant, Radford, VA. Final. 2010. Ammunition Plant, Radford, VA.
3 SWMU 40 RCRA Facility Investigation/Corrective Measures Study Report, Radford Army Ammunition Plant, Radford, VA. Final. April 2009. Ammunition Plant, Radford, VA.
4 SWMU 41 RCRA Facility Investigation/Corrective Measures Study Report, Radford Army Ammunition Plant, Radford, VA. Final. February 2011. Ammunition Plant, Radford, VA.
5 Final Hazardous Waste Management Corective Action Permit for the Radford Army Ammunition Plan facility, Radford, Virginia. Virginia Department of Environmental Quality, Apirl 1, 2016
6 SWMU 49 Monitored Natural Attenuation Groundwater Monitoring Work Plan, Radford Army Ammunition Plant, Radford, VA. Draft Final. 2014
7 SWMU 54 RCRA Facility Investigation/Corrective Measures Study Report, Radford Army Ammunition Plant, Radford, VA. Final. September 2008. Ammunition Plant, Radford, VA.
8 ARSAR RCRA Facility Investigation/Corrective Measures Study Report, Radford Army Ammunition Plant, Radford, VA. Final. 2014. Ammunition Plant, Radford, VA.
9 Hazardous Waste Management Post-Closure Care Permit for the Radford Army Ammunition Plan facility, HWMU-5 & HWMU-16, Radford, Virginia. Virginia Department of Environmental Quality, July 2014
10 SWMU 51 RCRA Facility Investigaiton/Corrective Measures Study Report, Radford Army Ammunition Plant, Radford, VA. Final. July 2008. Ammunition Plant, Radford, VA.

References for ARARs or Risk-Based Screening Levels:

USEPA Maximum Contaminant Levels for Drinking Water (40 CFR 141)	a) 2002 MCL Table
	b) 2010 MCL Table
	c) 2011 MCL Table
USEPA Regional Risk Based Screening Levels (RSL):	d) USEPA Region 3, Updated October 2007
	e) USEPA Region 3, Updated October 2008
	f) USEPA Region 3, Updated April 2009
	g) USEPA Region 3, Updated June 2011
	h) USEPA Regional Screening Levels, Updated May 2016

USEPA Adult Lead Model (ALM), 2009. Updated in May 2017 (USEPA 2017c in Attachment 8).
*The Adult Lead Model is used to assess exposure, not toxicity of lead. The lead blood level target (an indicator of toxicity) remains unchanged (DOD 2014).

Table A.8-2 Comparison of Cancer Slope (Risk) Factors Used Previously with EPA's Current Recommended Toxicity Criteria

		Oral Cancer Slope Factors						Inhalation Unit Cancer Risk Factors				
Chemical	CAS #	Date site toxicity criteria	previous SFo (mg/kg-day)$^{-1}$	Ref	Current SFo (mg/kg-day)$^{-1}$	Ref	Date Toxicity Updated or Reviewed	previous URF (ug/m3)$^{-1}$	Ref	Current URF (ug/m3)$^{-1}$	Ref	Date Toxicity Updated or Reviewed
Benzo(a)pyrene	50-32-8	2008	7.30E+00	I	1.00E+00	I	2017	1.00E-03	C	6.00E-04	I	2017
2,3,7,8-TCDD	1746-01-6	2009	1.30E+05	C	1.30E+05	C	2011	3.80E+01	C	3.80E+01	C	2011
2,4-dinitrotoluene	121-14-2	2008	NA		3.10E-01	C	2011	NA		8.90E-05	C	2011
2,6-dinitrotoluene	606-20-2	2008	NA		1.50E+00	P	2013	NA		NA		
dinitrotoluene mixture	E1615210	2008	6.80E-01	I	6.80E-01	I	1990	NA		NA		
vandium		2008	NA		NA			NA		NA		
arsenic	7440-38-2	2009	1.50E+00	I	1.50E+00	I		4.30E-03	I	4.30E-03	I	
Tetrachloroethene	127-18-4	2009	5.40E-01	C	2.10E-03	I	2012	5.90E-06	C	2.60E-07	I	2012
Trifluorotrichloroethane (1,1,2-trichloro-1,2,2-trifluroethane)	76-13-1	2011	NA		NA			NA		NA		
cis-1,2-Dichloroethene	156-59-2	2008	NA		NA	I	2010	NA		NA		2010
trans-1,2-Dichloroethene	156-60-5	2008	NA		NA	I	2010	NA		NA		2010
Trichloroethene	79-01-6	2008	1.30E-02	C	4.60E-02	I	2011	2.00E-06	C	4.10E-06	I	2011

Shaded cells indicate that toxicity updates indicate the chemical is a more potent carcinogen now than at time of the 2009 HHRA.

NA = criteria not available

Reference (Ref):

I = Environmental Protection Agency (EPA) Integrated Risk Information System (IRIS)

P = Provisional Peer-Reviewed Toxicity Values (PPRTV)

C = California Environmental Protection Agency

SFo - Oral Slope Factor

URF - Inhalation Unit Risk Factor

Table A.8-3 Comparison of Toxicity Factors Used Previously with EPA's Current Recommended Toxicity Criteria, Non-carcinogens

			Oral Reference Dose Values					Inhalation Reference Concentration Values				
Constituent	CAS #	Date site toxicity criteria	Previous Chronic RfDo (mg/kg-day)	Ref	Current RfDo (mg/kg-day)	Date Toxicity Updated	Ref	Previous Chronic RfC (mg/m3)	Ref	Current RfC (mg/m3)	Date Toxicity Updated	Ref
Benzo(a)pyrene	50-32-8	2008	NA		3.00E-04	2017	I	NA		2.0E--06	2017	I
2,3,7,8-TCDD	1746-01-6	2009	1.00E-09	A	7.00E-10	2012	I	4.00E-08	C	4.00E-08	2011	C
2,4-dinitrotoluene	121-14-2	2008	2.00E-03	I	2.00E-03	1992	I	NA		NA		
2,6-dinitrotoluene	606-20-2	2008	1.00E-03	P	3.00E-04	2013	P	NA		NA		
dinitrotoluene mixture	E1615210	2008	NA		NA			NA		NA		
vandium	7440-62-2	2008	5.00E-03	I	5.00E-03	1988	I	NA		1.00E-04	2012	A
arsenic	7440-38-2	2009	3.00E-04	I	3.00E-04	I		1.50E-05	C	1.50E-05	C	
Tetrachloroethene	127-18-4	2009	1.00E-02	I	6.00E-03	2012	I	2.70E-01	A	4.00E-02	2012	A
Trifluorotrichloroethane (1,1,2-trichloro-1,2,2-trifluroethane)	76-13-1	2011	3.00E+01	I	3.00E+01	I		3.00E+01	H	5.00E+00	2016	P
cis-1,2-Dichloroethene	156-59-2	2008	1.00E-02	P	2.00E-03	2010	I			NA	2010	
trans-1,2-Dichloroethene	156-60-5	2008	2.00E-02	I	2.00E-02	2010	I	6.00E-02	P	NA	2010	I
Trichloroethene	79-01-6	2008	NA		5.00E-04	2011	I	6.00E-01	C	2.00E-03	2011	i

Shaded cells indicate that toxicity updates indicate the chemical is more hazardous (more toxic) now than at time of the 2009 HHRA.

Reference (Ref):
ABSgi and ABSd were obtained from Supplemental Guidance to RAGS: Dermal Risk Assessment (EPA, 2004)
I = Environmental Protection Agency (EPA) Integrated Risk Information System (IRIS)
P = Provisional Peer-Reviewed Toxicity Values (PPRTV)
C = California Environmental Protection Agency
A = Agency for Toxic Substances and Disease Registry
H = Health Effects Assessment Summary Table (HEAST)
RfC - Inhalation Reference Concentration
RfDo - Oral Reference Dose

Table A.8-4a Comparison of Previous and Current USEPA Risk-Based Screening Levels (RSLs) for Constituents Driving Risk in Soil

Updated risk characterization calculations

Site	Constituent	Maximum Detected Concentration (mg/kg)	EPC (if available) (mg/kg)	Reference	Previous USEPA or site risk-based level Residential Use (mg/kg)	Previous USEPA RSL Industrial Use (mg/kg)	Date Previous RSL or site risk-based level	2017 USEPA Residential Use 1E-06 Cancer risk	2017 USEPA Residential Use 1E-04 Cancer risk	2017 USEPA Residential Use HQ=1	2017 USEPA Industrial Use 1E-06 Cancer risk	2017 USEPA Industrial Use 1E-04 Cancer risk	2017 USEPA Industrial Use HQ=1	2017 Residential cancer risk	2017 residential hazard	2017 industrial cancer risk	2017 industrial hazard
SSA-72	benzo(a)pyrene	4.30E-01		Table 5-1, SSP 2010	1.5E-02	2.1E-01	2009	1.1E-01	1.1E+01	1.8E+01	2.1E+00	2.1E+02	2.2E+02	3.9E-06	2.E-02	2.E-07	2.E-03
SSA-72	Aroclor 1254	5.50E-01		Table 5-1, SSP 2010	1.1E-01	7.4E-01	2009	2.4E-01	1.1E+01	1.2E+00	9.7E-01	9.7E+01	1.5E+01	2.3E-06	5.E-01	6.E-07	4.E-02
SSA-77	total 2,3,7,8-TCDD equivalents	1.29E-04		Table 8-3, SSP 2010	5.6E-06	1.8E-05	2009	4.8E-06	4.8E-04	5.1E-05	2.2E-05	2.2E-03	7.2E-04				
SWMU-51	total 2,3,7,8-TCDD equivalents	7.95E-07		Table 3-1, URS 2008a	1.2E+00	NA	2008	4.8E-06	4.8E-04	5.1E-05	2.2E-05	2.2E-03	7.2E-04				
SWMU-51	2,4-dinitrotoluene	7.80E+02		Table 3-1, URS 2008a	1.2E+00	NA	2008	1.7E+00	1.7E+02	1.3E+02	7.4E+00	7.4E+02	1.6E+03				
SWMU-51	2,6-dinitrotoluene	2.20E+02		Table 3-1, URS 2008a	1.0E-03	NA	2008	3.6E-01	3.6E+01	1.9E+01	1.5E+00	1.5E+02	2.5E+02				
SWMU-51	vanadium	not tested			1.1E+02	NA	2008	NA	NA	3.9E+02	NA	NA	5.8E+03				
SWMU-40	aluminum	4.75E+04	2.40E+04	Appendix E, URS 2009	7.8E+04	1.0E+06	2007	NA	NA	7.7E+04	NA	NA	1.1E+06		3.E-01		2.E-02
SWMU-40	arsenic	7.46E+01	2.06E+01	Appendix E, URS 2009	4.3E-01	1.9E+00	2007	6.8E-01	6.8E+01	3.5E+01	3.0E+00	3.0E+02	4.8E+02	3.0E-05	6.E-01	7.E-06	4.E-02
SWMU-40	PCBs (aroclor-1242, -1254)	1.70E+01	3.48	Appendix E, URS 2009	1.6E-01	1.4E+00	2007	2.3E-01	2.3E+01	1.2E+00	9.5E-01	9.5E+01	1.5E+01	1.5E-05	3.E+00	4.E-06	2.E-01

Table A.8-4b Comparison of Previous and Current USEPA Tapwater Risk-Based Screening Levels (RSLs) for Constituents Driving Risk in Groundwater (ug/L)

Site	Constituent	Reference	Previous USEPA or site risk-based level for tapwater, and basis (ug/L)	Date Previous RSL or site risk-based level	2017 USEPA Tapwater RSL 1E-06 Cancer risk	2017 USEPA Tapwater RSL 1E-04 Cancer risk	2017 USEPA Tapwater RSL HQ=1
SWMU-41b	tetrachloroethyelene	Shaw 2011a	1.1E-01 (cancer)	2009	1.10E+01	1.10E+03	4.10E+01
SWMU-54	total 2,3,7,8-TCDD equivalents	Shaw 2011b, Appendix C	5.2E-07 (cancer)	2008	1.20E-07	1.20E-05	1.20E-05
SWMU-54	2,4-dinitrotoluene	Shaw 2011b, Appendix C	7.3E+01 (non-cancer)	2008	2.40E-01	2.40E+01	3.80E+01
SWMU-54	dinitrotolune mixture	Shaw 2011b, Appendix C	9.3E-01 (cancer)	2008	1.10E-01	1.10E+01	NA
HWMU-16	Trifluorotrichloroethane (1,1,2-trichloro-1,2,2-trifluroethane)		5.9 E+04 (non-cancer)	2011	NA	NA	1.00E+04
Note: The RFI's indicate that the target cancer risk is 1E-05, and the target hazard quotient is 1 for for cleanup goal development							

Table A.8-5. Adult lead methodology (ALM) for the Radford site using the latest USEPA parameter values and the default year-long averaging time ($AT_{S,D}$). Shaded cells indicate parameters that were updated since the 2009 Radford ALM.

Parameter	Description of Parameter	Units	Radford 2017 Update	Reference[a]
$PbB_{fetal, 0.95}$	95th percentile PbB in fetus	ug/dL	10	DOD 2017
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9	ALM default
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4	ALM default
GSD_i	Geometric standard deviation PbB	--	1.8	USEPA 2017c parameter updates
PbB_0	Baseline PbB	ug/dL	0.64	USEPA 2017c parameter updates
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.1	TRW recommended value for construction workers (USEPA 2003a
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12	ALM default
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days yr^{-1}	250	site assumption for construction worker
$AT_{S, D}$	Averaging time (same for soil and dust)	days yr^{-1}	365	ALM default
RBRG		**ppm**	**1090**	

[a] see reference list for Attachment 8

Where:

$$RBRG = \frac{(PbB_{adult,central,goal} - PbB_0) \times AT_{S,D}}{(BKSF \times IR_s \times AF_{S,D} \times EF_{S,D})}$$ (Equation 4 - EPA, 2003)

$$PbB_{adult,central,goal} = \frac{PbB_{fetal,0.95}}{GSD_i^{1.645} \times R_{fetal/maternal}}$$ (Equation 2 - EPA, 2003)

USEPA, 2003. *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, OSWER Dir #9285.7-54. January (with 2009 update).

Table A.8-6. Evaluation of varying age-ranges in the IEUBK and resulting soil PRG for protection of residential child

age range (months)	lead soil PRG (mg/kg)
0 - 84	418
12 - 84	418
0 - 72	390
12 - 36	314
12 - 24	299
24 - 36	330
36 - 48	354
48 - 60	459
60 - 72	579
average of 12 - 72	*404*

These soil PRGs were set using a target blood lead level of 10 ug/L, a geometric standard deviation of 1.6, and a 5% probability of exceeding the cut-off

ATTACHMENT 9

Site Characterization Data

[This Page Intentionally Left Blank]

CC-001/SSA-72

[This Page Intentionally Left Blank]

Table 5-1
Summary of Historical Analytical Data For Soil Samples Collected at SSA 72
Modified from Previous Investigations
SSP Report for SSAs 18, 72, 30, 79, 60, and 77
Radford Army Ammunition Plant, Radford, Virginia

					Draper Aden Investigation 2004 Acidic Wastewater Sump SSA 72	
Sample ID Sample Date Sample Depth (ft bgs)	CAS	Facility-Wide Background Point Estimate$^{(A)}$	Adjusted Soil RSL (Residential)	Adjusted Soil RSL (Industrial)	B-3 Surface 25-Jun-04 0-1	B-3 (D=6') 25-Jun-04 6
TAL Inorganics (mg/kg)						
Aluminum	7429-90-5	40,041	7,700	99,000	24,000	19,400
Antimony	7440-36-0	--	3.1	41	0.81	0.6
Arsenic	7440-38-2	15.8	0.39	1.6	**2.9**	**2.6**
Barium	7440-39-3	209	1,500	19,000	91	94.1
Beryllium	7440-41-7	1.02	16	200	1.2	1.2
Chromium	7440-47-3	65.3	280	1,400	26.5	21.9
Cobalt	7440-48-4	72.3	2.3	30	13.9	21.1
Copper	7440-50-8	53.5	310	4,100	15.3	15.9
Iron	7439-89-6	50,962	5,500	72,000	37,200	33,000
Lead $^{(1)}$	7439-92-1	26.8	400	800	13.2	13.1
Manganese	7439-96-5	2,543	180	2,300	518	697
Mercury	7439-97-6	0.13	0.67	2.8	ND	0.027
Nickel	7440-02-0	62.8	160	2,000	14.4	13.5
Selenium	7782-49-2	--	39	510	0.58	0.72
Thallium	7440-28-0	2.11	0.51	6.6	1.1	1.3
Vanadium	7440-62-2	108	55	720	75.2	65.6
Zinc	7440-66-6	202	2,300	31,000	53.3	64.9
VOCs (ug/kg)						
Acetone	67-64-1	--	6,100,000	61,000,000	16	31
Carbon Disulfide	75-15-0	--	67,000	300,000	6	20
Ethylbenzene	100-41-4	--	5,700	29,000	2	ND
Isopropylbenzene	98-82-8	--	220,000	1,100,000	1	ND
SVOCs (ug/kg)						
Anthracene	120-12-7	--	1,700,000	17,000,000	100	1.2
Benzo(a)anthracene	56-55-3	--	150	2,100	290	9.2
Benzo(a)pyrene	50-32-8	--	15	210	**430**	9.6
Benzo(b)fluoranthene	205-99-2	--	150	2,100	210	6.5
Benzo(g,h,i)perylene $^{(2)}$	191-24-2	--	170,000	1,700,000	380	11
Benzo(k)fluoranthene	207-08-9	--	1,500	21,000	120	3.7
bis(2-ethylhexyl)phthalate	117-81-7	--	35,000	120,000	390	610
Chrysene	218-01-9	--	15,000	210,000	280	9.4
Fluorene	86-73-7	--	230,000	2,200,000	80	ND
Fluoranthene	206-44-0	--	230,000	2,200,000	410	11
Indeno(1,2,3-cd)pyrene	193-39-5	--	150	2,100	130	ND
Phenanthrene $^{(2)}$	85-01-8	--	170,000	1,700,000	190	3.9
Pyrene	129-00-0	--	170,000	1,700,000	790	17

Notes:

USEPA = U.S. Environmental Protection Agency
CAS = Chemical Abstracts Service
ft bgs = Feet Below Ground Surface
mg/kg = Milligram per Kilogram
ug/kg = Microgram per Kilogram
TAL = Target Analyte List
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
RSL = Regional Screening Level
USEPA Regional Screening Level (RSL) values from the October 2008 Regional Screening Table as presented in Work Plan Addendum 028 (URS 2009)
Adjusted RSLs = a Hazard Quotient (HQ) of 0.1 applied to non-carcinogens
-- = Not Available
ND = Not Detected

$^{(A)}$ = Facility-Wide Background Point Estimate as Reported in the Facility-Wide Background Study Report (IT 2001)

= Concentration Exceeds Soil Residential RSL

bold = Concentration Exceeds Soil Industrial RSL

underline = Concentration Exceeds Background Point Estimate

$^{(1)}$ = Lead criteria are Action Levels; see USEPA Region III guidance
$^{(2)}$ = RSL value for pyrene was used for these compounds

Table 5-3

Summary of Detected Chemicals in Soil Analytical Samples
Site Screening Area 72
SSP Report for SSAs 18, 72, 30, 79, 60, and 77
Radford Army Ammunition Plant, Radford, Virginia

Sample ID	CAS #	Facility-Wide Background Point Estimate$^{(A)}$	Adjusted Soil RSL (Residential)	Key	Adjusted Soil RSL (Industrial)	Key	Soil to Groundwater Risk-based SSL (DAF20)	B-3 Surface/72SB1A		MDL	RL	72SB1B		MDL	RL	72SB1B-DUP (DUP-2)		MDL	RL	72SB2B		MDL	RL	72SB3B		MDL	RL
Sample Date								6-25-04/8-12-09				8/12/2009				8/12/2009				11/11/2009				11/11/2009			
Sample Depth (ft bgs)								0-1				8-10				8-10				8-10				6-8			
								Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r			Result	LQ, VQ, r		
TAL Metals (mg/kg)																											
Aluminum	7429-90-5	40,041	7,700	n	99,000	nm	1,100,000	24,000		2.8	24.4	26,000		1.8	10	24,000		1.8	10	25,000		1.7	9.2	19,000		1.8	10
Antimony	7440-36-0	--	3.1	n	41	n	13.2	0.81	B,J,a	0.28	7.3	0.12	J	0.037	0.2	0.13	J	0.037	0.2	0.18	J	0.037	0.2	0.14	J	0.037	0.2
Arsenic	7440-38-2	15.8	0.39	c*	1.6	c	0.026	***2.9***		0.49	1.2	***1.5***	,L,m	0.03	0.1	***1.5***	,L,m	0.03	0.1	***2.2***	,L,m	0.027	0.091	***1.7***	,L,m	0.03	0.1
Barium	7440-39-3	209	1,500	n	19,000	nm	6,000	91		0.18	24.4	100		0.28	1	98		0.28	1	91	,K,m	0.26	0.92	98	,K,m	0.28	1
Beryllium	7440-41-7	1.02	16	n	200	n	1,160	1.2		0.038	0.61	1.5		0.035	1	1.5		0.035	1	0.44	J	0.032	0.92	0.67	J	0.035	1
Cadmium	7440-43-9	0.69	7	n	80	n	--	<0.16	U	0.028	0.61	0.73	J	0.24	2	0.59	J	0.24	2	1.5	J	0.22	1.8	1.4	J	0.24	2
Calcium	7440-70-2	--	--	--	--	--	--	1,510		18.3	609	1,000	,J,f	8.7	50	2,800	,J,f	8.7	50	930		8	46	1,100		8.7	50
Chromium	7440-47-3	65.3	280	c	1,400	c	--	26.5		0.15	1.2	32	,J,s	0.74	5	31	,J,s	0.74	5	28		0.68	4.6	24		0.74	5
Cobalt	7440-48-4	72.3	2.3	n	30	n	9.8	***13.9***		0.12	6.1	***16***	,L,m	0.44	2	***15***	,L,m	0.44	2	***13***		0.41	1.8	***12***		0.44	2
Copper	7440-50-8	53.5	310	n	4,100	n	1,020	15.3		0.19	3	17		0.043	0.2	17		0.043	0.2	14	,L,m	0.039	0.18	13	,L,m	0.043	0.2
Iron	7439-89-6	50,962	5,500	n	72,000	nm	12,800	***37,200***		5.2	12	***38,000***		0.47	10	***38,000***		0.47	10	***31,000***		0.43	9.2	***30,000***		0.47	10
Lead	7439-92-1	26.8	400	nL	800	nL	--	13.2		0.28	0.37	15	,L,m	0.049	0.2	16	,L,m	0.049	0.2	12		0.045	0.18	19		0.049	0.2
Magnesium	7439-95-4	--	--	--	--	--	--	2,260		2.8	609	3,100		4.4	50	3,600		4.4	50	2,100		4.1	46	2,500		4.4	50
Manganese	7439-96-5	2,543	180	n	2,300	n	1,140	518		0.38	1.8	650		0.21	1	610		0.21	1	510		0.2	0.92	500		0.21	1
Mercury [1]	7439-97-6	0.13	2.3	ns	31	ns	0.6	<0.12	U	0.02	0.12	0.014	J	0.0093	0.05	0.014	J	0.0093	0.05	0.066		0.008	0.05	0.037	J	0.008	0.05
Nickel	7440-02-0	62.8	150	n	2,000	n	960	14.4		0.21	4.9	15		0.025	0.1	15		0.025	0.1	15		0.023	0.091	13		0.025	0.1
Potassium	7440-09-7	--	--	--	--	--	--	1,490		4.4	609	1,800		6.8	50	1,800		6.8	50	1,500		6.3	46	1,600		6.8	50
Selenium	7782-49-2	--	39	n	510	n	19	0.58	B,J	0.33	0.61	0.21	,B,x	0.049	0.2	0.28	,B,x	0.049	0.2	<0.18	U,UL,m	0.045	0.18	<0.2	U,UL,m	0.049	0.2
Silver	7440-22-4	--	39	n	510	n	32	ND				0.052	J,B,o	0.011	0.1	0.041	J,B,o	0.011	0.1	0.044	J,L,m	0.0099	0.091	0.041	J,L,m	0.011	0.1
Sodium	7440-23-5	--	--	--	--	--	--	ND				35	J	5.4	100	36	J	5.4	100	27	J,L,o	4.9	92	22	J,L,o	5.4	100
Thallium	7440-28-0	2.11	0.51	n	6.6	n	3.4	1.1	B,J,b	0.43	1.2	0.21		0.0061	0.1	0.21		0.0061	0.1	0.23		0.0056	0.091	0.21		0.0061	0.1
Vanadium	7440-62-2	108	55	n	720	n	5,200	75.2		0.13	6.1	68		0.065	0.2	67		0.065	0.2	63	,L,m	0.059	0.18	55	,L,m	0.065	0.2
Zinc	7440-66-6	202	2,300	n	31,000	nm	13,600	53.3		1.1	2.4	66		0.79	5	64		0.79	5	56		0.72	4.6	57		0.79	5
Pesticides (mg/kg)																											
4,4'-DDE	72-55-9	--	1.4	c	5.1	c	1.2	<0.019	U	0.00028	0.019	<0.021	U	0.00031	0.021	<0.021	U	0.00031	0.021	<0.022	U	0.00032	0.022	0.026	,J,g	0.0003	0.02
PCBs (ug/kg)																											
Aroclor 1254 [2]	11097-69-1	--	110	n	740	c*	102	<37	U	6.7	37	<41	U	7.3	41	<40	U	7.2	40	<42	U	7.5	42	***550***	,J,c	14	78
VOCs (ug/kg)																											
Acetone	67-64-1	--	6.1E+06	n	6.1E+07	nms	8.8E+04	16	J	7	19	<25	U	3.9	25	<25	U	3.8	25	8.5	J	4	25	<21	U	3.4	21
Carbon Disulfide	75-15-0	--	6.7E+04	ns	3.0E+05	ns	5.4E+03	6		1	5	<6.2	U	0.42	6.2	<6.1	U	0.42	6.1	<6.4	U	0.43	6.4	<5.4	U	0.36	5.4
Ethylbenzene	100-41-4	--	5.7E+03	c	2.9E+04	c	3.8E+01	2	J	1	5	<6.2	U	0.19	6.2	<6.1	U	0.19	6.1	<6.4	U	0.2	6.4	<5.4	U	0.16	5.4
Isopropylbenzene	98-82-8	--	2.2E+05	ns	1.1E+06	ns	2.6E+04	1	J	1	5	<6.2	U	0.24	6.2	<6.1	U	0.24	6.1	<6.4	U	0.25	6.4	<5.4	U	0.21	5.4
Methylene Chloride	75-09-2	--	1.1E+04	c	5.4E+04	c	2.4E+01	ND				3.6	J,B,z	1.5	25	3.7	J,B,z	1.5	25	<25	U	1.6	25	<21	U	1.3	21
SVOCs (ug/kg)																											
Acenaphthylene [3]	208-96-8	--	1.7E+05	n	1.7E+06	n	3.0E+06	ND				<21	U	2.1	21	<21	U	2	21	<22	U	2.1	22	78		2	20
Anthracene	120-12-7	--	1.7E+06	n	1.7E+07	nm	9.0E+06	100		7	66	<21	U	3.1	21	<21	U	3.1	21	<22	U	3.3	22	18	J	3	20
Benzaldehyde	100-52-7	--	7.8E+05	ns	1.0E+07	nms	1.9E+04	<420	U	42	420	<210	U,R,l	7.6	210	<210	U,R,l	7.6	210	<220	U	7.9	220	18	J	7.3	200
Benzo(a)anthracene	56-55-3	--	1.5E+02	c	2.1E+03	c	2.8E+02	***290***		17	83	1.6	J	1.4	21	<21	U	1.4	21	<22	U	1.4	22	170		1.3	20
Benzo(a)pyrene	50-32-8	--	1.5E+01	c	2.1E+02	c	9.2E+01	***430***		26	170	<21	U	1.7	21	<21	U	1.7	21	<22	U	1.8	22	***120***		1.7	20
Benzo(b)fluoranthene	205-99-2	--	1.5E+02	c	2.1E+03	c	9.4E+02	210		33	170	<21	U	3.6	21	<21	U	3.6	21	<22	U	3.7	22	160		3.5	20
Benzo(g,h,i)perylene [3]	191-24-2	--	1.7E+05	n	1.7E+06	n	3.0E+06	380		33	170	<83	U	1.2	83	<82	U	1.1	82	<85	U	1.2	85	62	J	1.1	79
Benzo(k)fluoranthene	207-08-9	--	1.5E+03	c	2.1E+04	c	9.2E+03	120		17	83	<21	U	1.6	21	<21	U	1.6	21	<22	U	1.6	22	50		1.5	20
Bis(2-ethylhexyl) Phthalate	117-81-7	--	3.5E+04	c*	1.2E+05	c	3.2E+04	390		120	210	8.6	J,B,z	5.7	210	12	J,B,z	5.7	210	14	J	5.9	220	36	J	5.5	200
Butyl Benzyl Phthalate	85-68-7	--	2.6E+05	c*	9.1E+05	c	1.3E+04	ND				<210	U	6	210	6.9	J	6	210	<220	U	6.2	220	<200	U	5.8	200
Chrysene	218-01-9	--	1.5E+04	c	2.1E+05	c	2.8E+04	280		25	170	<21	U	4.3	21	<21	U	4.3	21	<22	U	4.4	22	150		4.1	20
Dibenz(a,h)anthracene	53-70-3	--	1.5E+01	c	2.1E+02	c	3.0E+02	ND				<83	U	9.5	83	<82	U	9.4	82	<85	U	9.8	85	12	J	9.1	79
Fluoranthene	206-44-0	--	2.3E+05	n	2.2E+06	n	4.2E+06	410		17	68	<21	U	0.94	21	<21	U	0.93	21	<22	U	0.97	22	210		0.9	20
Fluorene	86-73-7	--	2.3E+05	n	2.2E+06	n	6.6E+05	80	J	50	330	<41	U	8.5	41	<40	U	8.4	40	<42	U	8.8	42	8.7	J	8.1	39
Indeno(1,2,3-cd)pyrene	193-39-5	--	1.5E+02	c	2.1E+03	c	3.2E+03	130	J	42	170	<83	U	4.5	83	<82	U	4.5	82	<85	U	4.7	85	51	J	4.3	79
Phenanthrene [3]	85-01-8	--	1.7E+05	n	1.7E+06	n	3.0E+06	190		25	170	<21	U	1.3	21	<21	U	1.3	21	<22	U	1.3	22	79		1.2	20
Pyrene	129-00-0	--	1.7E+05	n	1.7E+06	n	3.0E+06	790		58	330	<21	U	1.5	21	<21	U	1.5	21	<22	U	1.5	22	330		1.4	20
Explosives (mg/kg)																											
Nitrobenzene	98-95-3	--	4.4E+00	c*	2.2E+01	c*	1.4E-03	ND				<2.5	U	0.045	2.5	<2.5	U	0.045	2.5	***0.079***	J	0.045	2.5	***0.1***	J	0.045	2.5
Cyanide (mg/kg)																											
Cyanide, Total	57-12-5	--	160	n	2,000	n	148	NT				0.16	J	0.082	0.37	0.29	J	0.082	0.37	<0.38	U	0.085	0.38	0.088	J	0.079	0.35
Total Organic Carbon, TOC (%)																											
Carbon, Total Organic	--	--	--	--	--	--	--	NT				NT				NT				NT				NT			
Percent Solids (%)																											
Percent Solids	--	--	--	--	--	--	--	88		0.1	0.1	81		0.1	0.1	82		0.1	0.1	78		0.1	0.1	85		0.1	0.1

Table 5-3
Summary of Detected Chemicals in Soil Analytical Samples
Site Screening Area 72
SSP Report for SSAs 18, 72, 30, 79, 60, and 77
Radford Army Ammunition Plant, Radford, Virginia

Notes:

CAS = Chemical Abstracts Service
ft bgs = Feet Below Ground Surface
mg/kg = Milligram Per Kilogram
µg/kg = Microgram Per Kilogram
TAL = Target Analyte List
TCL = Target Compound List
PCB = Polychlorinated Biphenyl
VOC = Volatile Organic Compound
SVOC = Semi-volatile Organic Compound
MDL = Method Detection Limit
RL = Reporting Limit
LQ = Laboratory Qualifier
VQ = Validation Qualifier
r = Reason Code
ND = Not Detected
NT = Not Tested

[1] = Mercuric chloride soil RSLs value used
[2] = Aroclor 1254 Unadjusted Soil Residential RSL used
[3] = Pyrene soil RSLs used

(A) = Facility-Wide Background Point Estimate as Reported in the Facility-Wide Background Study Report (IT 2001)
RSL = Regional Screening Level (RSL) from April 2009 RSL Table
Adjusted RSLs = a Hazard Quotient (HQ) of 0.1 applied to non-carcinogens
Key:
c = cancer
n = noncancer
* = where: n SL < 100X c SL
** = where n SL < 10X c SL
m = concentration may exceed ceiling limit
s = concentration may exceed Csat
-- = No Screening Value Available

▣ = Concentration Exceeds Adjusted Soil Residential RSL

☐ = Concentration Exceeds Adjusted Soil Industrial RSL

underline = Concentration Exceeds Facility Background Point Estimate

bold italic = Concentration Exceeds Soil-to-Groundwater Risk-based SSL (DAF 20)

Data Qualifiers:

Laboratory Qualifiers

B	Analyte found in associated blank as well as in the sample.
J	Analyte present. Reported value may not be accurate or precise.
U	The compound was analyzed for but not detected. The reporting limit will be adjusted to reflect any dilution, and for soil, the percent moisture.

Validation Qualifiers

B	Not detected substantially above the level reported in laboratory or field blanks.
J	Analyte present. Reported value may not be accurate or precise.
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
R	Unreliable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.
UL	Not detected, quantitation limit is probably higher.

Reason Codes

GC/MS Organics

l	MS/MSD recovery failure
z	Method blank and/or storage blank contamination

Inorganics and Conventionals

a	Matrix spike/matrix spike duplicate recovered low
b	Blank contamination in the calibration blank; result <5x blank contamination
f	Field duplicate imprecision
o	Calibration blank contamination
m	MS/MSD recovery failure
s	Serial dilution failure
x	CRDL standard recovery failure

GC and HPLC Organics

c	Calibration failure; poor or unstable (%D) response
g	Dual column confirmation imprecision

Table 5-2
Historical Analytical Data for Sump Water Samples Collected at SSA 72
Modified from Previous Investigations
SSP Report for SSAs 18, 72, 30, 79, 60, and 77
Radford Army Ammunition Plant, Radford, Virginia

				Draper Aden Investigation 2004	Ecology and Environment 2007
Sample ID Sample Date	CAS	Adjusted Tap Water RSL	MCL	B-3 Drain 25-Jun-04	ATK-SW-04 9-May-07
TAL Inorganics (ug/L)					
Aluminum	7429-90-5	3,700	--	NT	12,300
Antimony	7440-36-0	1.5	6	NT	**18.8**
Arsenic	7440-38-2	0.045	10	NT	**32.7**
Barium	7440-39-3	730	2,000	NT	124
Chromium (1)	7440-47-3	5,500	100	NT	77.7
Cobalt	7440-48-4	1.1	--	NT	5.2
Copper	7440-50-8	150	1,300	NT	134
Iron	7439-89-6	2,600	--	NT	26,600
Lead (2)	7439-92-1	15	--	NT	4050
Manganese	7439-96-5	180	--	NT	211
Mercury	7439-97-6	0.063	2	NT	0.45
Nickel	7440-02-0	73	--	NT	53.7
Vanadium	7440-62-2	26	--	NT	28.3
Zinc	7440-66-6	1,100	--	NT	154
Pesticides (ug/L)					
4,4'-DDT	50-29-3	0.2	--	NT	0.0096
alpha-BHC	319-84-6	0.011	--	NT	0.032
alpha-chlordane (3)	5103-71-9	0.19	--	NT	0.0064
Endrin aldehyde (4)	7421-93-4	1.1	--	NT	0.0064
Heptachlor	76-44-8	0.015	0.4	NT	0.022
Methoxyclor	72-43-5	18	40	NT	0.013
VOCs (ug/L)					
Acetone	67-64-1	2,200	--	NT	14
Carbon Disulfide	75-15-0	100	--	NT	0.11
SVOCs (ug/L)					
Di-n-butylphthalate	84-74-2	370	--	NT	3.2
Fluoranthene	206-44-0	150	--	NT	1.5
Phenanthrene (5)	85-01-8	110	--	NT	2.1
Pyrene	129-00-0	110	--	NT	1.4
Perchlorate (ug/L)					
Perchlorate	14797-73-0	2.6	--	ND	0.386

Notes:

USEPA = U.S. Environmental Protection Agency
CAS = Chemical Abstracts Service
MCL = Maximum Contaminant Level
ug/L = Microgram Per Liter
TAL = Target Analyte List
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
RSL = Regional Screening Level
USEPA Regional Screening Level (RSL) values from the October 2008 Regional Screening Table as presented in Work Plan Addendum 028 (URS 2009)
Adjusted RSLs = a Hazard Quotient (HQ) of 0.1 applied to non-carcinogens
-- = Not Available
ND = Not Detected
NT = Not Tested

☐ = Concentration Exceeds Adj. Tap Water RSL

bold = Concentration Exceeds MCL

(1) = Chromium III RSL used
(2) = Lead criteria are Action Levels
(3) = Chlordane RSL used
(4) = Endrin RSL used
(5) = RSL value for pyrene was used for these compounds

RAAP-001/SWMU 51

[This Page Intentionally Left Blank]

Table 3-1
Shallow Soil Confirmation Sample Results - SWMU 51 Interim Measures
Page 1 of 4

Analyte	Sample ID	**51SC01**					**51SC02**					**51SC03**					**51SC04**					**51SC05**					**51SC06**					**51SC07**				
	Sample Date	**3/4/09**					**3/4/09**					**3/4/09**					**3/4/09**					**3/4/09**					**3/4/09**					**3/4/09**				
	Sample Depth	**9-9.5**					**11-11.5**					**6-6.5**					**6-6.5**					**10-10.5**					**12-12.5**					**10-10.5**				
	S-RG	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL
Explosives (mg/kg)																																				
1,3-Dinitrobenzene	0.8	0.25	U		*0.004*	*0.25*	0.25	U		*0.004*	*0.25*	0.25	U		*0.004*	*0.25*	0.25	U		*0.004*	*0.25*	0.25	U		*0.004*	*0.25*	0.25	U		*0.004*	*0.25*	0.25	U		*0.004*	*0.25*
2,4,6-Trinitrotoluene	4.4	2.1		J	*0.019*	*0.25*	9.2			*0.039*	*0.5*	3.6			*0.019*	*0.25*	3			*0.019*	*0.25*	0.13	J	J	*0.019*	*0.25*	0.38			*0.019*	*0.25*	0.3		J	*0.019*	*0.25*
2,4-Dinitrotoluene	1.2	0.17	J	J	*0.005*	*0.25*	4.2			*0.005*	*0.25*	1.3			*0.005*	*0.25*	0.85			*0.005*	*0.25*	0.048	J	J	*0.005*	*0.25*	0.025	J	J	*0.005*	*0.25*	0.1	J	J	*0.005*	*0.25*
2,6-Dinitrotoluene	1.2	0.11	J	J	*0.007*	*1.2*	0.88	J	J	*0.007*	*1.2*	0.39	J	J	*0.007*	*1.2*	0.28	J	J	*0.007*	*1.2*	0.025	J	J	*0.007*	*1.2*	0.044	J	J	*0.007*	*1.2*	0.072	J	J	*0.007*	*1.2*
2-Nitrotoluene	91	0.25	U	UJ	*0.013*	*0.25*	0.21	J	J	*0.013*	*0.25*	0.098	J	J	*0.013*	*0.25*	0.14	J	J	*0.013*	*0.25*	0.064	J	J	*0.013*	*0.25*	0.25	U		*0.013*	*0.25*	0.25	U	UJ	*0.013*	*0.25*
4-Nitrotoluene	30.8	0.5	U		*0.018*	*0.5*	0.25	J	J	*0.018*	*0.5*	0.11	J	J	*0.018*	*0.5*	0.11	J	J	*0.018*	*0.5*	0.044	J	J	*0.018*	*0.5*	0.5	U		*0.018*	*0.5*	0.5	U	UJ	*0.018*	*0.5*
Nitroglycerin	0.8	0.5	U		*0.015*	*0.5*	0.5	U		*0.015*	*0.5*	0.5	U		*0.015*	*0.5*	0.5	U		*0.015*	*0.5*	0.5	U		*0.015*	*0.5*	0.5	U		*0.015*	*0.5*	0.5	U		*0.015*	*0.5*
Metals (mg/kg)																																				
Aluminum	40041	17200		J	*8.5*	*25.6*	19600			*8.4*	*25.2*	22300			*8.6*	*25.9*	21400			*8.5*	*25.6*	20100			*8.3*	*25*	12000			*7.7*	*23*	20100			*8.1*	*24.2*
Lead	400	10.8		J	*0.73*	*2.4*	14.7			*0.72*	*2.4*	9.8			*0.74*	*2.5*	11			*0.73*	*2.4*	9.1			*0.72*	*2.4*	6.4			*0.66*	*2.2*	12.5			*0.69*	*2.3*
Dioxins/Furans (ng/kg)																																				
TCDD TE	1000	0.7953					NT					NT					NT					NT					NT					NT				

**Refer to legend immediately following this table for a list of table notes.

Table 3-1
Shallow Soil Confirmation Sample Results - SWMU 51 Interim Measures
Page 2 of 4

Analyte	Sample ID Sample Date Sample Depth	51SC08 3/4/09 4-4.5					51SC09 3/4/09 8-8.5					51SC10 3/4/09 10-10.5					51SC15 3/10/09 13-13.5					51SC17 3/10/09 12-12.5					51SC19 3/10/09 8-8.5					51SC21 3/10/09 6-6.5				
	S-RG	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL
Explosives (mg/kg)																																				
1,3-Dinitrobenzene	0.8	0.25	U		0.004	0.25	0.25	U		0.004	0.25	0.25	U		0.004	0.25	0.25	U		0.004	0.25	0.25	U		0.004	0.25	0.41		K	0.004	0.25	0.4		K	0.004	0.25
2,4,6-Trinitrotoluene	4.4	21		K	0.097	1.2	1.4			0.019	0.25	27		K	0.097	1.2	0.05	J	J	0.019	0.25	4.2		K	0.019	0.25	1300			9.7	120	990			9.7	120
2,4-Dinitrotoluene	1.2	31		K	0.026	1.2	0.64			0.005	0.25	20		K	0.026	1.2	0.14	J	J	0.005	0.25	4.8		K	0.005	0.25	780			2.6	120	750			2.6	120
2,6-Dinitrotoluene	1.2	3.4		K	0.007	1.2	0.26	J	J	0.007	1.2	5		K	0.007	1.2	0.1	J	J	0.007	0.25	1.1		K	0.007	0.25	220			3.6	120	210			3.6	120
2-Nitrotoluene	91	0.63		K	0.013	0.25	0.27			0.013	0.25	1.4		K	0.013	0.25	0.63			0.013	0.25	0.6		K	0.013	0.25	170			6.5	120	240			6.5	120
4-Nitrotoluene	30.8	0.49	J	K	0.018	0.5	0.21	J	J	0.018	0.5	1.6		K	0.018	0.5	0.42	J	J	0.018	0.5	0.79		K	0.018	0.5	120	J	J	9.1	250	170	J	J	9.1	250
Nitroglycerin	0.8	0.5	U		0.015	0.5	0.5	U		0.015	0.5	0.5	U		0.015	0.5	0.5	U		0.015	0.5	0.5	U		0.015	0.5	1.1		K	0.015	0.5	0.54		K	0.015	0.5
Metals (mg/kg)																																				
Aluminum	40041	23300			8.9	26.7	33600			9.3	28	30500			8.8	26.3	29600			8.7	26.2	14900			7.9	23.7	19200			8.6	25.8	19000			8.7	26.1
Lead	400	11.8			0.76	2.5	12.6			0.8	2.7	15.1			0.75	2.5	17.2		J	0.75	2.5	11.8		J	0.68	2.3	12.8		J	0.74	2.5	37.9		J	0.75	2.5
Dioxins/Furans (ng/kg)																																				
TCDD TE	1000	NT					NT					NT					NT					NT					NT					1.327				

**Refer to legend immediately following this table for a list of table notes.

Table 3-1

Shallow Soil Confirmation Sample Results - SWMU 51 Interim Measures

Page 3 of 4

Analyte	Sample ID	**51SC23**					**51SC24**					**51SC25**					**51SC26**					**51SC42**					**51SC43**					**51SC44**				
	Sample Date	**3/10/09**					**3/10/09**					**3/10/09**					**3/10/09**					**4/7/09**					**4/7/09**					**4/7/09**				
	Sample Depth	**12-12.5**					**10-10.5**					**6-6.5**					**8-8.5**					**2-2.5**					**4-4.5**					**10-10.5**				
	S-RG	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL
Explosives (mg/kg)																																				
1,3-Dinitrobenzene	0.8	0.25	U		*0.004*	*0.25*	0.25	U		*0.004*	*0.25*	0.25	U		*0.004*	*0.25*	0.25	U		*0.004*	*0.25*	0.25	U		*0.004*	*0.25*	0.25	U		*0.004*	*0.25*	0.25	U		*0.004*	*0.25*
2,4,6-Trinitrotoluene	4.4	70			*0.19*	*2.5*	1.7			*0.019*	*0.25*	0.4			*0.019*	*0.25*	1.6			*0.019*	*0.25*	0.5			*0.019*	*0.25*	0.072	J		*0.019*	*0.25*	0.14	J		*0.019*	*0.25*
2,4-Dinitrotoluene	1.2	10			*0.053*	*2.5*	0.34			*0.005*	*0.25*	0.43			*0.005*	*0.25*	2.1			*0.005*	*0.25*	0.19	J		*0.005*	*0.25*	0.042	J		*0.005*	*0.25*	0.025	J		*0.005*	*0.25*
2,6-Dinitrotoluene	1.2	5.6		K	*0.007*	*0.25*	0.21	J	J	*0.007*	*0.25*	0.2	J	J	*0.007*	*0.25*	0.69			*0.007*	*0.25*	0.1	J		*0.007*	*0.25*	0.016	J		*0.007*	*0.25*	0.25	U		*0.007*	*0.25*
2-Nitrotoluene	91	2.6	PG	J	*0.013*	*0.25*	1.1			*0.013*	*0.25*	1.4			*0.013*	*0.25*	1.2			*0.013*	*0.25*	0.25	U		*0.013*	*0.25*	0.25	U		*0.013*	*0.25*	0.25	U		*0.013*	*0.25*
4-Nitrotoluene	30.8	1.8	PG	J	*0.018*	*0.5*	0.78			*0.018*	*0.5*	0.89			*0.018*	*0.5*	0.85			*0.018*	*0.5*	0.5	U		*0.018*	*0.5*	0.5	U		*0.018*	*0.5*	0.5	U		*0.018*	*0.5*
Nitroglycerin	0.8	20			*0.15*	*5*	0.5	U		*0.015*	*0.5*	0.5	U		*0.015*	*0.5*	0.5	U		*0.015*	*0.5*	0.5	U		*0.015*	*0.5*	0.5	U		*0.015*	*0.5*	0.5	U		*0.015*	*0.5*
Metals (mg/kg)																																				
Aluminum	40041	18600			*8.6*	*25.8*	32700			*8.7*	*26*	24600			*8.3*	*24.8*	18300			*8.2*	*24.6*	NT					NT					NT				
Lead	400	45.8		J	*0.74*	*2.5*	22.8		J	*0.74*	*2.5*	14.6		J	*0.71*	*2.4*	10.4		J	*0.7*	*2.3*	NT					NT					NT				
Dioxins/Furans (ng/kg)																																				
TCDD TE	1000	NT					NT					NT					NT					NT					NT					NT				

**Refer to legend immediately following this table for a list of table notes.

Table 3-1
Shallow Soil Confirmation Sample Results - SWMU 51 Interim Measures
Page 4 of 4

Analyte	Sample ID	**51SC45**					**51SC46**					**51SC47**					**51SC48**					**51SC49**					**51SC50**					**51SC51**				
	Sample Date	**4/7/09**					**4/7/09**					**4/7/09**					**4/7/09**					**4/7/09**					**4/7/09**					**4/7/09**				
	Sample Depth	**6-6.5**					**8-8.5**					**10-10.5**					**6-6.5**					**8-8.5**					**6-6.5**					**4-4.5**				
	S-RG	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL
Explosives (mg/kg)																																				
1,3-Dinitrobenzene	0.8	0.03	J		*0.004*	*0.25*	0.25	U		*0.004*	*0.25*	0.25	U		*0.004*	*0.25*	0.25	U		*0.004*	*0.25*	0.25	U		*0.004*	*0.25*	0.25	U		*0.004*	*0.25*	0.25	U		*0.004*	*0.25*
2,4,6-Trinitrotoluene	4.4	120			*0.39*	*5*	870			*3.9*	*50*	0.57			*0.019*	*0.25*	0.091	J		*0.019*	*0.25*	2			*0.019*	*0.25*	0.22	J		*0.019*	*0.25*	3.8			*0.019*	*0.25*
2,4-Dinitrotoluene	1.2	37			*0.11*	*5*	2.9			*0.005*	*0.25*	0.021	J		*0.005*	*0.25*	0.087	J		*0.005*	*0.25*	0.096	J		*0.005*	*0.25*	0.03	J		*0.005*	*0.25*	3.3			*0.005*	*0.25*
2,6-Dinitrotoluene	1.2	15			*0.15*	*5*	6			*0.007*	*0.25*	0.022	J PG		*0.007*	*0.25*	0.044	J		*0.007*	*0.25*	0.053	J		*0.007*	*0.25*	0.014	J		*0.007*	*0.25*	0.66			*0.007*	*0.25*
2-Nitrotoluene	91	3.8			*0.013*	*0.25*	0.6			*0.013*	*0.25*	0.25	U		*0.013*	*0.25*	0.25	U		*0.013*	*0.25*	0.25	U		*0.013*	*0.25*	0.25	U		*0.013*	*0.25*	0.12	J		*0.013*	*0.25*
4-Nitrotoluene	30.8	2.8			*0.018*	*0.5*	1.2			*0.018*	*0.5*	0.5	U		*0.018*	*0.5*	0.5	U		*0.018*	*0.5*	0.5	U		*0.018*	*0.5*	0.5	U		*0.018*	*0.5*	0.11	J		*0.018*	*0.5*
Nitroglycerin	0.8	0.5	U		*0.015*	*0.5*	4			*0.015*	*0.5*	0.5	U		*0.015*	*0.5*	0.5	U		*0.015*	*0.5*	0.5	U		*0.015*	*0.5*	0.5	U		*0.015*	*0.5*	0.5	U		*0.015*	*0.5*
Metals (mg/kg)																																				
Aluminum	40041	NT					NT					NT					NT					NT					NT					NT				
Lead	400	NT					NT					NT					NT					NT					NT					NT				
Dioxins/Furans (ng/kg)																																				
TCDD TE	1000	NT					NT					NT					NT					NT					NT					NT				

**Refer to legend immediately following this table for a list of table notes.

Table 3-1
Legend

12	J	Shading and black font indicate a S-RG exceedance.
12	*12*	Shading in the MDL/MRL columns indicates the MDL exceeds a criterion.

S-RG = remedial goal for soil <15 ft bgs

mg/kg = milligrams per kilogram (parts per million).

ng/kg = nanograms per kilogram (parts per trillion).

µg/kg = micrograms per kilogram (parts per billion).

SL = Screening Level (Source: ORNL Regional Screening Table, September 2008).

SLs for non-Carcinogenic compounds have been recalculated to an HI of 0.1.

NA = not applicable.

NT = analyte not tested.

Lab Q = Lab Data Qualifiers

* = Laboratory duplicate not within control limits.

B = (organics) Blank contamination. Value detected in sample and associated blank.

A (Dioxins) = B = (metals) Value <MRL and >MDL and is considered estimated.

E (metals) = Reported value is estimated because of the presence of interferences.

EMPC (Dioxins) = The ion-abundance ratio between the two characteristic PCDD/PCDF ions was outside accepted ranges. The detected PCDD/PCDF was reported as an estimated maximum possible concentration (EMPC).

J = (organics) Value <MRL and >MDL and is considered estimated.

U = Analyte not-detected at the method reporting limit.

X = (dioxins) Ion abundance ratio outside acceptable range. Value reported is EMPC.

Val Q = Validation Data Qualifiers

B = blank contamination. Value detected in sample and associated blank.

J = estimated concentration.

K = estimated concentration bias high.

L = estimated concentration bias low.

N = presumptive evidence for tentatively identified compounds using a library search.

U = analyte not detected.

UJ = estimated concentration non-detect.

UL = estimated concentration non-detect bias low.

Table 3-2
Deep Soil Confirmation Sample Results - SWMU 51 Interim Measures
Page 1 of 4

Analyte	Sample ID	**51SC11**					**51SC12**					**51SC13**					**51SC14**					**51SC16**					**51SC18**				
	Sample Date	**3/4/09**					**3/4/09**					**3/4/09**					**3/4/09**					**3/10/09**					**3/10/09**				
	Sample Depth	**23-23.5**					**23-23.5**					**24-24.5**					**23-23.5**					**23-23.5**					**23-23.5**				
	D-RG	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL
Explosives (mg/kg)																															
1,3-Dinitrobenzene	7.8	0.25	U		0.004	0.25	0.034	J PG	J	0.004	0.25	0.066	J PG	J	0.004	0.25	0.3		K	0.004	0.25	0.53		J	0.004	0.25	0.31		K	0.004	0.25
2,4,6-Trinitrotoluene	43	11		K	0.039	0.5	71			0.39	5	230			0.97	12	500			1.9	25	1900		J	19	250	1000			9.7	120
2,4-Dinitrotoluene	60.5	4.3		K	0.005	0.25	29			0.11	5	45			0.26	12	480			0.53	25	1000		J	5.3	250	640			2.6	120
2,6-Dinitrotoluene	14	2		K	0.007	1.2	12	J	J	0.15	25	34	J	J	0.36	62	140			0.73	120	250		J	7.3	250	130			3.6	120
2-Nitrotoluene	10000	0.63		K	0.013	0.25	4.6		K	0.013	0.25	6.9		K	0.013	0.25	120			1.3	25	250		J	13	250	73	J	J	6.5	120
4-Nitrotoluene	310	0.65		K	0.018	0.5	4.8		K	0.018	0.5	5.5		K	0.018	0.5	95			1.8	50	200	J	J	18	500	78	J	J	9.1	250
Nitroglycerin	7.8	0.5	U		0.015	0.5	0.5	U		0.015	0.5	0.5	U		0.015	0.5	0.5	U		0.015	0.5	0.2	J	J	0.015	0.5	0.24	J	J	0.015	0.5
Metals (mg/kg)																															
Aluminum	40041	18200			8.7	26.1	7710			7.7	23.1	15500			8.5	25.6	15700			8.7	26.1	16900			8.4	25.2	28400			8.6	25.9
Lead	400	34.1			0.75	2.5	4.9			0.66	2.2	309			0.73	2.4	86.7			0.75	2.5	46.5		J	0.72	2.4	13.9		J	0.74	2.5
Dioxins/Furans (ng/kg)																															
TCDD TE	1000	1.635					NT					NT					NT					NT					NT				

**Refer to legend immediately following this table for a list of table notes.

Table 3-2
Deep Soil Confirmation Sample Results - SWMU 51 Interim Measures
Page 2 of 4

Analyte	Sample ID	51SC20					51SC22					51SC27					51SC28					51SC29					51SC30				
	Sample Date	3/10/09					3/10/09					3/23/09					3/23/09					3/23/09					3/23/09				
	Sample Depth	23-23.5					23-23.5					23-23.5					23-23.5					23-23.5					23-23.5				
	D-RG	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL
Explosives (mg/kg)																															
1,3-Dinitrobenzene	7.8	0.42		K	0.004	0.25	0.44		K	0.004	0.25	0.25	U		0.004	0.25	0.25	U		0.004	0.25	0.25	U		0.004	0.25	0.25	U		0.004	0.25
2,4,6-Trinitrotoluene	43	1200			9.7	120	1200			9.7	120	14			0.097	1.2	16			0.097	1.2	12			0.097	1.2	11			0.097	1.2
2,4-Dinitrotoluene	60.5	830			2.6	120	870			2.6	120	4.4			0.005	0.25	1			0.005	0.25	1			0.005	0.25	2.8			0.005	0.25
2,6-Dinitrotoluene	14	220			3.6	120	250			3.6	120	0.71			0.007	0.25	0.39			0.007	0.25	0.42			0.007	0.25	0.27			0.007	0.25
2-Nitrotoluene	10000	140			6.5	120	200			6.5	120	0.24	J	J	0.013	0.25	0.11	J	J	0.013	0.25	0.13	J	J	0.013	0.25	0.095	J	J	0.013	0.25
4-Nitrotoluene	310	100	J	J	9.1	250	110	J	J	9.1	250	0.3	J	J	0.018	0.5	0.12	J	J	0.018	0.5	0.14	J	J	0.018	0.5	0.1	J	J	0.018	0.5
Nitroglycerin	7.8	1.5		K	0.015	0.5	3.5		K	0.015	0.5	0.4	J	J	0.015	0.5	0.17	J	J	0.015	0.5	0.17	J	J	0.015	0.5	0.12	J	J	0.015	0.5
Metals (mg/kg)																															
Aluminum	40041	21300			9.1	27.2	17300			8.4	25.1	24500			8.6	25.9	24600			8.7	26.1	26600			8.7	26.1	24600			8.7	26
Lead	400	335		J	0.78	2.6	49.6		J	0.72	2.4	15.8			0.74	2.5	15.6			0.74	2.5	13.9			0.75	2.5	13.3			0.74	2.5
Dioxins/Furans (ng/kg)																															
TCDD TE	1000	NT					NT					NT					NT					NT					NT				

**Refer to legend immediately following this table for a list of table notes.

Table 3-2
Deep Soil Confirmation Sample Results - SWMU 51 Interim Measures
Page 3 of 4

Analyte	Sample ID	51SC31					51SC32					51SC33					51SC34					51SC35					51SC36				
	Sample Date	3/23/09					3/23/09					3/23/09					3/23/09					3/23/09					3/23/09				
	Sample Depth	23-23.5					23-23.5					23-23.5					23-23.5					16-16.5					15-15.5				
	D-RG	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL
Explosives (mg/kg)																															
1,3-Dinitrobenzene	7.8	0.25	U		0.004	0.25	0.25	U		0.004	0.25	0.25	U		0.004	0.25	0.25	U		0.004	0.25	0.25	U		0.004	0.25	0.25	U		0.004	0.25
2,4,6-Trinitrotoluene	43	7.3			0.019	0.25	16			0.097	1.2	16			0.097	1.2	14		K	0.097	1.2	11		K	0.097	1.2	23		K	0.097	1.2
2,4-Dinitrotoluene	60.5	1.2			0.005	0.25	1.7			0.005	0.25	2.8			0.005	0.25	4.7		K	0.005	0.25	7		K	0.005	0.25	15		K	0.026	1.2
2,6-Dinitrotoluene	14	0.38			0.007	0.25	0.6			0.007	0.25	0.77			0.007	0.25	0.74		K	0.007	0.25	1.3		K	0.007	0.25	2.6		K	0.007	0.25
2-Nitrotoluene	10000	0.22	J	J	0.013	0.25	0.18	J	J	0.013	0.25	0.28			0.013	0.25	0.19	J	K	0.013	0.25	0.4		K	0.013	0.25	0.66		K	0.013	0.25
4-Nitrotoluene	310	0.18	J	J	0.018	0.5	0.2	J	J	0.018	0.5	0.3	J	J	0.018	0.5	0.2	J	K	0.018	0.5	0.61		K	0.018	0.5	0.93		K	0.018	0.5
Nitroglycerin	7.8	0.096	J	J	0.015	0.5	0.28	J	J	0.015	0.5	0.19	J	J	0.015	0.5	0.19	J	K	0.015	0.5	0.5	U		0.015	0.5	0.5	U		0.015	0.5
Metals (mg/kg)																															
Aluminum	40041	27800			8.6	25.8	24200			8.6	25.7	24200			8.5	25.4	22700			8.6	25.7	19000			8	24	17500			8.2	24.5
Lead	400	16.1			0.74	2.5	16.4			0.73	2.4	16.5			0.73	2.4	16.8			0.74	2.5	13.7			0.69	2.3	14.1			0.7	2.3
Dioxins/Furans (ng/kg)																															
TCDD TE	1000	0.6386					NT					NT					NT					NT					NT				

**Refer to legend immediately following this table for a list of table notes.

Table 3-2
Deep Soil Confirmation Sample Results - SWMU 51 Interim Measures
Page 4 of 4

Analyte	Sample ID	51SC37					51SC38					51SC39					51SC40					51SC41				
	Sample Date	3/23/09					3/23/09					3/23/09					3/23/09					3/23/09				
	Sample Depth	18-18.5					15-15.5					16-16.5					15-15.5					15-15.5				
	D-RG	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL
Explosives (mg/kg)																										
1,3-Dinitrobenzene	7.8	0.25	U		*0.004*	*0.25*	0.25	U		*0.004*	*0.25*	0.25	U		*0.004*	*0.25*	0.25	U		*0.004*	*0.25*	0.25	U		*0.004*	*0.25*
2,4,6-Trinitrotoluene	43	6.4		K	*0.019*	*0.25*	11		K	*0.097*	*1.2*	0.1	J	J	*0.019*	*0.25*	0.66			*0.019*	*0.25*	3			*0.019*	*0.25*
2,4-Dinitrotoluene	60.5	5		K	*0.005*	*0.25*	3.5			*0.005*	*0.25*	0.07	J	J	*0.005*	*0.25*	0.7			*0.005*	*0.25*	4			*0.005*	*0.25*
2,6-Dinitrotoluene	14	1.2		K	*0.007*	*0.25*	0.83			*0.007*	*0.25*	0.02	J	J	*0.007*	*0.25*	0.23	J	J	*0.007*	*0.25*	1.5			*0.007*	*0.25*
2-Nitrotoluene	10000	0.32		K	*0.013*	*0.25*	0.36	PG	J	*0.013*	*0.25*	0.25	U		*0.013*	*0.25*	0.057	J	J	*0.013*	*0.25*	0.082	J	J	*0.013*	*0.25*
4-Nitrotoluene	310	0.49	J	K	*0.018*	*0.5*	0.43	J PG	J	*0.018*	*0.5*	0.5	U		*0.018*	*0.5*	0.078	J	J	*0.018*	*0.5*	0.12	J	J	*0.018*	*0.5*
Nitroglycerin	7.8	0.5	U		*0.015*	*0.5*	0.85			*0.015*	*0.5*	0.5	U		*0.015*	*0.5*	0.5	U		*0.015*	*0.5*	0.5	U		*0.015*	*0.5*
Metals (mg/kg)																										
Aluminum	40041	15500			*7.9*	*23.8*	20700			*8.1*	*24.3*	33700			*8.8*	*26.4*	33500			*8.8*	*26.4*	35000			*8.8*	*26.3*
Lead	400	12.6			*0.68*	*2.3*	26.4			*0.69*	*2.3*	11.8			*0.75*	*2.5*	23.6			*0.76*	*2.5*	15.1			*0.75*	*2.5*
Dioxins/Furans (ng/kg)																										
TCDD TE	1000	NT					NT					NT					NT					0.1487				

**Refer to legend immediately following this table for a list of table notes.

Table 3-2
Legend

12	J	Shading and black font indicate a D-RG exceedance.
12	*12*	Shading in the MDL/MRL columns indicates the MDL exceeds a criterion.

D-RG = remedial goal for soil ≥15 ft bgs

mg/kg = milligrams per kilogram (parts per million).

ng/kg = nanograms per kilogram (parts per trillion).

µg/kg = micrograms per kilogram (parts per billion).

SL = Screening Level (Source: ORNL Regional Screening Table, September 2008).

SLs for non-Carcinogenic compounds have been recalculated to an HI of 0.1.

NA = not applicable.

NT = analyte not tested.

Lab Q = Lab Data Qualifiers

* = Laboratory duplicate not within control limits.

B = (organics) Blank contamination. Value detected in sample and associated blank.

A (Dioxins) = B = (metals) Value <MRL and >MDL and is considered estimated.

E (metals) = Reported value is estimated because of the presence of interferences.

EMPC (Dioxins) = The ion-abundance ratio between the two characteristic PCDD/PCDF ions was outside accepted ranges. The detected PCDD/PCDF was reported as an estimated maximum possible concentration (EMPC).

J = (organics) Value <MRL and >MDL and is considered estimated.

U = Analyte not-detected at the method reporting limit.

X = (dioxins) Ion abundance ratio outside acceptable range. Value reported is EMPC.

Val Q = Validation Data Qualifiers

B = blank contamination. Value detected in sample and associated blank.

J = estimated concentration.

K = estimated concentration bias high.

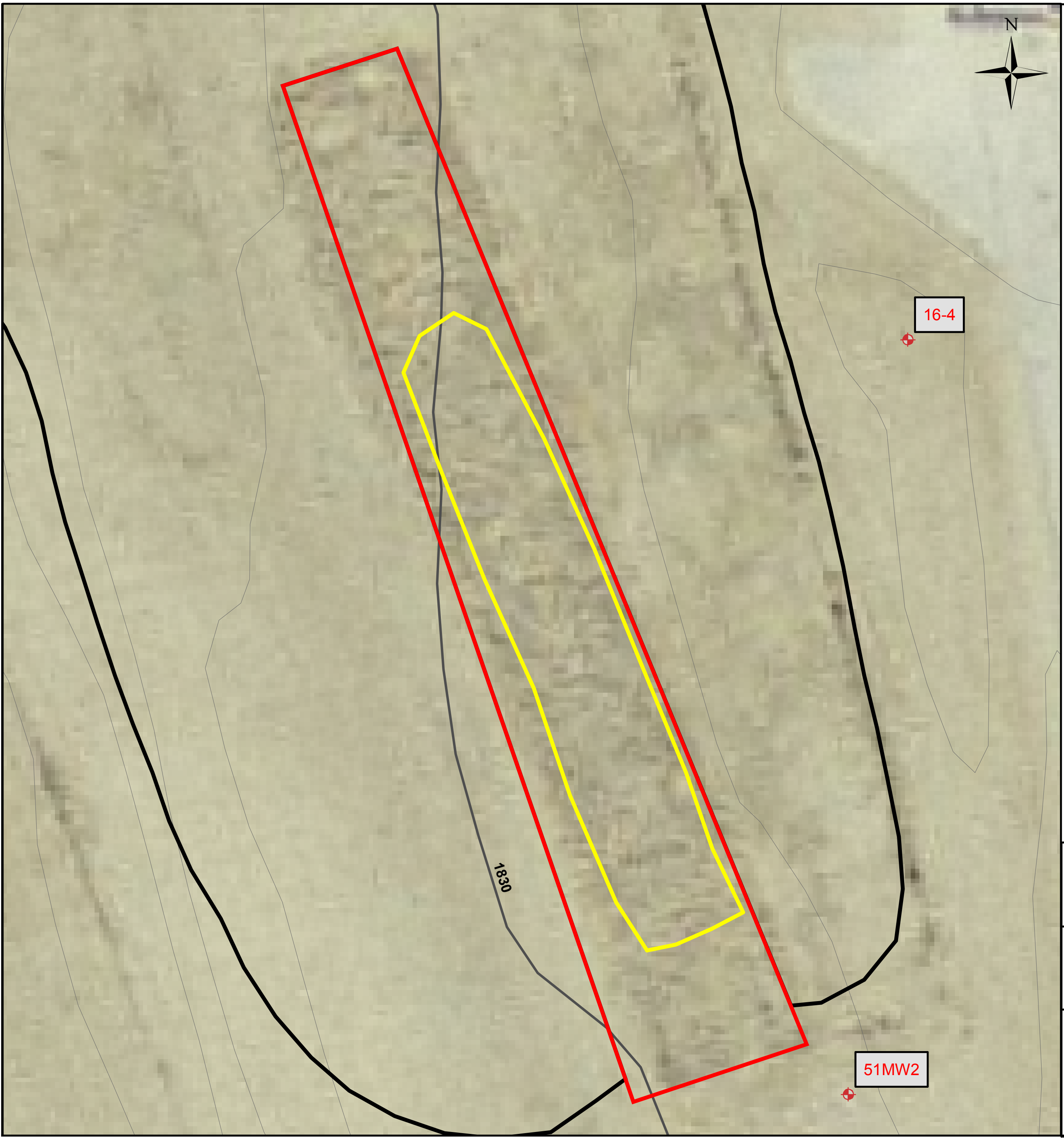
L = estimated concentration bias low.

N = presumptive evidence for tentatively identified compounds using a library search.

U = analyte not detected.

UJ = estimated concentration non-detect.

UL = estimated concentration non-detect bias low.



LEGEND

- ⊕ Monitoring Well Location
- — 10 ft Contour Line
- 🟨 Trench Boundary As Defined In the RFI (Shaw, 2008)
- ⬛ SWMU 30 Boundary
- 🟥 SWMU 51 Boundary

Notes:
1) Aerial photo, dated 2005, was obtained from Montgomery County, VA Planning & GIS Services.

Scale:
0 15 30 60
Feet

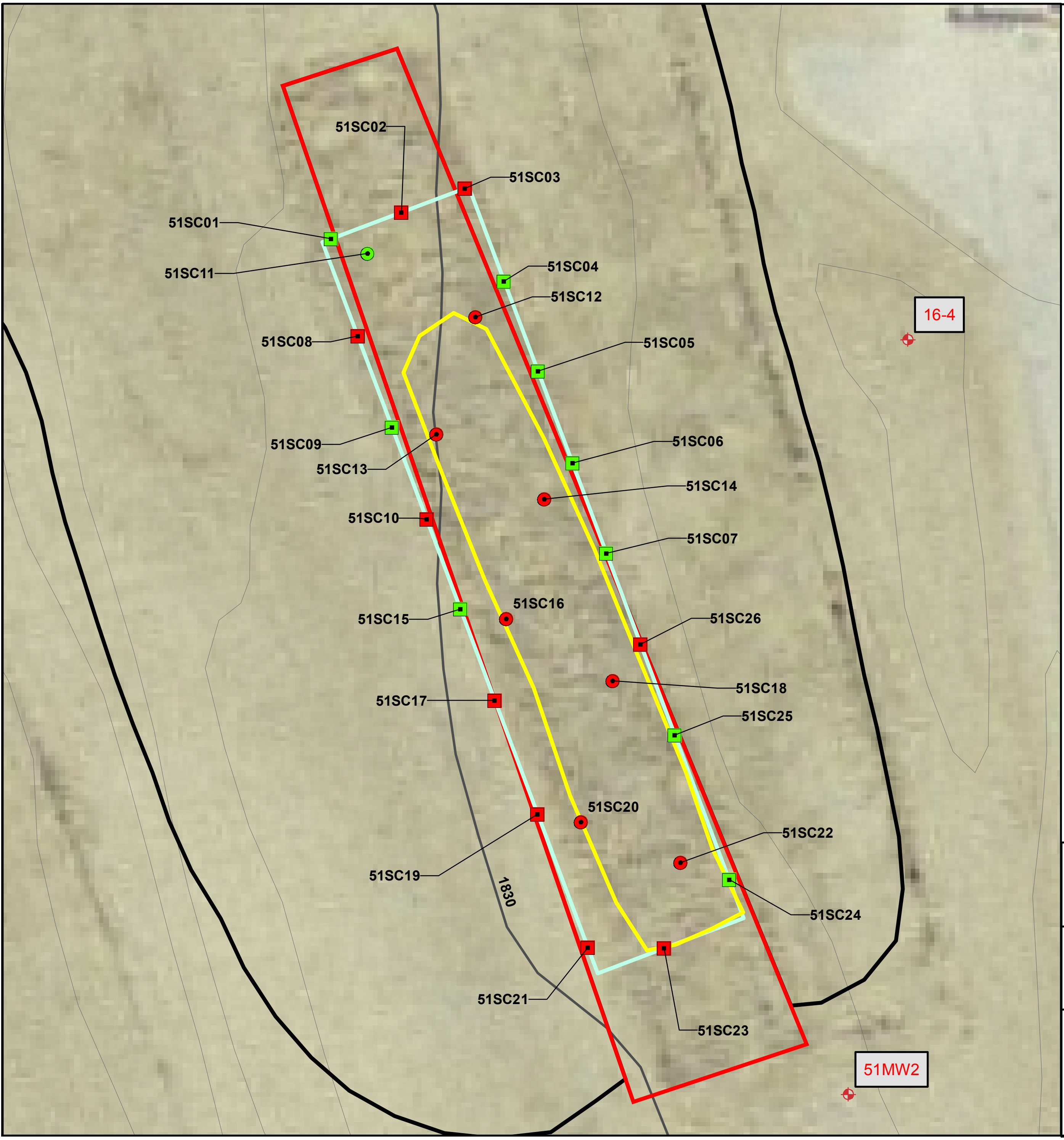
U.S. Army Corps of Engineers

Shaw® Shaw Environmental, Inc.

FIGURE 3-1
SWMU 51
RFI Trench Boundary

Radford Army Ammunition Plant,
Radford, VA

ArcGIS File: C:\Radford_MMA\GIS_Documents\Project_Maps\SWMU_51\Close_Out\RFAAP_Fig3-1_SWMU51_ConfirmationSamples_RFI_Trench.mxd (1/27/2010)



LEGEND

● Deep Soil (>= 15 ft bgs) Confirmation Sample Location < RGs

■ Shallow Soil (< 15 ft bgs) Confirmation Sample Location < RGs

● Deep Soil (>= 15 ft bgs) Confirmation Sample Location > RGs

■ Shallow Soil (< 15 ft bgs) Confirmation Sample Location > RGs

⌖ Monitoring Well Location

— 10 ft Contour Line

☐ Initial Excavation Boundary (160' x 32' x 23')

☐ Trench Boundary As Defined In the RFI (Shaw, 2008)

☐ SWMU 30 Boundary

☐ SWMU 51 Boundary

Notes:
1) Aerial photo, dated 2005, was obtained from Montgomery County, VA Planning & GIS Services.

N

Scale:
0 15 30 60
Feet

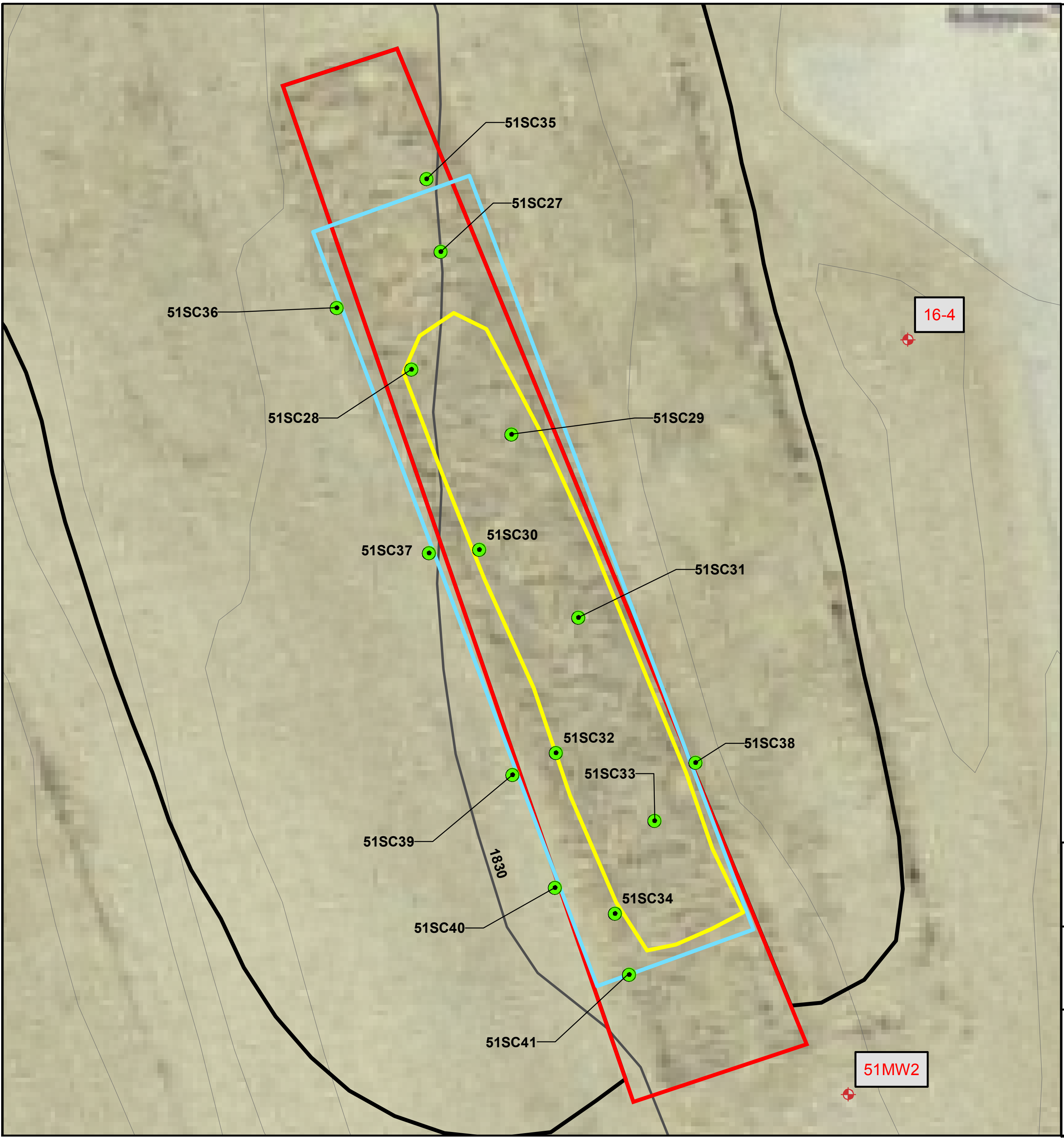
U.S. Army Corps of Engineers

Shaw® Shaw Environmental, Inc.

FIGURE 3-2
SWMU 51 Initial Excavation Boundary and Associated Confirmation Soil Sample Locations

Radford Army Ammunition Plant,
Radford, VA

ArcGIS File: C:\Radford_MMA\GIS_Documents\Project_Maps\SWMU_51\Close_Out\RFAAP_Fig3-2_SWMU51_ConfirmationSamples_InitialExcv.mxd (1/27/2010)



LEGEND

●	Deep Soil (>= 15 ft bgs) Confirmation Sample Location < RGs
🟩	Shallow Soil (< 15 ft bgs) Confirmation Sample Location < RGs
●	Deep Soil (>= 15 ft bgs) Confirmation Sample Location > RGs
🟥	Shallow Soil (< 15 ft bgs) Confirmation Sample Location > RGs
⊕	Monitoring Well Location
—	10 ft Contour Line
☐	Secondary Excavation Boundary (165' x 34' x 24')
☐	Trench Boundary As Defined In the RFI (Shaw, 2008)
☐	SWMU 30 Boundary
☐	SWMU 51 Boundary

Notes:
1) Aerial photo, dated 2005, was obtained from Montgomery County, VA Planning & GIS Services.

N

Scale:

0 15 30 60 Feet

U.S. Army Corps of Engineers

Shaw® Shaw Environmental, Inc.

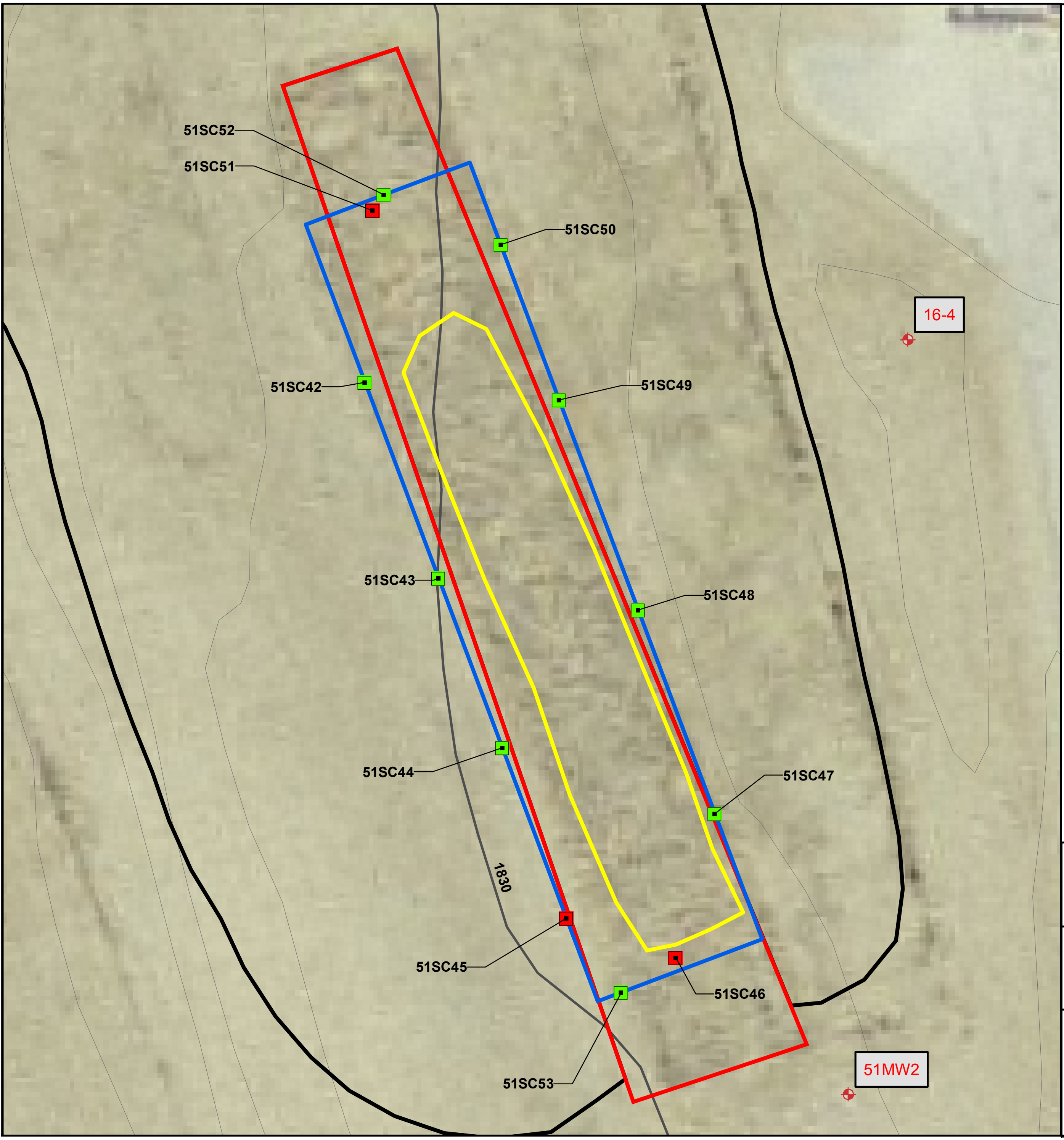
FIGURE 3-3

SWMU 51 Secondary Excavation Boundary and Associated Confirmation Soil Sample Locations

Radford Army Ammunition Plant,
Radford, VA

ArcGIS File: C:\Radford_MMA\GIS_Documents\Project_Maps\SWMU_51\Close_Out\RFAAP_Fig3-3_SWMU51_ConfirmationSamples_SecondaryExcv.mxd (1/27/2010)

ArcGIS File: C:\Radford_MMA\GIS_Documents\Project_Maps\SWMU_51\Close_Out\RFAAP_Fig3-4_SWMU51_ConfirmationSamples_FinalExcv.mxd (1/27/2010)



LEGEND

- 🟢 Deep Soil (>= 15 ft bgs) Confirmation Sample Location < RGs
- 🟩 Shallow Soil (< 15 ft bgs) Confirmation Sample Location < RGs
- 🔴 Deep Soil (>= 15 ft bgs) Confirmation Sample Location > RGs
- 🟥 Shallow Soil (< 15 ft bgs) Confirmation Sample Location > RGs
- ⊕ Monitoring Well Location
- — 10 ft Contour Line
- ▭ Final Excavation Boundary (170' x 36' x 25')
- ▭ Trench Boundary As Defined In the RFI (Shaw, 2008)
- ▭ SWMU 30 Boundary
- ▭ SWMU 51 Boundary

Notes:
1) Aerial photo, dated 2005, was obtained from Montgomery County, VA Planning & GIS Services.

N

Scale:

0 15 30 60 Feet

U.S. Army Corps of Engineers

Shaw® Shaw Environmental, Inc.

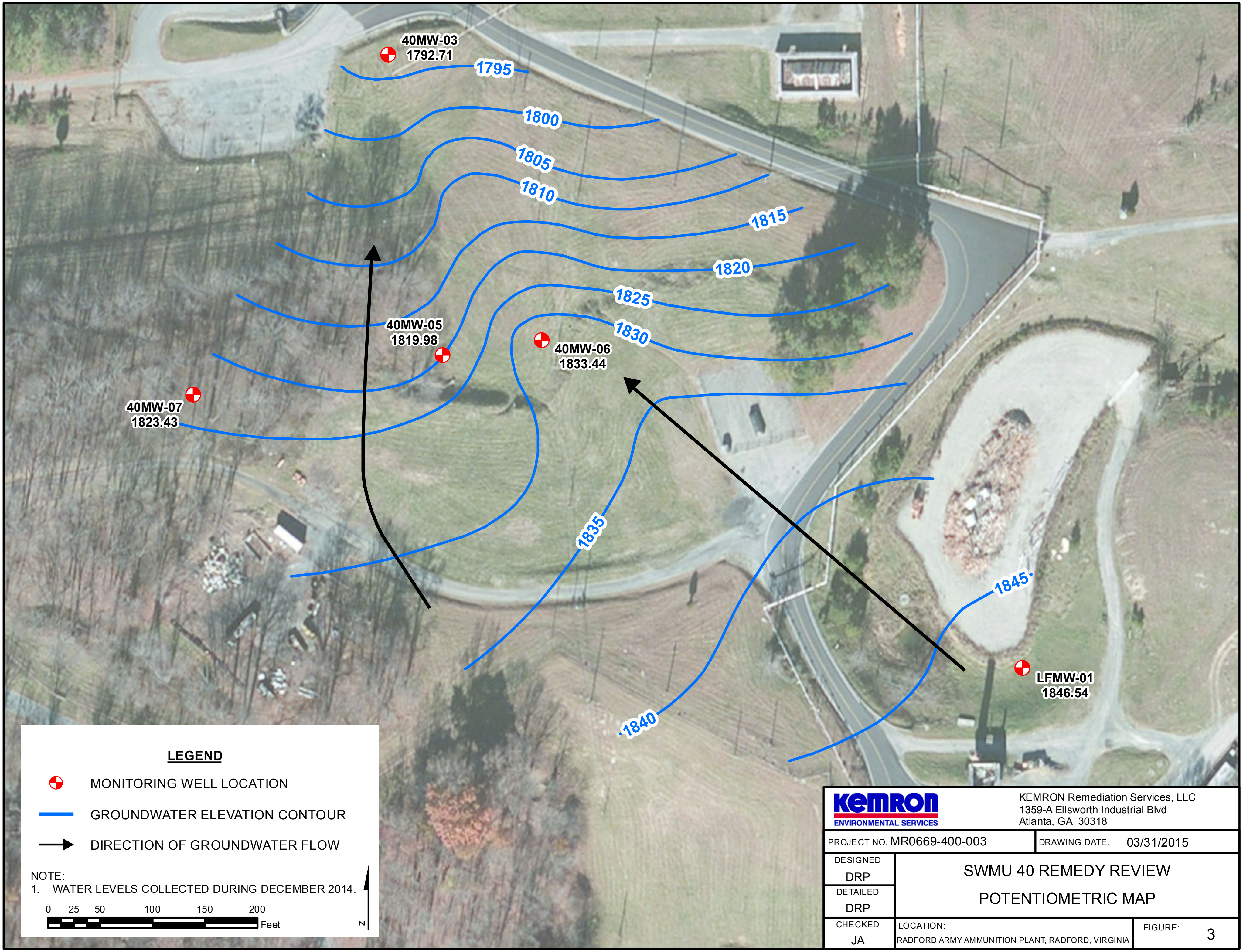
FIGURE 3-4

SWMU 51 Final Excavation Boundary and Associated Confirmation Sample Locations

Radford Army Ammunition Plant,
Radford, VA

RAAP-009/SWMU 40

[This Page Intentionally Left Blank]



NOTE:
1. WATER LEVELS COLLECTED DURING DECEMBER 2014.

KEMRON
ENVIRONMENTAL SERVICES

KEMRON Remediation Services, LLC
1359-A Ellsworth Industrial Blvd
Atlanta, GA 30318

PROJECT NO. MR0669-400-003	DRAWING DATE: 03/31/2015
DESIGNED DRP	SWMU 40 REMEDY REVIEW POTENTIOMETRIC MAP
DETAILED DRP	
CHECKED JA	LOCATION: RADFORD ARMY AMMUNITION PLANT, RADFORD, VIRGINIA
	FIGURE: 3

Table 1
November 2011 Screening Levels for Groundwater SVOC Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 1

						Location ID	40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01				
						Sample ID	40LFMW01GW112111					40DUPGW030612					40LFMW01GW030612					LFMW01GW061212					LFMW01GW92612				
						Sample Date	11/21/2011					3/6/2012					3/6/2012					6/12/2012					9/26/2012				
						Sample Type	N					FD					N					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8270C	120-82-1	1,2,4-Trichlorobenzene	0.99	0.39	70	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.69**	U	2.69	5.38	ug/L
SW8270C	95-50-1	1,2-Dichlorobenzene		28	600	ug/L	2.69	U	2.69	5.38	ug/L	2.63	U	2.63	5.26	ug/L	2.69	U	2.69	5.38	ug/L	2.5	U	2.5	5	ug/L	2.69	U	2.69	5.38	ug/L
SW8270C	541-73-1	1,3-Dichlorobenzene				ug/L	< 2.69	U	2.69	5.38	ug/L	< 2.63	U	2.63	5.26	ug/L	< 2.69	U	2.69	5.38	ug/L	< 2.5	U	2.5	5	ug/L	< 2.69	U	2.69	5.38	ug/L
SW8270C	106-46-7	1,4-Dichlorobenzene	0.42	47	75	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.69**	U	2.69	5.38	ug/L
SW8270C	95-95-4	2,4,5-Trichlorophenol		89		ug/L	2.69	U	2.69	5.38	ug/L	2.63	U	2.63	5.26	ug/L	2.69	U	2.69	5.38	ug/L	2.5	U	2.5	5	ug/L	2.69	U	2.69	5.38	ug/L
SW8270C	88-06-2	2,4,6-Trichlorophenol	3.5	0.9		ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.69**	U	2.69	5.38	ug/L
SW8270C	120-83-2	2,4-Dichlorophenol		3.5		ug/L	2.69	U	2.69	5.38	ug/L	2.63	U	2.63	5.26	ug/L	2.69	U	2.69	5.38	ug/L	2.5	U	2.5	5	ug/L	2.69	U	2.69	5.38	ug/L
SW8270C	105-67-9	2,4-Dimethylphenol		27		ug/L	2.69	U	2.69	5.38	ug/L	2.63	U	2.63	5.26	ug/L	2.69	U	2.69	5.38	ug/L	2.5	U	2.5	5	ug/L	2.69	U	2.69	5.38	ug/L
SW8270C	51-28-5	2,4-Dinitrophenol		3		ug/L	**< 13.4**	U	13.4	26.9	ug/L	**< 13.2**	U	13.2	26.3	ug/L	**< 13.4**	U	13.4	26.9	ug/L	**< 12.5**	UJ	12.5	25	ug/L	**< 13.4**	U	13.4	26.9	ug/L
SW8270C	121-14-2	2,4-Dinitrotoluene	0.2	3		ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.69**	U	2.69	5.38	ug/L
SW8270C	606-20-2	2,6-Dinitrotoluene		1.5		ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.69**	U	2.69	5.38	ug/L
SW8270C	91-58-7	2-Chloronaphthalene		55		ug/L	2.69	U	2.69	5.38	ug/L	2.63	U	2.63	5.26	ug/L	2.69	U	2.69	5.38	ug/L	2.5	U	2.5	5	ug/L	2.69	U	2.69	5.38	ug/L
SW8270C	95-57-8	2-Chlorophenol		7.1		ug/L	2.69	U	2.69	5.38	ug/L	2.63	U	2.63	5.26	ug/L	2.69	U	2.69	5.38	ug/L	2.5	U	2.5	5	ug/L	2.69	U	2.69	5.38	ug/L
SW8270C	91-57-6	2-Methylnaphthalene		2.7		ug/L	2.69	U	2.69	5.38	ug/L	2.63	U	2.63	5.26	ug/L	2.69	U	2.69	5.38	ug/L	2.5	U	2.5	5	ug/L	2.69	U	2.69	5.38	ug/L
SW8270C	95-48-7	2-Methylphenol		72		ug/L	2.69	U	2.69	5.38	ug/L	2.63	U	2.63	5.26	ug/L	2.69	U	2.69	5.38	ug/L	2.5	U	2.5	5	ug/L	2.69	U	2.69	5.38	ug/L
SW8270C	88-74-4	2-Nitroaniline		15		ug/L	13.4	U	13.4	26.9	ug/L	13.2	U	13.2	26.3	ug/L	13.4	U	13.4	26.9	ug/L	12.5	U	12.5	25	ug/L	13.4	U	13.4	26.9	ug/L
SW8270C	88-75-5	2-Nitrophenol				ug/L	< 2.69	U	2.69	5.38	ug/L	< 2.63	U	2.63	5.26	ug/L	< 2.69	U	2.69	5.38	ug/L	< 2.5	U	2.5	5	ug/L	< 2.69	U	2.69	5.38	ug/L
SW8270C	91-94-1	3,3'-Dichlorobenzidine	0.11			ug/L	**< 2.69**	U	2.69	10.8	ug/L	**< 2.63**	U	2.63	10.5	ug/L	**< 2.69**	U	2.69	10.8	ug/L	**< 2.5**	U	2.5	10	ug/L	**< 2.69**	U	2.69	10.8	ug/L
SW8270C	106-44-5	3-,4-Methylphenol		7.2		ug/L	2.69	U	2.69	5.38	ug/L	2.63	U	2.63	5.26	ug/L	2.69	U	2.69	5.38	ug/L	2.5	U	2.5	5	ug/L	2.69	U	2.69	5.38	ug/L
SW8270C	99-09-2	3-Nitroaniline				ug/L	< 13.4	U	13.4	26.9	ug/L	< 13.2	U	13.2	26.3	ug/L	< 13.4	U	13.4	26.9	ug/L	< 12.5	U	12.5	25	ug/L	< 13.4	U	13.4	26.9	ug/L
SW8270C	534-52-1	4,6-Dinitro-2-methylphenol		0.12		ug/L	**< 13.4**	U	13.4	26.9	ug/L	**< 13.2**	U	13.2	26.3	ug/L	**< 13.4**	U	13.4	26.9	ug/L	**< 12.5**	U	12.5	25	ug/L	**< 13.4**	U	13.4	26.9	ug/L
SW8270C	101-55-3	4-Bromophenyl-phenylether				ug/L	< 2.69	U	2.69	5.38	ug/L	< 2.63	U	2.63	5.26	ug/L	< 2.69	U	2.69	5.38	ug/L	< 2.5	U	2.5	5	ug/L	< 2.69	U	2.69	5.38	ug/L
SW8270C	59-50-7	4-Chloro-3-methylphenol		110		ug/L	2.69	U	2.69	5.38	ug/L	2.63	U	2.63	5.26	ug/L	2.69	U	2.69	5.38	ug/L	2.5	U	2.5	5	ug/L	2.69	U	2.69	5.38	ug/L
SW8270C	106-47-8	4-Chloroaniline	0.32	5.9		ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.69**	U	2.69	5.38	ug/L
SW8270C	7005-72-3	4-Chlorophenyl-phenyl ether				ug/L	< 2.69	U	2.69	5.38	ug/L	< 2.63	U	2.63	5.26	ug/L	< 2.69	U	2.69	5.38	ug/L	< 2.5	U	2.5	5	ug/L	< 2.69	U	2.69	5.38	ug/L
SW8270C	100-01-6	4-Nitroaniline	3.3	6.1		ug/L	**< 13.4**	U	13.4	26.9	ug/L	**< 13.2**	U	13.2	26.3	ug/L	**< 13.4**	U	13.4	26.9	ug/L	**< 12.5**	U	12.5	25	ug/L	**< 13.4**	U	13.4	26.9	ug/L
SW8270C	100-02-7	4-Nitrophenol				ug/L	< 13.4	U	13.4	26.9	ug/L	< 13.2	U	13.2	26.3	ug/L	< 13.4	U	13.4	26.9	ug/L	< 12.5	U	12.5	25	ug/L	< 13.4	U	13.4	26.9	ug/L
SW8270C	83-32-9	Acenaphthene		40		ug/L	2.69	U	2.69	5.38	ug/L	2.63	U	2.63	5.26	ug/L	2.69	U	2.69	5.38	ug/L	2.5	U	2.5	5	ug/L	2.69	U	2.69	5.38	ug/L
SW8270C	208-96-8	Acenaphthylene				ug/L	< 2.69	U	2.69	5.38	ug/L	< 2.63	U	2.63	5.26	ug/L	< 2.69	U	2.69	5.38	ug/L	< 2.5	U	2.5	5	ug/L	< 2.69	U	2.69	5.38	ug/L
SW8270C	120-12-7	Anthracene		130		ug/L	2.69	U	2.69	5.38	ug/L	2.63	U	2.63	5.26	ug/L	2.69	U	2.69	5.38	ug/L	2.5	U	2.5	5	ug/L	2.69	U	2.69	5.38	ug/L
SW8270C	56-55-3	Benzo(a)anthracene	0.029			ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.69**	U	2.69	5.38	ug/L
SW8270C	50-32-8	Benzo(a)pyrene	0.0029		0.2	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.69**	U	2.69	5.38	ug/L
SW8270C	205-99-2	Benzo(b)fluoranthene	0.029			ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.69**	U	2.69	5.38	ug/L
SW8270C	191-24-2	Benzo(g,h,i)Perylene				ug/L	< 2.69	U	2.69	5.38	ug/L	< 2.63	U	2.63	5.26	ug/L	< 2.69	U	2.69	5.38	ug/L	< 2.5	U	2.5	5	ug/L	< 2.69	U	2.69	5.38	ug/L
SW8270C	207-08-9	Benzo(k)fluoranthene	0.29			ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.69**	U	2.69	5.38	ug/L
SW8270C	65-85-0	Benzoic acid		5800		ug/L	13.4	UJ	13.4	26.9	ug/L	13.2	R	13.2	26.3	ug/L	13.4	R	13.4	26.9	ug/L	12.5	UJ	12.5	25	ug/L	13.4	R	13.4	26.9	ug/L
SW8270C	100-51-6	Benzyl alcohol		150		ug/L	2.69	U	2.69	5.38	ug/L	2.63	U	2.63	5.26	ug/L	2.69	U	2.69	5.38	ug/L	2.5	U	2.5	5	ug/L	2.69	U	2.69	5.38	ug/L
SW8270C	111-91-1	Bis(2-Chloroethoxy)Methane		4.7		ug/L	2.69	U	2.69	5.38	ug/L	2.63	U	2.63	5.26	ug/L	2.69	U	2.69	5.38	ug/L	2.5	U	2.5	5	ug/L	2.69	U	2.69	5.38	ug/L
SW8270C	111-44-4	Bis(2-Chloroethyl)ether	0.012			ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.69**	U	2.69	5.38	ug/L
SW8270C	108-60-1	bis(2-Chloroisopropyl)ether	0.31	55		ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.69**	U	2.69	5.38	ug/L
SW8270C	117-81-7	bis(2-Ethylhexyl)phthalate	0.071	0.46	6	ug/L	**< 3.23**	U	3.23	10.8	ug/L	**< 3.16**	U	3.16	10.5	ug/L	**< 3.23**	U	3.23	10.8	ug/L	**< 3**	U	3	10	ug/L	**< 3.23**	U	3.23	10.8	ug/L
SW8270C	85-68-7	Butylbenzylphthalate	14	120		ug/L	2.69	U	2.69	5.38	ug/L	2.63	U	2.63	5.26	ug/L	2.69	U	2.69	5.38	ug/L	2.5	U	2.5	5	ug/L	2.69	U	2.69	5.38	ug/L
SW8270C	218-01-9	Chrysene	2.9			ug/L	2.69	U	2.69	5.38	ug/L	2.63	U	2.63	5.26	ug/L	2.69	U	2.69	5.38	ug/L	2.5	U	2.5	5	ug/L	2.69	U	2.69	5.38	ug/L
SW8270C	53-70-3	Dibenzo(a,h)Anthracene	0.0029			ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.69**	U	2.69	5.38	ug/L
SW8270C	132-64-9	Dibenzofuran		0.58		ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.69**	U	2.69	5.38	ug/L
SW8270C	84-66-2	Diethylphthalate		1100		ug/L	2.69	U	2.69	5.38	ug/L	2.63	U	2.63	5.26	ug/L	2.69	U	2.69	5.38	ug/L	2.5	U	2.5	5	ug/L	2.69	U	2.69	5.38	ug/L
SW8270C	131-11-3	Dimethylphthalate				ug/L	< 2.69	U	2.69	5.38	ug/L	< 2.63	U	2.63	5.26	ug/L	< 2.69	U	2.69	5.38	ug/L	< 2.5	U	2.5	5	ug/L	< 2.69	U	2.69	5.38	ug/L
SW8270C	84-74-2	Di-N-Butylphthalate		67		ug/L	2.69	U	2.69	5.38	ug/L	2.63	U	2.63	5.26	ug/L	2.69	U	2.69	5.38	ug/L	2.5	U	2.5	5	ug/L	2.69	U	2.69	5.38	ug/L
SW8270C	117-84-0	Di-n-octylphthalate				ug/L	< 2.69	U	2.69	5.38	ug/L	< 2.63	U	2.63	5.26	ug/L	< 2.69	U	2.69	5.38	ug/L	< 2.5	U	2.5	5	ug/L	< 2.69	U	2.69	5.38	ug/L
SW8270C	206-44-0	Fluoranthene		63		ug/L	2.69	U	2.69	5.38	ug/L	2.63	U	2.63	5.26	ug/L	2.69	U	2.69	5.38	ug/L	2.5	U	2.5	5	ug/L	2.69	U	2.69	5.38	ug/L
SW8270C	86-73-7	Fluorene		22		ug/L	2.69	U	2.69	5.38	ug/L	2.63	U	2.63	5.26	ug/L	2.69	U	2.69	5.38	ug/L	2.5	U	2.5	5	ug/L	2.69	U	2.69	5.38	ug/L
SW8270C	118-74-1	Hexachlorobenzene	0.042	1.3	1	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.69**	U	2.69	5.38	ug/L
SW8270C	87-68-3	Hexachlorobutadiene	0.26	0.47		ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.69**	U	2.69	5.38	ug/L
SW8270C	77-47-4	Hexachlorocyclopentadiene		2.2	50	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.5**	UJ	2.5	5	ug/L	**< 2.69**	U	2.69	5.38	ug/L
SW8270C	67-72-1	Hexachloroethane	0.79	0.51		ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.69**	U	2.69	5.38	ug/L
SW8270C	193-39-5	Indeno(1,2,3-cd)pyrene	0.029			ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.69**	U	2.69	5.38	ug/L
SW8270C	78-59-1	Isophorone	67	300		ug/L	2.69	U	2.69	5.38	ug/L	2.63	U	2.63	5.26	ug/L	2.69	U	2.69	5.38	ug/L	2.5	U	2.5	5	ug/L	2.69	U	2.69	5.38	ug/L
SW8270C	91-20-3	Naphthalene	0.14	0.61		ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.69**	U	2.69	5.38	ug/L
SW8270C	98-95-3	Nitrobenzene	0.12	1.1		ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.69**	U	2.69	5.38	ug/L
SW8270C	86-30-6	N-Nitrosodiphenylamine	10			ug/L	2.69	U	2.69	5.38	ug/L	2.63	U	2.63	5.26	ug/L	2.69	U	2.69	5.38	ug/L	2.5	U	2.5	5	ug/L	2.69	U	2.69	5.38	ug/L
SW8270C	621-64-7	N-Nitrosodipropylamine	0.0093			ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.69**	U	2.69	5.38	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.69**	U	2.69	5.38	ug/L
SW8270C	87-86-5	Pentachlorophenol	0.17	7.8	1	ug/L	**< 13.4**	U	13.4	26.9	ug/L	**< 13.2**	U	13.2	26.3	ug/L	**< 13.4**	U	13.4	26.9	ug/L	**< 12.5**	U	12.5	25	ug/L	**< 13.4**	U	13.4	26.9	ug/L
SW8270C	85-01-8	Phenanthrene				ug/L	< 2.69	U	2.69	5.38	ug/L	< 2.63	U	2.63	5.26	ug/L	< 2.69	U	2.69	5.38	ug/L	< 2.5	U	2.5	5	ug/L	< 2.69	U	2.69	5.38	ug/L
SW8270C	108-95-2	Phenol		450		ug/L	2.69	U	2.69	5.38	ug/L	2.63	U	2.63	5.26	ug/L	2.69	U	2.69	5.38	ug/L	2.5	UL	2.5	5	ug/L	2.69	U	2.69	5.38	ug/L
SW8270C	129-00-0	Pyrene		8.7		ug/L	2.69	U	2.69	5.38	ug/L	2.63	U	2.63	5.26	ug/L	2.69	U	2.69	5.38	ug/L	2.5	U	2.5	5	ug/L	2.69	U	2.69	5.38	ug/L

		Location ID	40MW5					40MW5					40MW5					40MW5					40MW5				
		Sample ID	40DUPGW112011					40MW5GW112011					40MW5GW030712					40MW5GW061212					40DUPGW92512				
		Sample Date	11/20/2011					11/20/2011					3/7/2012					6/12/2012					9/25/2012				
		Sample Type	FD					N					N					N					FD				
Method	CAS	Chemical	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8270C	120-82-1	1,2,4-Trichlorobenzene	**< 2.98**	U	2.98	5.95	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.5**	U	2.5	5	ug/L
SW8270C	95-50-1	1,2-Dichlorobenzene	2.98	U	2.98	5.95	ug/L	2.5	U	2.5	5	ug/L	2.55	U	2.55	5.1	ug/L	2.55	U	2.55	5.1	ug/L	2.5	U	2.5	5	ug/L
SW8270C	541-73-1	1,3-Dichlorobenzene	< 2.98	U	2.98	5.95	ug/L	< 2.5	U	2.5	5	ug/L	< 2.55	U	2.55	5.1	ug/L	< 2.55	U	2.55	5.1	ug/L	< 2.5	U	2.5	5	ug/L
SW8270C	106-46-7	1,4-Dichlorobenzene	**< 2.98**	U	2.98	5.95	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.5**	U	2.5	5	ug/L
SW8270C	95-95-4	2,4,5-Trichlorophenol	2.98	U	2.98	5.95	ug/L	2.5	U	2.5	5	ug/L	2.55	U	2.55	5.1	ug/L	2.55	U	2.55	5.1	ug/L	2.5	U	2.5	5	ug/L
SW8270C	88-06-2	2,4,6-Trichlorophenol	**< 2.98**	U	2.98	5.95	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.5**	U	2.5	5	ug/L
SW8270C	120-83-2	2,4-Dichlorophenol	2.98	U	2.98	5.95	ug/L	2.5	U	2.5	5	ug/L	2.55	U	2.55	5.1	ug/L	2.55	U	2.55	5.1	ug/L	2.5	U	2.5	5	ug/L
SW8270C	105-67-9	2,4-Dimethylphenol	2.98	U	2.98	5.95	ug/L	2.5	U	2.5	5	ug/L	2.55	U	2.55	5.1	ug/L	2.55	U	2.55	5.1	ug/L	2.5	U	2.5	5	ug/L
SW8270C	51-28-5	2,4-Dinitrophenol	**< 14.9**	U	14.9	29.8	ug/L	**< 12.5**	U	12.5	25	ug/L	**< 12.8**	U	12.8	25.5	ug/L	**< 12.8**	UJ	12.8	25.5	ug/L	**< 12.5**	U	12.5	25	ug/L
SW8270C	121-14-2	2,4-Dinitrotoluene	**< 2.98**	U	2.98	5.95	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.5**	U	2.5	5	ug/L
SW8270C	606-20-2	2,6-Dinitrotoluene	**< 2.98**	U	2.98	5.95	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.5**	U	2.5	5	ug/L
SW8270C	91-58-7	2-Chloronaphthalene	2.98	U	2.98	5.95	ug/L	2.5	U	2.5	5	ug/L	2.55	U	2.55	5.1	ug/L	2.55	U	2.55	5.1	ug/L	2.5	U	2.5	5	ug/L
SW8270C	95-57-8	2-Chlorophenol	2.98	U	2.98	5.95	ug/L	2.5	U	2.5	5	ug/L	2.55	U	2.55	5.1	ug/L	2.55	U	2.55	5.1	ug/L	2.5	U	2.5	5	ug/L
SW8270C	91-57-6	2-Methylnaphthalene	**< 2.98**	U	2.98	5.95	ug/L	2.5	U	2.5	5	ug/L	**< 2.55**	U	2.55	5.1	ug/L	2.55	U	2.55	5.1	ug/L	2.5	U	2.5	5	ug/L
SW8270C	95-48-7	2-Methylphenol	2.98	U	2.98	5.95	ug/L	2.5	U	2.5	5	ug/L	2.55	U	2.55	5.1	ug/L	2.55	U	2.55	5.1	ug/L	2.5	U	2.5	5	ug/L
SW8270C	88-74-4	2-Nitroaniline	14.9	U	14.9	29.8	ug/L	12.5	U	12.5	25	ug/L	12.8	U	12.8	25.5	ug/L	12.8	U	12.8	25.5	ug/L	12.5	U	12.5	25	ug/L
SW8270C	88-75-5	2-Nitrophenol	< 2.98	U	2.98	5.95	ug/L	< 2.5	U	2.5	5	ug/L	< 2.55	U	2.55	5.1	ug/L	< 2.55	U	2.55	5.1	ug/L	< 2.5	U	2.5	5	ug/L
SW8270C	91-94-1	3,3'-Dichlorobenzidine	**< 2.98**	U	2.98	11.9	ug/L	**< 2.5**	U	2.5	10	ug/L	**< 2.55**	U	2.55	10.2	ug/L	**< 2.55**	U	2.55	10.2	ug/L	**< 2.5**	U	2.5	10	ug/L
SW8270C	106-44-5	3-,4-Methylphenol	2.98	U	2.98	5.95	ug/L	2.5	U	2.5	5	ug/L	2.55	U	2.55	5.1	ug/L	2.55	U	2.55	5.1	ug/L	2.5	U	2.5	5	ug/L
SW8270C	99-09-2	3-Nitroaniline	< 14.9	U	14.9	29.8	ug/L	< 12.5	U	12.5	25	ug/L	< 12.8	U	12.8	25.5	ug/L	< 12.8	U	12.8	25.5	ug/L	< 12.5	U	12.5	25	ug/L
SW8270C	534-52-1	4,6-Dinitro-2-methylphenol	**< 14.9**	U	14.9	29.8	ug/L	**< 12.5**	U	12.5	25	ug/L	**< 12.8**	U	12.8	25.5	ug/L	**< 12.8**	U	12.8	25.5	ug/L	**< 12.5**	U	12.5	25	ug/L
SW8270C	101-55-3	4-Bromophenyl-phenylether	< 2.98	U	2.98	5.95	ug/L	< 2.5	U	2.5	5	ug/L	< 2.55	U	2.55	5.1	ug/L	< 2.55	U	2.55	5.1	ug/L	< 2.5	U	2.5	5	ug/L
SW8270C	59-50-7	4-Chloro-3-methylphenol	2.98	U	2.98	5.95	ug/L	2.5	U	2.5	5	ug/L	2.55	U	2.55	5.1	ug/L	2.55	U	2.55	5.1	ug/L	2.5	U	2.5	5	ug/L
SW8270C	106-47-8	4-Chloroaniline	**< 2.98**	U	2.98	5.95	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.5**	U	2.5	5	ug/L
SW8270C	7005-72-3	4-Chlorophenyl-phenyl ether	< 2.98	U	2.98	5.95	ug/L	< 2.5	U	2.5	5	ug/L	< 2.55	U	2.55	5.1	ug/L	< 2.55	U	2.55	5.1	ug/L	< 2.5	U	2.5	5	ug/L
SW8270C	100-01-6	4-Nitroaniline	**< 14.9**	U	14.9	29.8	ug/L	**< 12.5**	U	12.5	25	ug/L	**< 12.8**	U	12.8	25.5	ug/L	**< 12.8**	U	12.8	25.5	ug/L	**< 12.5**	U	12.5	25	ug/L
SW8270C	100-02-7	4-Nitrophenol	< 14.9	U	14.9	29.8	ug/L	< 12.5	U	12.5	25	ug/L	< 12.8	U	12.8	25.5	ug/L	< 12.8	U	12.8	25.5	ug/L	< 12.5	U	12.5	25	ug/L
SW8270C	83-32-9	Acenaphthene	2.98	U	2.98	5.95	ug/L	2.5	U	2.5	5	ug/L	2.55	U	2.55	5.1	ug/L	2.55	U	2.55	5.1	ug/L	2.5	U	2.5	5	ug/L
SW8270C	208-96-8	Acenaphthylene	< 2.98	U	2.98	5.95	ug/L	< 2.5	U	2.5	5	ug/L	< 2.55	U	2.55	5.1	ug/L	< 2.55	U	2.55	5.1	ug/L	< 2.5	U	2.5	5	ug/L
SW8270C	120-12-7	Anthracene	2.98	U	2.98	5.95	ug/L	2.5	U	2.5	5	ug/L	2.55	U	2.55	5.1	ug/L	2.55	U	2.55	5.1	ug/L	2.5	U	2.5	5	ug/L
SW8270C	56-55-3	Benzo(a)anthracene	**< 2.98**	U	2.98	5.95	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.5**	U	2.5	5	ug/L
SW8270C	50-32-8	Benzo(a)pyrene	**< 2.98**	U	2.98	5.95	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.5**	U	2.5	5	ug/L
SW8270C	205-99-2	Benzo(b)fluoranthene	**< 2.98**	U	2.98	5.95	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.5**	U	2.5	5	ug/L
SW8270C	191-24-2	Benzo(g,h,i)Perylene	< 2.98	U	2.98	5.95	ug/L	< 2.5	U	2.5	5	ug/L	< 2.55	U	2.55	5.1	ug/L	< 2.55	U	2.55	5.1	ug/L	< 2.5	U	2.5	5	ug/L
SW8270C	207-08-9	Benzo(k)fluoranthene	**< 2.98**	U	2.98	5.95	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.5**	U	2.5	5	ug/L
SW8270C	65-85-0	Benzoic acid	14.9	UJ	14.9	29.8	ug/L	12.5	UJ	12.5	25	ug/L	12.8	R	12.8	25.5	ug/L	12.8	UJ	12.8	25.5	ug/L	12.5	R	12.5	25	ug/L
SW8270C	100-51-6	Benzyl alcohol	2.98	U	2.98	5.95	ug/L	2.5	U	2.5	5	ug/L	2.55	U	2.55	5.1	ug/L	2.55	U	2.55	5.1	ug/L	2.5	U	2.5	5	ug/L
SW8270C	111-91-1	Bis(2-Chloroethoxy)Methane	2.98	U	2.98	5.95	ug/L	2.5	U	2.5	5	ug/L	2.55	U	2.55	5.1	ug/L	2.55	U	2.55	5.1	ug/L	2.5	U	2.5	5	ug/L
SW8270C	111-44-4	Bis(2-Chloroethyl)ether	**< 2.98**	U	2.98	5.95	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.5**	U	2.5	5	ug/L
SW8270C	108-60-1	bis(2-Chloroisopropyl)ether	**< 2.98**	U	2.98	5.95	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.5**	U	2.5	5	ug/L
SW8270C	117-81-7	bis(2-Ethylhexyl)phthalate	**< 3.57**	U	3.57	11.9	ug/L	**< 3**	U	3	10	ug/L	**< 3.06**	U	3.06	10.2	ug/L	**< 3.06**	U	3.06	10.2	ug/L	**3.2**	J	3	10	ug/L
SW8270C	85-68-7	Butylbenzylphthalate	2.98	U	2.98	5.95	ug/L	2.5	U	2.5	5	ug/L	2.55	U	2.55	5.1	ug/L	2.55	U	2.55	5.1	ug/L	2.5	U	2.5	5	ug/L
SW8270C	218-01-9	Chrysene	**< 2.98**	U	2.98	5.95	ug/L	2.5	U	2.5	5	ug/L	2.55	U	2.55	5.1	ug/L	2.55	U	2.55	5.1	ug/L	2.5	U	2.5	5	ug/L
SW8270C	53-70-3	Dibenzo(a,h)Anthracene	**< 2.98**	U	2.98	5.95	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.5**	UJ	2.5	5	ug/L
SW8270C	132-64-9	Dibenzofuran	**< 2.98**	U	2.98	5.95	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.5**	U	2.5	5	ug/L
SW8270C	84-66-2	Diethylphthalate	2.98	U	2.98	5.95	ug/L	2.5	U	2.5	5	ug/L	2.55	U	2.55	5.1	ug/L	2.55	U	2.55	5.1	ug/L	2.5	U	2.5	5	ug/L
SW8270C	131-11-3	Dimethylphthalate	< 2.98	U	2.98	5.95	ug/L	< 2.5	U	2.5	5	ug/L	< 2.55	U	2.55	5.1	ug/L	< 2.55	U	2.55	5.1	ug/L	< 2.5	U	2.5	5	ug/L
SW8270C	84-74-2	Di-N-Butylphthalate	2.98	U	2.98	5.95	ug/L	2.5	U	2.5	5	ug/L	2.55	U	2.55	5.1	ug/L	2.55	U	2.55	5.1	ug/L	2.5	U	2.5	5	ug/L
SW8270C	117-84-0	Di-n-octylphthalate	< 2.98	U	2.98	5.95	ug/L	< 2.5	U	2.5	5	ug/L	< 2.55	U	2.55	5.1	ug/L	< 2.55	U	2.55	5.1	ug/L	< 2.5	U	2.5	5	ug/L
SW8270C	206-44-0	Fluoranthene	2.98	U	2.98	5.95	ug/L	2.5	U	2.5	5	ug/L	2.55	U	2.55	5.1	ug/L	2.55	U	2.55	5.1	ug/L	2.5	U	2.5	5	ug/L
SW8270C	86-73-7	Fluorene	2.98	U	2.98	5.95	ug/L	2.5	U	2.5	5	ug/L	2.55	U	2.55	5.1	ug/L	2.55	U	2.55	5.1	ug/L	2.5	U	2.5	5	ug/L
SW8270C	118-74-1	Hexachlorobenzene	**< 2.98**	U	2.98	5.95	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.5**	U	2.5	5	ug/L
SW8270C	87-68-3	Hexachlorobutadiene	**< 2.98**	U	2.98	5.95	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.5**	U	2.5	5	ug/L
SW8270C	77-47-4	Hexachlorocyclopentadiene	**< 2.98**	U	2.98	5.95	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.55**	UJ	2.55	5.1	ug/L	**< 2.5**	U	2.5	5	ug/L
SW8270C	67-72-1	Hexachloroethane	**< 2.98**	U	2.98	5.95	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.5**	U	2.5	5	ug/L
SW8270C	193-39-5	Indeno(1,2,3-cd)pyrene	**< 2.98**	U	2.98	5.95	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.5**	U	2.5	5	ug/L
SW8270C	78-59-1	Isophorone	2.98	U	2.98	5.95	ug/L	2.5	U	2.5	5	ug/L	2.55	U	2.55	5.1	ug/L	2.55	U	2.55	5.1	ug/L	2.5	U	2.5	5	ug/L
SW8270C	91-20-3	Naphthalene	**< 2.98**	U	2.98	5.95	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.5**	U	2.5	5	ug/L
SW8270C	98-95-3	Nitrobenzene	**< 2.98**	U	2.98	5.95	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.5**	U	2.5	5	ug/L
SW8270C	86-30-6	N-Nitrosodiphenylamine	2.98	U	2.98	5.95	ug/L	2.5	U	2.5	5	ug/L	2.55	U	2.55	5.1	ug/L	2.55	U	2.55	5.1	ug/L	2.5	U	2.5	5	ug/L
SW8270C	621-64-7	N-Nitrosodipropylamine	**< 2.98**	U	2.98	5.95	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.55**	U	2.55	5.1	ug/L	**< 2.5**	U	2.5	5	ug/L
SW8270C	87-86-5	Pentachlorophenol	**< 14.9**	U	14.9	29.8	ug/L	**< 12.5**	U	12.5	25	ug/L	**< 12.8**	U	12.8	25.5	ug/L	**< 12.8**	U	12.8	25.5	ug/L	**< 12.5**	U	12.5	25	ug/L
SW8270C	85-01-8	Phenanthrene	< 2.98	U	2.98	5.95	ug/L	< 2.5	U	2.5	5	ug/L	< 2.55	U	2.55	5.1	ug/L	< 2.55	U	2.55	5.1	ug/L	< 2.5	U	2.5	5	ug/L
SW8270C	108-95-2	Phenol	2.98	U	2.98	5.95	ug/L	2.5	U	2.5	5	ug/L	2.55	U	2.55	5.1	ug/L	2.55	UL	2.55	5.1	ug/L	2.5	U	2.5	5	ug/L
SW8270C	129-00-0	Pyrene	2.98	U	2.98	5.95	ug/L	2.5	U	2.5	5	ug/L	2.55	U	2.55	5.1	ug/L	2.55	U	2.55	5.1	ug/L	2.5	U	2.5	5	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

Table 1
November 2011 Screening Levels for Groundwater SVOC Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 1

						Location ID	40MW5					40MW6					40MW6				
						Sample ID	40MW5GW92512					40MW6GW112111					40MW6GW030712				
						Sample Date	9/25/2012					11/21/2011					3/7/2012				
						Sample Type	N					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8270C	120-82-1	1,2,4-Trichlorobenzene	0.99	0.39	70	ug/L	**< 2.65**	U	2.65	5.29	ug/L	**< 2.72**	U	2.72	5.43	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	95-50-1	1,2-Dichlorobenzene		28	600	ug/L	2.65	U	2.65	5.29	ug/L	2.72	U	2.72	5.43	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	541-73-1	1,3-Dichlorobenzene				ug/L	< 2.65	U	2.65	5.29	ug/L	< 2.72	U	2.72	5.43	ug/L	< 2.66	U	2.66	5.32	ug/L
SW8270C	106-46-7	1,4-Dichlorobenzene	0.42	47	75	ug/L	**< 2.65**	U	2.65	5.29	ug/L	**< 2.72**	U	2.72	5.43	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	95-95-4	2,4,5-Trichlorophenol		89		ug/L	2.65	U	2.65	5.29	ug/L	2.72	U	2.72	5.43	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	88-06-2	2,4,6-Trichlorophenol	3.5	0.9		ug/L	**< 2.65**	U	2.65	5.29	ug/L	**< 2.72**	U	2.72	5.43	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	120-83-2	2,4-Dichlorophenol		3.5		ug/L	2.65	U	2.65	5.29	ug/L	2.72	U	2.72	5.43	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	105-67-9	2,4-Dimethylphenol		27		ug/L	2.65	U	2.65	5.29	ug/L	2.72	U	2.72	5.43	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	51-28-5	2,4-Dinitrophenol		3		ug/L	**< 13.2**	U	13.2	26.5	ug/L	**< 13.6**	U	13.6	27.2	ug/L	**< 13.3**	U	13.3	26.6	ug/L
SW8270C	121-14-2	2,4-Dinitrotoluene	0.2	3		ug/L	**< 2.65**	U	2.65	5.29	ug/L	**< 2.72**	U	2.72	5.43	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	606-20-2	2,6-Dinitrotoluene		1.5		ug/L	**< 2.65**	U	2.65	5.29	ug/L	**< 2.72**	U	2.72	5.43	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	91-58-7	2-Chloronaphthalene		55		ug/L	2.65	U	2.65	5.29	ug/L	2.72	U	2.72	5.43	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	95-57-8	2-Chlorophenol		7.1		ug/L	2.65	U	2.65	5.29	ug/L	2.72	U	2.72	5.43	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	91-57-6	2-Methylnaphthalene		2.7		ug/L	2.65	U	2.65	5.29	ug/L	**< 2.72**	U	2.72	5.43	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	95-48-7	2-Methylphenol		72		ug/L	2.65	U	2.65	5.29	ug/L	2.72	U	2.72	5.43	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	88-74-4	2-Nitroaniline		15		ug/L	13.2	U	13.2	26.5	ug/L	13.6	U	13.6	27.2	ug/L	13.3	U	13.3	26.6	ug/L
SW8270C	88-75-5	2-Nitrophenol				ug/L	< 2.65	U	2.65	5.29	ug/L	< 2.72	U	2.72	5.43	ug/L	< 2.66	U	2.66	5.32	ug/L
SW8270C	91-94-1	3,3'-Dichlorobenzidine	0.11			ug/L	**< 2.65**	U	2.65	10.6	ug/L	**< 2.72**	U	2.72	10.9	ug/L	**< 2.66**	U	2.66	10.6	ug/L
SW8270C	106-44-5	3-,4-Methylphenol		7.2		ug/L	2.65	U	2.65	5.29	ug/L	2.72	U	2.72	5.43	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	99-09-2	3-Nitroaniline				ug/L	< 13.2	U	13.2	26.5	ug/L	< 13.6	U	13.6	27.2	ug/L	< 13.3	U	13.3	26.6	ug/L
SW8270C	534-52-1	4,6-Dinitro-2-methylphenol		0.12		ug/L	**< 13.2**	U	13.2	26.5	ug/L	**< 13.6**	U	13.6	27.2	ug/L	**< 13.3**	U	13.3	26.6	ug/L
SW8270C	101-55-3	4-Bromophenyl-phenylether				ug/L	< 2.65	U	2.65	5.29	ug/L	< 2.72	U	2.72	5.43	ug/L	< 2.66	U	2.66	5.32	ug/L
SW8270C	59-50-7	4-Chloro-3-methylphenol		110		ug/L	2.65	U	2.65	5.29	ug/L	2.72	U	2.72	5.43	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	106-47-8	4-Chloroaniline	0.32	5.9		ug/L	**< 2.65**	U	2.65	5.29	ug/L	**< 2.72**	U	2.72	5.43	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	7005-72-3	4-Chlorophenyl-phenyl ether				ug/L	< 2.65	U	2.65	5.29	ug/L	< 2.72	U	2.72	5.43	ug/L	< 2.66	U	2.66	5.32	ug/L
SW8270C	100-01-6	4-Nitroaniline	3.3	6.1		ug/L	**< 13.2**	U	13.2	26.5	ug/L	**< 13.6**	U	13.6	27.2	ug/L	**< 13.3**	U	13.3	26.6	ug/L
SW8270C	100-02-7	4-Nitrophenol				ug/L	< 13.2	U	13.2	26.5	ug/L	< 13.6	U	13.6	27.2	ug/L	< 13.3	U	13.3	26.6	ug/L
SW8270C	83-32-9	Acenaphthene		40		ug/L	2.65	U	2.65	5.29	ug/L	2.72	U	2.72	5.43	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	208-96-8	Acenaphthylene				ug/L	< 2.65	U	2.65	5.29	ug/L	< 2.72	U	2.72	5.43	ug/L	< 2.66	U	2.66	5.32	ug/L
SW8270C	120-12-7	Anthracene		130		ug/L	2.65	U	2.65	5.29	ug/L	2.72	U	2.72	5.43	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	56-55-3	Benzo(a)anthracene	0.029			ug/L	**< 2.65**	U	2.65	5.29	ug/L	**< 2.72**	U	2.72	5.43	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	50-32-8	Benzo(a)pyrene	0.0029		0.2	ug/L	**< 2.65**	U	2.65	5.29	ug/L	**< 2.72**	U	2.72	5.43	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	205-99-2	Benzo(b)fluoranthene	0.029			ug/L	**< 2.65**	U	2.65	5.29	ug/L	**< 2.72**	U	2.72	5.43	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	191-24-2	Benzo(g,h,i)Perylene				ug/L	< 2.65	U	2.65	5.29	ug/L	< 2.72	U	2.72	5.43	ug/L	< 2.66	U	2.66	5.32	ug/L
SW8270C	207-08-9	Benzo(k)fluoranthene	0.29			ug/L	**< 2.65**	U	2.65	5.29	ug/L	**< 2.72**	U	2.72	5.43	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	65-85-0	Benzoic acid		5800		ug/L	13.2	R	13.2	26.5	ug/L	13.6	UJ	13.6	27.2	ug/L	13.3	R	13.3	26.6	ug/L
SW8270C	100-51-6	Benzyl alcohol		150		ug/L	2.65	U	2.65	5.29	ug/L	2.72	U	2.72	5.43	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	111-91-1	Bis(2-Chloroethoxy)Methane		4.7		ug/L	2.65	U	2.65	5.29	ug/L	2.72	U	2.72	5.43	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	111-44-4	Bis(2-Chloroethyl)ether	0.012			ug/L	**< 2.65**	U	2.65	5.29	ug/L	**< 2.72**	U	2.72	5.43	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	108-60-1	bis(2-Chloroisopropyl)ether	0.31	55		ug/L	**< 2.65**	U	2.65	5.29	ug/L	**< 2.72**	U	2.72	5.43	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	117-81-7	bis(2-Ethylhexyl)phthalate	0.071	0.46	6	ug/L	**< 3.17**	U	3.17	10.6	ug/L	**< 3.26**	U	3.26	10.9	ug/L	**< 3.19**	U	3.19	10.6	ug/L
SW8270C	85-68-7	Butylbenzylphthalate	14	120		ug/L	2.65	U	2.65	5.29	ug/L	2.72	U	2.72	5.43	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	218-01-9	Chrysene	2.9			ug/L	2.65	U	2.65	5.29	ug/L	2.72	U	2.72	5.43	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	53-70-3	Dibenzo(a,h)Anthracene	0.0029			ug/L	**< 2.65**	UJ	2.65	5.29	ug/L	**< 2.72**	U	2.72	5.43	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	132-64-9	Dibenzofuran		0.58		ug/L	**< 2.65**	U	2.65	5.29	ug/L	**< 2.72**	U	2.72	5.43	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	84-66-2	Diethylphthalate		1100		ug/L	2.65	U	2.65	5.29	ug/L	2.72	U	2.72	5.43	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	131-11-3	Dimethylphthalate				ug/L	< 2.65	U	2.65	5.29	ug/L	< 2.72	U	2.72	5.43	ug/L	< 2.66	U	2.66	5.32	ug/L
SW8270C	84-74-2	Di-N-Butylphthalate		67		ug/L	2.65	U	2.65	5.29	ug/L	2.72	U	2.72	5.43	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	117-84-0	Di-n-octylphthalate				ug/L	< 2.65	U	2.65	5.29	ug/L	< 2.72	U	2.72	5.43	ug/L	< 2.66	U	2.66	5.32	ug/L
SW8270C	206-44-0	Fluoranthene		63		ug/L	2.65	U	2.65	5.29	ug/L	2.72	U	2.72	5.43	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	86-73-7	Fluorene		22		ug/L	2.65	U	2.65	5.29	ug/L	2.72	U	2.72	5.43	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	118-74-1	Hexachlorobenzene	0.042	1.3	1	ug/L	**< 2.65**	U	2.65	5.29	ug/L	**< 2.72**	U	2.72	5.43	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	87-68-3	Hexachlorobutadiene	0.26	0.47		ug/L	**< 2.65**	U	2.65	5.29	ug/L	**< 2.72**	U	2.72	5.43	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	77-47-4	Hexachlorocyclopentadiene		2.2	50	ug/L	**< 2.65**	U	2.65	5.29	ug/L	**< 2.72**	U	2.72	5.43	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	67-72-1	Hexachloroethane	0.79	0.51		ug/L	**< 2.65**	U	2.65	5.29	ug/L	**< 2.72**	U	2.72	5.43	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	193-39-5	Indeno(1,2,3-cd)pyrene	0.029			ug/L	**< 2.65**	U	2.65	5.29	ug/L	**< 2.72**	U	2.72	5.43	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	78-59-1	Isophorone	67	300		ug/L	2.65	U	2.65	5.29	ug/L	2.72	U	2.72	5.43	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	91-20-3	Naphthalene	0.14	0.61		ug/L	**< 2.65**	U	2.65	5.29	ug/L	**< 2.72**	U	2.72	5.43	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	98-95-3	Nitrobenzene	0.12	1.1		ug/L	**< 2.65**	U	2.65	5.29	ug/L	**< 2.72**	U	2.72	5.43	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	86-30-6	N-Nitrosodiphenylamine	10			ug/L	2.65	U	2.65	5.29	ug/L	2.72	U	2.72	5.43	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	621-64-7	N-Nitrosodipropylamine	0.0093			ug/L	**< 2.65**	U	2.65	5.29	ug/L	**< 2.72**	U	2.72	5.43	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	87-86-5	Pentachlorophenol	0.17	7.8	1	ug/L	**< 13.2**	U	13.2	26.5	ug/L	**< 13.6**	U	13.6	27.2	ug/L	**< 13.3**	U	13.3	26.6	ug/L
SW8270C	85-01-8	Phenanthrene				ug/L	< 2.65	U	2.65	5.29	ug/L	< 2.72	U	2.72	5.43	ug/L	< 2.66	U	2.66	5.32	ug/L
SW8270C	108-95-2	Phenol		450		ug/L	2.65	U	2.65	5.29	ug/L	2.72	U	2.72	5.43	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	129-00-0	Pyrene		8.7		ug/L	2.65	U	2.65	5.29	ug/L	2.72	U	2.72	5.43	ug/L	2.66	U	2.66	5.32	ug/L

		Location ID	40MW6					40MW6					40MW6					40MW7				
		Sample ID	40DUPGW061212					40MW6GW061212					40MW6GW92512					40MW7GW112011				
		Sample Date	6/12/2012					6/12/2012					9/25/2012					11/20/2011				
		Sample Type	FD					N					N					N				
Method	CAS	Chemical	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8270C	120-82-1	1,2,4-Trichlorobenzene	**< 2.6**	U	2.6	5.21	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	95-50-1	1,2-Dichlorobenzene	2.6	U	2.6	5.21	ug/L	2.5	U	2.5	5	ug/L	2.63	U	2.63	5.26	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	541-73-1	1,3-Dichlorobenzene	< 2.6	U	2.6	5.21	ug/L	< 2.5	U	2.5	5	ug/L	< 2.63	U	2.63	5.26	ug/L	< 2.66	U	2.66	5.32	ug/L
SW8270C	106-46-7	1,4-Dichlorobenzene	**< 2.6**	U	2.6	5.21	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	95-95-4	2,4,5-Trichlorophenol	2.6	U	2.6	5.21	ug/L	2.5	U	2.5	5	ug/L	2.63	U	2.63	5.26	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	88-06-2	2,4,6-Trichlorophenol	**< 2.6**	U	2.6	5.21	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	120-83-2	2,4-Dichlorophenol	2.6	U	2.6	5.21	ug/L	2.5	U	2.5	5	ug/L	2.63	U	2.63	5.26	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	105-67-9	2,4-Dimethylphenol	2.6	U	2.6	5.21	ug/L	2.5	U	2.5	5	ug/L	2.63	U	2.63	5.26	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	51-28-5	2,4-Dinitrophenol	**< 13**	UJ	13	26	ug/L	**< 12.5**	UJ	12.5	25	ug/L	**< 13.2**	U	13.2	26.3	ug/L	**< 13.3**	U	13.3	26.6	ug/L
SW8270C	121-14-2	2,4-Dinitrotoluene	**< 2.6**	U	2.6	5.21	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	606-20-2	2,6-Dinitrotoluene	**< 2.6**	U	2.6	5.21	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	91-58-7	2-Chloronaphthalene	2.6	U	2.6	5.21	ug/L	2.5	U	2.5	5	ug/L	2.63	U	2.63	5.26	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	95-57-8	2-Chlorophenol	2.6	U	2.6	5.21	ug/L	2.5	U	2.5	5	ug/L	2.63	U	2.63	5.26	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	91-57-6	2-Methylnaphthalene	2.6	U	2.6	5.21	ug/L	2.5	U	2.5	5	ug/L	2.63	U	2.63	5.26	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	95-48-7	2-Methylphenol	2.6	U	2.6	5.21	ug/L	2.5	U	2.5	5	ug/L	2.63	U	2.63	5.26	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	88-74-4	2-Nitroaniline	13	U	13	26	ug/L	12.5	U	12.5	25	ug/L	13.2	U	13.2	26.3	ug/L	13.3	U	13.3	26.6	ug/L
SW8270C	88-75-5	2-Nitrophenol	< 2.6	U	2.6	5.21	ug/L	< 2.5	U	2.5	5	ug/L	< 2.63	U	2.63	5.26	ug/L	< 2.66	U	2.66	5.32	ug/L
SW8270C	91-94-1	3,3'-Dichlorobenzidine	**< 2.6**	U	2.6	10.4	ug/L	**< 2.5**	U	2.5	10	ug/L	**< 2.63**	U	2.63	10.5	ug/L	**< 2.66**	U	2.66	10.6	ug/L
SW8270C	106-44-5	3-,4-Methylphenol	2.6	U	2.6	5.21	ug/L	2.5	U	2.5	5	ug/L	2.63	U	2.63	5.26	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	99-09-2	3-Nitroaniline	< 13	U	13	26	ug/L	< 12.5	U	12.5	25	ug/L	< 13.2	U	13.2	26.3	ug/L	< 13.3	U	13.3	26.6	ug/L
SW8270C	534-52-1	4,6-Dinitro-2-methylphenol	**< 13**	U	13	26	ug/L	**< 12.5**	U	12.5	25	ug/L	**< 13.2**	U	13.2	26.3	ug/L	**< 13.3**	U	13.3	26.6	ug/L
SW8270C	101-55-3	4-Bromophenyl-phenylether	< 2.6	U	2.6	5.21	ug/L	< 2.5	U	2.5	5	ug/L	< 2.63	U	2.63	5.26	ug/L	< 2.66	U	2.66	5.32	ug/L
SW8270C	59-50-7	4-Chloro-3-methylphenol	2.6	U	2.6	5.21	ug/L	2.5	U	2.5	5	ug/L	2.63	U	2.63	5.26	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	106-47-8	4-Chloroaniline	**< 2.6**	U	2.6	5.21	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	7005-72-3	4-Chlorophenyl-phenyl ether	< 2.6	U	2.6	5.21	ug/L	< 2.5	U	2.5	5	ug/L	< 2.63	U	2.63	5.26	ug/L	< 2.66	U	2.66	5.32	ug/L
SW8270C	100-01-6	4-Nitroaniline	**< 13**	U	13	26	ug/L	**< 12.5**	U	12.5	25	ug/L	**< 13.2**	U	13.2	26.3	ug/L	**< 13.3**	U	13.3	26.6	ug/L
SW8270C	100-02-7	4-Nitrophenol	< 13	U	13	26	ug/L	< 12.5	U	12.5	25	ug/L	< 13.2	U	13.2	26.3	ug/L	< 13.3	U	13.3	26.6	ug/L
SW8270C	83-32-9	Acenaphthene	2.6	U	2.6	5.21	ug/L	2.5	U	2.5	5	ug/L	2.63	U	2.63	5.26	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	208-96-8	Acenaphthylene	< 2.6	U	2.6	5.21	ug/L	< 2.5	U	2.5	5	ug/L	< 2.63	U	2.63	5.26	ug/L	< 2.66	U	2.66	5.32	ug/L
SW8270C	120-12-7	Anthracene	2.6	U	2.6	5.21	ug/L	2.5	U	2.5	5	ug/L	2.63	U	2.63	5.26	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	56-55-3	Benzo(a)anthracene	**< 2.6**	U	2.6	5.21	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	50-32-8	Benzo(a)pyrene	**< 2.6**	U	2.6	5.21	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	205-99-2	Benzo(b)fluoranthene	**< 2.6**	U	2.6	5.21	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	191-24-2	Benzo(g,h,i)Perylene	< 2.6	U	2.6	5.21	ug/L	< 2.5	U	2.5	5	ug/L	< 2.63	U	2.63	5.26	ug/L	< 2.66	U	2.66	5.32	ug/L
SW8270C	207-08-9	Benzo(k)fluoranthene	**< 2.6**	U	2.6	5.21	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	65-85-0	Benzoic acid	13	UJ	13	26	ug/L	12.5	UJ	12.5	25	ug/L	13.2	R	13.2	26.3	ug/L	13.3	UJ	13.3	26.6	ug/L
SW8270C	100-51-6	Benzyl alcohol	2.6	U	2.6	5.21	ug/L	2.5	U	2.5	5	ug/L	2.63	U	2.63	5.26	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	111-91-1	Bis(2-Chloroethoxy)Methane	2.6	U	2.6	5.21	ug/L	2.5	U	2.5	5	ug/L	2.63	U	2.63	5.26	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	111-44-4	Bis(2-Chloroethyl)ether	**< 2.6**	U	2.6	5.21	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	108-60-1	bis(2-Chloroisopropyl)ether	**< 2.6**	U	2.6	5.21	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	117-81-7	bis(2-Ethylhexyl)phthalate	**< 3.13**	U	3.13	10.4	ug/L	**< 3**	U	3	10	ug/L	**< 3.16**	U	3.16	10.5	ug/L	**5.31**	B	3.19	10.6	ug/L
SW8270C	85-68-7	Butylbenzylphthalate	2.6	U	2.6	5.21	ug/L	2.5	U	2.5	5	ug/L	2.63	U	2.63	5.26	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	218-01-9	Chrysene	2.6	U	2.6	5.21	ug/L	2.5	U	2.5	5	ug/L	2.63	U	2.63	5.26	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	53-70-3	Dibenzo(a,h)Anthracene	**< 2.6**	U	2.6	5.21	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	132-64-9	Dibenzofuran	**< 2.6**	U	2.6	5.21	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	84-66-2	Diethylphthalate	2.6	U	2.6	5.21	ug/L	2.5	U	2.5	5	ug/L	2.63	U	2.63	5.26	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	131-11-3	Dimethylphthalate	< 2.6	U	2.6	5.21	ug/L	< 2.5	U	2.5	5	ug/L	< 2.63	U	2.63	5.26	ug/L	< 2.66	U	2.66	5.32	ug/L
SW8270C	84-74-2	Di-N-Butylphthalate	2.6	U	2.6	5.21	ug/L	2.5	U	2.5	5	ug/L	2.63	U	2.63	5.26	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	117-84-0	Di-n-octylphthalate	< 2.6	U	2.6	5.21	ug/L	< 2.5	U	2.5	5	ug/L	< 2.63	U	2.63	5.26	ug/L	< 2.66	U	2.66	5.32	ug/L
SW8270C	206-44-0	Fluoranthene	2.6	U	2.6	5.21	ug/L	2.5	U	2.5	5	ug/L	2.63	U	2.63	5.26	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	86-73-7	Fluorene	2.6	U	2.6	5.21	ug/L	2.5	U	2.5	5	ug/L	2.63	U	2.63	5.26	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	118-74-1	Hexachlorobenzene	**< 2.6**	U	2.6	5.21	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	87-68-3	Hexachlorobutadiene	**< 2.6**	U	2.6	5.21	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	77-47-4	Hexachlorocyclopentadiene	**< 2.6**	UJ	2.6	5.21	ug/L	**< 2.5**	UJ	2.5	5	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	67-72-1	Hexachloroethane	**< 2.6**	U	2.6	5.21	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	193-39-5	Indeno(1,2,3-cd)pyrene	**< 2.6**	U	2.6	5.21	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	78-59-1	Isophorone	2.6	U	2.6	5.21	ug/L	2.5	U	2.5	5	ug/L	2.63	U	2.63	5.26	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	91-20-3	Naphthalene	**< 2.6**	U	2.6	5.21	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	98-95-3	Nitrobenzene	**< 2.6**	U	2.6	5.21	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	86-30-6	N-Nitrosodiphenylamine	2.6	U	2.6	5.21	ug/L	2.5	U	2.5	5	ug/L	2.63	U	2.63	5.26	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	621-64-7	N-Nitrosodipropylamine	**< 2.6**	U	2.6	5.21	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.63**	U	2.63	5.26	ug/L	**< 2.66**	U	2.66	5.32	ug/L
SW8270C	87-86-5	Pentachlorophenol	**< 13**	U	13	26	ug/L	**< 12.5**	U	12.5	25	ug/L	**< 13.2**	U	13.2	26.3	ug/L	**< 13.3**	U	13.3	26.6	ug/L
SW8270C	85-01-8	Phenanthrene	< 2.6	U	2.6	5.21	ug/L	< 2.5	U	2.5	5	ug/L	< 2.63	U	2.63	5.26	ug/L	< 2.66	U	2.66	5.32	ug/L
SW8270C	108-95-2	Phenol	2.6	UL	2.6	5.21	ug/L	2.5	UL	2.5	5	ug/L	2.63	U	2.63	5.26	ug/L	2.66	U	2.66	5.32	ug/L
SW8270C	129-00-0	Pyrene	2.6	U	2.6	5.21	ug/L	2.5	U	2.5	5	ug/L	2.63	U	2.63	5.26	ug/L	2.66	U	2.66	5.32	ug/L

		Location ID	40MW7					40MW7					40MW7				
		Sample ID	40MW7GW030612					40MW7GW601212					40MW7GW92512				
		Sample Date	3/6/2012					6/12/2012					9/25/2012				
		Sample Type	N					N					N				
Method	CAS	Chemical	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8270C	120-82-1	1,2,4-Trichlorobenzene	**< 2.72**	U	2.72	5.43	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.84**	U	2.84	5.68	ug/L
SW8270C	95-50-1	1,2-Dichlorobenzene	2.72	U	2.72	5.43	ug/L	2.5	U	2.5	5	ug/L	2.84	U	2.84	5.68	ug/L
SW8270C	541-73-1	1,3-Dichlorobenzene	< 2.72	U	2.72	5.43	ug/L	< 2.5	U	2.5	5	ug/L	< 2.84	U	2.84	5.68	ug/L
SW8270C	106-46-7	1,4-Dichlorobenzene	**< 2.72**	U	2.72	5.43	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.84**	U	2.84	5.68	ug/L
SW8270C	95-95-4	2,4,5-Trichlorophenol	2.72	U	2.72	5.43	ug/L	2.5	U	2.5	5	ug/L	2.84	U	2.84	5.68	ug/L
SW8270C	88-06-2	2,4,6-Trichlorophenol	**< 2.72**	U	2.72	5.43	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.84**	U	2.84	5.68	ug/L
SW8270C	120-83-2	2,4-Dichlorophenol	2.72	U	2.72	5.43	ug/L	2.5	U	2.5	5	ug/L	2.84	U	2.84	5.68	ug/L
SW8270C	105-67-9	2,4-Dimethylphenol	2.72	U	2.72	5.43	ug/L	2.5	U	2.5	5	ug/L	2.84	U	2.84	5.68	ug/L
SW8270C	51-28-5	2,4-Dinitrophenol	**< 13.6**	U	13.6	27.2	ug/L	**< 12.5**	UJ	12.5	25	ug/L	**< 14.2**	U	14.2	28.4	ug/L
SW8270C	121-14-2	2,4-Dinitrotoluene	**< 2.72**	U	2.72	5.43	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.84**	U	2.84	5.68	ug/L
SW8270C	606-20-2	2,6-Dinitrotoluene	**< 2.72**	U	2.72	5.43	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.84**	U	2.84	5.68	ug/L
SW8270C	91-58-7	2-Chloronaphthalene	2.72	U	2.72	5.43	ug/L	2.5	U	2.5	5	ug/L	2.84	U	2.84	5.68	ug/L
SW8270C	95-57-8	2-Chlorophenol	2.72	U	2.72	5.43	ug/L	2.5	U	2.5	5	ug/L	2.84	U	2.84	5.68	ug/L
SW8270C	91-57-6	2-Methylnaphthalene	**< 2.72**	U	2.72	5.43	ug/L	2.5	U	2.5	5	ug/L	**< 2.84**	U	2.84	5.68	ug/L
SW8270C	95-48-7	2-Methylphenol	2.72	U	2.72	5.43	ug/L	2.5	U	2.5	5	ug/L	2.84	U	2.84	5.68	ug/L
SW8270C	88-74-4	2-Nitroaniline	13.6	U	13.6	27.2	ug/L	12.5	U	12.5	25	ug/L	14.2	U	14.2	28.4	ug/L
SW8270C	88-75-5	2-Nitrophenol	< 2.72	U	2.72	5.43	ug/L	< 2.5	U	2.5	5	ug/L	< 2.84	U	2.84	5.68	ug/L
SW8270C	91-94-1	3,3'-Dichlorobenzidine	**< 2.72**	U	2.72	10.9	ug/L	**< 2.5**	U	2.5	10	ug/L	**< 2.84**	U	2.84	11.4	ug/L
SW8270C	106-44-5	3-,4-Methylphenol	2.72	U	2.72	5.43	ug/L	2.5	U	2.5	5	ug/L	2.84	U	2.84	5.68	ug/L
SW8270C	99-09-2	3-Nitroaniline	< 13.6	U	13.6	27.2	ug/L	< 12.5	U	12.5	25	ug/L	< 14.2	U	14.2	28.4	ug/L
SW8270C	534-52-1	4,6-Dinitro-2-methylphenol	**< 13.6**	U	13.6	27.2	ug/L	**< 12.5**	U	12.5	25	ug/L	**< 14.2**	U	14.2	28.4	ug/L
SW8270C	101-55-3	4-Bromophenyl-phenylether	< 2.72	U	2.72	5.43	ug/L	< 2.5	U	2.5	5	ug/L	< 2.84	U	2.84	5.68	ug/L
SW8270C	59-50-7	4-Chloro-3-methylphenol	2.72	U	2.72	5.43	ug/L	2.5	U	2.5	5	ug/L	2.84	U	2.84	5.68	ug/L
SW8270C	106-47-8	4-Chloroaniline	**< 2.72**	U	2.72	5.43	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.84**	U	2.84	5.68	ug/L
SW8270C	7005-72-3	4-Chlorophenyl-phenyl ether	< 2.72	U	2.72	5.43	ug/L	< 2.5	U	2.5	5	ug/L	< 2.84	U	2.84	5.68	ug/L
SW8270C	100-01-6	4-Nitroaniline	**< 13.6**	U	13.6	27.2	ug/L	**< 12.5**	U	12.5	25	ug/L	**< 14.2**	U	14.2	28.4	ug/L
SW8270C	100-02-7	4-Nitrophenol	< 13.6	U	13.6	27.2	ug/L	< 12.5	U	12.5	25	ug/L	< 14.2	U	14.2	28.4	ug/L
SW8270C	83-32-9	Acenaphthene	2.72	U	2.72	5.43	ug/L	2.5	U	2.5	5	ug/L	2.84	U	2.84	5.68	ug/L
SW8270C	208-96-8	Acenaphthylene	< 2.72	U	2.72	5.43	ug/L	< 2.5	U	2.5	5	ug/L	< 2.84	U	2.84	5.68	ug/L
SW8270C	120-12-7	Anthracene	2.72	U	2.72	5.43	ug/L	2.5	U	2.5	5	ug/L	2.84	U	2.84	5.68	ug/L
SW8270C	56-55-3	Benzo(a)anthracene	**< 2.72**	U	2.72	5.43	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.84**	U	2.84	5.68	ug/L
SW8270C	50-32-8	Benzo(a)pyrene	**< 2.72**	U	2.72	5.43	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.84**	U	2.84	5.68	ug/L
SW8270C	205-99-2	Benzo(b)fluoranthene	**< 2.72**	U	2.72	5.43	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.84**	U	2.84	5.68	ug/L
SW8270C	191-24-2	Benzo(g,h,i)Perylene	< 2.72	U	2.72	5.43	ug/L	< 2.5	U	2.5	5	ug/L	< 2.84	U	2.84	5.68	ug/L
SW8270C	207-08-9	Benzo(k)fluoranthene	**< 2.72**	U	2.72	5.43	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.84**	U	2.84	5.68	ug/L
SW8270C	65-85-0	Benzoic acid	13.6	R	13.6	27.2	ug/L	12.5	UJ	12.5	25	ug/L	14.2	R	14.2	28.4	ug/L
SW8270C	100-51-6	Benzyl alcohol	2.72	U	2.72	5.43	ug/L	2.5	U	2.5	5	ug/L	2.84	U	2.84	5.68	ug/L
SW8270C	111-91-1	Bis(2-Chloroethoxy)Methane	2.72	U	2.72	5.43	ug/L	2.5	U	2.5	5	ug/L	2.84	U	2.84	5.68	ug/L
SW8270C	111-44-4	Bis(2-Chloroethyl)ether	**< 2.72**	U	2.72	5.43	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.84**	U	2.84	5.68	ug/L
SW8270C	108-60-1	bis(2-Chloroisopropyl)ether	**< 2.72**	U	2.72	5.43	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.84**	U	2.84	5.68	ug/L
SW8270C	117-81-7	bis(2-Ethylhexyl)phthalate	**< 3.26**	U	3.26	10.9	ug/L	**< 3**	U	3	10	ug/L	**< 3.41**	U	3.41	11.4	ug/L
SW8270C	85-68-7	Butylbenzylphthalate	2.72	U	2.72	5.43	ug/L	2.5	U	2.5	5	ug/L	2.84	U	2.84	5.68	ug/L
SW8270C	218-01-9	Chrysene	2.72	U	2.72	5.43	ug/L	2.5	U	2.5	5	ug/L	2.84	U	2.84	5.68	ug/L
SW8270C	53-70-3	Dibenzo(a,h)Anthracene	**< 2.72**	U	2.72	5.43	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.84**	U	2.84	5.68	ug/L
SW8270C	132-64-9	Dibenzofuran	**< 2.72**	U	2.72	5.43	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.84**	U	2.84	5.68	ug/L
SW8270C	84-66-2	Diethylphthalate	2.72	U	2.72	5.43	ug/L	2.5	U	2.5	5	ug/L	2.84	U	2.84	5.68	ug/L
SW8270C	131-11-3	Dimethylphthalate	< 2.72	U	2.72	5.43	ug/L	< 2.5	U	2.5	5	ug/L	< 2.84	U	2.84	5.68	ug/L
SW8270C	84-74-2	Di-N-Butylphthalate	2.72	U	2.72	5.43	ug/L	2.5	U	2.5	5	ug/L	2.84	U	2.84	5.68	ug/L
SW8270C	117-84-0	Di-n-octylphthalate	< 2.72	U	2.72	5.43	ug/L	< 2.5	U	2.5	5	ug/L	< 2.84	U	2.84	5.68	ug/L
SW8270C	206-44-0	Fluoranthene	2.72	U	2.72	5.43	ug/L	2.5	U	2.5	5	ug/L	2.84	U	2.84	5.68	ug/L
SW8270C	86-73-7	Fluorene	2.72	U	2.72	5.43	ug/L	2.5	U	2.5	5	ug/L	2.84	U	2.84	5.68	ug/L
SW8270C	118-74-1	Hexachlorobenzene	**< 2.72**	U	2.72	5.43	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.84**	U	2.84	5.68	ug/L
SW8270C	87-68-3	Hexachlorobutadiene	**< 2.72**	U	2.72	5.43	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.84**	U	2.84	5.68	ug/L
SW8270C	77-47-4	Hexachlorocyclopentadiene	**< 2.72**	U	2.72	5.43	ug/L	**< 2.5**	UJ	2.5	5	ug/L	**< 2.84**	U	2.84	5.68	ug/L
SW8270C	67-72-1	Hexachloroethane	**< 2.72**	U	2.72	5.43	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.84**	U	2.84	5.68	ug/L
SW8270C	193-39-5	Indeno(1,2,3-cd)pyrene	**< 2.72**	U	2.72	5.43	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.84**	U	2.84	5.68	ug/L
SW8270C	78-59-1	Isophorone	2.72	U	2.72	5.43	ug/L	2.5	U	2.5	5	ug/L	2.84	U	2.84	5.68	ug/L
SW8270C	91-20-3	Naphthalene	**< 2.72**	U	2.72	5.43	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.84**	U	2.84	5.68	ug/L
SW8270C	98-95-3	Nitrobenzene	**< 2.72**	U	2.72	5.43	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.84**	U	2.84	5.68	ug/L
SW8270C	86-30-6	N-Nitrosodiphenylamine	2.72	U	2.72	5.43	ug/L	2.5	U	2.5	5	ug/L	2.84	U	2.84	5.68	ug/L
SW8270C	621-64-7	N-Nitrosodipropylamine	**< 2.72**	U	2.72	5.43	ug/L	**< 2.5**	U	2.5	5	ug/L	**< 2.84**	U	2.84	5.68	ug/L
SW8270C	87-86-5	Pentachlorophenol	**< 13.6**	U	13.6	27.2	ug/L	**< 12.5**	U	12.5	25	ug/L	**< 14.2**	U	14.2	28.4	ug/L
SW8270C	85-01-8	Phenanthrene	< 2.72	U	2.72	5.43	ug/L	< 2.5	U	2.5	5	ug/L	< 2.84	U	2.84	5.68	ug/L
SW8270C	108-95-2	Phenol	2.72	U	2.72	5.43	ug/L	2.5	UL	2.5	5	ug/L	2.84	U	2.84	5.68	ug/L
SW8270C	129-00-0	Pyrene	2.72	U	2.72	5.43	ug/L	2.5	U	2.5	5	ug/L	2.84	U	2.84	5.68	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

Table 2
November 2011 Screening Levels for Groundwater SVOC PAH Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 1

						Location ID	40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01				
						Sample ID	40LFMW01GW112111					40DUPGW030612					40LFMW01GW030612					LFMW01GW061212					LFMW01GW92612				
						Sample Date	11/21/2011					3/6/2012					3/6/2012					6/12/2012					9/26/2012				
						Sample Type	N					FD					N					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8270C PAHL	90-12-0	1-Methylnaphthalene	0.97	46		ug/L	0.0281	U	0.0281	0.0562	ug/L	0.026	U	0.026	0.0521	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	91-57-6	2-Methylnaphthalene		2.7		ug/L	0.0281	U	0.0281	0.0562	ug/L	0.026	U	0.026	0.0521	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	83-32-9	Acenaphthene		40		ug/L	0.0281	U	0.0281	0.0562	ug/L	0.026	U	0.026	0.0521	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	208-96-8	Acenaphthylene				ug/L	< 0.0281	U	0.0281	0.0562	ug/L	< 0.026	U	0.026	0.0521	ug/L	< 0.0269	U	0.0269	0.0538	ug/L	< 0.0281	U	0.0281	0.0562	ug/L	< 0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	120-12-7	Anthracene		130		ug/L	0.0281	U	0.0281	0.0562	ug/L	0.026	U	0.026	0.0521	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	56-55-3	Benzo(a)anthracene	0.029			ug/L	0.0281	U	0.0281	0.0562	ug/L	0.026	U	0.026	0.0521	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	50-32-8	Benzo(a)pyrene	0.0029		0.20	ug/L	**< 0.0281**	U	0.0281	0.0562	ug/L	**< 0.026**	U	0.026	0.0521	ug/L	**< 0.0269**	U	0.0269	0.0538	ug/L	**< 0.0281**	U	0.0281	0.0562	ug/L	**< 0.0255**	U	0.0255	0.051	ug/L
SW8270C PAHL	205-99-2	Benzo(b)fluoranthene	0.029			ug/L	0.0281	U	0.0281	0.0562	ug/L	0.026	U	0.026	0.0521	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	191-24-2	Benzo(g,h,i)Perylene				ug/L	< 0.0281	U	0.0281	0.0562	ug/L	< 0.026	U	0.026	0.0521	ug/L	< 0.0269	U	0.0269	0.0538	ug/L	< 0.0281	U	0.0281	0.0562	ug/L	< 0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	207-08-9	Benzo(k)fluoranthene	0.29			ug/L	0.0281	U	0.0281	0.0562	ug/L	0.026	U	0.026	0.0521	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	218-01-9	Chrysene	2.9			ug/L	0.0281	U	0.0281	0.0562	ug/L	0.026	U	0.026	0.0521	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0308	J	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	53-70-3	Dibenzo(a,h)Anthracene	0.0029			ug/L	**< 0.0281**	U	0.0281	0.0562	ug/L	**< 0.026**	U	0.026	0.0521	ug/L	**< 0.0269**	U	0.0269	0.0538	ug/L	**< 0.0281**	U	0.0281	0.0562	ug/L	**< 0.0255**	U	0.0255	0.051	ug/L
SW8270C PAHL	206-44-0	Fluoranthene		63		ug/L	0.0281	U	0.0281	0.0562	ug/L	0.026	U	0.026	0.0521	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	86-73-7	Fluorene		22		ug/L	0.0281	U	0.0281	0.0562	ug/L	0.026	U	0.026	0.0521	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	193-39-5	Indeno(1,2,3-cd)pyrene	0.029			ug/L	0.0281	U	0.0281	0.0562	ug/L	0.026	U	0.026	0.0521	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	91-20-3	Naphthalene	0.14	0.61		ug/L	0.0281	U	0.0281	0.0562	ug/L	0.026	U	0.026	0.0521	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	85-01-8	Phenanthrene				ug/L	< 0.0281	U	0.0281	0.0562	ug/L	< 0.026	U	0.026	0.0521	ug/L	< 0.0269	U	0.0269	0.0538	ug/L	< 0.0281	U	0.0281	0.0562	ug/L	< 0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	129-00-0	Pyrene		8.7		ug/L	0.0281	U	0.0281	0.0562	ug/L	0.026	U	0.026	0.0521	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 2
November 2011 Screening Levels for Groundwater SVOC PAH Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 1

						Location ID	40MW5					40MW5					40MW5					40MW5					40MW5				
						Sample ID	40DUPGW112011					40MW5GW112011					40MW5GW030712					40MW5GW061212					40DUPGW92512				
						Sample Date	11/20/2011					11/20/2011					3/7/2012					6/12/2012					9/25/2012				
						Sample Type	FD					N					N					N					FD				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8270C PAHL	90-12-0	1-Methylnaphthalene	0.97	46		ug/L	0.0263	U	0.0263	0.0526	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L	0.026	UJ	0.026	0.0521	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	91-57-6	2-Methylnaphthalene		2.7		ug/L	0.0263	U	0.0263	0.0526	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L	0.026	UJ	0.026	0.0521	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	83-32-9	Acenaphthene		40		ug/L	0.0263	U	0.0263	0.0526	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L	0.026	UJ	0.026	0.0521	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	208-96-8	Acenaphthylene				ug/L	< 0.0263	U	0.0263	0.0526	ug/L	< 0.0269	U	0.0269	0.0538	ug/L	< 0.0255	U	0.0255	0.051	ug/L	< 0.026	UJ	0.026	0.0521	ug/L	< 0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	120-12-7	Anthracene		130		ug/L	0.0263	U	0.0263	0.0526	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L	0.026	UJ	0.026	0.0521	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	56-55-3	Benzo(a)anthracene	0.029			ug/L	0.0263	U	0.0263	0.0526	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L	0.026	UJ	0.026	0.0521	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	50-32-8	Benzo(a)pyrene	0.0029		0.20	ug/L	**< 0.0263**	U	0.0263	0.0526	ug/L	**< 0.0269**	U	0.0269	0.0538	ug/L	**< 0.0255**	U	0.0255	0.051	ug/L	**< 0.026**	UJ	0.026	0.0521	ug/L	**< 0.0255**	U	0.0255	0.051	ug/L
SW8270C PAHL	205-99-2	Benzo(b)fluoranthene	0.029			ug/L	0.0263	U	0.0263	0.0526	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L	0.026	UJ	0.026	0.0521	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	191-24-2	Benzo(g,h,i)Perylene				ug/L	< 0.0263	U	0.0263	0.0526	ug/L	< 0.0269	U	0.0269	0.0538	ug/L	<0.0255	U	0.0255	0.051	ug/L	< 0.026	UJ	0.026	0.0521	ug/L	< 0.0255	UJ	0.0255	0.051	ug/L
SW8270C PAHL	207-08-9	Benzo(k)fluoranthene	0.29			ug/L	0.0263	U	0.0263	0.0526	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L	0.026	UJ	0.026	0.0521	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	218-01-9	Chrysene	2.9			ug/L	0.0263	U	0.0263	0.0526	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L	0.026	UJ	0.026	0.0521	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	53-70-3	Dibenzo(a,h)Anthracene	0.0029			ug/L	**< 0.0263**	U	0.0263	0.0526	ug/L	**< 0.0269**	U	0.0269	0.0538	ug/L	**< 0.0255**	U	0.0255	0.051	ug/L	**< 0.026**	UJ	0.026	0.0521	ug/L	**< 0.0255**	UJ	0.0255	0.051	ug/L
SW8270C PAHL	206-44-0	Fluoranthene		63		ug/L	0.0263	U	0.0263	0.0526	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L	0.026	UJ	0.026	0.0521	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	86-73-7	Fluorene		22		ug/L	0.0263	U	0.0263	0.0526	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L	0.026	UJ	0.026	0.0521	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	193-39-5	Indeno(1,2,3-cd)pyrene	0.029			ug/L	0.0263	U	0.0263	0.0526	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L	0.026	UJ	0.026	0.0521	ug/L	0.0255	UJ	0.0255	0.051	ug/L
SW8270C PAHL	91-20-3	Naphthalene	0.14	0.61		ug/L	0.0263	U	0.0263	0.0526	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L	0.026	UJ	0.026	0.0521	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	85-01-8	Phenanthrene				ug/L	< 0.0263	U	0.0263	0.0526	ug/L	< 0.0269	U	0.0269	0.0538	ug/L	< 0.0255	U	0.0255	0.051	ug/L	< 0.026	UJ	0.026	0.0521	ug/L	< 0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	129-00-0	Pyrene		8.7		ug/L	0.0263	U	0.0263	0.0526	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L	0.026	UJ	0.026	0.0521	ug/L	0.0255	U	0.0255	0.051	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 2
November 2011 Screening Levels for Groundwater SVOC PAH Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 1

						Location ID	40MW5					40MW6					40MW6					40MW6					40MW6				
						Sample ID	40MW5GW92512					40MW6GW112111					40MW6GW030712					40DUPGW061212					40MW6GW061212				
						Sample Date	9/25/2012					11/21/2011					3/7/2012					6/12/2012					6/12/2012				
						Sample Type	N					N					N					FD					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8270C PAHL	90-12-0	1-Methylnaphthalene	0.97	46		ug/L	0.0338	U	0.0338	0.0676	ug/L	0.0287	U	0.0287	0.0575	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L	0.0281	U	0.0281	0.0562	ug/L
SW8270C PAHL	91-57-6	2-Methylnaphthalene		2.7		ug/L	0.0338	U	0.0338	0.0676	ug/L	0.0287	U	0.0287	0.0575	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L	0.0281	U	0.0281	0.0562	ug/L
SW8270C PAHL	83-32-9	Acenaphthene		40		ug/L	0.0338	U	0.0338	0.0676	ug/L	0.0287	U	0.0287	0.0575	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L	0.0281	U	0.0281	0.0562	ug/L
SW8270C PAHL	208-96-8	Acenaphthylene				ug/L	< 0.0338	U	0.0338	0.0676	ug/L	<0.0287	U	0.0287	0.0575	ug/L	< 0.0269	U	0.0269	0.0538	ug/L	< 0.0255	U	0.0255	0.051	ug/L	< 0.0281	U	0.0281	0.0562	ug/L
SW8270C PAHL	120-12-7	Anthracene		130		ug/L	0.0338	U	0.0338	0.0676	ug/L	0.0287	U	0.0287	0.0575	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L	0.0281	U	0.0281	0.0562	ug/L
SW8270C PAHL	56-55-3	Benzo(a)anthracene	0.029			ug/L	**< 0.0338**	U	0.0338	0.0676	ug/L	0.0287	U	0.0287	0.0575	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255		0.0255	0.051	ug/L	**0.211**	J	0.0281	0.0562	ug/L
SW8270C PAHL	50-32-8	Benzo(a)pyrene	0.0029		0.20	ug/L	**< 0.0338**	U	0.0338	0.0676	ug/L	**< 0.0287**	U	0.0287	0.0575	ug/L	**< 0.0269**	U	0.0269	0.0538	ug/L	**< 0.0255**		0.0255	0.051	ug/L	**0.0793**	J	0.0281	0.0562	ug/L
SW8270C PAHL	205-99-2	Benzo(b)fluoranthene	0.029			ug/L	**< 0.0338**	U	0.0338	0.0676	ug/L	0.0287	U	0.0287	0.0575	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255		0.0255	0.051	ug/L	**0.261**	J	0.0281	0.0562	ug/L
SW8270C PAHL	191-24-2	Benzo(g,h,i)Perylene				ug/L	< 0.0338	UJ	0.0338	0.0676	ug/L	<0.0287	U	0.0287	0.0575	ug/L	< 0.0269	U	0.0269	0.0538	ug/L	< 0.0255		0.0255	0.051	ug/L	0.0475	J	0.0281	0.0562	ug/L
SW8270C PAHL	207-08-9	Benzo(k)fluoranthene	0.29			ug/L	0.0338	U	0.0338	0.0676	ug/L	0.0287	U	0.0287	0.0575	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255		0.0255	0.051	ug/L	0.17	J	0.0281	0.0562	ug/L
SW8270C PAHL	218-01-9	Chrysene	2.9			ug/L	0.0338	U	0.0338	0.0676	ug/L	0.0287	U	0.0287	0.0575	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0301		0.0255	0.051	ug/L	0.89	J	0.0281	0.0562	ug/L
SW8270C PAHL	53-70-3	Dibenzo(a,h)Anthracene	0.0029			ug/L	**< 0.0338**	UJ	0.0338	0.0676	ug/L	**< 0.0287**	U	0.0287	0.0575	ug/L	**< 0.0269**	U	0.0269	0.0538	ug/L	**< 0.0255**	U	0.0255	0.051	ug/L	**< 0.0281**	U	0.0281	0.0562	ug/L
SW8270C PAHL	206-44-0	Fluoranthene		63		ug/L	0.0338	U	0.0338	0.0676	ug/L	0.0287	U	0.0287	0.0575	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0265		0.0255	0.051	ug/L	0.606	J	0.0281	0.0562	ug/L
SW8270C PAHL	86-73-7	Fluorene		22		ug/L	0.0338	U	0.0338	0.0676	ug/L	0.0287	U	0.0287	0.0575	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L	< 0.0281	U	0.0281	0.0562	ug/L
SW8270C PAHL	193-39-5	Indeno(1,2,3-cd)pyrene	0.029			ug/L	**< 0.0338**	UJ	0.0338	0.0676	ug/L	0.0287	U	0.0287	0.0575	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255		0.0255	0.051	ug/L	**0.0391**	J	0.0281	0.0562	ug/L
SW8270C PAHL	91-20-3	Naphthalene	0.14	0.61		ug/L	0.0338	U	0.0338	0.0676	ug/L	0.0287	U	0.0287	0.0575	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L	0.0281	U	0.0281	0.0562	ug/L
SW8270C PAHL	85-01-8	Phenanthrene				ug/L	< 0.0338	U	0.0338	0.0676	ug/L	<0.0287	U	0.0287	0.0575	ug/L	< 0.0269	U	0.0269	0.0538	ug/L	< 0.0255		0.0255	0.051	ug/L	0.236	J	0.0281	0.0562	ug/L
SW8270C PAHL	129-00-0	Pyrene		8.7		ug/L	0.0338	U	0.0338	0.0676	ug/L	0.0287	U	0.0287	0.0575	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255		0.0255	0.051	ug/L	0.476	J	0.0281	0.0562	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 2
November 2011 Screening Levels for Groundwater SVOC PAH Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 1

						Location ID	40MW6					40MW7					40MW7					40MW7					40MW7				
						Sample ID	40MW6GW92512					40MW7GW112011					40MW7GW030612					40MW7GW601212					40MW7GW92512				
						Sample Date	9/25/2012					11/20/2011					3/6/2012					6/12/2012					9/25/2012				
						Sample Type	N					N					N					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8270C PAHL	90-12-0	1-Methylnaphthalene	0.97	46		ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0284	U	0.0284	0.0568	ug/L	0.025	U	0.025	0.05	ug/L
SW8270C PAHL	91-57-6	2-Methylnaphthalene		2.7		ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0284	U	0.0284	0.0568	ug/L	0.025	U	0.025	0.05	ug/L
SW8270C PAHL	83-32-9	Acenaphthene		40		ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0284	U	0.0284	0.0568	ug/L	0.025	U	0.025	0.05	ug/L
SW8270C PAHL	208-96-8	Acenaphthylene				ug/L	< 0.0281	U	0.0281	0.0562	ug/L	<0.0255	U	0.0255	0.051	ug/L	< 0.0269	U	0.0269	0.0538	ug/L	< 0.0284	U	0.0284	0.0568	ug/L	< 0.025	U	0.025	0.05	ug/L
SW8270C PAHL	120-12-7	Anthracene		130		ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0284	U	0.0284	0.0568	ug/L	0.025	U	0.025	0.05	ug/L
SW8270C PAHL	56-55-3	Benzo(a)anthracene	0.029			ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0284	U	0.0284	0.0568	ug/L	0.025	U	0.025	0.05	ug/L
SW8270C PAHL	50-32-8	Benzo(a)pyrene	0.0029		0.20	ug/L	**< 0.0281**	U	0.0281	0.0562	ug/L	**< 0.0255**	U	0.0255	0.051	ug/L	**< 0.0269**	U	0.0269	0.0538	ug/L	**< 0.0284**	U	0.0284	0.0568	ug/L	**< 0.025**	U	0.025	0.05	ug/L
SW8270C PAHL	205-99-2	Benzo(b)fluoranthene	0.029			ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0284	U	0.0284	0.0568	ug/L	0.025	U	0.025	0.05	ug/L
SW8270C PAHL	191-24-2	Benzo(g,h,i)Perylene				ug/L	< 0.0281	U	0.0281	0.0562	ug/L	<0.0255	U	0.0255	0.051	ug/L	< 0.0269	U	0.0269	0.0538	ug/L	< 0.0284	U	0.0284	0.0568	ug/L	< 0.025	U	0.025	0.05	ug/L
SW8270C PAHL	207-08-9	Benzo(k)fluoranthene	0.29			ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0284	U	0.0284	0.0568	ug/L	0.025	U	0.025	0.05	ug/L
SW8270C PAHL	218-01-9	Chrysene	2.9			ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0832	J	0.0284	0.0568	ug/L	0.025	U	0.025	0.05	ug/L
SW8270C PAHL	53-70-3	Dibenzo(a,h)Anthracene	0.0029			ug/L	**< 0.0281**	U	0.0281	0.0562	ug/L	**< 0.0255**	U	0.0255	0.051	ug/L	**< 0.0269**	U	0.0269	0.0538	ug/L	**< 0.0284**	U	0.0284	0.0568	ug/L	**< 0.025**	U	0.025	0.05	ug/L
SW8270C PAHL	206-44-0	Fluoranthene		63		ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0327	B	0.0284	0.0568	ug/L	0.025	U	0.025	0.05	ug/L
SW8270C PAHL	86-73-7	Fluorene		22		ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0284	U	0.0284	0.0568	ug/L	0.025	U	0.025	0.05	ug/L
SW8270C PAHL	193-39-5	Indeno(1,2,3-cd)pyrene	0.029			ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0284	U	0.0284	0.0568	ug/L	0.025	U	0.025	0.05	ug/L
SW8270C PAHL	91-20-3	Naphthalene	0.14	0.61		ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0299	J	0.0255	0.051	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0284	U	0.0284	0.0568	ug/L	0.025	U	0.025	0.05	ug/L
SW8270C PAHL	85-01-8	Phenanthrene				ug/L	< 0.0281	U	0.0281	0.0562	ug/L	<0.0255	U	0.0255	0.051	ug/L	< 0.0269	U	0.0269	0.0538	ug/L	< 0.0284	U	0.0284	0.0568	ug/L	< 0.025	U	0.025	0.05	ug/L
SW8270C PAHL	129-00-0	Pyrene		8.7		ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0284	U	0.0284	0.0568	ug/L	0.025	U	0.025	0.05	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

Table 3
November 2011 Screening Levels for Groundwater VOC Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 1

						Location ID	40LFMW01					40LFMW01					40LFMW01					40LFMW01				
						Sample ID	40LFMW01GW112111					40DUPGW030612					40LFMW01GW030612					LFMW01GW061212				
						Sample Date	11/21/2011					3/6/2012					3/6/2012					6/12/2012				
						Sample Type	N					FD					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8260B	630-20-6	1,1,1,2-Tetrachloroethane	0.5	37		ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	71-55-6	1,1,1-Trichloroethane		750	200	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	79-34-5	1,1,2,2-Tetrachloroethane	0.066	28		ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L
SW8260B	79-00-5	1,1,2-Trichloroethane	0.24	0.041	5	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L
SW8260B	75-34-3	1,1-Dichloroethane	2.4	290		ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	75-35-4	1,1-Dichloroethene		26	7	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW8260B	563-58-6	1,1-Dichloropropene				ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L
SW8260B	87-61-6	1,2,3-Trichlorobenzene		0.52		ug/L	0.15	U	0.15	1	ug/L	0.15	U	0.15	1	ug/L	0.15	U	0.15	1	ug/L	0.15	U	0.15	1	ug/L
SW8260B	96-18-4	1,2,3-Trichloropropane	0.00065	0.062		ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW8260B	120-82-1	1,2,4-Trichlorobenzene	0.99	0.39	70	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L
SW8260B	95-63-6	1,2,4-Trimethylbenzene		1.5		ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	96-12-8	1,2-Dibromo-3-chloropropane	0.00032	0.036	0.2	ug/L	**< 1**	U	1	5	ug/L	**< 1**	U	1	5	ug/L	**< 1**	U	1	5	ug/L	**< 1**	U	1	5	ug/L
SW8260B	106-93-4	1,2-Dibromoethane	0.0065	1.6	0.05	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L
SW8260B	95-50-1	1,2-Dichlorobenzene		28	600	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	107-06-2	1,2-Dichloroethane	0.15	1.3	5	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L
SW8260B	78-87-5	1,2-Dichloropropane	0.38	0.83	5	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L
SW8260B	108-67-8	1,3,5-Trimethylbenzene		8.7		ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	541-73-1	1,3-Dichlorobenzene				ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L
SW8260B	142-28-9	1,3-Dichloropropane		29		ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L
SW8260B	106-46-7	1,4-Dichlorobenzene	0.42	47	75	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	594-20-7	2,2-Dichloropropane				ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L
SW8260B	78-93-3	2-Butanone		490		ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L
SW8260B	110-75-8	2-Chloroethyl vinyl ether				ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L
SW8260B	95-49-8	2-Chlorotoluene		18		ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	591-78-6	2-Hexanone		3.4		ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L
SW8260B	106-43-4	4-Chlorotoluene		19		ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	108-10-1	4-Methyl-2-pentanone		100		ug/L	2.5	U	2.5	10	ug/L	2.5	UJ	2.5	10	ug/L	2.5	UJ	2.5	10	ug/L	2.5	U	2.5	10	ug/L
SW8260B	67-64-1	Acetone		1200		ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L
SW8260B	71-43-2	Benzene	0.39	2.9	5	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	108-86-1	Bromobenzene		5.4		ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	74-97-5	Bromochloromethane		8.3		ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L
SW8260B	75-27-4	Bromodichloromethane	0.12	29	80	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L
SW8260B	75-25-2	Bromoform	7.9	29	80	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW8260B	74-83-9	Bromomethane		0.7		ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW8260B	75-15-0	Carbon disulfide		72		ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW8260B	56-23-5	Carbon tetrachloride	0.39	4	5	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	108-90-7	Chlorobenzene		7.2	100	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	124-48-1	Chlorodibromomethane	0.15	29	80	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L
SW8260B	75-00-3	Chloroethane		2100		ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW8260B	67-66-3	Chloroform	0.19	8.4	80	ug/L	**0.947**	B	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	**1.13**		0.125	1	ug/L
SW8260B	74-87-3	Chloromethane		19		ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW8260B	156-59-2	cis-1,2-Dichloroethene		2.8	70	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	10061-01-5	cis-1,3-Dichloropropene				ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L
SW8260B	74-95-3	Dibromomethane		0.79		ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	75-71-8	Dichlorodifluoromethane		19		ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	100-41-4	Ethylbenzene	1.3	67	700	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	87-68-3	Hexachlorobutadiene	0.26	0.47		ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	98-82-8	Isopropylbenzene		39		ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	XYLMP	M,P-XYLENE (SUM OF ISOMERS)		19		ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW8260B	75-09-2	Methylene chloride	4.7	64	5	ug/L	0.25	U	0.25	5	ug/L	0.25	U	0.25	5	ug/L	0.25	U	0.25	5	ug/L	0.25	U	0.25	5	ug/L
SW8260B	91-20-3	Naphthalene	0.14	0.61		ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L
SW8260B	104-51-8	n-Butylbenzene		78		ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	103-65-1	n-Propylbenzene		53		ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	95-47-6	o-Xylene		19		ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	99-87-6	p-Isopropyltoluene				ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L
SW8260B	135-98-8	sec-Butylbenzene				ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L
SW8260B	100-42-5	Styrene		110	100	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	98-06-6	tert-Butylbenzene				ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L
SW8260B	127-18-4	Tetrachloroethene	0.072	8.4	5	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L
SW8260B	108-88-3	Toluene		86	1000	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	156-60-5	trans-1,2-Dichloroethene		8.6	100	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	10061-02-6	trans-1,3-Dichloropropene				ug/L	< 0.5	U	0.5	1	ug/L	< 0.5	U	0.5	1	ug/L	< 0.5	U	0.5	1	ug/L	< 0.5	U	0.5	1	ug/L
SW8260B	79-01-6	Trichloroethene	0.44	0.26	5	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	75-69-4	Trichlorofluoromethane		110		ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	108-05-4	Vinyl acetate		41		ug/L	2.5	U	2.5	10	ug/L	2.5	UJ	2.5	10	ug/L	2.5	UJ	2.5	10	ug/L	2.5	U	2.5	10	ug/L
SW8260B	75-01-4	Vinyl chloride	0.015	3.6	2	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L

		Location ID	40LFMW01					40MW5					40MW5					40MW5				
		Sample ID	LFMW01GW92612					40DUPGW112011					40MW5GW112011					40MW5GW030712				
		Sample Date	9/26/2012					11/20/2011					11/20/2011					3/7/2012				
		Sample Type	N					FD					N					N				
Method	CAS	Chemical	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8260B	630-20-6	1,1,1,2-Tetrachloroethane	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	71-55-6	1,1,1-Trichloroethane	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	79-34-5	1,1,2,2-Tetrachloroethane	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L
SW8260B	79-00-5	1,1,2-Trichloroethane	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L
SW8260B	75-34-3	1,1-Dichloroethane	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	75-35-4	1,1-Dichloroethene	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW8260B	563-58-6	1,1-Dichloropropene	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L
SW8260B	87-61-6	1,2,3-Trichlorobenzene	0.15	U	0.15	1	ug/L	0.15	U	0.15	1	ug/L	0.15	U	0.15	1	ug/L	0.15	U	0.15	1	ug/L
SW8260B	96-18-4	1,2,3-Trichloropropane	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW8260B	120-82-1	1,2,4-Trichlorobenzene	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L
SW8260B	95-63-6	1,2,4-Trimethylbenzene	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	96-12-8	1,2-Dibromo-3-chloropropane	**< 1**	U	1	5	ug/L	**< 1**	U	1	5	ug/L	**< 1**	U	1	5	ug/L	**< 1**	U	1	5	ug/L
SW8260B	106-93-4	1,2-Dibromoethane	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L
SW8260B	95-50-1	1,2-Dichlorobenzene	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	107-06-2	1,2-Dichloroethane	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L
SW8260B	78-87-5	1,2-Dichloropropane	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L
SW8260B	108-67-8	1,3,5-Trimethylbenzene	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	541-73-1	1,3-Dichlorobenzene	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L
SW8260B	142-28-9	1,3-Dichloropropane	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L
SW8260B	106-46-7	1,4-Dichlorobenzene	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	594-20-7	2,2-Dichloropropane	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L
SW8260B	78-93-3	2-Butanone	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L
SW8260B	110-75-8	2-Chloroethyl vinyl ether	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L
SW8260B	95-49-8	2-Chlorotoluene	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	591-78-6	2-Hexanone	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L
SW8260B	106-43-4	4-Chlorotoluene	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	108-10-1	4-Methyl-2-pentanone	2.5	U	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	U	2.5	10	ug/L
SW8260B	67-64-1	Acetone	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L
SW8260B	71-43-2	Benzene	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	108-86-1	Bromobenzene	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	74-97-5	Bromochloromethane	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L
SW8260B	75-27-4	Bromodichloromethane	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L
SW8260B	75-25-2	Bromoform	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW8260B	74-83-9	Bromomethane	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW8260B	75-15-0	Carbon disulfide	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW8260B	56-23-5	Carbon tetrachloride	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	108-90-7	Chlorobenzene	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	124-48-1	Chlorodibromomethane	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L
SW8260B	75-00-3	Chloroethane	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW8260B	67-66-3	Chloroform	**1.08**	B	0.125	1	ug/L	**3.33**		0.125	1	ug/L	**3.17**		0.125	1	ug/L	**1.71**		0.125	1	ug/L
SW8260B	74-87-3	Chloromethane	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW8260B	156-59-2	cis-1,2-Dichloroethene	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	10061-01-5	cis-1,3-Dichloropropene	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L
SW8260B	74-95-3	Dibromomethane	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	75-71-8	Dichlorodifluoromethane	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	100-41-4	Ethylbenzene	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	87-68-3	Hexachlorobutadiene	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	98-82-8	Isopropylbenzene	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	XYLMP	M,P-XYLENE (SUM OF ISOMERS)	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW8260B	75-09-2	Methylene chloride	0.25	U	0.25	5	ug/L	0.25	U	0.25	5	ug/L	0.25	U	0.25	5	ug/L	0.25	U	0.25	5	ug/L
SW8260B	91-20-3	Naphthalene	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L
SW8260B	104-51-8	n-Butylbenzene	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	103-65-1	n-Propylbenzene	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	95-47-6	o-Xylene	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	99-87-6	p-Isopropyltoluene	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L
SW8260B	135-98-8	sec-Butylbenzene	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L
SW8260B	100-42-5	Styrene	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	98-06-6	tert-Butylbenzene	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L
SW8260B	127-18-4	Tetrachloroethene	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L
SW8260B	108-88-3	Toluene	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	156-60-5	trans-1,2-Dichloroethene	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	10061-02-6	trans-1,3-Dichloropropene	< 0.5	U	0.5	1	ug/L	< 0.5	U	0.5	1	ug/L	< 0.5	U	0.5	1	ug/L	< 0.5	U	0.5	1	ug/L
SW8260B	79-01-6	Trichloroethene	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	75-69-4	Trichlorofluoromethane	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	108-05-4	Vinyl acetate	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L
SW8260B	75-01-4	Vinyl chloride	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L

		Location ID	40MW5					40MW5					40MW5				
		Sample ID	40MW5GW061212					40DUPGW92512					40MW5GW92512				
		Sample Date	6/12/2012					9/25/2012					9/25/2012				
		Sample Type	N					FD					N				
Method	CAS	Chemical	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8260B	630-20-6	1,1,1,2-Tetrachloroethane	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	UL	0.25	1	ug/L
SW8260B	71-55-6	1,1,1-Trichloroethane	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	UL	0.25	1	ug/L
SW8260B	79-34-5	1,1,2,2-Tetrachloroethane	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	UL	0.2	1	ug/L
SW8260B	79-00-5	1,1,2-Trichloroethane	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	UL	0.25	1	ug/L
SW8260B	75-34-3	1,1-Dichloroethane	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	UL	0.125	1	ug/L
SW8260B	75-35-4	1,1-Dichloroethene	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L
SW8260B	563-58-6	1,1-Dichloropropene	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	UL	0.25	1	ug/L
SW8260B	87-61-6	1,2,3-Trichlorobenzene	0.15	U	0.15	1	ug/L	0.15	U	0.15	1	ug/L	0.15	UL	0.15	1	ug/L
SW8260B	96-18-4	1,2,3-Trichloropropane	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	UL	0.5	1	ug/L
SW8260B	120-82-1	1,2,4-Trichlorobenzene	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	UL	0.2	1	ug/L
SW8260B	95-63-6	1,2,4-Trimethylbenzene	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	UL	0.25	1	ug/L
SW8260B	96-12-8	1,2-Dibromo-3-chloropropane	**< 1**	U	1	5	ug/L	**< 1**	UJ	1	5	ug/L	**< 1**	UL	1	5	ug/L
SW8260B	106-93-4	1,2-Dibromoethane	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	UL	0.25	1	ug/L
SW8260B	95-50-1	1,2-Dichlorobenzene	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	UL	0.125	1	ug/L
SW8260B	107-06-2	1,2-Dichloroethane	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	UL	0.25	1	ug/L
SW8260B	78-87-5	1,2-Dichloropropane	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	UL	0.2	1	ug/L
SW8260B	108-67-8	1,3,5-Trimethylbenzene	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	UL	0.25	1	ug/L
SW8260B	541-73-1	1,3-Dichlorobenzene	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	UL	0.25	1	ug/L
SW8260B	142-28-9	1,3-Dichloropropane	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	UL	0.2	1	ug/L
SW8260B	106-46-7	1,4-Dichlorobenzene	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	UL	0.125	1	ug/L
SW8260B	594-20-7	2,2-Dichloropropane	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	UL	0.25	1	ug/L
SW8260B	78-93-3	2-Butanone	2.5	U	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	UL	2.5	10	ug/L
SW8260B	110-75-8	2-Chloroethyl vinyl ether	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L
SW8260B	95-49-8	2-Chlorotoluene	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	UL	0.125	1	ug/L
SW8260B	591-78-6	2-Hexanone	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	UL	2.5	10	ug/L
SW8260B	106-43-4	4-Chlorotoluene	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	UL	0.25	1	ug/L
SW8260B	108-10-1	4-Methyl-2-pentanone	2.5	U	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	UL	2.5	10	ug/L
SW8260B	67-64-1	Acetone	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L
SW8260B	71-43-2	Benzene	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	UL	0.125	1	ug/L
SW8260B	108-86-1	Bromobenzene	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	UL	0.125	1	ug/L
SW8260B	74-97-5	Bromochloromethane	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	UL	0.2	1	ug/L
SW8260B	75-27-4	Bromodichloromethane	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	UL	0.25	1	ug/L
SW8260B	75-25-2	Bromoform	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L
SW8260B	74-83-9	Bromomethane	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L
SW8260B	75-15-0	Carbon disulfide	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L
SW8260B	56-23-5	Carbon tetrachloride	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	UL	0.25	1	ug/L
SW8260B	108-90-7	Chlorobenzene	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	UL	0.125	1	ug/L
SW8260B	124-48-1	Chlorodibromomethane	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	UL	0.25	1	ug/L
SW8260B	75-00-3	Chloroethane	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L
SW8260B	67-66-3	Chloroform	**2.59**		0.125	1	ug/L	**2.73**		0.125	1	ug/L	**3.48**	L	0.125	1	ug/L
SW8260B	74-87-3	Chloromethane	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L
SW8260B	156-59-2	cis-1,2-Dichloroethene	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	UL	0.25	1	ug/L
SW8260B	10061-01-5	cis-1,3-Dichloropropene	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	UL	0.25	1	ug/L
SW8260B	74-95-3	Dibromomethane	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	UL	0.25	1	ug/L
SW8260B	75-71-8	Dichlorodifluoromethane	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	UL	0.25	1	ug/L
SW8260B	100-41-4	Ethylbenzene	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	UL	0.25	1	ug/L
SW8260B	87-68-3	Hexachlorobutadiene	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	UL	0.25	1	ug/L
SW8260B	98-82-8	Isopropylbenzene	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	UL	0.25	1	ug/L
SW8260B	XYLMP	M,P-XYLENE (SUM OF ISOMERS)	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L
SW8260B	75-09-2	Methylene chloride	0.25	U	0.25	5	ug/L	0.25	U	0.25	5	ug/L	0.25	UL	0.25	5	ug/L
SW8260B	91-20-3	Naphthalene	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	UL	0.2	1	ug/L
SW8260B	104-51-8	n-Butylbenzene	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	UL	0.25	1	ug/L
SW8260B	103-65-1	n-Propylbenzene	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	UL	0.125	1	ug/L
SW8260B	95-47-6	o-Xylene	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	UL	0.25	1	ug/L
SW8260B	99-87-6	p-Isopropyltoluene	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	UL	0.25	1	ug/L
SW8260B	135-98-8	sec-Butylbenzene	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	UL	0.25	1	ug/L
SW8260B	100-42-5	Styrene	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	UL	0.125	1	ug/L
SW8260B	98-06-6	tert-Butylbenzene	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	UL	0.25	1	ug/L
SW8260B	127-18-4	Tetrachloroethene	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	UL	0.25	1	ug/L
SW8260B	108-88-3	Toluene	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	UL	0.25	1	ug/L
SW8260B	156-60-5	trans-1,2-Dichloroethene	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	UL	0.25	1	ug/L
SW8260B	10061-02-6	trans-1,3-Dichloropropene	< 0.5	U	0.5	1	ug/L	< 0.5	U	0.5	1	ug/L	< 0.5	UL	0.5	1	ug/L
SW8260B	79-01-6	Trichloroethene	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	UL	0.25	1	ug/L
SW8260B	75-69-4	Trichlorofluoromethane	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	UL	0.25	1	ug/L
SW8260B	108-05-4	Vinyl acetate	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	UL	2.5	10	ug/L
SW8260B	75-01-4	Vinyl chloride	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	UL	0.25	1	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

U = Not Detected. The asscociated number indicates the approximate sample concentratior
B = Not detected substantially above the level reported in laboratory or field blanks
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower
L = Analyte present. Reported value may be biased low. Actual value is expected to be highe
UJ = Not detected. Quantitation limit may be inaccurate or imprecise
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

Table 3
November 2011 Screening Levels for Groundwater VOC Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 1

						Location ID	40MW6					40MW6					40MW6					40MW6					40MW6					40MW7					40MW7					40MW7					40MW7				
						Sample ID	40MW6GW112111					40MW6GW030712					40DUPGW061212					40MW6GW061212					40MW6GW92512					40MW7GW112011					40MW7GW030612					40MW7GW601212					40MW7GW92512				
						Sample Date	11/21/2011					3/7/2012					6/12/2012					6/12/2012					9/25/2012					11/20/2011					3/6/2012					6/12/2012					9/25/2012				
						Sample Type	N					N					FD					N					N					N					N					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8260B	630-20-6	1,1,1,2-Tetrachloroethane	0.5	37		ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	71-55-6	1,1,1-Trichloroethane		750	200	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	79-34-5	1,1,2,2-Tetrachloroethane	0.066	28		ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L
SW8260B	79-00-5	1,1,2-Trichloroethane	0.24	0.041	5	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L
SW8260B	75-34-3	1,1-Dichloroethane	2.4	290		ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	75-35-4	1,1-Dichloroethene		26	7	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW8260B	563-58-6	1,1-Dichloropropene				ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L
SW8260B	87-61-6	1,2,3-Trichlorobenzene		0.52		ug/L	0.15	U	0.15	1	ug/L	0.15	U	0.15	1	ug/L	0.15	U	0.15	1	ug/L	0.15	U	0.15	1	ug/L	0.15	U	0.15	1	ug/L	0.15	U	0.15	1	ug/L	0.15	U	0.15	1	ug/L	0.15	U	0.15	1	ug/L	0.15	U	0.15	1	ug/L
SW8260B	96-18-4	1,2,3-Trichloropropane	0.00065	0.062		ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW8260B	120-82-1	1,2,4-Trichlorobenzene	0.99	0.39	70	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L
SW8260B	95-63-6	1,2,4-Trimethylbenzene		1.5		ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	96-12-8	1,2-Dibromo-3-chloropropane	0.00032	0.036	0.2	ug/L	**< 1**	U	1	5	ug/L	**< 1**	U	1	5	ug/L	**< 1**	U	1	5	ug/L	**< 1**	U	1	5	ug/L	**< 1**	U	1	5	ug/L	**< 1**	U	1	5	ug/L	**< 1**	U	1	5	ug/L	**< 1**	U	1	5	ug/L	**< 1**	U	1	5	ug/L
SW8260B	106-93-4	1,2-Dibromoethane	0.0065	1.6	0.05	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L
SW8260B	95-50-1	1,2-Dichlorobenzene		28	600	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	107-06-2	1,2-Dichloroethane	0.15	1.3	5	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L
SW8260B	78-87-5	1,2-Dichloropropane	0.38	0.83	5	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L
SW8260B	108-67-8	1,3,5-Trimethylbenzene		8.7		ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	541-73-1	1,3-Dichlorobenzene				ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L
SW8260B	142-28-9	1,3-Dichloropropane		29		ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L
SW8260B	106-46-7	1,4-Dichlorobenzene	0.42	47	75	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	594-20-7	2,2-Dichloropropane				ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L
SW8260B	78-93-3	2-Butanone		490		ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L
SW8260B	110-75-8	2-Chloroethyl vinyl ether				ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L
SW8260B	95-49-8	2-Chlorotoluene		18		ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	591-78-6	2-Hexanone		3.4		ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L
SW8260B	106-43-4	4-Chlorotoluene		19		ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	108-10-1	4-Methyl-2-pentanone		100		ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	UJ	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L
SW8260B	67-64-1	Acetone		1200		ug/L	2.5	U	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	4.38	L	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L
SW8260B	71-43-2	Benzene	0.39	2.9	5	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	108-86-1	Bromobenzene		5.4		ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	74-97-5	Bromochloromethane		8.3		ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L	0.2	U	0.2	1	ug/L
SW8260B	75-27-4	Bromodichloromethane	0.12	29	80	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L
SW8260B	75-25-2	Bromoform	7.9	29	80	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW8260B	74-83-9	Bromomethane		0.7		ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW8260B	75-15-0	Carbon disulfide		72		ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW8260B	56-23-5	Carbon tetrachloride	0.39	4	5	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	108-90-7	Chlorobenzene		7.2	100	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	124-48-1	Chlorodibromomethane	0.15	29	80	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L
SW8260B	75-00-3	Chloroethane		2100		ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW8260B	67-66-3	Chloroform	0.19	8.4	80	ug/L	**2.58**		0.125	1	ug/L	**0.277**	J	0.125	1	ug/L	**2.73**		0.125	1	ug/L	**2.71**		0.125	1	ug/L	**2.72**		0.125	1	ug/L	**1.8**		0.125	1	ug/L	**1.94**		0.125	1	ug/L	**1.99**		0.125	1	ug/L	**1.73**	B	0.125	1	ug/L
SW8260B	74-87-3	Chloromethane		19		ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW8260B	156-59-2	cis-1,2-Dichloroethene		2.8	70	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	10061-01-5	cis-1,3-Dichloropropene				ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L
SW8260B	74-95-3	Dibromomethane		0.79		ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	75-71-8	Dichlorodifluoromethane		19		ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	100-41-4	Ethylbenzene	1.3	67	700	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	87-68-3	Hexachlorobutadiene	0.26	0.47		ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	98-82-8	Isopropylbenzene		39		ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	XYLMP	M,P-XYLENE (SUM OF ISOMERS)		19		ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW8260B	75-09-2	Methylene chloride	4.7	64	5	ug/L	0.25	U	0.25	5	ug/L	0.25	U	0.25	5	ug/L	0.25	U	0.25	5	ug/L	0.25	U	0.25	5	ug/L	0.25	U	0.25	5	ug/L	0.25	U	0.25	5	ug/L	0.25	U	0.25	5	ug/L	0.25	U	0.25	5	ug/L	0.25	U	0.25	5	ug/L
SW8260B	91-20-3	Naphthalene	0.14	0.61		ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L	**< 0.2**	U	0.2	1	ug/L
SW8260B	104-51-8	n-Butylbenzene		78		ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	103-65-1	n-Propylbenzene		53		ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	95-47-6	o-Xylene		19		ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	99-87-6	p-Isopropyltoluene				ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L
SW8260B	135-98-8	sec-Butylbenzene				ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L
SW8260B	100-42-5	Styrene		110	100	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L	0.125	U	0.125	1	ug/L
SW8260B	98-06-6	tert-Butylbenzene				ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L	< 0.25	U	0.25	1	ug/L
SW8260B	127-18-4	Tetrachloroethene	0.072	8.4	5	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L
SW8260B	108-88-3	Toluene		86	1000	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	156-60-5	trans-1,2-Dichloroethene		8.6	100	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	10061-02-6	trans-1,3-Dichloropropene				ug/L	< 0.5	U	0.5	1	ug/L	< 0.5	U	0.5	1	ug/L	< 0.5	U	0.5	1	ug/L	< 0.5	U	0.5	1	ug/L	< 0.5	U	0.5	1	ug/L	< 0.5	U	0.5	1	ug/L	< 0.5	U	0.5	1	ug/L	< 0.5	U	0.5	1	ug/L	< 0.5	U	0.5	1	ug/L
SW8260B	79-01-6	Trichloroethene	0.44	0.26	5	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	75-69-4	Trichlorofluoromethane		110		ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L	0.25	U	0.25	1	ug/L
SW8260B	108-05-4	Vinyl acetate		41		ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	UJ	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L
SW8260B	75-01-4	Vinyl chloride	0.015	3.6	2	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L	**< 0.25**	U	0.25	1	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the Nov

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

U = Not Detected. The asscociated number indicates the approximate sample concentratior
B = Not detected substantially above the level reported in laboratory or field blanks
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower
L = Analyte present. Reported value may be biased low. Actual value is expected to be highe
UJ = Not detected. Quantitation limit may be inaccurate or imprecise
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

Table 4
November 2011 Screening Levels for Groundwater Metals Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 1

							Location ID	40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01					40MW5					40MW5					40MW5				
							Sample ID	40LFMW01GW112111					40DUPGW030612					40LFMW01GW030612					LFMW01GW061212					LFMW01GW92612					40DUPGW112011					40MW5GW112011					40MW5GW030712				
							Sample Date	11/21/2011					3/6/2012					3/6/2012					6/12/2012					9/26/2012					11/20/2011					11/20/2011					3/7/2012				
							Sample Type	N					FD					N					N					N					FD					N					N				
Method	CAS	Chemical	fraction	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6010B	7429-90-5	Aluminum	T		1600		ug/L	***17900***		50	100	ug/L	112		50	100	ug/L	123		50	100	ug/L	74.8	J	50	100	ug/L	**9150**		50	100	ug/L	1540		50	100	ug/L	1890		50	100	ug/L	221		50	100	ug/L
SW6010B	7429-90-5	Aluminum	D		1600		ug/L	50	U	50	100	ug/L	NS					NS					50	U	50	100	ug/L	92.9	J	50	100	ug/L	50	U	50	100	ug/L	50	U	50	100	ug/L	NS				
SW6010B	7439-89-6	Iron, Ferrous	T		1100		ug/L	**21800**	L	50	100	ug/L	87.5	J	50	100	ug/L	93	J	50	100	ug/L	120		50	100	ug/L	**8950**		50	100	ug/L	**1580**	L	50	100	ug/L	**2040**	L	50	100	ug/L	156		50	100	ug/L
SW6010B	7439-89-6	Iron, Ferrous	D		1100		ug/L	102		50	100	ug/L	NS					NS					50	U	50	100	ug/L	74.1	J	50	100	ug/L	82	J	50	100	ug/L	74.1	J	50	100	ug/L	NS				
SW6010B	7439-95-4	Magnesium	T				ug/L	74800		250	500	ug/L	27800		250	500	ug/L	28100		250	500	ug/L	33800		2500	5000	ug/L	51100		250	500	ug/L	31300		250	500	ug/L	32500		250	500	ug/L	33500		250	500	ug/L
SW6010B	7439-95-4	Magnesium	D				ug/L	33100		250	500	ug/L	NS					NS					32700		2500	5000	ug/L	35400		250	500	ug/L	29600		250	500	ug/L	29800		250	500	ug/L	NS				
SW6010B	7440-09-7	Potassium	T				ug/L	5920		500	1000	ug/L	943	J	500	1000	ug/L	885	J	500	1000	ug/L	1740		500	1000	ug/L	3700		500	1000	ug/L	1370		500	1000	ug/L	1370		500	1000	ug/L	1160		500	1000	ug/L
SW6010B	7440-09-7	Potassium	D				ug/L	1620		500	1000	ug/L	NS					NS					1630		500	1000	ug/L	1690		500	1000	ug/L	1060		500	1000	ug/L	1080		500	1000	ug/L	NS				
SW6010B	7440-23-5	Sodium	T				ug/L	8230		250	500	ug/L	7860		250	500	ug/L	7690		250	500	ug/L	8450		250	500	ug/L	6640		250	500	ug/L	5480		250	500	ug/L	5220		250	500	ug/L	4790		250	500	ug/L
SW6010B	7440-23-5	Sodium	D				ug/L	8480		250	500	ug/L	NS					NS					8120		250	500	ug/L	7100		250	500	ug/L	5330		250	500	ug/L	5350		250	500	ug/L	NS				
SW6010B	7440-41-7	Beryllium	T		1.6	4.0	ug/L	1.37	J	1	2	ug/L	1	U	1	2	ug/L	1	U	1	2	ug/L	1	U	1	2	ug/L	1	U	1	2	ug/L	1	UJ	1	2	ug/L	1	UJ	1	2	ug/L	1	U	1	2	ug/L
SW6010B	7440-41-7	Beryllium	D		1.6	4.0	ug/L	1	UJ	1	2	ug/L	NS					NS					1	U	1	2	ug/L	1	U	1	2	ug/L	1	UJ	1	2	ug/L	1	UJ	1	2	ug/L	NS				
SW6010B	7440-62-2	Vanadium	T		7.8		ug/L	**32.5**		5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	**18.1**		5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L
SW6010B	7440-62-2	Vanadium	D		7.8		ug/L	5	U	5	10	ug/L	NS					NS					5	U	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	NS				
SW6010B	7440-66-6	Zinc	T		470		ug/L	126	B	10	20	ug/L	10	U	10	20	ug/L	10	U	10	20	ug/L	10	U	10	20	ug/L	52.6		10	20	ug/L	10	U	10	20	ug/L	10	U	10	20	ug/L	10	U	10	20	ug/L
SW6010B	7440-66-6	Zinc	D		470		ug/L	10	U	10	20	ug/L	NS					NS					10	U	10	20	ug/L	10	U	10	20	ug/L	10	U	10	20	ug/L	10	U	10	20	ug/L	NS				
SW6010B	7440-70-2	Calcium	T				ug/L	142000		100	200	ug/L	71300	J	100	200	ug/L	71400	J	100	200	ug/L	82800		1000	2000	ug/L	105000		100	200	ug/L	84800		100	200	ug/L	87200		100	200	ug/L	93400	J	100	200	ug/L
SW6010B	7440-70-2	Calcium	D				ug/L	81500		100	200	ug/L	NS					NS					82000		1000	2000	ug/L	85700		100	200	ug/L	81700		100	200	ug/L	82800		100	200	ug/L	NS				
SW6020	7439-92-1	Lead	T			15	ug/L	11		1	2	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L	5.46		0.5	1	ug/L	1	U	1	2	ug/L	1	U	1	2	ug/L	0.5	U	0.5	1	ug/L
SW6020	7439-92-1	Lead	D			15	ug/L	< 1	U	1	2	ug/L	NS					NS					0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	1	U	1	2	ug/L	0.5	U	0.5	1.0	ug/L	NS				
SW6020	7439-96-5	Manganese	T		32		ug/L	**125**		2	4	ug/L	1.25	J	1	2	ug/L	1.52	J	1	2	ug/L	2.18	L	1	2	ug/L	**52.6**		1	2	ug/L	7.67	B	2	4	ug/L	15.2	B	2	4	ug/L	1.11	J	1	2	ug/L
SW6020	7439-96-5	Manganese	D		32		ug/L	3.95	B	2	4	ug/L	NS					NS					1	UL	1	2	ug/L	1	U	1	2	ug/L	2	U	2	4	ug/L	1	U	1	2	ug/L	NS				
SW6020	7440-02-0	Nickel	T		30		ug/L	19.5		4	8	ug/L	4.21	K	2	4	ug/L	3.22	K	2	4	ug/L	4.95		2	4	ug/L	17.7		2	4	ug/L	4	U	4	8	ug/L	4.53	J	4	8	ug/L	4.7	K	2	4	ug/L
SW6020	7440-02-0	Nickel	D		30		ug/L	4	U	4	8	ug/L	NS					NS					4.81		2	4	ug/L	8.44		2	4	ug/L	4	U	4	8	ug/L	3.83	J	2	4	ug/L	NS				
SW6020	7440-22-4	Silver	T		7.1		ug/L	1	U	1	2	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	1	U	1	2	ug/L	1	U	1	2	ug/L	0.5	U	0.5	1	ug/L
SW6020	7440-22-4	Silver	D		7.1		ug/L	1	U	1	2	ug/L	NS					NS					0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	1	U	1	2	ug/L	0.5	U	0.5	1.0	ug/L	NS				
SW6020	7440-28-0	Thallium	T		0.016	2.0	ug/L	**< 0.2**	UL	0.2	0.4	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**0.123**	J	0.1	0.2	ug/L	**< 0.2**	UL	0.2	0.4	ug/L	**< 0.2**	UL	0.2	0.4	ug/L	**< 0.1**	U	0.1	0.2	ug/L
SW6020	7440-28-0	Thallium	D		0.016	2.0	ug/L	**< 0.2**	UL	0.2	0.4	ug/L	NS					NS					**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.2**	UL	0.2	0.4	ug/L	**< 0.1**	U	0.1	0.2	ug/L	NS				
SW6020	7440-36-0	Antimony	T		0.60	6.0	ug/L	**< 1**	U	1	2	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	**< 1**	U	1	2	ug/L	**< 1**	U	1	2	ug/L	0.5	U	0.5	1	ug/L
SW6020	7440-36-0	Antimony	D		0.60	6.0	ug/L	**< 1**	U	1	2	ug/L	NS					NS					0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	**< 1**	U	1	2	ug/L	0.5	U	0.5	1.0	ug/L	NS				
SW6020	7440-38-2	Arsenic	T	0.045	0.47	10	ug/L	**2.68**		1	2	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**1.43**		0.5	1	ug/L	**< 1**	U	1	2	ug/L	**< 1**	U	1	2	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-38-2	Arsenic	D	0.045	0.47	10	ug/L	**< 1**	U	1	2	ug/L	NS					NS					**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 1**	U	1	2	ug/L	**< 0.5**	U	0.5	1.0	ug/L	NS				
SW6020	7440-39-3	Barium	T		290	2000	ug/L	133		3	6	ug/L	94.7		1.5	3	ug/L	94.1		1.5	3	ug/L	65.7	L	1.5	3	ug/L	125		1.5	3	ug/L	59.9		3	6	ug/L	57.1		3	6	ug/L	57.2		1.5	3	ug/L
SW6020	7440-39-3	Barium	D		290	2000	ug/L	90.2		3	6	ug/L	NS					NS					63.4		1.5	3	ug/L	92.6		1.5	3	ug/L	53.2		3	6	ug/L	55.4	J	1.5	3.0	ug/L	NS				
SW6020	7440-43-9	Cadmium	T		0.69	5.0	ug/L	0.6	UL	0.6	1.2	ug/L	0.3	U	0.3	0.6	ug/L	0.3	U	0.3	0.6	ug/L	0.3	U	0.3	0.6	ug/L	0.3	U	0.3	0.6	ug/L	0.6	UL	0.6	1.2	ug/L	0.6	UL	0.6	1.2	ug/L	0.3	U	0.3	0.6	ug/L
SW6020	7440-43-9	Cadmium	D		0.69	5.0	ug/L	0.6	UL	0.6	1.2	ug/L	NS					NS					0.3	U	0.3	0.6	ug/L	0.3	U	0.3	0.6	ug/L	0.6	UL	0.6	1.2	ug/L	0.3	U	0.3	0.6	ug/L	NS				
SW6020	7440-47-3	Chromium	T			100	ug/L	19.7		2	4	ug/L	3.28		1	2	ug/L	3.74		1	2	ug/L	3.14	L	1	2	ug/L	12.5		1	2	ug/L	4.22		2	4	ug/L	3.89	K	2	4	ug/L	4.83		1	2	ug/L
SW6020	7440-47-3	Chromium	D			100	ug/L	2.91	K	2	4	ug/L	NS					NS					2.72		1	2	ug/L	2.8		1	2	ug/L	2.99	K	2	4	ug/L	1.76	J	1	2	ug/L	NS				
SW6020	7440-48-4	Cobalt	T		0.47		ug/L	**5.54**		1	2	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**3.14**		0.5	1	ug/L	**< 1**	U	1	2	ug/L	**< 1**	U	1	2	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-48-4	Cobalt	D		0.47		ug/L	**< 1**	U	1	2	ug/L	NS					NS					**< 0.5**	U	0.5	1	ug/L	**0.903**	J	0.5	1	ug/L	**< 1**	U	1	2	ug/L	**< 0.5**	U	0.5	1.0	ug/L	NS				
SW6020	7440-50-8	Copper	T		62	1300	ug/L	13.9		2	4	ug/L	1	U	1	2	ug/L	1	U	1	2	ug/L	1.15	J	1	2	ug/L	8.87		1	2	ug/L	2	U	2	4	ug/L	2	U	2	4	ug/L	1	U	1	2	ug/L
SW6020	7440-50-8	Copper	D		62	1300	ug/L	2	U	2	4	ug/L	NS					NS					1	U	1	2	ug/L	1	U	1	2	ug/L	2	U	2	4	ug/L	1	U	1	2	ug/L	NS				
SW6020	7782-49-2	Selenium	T		7.8	50	ug/L	1	U	1	2	ug/L	0.5	UL	0.5	1	ug/L	0.5	UL	0.5	1	ug/L	0.726	K	0.5	1	ug/L	1.18		0.5	1	ug/L	1.06	J	1	2	ug/L	1.31	K	1	2	ug/L	0.775	L	0.5	1	ug/L
SW6020	7782-49-2	Selenium	D		7.8	50	ug/L	1	U	1	2	ug/L	NS					NS					0.7	J	0.5	1	ug/L	1.06		0.5	1	ug/L	1.11	J	1	2	ug/L	1.19	K	0.5	1.0	ug/L	NS				
SW7470A	7439-97-6	Mercury	T		0.063	2.0	ug/L	**0.157**	B	0.1	0.2	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	UL	0.1	0.2	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	U	0.1	0.2	ug/L
SW7470A	7439-97-6	Mercury	D		0.063	2.0	ug/L	**0.126**	B	0.1	0.2	ug/L	NS					NS					**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	UL	0.1	0.2	ug/L	**0.123**	B	0.1	0.2	ug/L	**< 0.1**	U	0.1	0.2	ug/L	NS				

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.
NS=Not Sampled because Turbidty was stable at less than or equl to 10 NTUs
Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

Table 4

November 2011 Screening Levels for Groundwater Metals Data - Residential Tapwater Pathway

SWMU 40 (RAAP-009)

Radford Army Ammunition Plant

Longterm Monitoring Data Year 1

							Location ID	40MW5					40MW5					40MW5					40MW6					40MW6					40MW6					40MW6					40MW6				
							Sample ID	40MW5GW061212					40DUPGW92512					40MW5GW92512					40MW6GW112111					40MW6GW030712					40DUPGW061212					40MW6GW061212					40MW6GW92512				
							Sample Date	6/12/2012					9/25/2012					9/25/2012					11/21/2011					3/7/2012					6/12/2012					6/12/2012					9/25/2012				
							Sample Type	N					FD					N					N					N					FD					N					N				
Method	CAS	Chemical	fraction	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6010B	7429-90-5	Aluminum	T		1600		ug/L	911		50	100	ug/L	140	J	50	100	ug/L	266	J	50	100	ug/L	242		50	100	ug/L	210		50	100	ug/L	209		50	100	ug/L	230		50	100	ug/L	467		50	100	ug/L
SW6010B	7429-90-5	Aluminum	D		1600		ug/L	50	U	50	100	ug/L	50	U	50	100	ug/L	50	U	50	100	ug/L	NS					NS					NS					NS					50	U	50	100	ug/L
SW6010B	7439-89-6	Iron, Ferrous	T		1100		ug/L	950		50	100	ug/L	123		50	100	ug/L	217		50	100	ug/L	323	L	50	100	ug/L	155		50	100	ug/L	238		50	100	ug/L	296		50	100	ug/L	393		50	100	ug/L
SW6010B	7439-89-6	Iron, Ferrous	D		1100		ug/L	50	U	50	100	ug/L	50	U	50	100	ug/L	50	U	50	100	ug/L	NS					NS					NS					NS					50	U	50	100	ug/L
SW6010B	7439-95-4	Magnesium	T				ug/L	34700		2500	5000	ug/L	32500		250	500	ug/L	32000		250	500	ug/L	32000		250	500	ug/L	36100		250	500	ug/L	33100		2500	5000	ug/L	34000		2500	5000	ug/L	33700		250	500	ug/L
SW6010B	7439-95-4	Magnesium	D				ug/L	34600		2500	5000	ug/L	32100		250	500	ug/L	32300		250	500	ug/L	NS					NS					NS					NS					33500		250	500	ug/L
SW6010B	7440-09-7	Potassium	T				ug/L	1270		500	1000	ug/L	1260		500	1000	ug/L	1300		500	1000	ug/L	1000		500	1000	ug/L	1020		500	1000	ug/L	1050		500	1000	ug/L	1140		500	1000	ug/L	1220		500	1000	ug/L
SW6010B	7440-09-7	Potassium	D				ug/L	1240		500	1000	ug/L	1230		500	1000	ug/L	1230		500	1000	ug/L	NS					NS					NS					NS					1140		500	1000	ug/L
SW6010B	7440-23-5	Sodium	T				ug/L	5280		250	500	ug/L	5270		250	500	ug/L	5730		250	500	ug/L	5100		250	500	ug/L	4400		250	500	ug/L	4960		250	500	ug/L	5180		250	500	ug/L	5240		250	500	ug/L
SW6010B	7440-23-5	Sodium	D				ug/L	5170		250	500	ug/L	5420		250	500	ug/L	5430		250	500	ug/L	NS					NS					NS					NS					5180		250	500	ug/L
SW6010B	7440-41-7	Beryllium	T		1.6	4.0	ug/L	1	U	1	2	ug/L	1	U	1	2	ug/L	1	U	1	2	ug/L	1	UJ	1	2	ug/L	1	U	1	2	ug/L	1	U	1	2	ug/L	1	U	1	2	ug/L	1	U	1	2	ug/L
SW6010B	7440-41-7	Beryllium	D		1.6	4.0	ug/L	1	U	1	2	ug/L	1	U	1	2	ug/L	1	U	1	2	ug/L	NS					NS					NS					NS					1	U	1	2	ug/L
SW6010B	7440-62-2	Vanadium	T		7.8		ug/L	**8.74**	J	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	6.42	J	5	10	ug/L	**8.09**	J	5	10	ug/L	5	U	5	10	ug/L
SW6010B	7440-62-2	Vanadium	D		7.8		ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	NS					NS					NS					NS					5	U	5	10	ug/L
SW6010B	7440-66-6	Zinc	T		470		ug/L	10	U	10	20	ug/L	10	U	10	20	ug/L	10	U	10	20	ug/L	10	U	10	20	ug/L	10	U	10	20	ug/L	10	U	10	20	ug/L	10	U	10	20	ug/L	10	U	10	20	ug/L
SW6010B	7440-66-6	Zinc	D		470		ug/L	10	U	10	20	ug/L	10	U	10	20	ug/L	10	U	10	20	ug/L	NS					NS					NS					NS					10	U	10	20	ug/L
SW6010B	7440-70-2	Calcium	T				ug/L	89900		1000	2000	ug/L	84900		100	200	ug/L	86900		100	200	ug/L	84500		100	200	ug/L	98400	J	100	200	ug/L	85000		1000	2000	ug/L	85300		1000	2000	ug/L	88200		100	200	ug/L
SW6010B	7440-70-2	Calcium	D				ug/L	88400		1000	2000	ug/L	86100		100	200	ug/L	89200		100	200	ug/L	NS					NS					NS					NS					89400		100	200	ug/L
SW6020	7439-92-1	Lead	T			15	ug/L	0.5	UL	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	1	U	1	2	ug/L	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L	0.525	L	0.5	1	ug/L	0.733	J	0.5	1	ug/L
SW6020	7439-92-1	Lead	D			15	ug/L	0.5	UL	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	NS					NS					NS					NS					0.5	U	0.5	1	ug/L
SW6020	7439-96-5	Manganese	T		32		ug/L	4.84	L	1	2	ug/L	4	B	1	2	ug/L	2.13	B	1	2	ug/L	2	U	2	4	ug/L	1.09	J	1	2	ug/L	1.82	J	1	2	ug/L	2.93	J	1	2	ug/L	2.41	B	1	2	ug/L
SW6020	7439-96-5	Manganese	D		32		ug/L	1	UL	1	2	ug/L	1	U	1	2	ug/L	1	U	1	2	ug/L	NS					NS					NS					NS					1.07	B	1	2	ug/L
SW6020	7440-02-0	Nickel	T		30		ug/L	5.52		2	4	ug/L	8.39		2	4	ug/L	7.3		2	4	ug/L	4	U	4	8	ug/L	2.92	K	2	4	ug/L	4.94		2	4	ug/L	4.89		2	4	ug/L	7.88		2	4	ug/L
SW6020	7440-02-0	Nickel	D		30		ug/L	4.89		2	4	ug/L	7.96		2	4	ug/L	8.21		2	4	ug/L	NS					NS					NS					NS					8.14		2	4	ug/L
SW6020	7440-22-4	Silver	T		7.1		ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	1	U	1	2	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW6020	7440-22-4	Silver	D		7.1		ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	NS					NS					NS					NS					0.5	U	0.5	1	ug/L
SW6020	7440-28-0	Thallium	T		0.016	2.0	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.2**	UL	0.2	0.4	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	U	0.1	0.2	ug/L
SW6020	7440-28-0	Thallium	D		0.016	2.0	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	U	0.1	0.2	ug/L	NS					NS					NS					NS					**< 0.1**	U	0.1	0.2	ug/L
SW6020	7440-36-0	Antimony	T		0.60	6.0	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	**< 1**	U	1	2	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW6020	7440-36-0	Antimony	D		0.60	6.0	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	NS					NS					NS					NS					0.5	U	0.5	1	ug/L
SW6020	7440-38-2	Arsenic	T	0.045	0.47	10	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 1**	U	1	2	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-38-2	Arsenic	D	0.045	0.47	10	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	NS					NS					NS					NS					**< 0.5**	U	0.5	1	ug/L
SW6020	7440-39-3	Barium	T		290	2000	ug/L	56.9	L	1.5	3	ug/L	58.1		1.5	3	ug/L	56.2		1.5	3	ug/L	49.9		3	6	ug/L	53.8		1.5	3	ug/L	48.8	L	1.5	3	ug/L	52.2	L	1.5	3	ug/L	51.4		1.5	3	ug/L
SW6020	7440-39-3	Barium	D		290	2000	ug/L	54.3	L	1.5	3	ug/L	56.3		1.5	3	ug/L	58.7		1.5	3	ug/L	NS					NS					NS					NS					51.5		1.5	3	ug/L
SW6020	7440-43-9	Cadmium	T		0.69	5.0	ug/L	0.3	U	0.3	0.6	ug/L	0.3	U	0.3	0.6	ug/L	0.3	U	0.3	0.6	ug/L	0.6	UL	0.6	1.2	ug/L	0.3	U	0.3	0.6	ug/L	0.3	U	0.3	0.6	ug/L	0.3	U	0.3	0.6	ug/L	0.3	U	0.3	0.6	ug/L
SW6020	7440-43-9	Cadmium	D		0.69	5.0	ug/L	0.3	U	0.3	0.6	ug/L	0.3	U	0.3	0.6	ug/L	0.3	U	0.3	0.6	ug/L	NS					NS					NS					NS					0.3	U	0.3	0.6	ug/L
SW6020	7440-47-3	Chromium	T			100	ug/L	2.62	L	1	2	ug/L	2.6		1	2	ug/L	2.5		1	2	ug/L	3.92	K	2	4	ug/L	1.46	J	1	2	ug/L	1.43	L	1	2	ug/L	1.97	L	1	2	ug/L	2.86		1	2	ug/L
SW6020	7440-47-3	Chromium	D			100	ug/L	1.35	L	1	2	ug/L	2.3		1	2	ug/L	2.3		1	2	ug/L	NS					NS					NS					NS					2.59		1	2	ug/L
SW6020	7440-48-4	Cobalt	T		0.47		ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 1**	U	1	2	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-48-4	Cobalt	D		0.47		ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	NS					NS					NS					NS					**< 0.5**	U	0.5	1	ug/L
SW6020	7440-50-8	Copper	T		62	1300	ug/L	1.98	J	1	2	ug/L	1.43	J	1	2	ug/L	2.59		1	2	ug/L	2	U	2	4	ug/L	1.14	J	1	2	ug/L	1.14	J	1	2	ug/L	2.01	J	1	2	ug/L	1.05	J	1	2	ug/L
SW6020	7440-50-8	Copper	D		62	1300	ug/L	1	U	1	2	ug/L	1.18	J	1	2	ug/L	1.24	J	1	2	ug/L	NS					NS					NS					NS					1	U	1	2	ug/L
SW6020	7782-49-2	Selenium	T		7.8	50	ug/L	0.784	K	0.5	1	ug/L	1.02		0.5	1	ug/L	0.845	J	0.5	1	ug/L	1.28	J	1	2	ug/L	0.5	U	0.5	1	ug/L	0.697	J	0.5	1	ug/L	1.24	J	0.5	1	ug/L	0.943	J	0.5	1	ug/L
SW6020	7782-49-2	Selenium	D		7.8	50	ug/L	0.847	K	0.5	1	ug/L	1.17		0.5	1	ug/L	1.05		0.5	1	ug/L	NS					NS					NS					NS					1.11		0.5	1	ug/L
SW7470A	7439-97-6	Mercury	T		0.063	2.0	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	UL	0.1	0.2	ug/L	**< 0.1**	UL	0.1	0.2	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	UL	0.1	0.2	ug/L
SW7470A	7439-97-6	Mercury	D		0.063	2.0	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	UL	0.1	0.2	ug/L	**< 0.1**	UL	0.1	0.2	ug/L	NS					NS					NS					NS					**< 0.1**	UL	0.1	0.2	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.
NS=Not Sampled because Turbidty was stable at less than or equl to 10 NTUs
Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

Table 4
November 2011 Screening Levels for Groundwater Metals Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 1

							Location ID Sample ID Sample Date Sample Type	40MW7 40MW7GW112011 11/20/2011 N					40MW7 40MW7GW030612 3/6/2012 N					40MW7 40MW7GW601212 6/12/2012 N					40MW7 40MW7GW92512 9/25/2012 N				
Method	CAS	Chemical	fraction	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6010B	7429-90-5	Aluminum	T		1600		ug/L	8290		50	100	ug/L	344		50	100	ug/L	70.3	J	50	100	ug/L	**1730**		50	100	ug/L
SW6010B	7429-90-5	Aluminum	D		1600		ug/L	50	U	50	100	ug/L	NS					NS					50	U	50	100	ug/L
SW6010B	7439-89-6	Iron, Ferrous	T		1100		ug/L	**7950**	L	50	100	ug/L	263		50	100	ug/L	149		50	100	ug/L	**1620**		50	100	ug/L
SW6010B	7439-89-6	Iron, Ferrous	D		1100		ug/L	73.1	J	50	100	ug/L	NS					NS					50	U	50	100	ug/L
SW6010B	7439-95-4	Magnesium	T				ug/L	61900		250	500	ug/L	36100		250	500	ug/L	36400		2500	5000	ug/L	41100		250	500	ug/L
SW6010B	7439-95-4	Magnesium	D				ug/L	32500		250	500	ug/L	NS					NS					36100		250	500	ug/L
SW6010B	7440-09-7	Potassium	T				ug/L	4250		500	1000	ug/L	1720		500	1000	ug/L	1670		500	1000	ug/L	2130		500	1000	ug/L
SW6010B	7440-09-7	Potassium	D				ug/L	2300		500	1000	ug/L	NS					NS					1770		500	1000	ug/L
SW6010B	7440-23-5	Sodium	T				ug/L	66700		250	500	ug/L	8540		250	500	ug/L	4030		250	500	ug/L	3510		250	500	ug/L
SW6010B	7440-23-5	Sodium	D				ug/L	78300		250	500	ug/L	NS					NS					3360		250	500	ug/L
SW6010B	7440-41-7	Beryllium	T		1.6	4.0	ug/L	1	UJ	1	2	ug/L	1	U	1	2	ug/L	1	U	1	2	ug/L	1	U	1	2	ug/L
SW6010B	7440-41-7	Beryllium	D		1.6	4.0	ug/L	1	UJ	1	2	ug/L	NS					NS					1	U	1	2	ug/L
SW6010B	7440-62-2	Vanadium	T		7.8		ug/L	**9.26**	J	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L
SW6010B	7440-62-2	Vanadium	D		7.8		ug/L	5	U	5	10	ug/L	NS					NS					5	U	5	10	ug/L
SW6010B	7440-66-6	Zinc	T		470		ug/L	68.5		10	20	ug/L	10	U	10	20	ug/L	10	U	10	20	ug/L	10	U	10	20	ug/L
SW6010B	7440-66-6	Zinc	D		470		ug/L	10	U	10	20	ug/L	NS					NS					10	U	10	20	ug/L
SW6010B	7440-70-2	Calcium	T				ug/L	190000		100	200	ug/L	80600	J	100	200	ug/L	77800		1000	2000	ug/L	101000		100	200	ug/L
SW6010B	7440-70-2	Calcium	D				ug/L	70600		100	200	ug/L	NS					NS					77700		100	200	ug/L
SW6020	7439-92-1	Lead	T			15	ug/L	9.37		1	2	ug/L	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L	1.61		0.5	1	ug/L
SW6020	7439-92-1	Lead	D			15	ug/L	1	U	1	2	ug/L	NS					NS					0.5	U	0.5	1	ug/L
SW6020	7439-96-5	Manganese	T		32		ug/L	**181**		2	4	ug/L	10.8		1	2	ug/L	6.47	L	1	2	ug/L	26.5		1	2	ug/L
SW6020	7439-96-5	Manganese	D		32		ug/L	23.9	B	2	4	ug/L	NS					NS					3.77	B	1	2	ug/L
SW6020	7440-02-0	Nickel	T		30		ug/L	13.8		4	8	ug/L	5.54	K	2	4	ug/L	4.82		2	4	ug/L	10.4		2	4	ug/L
SW6020	7440-02-0	Nickel	D		30		ug/L	4	U	4	8	ug/L	NS					NS					7.06		2	4	ug/L
SW6020	7440-22-4	Silver	T		7.1		ug/L	1	U	1	2	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW6020	7440-22-4	Silver	D		7.1		ug/L	1	U	1	2	ug/L	NS					NS					0.5	U	0.5	1	ug/L
SW6020	7440-28-0	Thallium	T		0.016	2.0	ug/L	**< 0.2**	UL	0.2	0.4	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	U	0.1	0.2	ug/L
SW6020	7440-28-0	Thallium	D		0.016	2.0	ug/L	**< 0.2**	UL	0.2	0.4	ug/L	NS					NS					**< 0.1**	U	0.1	0.2	ug/L
SW6020	7440-36-0	Antimony	T		0.60	6.0	ug/L	**< 1**	U	1	2	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW6020	7440-36-0	Antimony	D		0.60	6.0	ug/L	**< 1**	U	1	2	ug/L	NS					NS					0.5	U	0.5	1	ug/L
SW6020	7440-38-2	Arsenic	T	0.045	0.47	10	ug/L	**2**	K	1	2	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**0.615**	J	0.5	1	ug/L
SW6020	7440-38-2	Arsenic	D	0.045	0.47	10	ug/L	**< 1**	U	1	2	ug/L	NS					NS					**< 0.5**	U	0.5	1	ug/L
SW6020	7440-39-3	Barium	T		290	2000	ug/L	252		3	6	ug/L	145		1.5	3	ug/L	146	L	1.5	3	ug/L	172		1.5	3	ug/L
SW6020	7440-39-3	Barium	D		290	2000	ug/L	75.8		3	6	ug/L	NS					NS					170		1.5	3	ug/L
SW6020	7440-43-9	Cadmium	T		0.69	5.0	ug/L	0.6	UL	0.6	1.2	ug/L	0.3	U	0.3	0.6	ug/L	0.3	U	0.3	0.6	ug/L	0.3	U	0.3	0.6	ug/L
SW6020	7440-43-9	Cadmium	D		0.69	5.0	ug/L	0.6	UL	0.6	1.2	ug/L	NS					NS					0.3	U	0.3	0.6	ug/L
SW6020	7440-47-3	Chromium	T			100	ug/L	10.2		2	4	ug/L	9.15		1	2	ug/L	2.13	L	1	2	ug/L	4.42		1	2	ug/L
SW6020	7440-47-3	Chromium	D			100	ug/L	4.04		2	4	ug/L	NS					NS					2.73		1	2	ug/L
SW6020	7440-48-4	Cobalt	T		0.47		ug/L	**3.04**		1	2	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**1.02**		0.5	1	ug/L
SW6020	7440-48-4	Cobalt	D		0.47		ug/L	**< 1**	U	1	2	ug/L	NS					NS					**0.825**	J	0.5	1	ug/L
SW6020	7440-50-8	Copper	T		62	1300	ug/L	5.01		2	4	ug/L	1.44	J	1	2	ug/L	1	U	1	2	ug/L	2.32		1	2	ug/L
SW6020	7440-50-8	Copper	D		62	1300	ug/L	2	U	2	4	ug/L	NS					NS					1	U	1	2	ug/L
SW6020	7782-49-2	Selenium	T		7.8	50	ug/L	1.86	K	1	2	ug/L	0.5	UL	0.5	1	ug/L	0.652	K	0.5	1	ug/L	0.848	J	0.5	1	ug/L
SW6020	7782-49-2	Selenium	D		7.8	50	ug/L	1.81	K	1	2	ug/L	NS					NS					0.913	J	0.5	1	ug/L
SW7470A	7439-97-6	Mercury	T		0.063	2.0	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	U	0.1	0.2	ug/L	**< 0.1**	UL	0.1	0.2	ug/L
SW7470A	7439-97-6	Mercury	D		0.063	2.0	ug/L	**< 0.1**	U	0.1	0.2	ug/L	NS					NS					**< 0.1**	UL	0.1	0.2	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.
NS=Not Sampled because Turbidty was stable at less than or equl to 10 NTUs
Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

Table 5
November 2011 Screening Levels for Groundwater Perchlorate Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 1

					Location ID	40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01				
					Sample ID	40LFMW01GW112111					40DUPGW030612					40LFMW01GW030612					LFMW01GW061212					LFMW01GW92612				
					Sample Date	11/21/2011					3/6/2012					3/6/2012					6/12/2012					9/26/2012				
					Sample Type	N					FD					N					N					N				
Method	CAS	Chemical	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6850	14797-73-0	PERCHLORATE	1.1	15	ug/L	**9.67**	J	0.1	0.2	ug/L	**8.93**		0.1	0.2	ug/L	**8.88**		0.1	0.2	ug/L	**4.81**		0.1	0.2	ug/L	**8.75**		0.1	0.2	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

U = Not Detected. The asscociated number indicates the approximate sample concentratior
B = Not detected substantially above the level reported in laboratory or field blanks
R = Unusable result. Analyte may or may not be present in the sample
J = Analyte present. Reported value may or may not be accurate or precise
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower
L = Analyte present. Reported value may be biased low. Actual value is expected to be highe
UJ = Not detected. Quantitation limit may be inaccurate or imprecise
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

Table 5
November 2011 Screening Levels for Groundwater Perchlorate Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 1

					Location ID	40MW5					40MW5					40MW5					40MW5					40MW5				
					Sample ID	40DUPGW112011					40MW5GW112011					40MW5GW030712					40MW5GW061212					40DUPGW92512				
					Sample Date	11/20/2011					11/20/2011					3/7/2012					6/12/2012					9/25/2012				
					Sample Type	FD					N					N					N					FD				
Method	CAS	Chemical	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6850	14797-73-0	PERCHLORATE	1.1	15	ug/L	**1.55**	J	0.1	0.2	ug/L	**1.55**	J	0.1	0.2	ug/L	0.931		0.1	0.2	ug/L	0.986		0.1	0.2	ug/L	**1.81**		0.1	0.2	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

U = Not Detected. The asscociated number indicates the approximate sample concentratior
B = Not detected substantially above the level reported in laboratory or field blanks
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower
L = Analyte present. Reported value may be biased low. Actual value is expected to be highe
UJ = Not detected. Quantitation limit may be inaccurate or imprecise
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

Table 5
November 2011 Screening Levels for Groundwater Perchlorate Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 1

					Location ID	40MW5					40MW6					40MW6					40MW6					40MW6				
					Sample ID	40MW5GW92512					40MW6GW112111					40MW6GW030712					40DUPGW061212					40MW6GW061212				
					Sample Date	9/25/2012					11/21/2011					3/7/2012					6/12/2012					6/12/2012				
					Sample Type	N					N					N					FD					N				
Method	CAS	Chemical	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6850	14797-73-0	PERCHLORATE	1.1	15	ug/L	**1.71**		0.1	0.2	ug/L	0.885	J	0.1	0.2	ug/L	0.526		0.1	0.2	ug/L	0.635		0.1	0.2	ug/L	0.647		0.1	0.2	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentratior
B = Not detected substantially above the level reported in laboratory or field blanks
R = Unusable result. Analyte may or may not be present in the sample
J = Analyte present. Reported value may or may not be accurate or precise
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower
L = Analyte present. Reported value may be biased low. Actual value is expected to be highei
UJ = Not detected. Quantitation limit may be inaccurate or imprecise
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported

Table 5
November 2011 Screening Levels for Groundwater Perchlorate Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 1

					Location ID	40MW6					40MW7					40MW7					40MW7					40MW7				
					Sample ID	40MW6GW92512					40MW7GW112011					40MW7GW030612					40MW7GW601212					40MW7GW92512				
					Sample Date	9/25/2012					11/20/2011					3/6/2012					6/12/2012					9/25/2012				
					Sample Type	N					N					N					N					N				
Method	CAS	Chemical	T-NCSL	MCL	Units	Result	Int Qual	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6850	14797-73-0	PERCHLORATE	1.1	15	ug/L	**1.25**		0.1	0.2	ug/L	**4.5**	J	0.1	0.2	ug/L	**4.18**		0.1	0.2	ug/L	**3.69**		0.1	0.2	ug/L	**3.66**		0.1	0.2	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentratior
B = Not detected substantially above the level reported in laboratory or field blanks
R = Unusable result. Analyte may or may not be present in the sample
J = Analyte present. Reported value may or may not be accurate or precise
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower
L = Analyte present. Reported value may be biased low. Actual value is expected to be highe
UJ = Not detected. Quantitation limit may be inaccurate or imprecise
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported

Table 6
November 2011 Screening Levels for Groundwater Pesticides Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 1

						Location ID	40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01				
						Sample ID	40LFMW01GW112111					40DUPGW030612					40LFMW01GW030612					LFMW01GW061212					LFMW01GW92612				
						Sample Date	11/21/2011					3/6/2012					3/6/2012					6/12/2012					9/26/2012				
						Sample Type	N					FD					N					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8081A	72-54-8	4,4'-DDD	0.28			ug/L	0.0119	UL	0.0119	0.0595	ug/L	0.01	U	0.01	0.05	ug/L	0.0253	J	0.0109	0.0543	ug/L	0.011	UL	0.011	0.0549	ug/L	0.0105	UL	0.0105	0.0526	ug/L
SW8081A	72-55-9	4,4'-DDE	0.2			ug/L	0.0119	UL	0.0119	0.0595	ug/L	0.01	U	0.01	0.05	ug/L	0.0109	U	0.0109	0.0543	ug/L	0.011	UL	0.011	0.0549	ug/L	0.0105	UL	0.0105	0.0526	ug/L
SW8081A	50-29-3	4,4'-DDT	0.2	0.78		ug/L	0.0119	UL	0.0119	0.0595	ug/L	0.01	U	0.01	0.05	ug/L	0.0109	U	0.0109	0.0543	ug/L	0.011	UL	0.011	0.0549	ug/L	0.0105	UL	0.0105	0.0526	ug/L
SW8081A	309-00-2	Aldrin	0.00021	0.0024		ug/L	**< 0.0119**	UL	0.0119	0.0595	ug/L	**< 0.01**	U	0.01	0.05	ug/L	**< 0.0109**	U	0.0109	0.0543	ug/L	**< 0.011**	UL	0.011	0.0549	ug/L	**< 0.0105**	UL	0.0105	0.0526	ug/L
SW8081A	5103-71-9	alpha Chlordane				ug/L	< 0.0119	UL	0.0119	0.0595	ug/L	< 0.01	U	0.01	0.05	ug/L	< 0.0109	U	0.0109	0.0543	ug/L	< 0.011	UL	0.011	0.0549	ug/L	< 0.0105	UL	0.0105	0.0526	ug/L
SW8081A	319-84-6	alpha-BHC	0.0062	7.3		ug/L	**< 0.0119**	UL	0.0119	0.0595	ug/L	**< 0.01**	U	0.01	0.05	ug/L	**< 0.0109**	U	0.0109	0.0543	ug/L	**< 0.011**	UL	0.011	0.0549	ug/L	**< 0.0105**	UL	0.0105	0.0526	ug/L
SW8081A	319-85-7	beta-BHC	0.022			ug/L	0.0119	UL	0.0119	0.0595	ug/L	0.01	U	0.01	0.05	ug/L	0.0109	U	0.0109	0.0543	ug/L	0.011	UL	0.011	0.0549	ug/L	0.0105	UL	0.0105	0.0526	ug/L
SW8081A	319-86-8	delta-BHC				ug/L	< 0.0119	UL	0.0119	0.0595	ug/L	< 0.01	U	0.01	0.05	ug/L	< 0.0109	U	0.0109	0.0543	ug/L	< 0.011	UL	0.011	0.0549	ug/L	< 0.0105	UL	0.0105	0.0526	ug/L
SW8081A	60-57-1	Dieldrin	0.0015	0.028		ug/L	**< 0.0119**	UL	0.0119	0.0595	ug/L	**< 0.01**	U	0.01	0.05	ug/L	**< 0.0109**	U	0.0109	0.0543	ug/L	**< 0.011**	UL	0.011	0.0549	ug/L	**< 0.0105**	UL	0.0105	0.0526	ug/L
SW8081A	959-98-8	Endosulfan I				ug/L	< 0.0119	UL	0.0119	0.0595	ug/L	< 0.01	U	0.01	0.05	ug/L	< 0.0109	U	0.0109	0.0543	ug/L	< 0.011	UL	0.011	0.0549	ug/L	< 0.0105	UL	0.0105	0.0526	ug/L
SW8081A	33213-65-9	Endosulfan II				ug/L	< 0.0119	UL	0.0119	0.0595	ug/L	< 0.01	U	0.01	0.05	ug/L	< 0.0109	U	0.0109	0.0543	ug/L	< 0.011	UL	0.011	0.0549	ug/L	< 0.0105	UL	0.0105	0.0526	ug/L
SW8081A	1031-07-8	Endosulfan sulfate				ug/L	< 0.0119	UL	0.0119	0.0595	ug/L	< 0.01	U	0.01	0.05	ug/L	< 0.0109	U	0.0109	0.0543	ug/L	< 0.011	UL	0.011	0.0549	ug/L	< 0.0105	UL	0.0105	0.0526	ug/L
SW8081A	72-20-8	Endrin		0.17	2	ug/L	0.0119	UL	0.0119	0.0595	ug/L	0.01	U	0.01	0.05	ug/L	0.0109	U	0.0109	0.0543	ug/L	0.011	UL	0.011	0.0549	ug/L	0.0105	UL	0.0105	0.0526	ug/L
SW8081A	7421-93-4	Endrin aldehyde				ug/L	< 0.0119	UL	0.0119	0.0595	ug/L	< 0.01	U	0.01	0.05	ug/L	< 0.0109	U	0.0109	0.0543	ug/L	< 0.011	UL	0.011	0.0549	ug/L	< 0.0105	UL	0.0105	0.0526	ug/L
SW8081A	53494-70-5	Endrin ketone				ug/L	< 0.0119	UL	0.0119	0.0595	ug/L	< 0.01	U	0.01	0.05	ug/L	< 0.0109	U	0.0109	0.0543	ug/L	< 0.011	UL	0.011	0.0549	ug/L	< 0.0105	UL	0.0105	0.0526	ug/L
SW8081A	5103-74-2	gamma Chlordane				ug/L	< 0.0119	UL	0.0119	0.0595	ug/L	< 0.01	U	0.01	0.05	ug/L	< 0.0109	U	0.0109	0.0543	ug/L	< 0.011	UL	0.011	0.0549	ug/L	< 0.0105	UL	0.0105	0.0526	ug/L
SW8081A	58-89-9	gamma-BHC (Lindane)	0.036	0.27	0.2	ug/L	0.0119	UL	0.0119	0.0595	ug/L	0.01	U	0.01	0.05	ug/L	0.0109	U	0.0109	0.0543	ug/L	0.011	UL	0.011	0.0549	ug/L	0.0105	UL	0.0105	0.0526	ug/L
SW8081A	76-44-8	Heptachlor	0.0018	0.092	0.4	ug/L	**< 0.0119**	UL	0.0119	0.0595	ug/L	**< 0.01**	U	0.01	0.05	ug/L	**< 0.0109**	U	0.0109	0.0543	ug/L	**< 0.011**	UL	0.011	0.0549	ug/L	**< 0.0105**	UL	0.0105	0.0526	ug/L
SW8081A	1024-57-3	Heptachlor epoxide	0.0033	0.0092	0.2	ug/L	**< 0.0119**	UL	0.0119	0.0595	ug/L	**< 0.01**	U	0.01	0.05	ug/L	**< 0.0109**	U	0.0109	0.0543	ug/L	**< 0.011**	UL	0.011	0.0549	ug/L	**< 0.0105**	UL	0.0105	0.0526	ug/L
SW8081A	72-43-5	Methoxychlor		2.7	40	ug/L	0.0119	UL	0.0119	0.0595	ug/L	0.01	U	0.01	0.05	ug/L	0.0109	U	0.0109	0.0543	ug/L	0.011	UL	0.011	0.0549	ug/L	0.0105	UL	0.0105	0.0526	ug/L
SW8081A	8001-35-2	Toxaphene	0.013		3	ug/L	**< 0.357**	UL	0.357	1.19	ug/L	**< 0.3**	U	0.3	1	ug/L	**< 0.326**	U	0.326	1.09	ug/L	**< 0.33**	UL	0.33	1.1	ug/L	**< 0.316**	UL	0.316	1.05	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 6
November 2011 Screening Levels for Groundwater Pesticides Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 1

						Location ID	40MW5					40MW5					40MW5					40MW5					40MW5				
						Sample ID	40DUPGW112011					40MW5GW112011					40MW5GW030712					40MW5GW061212					40DUPGW92512				
						Sample Date	11/20/2011					11/20/2011					3/7/2012					6/12/2012					9/25/2012				
						Sample Type	FD					N					N					N					FD				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8081A	72-54-8	4,4'-DDD	0.28			ug/L	0.0118	U	0.0118	0.0588	ug/L	0.0109	U	0.0109	0.0543	ug/L	0.0103	U	0.0103	0.0515	ug/L	0.011	UL	0.011	0.0549	ug/L	0.0102	U	0.0102	0.051	ug/L
SW8081A	72-55-9	4,4'-DDE	0.2			ug/L	0.0118	U	0.0118	0.0588	ug/L	0.0109	U	0.0109	0.0543	ug/L	0.0103	U	0.0103	0.0515	ug/L	0.011	UL	0.011	0.0549	ug/L	0.0102	U	0.0102	0.051	ug/L
SW8081A	50-29-3	4,4'-DDT	0.2	0.78		ug/L	0.0118	U	0.0118	0.0588	ug/L	0.0109	U	0.0109	0.0543	ug/L	0.0103	U	0.0103	0.0515	ug/L	0.011	UL	0.011	0.0549	ug/L	0.0102	U	0.0102	0.051	ug/L
SW8081A	309-00-2	Aldrin	0.00021	0.0024		ug/L	**< 0.0118**	U	0.0118	0.0588	ug/L	**< 0.0109**	U	0.0109	0.0543	ug/L	**< 0.0103**	U	0.0103	0.0515	ug/L	**< 0.011**	UL	0.011	0.0549	ug/L	**< 0.0102**	UJ	0.0102	0.051	ug/L
SW8081A	5103-71-9	alpha Chlordane				ug/L	< 0.0118	U	0.0118	0.0588	ug/L	< 0.0109	U	0.0109	0.0543	ug/L	< 0.0103	U	0.0103	0.0515	ug/L	< 0.011	UL	0.011	0.0549	ug/L	< 0.0102	U	0.0102	0.051	ug/L
SW8081A	319-84-6	alpha-BHC	0.0062	7.3		ug/L	**< 0.0118**	U	0.0118	0.0588	ug/L	**< 0.0109**	U	0.0109	0.0543	ug/L	**< 0.0103**	U	0.0103	0.0515	ug/L	**< 0.011**	UL	0.011	0.0549	ug/L	**< 0.0102**	U	0.0102	0.051	ug/L
SW8081A	319-85-7	beta-BHC	0.022			ug/L	0.0118	U	0.0118	0.0588	ug/L	0.0109	U	0.0109	0.0543	ug/L	0.0103	U	0.0103	0.0515	ug/L	0.011	UL	0.011	0.0549	ug/L	0.0102	U	0.0102	0.051	ug/L
SW8081A	319-86-8	delta-BHC				ug/L	< 0.0118	U	0.0118	0.0588	ug/L	< 0.0109	U	0.0109	0.0543	ug/L	< 0.0103	U	0.0103	0.0515	ug/L	< 0.011	UL	0.011	0.0549	ug/L	< 0.0102	U	0.0102	0.051	ug/L
SW8081A	60-57-1	Dieldrin	0.0015	0.028		ug/L	**< 0.0118**	U	0.0118	0.0588	ug/L	**< 0.0109**	U	0.0109	0.0543	ug/L	**< 0.0103**	U	0.0103	0.0515	ug/L	**< 0.011**	UL	0.011	0.0549	ug/L	**< 0.0102**	U	0.0102	0.051	ug/L
SW8081A	959-98-8	Endosulfan I				ug/L	< 0.0118	U	0.0118	0.0588	ug/L	< 0.0109	U	0.0109	0.0543	ug/L	< 0.0103	U	0.0103	0.0515	ug/L	< 0.011	UL	0.011	0.0549	ug/L	< 0.0102	U	0.0102	0.051	ug/L
SW8081A	33213-65-9	Endosulfan II				ug/L	< 0.0118	U	0.0118	0.0588	ug/L	< 0.0109	U	0.0109	0.0543	ug/L	< 0.0103	U	0.0103	0.0515	ug/L	< 0.011	UL	0.011	0.0549	ug/L	< 0.0102	U	0.0102	0.051	ug/L
SW8081A	1031-07-8	Endosulfan sulfate				ug/L	< 0.0118	U	0.0118	0.0588	ug/L	< 0.0109	U	0.0109	0.0543	ug/L	< 0.0103	U	0.0103	0.0515	ug/L	< 0.011	UL	0.011	0.0549	ug/L	< 0.0102	U	0.0102	0.051	ug/L
SW8081A	72-20-8	Endrin		0.17	2	ug/L	0.0118	U	0.0118	0.0588	ug/L	0.0109	U	0.0109	0.0543	ug/L	0.0103	U	0.0103	0.0515	ug/L	0.011	UL	0.011	0.0549	ug/L	0.0102	U	0.0102	0.051	ug/L
SW8081A	7421-93-4	Endrin aldehyde				ug/L	< 0.0118	U	0.0118	0.0588	ug/L	< 0.0109	U	0.0109	0.0543	ug/L	< 0.0103	U	0.0103	0.0515	ug/L	< 0.011	UL	0.011	0.0549	ug/L	< 0.0102	U	0.0102	0.051	ug/L
SW8081A	53494-70-5	Endrin ketone				ug/L	< 0.0118	U	0.0118	0.0588	ug/L	< 0.0109	U	0.0109	0.0543	ug/L	< 0.0103	U	0.0103	0.0515	ug/L	< 0.011	UL	0.011	0.0549	ug/L	< 0.0102	U	0.0102	0.051	ug/L
SW8081A	5103-74-2	gamma Chlordane				ug/L	< 0.0118	U	0.0118	0.0588	ug/L	< 0.0109	U	0.0109	0.0543	ug/L	< 0.0103	U	0.0103	0.0515	ug/L	< 0.011	UL	0.011	0.0549	ug/L	< 0.0102	U	0.0102	0.051	ug/L
SW8081A	58-89-9	gamma-BHC (Lindane)	0.036	0.27	0.2	ug/L	0.0118	U	0.0118	0.0588	ug/L	0.0109	U	0.0109	0.0543	ug/L	0.0103	U	0.0103	0.0515	ug/L	0.011	UL	0.011	0.0549	ug/L	0.0102	UJ	0.0102	0.051	ug/L
SW8081A	76-44-8	Heptachlor	0.0018	0.092	0.4	ug/L	**< 0.0118**	U	0.0118	0.0588	ug/L	**< 0.0109**	U	0.0109	0.0543	ug/L	**< 0.0103**	U	0.0103	0.0515	ug/L	**< 0.011**	UL	0.011	0.0549	ug/L	**< 0.0102**	UJ	0.0102	0.051	ug/L
SW8081A	1024-57-3	Heptachlor epoxide	0.0033	0.0092	0.2	ug/L	**< 0.0118**	U	0.0118	0.0588	ug/L	**< 0.0109**	U	0.0109	0.0543	ug/L	**< 0.0103**	U	0.0103	0.0515	ug/L	**< 0.011**	UL	0.011	0.0549	ug/L	**< 0.0102**	U	0.0102	0.051	ug/L
SW8081A	72-43-5	Methoxychlor		2.7	40	ug/L	0.0118	U	0.0118	0.0588	ug/L	0.0109	U	0.0109	0.0543	ug/L	0.0103	U	0.0103	0.0515	ug/L	0.011	UL	0.011	0.0549	ug/L	0.0102	U	0.0102	0.051	ug/L
SW8081A	8001-35-2	Toxaphene	0.013		3	ug/L	**< 0.353**	U	0.353	1.18	ug/L	**< 0.326**	U	0.326	1.09	ug/L	**< 0.309**	U	0.309	1.03	ug/L	**< 0.33**	UL	0.33	1.1	ug/L	**< 0.306**	U	0.306	1.02	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 6
November 2011 Screening Levels for Groundwater Pesticides Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 1

						Location ID	40MW5					40MW6					40MW6					40MW6					40MW6				
						Sample ID	40MW5GW92512					40MW6GW112111					40MW6GW030712					40DUPGW061212					40MW6GW061212				
						Sample Date	9/25/2012					11/21/2011					3/7/2012					6/12/2012					6/12/2012				
						Sample Type	N					N					N					FD					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8081A	72-54-8	4,4'-DDD	0.28			ug/L	0.0108	U	0.0108	0.0538	ug/L	0.01	U	0.01	0.05	ug/L	0.0104	U	0.0104	0.0521	ug/L	0.0115	UL	0.0115	0.0575	ug/L	0.0108	UL	0.0108	0.0538	ug/L
SW8081A	72-55-9	4,4'-DDE	0.2			ug/L	0.0108	U	0.0108	0.0538	ug/L	0.01	U	0.01	0.05	ug/L	0.0104	U	0.0104	0.0521	ug/L	0.0115	UL	0.0115	0.0575	ug/L	0.0108	UL	0.0108	0.0538	ug/L
SW8081A	50-29-3	4,4'-DDT	0.2	0.78		ug/L	0.0108	U	0.0108	0.0538	ug/L	0.01	U	0.01	0.05	ug/L	0.0104	U	0.0104	0.0521	ug/L	0.0115	UL	0.0115	0.0575	ug/L	0.0108	UL	0.0108	0.0538	ug/L
SW8081A	309-00-2	Aldrin	0.00021	0.0024		ug/L	**< 0.0108**	UJ	0.0108	0.0538	ug/L	**< 0.01**	U	0.01	0.05	ug/L	**< 0.0104**	U	0.0104	0.0521	ug/L	**< 0.0115**	UL	0.0115	0.0575	ug/L	**< 0.0108**	UL	0.0108	0.0538	ug/L
SW8081A	5103-71-9	alpha Chlordane				ug/L	< 0.0108	U	0.0108	0.0538	ug/L	< 0.01	U	0.01	0.05	ug/L	< 0.0104	U	0.0104	0.0521	ug/L	< 0.0115	UL	0.0115	0.0575	ug/L	< 0.0108	UL	0.0108	0.0538	ug/L
SW8081A	319-84-6	alpha-BHC	0.0062	7.3		ug/L	**< 0.0108**	U	0.0108	0.0538	ug/L	**< 0.01**	U	0.01	0.05	ug/L	**< 0.0104**	U	0.0104	0.0521	ug/L	**< 0.0115**	UL	0.0115	0.0575	ug/L	**< 0.0108**	UL	0.0108	0.0538	ug/L
SW8081A	319-85-7	beta-BHC	0.022			ug/L	0.0108	U	0.0108	0.0538	ug/L	0.01	U	0.01	0.05	ug/L	0.0104	U	0.0104	0.0521	ug/L	0.0115	UL	0.0115	0.0575	ug/L	0.0108	UL	0.0108	0.0538	ug/L
SW8081A	319-86-8	delta-BHC				ug/L	< 0.0108	U	0.0108	0.0538	ug/L	< 0.01	U	0.01	0.05	ug/L	< 0.0104	U	0.0104	0.0521	ug/L	< 0.0115	UL	0.0115	0.0575	ug/L	< 0.0108	UL	0.0108	0.0538	ug/L
SW8081A	60-57-1	Dieldrin	0.0015	0.028		ug/L	**< 0.0108**	U	0.0108	0.0538	ug/L	**< 0.01**	U	0.01	0.05	ug/L	**< 0.0104**	U	0.0104	0.0521	ug/L	**< 0.0115**	UL	0.0115	0.0575	ug/L	**< 0.0108**	UL	0.0108	0.0538	ug/L
SW8081A	959-98-8	Endosulfan I				ug/L	< 0.0108	U	0.0108	0.0538	ug/L	< 0.01	U	0.01	0.05	ug/L	< 0.0104	U	0.0104	0.0521	ug/L	< 0.0115	UL	0.0115	0.0575	ug/L	< 0.0108	UL	0.0108	0.0538	ug/L
SW8081A	33213-65-9	Endosulfan II				ug/L	< 0.0108	U	0.0108	0.0538	ug/L	< 0.01	U	0.01	0.05	ug/L	< 0.0104	U	0.0104	0.0521	ug/L	< 0.0115	UL	0.0115	0.0575	ug/L	< 0.0108	UL	0.0108	0.0538	ug/L
SW8081A	1031-07-8	Endosulfan sulfate				ug/L	< 0.0108	U	0.0108	0.0538	ug/L	< 0.01	U	0.01	0.05	ug/L	< 0.0104	U	0.0104	0.0521	ug/L	< 0.0115	UL	0.0115	0.0575	ug/L	< 0.0108	UL	0.0108	0.0538	ug/L
SW8081A	72-20-8	Endrin		0.17	2	ug/L	0.0108	U	0.0108	0.0538	ug/L	0.01	U	0.01	0.05	ug/L	0.0104	U	0.0104	0.0521	ug/L	0.0115	UL	0.0115	0.0575	ug/L	0.0108	UL	0.0108	0.0538	ug/L
SW8081A	7421-93-4	Endrin aldehyde				ug/L	< 0.0108	U	0.0108	0.0538	ug/L	< 0.01	U	0.01	0.05	ug/L	< 0.0104	U	0.0104	0.0521	ug/L	< 0.0115	UL	0.0115	0.0575	ug/L	< 0.0108	UL	0.0108	0.0538	ug/L
SW8081A	53494-70-5	Endrin ketone				ug/L	< 0.0108	U	0.0108	0.0538	ug/L	< 0.01	U	0.01	0.05	ug/L	< 0.0104	U	0.0104	0.0521	ug/L	< 0.0115	UL	0.0115	0.0575	ug/L	< 0.0108	UL	0.0108	0.0538	ug/L
SW8081A	5103-74-2	gamma Chlordane				ug/L	< 0.0108	U	0.0108	0.0538	ug/L	< 0.01	U	0.01	0.05	ug/L	< 0.0104	U	0.0104	0.0521	ug/L	< 0.0115	UL	0.0115	0.0575	ug/L	< 0.0108	UL	0.0108	0.0538	ug/L
SW8081A	58-89-9	gamma-BHC (Lindane)	0.036	0.27	0.2	ug/L	0.0108	UJ	0.0108	0.0538	ug/L	0.01	U	0.01	0.05	ug/L	0.0104	U	0.0104	0.0521	ug/L	0.0115	UL	0.0115	0.0575	ug/L	0.0108	UL	0.0108	0.0538	ug/L
SW8081A	76-44-8	Heptachlor	0.0018	0.092	0.4	ug/L	**< 0.0108**	UJ	0.0108	0.0538	ug/L	**< 0.01**	U	0.01	0.05	ug/L	**< 0.0104**	U	0.0104	0.0521	ug/L	**< 0.0115**	UL	0.0115	0.0575	ug/L	**< 0.0108**	UL	0.0108	0.0538	ug/L
SW8081A	1024-57-3	Heptachlor epoxide	0.0033	0.0092	0.2	ug/L	**< 0.0108**	U	0.0108	0.0538	ug/L	**< 0.01**	U	0.01	0.05	ug/L	**< 0.0104**	U	0.0104	0.0521	ug/L	**< 0.0115**	UL	0.0115	0.0575	ug/L	**< 0.0108**	UL	0.0108	0.0538	ug/L
SW8081A	72-43-5	Methoxychlor		2.7	40	ug/L	0.0108	U	0.0108	0.0538	ug/L	0.01	U	0.01	0.05	ug/L	0.0104	U	0.0104	0.0521	ug/L	0.0115	UL	0.0115	0.0575	ug/L	0.0108	UL	0.0108	0.0538	ug/L
SW8081A	8001-35-2	Toxaphene	0.013		3	ug/L	**< 0.323**	U	0.323	1.08	ug/L	**< 0.3**	U	0.3	1	ug/L	**< 0.313**	U	0.313	1.04	ug/L	**< 0.345**	UL	0.345	1.15	ug/L	**< 0.323**	UL	0.323	1.08	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 6

November 2011 Screening Levels for Groundwater Pesticides Data - Residential Tapwater Pathway

SWMU 40 (RAAP-009)

Radford Army Ammunition Plant

Longterm Monitoring Data Year 1

						Location ID	40MW6					40MW7					40MW7					40MW7					40MW7				
						Sample ID	40MW6GW92512					40MW7GW112011					40MW7GW030612					40MW7GW601212					40MW7GW92512				
						Sample Date	9/25/2012					11/20/2011					3/6/2012					6/12/2012					9/25/2012				
						Sample Type	N					N					N					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8081A	72-54-8	4,4'-DDD	0.28			ug/L	0.0103	UL	0.0103	0.0515	ug/L	0.0105	UL	0.0105	0.0526	ug/L	0.0104	U	0.0104	0.0521	ug/L	0.01	UL	0.01	0.05	ug/L	0.0105	UL	0.0105	0.0526	ug/L
SW8081A	72-55-9	4,4'-DDE	0.2			ug/L	0.0103	UL	0.0103	0.0515	ug/L	0.0105	UL	0.0105	0.0526	ug/L	0.0104	U	0.0104	0.0521	ug/L	0.01	UL	0.01	0.05	ug/L	0.0105	UL	0.0105	0.0526	ug/L
SW8081A	50-29-3	4,4'-DDT	0.2	0.78		ug/L	0.0103	UL	0.0103	0.0515	ug/L	0.0105	UL	0.0105	0.0526	ug/L	0.0104	U	0.0104	0.0521	ug/L	0.01	UL	0.01	0.05	ug/L	0.0105	UL	0.0105	0.0526	ug/L
SW8081A	309-00-2	Aldrin	0.00021	0.0024		ug/L	**< 0.0103**	UL	0.0103	0.0515	ug/L	**< 0.0105**	UL	0.0105	0.0526	ug/L	**< 0.0104**	U	0.0104	0.0521	ug/L	**< 0.01**	UL	0.01	0.05	ug/L	**< 0.0105**	UL	0.0105	0.0526	ug/L
SW8081A	5103-71-9	alpha Chlordane				ug/L	< 0.0103	UL	0.0103	0.0515	ug/L	< 0.0105	UL	0.0105	0.0526	ug/L	< 0.0104	U	0.0104	0.0521	ug/L	< 0.01	UL	0.01	0.05	ug/L	< 0.0105	UL	0.0105	0.0526	ug/L
SW8081A	319-84-6	alpha-BHC	0.0062	7.3		ug/L	**< 0.0103**	UL	0.0103	0.0515	ug/L	**< 0.0105**	UL	0.0105	0.0526	ug/L	**< 0.0104**	U	0.0104	0.0521	ug/L	**< 0.01**	UL	0.01	0.05	ug/L	**< 0.0105**	UL	0.0105	0.0526	ug/L
SW8081A	319-85-7	beta-BHC	0.022			ug/L	0.0103	UL	0.0103	0.0515	ug/L	0.0105	UL	0.0105	0.0526	ug/L	0.0104	U	0.0104	0.0521	ug/L	0.01	UL	0.01	0.05	ug/L	0.0105	UL	0.0105	0.0526	ug/L
SW8081A	319-86-8	delta-BHC				ug/L	< 0.0103	UL	0.0103	0.0515	ug/L	< 0.0105	UL	0.0105	0.0526	ug/L	< 0.0104	U	0.0104	0.0521	ug/L	< 0.01	UL	0.01	0.05	ug/L	< 0.0105	UL	0.0105	0.0526	ug/L
SW8081A	60-57-1	Dieldrin	0.0015	0.028		ug/L	**< 0.0103**	UL	0.0103	0.0515	ug/L	**< 0.0105**	UL	0.0105	0.0526	ug/L	**< 0.0104**	U	0.0104	0.0521	ug/L	**< 0.01**	UL	0.01	0.05	ug/L	**< 0.0105**	UL	0.0105	0.0526	ug/L
SW8081A	959-98-8	Endosulfan I				ug/L	< 0.0103	UL	0.0103	0.0515	ug/L	< 0.0105	UL	0.0105	0.0526	ug/L	< 0.0104	U	0.0104	0.0521	ug/L	< 0.01	UL	0.01	0.05	ug/L	< 0.0105	UL	0.0105	0.0526	ug/L
SW8081A	33213-65-9	Endosulfan II				ug/L	< 0.0103	UL	0.0103	0.0515	ug/L	< 0.0105	UL	0.0105	0.0526	ug/L	< 0.0104	U	0.0104	0.0521	ug/L	< 0.01	UL	0.01	0.05	ug/L	< 0.0105	UL	0.0105	0.0526	ug/L
SW8081A	1031-07-8	Endosulfan sulfate				ug/L	< 0.0103	UL	0.0103	0.0515	ug/L	< 0.0105	UL	0.0105	0.0526	ug/L	< 0.0104	U	0.0104	0.0521	ug/L	< 0.01	UL	0.01	0.05	ug/L	< 0.0105	UL	0.0105	0.0526	ug/L
SW8081A	72-20-8	Endrin		0.17	2	ug/L	0.0103	UL	0.0103	0.0515	ug/L	0.0105	UL	0.0105	0.0526	ug/L	0.0104	U	0.0104	0.0521	ug/L	0.01	UL	0.01	0.05	ug/L	0.0105	UL	0.0105	0.0526	ug/L
SW8081A	7421-93-4	Endrin aldehyde				ug/L	< 0.0103	UL	0.0103	0.0515	ug/L	< 0.0105	UL	0.0105	0.0526	ug/L	< 0.0104	U	0.0104	0.0521	ug/L	< 0.01	UL	0.01	0.05	ug/L	< 0.0105	UL	0.0105	0.0526	ug/L
SW8081A	53494-70-5	Endrin ketone				ug/L	< 0.0103	UL	0.0103	0.0515	ug/L	< 0.0105	UL	0.0105	0.0526	ug/L	< 0.0104	U	0.0104	0.0521	ug/L	< 0.01	UL	0.01	0.05	ug/L	< 0.0105	UL	0.0105	0.0526	ug/L
SW8081A	5103-74-2	gamma Chlordane				ug/L	< 0.0103	UL	0.0103	0.0515	ug/L	< 0.0105	UL	0.0105	0.0526	ug/L	< 0.0104	U	0.0104	0.0521	ug/L	< 0.01	UL	0.01	0.05	ug/L	< 0.0105	UL	0.0105	0.0526	ug/L
SW8081A	58-89-9	gamma-BHC (Lindane)	0.036	0.27	0.2	ug/L	0.0103	UL	0.0103	0.0515	ug/L	0.0105	UL	0.0105	0.0526	ug/L	0.0104	U	0.0104	0.0521	ug/L	0.01	UL	0.01	0.05	ug/L	0.0105	UL	0.0105	0.0526	ug/L
SW8081A	76-44-8	Heptachlor	0.0018	0.092	0.4	ug/L	**< 0.0103**	UL	0.0103	0.0515	ug/L	**< 0.0105**	UL	0.0105	0.0526	ug/L	**< 0.0104**	U	0.0104	0.0521	ug/L	**< 0.01**	UL	0.01	0.05	ug/L	**< 0.0105**	UL	0.0105	0.0526	ug/L
SW8081A	1024-57-3	Heptachlor epoxide	0.0033	0.0092	0.2	ug/L	**< 0.0103**	UL	0.0103	0.0515	ug/L	**< 0.0105**	UL	0.0105	0.0526	ug/L	**< 0.0104**	U	0.0104	0.0521	ug/L	**< 0.01**	UL	0.01	0.05	ug/L	**< 0.0105**	UL	0.0105	0.0526	ug/L
SW8081A	72-43-5	Methoxychlor		2.7	40	ug/L	0.0103	UL	0.0103	0.0515	ug/L	0.0105	UL	0.0105	0.0526	ug/L	0.0104	U	0.0104	0.0521	ug/L	0.01	UL	0.01	0.05	ug/L	0.0105	UL	0.0105	0.0526	ug/L
SW8081A	8001-35-2	Toxaphene	0.013		3	ug/L	**< 0.309**	UL	0.309	1.03	ug/L	**< 0.316**	UL	0.316	1.05	ug/L	**< 0.313**	U	0.313	1.04	ug/L	**< 0.3**	UL	0.3	1	ug/L	**< 0.316**	UL	0.316	1.05	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 7
November 2011 Screening Levels for Groundwater Dioxin/Furan Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 1

							Location ID Sample ID Sample Date Sample Type	40LFMW01 40LFMW01GW112111 11/21/2011 N					
Method	CAS	Chemical	CSL	T-NCSL	MCL	TEF	Units	Result	TEF Adjusted Value	VQ	LOD	LOQ	DL Unit
SW8290	1746-01-6	2378-TCDD	0.52	1.6	30	1	pg/l	< 2.73	1.365	U	2.73	12.50	pg/l
SW8290	40321-76-4	12378-PeCDD				1	pg/l	< 2.41	1.205	U	2.41	31.30	pg/l
SW8290	39227-28-6	123478-HxCDD				0.1	pg/l	< 2.10	0.12	U	2.10	31.30	pg/l
SW8290	57653-85-7	123678-HxCDD				0.1	pg/l	< 2.40	0.105	U	2.40	31.30	pg/l
SW8290	19408-74-3	123789-HxCDD				0.1	pg/l	< 2.14	0.107	U	2.14	31.30	pg/l
SW8290	35822-46-9	1234678-HpCDD				0.01	pg/l	6.17	0.0617	B	3.58	31.30	pg/l
SW8290	3268-87-9	OCDD				0.0003	pg/l	162	0.0486	J	7.47	62.50	pg/l
						Total:			**3.0123**				pg/l
SW8290	51207-31-9	2378-TCDF	5,800,000			0.1	pg/l	< 1.91	0.0955	U	1.91	12.50	pg/l
SW8290	57117-31-4	12378-PeCDF				0.03	pg/l	< 1.69	0.02535	U	1.69	31.30	pg/l
SW8290	57117-41-6	23478-PeCDF				0.3	pg/l	< 1.79	0.2685	U	1.79	31.30	pg/l
SW8290	70648-26-9	123478-HxCDF				0.1	pg/l	< 1.22	0.0685	U	1.22	31.30	pg/l
SW8290	72918-21-9	123678-HxCDF				0.1	pg/l	< 1.64	0.061	U	1.64	31.30	pg/l
SW8290	57117-44-9	123789-HxCDF				0.1	pg/l	< 1.37	0.082	U	1.37	31.30	pg/l
SW8290	60851-34-5	234678-HxCDF				0.1	pg/l	< 1.39	0.0695	U	1.39	31.30	pg/l
SW8290	67562-39-4	1234678-HpCDF				0.01	pg/l	< 2.04	0.0102	U	2.04	31.30	pg/l
SW8290	55673-89-7	1234789-HpCDF				0.01	pg/l	< 2.75	0.01375	U	2.75	31.30	pg/l
SW8290	39001-02-0	OCDF				0.0003	pg/l	< 5.61	0.0008415	UJ	5.61	62.50	pg/l
						Total:			0.6951415				pg/l
SW8290		Total TEQ					pg/l		3.72				pg/l
SW8290	30402-14-3	TETRACHLORINATED DIBENZOFURANS, (TOTAL)					pg/l	8.50		B	1.91	12.50	pg/l
SW8290	37871-00-4	Total HpCDD					pg/l	6.17		J	3.58	31.30	pg/l
SW8290	38998-75-3	Total HpCDF					pg/l	< 2.04		U	2.04	31.30	pg/l
SW8290	34465-46-8	Total HxCDD					pg/l	< 2.10		U	2.10	31.30	pg/l
SW8290	55684-94-1	Total HxCDF					pg/l	< 1.22		U	1.22	31.30	pg/l
SW8290	36088-22-9	Total PeCDD					pg/l	< 2.41		U	2.41	31.30	pg/l
SW8290	30402-15-4	Total PeCDF					pg/l	< 1.79		U	1.79	31.30	pg/l
SW8290	41903-57-5	Total TCDD					pg/l	< 2.73		U	2.73	12.5	pg/l

		40MW5 40DUPGW112011 11/20/2011 FD						40MW5 40MW5GW112011 11/20/2011 N					
Chemical	TEF	Result	TEF Adjusted Value	VQ	LOD	LOQ	DL Unit	Result	TEF Adjusted Value	VQ	LOD	LOQ	DL Unit
2378-TCDD	1	< 1.66	0.830	U	1.66	10.60	pg/l	< 7.84	3.92	U	7.84	10.90	pg/l
12378-PeCDD	1	< 2.25	1.125	U	2.25	26.60	pg/l	< 9.85	4.925	U	9.85	27.20	pg/l
123478-HxCDD	0.1	< 1.31	0.066	U	1.31	26.60	pg/l	< 3.86	0.2195	U	3.86	27.20	pg/l
123678-HxCDD	0.1	< 1.49	0.075	U	1.49	26.60	pg/l	< 4.39	0.193	U	4.39	27.20	pg/l
123789-HxCDD	0.1	< 1.33	0.067	U	1.33	26.60	pg/l	< 3.92	0.196	U	3.92	27.20	pg/l
1234678-HpCDD	0.01	< 1.81	0.0091	U	1.81	26.60	pg/l	< 4.78	0.0239	U	4.78	27.20	pg/l
OCDD	0.0003	18.3	0.0055	B	4.37	53.20	pg/l	43.7	0.01311	B	9.77	54.30	pg/l
	Total:		**2.17604**				pg/l		**9.49051**				pg/l
2378-TCDF	0.1	< 1.54	0.0770	U	1.54	10.60	pg/l	< 5.23	0.2615	U	5.23	10.90	pg/l
12378-PeCDF	0.03	< 1.27	0.0191	U	1.27	26.60	pg/l	< 5.76	0.0864	U	5.76	27.20	pg/l
23478-PeCDF	0.3	< 1.35	0.2025	U	1.35	26.60	pg/l	< 6.12	0.918	U	6.12	27.20	pg/l
123478-HxCDF	0.1	< 1.06	0.0530	U	1.06	26.60	pg/l	< 2.39	0.134	U	2.39	27.20	pg/l
123678-HxCDF	0.1	< 1.43	0.0715	U	1.43	26.60	pg/l	< 3.23	0.1195	U	3.23	27.20	pg/l
123789-HxCDF	0.1	< 1.19	0.0595	U	1.19	26.60	pg/l	< 2.68	0.1615	U	2.68	27.20	pg/l
234678-HxCDF	0.1	< 1.21	0.0605	U	1.21	26.60	pg/l	< 2.74	0.137	U	2.74	27.20	pg/l
1234678-HpCDF	0.01	< 1.30	0.0065	U	1.30	26.60	pg/l	< 2.98	0.0149	U	2.98	27.20	pg/l
1234789-HpCDF	0.01	< 1.75	0.0088	U	1.75	26.60	pg/l	< 4.03	0.02015	U	4.03	27.20	pg/l
OCDF	0.0003	< 4.09	0.0006	U	4.09	53.20	pg/l	< 8.46	0.001269	U	8.46	54.30	pg/l
	Total:		0.55891				pg/l		1.854219				pg/l
Total TEQ			2.74				pg/l		11.4				pg/l
TETRACHLORINATED DIBENZOFURANS, (TOTAL)		< 1.54		U	1.54	10.60	pg/l	< 5.23		U	5.23	10.90	pg/l
Total HpCDD		< 1.81		U	1.81	26.60	pg/l	< 4.78		U	4.78	27.20	pg/l
Total HpCDF		< 1.30		U	1.30	26.60	pg/l	< 2.98		U	2.98	27.20	pg/l
Total HxCDD		< 1.31		U	1.31	26.60	pg/l	< 3.86		U	3.86	27.20	pg/l
Total HxCDF		< 1.06		U	1.06	26.60	pg/l	< 2.39		U	2.39	27.20	pg/l
Total PeCDD		< 2.25		U	2.25	26.60	pg/l	< 9.85		U	9.85	27.20	pg/l
Total PeCDF		< 1.35		U	1.35	26.60	pg/l	< 6.12		U	6.12	27.20	pg/l
Total TCDD		< 1.66		U	1.66	10.6	pg/l	< 7.84		U	7.84	10.9	pg/l

		40MW6 40MW6GW112111 11/21/2011 N						40MW7 40MW7GW112011 11/20/2011 N					
Chemical	TEF	Result	TEF Adjusted Value	VQ	LOD	LOQ	DL Unit	Result	TEF Adjusted Value	VQ	LOD	LOQ	DL Unit
2378-TCDD	1	< 2.08	1.04	U	2.08	11.10	pg/l	< 2.28	1.14	U	2.28	11.40	pg/l
12378-PeCDD	1	< 2.21	1.105	U	2.21	27.80	pg/l	< 1.61	0.805	U	1.61	28.40	pg/l
123478-HxCDD	0.1	< 2.70	0.1535	U	2.70	27.80	pg/l	< 1.89	0.0945	U	1.89	28.40	pg/l
123678-HxCDD	0.1	< 3.07	0.135	U	3.07	27.80	pg/l	< 1.89	0.0945	U	1.89	28.40	pg/l
123789-HxCDD	0.1	< 2.74	0.137	U	2.74	27.80	pg/l	< 1.87	0.0935	U	1.87	28.40	pg/l
1234678-HpCDD	0.01	< 2.83	0.01415	U	2.83	27.80	pg/l	< 2.36	0.0118	U	2.36	28.40	pg/l
OCDD	0.0003	22.3	0.00669	B	6.67	55.60	pg/l	27.4	0.00822	B	6.70	56.80	pg/l
	Total:		**2.59134**				pg/l		**2.24752**				pg/l
2378-TCDF	0.1	< 1.54	0.077	U	1.54	11.10	pg/l	< 1.59	0.0795	U	1.59	11.40	pg/l
12378-PeCDF	0.03	< 1.02	0.0153	U	1.02	27.80	pg/l	< 0.983	0.014745	U	0.983	28.40	pg/l
23478-PeCDF	0.3	< 1.08	0.162	U	1.08	27.80	pg/l	< 1.03	0.1545	U	1.03	28.40	pg/l
123478-HxCDF	0.1	< 1.11	0.062	U	1.11	27.80	pg/l	< 1.33	0.0715	U	1.33	28.40	pg/l
123678-HxCDF	0.1	< 1.50	0.0555	U	1.50	27.80	pg/l	< 1.79	0.0665	U	1.79	28.40	pg/l
123789-HxCDF	0.1	< 1.24	0.075	U	1.24	27.80	pg/l	< 1.43	0.0895	U	1.43	28.40	pg/l
234678-HxCDF	0.1	< 1.27	0.0635	U	1.27	27.80	pg/l	< 1.51	0.0755	U	1.51	28.40	pg/l
1234678-HpCDF	0.01	< 2.18	0.0109	U	2.18	27.80	pg/l	< 1.89	0.00945	U	1.89	28.40	pg/l
1234789-HpCDF	0.01	< 2.94	0.0147	U	2.94	27.80	pg/l	< 2.39	0.01195	U	2.39	28.40	pg/l
OCDF	0.0003	< 6.61	0.0009915	UJ	6.61	55.60	pg/l	< 5.61	0.0008415	U	5.61	56.80	pg/l
	Total:		0.5368915				pg/l		0.5739865				pg/l
Total TEQ			3.13				pg/l		2.82				pg/l
TETRACHLORINATED DIBENZOFURANS, (TOTAL)		2.44		B	1.54	11.10	pg/l	< 1.59		U	1.59	11.40	pg/l
Total HpCDD		4.42		J	2.83	27.80	pg/l	< 2.36		U	2.36	28.40	pg/l
Total HpCDF		< 2.18		U	2.18	27.80	pg/l	< 1.89		U	1.89	28.40	pg/l
Total HxCDD		< 2.70		U	2.70	27.80	pg/l	< 1.89		U	1.89	28.40	pg/l
Total HxCDF		< 1.11		U	1.11	27.80	pg/l	< 1.33		U	1.33	28.40	pg/l
Total PeCDD		< 2.21		U	2.21	27.80	pg/l	< 1.61		U	1.61	28.40	pg/l
Total PeCDF		< 1.08		U	1.08	27.80	pg/l	< 1.03		U	1.03	28.40	pg/l
Total TCDD		< 2.08		U	2.08	11.1	pg/l	< 2.28		U	2.28	11.4	pg/l

Notes:

For dioxin/furan data, a toxicity equivalence factor (TEF) must first be applied to adjust the measured concentrations to a toxicity equivalent concentration
The following table contains the various dioxin-like toxicity equivalency factors for Dioxins and Furans (Van den Berg et al. 2006), which are the World Health Organization 2005 values.

CAS = Chemical Abstracts Service
pg/L = Picogram Per Liter
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 1
November 2011 Screening Levels for Groundwater SVOC PAH Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 2

						Location ID	40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01				
						Sample ID	40LFMW01GW112111					40DUPGW030612					40LFMW01GW030612					LFMW01GW061212					LFMW01GW92612				
						Sample Date	11/21/2011					3/6/2012					3/6/2012					6/12/2012					9/26/2012				
						Sample Type	N					FD					N					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8270C PAHL	56-55-3	Benzo(a)anthracene	0.029			ug/L	0.0281	U	0.0281	0.0562	ug/L	0.026	U	0.026	0.0521	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	50-32-8	Benzo(a)pyrene	0.0029		0.20	ug/L	**< 0.0281**	U	0.0281	0.0562	ug/L	**< 0.026**	U	0.026	0.0521	ug/L	**< 0.0269**	U	0.0269	0.0538	ug/L	**< 0.0281**	U	0.0281	0.0562	ug/L	**< 0.0255**	U	0.0255	0.051	ug/L
SW8270C PAHL	205-99-2	Benzo(b)fluoranthene	0.029			ug/L	0.0281	U	0.0281	0.0562	ug/L	0.026	U	0.026	0.0521	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	207-08-9	Benzo(k)fluoranthene	0.29			ug/L	0.0281	U	0.0281	0.0562	ug/L	0.026	U	0.026	0.0521	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	218-01-9	Chrysene	2.9			ug/L	0.0281	U	0.0281	0.0562	ug/L	0.026	U	0.026	0.0521	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0308	J	0.0281	0.0562	ug/L	0.0255	U	0.0255	0.051	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate
Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentratior
B = Not detected substantially above the level reported in laboratory or field blanks
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower
L = Analyte present. Reported value may be biased low. Actual value is expected to be highe
UJ = Not detected. Quantitation limit may be inaccurate or imprecise
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported

Table 1
November 2011 Screening Levels for Groundwater SVOC PAH Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 2

						Location ID	40LFMW01					40LFMW01					40MW5					40MW5					40MW5				
						Sample ID	40DUPGW61913					LFMW01GW61913					40DUPGW112011					40MW5GW112011					40MW5GW030712				
						Sample Date	6/19/2013					6/19/2013					11/20/2011					11/20/2011					3/7/2012				
						Sample Type	FD					N					FD					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8270C PAHL	56-55-3	Benzo(a)anthracene	0.029			ug/L	0.026	U	0.026	0.0521	ug/L	0.0258	U	0.0258	0.0515	ug/L	0.0263	U	0.0263	0.0526	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	50-32-8	Benzo(a)pyrene	0.0029		0.20	ug/L	**< 0.026**	U	0.026	0.0521	ug/L	**< 0.0258**	U	0.0258	0.0515	ug/L	**< 0.0263**	U	0.0263	0.0526	ug/L	**< 0.0269**	U	0.0269	0.0538	ug/L	**< 0.0255**	U	0.0255	0.051	ug/L
SW8270C PAHL	205-99-2	Benzo(b)fluoranthene	0.029			ug/L	0.026	U	0.026	0.0521	ug/L	0.0258	U	0.0258	0.0515	ug/L	0.0263	U	0.0263	0.0526	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	207-08-9	Benzo(k)fluoranthene	0.29			ug/L	0.026	U	0.026	0.0521	ug/L	0.0258	U	0.0258	0.0515	ug/L	0.0263	U	0.0263	0.0526	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	218-01-9	Chrysene	2.9			ug/L	0.026	U	0.026	0.0521	ug/L	0.0258	U	0.0258	0.0515	ug/L	0.0263	U	0.0263	0.0526	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentratior
B = Not detected substantially above the level reported in laboratory or field blanks
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower
L = Analyte present. Reported value may be biased low. Actual value is expected to be highe
UJ = Not detected. Quantitation limit may be inaccurate or imprecise
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported

Table 1
November 2011 Screening Levels for Groundwater SVOC PAH Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 2

						Location ID	40MW5					40MW5					40MW5					40MW5					40MW6				
						Sample ID	40MW5GW061212					40DUPGW92512					40MW5GW92512					40MW5GW61913					40MW6GW112111				
						Sample Date	6/12/2012					9/25/2012					9/25/2012					6/19/2013					11/21/2011				
						Sample Type	N					FD					N					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8270C PAHL	56-55-3	Benzo(a)anthracene	0.029			ug/L	0.026	UJ	0.026	0.0521	ug/L	0.0255	U	0.0255	0.051	ug/L	**< 0.0338**	U	0.0338	0.0676	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0287	U	0.0287	0.0575	ug/L
SW8270C PAHL	50-32-8	Benzo(a)pyrene	0.0029		0.20	ug/L	**< 0.026**	UJ	0.026	0.0521	ug/L	**< 0.0255**	U	0.0255	0.051	ug/L	**< 0.0338**	U	0.0338	0.0676	ug/L	**< 0.0269**	U	0.0269	0.0538	ug/L	**< 0.0287**	U	0.0287	0.0575	ug/L
SW8270C PAHL	205-99-2	Benzo(b)fluoranthene	0.029			ug/L	0.026	UJ	0.026	0.0521	ug/L	0.0255	U	0.0255	0.051	ug/L	**< 0.0338**	U	0.0338	0.0676	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0287	U	0.0287	0.0575	ug/L
SW8270C PAHL	207-08-9	Benzo(k)fluoranthene	0.29			ug/L	0.026	UJ	0.026	0.0521	ug/L	0.0255	U	0.0255	0.051	ug/L	0.0338	U	0.0338	0.0676	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0287	U	0.0287	0.0575	ug/L
SW8270C PAHL	218-01-9	Chrysene	2.9			ug/L	0.026	UJ	0.026	0.0521	ug/L	0.0255	U	0.0255	0.051	ug/L	0.0338	U	0.0338	0.0676	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0287	U	0.0287	0.0575	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate
Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentratior
B = Not detected substantially above the level reported in laboratory or field blanks
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower
L = Analyte present. Reported value may be biased low. Actual value is expected to be highei
UJ = Not detected. Quantitation limit may be inaccurate or imprecise
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported

Table 1
November 2011 Screening Levels for Groundwater SVOC PAH Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 2

						Location ID	40MW6					40MW6					40MW6					40MW6					40MW6				
						Sample ID	40MW6GW030712					40DUPGW061212					40MW6GW061212					40MW6GW92512					40MW6GW61913				
						Sample Date	3/7/2012					6/12/2012					6/12/2012					9/25/2012					6/19/2013				
						Sample Type	N					FD					N					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8270C PAHL	56-55-3	Benzo(a)anthracene	0.029			ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255		0.0255	0.051	ug/L	**0.211**	J	0.0281	0.0562	ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0258	U	0.0258	0.0515	ug/L
SW8270C PAHL	50-32-8	Benzo(a)pyrene	0.0029		0.20	ug/L	**< 0.0269**	U	0.0269	0.0538	ug/L	**< 0.0255**		0.0255	0.051	ug/L	**0.0793**	J	0.0281	0.0562	ug/L	**< 0.0281**	U	0.0281	0.0562	ug/L	**< 0.0258**	U	0.0258	0.0515	ug/L
SW8270C PAHL	205-99-2	Benzo(b)fluoranthene	0.029			ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255		0.0255	0.051	ug/L	**0.261**	J	0.0281	0.0562	ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0258	U	0.0258	0.0515	ug/L
SW8270C PAHL	207-08-9	Benzo(k)fluoranthene	0.29			ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255		0.0255	0.051	ug/L	0.17	J	0.0281	0.0562	ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0258	U	0.0258	0.0515	ug/L
SW8270C PAHL	218-01-9	Chrysene	2.9			ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0301		0.0255	0.051	ug/L	0.89	J	0.0281	0.0562	ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0258	U	0.0258	0.0515	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate
Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentratior
B = Not detected substantially above the level reported in laboratory or field blanks
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported

Table 1
November 2011 Screening Levels for Groundwater SVOC PAH Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 2

						Location ID	40MW7					40MW7					40MW7					40MW7					40MW7				
						Sample ID	40MW7GW112011					40MW7GW030612					40MW7GW601212					40MW7GW92512					40MW7GW61913				
						Sample Date	11/20/2011					3/6/2012					6/12/2012					9/25/2012					6/19/2013				
						Sample Type	N					N					N					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8270C PAHL	56-55-3	Benzo(a)anthracene	0.029			ug/L	0.0255	U	0.0255	0.051	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0284	U	0.0284	0.0568	ug/L	0.025	U	0.025	0.05	ug/L	0.0275	U	0.0275	0.0549	ug/L
SW8270C PAHL	50-32-8	Benzo(a)pyrene	0.0029		0.20	ug/L	**< 0.0255**	U	0.0255	0.051	ug/L	**< 0.0269**	U	0.0269	0.0538	ug/L	**< 0.0284**	U	0.0284	0.0568	ug/L	**< 0.025**	U	0.025	0.05	ug/L	**< 0.0275**	U	0.0275	0.0549	ug/L
SW8270C PAHL	205-99-2	Benzo(b)fluoranthene	0.029			ug/L	0.0255	U	0.0255	0.051	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0284	U	0.0284	0.0568	ug/L	0.025	U	0.025	0.05	ug/L	0.0275	U	0.0275	0.0549	ug/L
SW8270C PAHL	207-08-9	Benzo(k)fluoranthene	0.29			ug/L	0.0255	U	0.0255	0.051	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0284	U	0.0284	0.0568	ug/L	0.025	U	0.025	0.05	ug/L	0.0275	U	0.0275	0.0549	ug/L
SW8270C PAHL	218-01-9	Chrysene	2.9			ug/L	0.0255	U	0.0255	0.051	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0832	J	0.0284	0.0568	ug/L	0.025	U	0.025	0.05	ug/L	0.0275	U	0.0275	0.0549	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate
Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentratior
B = Not detected substantially above the level reported in laboratory or field blanks
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower
L = Analyte present. Reported value may be biased low. Actual value is expected to be highe
UJ = Not detected. Quantitation limit may be inaccurate or imprecise
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported

Table 2
November 2011 Screening Levels for Groundwater VOC Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 2

						Location ID	40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01				
						Sample ID	40LFMW01GW112111					40DUPGW030612					40LFMW01GW030612					LFMW01GW061212					LFMW01GW92612					40DUPGW61913					LFMW01GW61913				
						Sample Date	11/21/2011					3/6/2012					3/6/2012					6/12/2012					9/26/2012					6/19/2013					6/19/2013				
						Sample Type	N					FD					N					N					N					FD					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8260B	110-75-8	2-Chloroethyl vinyl ether				ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	U	2	10	ug/L	< 2	U	2	10	ug/L
SW8260B	67-64-1	Acetone		1200		ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 2
November 2011 Screening Levels for Groundwater VOC Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 2

						Location ID	40MW5					40MW5					40MW5				
						Sample ID	40DUPGW112011					40MW5GW112011					40MW5GW030712				
						Sample Date	11/20/2011					11/20/2011					3/7/2012				
						Sample Type	FD					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8260B	110-75-8	2-Chloroethyl vinyl ether				ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L
SW8260B	67-64-1	Acetone		1200		ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L

						Location ID	40MW5					40MW5					40MW5					40MW5				
						Sample ID	40MW5GW061212					40DUPGW92512					40MW5GW92512					40MW5GW61913				
						Sample Date	6/12/2012					9/25/2012					9/25/2012					6/19/2013				
						Sample Type	N					FD					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8260B	110-75-8	2-Chloroethyl vinyl ether				ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	U	2	10	ug/L
SW8260B	67-64-1	Acetone		1200		ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	U	2.5	10	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 2
November 2011 Screening Levels for Groundwater VOC Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 2

						Location ID	40MW6					40MW6					40MW6					40MW6					40MW6					40MW6					40MW7				
						Sample ID	40MW6GW112111					40MW6GW030712					40DUPGW061212					40MW6GW061212					40MW6GW92512					40MW6GW61913					40MW7GW112011				
						Sample Date	11/21/2011					3/7/2012					6/12/2012					6/12/2012					9/25/2012					6/19/2013					11/20/2011				
						Sample Type	N					N					FD					N					N					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8260B	110-75-8	2-Chloroethyl vinyl ether				ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	U	2	10	ug/L	< 2	R	2	10	ug/L
SW8260B	67-64-1	Acetone		1200		ug/L	2.5	U	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	U	2.5	10	ug/L	4.38	L	2.5	10	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 2
November 2011 Screening Levels for Groundwater VOC Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 2

						Location ID	40MW7					40MW7					40MW7					40MW7				
						Sample ID	40MW7GW030612					40MW7GW601212					40MW7GW92512					40MW7GW61913				
						Sample Date	3/6/2012					6/12/2012					9/25/2012					6/19/2013				
						Sample Type	N					N					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8260B	110-75-8	2-Chloroethyl vinyl ether				ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	U	2	10	ug/L
SW8260B	67-64-1	Acetone		1200		ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	UJ	2.5	10	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 3
November 2011 Screening Levels for Groundwater Metals Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 2

							Location ID	40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01				
							Sample ID	40LFMW01GW112111					40DUPGW030612					40LFMW01GW030612					LFMW01GW061212					LFMW01GW92612					40DUPGW61913					LFMW01GW61913				
							Sample Date	11/21/2011					3/6/2012					3/6/2012					6/12/2012					9/26/2012					6/19/2013					6/19/2013				
							Sample Type	N					FD					N					N					N					FD					N				
Method	CAS	Chemical	fraction	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6010B	7429-90-5	Aluminum	T		1600		ug/L	***17900***		50	100	ug/L	112		50	100	ug/L	123		50	100	ug/L	74.8	J	50	100	ug/L	**9150**		50	100	ug/L	127	J	100	200	ug/L	145	J	100	200	ug/L
SW6010B	7429-90-5	Aluminum	D		1600		ug/L	50	U	50	100	ug/L	NS					NS					50	U	50	100	ug/L	92.9	J	50	100	ug/L	< 100	U	100	200	ug/L	100	U	100	200	ug/L
SW6010B	7439-89-6	Iron	T		1100		ug/L	**21800**	L	50	100	ug/L	87.5	J	50	100	ug/L	93	J	50	100	ug/L	120		50	100	ug/L	**8950**		50	100	ug/L	290		50	100	ug/L	311		50	100	ug/L
SW6010B	7439-89-6	Iron	D		1100		ug/L	102		50	100	ug/L	NS					NS					50	U	50	100	ug/L	74.1	J	50	100	ug/L	50	U	50	100	ug/L	50	U	50	100	ug/L
SW6010B	7439-95-4	Magnesium	T				ug/L	74800		250	500	ug/L	27800		250	500	ug/L	28100		250	500	ug/L	33800		2500	5000	ug/L	51100		250	500	ug/L	30300		250	500	ug/L	29200		250	500	ug/L
SW6010B	7439-95-4	Magnesium	D				ug/L	33100		250	500	ug/L	NS					NS					32700		2500	5000	ug/L	35400		250	500	ug/L	29300		250	500	ug/L	29800		250	500	ug/L
SW6010B	7440-09-7	Potassium	T				ug/L	5920		500	1000	ug/L	943	J	500	1000	ug/L	885	J	500	1000	ug/L	1740		500	1000	ug/L	3700		500	1000	ug/L	1740		500	1000	ug/L	1660		500	1000	ug/L
SW6010B	7440-09-7	Potassium	D				ug/L	1620		500	1000	ug/L	NS					NS					1630		500	1000	ug/L	1690		500	1000	ug/L	1620		500	1000	ug/L	1690		500	1000	ug/L
SW6010B	7440-23-5	Sodium	T				ug/L	8230		250	500	ug/L	7860		250	500	ug/L	7690		250	500	ug/L	8450		250	500	ug/L	6640		250	500	ug/L	8410		250	500	ug/L	8180		250	500	ug/L
SW6010B	7440-23-5	Sodium	D				ug/L	8480		250	500	ug/L	NS					NS					8120		250	500	ug/L	7100		250	500	ug/L	8490		250	500	ug/L	8540		250	500	ug/L
SW6010B	7440-62-2	Vanadium	T		7.8		ug/L	**32.5**		5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	**18.1**		5	10	ug/L	**8.64**	J	5	10	ug/L	**9.29**	J	5	10	ug/L
SW6010B	7440-62-2	Vanadium	D		7.8		ug/L	5	U	5	10	ug/L	NS					NS					5	U	5	10	ug/L	5	U	5	10	ug/L	**10.9**		5	10	ug/L	**10.8**		5	10	ug/L
SW6010B	7440-70-2	Calcium	T				ug/L	142000		100	200	ug/L	71300	J	100	200	ug/L	71400	J	100	200	ug/L	82800		1000	2000	ug/L	105000		100	200	ug/L	75800		250	500	ug/L	75900		250	500	ug/L
SW6010B	7440-70-2	Calcium	D				ug/L	81500		100	200	ug/L	NS					NS					82000		1000	2000	ug/L	85700		100	200	ug/L	78100		250	500	ug/L	77700		250	500	ug/L
SW6020	7439-92-1	Lead	T			15	ug/L	11		1	2	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L	5.46		0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW6020	7439-92-1	Lead	D			15	ug/L	< 1	U	1	2	ug/L	NS					NS					0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW6020	7439-96-5	Manganese	T		32		ug/L	**125**		2	4	ug/L	1.25	J	1	2	ug/L	1.52	J	1	2	ug/L	2.18	L	1	2	ug/L	**52.6**		1	2	ug/L	2.48		1	2	ug/L	2.89		1	2	ug/L
SW6020	7439-96-5	Manganese	D		32		ug/L	3.95	B	2	4	ug/L	NS					NS					1	UL	1	2	ug/L	1	U	1	2	ug/L	1	U	1	2	ug/L	1	U	1	2	ug/L
SW6020	7440-38-2	Arsenic	T	0.045	0.47	10	ug/L	**2.68**		1	2	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**1.43**		0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-38-2	Arsenic	D	0.045	0.47	10	ug/L	**< 1**	U	1	2	ug/L	NS					NS					**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-39-3	Barium	T		290	2000	ug/L	133		3	6	ug/L	94.7		1.5	3	ug/L	94.1		1.5	3	ug/L	65.7	L	1.5	3	ug/L	125		1.5	3	ug/L	61.9		1.5	3	ug/L	62.3		1.5	3	ug/L
SW6020	7440-39-3	Barium	D		290	2000	ug/L	90.2		3	6	ug/L	NS					NS					63.4		1.5	3	ug/L	92.6		1.5	3	ug/L	61.4		1.5	3	ug/L	57.5		1.5	3	ug/L
SW6020	7440-48-4	Cobalt	T		0.47		ug/L	**5.54**		1	2	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**3.14**		0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-48-4	Cobalt	D		0.47		ug/L	**< 1**	U	1	2	ug/L	NS					NS					**< 0.5**	U	0.5	1	ug/L	**0.903**	J	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7782-49-2	Selenium	T		7.8	50	ug/L	1	U	1	2	ug/L	0.5	UL	0.5	1	ug/L	0.5	UL	0.5	1	ug/L	0.726	K	0.5	1	ug/L	1.18		0.5	1	ug/L	0.676	J	0.5	1	ug/L	0.928	J	0.5	1	ug/L
SW6020	7782-49-2	Selenium	D		7.8	50	ug/L	1	U	1	2	ug/L	NS					NS					0.7	J	0.5	1	ug/L	1.06		0.5	1	ug/L	0.523	J	0.5	1	ug/L	1.71	J	0.5	1	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.
NS=Not Sampled because Turbidty was stable at less than or equl to 10 NTUs
Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

Table 3
November 2011 Screening Levels for Groundwater Metals Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 2

							Location ID	40MW5					40MW5					40MW5					40MW5					40MW5					40MW5					40MW5				
							Sample ID	40DUPGW112011					40MW5GW112011					40MW5GW030712					40MW5GW061212					40DUPGW92512					40MW5GW92512					40MW5GW61913				
							Sample Date	11/20/2011					11/20/2011					3/7/2012					6/12/2012					9/25/2012					9/25/2012					6/19/2013				
							Sample Type	FD					N					N					N					FD					N					N				
Method	CAS	Chemical	fraction	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6010B	7429-90-5	Aluminum	T		1600		ug/L	1540		50	100	ug/L	1890		50	100	ug/L	221		50	100	ug/L	911		50	100	ug/L	140	J	50	100	ug/L	266	J	50	100	ug/L	100	U	100	200	ug/L
SW6010B	7429-90-5	Aluminum	D		1600		ug/L	50	U	50	100	ug/L	50	U	50	100	ug/L	NS					50	U	50	100	ug/L	50	U	50	100	ug/L	50	U	50	100	ug/L	NS				
SW6010B	7439-89-6	Iron	T		1100		ug/L	**1580**	L	50	100	ug/L	**2040**	L	50	100	ug/L	156		50	100	ug/L	950		50	100	ug/L	123		50	100	ug/L	217		50	100	ug/L	137		50	100	ug/L
SW6010B	7439-89-6	Iron	D		1100		ug/L	82	J	50	100	ug/L	74.1	J	50	100	ug/L	NS					50	U	50	100	ug/L	50	U	50	100	ug/L	50	U	50	100	ug/L	NS				
SW6010B	7439-95-4	Magnesium	T				ug/L	31300		250	500	ug/L	32500		250	500	ug/L	33500		250	500	ug/L	34700		2500	5000	ug/L	32500		250	500	ug/L	32000		250	500	ug/L	32500		250	500	ug/L
SW6010B	7439-95-4	Magnesium	D				ug/L	29600		250	500	ug/L	29800		250	500	ug/L	NS					34600		2500	5000	ug/L	32100		250	500	ug/L	32300		250	500	ug/L	NS				
SW6010B	7440-09-7	Potassium	T				ug/L	1370		500	1000	ug/L	1370		500	1000	ug/L	1160		500	1000	ug/L	1270		500	1000	ug/L	1260		500	1000	ug/L	1300		500	1000	ug/L	1100		500	1000	ug/L
SW6010B	7440-09-7	Potassium	D				ug/L	1060		500	1000	ug/L	1080		500	1000	ug/L	NS					1240		500	1000	ug/L	1230		500	1000	ug/L	1230		500	1000	ug/L	NS				
SW6010B	7440-23-5	Sodium	T				ug/L	5480		250	500	ug/L	5220		250	500	ug/L	4790		250	500	ug/L	5280		250	500	ug/L	5270		250	500	ug/L	5730		250	500	ug/L	4590		250	500	ug/L
SW6010B	7440-23-5	Sodium	D				ug/L	5330		250	500	ug/L	5350		250	500	ug/L	NS					5170		250	500	ug/L	5420		250	500	ug/L	5430		250	500	ug/L	NS				
SW6010B	7440-62-2	Vanadium	T		7.8		ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	**8.74**	J	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	**10.5**		5	10	ug/L
SW6010B	7440-62-2	Vanadium	D		7.8		ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	NS					5	U	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	NS				
SW6010B	7440-70-2	Calcium	T				ug/L	84800		100	200	ug/L	87200		100	200	ug/L	93400	J	100	200	ug/L	89900		1000	2000	ug/L	84900		100	200	ug/L	86900		100	200	ug/L	91600		250	500	ug/L
SW6010B	7440-70-2	Calcium	D				ug/L	81700		100	200	ug/L	82800		100	200	ug/L	NS					88400		1000	2000	ug/L	86100		100	200	ug/L	89200		100	200	ug/L	NS				
SW6020	7439-92-1	Lead	T			15	ug/L	1	U	1	2	ug/L	1	U	1	2	ug/L	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW6020	7439-92-1	Lead	D			15	ug/L	1	U	1	2	ug/L	0.5	U	0.5	1.0	ug/L	NS					0.5	UL	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	NS				
SW6020	7439-96-5	Manganese	T		32		ug/L	7.67	B	2	4	ug/L	15.2	B	2	4	ug/L	1.11	J	1	2	ug/L	4.84	L	1	2	ug/L	4	B	1	2	ug/L	2.13	B	1	2	ug/L	1.8	J	1	2	ug/L
SW6020	7439-96-5	Manganese	D		32		ug/L	2	U	2	4	ug/L	1	U	1	2	ug/L	NS					1	UL	1	2	ug/L	1	U	1	2	ug/L	1	U	1	2	ug/L	NS				
SW6020	7440-38-2	Arsenic	T	0.045	0.47	10	ug/L	**< 1**	U	1	2	ug/L	**< 1**	U	1	2	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-38-2	Arsenic	D	0.045	0.47	10	ug/L	**< 1**	U	1	2	ug/L	**< 0.5**	U	0.5	1.0	ug/L	NS					**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	NS				
SW6020	7440-39-3	Barium	T		290	2000	ug/L	59.9		3	6	ug/L	57.1		3	6	ug/L	57.2		1.5	3	ug/L	56.9	L	1.5	3	ug/L	58.1		1.5	3	ug/L	56.2		1.5	3	ug/L	56.9		1.5	3	ug/L
SW6020	7440-39-3	Barium	D		290	2000	ug/L	53.2		3	6	ug/L	55.4	J	1.5	3.0	ug/L	NS					54.3	L	1.5	3	ug/L	56.3		1.5	3	ug/L	58.7		1.5	3	ug/L	NS				
SW6020	7440-48-4	Cobalt	T		0.47		ug/L	**< 1**	U	1	2	ug/L	**< 1**	U	1	2	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-48-4	Cobalt	D		0.47		ug/L	**< 1**	U	1	2	ug/L	**< 0.5**	U	0.5	1.0	ug/L	NS					**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	NS				
SW6020	7782-49-2	Selenium	T		7.8	50	ug/L	1.06	J	1	2	ug/L	1.31	K	1	2	ug/L	0.775	L	0.5	1	ug/L	0.784	K	0.5	1	ug/L	1.02		0.5	1	ug/L	0.845	J	0.5	1	ug/L	0.943	J	0.5	1	ug/L
SW6020	7782-49-2	Selenium	D		7.8	50	ug/L	1.11	J	1	2	ug/L	1.19	K	0.5	1.0	ug/L	NS					0.847	K	0.5	1	ug/L	1.17		0.5	1	ug/L	1.05		0.5	1	ug/L	NS				

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.
NS=Not Sampled because Turbidty was stable at less than or equl to 10 NTUs
Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

Table 3
November 2011 Screening Levels for Groundwater Metals Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 2

							Location ID	40MW6					40MW6					40MW6					40MW6					40MW6					40MW6					40MW7				
							Sample ID	40MW6GW112111					40MW6GW030712					40DUPGW061212					40MW6GW061212					40MW6GW92512					40MW6GW61913					40MW7GW112011				
							Sample Date	11/21/2011					3/7/2012					6/12/2012					6/12/2012					9/25/2012					6/19/2013					11/20/2011				
							Sample Type	N					N					FD					N					N					N					N				
Method	CAS	Chemical	fraction	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6010B	7429-90-5	Aluminum	T		1600		ug/L	242		50	100	ug/L	210		50	100	ug/L	209		50	100	ug/L	230		50	100	ug/L	467		50	100	ug/L	378		100	200	ug/L	**8290**		50	100	ug/L
SW6010B	7429-90-5	Aluminum	D		1600		ug/L	NS					NS					NS					NS					50	U	50	100	ug/L	NS					50	U	50	100	ug/L
SW6010B	7439-89-6	Iron	T		1100		ug/L	323	L	50	100	ug/L	155		50	100	ug/L	238		50	100	ug/L	296		50	100	ug/L	393		50	100	ug/L	478		50	100	ug/L	**7950**	L	50	100	ug/L
SW6010B	7439-89-6	Iron	D		1100		ug/L	NS					NS					NS					NS					50	U	50	100	ug/L	NS					73.1	J	50	100	ug/L
SW6010B	7439-95-4	Magnesium	T				ug/L	32000		250	500	ug/L	36100		250	500	ug/L	33100		2500	5000	ug/L	34000		2500	5000	ug/L	33700		250	500	ug/L	33900		250	500	ug/L	61900		250	500	ug/L
SW6010B	7439-95-4	Magnesium	D				ug/L	NS					NS					NS					NS					33500		250	500	ug/L	NS					32500		250	500	ug/L
SW6010B	7440-09-7	Potassium	T				ug/L	1000		500	1000	ug/L	1020		500	1000	ug/L	1050		500	1000	ug/L	1140		500	1000	ug/L	1220		500	1000	ug/L	1240		500	1000	ug/L	4250		500	1000	ug/L
SW6010B	7440-09-7	Potassium	D				ug/L	NS					NS					NS					NS					1140		500	1000	ug/L	NS					2300		500	1000	ug/L
SW6010B	7440-23-5	Sodium	T				ug/L	5100		250	500	ug/L	4400		250	500	ug/L	4960		250	500	ug/L	5180		250	500	ug/L	5240		250	500	ug/L	4090		250	500	ug/L	66700		250	500	ug/L
SW6010B	7440-23-5	Sodium	D				ug/L	NS					NS					NS					NS					5180		250	500	ug/L	NS					78300		250	500	ug/L
SW6010B	7440-62-2	Vanadium	T		7.8		ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	6.42	J	5	10	ug/L	**8.09**	J	5	10	ug/L	5	U	5	10	ug/L	**10.9**		5	10	ug/L	**9.26**	J	5	10	ug/L
SW6010B	7440-62-2	Vanadium	D		7.8		ug/L	NS					NS					NS					NS					5	U	5	10	ug/L	NS					5	U	5	10	ug/L
SW6010B	7440-70-2	Calcium	T				ug/L	84500		100	200	ug/L	98400	J	100	200	ug/L	85000		1000	2000	ug/L	85300		1000	2000	ug/L	88200		100	200	ug/L	89800		250	500	ug/L	190000		100	200	ug/L
SW6010B	7440-70-2	Calcium	D				ug/L	NS					NS					NS					NS					89400		100	200	ug/L	NS					70600		100	200	ug/L
SW6020	7439-92-1	Lead	T			15	ug/L	1	U	1	2	ug/L	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L	0.525	L	0.5	1	ug/L	0.733	J	0.5	1	ug/L	0.569	J	0.5	1	ug/L	9.37		1	2	ug/L
SW6020	7439-92-1	Lead	D			15	ug/L	NS					NS					NS					NS					0.5	U	0.5	1	ug/L	NS					1	U	1	2	ug/L
SW6020	7439-96-5	Manganese	T		32		ug/L	2	U	2	4	ug/L	1.09	J	1	2	ug/L	1.82	J	1	2	ug/L	2.93	J	1	2	ug/L	2.41	B	1	2	ug/L	2.92		1	2	ug/L	**181**		2	4	ug/L
SW6020	7439-96-5	Manganese	D		32		ug/L	NS					NS					NS					NS					1.07	B	1	2	ug/L	NS					23.9	B	2	4	ug/L
SW6020	7440-38-2	Arsenic	T	0.045	0.47	10	ug/L	**< 1**	U	1	2	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**2**	K	1	2	ug/L
SW6020	7440-38-2	Arsenic	D	0.045	0.47	10	ug/L	NS					NS					NS					NS					**< 0.5**	U	0.5	1	ug/L	NS					**< 1**	U	1	2	ug/L
SW6020	7440-39-3	Barium	T		290	2000	ug/L	49.9		3	6	ug/L	53.8		1.5	3	ug/L	48.8	L	1.5	3	ug/L	52.2	L	1.5	3	ug/L	51.4		1.5	3	ug/L	49.1		1.5	3	ug/L	252		3	6	ug/L
SW6020	7440-39-3	Barium	D		290	2000	ug/L	NS					NS					NS					NS					51.5		1.5	3	ug/L	NS					75.8		3	6	ug/L
SW6020	7440-48-4	Cobalt	T		0.47		ug/L	**< 1**	U	1	2	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**3.04**		1	2	ug/L
SW6020	7440-48-4	Cobalt	D		0.47		ug/L	NS					NS					NS					NS					**< 0.5**	U	0.5	1	ug/L	NS					**< 1**	U	1	2	ug/L
SW6020	7782-49-2	Selenium	T		7.8	50	ug/L	1.28	J	1	2	ug/L	0.5	U	0.5	1	ug/L	0.697	J	0.5	1	ug/L	1.24	J	0.5	1	ug/L	0.943	J	0.5	1	ug/L	1.06		0.5	1	ug/L	1.86	K	1	2	ug/L
SW6020	7782-49-2	Selenium	D		7.8	50	ug/L	NS					NS					NS					NS					1.11		0.5	1	ug/L	NS					1.81	K	1	2	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.
NS=Not Sampled because Turbidty was stable at less than or equl to 10 NTUs
Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

Table 3
November 2011 Screening Levels for Groundwater Metals Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 2

							Location ID	40MW7					40MW7					40MW7					40MW7				
							Sample ID	40MW7GW030612					40MW7GW601212					40MW7GW92512					40MW7GW61913				
							Sample Date	3/6/2012					6/12/2012					9/25/2012					6/19/2013				
							Sample Type	N					N					N					N				
Method	CAS	Chemical	fraction	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6010B	7429-90-5	Aluminum	T		1600		ug/L	344		50	100	ug/L	70.3	J	50	100	ug/L	**1730**		50	100	ug/L	100	U	100	200	ug/L
SW6010B	7429-90-5	Aluminum	D		1600		ug/L	NS					NS					50	U	50	100	ug/L	NS				
SW6010B	7439-89-6	Iron	T		1100		ug/L	263		50	100	ug/L	149		50	100	ug/L	**1620**		50	100	ug/L	55.3	J	50	100	ug/L
SW6010B	7439-89-6	Iron	D		1100		ug/L	NS					NS					50	U	50	100	ug/L	NS				
SW6010B	7439-95-4	Magnesium	T				ug/L	36100		250	500	ug/L	36400		2500	5000	ug/L	41100		250	500	ug/L	32200		250	500	ug/L
SW6010B	7439-95-4	Magnesium	D				ug/L	NS					NS					36100		250	500	ug/L	NS				
SW6010B	7440-09-7	Potassium	T				ug/L	1720		500	1000	ug/L	1670		500	1000	ug/L	2130		500	1000	ug/L	1550		500	1000	ug/L
SW6010B	7440-09-7	Potassium	D				ug/L	NS					NS					1770		500	1000	ug/L	NS				
SW6010B	7440-23-5	Sodium	T				ug/L	8540		250	500	ug/L	4030		250	500	ug/L	3510		250	500	ug/L	3990		250	500	ug/L
SW6010B	7440-23-5	Sodium	D				ug/L	NS					NS					3360		250	500	ug/L	NS				
SW6010B	7440-62-2	Vanadium	T		7.8		ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	**9.8**	J	5	10	ug/L
SW6010B	7440-62-2	Vanadium	D		7.8		ug/L	NS					NS					5	U	5	10	ug/L	NS				
SW6010B	7440-70-2	Calcium	T				ug/L	80600	J	100	200	ug/L	77800		1000	2000	ug/L	101000		100	200	ug/L	71300		250	500	ug/L
SW6010B	7440-70-2	Calcium	D				ug/L	NS					NS					77700		100	200	ug/L	NS				
SW6020	7439-92-1	Lead	T			15	ug/L	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L	1.61		0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW6020	7439-92-1	Lead	D			15	ug/L	NS					NS					0.5	U	0.5	1	ug/L	NS				
SW6020	7439-96-5	Manganese	T		32		ug/L	10.8		1	2	ug/L	6.47	L	1	2	ug/L	26.5		1	2	ug/L	1.76	J	1	2	ug/L
SW6020	7439-96-5	Manganese	D		32		ug/L	NS					NS					3.77	B	1	2	ug/L	NS				
SW6020	7440-38-2	Arsenic	T	0.045	0.47	10	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**0.615**	J	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-38-2	Arsenic	D	0.045	0.47	10	ug/L	NS					NS					**< 0.5**	U	0.5	1	ug/L	NS				
SW6020	7440-39-3	Barium	T		290	2000	ug/L	145		1.5	3	ug/L	146	L	1.5	3	ug/L	172		1.5	3	ug/L	130		1.5	3	ug/L
SW6020	7440-39-3	Barium	D		290	2000	ug/L	NS					NS					170		1.5	3	ug/L	NS				
SW6020	7440-48-4	Cobalt	T		0.47		ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**1.02**		0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-48-4	Cobalt	D		0.47		ug/L	NS					NS					**0.825**	J	0.5	1	ug/L	NS				
SW6020	7782-49-2	Selenium	T		7.8	50	ug/L	0.5	UL	0.5	1	ug/L	0.652	K	0.5	1	ug/L	0.848	J	0.5	1	ug/L	0.678	J	0.5	1	ug/L
SW6020	7782-49-2	Selenium	D		7.8	50	ug/L	NS					NS					0.913	J	0.5	1	ug/L	NS				

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.
NS=Not Sampled because Turbidty was stable at less than or equl to 10 NTUs
Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

Table 4
November 2011 Screening Levels for Groundwater Perchlorate Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 2

					Location ID	40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01				
					Sample ID	40LFMW01GW112111					40DUPGW030612					40LFMW01GW030612					LFMW01GW061212					LFMW01GW92612					40DUPGW61913					LFMW01GW61913				
					Sample Date	11/21/2011					3/6/2012					3/6/2012					6/12/2012					9/26/2012					6/19/2013					6/19/2013				
					Sample Type	N					FD					N					N					N					FD					N				
Method	CAS	Chemical	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	Int Qual	VQ	LOQ	DL Unit
SW6850	14797-73-0	PERCHLORATE	1.1	15	ug/L	**9.67**	J	0.1	0.2	ug/L	**8.93**		0.1	0.2	ug/L	**8.88**		0.1	0.2	ug/L	**4.81**		0.1	0.2	ug/L	**8.75**		0.1	0.2	ug/L	**4.44**		0.2	0.4	ug/L	**4.38**		0.2	0.4	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 4
November 2011 Screening Levels for Groundwater Perchlorate Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 2

					Location ID	40MW5					40MW5					40MW5					40MW5					40MW5					40MW5					40MW5				
					Sample ID	40DUPGW112011					40MW5GW112011					40MW5GW030712					40MW5GW061212					40DUPGW92512					40MW5GW92512					40MW5GW61913				
					Sample Date	11/20/2011					11/20/2011					3/7/2012					6/12/2012					9/25/2012					9/25/2012					6/19/2013				
					Sample Type	FD					N					N					N					FD					N					N				
Method	CAS	Chemical	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6850	14797-73-0	PERCHLORATE	1.1	15	ug/L	**1.55**	J	0.1	0.2	ug/L	**1.55**	J	0.1	0.2	ug/L	0.931		0.1	0.2	ug/L	0.986		0.1	0.2	ug/L	**1.81**		0.1	0.2	ug/L	**1.71**		0.1	0.2	ug/L	0.85		0.1	0.2	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 4
November 2011 Screening Levels for Groundwater Perchlorate Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 2

					Location ID	40MW6					40MW6					40MW6					40MW6					40MW6					40MW6					40MW7				
					Sample ID	40MW6GW112111					40MW6GW030712					40DUPGW061212					40MW6GW061212					40MW6GW92512					40MW6GW61913					40MW7GW112011				
					Sample Date	11/21/2011					3/7/2012					6/12/2012					6/12/2012					9/25/2012					6/19/2013					11/20/2011				
					Sample Type	N					N					FD					N					N					N					N				
Method	CAS	Chemical	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6850	14797-73-0	PERCHLORATE	1.1	15	ug/L	0.885	J	0.1	0.2	ug/L	0.526		0.1	0.2	ug/L	0.635		0.1	0.2	ug/L	0.647		0.1	0.2	ug/L	**1.25**		0.1	0.2	ug/L	0.535		0.1	0.2	ug/L	**4.5**	J	0.1	0.2	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

Table 4
November 2011 Screening Levels for Groundwater Perchlorate Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 2

					Location ID	40MW7					40MW7					40MW7					40MW7				
					Sample ID	40MW7GW030612					40MW7GW601212					40MW7GW92512					40MW7GW61913				
					Sample Date	3/6/2012					6/12/2012					9/25/2012					6/19/2013				
					Sample Type	N					N					N					N				
Method	CAS	Chemical	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	Int Qual	LOD	LOQ	DL Unit
SW6850	14797-73-0	PERCHLORATE	1.1	15	ug/L	**4.18**		0.1	0.2	ug/L	**3.69**		0.1	0.2	ug/L	**3.66**		0.1	0.2	ug/L	**4.1**		0.1	0.2	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 1
November 2011 Screening Levels for Groundwater SVOC PAH Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 3

						Location ID	40LFMW01					40LFMW01					40LFMW01					40LFMW01				
						Sample ID	40LFMW01GW112111					40DUPGW030612					40LFMW01GW030612					LFMW01GW061212				
						Sample Date	11/21/2011					3/6/2012					3/6/2012					6/12/2012				
						Sample Type	N					FD					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8270C PAHL	56-55-3	Benzo(a)anthracene	0.029			ug/L	0.0281	U	0.0281	0.0562	ug/L	0.026	U	0.026	0.0521	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0281	U	0.0281	0.0562	ug/L
SW8270C PAHL	50-32-8	Benzo(a)pyrene	0.0029		0.20	ug/L	**< 0.0281**	U	0.0281	0.0562	ug/L	**< 0.026**	U	0.026	0.0521	ug/L	**< 0.0269**	U	0.0269	0.0538	ug/L	**< 0.0281**	U	0.0281	0.0562	ug/L
SW8270C PAHL	205-99-2	Benzo(b)fluoranthene	0.029			ug/L	0.0281	U	0.0281	0.0562	ug/L	0.026	U	0.026	0.0521	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0281	U	0.0281	0.0562	ug/L
SW8270C PAHL	207-08-9	Benzo(k)fluoranthene	0.29			ug/L	0.0281	U	0.0281	0.0562	ug/L	0.026	U	0.026	0.0521	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0281	U	0.0281	0.0562	ug/L
SW8270C PAHL	218-01-9	Chrysene	2.9			ug/L	0.0281	U	0.0281	0.0562	ug/L	0.026	U	0.026	0.0521	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0308	J	0.0281	0.0562	ug/L

				40LFMW01					40LFMW01					40LFMW01					40LFMW01				
				LFMW01GW92612					40DUPGW61913					LFMW01GW61913					LFMW01GW32714				
				9/26/2012					6/19/2013					6/19/2013					3/27/2014				
				N					FD					N					N				
Method	CAS	Chemical	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8270C PAHL	56-55-3	Benzo(a)anthracene	ug/L	0.0255	U	0.0255	0.051	ug/L	0.026	U	0.026	0.0521	ug/L	0.0258	U	0.0258	0.0515	ug/L	0.025	U	0.025	0.05	ug/L
SW8270C PAHL	50-32-8	Benzo(a)pyrene	ug/L	**< 0.0255**	U	0.0255	0.051	ug/L	**< 0.026**	U	0.026	0.0521	ug/L	**< 0.0258**	U	0.0258	0.0515	ug/L	**< 0.025**	U	0.025	0.05	ug/L
SW8270C PAHL	205-99-2	Benzo(b)fluoranthene	ug/L	0.0255	U	0.0255	0.051	ug/L	0.026	U	0.026	0.0521	ug/L	0.0258	U	0.0258	0.0515	ug/L	0.025	U	0.025	0.05	ug/L
SW8270C PAHL	207-08-9	Benzo(k)fluoranthene	ug/L	0.0255	U	0.0255	0.051	ug/L	0.026	U	0.026	0.0521	ug/L	0.0258	U	0.0258	0.0515	ug/L	0.025	U	0.025	0.05	ug/L
SW8270C PAHL	218-01-9	Chrysene	ug/L	0.0255	U	0.0255	0.051	ug/L	0.026	U	0.026	0.0521	ug/L	0.0258	U	0.0258	0.0515	ug/L	0.025	U	0.025	0.05	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate
Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 1
November 2011 Screening Levels for Groundwater SVOC PAH Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 3

						Location ID	40MW5					40MW5					40MW5				
						Sample ID	40DUPGW112011					40MW5GW112011					40MW5GW030712				
						Sample Date	11/20/2011					11/20/2011					3/7/2012				
						Sample Type	FD					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8270C PAHL	56-55-3	Benzo(a)anthracene	0.029			ug/L	0.0263	U	0.0263	0.0526	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	50-32-8	Benzo(a)pyrene	0.0029		0.20	ug/L	**< 0.0263**	U	0.0263	0.0526	ug/L	**< 0.0269**	U	0.0269	0.0538	ug/L	**< 0.0255**	U	0.0255	0.051	ug/L
SW8270C PAHL	205-99-2	Benzo(b)fluoranthene	0.029			ug/L	0.0263	U	0.0263	0.0526	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	207-08-9	Benzo(k)fluoranthene	0.29			ug/L	0.0263	U	0.0263	0.0526	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L
SW8270C PAHL	218-01-9	Chrysene	2.9			ug/L	0.0263	U	0.0263	0.0526	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255	U	0.0255	0.051	ug/L

						Location ID	40MW5					40MW5					40MW5				
						Sample ID	40MW5GW061212					40DUPGW92512					40MW5GW92512				
						Sample Date	6/12/2012					9/25/2012					9/25/2012				
						Sample Type	N					FD					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8270C PAHL	56-55-3	Benzo(a)anthracene	0.029			ug/L	0.026	UJ	0.026	0.0521	ug/L	0.0255	U	0.0255	0.051	ug/L	**< 0.0338**	U	0.0338	0.0676	ug/L
SW8270C PAHL	50-32-8	Benzo(a)pyrene	0.0029		0.20	ug/L	**< 0.026**	UJ	0.026	0.0521	ug/L	**< 0.0255**	U	0.0255	0.051	ug/L	**< 0.0338**	U	0.0338	0.0676	ug/L
SW8270C PAHL	205-99-2	Benzo(b)fluoranthene	0.029			ug/L	0.026	UJ	0.026	0.0521	ug/L	0.0255	U	0.0255	0.051	ug/L	**< 0.0338**	U	0.0338	0.0676	ug/L
SW8270C PAHL	207-08-9	Benzo(k)fluoranthene	0.29			ug/L	0.026	UJ	0.026	0.0521	ug/L	0.0255	U	0.0255	0.051	ug/L	0.0338	U	0.0338	0.0676	ug/L
SW8270C PAHL	218-01-9	Chrysene	2.9			ug/L	0.026	UJ	0.026	0.0521	ug/L	0.0255	U	0.0255	0.051	ug/L	0.0338	U	0.0338	0.0676	ug/L

						Location ID	40MW5					40MW5					40MW5				
						Sample ID	40MW5GW61913					40MW5GW32714					40DUPGW32714				
						Sample Date	6/19/2013					3/27/2014					3/27/2014				
						Sample Type	N					N					FD				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8270C PAHL	56-55-3	Benzo(a)anthracene	0.029			ug/L	0.0269	U	0.0269	0.0538	ug/L	0.026	U	0.026	0.0521	ug/L	0.026	U	0.026	0.0521	ug/L
SW8270C PAHL	50-32-8	Benzo(a)pyrene	0.0029		0.20	ug/L	**< 0.0269**	U	0.0269	0.0538	ug/L	**< 0.026**	U	0.026	0.0521	ug/L	**< 0.026**	U	0.026	0.0521	ug/L
SW8270C PAHL	205-99-2	Benzo(b)fluoranthene	0.029			ug/L	0.0269	U	0.0269	0.0538	ug/L	0.026	U	0.026	0.0521	ug/L	0.026	U	0.026	0.0521	ug/L
SW8270C PAHL	207-08-9	Benzo(k)fluoranthene	0.29			ug/L	0.0269	U	0.0269	0.0538	ug/L	0.026	U	0.026	0.0521	ug/L	0.026	U	0.026	0.0521	ug/L
SW8270C PAHL	218-01-9	Chrysene	2.9			ug/L	0.0269	U	0.0269	0.0538	ug/L	0.026	U	0.026	0.0521	ug/L	0.026	U	0.026	0.0521	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 1
November 2011 Screening Levels for Groundwater SVOC PAH Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 3

						Location ID	40MW6					40MW6					40MW6					40MW6					40MW6					40MW6					40MW6				
						Sample ID	40MW6GW112111					40MW6GW030712					40DUPGW061212					40MW6GW061212					40MW6GW92512					40MW6GW61913					40MW6GW32714				
						Sample Date	11/21/2011					3/7/2012					6/12/2012					6/12/2012					9/25/2012					6/19/2013					3/27/2014				
						Sample Type	N					N					FD					N					N					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8270C PAHL	56-55-3	Benzo(a)anthracene	0.029			ug/L	0.0287	U	0.0287	0.0575	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255		0.0255	0.051	ug/L	**0.211**	J	0.0281	0.0562	ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0258	U	0.0258	0.0515	ug/L	0.026	U	0.026	0.0521	ug/L
SW8270C PAHL	50-32-8	Benzo(a)pyrene	0.0029		0.20	ug/L	**< 0.0287**	U	0.0287	0.0575	ug/L	**< 0.0269**	U	0.0269	0.0538	ug/L	**< 0.0255**		0.0255	0.051	ug/L	**0.0793**	J	0.0281	0.0562	ug/L	**< 0.0281**	U	0.0281	0.0562	ug/L	**< 0.0258**	U	0.0258	0.0515	ug/L	**< 0.026**	U	0.026	0.0521	ug/L
SW8270C PAHL	205-99-2	Benzo(b)fluoranthene	0.029			ug/L	0.0287	U	0.0287	0.0575	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255		0.0255	0.051	ug/L	**0.261**	J	0.0281	0.0562	ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0258	U	0.0258	0.0515	ug/L	0.026	U	0.026	0.0521	ug/L
SW8270C PAHL	207-08-9	Benzo(k)fluoranthene	0.29			ug/L	0.0287	U	0.0287	0.0575	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0255		0.0255	0.051	ug/L	0.17	J	0.0281	0.0562	ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0258	U	0.0258	0.0515	ug/L	0.026	U	0.026	0.0521	ug/L
SW8270C PAHL	218-01-9	Chrysene	2.9			ug/L	0.0287	U	0.0287	0.0575	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0301		0.0255	0.051	ug/L	0.89	J	0.0281	0.0562	ug/L	0.0281	U	0.0281	0.0562	ug/L	0.0258	U	0.0258	0.0515	ug/L	0.026	U	0.026	0.0521	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate
Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 1
November 2011 Screening Levels for Groundwater SVOC PAH Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 3

						Location ID	40MW7					40MW7					40MW7					40MW7					40MW7					40MW7				
						Sample ID	40MW7GW112011					40MW7GW030612					40MW7GW601212					40MW7GW92512					40MW7GW61913					40MW7GW32714				
						Sample Date	11/20/2011					3/6/2012					6/12/2012					9/25/2012					6/19/2013					3/27/2014				
						Sample Type	N					N					N					N					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8270C PAHL	56-55-3	Benzo(a)anthracene	0.029			ug/L	0.0255	U	0.0255	0.051	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0284	U	0.0284	0.0568	ug/L	0.025	U	0.025	0.05	ug/L	0.0275	U	0.0275	0.0549	ug/L	0.026	U	0.026	0.0521	ug/L
SW8270C PAHL	50-32-8	Benzo(a)pyrene	0.0029		0.20	ug/L	**< 0.0255**	U	0.0255	0.051	ug/L	**< 0.0269**	U	0.0269	0.0538	ug/L	**< 0.0284**	U	0.0284	0.0568	ug/L	**< 0.025**	U	0.025	0.05	ug/L	**< 0.0275**	U	0.0275	0.0549	ug/L	**< 0.026**	U	0.026	0.0521	ug/L
SW8270C PAHL	205-99-2	Benzo(b)fluoranthene	0.029			ug/L	0.0255	U	0.0255	0.051	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0284	U	0.0284	0.0568	ug/L	0.025	U	0.025	0.05	ug/L	0.0275	U	0.0275	0.0549	ug/L	0.026	U	0.026	0.0521	ug/L
SW8270C PAHL	207-08-9	Benzo(k)fluoranthene	0.29			ug/L	0.0255	U	0.0255	0.051	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0284	U	0.0284	0.0568	ug/L	0.025	U	0.025	0.05	ug/L	0.0275	U	0.0275	0.0549	ug/L	0.026	U	0.026	0.0521	ug/L
SW8270C PAHL	218-01-9	Chrysene	2.9			ug/L	0.0255	U	0.0255	0.051	ug/L	0.0269	U	0.0269	0.0538	ug/L	0.0832	J	0.0284	0.0568	ug/L	0.025	U	0.025	0.05	ug/L	0.0275	U	0.0275	0.0549	ug/L	0.026	U	0.026	0.0521	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate
Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 2
November 2011 Screening Levels for Groundwater VOC Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 3

						Location ID	40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01				
						Sample ID	40LFMW01GW112111					40DUPGW030612					40LFMW01GW030612					LFMW01GW061212					LFMW01GW92612					40DUPGW61913					LFMW01GW61913					LFMW01GW32714				
						Sample Date	11/21/2011					3/6/2012					3/6/2012					6/12/2012					9/26/2012					6/19/2013					6/19/2013					3/27/2014				
						Sample Type	N					FD					N					N					N					FD					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8260B	110-75-8	2-Chloroethyl vinyl ether				ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	U	2	10	ug/L	< 2	U	2	10	ug/L	< 2	U	2	10	ug/L
SW8260B	67-64-1	Acetone		1200		ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	UJ	2.5	10	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 2
November 2011 Screening Levels for Groundwater VOC Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 3

						Location ID	40MW5					40MW5					40MW5					40MW5					40MW5					40MW5					40MW5					40MW5					40MW5				
						Sample ID	40DUPGW112011					40MW5GW112011					40MW5GW030712					40MW5GW061212					40DUPGW92512					40MW5GW92512					40MW5GW61913					40MW5GW32714					40DUPGW32714				
						Sample Date	11/20/2011					11/20/2011					3/7/2012					6/12/2012					9/25/2012					9/25/2012					6/19/2013					3/27/2014					3/27/2014				
						Sample Type	FD					N					N					N					FD					N					N					N					FD				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8260B	110-75-8	2-Chloroethyl vinyl ether				ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	U	2	10	ug/L	< 2	U	2	10	ug/L	< 2	U	2	10	ug/L
SW8260B	67-64-1	Acetone		1200		ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	UJ	2.5	10	ug/L	2.5	UJ	2.5	10	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 2
November 2011 Screening Levels for Groundwater VOC Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 3

						Location ID	40MW6					40MW6					40MW6					40MW6					40MW6					40MW6					40MW6				
						Sample ID	40MW6GW112111					40MW6GW030712					40DUPGW061212					40MW6GW061212					40MW6GW92512					40MW6GW61913					40MW6GW32714				
						Sample Date	11/21/2011					3/7/2012					6/12/2012					6/12/2012					9/25/2012					6/19/2013					3/27/2014				
						Sample Type	N					N					FD					N					N					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8260B	110-75-8	2-Chloroethyl vinyl ether				ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	U	2	10	ug/L	< 2	U	2	10	ug/L
SW8260B	67-64-1	Acetone		1200		ug/L	2.5	U	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	UJ	2.5	10	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 2
November 2011 Screening Levels for Groundwater VOC Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 3

						Location ID	40MW7					40MW7					40MW7					40MW7					40MW7					40MW7				
						Sample ID	40MW7GW112011					40MW7GW030612					40MW7GW601212					40MW7GW92512					40MW7GW61913					40MW7GW32714				
						Sample Date	11/20/2011					3/6/2012					6/12/2012					9/25/2012					6/19/2013					3/27/2014				
						Sample Type	N					N					N					N					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8260B	110-75-8	2-Chloroethyl vinyl ether				ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	U	2	10	ug/L	< 2	U	2	10	ug/L
SW8260B	67-64-1	Acetone		1200		ug/L	4.38	L	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	UJ	2.5	10	ug/L	2.5	UJ	2.5	10	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate
Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 3
November 2011 Screening Levels for Groundwater Metals Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 3

							Location ID	40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01				
							Sample ID	40LFMW01GW112111					40DUPGW030612					40LFMW01GW030612					LFMW01GW061212					LFMW01GW92612					40DUPGW61913					LFMW01GW61913					LFMW01GW32714				
							Sample Date	11/21/2011					3/6/2012					3/6/2012					6/12/2012					9/26/2012					6/19/2013					6/19/2013					3/27/2014				
							Sample Type	N					FD					N					N					N					FD					N					N				
Method	CAS	Chemical	fraction	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6010B	7429-90-5	Aluminum	T		1600		ug/L	***17900***		50	100	ug/L	112		50	100	ug/L	123		50	100	ug/L	74.8	J	50	100	ug/L	**9150**		50	100	ug/L	127	J	100	200	ug/L	145	J	100	200	ug/L	124	J	100	200	ug/L
SW6010B	7429-90-5	Aluminum	D		1600		ug/L	50	U	50	100	ug/L	NS					NS					50	U	50	100	ug/L	92.9	J	50	100	ug/L	< 100	U	100	200	ug/L	100	U	100	200	ug/L	NS				
SW6010B	7439-89-6	Iron	T		1100		ug/L	**21800**	L	50	100	ug/L	87.5	J	50	100	ug/L	93	J	50	100	ug/L	120		50	100	ug/L	**8950**		50	100	ug/L	290		50	100	ug/L	311		50	100	ug/L	172	J	50	100	ug/L
SW6010B	7439-89-6	Iron	D		1100		ug/L	102		50	100	ug/L	NS					NS					50	U	50	100	ug/L	74.1	J	50	100	ug/L	50	U	50	100	ug/L	50	U	50	100	ug/L	NS				
SW6010B	7439-95-4	Magnesium	T				ug/L	74800		250	500	ug/L	27800		250	500	ug/L	28100		250	500	ug/L	33800		2500	5000	ug/L	51100		250	500	ug/L	30300		250	500	ug/L	29200		250	500	ug/L	34600		250	500	ug/L
SW6010B	7439-95-4	Magnesium	D				ug/L	33100		250	500	ug/L	NS					NS					32700		2500	5000	ug/L	35400		250	500	ug/L	29300		250	500	ug/L	29800		250	500	ug/L	NS				
SW6010B	7440-09-7	Potassium	T				ug/L	5920		500	1000	ug/L	943	J	500	1000	ug/L	885	J	500	1000	ug/L	1740		500	1000	ug/L	3700		500	1000	ug/L	1740		500	1000	ug/L	1660		500	1000	ug/L	1730		500	1000	ug/L
SW6010B	7440-09-7	Potassium	D				ug/L	1620		500	1000	ug/L	NS					NS					1630		500	1000	ug/L	1690		500	1000	ug/L	1620		500	1000	ug/L	1690		500	1000	ug/L	NS				
SW6010B	7440-23-5	Sodium	T				ug/L	8230		250	500	ug/L	7860		250	500	ug/L	7690		250	500	ug/L	8450		250	500	ug/L	6640		250	500	ug/L	8410		250	500	ug/L	8180		250	500	ug/L	5260		250	500	ug/L
SW6010B	7440-23-5	Sodium	D				ug/L	8480		250	500	ug/L	NS					NS					8120		250	500	ug/L	7100		250	500	ug/L	8490		250	500	ug/L	8540		250	500	ug/L	NS				
SW6010B	7440-62-2	Vanadium	T		7.8		ug/L	**32.5**		5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	**18.1**		5	10	ug/L	**8.64**	J	5	10	ug/L	**9.29**	J	5	10	ug/L	5	U	5	10	ug/L
SW6010B	7440-62-2	Vanadium	D		7.8		ug/L	5	U	5	10	ug/L	NS					NS					5	U	5	10	ug/L	5	U	5	10	ug/L	**10.9**		5	10	ug/L	**10.8**		5	10	ug/L	NS				
SW6010B	7440-70-2	Calcium	T				ug/L	142000		100	200	ug/L	71300	J	100	200	ug/L	71400	J	100	200	ug/L	82800		1000	2000	ug/L	105000		100	200	ug/L	75800		250	500	ug/L	75900		250	500	ug/L	92400		2500	5000	ug/L
SW6010B	7440-70-2	Calcium	D				ug/L	81500		100	200	ug/L	NS					NS					82000		1000	2000	ug/L	85700		100	200	ug/L	78100		250	500	ug/L	77700		250	500	ug/L	NS				
SW6020	7439-92-1	Lead	T			15	ug/L	11		1	2	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L	5.46		0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW6020	7439-92-1	Lead	D			15	ug/L	< 1	U	1	2	ug/L	NS					NS					0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	NS				
SW6020	7439-96-5	Manganese	T		32		ug/L	**125**		2	4	ug/L	1.25	J	1	2	ug/L	1.52	J	1	2	ug/L	2.18	L	1	2	ug/L	**52.6**		1	2	ug/L	2.48		1	2	ug/L	2.89		1	2	ug/L	2.75	B	1	2	ug/L
SW6020	7439-96-5	Manganese	D		32		ug/L	3.95	B	2	4	ug/L	NS					NS					1	UL	1	2	ug/L	1	U	1	2	ug/L	1	U	1	2	ug/L	1	U	1	2	ug/L	NS				
SW6020	7440-38-2	Arsenic	T	0.045	0.47	10	ug/L	**2.68**		1	2	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**1.43**		0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	**U**	**0.5**	**1**	**ug/L**
SW6020	7440-38-2	Arsenic	D	0.045	0.47	10	ug/L	**< 1**	U	1	2	ug/L	NS					NS					**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	NS				
SW6020	7440-39-3	Barium	T		290	2000	ug/L	133		3	6	ug/L	94.7		1.5	3	ug/L	94.1		1.5	3	ug/L	65.7	L	1.5	3	ug/L	125		1.5	3	ug/L	61.9		1.5	3	ug/L	62.3		1.5	3	ug/L	69.8		1.5	3	ug/L
SW6020	7440-39-3	Barium	D		290	2000	ug/L	90.2		3	6	ug/L	NS					NS					63.4		1.5	3	ug/L	92.6		1.5	3	ug/L	61.4		1.5	3	ug/L	57.5		1.5	3	ug/L	NS				
SW6020	7440-48-4	Cobalt	T		0.47		ug/L	**5.54**		1	2	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**3.14**		0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	**U**	**0.5**	**1**	**ug/L**
SW6020	7440-48-4	Cobalt	D		0.47		ug/L	**< 1**	U	1	2	ug/L	NS					NS					**< 0.5**	U	0.5	1	ug/L	**0.903**	J	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	NS				
SW6020	7782-49-2	Selenium	T		7.8	50	ug/L	1	U	1	2	ug/L	0.5	UL	0.5	1	ug/L	0.5	UL	0.5	1	ug/L	0.726	K	0.5	1	ug/L	1.18		0.5	1	ug/L	0.676	J	0.5	1	ug/L	0.928	J	0.5	1	ug/L	1.49		0.5	1	ug/L
SW6020	7782-49-2	Selenium	D		7.8	50	ug/L	1	U	1	2	ug/L	NS					NS					0.7	J	0.5	1	ug/L	1.06		0.5	1	ug/L	0.523	J	0.5	1	ug/L	1.71	J	0.5	1	ug/L	NS				

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.
NS=Not Sampled because Turbidty was stable at less than or equl to 10 NTUs
Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

Table 3
November 2011 Screening Levels for Groundwater Metals Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 3

							Location ID	40MW5					40MW5					40MW5				
							Sample ID	40DUPGW112011					40MW5GW112011					40MW5GW030712				
							Sample Date	11/20/2011					11/20/2011					3/7/2012				
							Sample Type	FD					N					N				
Method	CAS	Chemical	fraction	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6010B	7429-90-5	Aluminum	T		1600		ug/L	1540		50	100	ug/L	1890		50	100	ug/L	221		50	100	ug/L
SW6010B	7429-90-5	Aluminum	D		1600		ug/L	50	U	50	100	ug/L	50	U	50	100	ug/L	NS				
SW6010B	7439-89-6	Iron	T		1100		ug/L	**1580**	L	50	100	ug/L	**2040**	L	50	100	ug/L	156		50	100	ug/L
SW6010B	7439-89-6	Iron	D		1100		ug/L	82	J	50	100	ug/L	74.1	J	50	100	ug/L	NS				
SW6010B	7439-95-4	Magnesium	T				ug/L	31300		250	500	ug/L	32500		250	500	ug/L	33500		250	500	ug/L
SW6010B	7439-95-4	Magnesium	D				ug/L	29600		250	500	ug/L	29800		250	500	ug/L	NS				
SW6010B	7440-09-7	Potassium	T				ug/L	1370		500	1000	ug/L	1370		500	1000	ug/L	1160		500	1000	ug/L
SW6010B	7440-09-7	Potassium	D				ug/L	1060		500	1000	ug/L	1080		500	1000	ug/L	NS				
SW6010B	7440-23-5	Sodium	T				ug/L	5480		250	500	ug/L	5220		250	500	ug/L	4790		250	500	ug/L
SW6010B	7440-23-5	Sodium	D				ug/L	5330		250	500	ug/L	5350		250	500	ug/L	NS				
SW6010B	7440-62-2	Vanadium	T		7.8		ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L
SW6010B	7440-62-2	Vanadium	D		7.8		ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	NS				
SW6010B	7440-70-2	Calcium	T				ug/L	84800		100	200	ug/L	87200		100	200	ug/L	93400	J	100	200	ug/L
SW6010B	7440-70-2	Calcium	D				ug/L	81700		100	200	ug/L	82800		100	200	ug/L	NS				
SW6020	7439-92-1	Lead	T			15	ug/L	1	U	1	2	ug/L	1	U	1	2	ug/L	0.5	U	0.5	1	ug/L
SW6020	7439-92-1	Lead	D			15	ug/L	1	U	1	2	ug/L	0.5	U	0.5	1.0	ug/L	NS				
SW6020	7439-96-5	Manganese	T		32		ug/L	7.67	B	2	4	ug/L	15.2	B	2	4	ug/L	1.11	J	1	2	ug/L
SW6020	7439-96-5	Manganese	D		32		ug/L	2	U	2	4	ug/L	1	U	1	2	ug/L	NS				
SW6020	7440-38-2	Arsenic	T	0.045	0.47	10	ug/L	**< 1**	U	1	2	ug/L	**< 1**	U	1	2	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-38-2	Arsenic	D	0.045	0.47	10	ug/L	**< 1**	U	1	2	ug/L	**< 0.5**	U	0.5	1.0	ug/L	NS				
SW6020	7440-39-3	Barium	T		290	2000	ug/L	59.9		3	6	ug/L	57.1		3	6	ug/L	57.2		1.5	3	ug/L
SW6020	7440-39-3	Barium	D		290	2000	ug/L	53.2		3	6	ug/L	55.4	J	1.5	3.0	ug/L	NS				
SW6020	7440-48-4	Cobalt	T		0.47		ug/L	**< 1**	U	1	2	ug/L	**< 1**	U	1	2	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-48-4	Cobalt	D		0.47		ug/L	**< 1**	U	1	2	ug/L	**< 0.5**	U	0.5	1.0	ug/L	NS				
SW6020	7782-49-2	Selenium	T		7.8	50	ug/L	1.06	J	1	2	ug/L	1.31	K	1	2	ug/L	0.775	L	0.5	1	ug/L
SW6020	7782-49-2	Selenium	D		7.8	50	ug/L	1.11	J	1	2	ug/L	1.19	K	0.5	1.0	ug/L	NS				

				Location ID	40MW5					40MW5					40MW5				
				Sample ID	40MW5GW061212					40DUPGW92512					40MW5GW92512				
				Sample Date	6/12/2012					9/25/2012					9/25/2012				
				Sample Type	N					FD					N				
Method	CAS	Chemical	fraction	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6010B	7429-90-5	Aluminum	T	ug/L	911		50	100	ug/L	140	J	50	100	ug/L	266	J	50	100	ug/L
SW6010B	7429-90-5	Aluminum	D	ug/L	50	U	50	100	ug/L	50	U	50	100	ug/L	50	U	50	100	ug/L
SW6010B	7439-89-6	Iron	T	ug/L	950		50	100	ug/L	123		50	100	ug/L	217		50	100	ug/L
SW6010B	7439-89-6	Iron	D	ug/L	50	U	50	100	ug/L	50	U	50	100	ug/L	50	U	50	100	ug/L
SW6010B	7439-95-4	Magnesium	T	ug/L	34700		2500	5000	ug/L	32500		250	500	ug/L	32000		250	500	ug/L
SW6010B	7439-95-4	Magnesium	D	ug/L	34600		2500	5000	ug/L	32100		250	500	ug/L	32300		250	500	ug/L
SW6010B	7440-09-7	Potassium	T	ug/L	1270		500	1000	ug/L	1260		500	1000	ug/L	1300		500	1000	ug/L
SW6010B	7440-09-7	Potassium	D	ug/L	1240		500	1000	ug/L	1230		500	1000	ug/L	1230		500	1000	ug/L
SW6010B	7440-23-5	Sodium	T	ug/L	5280		250	500	ug/L	5270		250	500	ug/L	5730		250	500	ug/L
SW6010B	7440-23-5	Sodium	D	ug/L	5170		250	500	ug/L	5420		250	500	ug/L	5430		250	500	ug/L
SW6010B	7440-62-2	Vanadium	T	ug/L	**8.74**	J	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L
SW6010B	7440-62-2	Vanadium	D	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L
SW6010B	7440-70-2	Calcium	T	ug/L	89900		1000	2000	ug/L	84900		100	200	ug/L	86900		100	200	ug/L
SW6010B	7440-70-2	Calcium	D	ug/L	88400		1000	2000	ug/L	86100		100	200	ug/L	89200		100	200	ug/L
SW6020	7439-92-1	Lead	T	ug/L	0.5	UL	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW6020	7439-92-1	Lead	D	ug/L	0.5	UL	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW6020	7439-96-5	Manganese	T	ug/L	4.84	L	1	2	ug/L	4	B	1	2	ug/L	2.13	B	1	2	ug/L
SW6020	7439-96-5	Manganese	D	ug/L	1	UL	1	2	ug/L	1	U	1	2	ug/L	1	U	1	2	ug/L
SW6020	7440-38-2	Arsenic	T	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-38-2	Arsenic	D	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-39-3	Barium	T	ug/L	56.9	L	1.5	3	ug/L	58.1		1.5	3	ug/L	56.2		1.5	3	ug/L
SW6020	7440-39-3	Barium	D	ug/L	54.3	L	1.5	3	ug/L	56.3		1.5	3	ug/L	58.7		1.5	3	ug/L
SW6020	7440-48-4	Cobalt	T	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-48-4	Cobalt	D	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7782-49-2	Selenium	T	ug/L	0.784	K	0.5	1	ug/L	1.02		0.5	1	ug/L	0.845	J	0.5	1	ug/L
SW6020	7782-49-2	Selenium	D	ug/L	0.847	K	0.5	1	ug/L	1.17		0.5	1	ug/L	1.05		0.5	1	ug/L

				Location ID	40MW5					40MW5					40MW5				
				Sample ID	40MW5GW61913					40MW5GW32714					40DUPGW32714				
				Sample Date	6/19/2013					3/27/2014					3/27/2014				
				Sample Type	N					N					FD				
Method	CAS	Chemical	fraction	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6010B	7429-90-5	Aluminum	T	ug/L	100	U	100	200	ug/L	169	J	100	200	ug/L	366		100	200	ug/L
SW6010B	7429-90-5	Aluminum	D	ug/L	NS					NS					NS				
SW6010B	7439-89-6	Iron	T	ug/L	137		50	100	ug/L	125	J	50	100	ug/L	339	J	50	100	ug/L
SW6010B	7439-89-6	Iron	D	ug/L	NS					NS					NS				
SW6010B	7439-95-4	Magnesium	T	ug/L	32500		250	500	ug/L	19000		250	500	ug/L	19500		250	500	ug/L
SW6010B	7439-95-4	Magnesium	D	ug/L	NS					NS					NS				
SW6010B	7440-09-7	Potassium	T	ug/L	1100		500	1000	ug/L	946	J	500	1000	ug/L	1020		500	1000	ug/L
SW6010B	7440-09-7	Potassium	D	ug/L	NS					NS					NS				
SW6010B	7440-23-5	Sodium	T	ug/L	4590		250	500	ug/L	5370		250	500	ug/L	5640		250	500	ug/L
SW6010B	7440-23-5	Sodium	D	ug/L	NS					NS					NS				
SW6010B	7440-62-2	Vanadium	T	ug/L	**10.5**		5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L
SW6010B	7440-62-2	Vanadium	D	ug/L	NS					NS					NS				
SW6010B	7440-70-2	Calcium	T	ug/L	91600		250	500	ug/L	68300		2500	5000	ug/L	72700		2500	5000	ug/L
SW6010B	7440-70-2	Calcium	D	ug/L	NS					NS					NS				
SW6020	7439-92-1	Lead	T	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW6020	7439-92-1	Lead	D	ug/L	NS					NS					NS				
SW6020	7439-96-5	Manganese	T	ug/L	1.8	J	1	2	ug/L	1.06	B	1	2	ug/L	1.57	B	1	2	ug/L
SW6020	7439-96-5	Manganese	D	ug/L	NS					NS					NS				
SW6020	7440-38-2	Arsenic	T	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	**U**	**0.5**	**1**	**ug/L**	**< 0.5**	**U**	**0.5**	**1**	**ug/L**
SW6020	7440-38-2	Arsenic	D	ug/L	NS					NS					NS				
SW6020	7440-39-3	Barium	T	ug/L	56.9		1.5	3	ug/L	34.1		1.5	3	ug/L	33.2		1.5	3	ug/L
SW6020	7440-39-3	Barium	D	ug/L	NS					NS					NS				
SW6020	7440-48-4	Cobalt	T	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	**U**	**0.5**	**1**	**ug/L**	**< 0.5**	**U**	**0.5**	**1**	**ug/L**
SW6020	7440-48-4	Cobalt	D	ug/L	NS					NS					NS				
SW6020	7782-49-2	Selenium	T	ug/L	0.943	J	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW6020	7782-49-2	Selenium	D	ug/L	NS					NS					NS				

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.
NS=Not Sampled because Turbidty was stable at less than or equl to 10 NTUs
Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

Table 3
November 2011 Screening Levels for Groundwater Metals Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 3

							Location ID	40MW6					40MW6					40MW6				
							Sample ID	40MW6GW112111					40MW6GW030712					40DUPGW061212				
							Sample Date	11/21/2011					3/7/2012					6/12/2012				
							Sample Type	N					N					FD				
Method	CAS	Chemical	fraction	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6010B	7429-90-5	Aluminum	T		1600		ug/L	242		50	100	ug/L	210		50	100	ug/L	209		50	100	ug/L
SW6010B	7429-90-5	Aluminum	D		1600		ug/L	NS					NS					NS				
SW6010B	7439-89-6	Iron	T		1100		ug/L	323	L	50	100	ug/L	155		50	100	ug/L	238		50	100	ug/L
SW6010B	7439-89-6	Iron	D		1100		ug/L	NS					NS					NS				
SW6010B	7439-95-4	Magnesium	T				ug/L	32000		250	500	ug/L	36100		250	500	ug/L	33100		2500	5000	ug/L
SW6010B	7439-95-4	Magnesium	D				ug/L	NS					NS					NS				
SW6010B	7440-09-7	Potassium	T				ug/L	1000		500	1000	ug/L	1020		500	1000	ug/L	1050		500	1000	ug/L
SW6010B	7440-09-7	Potassium	D				ug/L	NS					NS					NS				
SW6010B	7440-23-5	Sodium	T				ug/L	5100		250	500	ug/L	4400		250	500	ug/L	4960		250	500	ug/L
SW6010B	7440-23-5	Sodium	D				ug/L	NS					NS					NS				
SW6010B	7440-62-2	Vanadium	T		7.8		ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	6.42	J	5	10	ug/L
SW6010B	7440-62-2	Vanadium	D		7.8		ug/L	NS					NS					NS				
SW6010B	7440-70-2	Calcium	T				ug/L	84500		100	200	ug/L	98400	J	100	200	ug/L	85000		1000	2000	ug/L
SW6010B	7440-70-2	Calcium	D				ug/L	NS					NS					NS				
SW6020	7439-92-1	Lead	T			15	ug/L	1	U	1	2	ug/L	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L
SW6020	7439-92-1	Lead	D			15	ug/L	NS					NS					NS				
SW6020	7439-96-5	Manganese	T		32		ug/L	2	U	2	4	ug/L	1.09	J	1	2	ug/L	1.82	J	1	2	ug/L
SW6020	7439-96-5	Manganese	D		32		ug/L	NS					NS					NS				
SW6020	7440-38-2	Arsenic	T	0.045	0.47	10	ug/L	**< 1**	U	1	2	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-38-2	Arsenic	D	0.045	0.47	10	ug/L	NS					NS					NS				
SW6020	7440-39-3	Barium	T		290	2000	ug/L	49.9		3	6	ug/L	53.8		1.5	3	ug/L	48.8	L	1.5	3	ug/L
SW6020	7440-39-3	Barium	D		290	2000	ug/L	NS					NS					NS				
SW6020	7440-48-4	Cobalt	T		0.47		ug/L	**< 1**	U	1	2	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-48-4	Cobalt	D		0.47		ug/L	NS					NS					NS				
SW6020	7782-49-2	Selenium	T		7.8	50	ug/L	1.28	J	1	2	ug/L	0.5	U	0.5	1	ug/L	0.697	J	0.5	1	ug/L
SW6020	7782-49-2	Selenium	D		7.8	50	ug/L	NS					NS					NS				

					40MW6					40MW6					40MW6					40MW6				
					40MW6GW061212					40MW6GW92512					40MW6GW61913					40MW6GW32714				
					6/12/2012					9/25/2012					6/19/2013					3/27/2014				
					N					N					N					N				
Method	CAS	Chemical	fraction	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6010B	7429-90-5	Aluminum	T	ug/L	230		50	100	ug/L	467		50	100	ug/L	378		100	200	ug/L	288		100	200	ug/L
SW6010B	7429-90-5	Aluminum	D	ug/L	NS					50	U	50	100	ug/L	NS					NS				
SW6010B	7439-89-6	Iron	T	ug/L	296		50	100	ug/L	393		50	100	ug/L	478		50	100	ug/L	292	J	50	100	ug/L
SW6010B	7439-89-6	Iron	D	ug/L	NS					50	U	50	100	ug/L	NS					NS				
SW6010B	7439-95-4	Magnesium	T	ug/L	34000		2500	5000	ug/L	33700		250	500	ug/L	33900		250	500	ug/L	7560		250	500	ug/L
SW6010B	7439-95-4	Magnesium	D	ug/L	NS					33500		250	500	ug/L	NS					NS				
SW6010B	7440-09-7	Potassium	T	ug/L	1140		500	1000	ug/L	1220		500	1000	ug/L	1240		500	1000	ug/L	738	J	500	1000	ug/L
SW6010B	7440-09-7	Potassium	D	ug/L	NS					1140		500	1000	ug/L	NS					NS				
SW6010B	7440-23-5	Sodium	T	ug/L	5180		250	500	ug/L	5240		250	500	ug/L	4090		250	500	ug/L	7740	B	250	500	ug/L
SW6010B	7440-23-5	Sodium	D	ug/L	NS					5180		250	500	ug/L	NS					NS				
SW6010B	7440-62-2	Vanadium	T	ug/L	**8.09**	J	5	10	ug/L	5	U	5	10	ug/L	**10.9**		5	10	ug/L	5	U	5	10	ug/L
SW6010B	7440-62-2	Vanadium	D	ug/L	NS					5	U	5	10	ug/L	NS					NS				
SW6010B	7440-70-2	Calcium	T	ug/L	85300		1000	2000	ug/L	88200		100	200	ug/L	89800		250	500	ug/L	23500		250	500	ug/L
SW6010B	7440-70-2	Calcium	D	ug/L	NS					89400		100	200	ug/L	NS					NS				
SW6020	7439-92-1	Lead	T	ug/L	0.525	L	0.5	1	ug/L	0.733	J	0.5	1	ug/L	0.569	J	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW6020	7439-92-1	Lead	D	ug/L	NS					0.5	U	0.5	1	ug/L	NS					NS				
SW6020	7439-96-5	Manganese	T	ug/L	2.93	J	1	2	ug/L	2.41	B	1	2	ug/L	2.92		1	2	ug/L	1.66	B	1	2	ug/L
SW6020	7439-96-5	Manganese	D	ug/L	NS					1.07	B	1	2	ug/L	NS					NS				
SW6020	7440-38-2	Arsenic	T	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	**U**	**0.5**	**1**	**ug/L**
SW6020	7440-38-2	Arsenic	D	ug/L	NS					**< 0.5**	U	0.5	1	ug/L	NS					NS				
SW6020	7440-39-3	Barium	T	ug/L	52.2	L	1.5	3	ug/L	51.4		1.5	3	ug/L	49.1		1.5	3	ug/L	12.7		1.5	3	ug/L
SW6020	7440-39-3	Barium	D	ug/L	NS					51.5		1.5	3	ug/L	NS					NS				
SW6020	7440-48-4	Cobalt	T	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	**U**	**0.5**	**1**	**ug/L**
SW6020	7440-48-4	Cobalt	D	ug/L	NS					**< 0.5**	U	0.5	1	ug/L	NS					NS				
SW6020	7782-49-2	Selenium	T	ug/L	1.24	J	0.5	1	ug/L	0.943	J	0.5	1	ug/L	1.06		0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW6020	7782-49-2	Selenium	D	ug/L	NS					1.11		0.5	1	ug/L	NS					NS				

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.
NS=Not Sampled because Turbidty was stable at less than or equl to 10 NTUs
Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

Table 3
November 2011 Screening Levels for Groundwater Metals Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 3

							Location ID	40MW7					40MW7					40MW7					40MW7					40MW7					40MW7				
							Sample ID	40MW7GW112011					40MW7GW030612					40MW7GW601212					40MW7GW92512					40MW7GW61913					40MW7GW32714				
							Sample Date	11/20/2011					3/6/2012					6/12/2012					9/25/2012					6/19/2013					3/27/2014				
							Sample Type	N					N					N					N					N					N				
Method	CAS	Chemical	fraction	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6010B	7429-90-5	Aluminum	T		1600		ug/L	**8290**		50	100	ug/L	344		50	100	ug/L	70.3	J	50	100	ug/L	**1730**		50	100	ug/L	100	U	100	200	ug/L	100	U	100	200	ug/L
SW6010B	7429-90-5	Aluminum	D		1600		ug/L	50	U	50	100	ug/L	NS					NS					50	U	50	100	ug/L	NS					NS				
SW6010B	7439-89-6	Iron	T		1100		ug/L	**7950**	L	50	100	ug/L	263		50	100	ug/L	149		50	100	ug/L	**1620**		50	100	ug/L	55.3	J	50	100	ug/L	213	J	50	100	ug/L
SW6010B	7439-89-6	Iron	D		1100		ug/L	73.1	J	50	100	ug/L	NS					NS					50	U	50	100	ug/L	NS					NS				
SW6010B	7439-95-4	Magnesium	T				ug/L	61900		250	500	ug/L	36100		250	500	ug/L	36400		2500	5000	ug/L	41100		250	500	ug/L	32200		250	500	ug/L	32600		2500	5000	ug/L
SW6010B	7439-95-4	Magnesium	D				ug/L	32500		250	500	ug/L	NS					NS					36100		250	500	ug/L	NS					NS				
SW6010B	7440-09-7	Potassium	T				ug/L	4250		500	1000	ug/L	1720		500	1000	ug/L	1670		500	1000	ug/L	2130		500	1000	ug/L	1550		500	1000	ug/L	1570		500	1000	ug/L
SW6010B	7440-09-7	Potassium	D				ug/L	2300		500	1000	ug/L	NS					NS					1770		500	1000	ug/L	NS					NS				
SW6010B	7440-23-5	Sodium	T				ug/L	66700		250	500	ug/L	8540		250	500	ug/L	4030		250	500	ug/L	3510		250	500	ug/L	3990		250	500	ug/L	3660		250	500	ug/L
SW6010B	7440-23-5	Sodium	D				ug/L	78300		250	500	ug/L	NS					NS					3360		250	500	ug/L	NS					NS				
SW6010B	7440-62-2	Vanadium	T		7.8		ug/L	**9.26**	J	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	**9.8**	J	5	10	ug/L	5	U	5	10	ug/L
SW6010B	7440-62-2	Vanadium	D		7.8		ug/L	5	U	5	10	ug/L	NS					NS					5	U	5	10	ug/L	NS					NS				
SW6010B	7440-70-2	Calcium	T				ug/L	190000		100	200	ug/L	80600	J	100	200	ug/L	77800		1000	2000	ug/L	101000		100	200	ug/L	71300		250	500	ug/L	81500		2500	5000	ug/L
SW6010B	7440-70-2	Calcium	D				ug/L	70600		100	200	ug/L	NS					NS					77700		100	200	ug/L	NS					NS				
SW6020	7439-92-1	Lead	T			15	ug/L	9.37		1	2	ug/L	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L	1.61		0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW6020	7439-92-1	Lead	D			15	ug/L	1	U	1	2	ug/L	NS					NS					0.5	U	0.5	1	ug/L	NS					NS				
SW6020	7439-96-5	Manganese	T		32		ug/L	**181**		2	4	ug/L	10.8		1	2	ug/L	6.47	L	1	2	ug/L	26.5		1	2	ug/L	1.76	J	1	2	ug/L	1.88	B	1	2	ug/L
SW6020	7439-96-5	Manganese	D		32		ug/L	23.9	B	2	4	ug/L	NS					NS					3.77	B	1	2	ug/L	NS					NS				
SW6020	7440-38-2	Arsenic	T	0.045	0.47	10	ug/L	**2**	K	1	2	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**0.615**	J	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	**U**	**0.5**	**1**	**ug/L**
SW6020	7440-38-2	Arsenic	D	0.045	0.47	10	ug/L	**< 1**	U	1	2	ug/L	NS					NS					**< 0.5**	U	0.5	1	ug/L	NS					NS				
SW6020	7440-39-3	Barium	T		290	2000	ug/L	252		3	6	ug/L	145		1.5	3	ug/L	146	L	1.5	3	ug/L	172		1.5	3	ug/L	130		1.5	3	ug/L	118		1.5	3	ug/L
SW6020	7440-39-3	Barium	D		290	2000	ug/L	75.8		3	6	ug/L	NS					NS					170		1.5	3	ug/L	NS					NS				
SW6020	7440-48-4	Cobalt	T		0.47		ug/L	**3.04**		1	2	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**1.02**		0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	**U**	**0.5**	**1**	**ug/L**
SW6020	7440-48-4	Cobalt	D		0.47		ug/L	**< 1**	U	1	2	ug/L	NS					NS					**0.825**	J	0.5	1	ug/L	NS					NS				
SW6020	7782-49-2	Selenium	T		7.8	50	ug/L	1.86	K	1	2	ug/L	0.5	UL	0.5	1	ug/L	0.652	K	0.5	1	ug/L	0.848	J	0.5	1	ug/L	0.678	J	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW6020	7782-49-2	Selenium	D		7.8	50	ug/L	1.81	K	1	2	ug/L	NS					NS					0.913	J	0.5	1	ug/L	NS					NS				

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.
NS=Not Sampled because Turbidty was stable at less than or equl to 10 NTUs
Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

Table 4

November 2011 Screening Levels for Groundwater Perchlorate Data - Residential Tapwater Pathway

SWMU 40 (RAAP-009)

Radford Army Ammunition Plant

Longterm Monitoring Data Year 3

					Location ID	40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01				
					Sample ID	40LFMW01GW112111					40DUPGW030612					40LFMW01GW030612					LFMW01GW061212					LFMW01GW92612					40DUPGW61913					LFMW01GW61913					LFMW01GW32714				
					Sample Date	11/21/2011					3/6/2012					3/6/2012					6/12/2012					9/26/2012					6/19/2013					6/19/2013					3/27/2014				
					Sample Type	N					FD					N					N					N					FD					N					N				
Method	CAS	Chemical	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	Int Qual	VQ	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6850	14797-73-0	PERCHLORATE	1.1	15	ug/L	**9.67**	J	0.1	0.2	ug/L	**8.93**		0.1	0.2	ug/L	**8.88**		0.1	0.2	ug/L	**4.81**		0.1	0.2	ug/L	**8.75**		0.1	0.2	ug/L	**4.44**		0.2	0.4	ug/L	**4.38**		0.2	0.4	ug/L	**7.47**		0.1	0.2	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 4
November 2011 Screening Levels for Groundwater Perchlorate Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 3

					Location ID	40MW5					40MW5					40MW5					40MW5				
					Sample ID	40DUPGW112011					40MW5GW112011					40MW5GW030712					40MW5GW061212				
					Sample Date	11/20/2011					11/20/2011					3/7/2012					6/12/2012				
					Sample Type	FD					N					N					N				
Method	CAS	Chemical	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6850	14797-73-0	PERCHLORATE	1.1	15	ug/L	**1.55**	J	0.1	0.2	ug/L	**1.55**	J	0.1	0.2	ug/L	0.931		0.1	0.2	ug/L	0.986		0.1	0.2	ug/L

					Location ID	40MW5					40MW5					40MW5					40MW5				
					Sample ID	40DUPGW92512					40MW5GW92512					40MW5GW61913					40MW5GW32714				
					Sample Date	9/25/2012					9/25/2012					6/19/2013					3/27/2014				
					Sample Type	FD					N					N					N				
Method	CAS	Chemical	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6850	14797-73-0	PERCHLORATE	1.1	15	ug/L	**1.81**		0.1	0.2	ug/L	**1.71**		0.1	0.2	ug/L	0.85		0.1	0.2	ug/L	0.721		0.1	0.2	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 4
November 2011 Screening Levels for Groundwater Perchlorate Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 3

					Location ID	40MW6					40MW6					40MW6					40MW6					40MW6					40MW6					40MW6				
					Sample ID	40MW6GW112111					40MW6GW030712					40DUPGW061212					40MW6GW061212					40MW6GW92512					40MW6GW61913					40MW6GW32714				
					Sample Date	11/21/2011					3/7/2012					6/12/2012					6/12/2012					9/25/2012					6/19/2013					3/27/2014				
					Sample Type	N					N					FD					N					N					N					N				
Method	CAS	Chemical	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6850	14797-73-0	PERCHLORATE	1.1	15	ug/L	0.885	J	0.1	0.2	ug/L	0.526		0.1	0.2	ug/L	0.635		0.1	0.2	ug/L	0.647		0.1	0.2	ug/L	**1.25**		0.1	0.2	ug/L	0.535		0.1	0.2	ug/L	0.506		0.1	0.2	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 4
November 2011 Screening Levels for Groundwater Perchlorate Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 3

					Location ID	40MW7					40MW7					40MW7					40MW7					40MW7					40MW7				
					Sample ID	40MW7GW112011					40MW7GW030612					40MW7GW601212					40MW7GW92512					40MW7GW61913					40MW7GW32714				
					Sample Date	11/20/2011					3/6/2012					6/12/2012					9/25/2012					6/19/2013					3/27/2014				
					Sample Type	N					N					N					N					N					N				
Method	CAS	Chemical	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	Int Qual	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6850	14797-73-0	PERCHLORATE	1.1	15	ug/L	**4.5**	J	0.1	0.2	ug/L	**4.18**		0.1	0.2	ug/L	**3.69**		0.1	0.2	ug/L	**3.66**		0.1	0.2	ug/L	**4.1**		0.1	0.2	ug/L	**3.74**		0.1	0.2	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Level
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentration
B = Not detected substantially above the level reported in laboratory or field blanks.
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise.
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L = Analyte present. Reported value may be biased low. Actual value is expected to be higher
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported.

Table 1
November 2011 Screening Levels for Groundwater VOC Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 4

						Location ID	40LFMW01					40LFMW01					40LFMW01				
						Sample ID	40LFMW01GW112111					40DUPGW030612					40LFMW01GW030612				
						Sample Date	11/21/2011					3/6/2012					3/6/2012				
						Sample Type	N					FD					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8260B	110-75-8	2-Chloroethyl vinyl ether				ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L
SW8260B	67-64-1	Acetone		1200		ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L

						Location ID	40LFMW01					40LFMW01					40LFMW01				
						Sample ID	LFMW01GW061212					LFMW01GW92612					40DUPGW61913				
						Sample Date	6/12/2012					9/26/2012					6/19/2013				
						Sample Type	N					N					FD				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8260B	110-75-8	2-Chloroethyl vinyl ether				ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	U	2	10	ug/L
SW8260B	67-64-1	Acetone		1200		ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	U	2.5	10	ug/L

						Location ID	40LFMW01					40LFMW01					40LFMW01				
						Sample ID	LFMW01GW61913					LFMW01GW32714					LFMW01GW12214				
						Sample Date	6/19/2013					3/27/2014					12/2/2014				
						Sample Type	N					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8260B	110-75-8	2-Chloroethyl vinyl ether				ug/L	< 2	U	2	10	ug/L	< 2	U	2	10	ug/L	< 2	U	2	10	ug/L
SW8260B	67-64-1	Acetone		1200		ug/L	2.5	U	2.5	10	ug/L	2.5	UJ	2.5	10	ug/L	2.5	UJ	2.5	10	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate
Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentratior
B = Not detected substantially above the level reported in laboratory or field blanks
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower
L = Analyte present. Reported value may be biased low. Actual value is expected to be highe
UJ = Not detected. Quantitation limit may be inaccurate or imprecise
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported

Table 1
November 2011 Screening Levels for Groundwater VOC Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 4

						Location ID	40MW5					40MW5					40MW5					40MW5				
						Sample ID	40DUPGW112011					40MW5GW112011					40MW5GW030712					40MW5GW061212				
						Sample Date	11/20/2011					11/20/2011					3/7/2012					6/12/2012				
						Sample Type	FD					N					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8260B	110-75-8	2-Chloroethyl vinyl ether				ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L
SW8260B	67-64-1	Acetone		1200		ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L

						Location ID	40MW5					40MW5					40MW5					40MW5				
						Sample ID	40DUPGW92512					40MW5GW92512					40MW5GW61913					40MW5GW32714				
						Sample Date	9/25/2012					9/25/2012					6/19/2013					3/27/2014				
						Sample Type	FD					N					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8260B	110-75-8	2-Chloroethyl vinyl ether				ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	U	2	10	ug/L	< 2	U	2	10	ug/L
SW8260B	67-64-1	Acetone		1200		ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	UJ	2.5	10	ug/L

						Location ID	40MW5					40MW5					40MW5				
						Sample ID	40DUPGW32714					40MW5GW12214					40DUPGW12214				
						Sample Date	3/27/2014					12/2/2014					12/2/2014				
						Sample Type	FD					N					FD				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8260B	110-75-8	2-Chloroethyl vinyl ether				ug/L	< 2	U	2	10	ug/L	< 2	U	2	10	ug/L	< 2	U	2	10	ug/L
SW8260B	67-64-1	Acetone		1200		ug/L	2.5	UJ	2.5	10	ug/L	2.5	UJ	2.5	10	ug/L	2.5	UJ	2.5	10	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentratior
B = Not detected substantially above the level reported in laboratory or field blanks
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower
L = Analyte present. Reported value may be biased low. Actual value is expected to be highe
UJ = Not detected. Quantitation limit may be inaccurate or imprecise
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported

Table 1
November 2011 Screening Levels for Groundwater VOC Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 4

						Location ID	40MW6					40MW6					40MW6					40MW6					40MW6					40MW6					40MW6					40MW6				
						Sample ID	40MW6GW112111					40MW6GW030712					40DUPGW061212					40MW6GW061212					40MW6GW92512					40MW6GW61913					40MW6GW32714					40MW6GW12214				
						Sample Date	11/21/2011					3/7/2012					6/12/2012					6/12/2012					9/25/2012					6/19/2013					3/27/2014					12/2/2014				
						Sample Type	N					N					FD					N					N					N					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8260B	110-75-8	2-Chloroethyl vinyl ether				ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	U	2	10	ug/L	< 2	U	2	10	ug/L	< 2	U	2	10	ug/L
SW8260B	67-64-1	Acetone		1200		ug/L	2.5	U	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	U	2.5	10	ug/L	2.5	UJ	2.5	10	ug/L	2.5	UJ	2.5	10	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentratior
B = Not detected substantially above the level reported in laboratory or field blanks
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower
L = Analyte present. Reported value may be biased low. Actual value is expected to be highe
UJ = Not detected. Quantitation limit may be inaccurate or imprecise
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported

Table 1
November 2011 Screening Levels for Groundwater VOC Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 4

						Location ID	40MW7					40MW7					40MW7					40MW7					40MW7					40MW7					40MW7				
						Sample ID	40MW7GW112011					40MW7GW030612					40MW7GW601212					40MW7GW92512					40MW7GW61913					40MW7GW32714					40MW7GW12214				
						Sample Date	11/20/2011					3/6/2012					6/12/2012					9/25/2012					6/19/2013					3/27/2014					12/2/2014				
						Sample Type	N					N					N					N					N					N					N				
Method	CAS	Chemical	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW8260B	110-75-8	2-Chloroethyl vinyl ether				ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	R	2	10	ug/L	< 2	U	2	10	ug/L	< 2	U	2	10	ug/L	< 2	U	2	10	ug/L
SW8260B	67-64-1	Acetone		1200		ug/L	4.38	L	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	R	2.5	10	ug/L	2.5	UJ	2.5	10	ug/L	2.5	UJ	2.5	10	ug/L	2.5	UJ	2.5	10	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Level
T-NCSL = Adjusted Noncarcinogenic Screening Level
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentratior
B = Not detected substantially above the level reported in laboratory or field blanks
R = Unusable result. Analyte may or may not be present in the sample.
J = Analyte present. Reported value may or may not be accurate or precise
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower
L = Analyte present. Reported value may be biased low. Actual value is expected to be highe
UJ = Not detected. Quantitation limit may be inaccurate or imprecise
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported

Table 2
November 2011 Screening Levels for Groundwater Metals Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 4

							Location ID	40LFMW01					40LFMW01					40LFMW01				
							Sample ID	40LFMW01GW112111					40DUPGW030612					40LFMW01GW030612				
							Sample Date	11/21/2011					3/6/2012					3/6/2012				
							Sample Type	N					FD					N				
Method	CAS	Chemical	fraction	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6010B	7429-90-5	Aluminum	T		1600		ug/L	***17900***		50	100	ug/L	112		50	100	ug/L	123		50	100	ug/L
SW6010B	7429-90-5	Aluminum	D		1600		ug/L	50	U	50	100	ug/L	NS					NS				
SW6010B	7439-89-6	Iron	T		1100		ug/L	**21800**	L	50	100	ug/L	87.5	J	50	100	ug/L	93	J	50	100	ug/L
SW6010B	7439-89-6	Iron	D		1100		ug/L	102		50	100	ug/L	NS					NS				
SW6010B	7439-95-4	Magnesium	T				ug/L	74800		250	500	ug/L	27800		250	500	ug/L	28100		250	500	ug/L
SW6010B	7439-95-4	Magnesium	D				ug/L	33100		250	500	ug/L	NS					NS				
SW6010B	7440-09-7	Potassium	T				ug/L	5920		500	1000	ug/L	943	J	500	1000	ug/L	885	J	500	1000	ug/L
SW6010B	7440-09-7	Potassium	D				ug/L	1620		500	1000	ug/L	NS					NS				
SW6010B	7440-23-5	Sodium	T				ug/L	8230		250	500	ug/L	7860		250	500	ug/L	7690		250	500	ug/L
SW6010B	7440-23-5	Sodium	D				ug/L	8480		250	500	ug/L	NS					NS				
SW6010B	7440-62-2	Vanadium	T		7.8		ug/L	**32.5**		5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L
SW6010B	7440-62-2	Vanadium	D		7.8		ug/L	5	U	5	10	ug/L	NS					NS				
SW6010B	7440-70-2	Calcium	T				ug/L	142000		100	200	ug/L	71300	J	100	200	ug/L	71400	J	100	200	ug/L
SW6010B	7440-70-2	Calcium	D				ug/L	81500		100	200	ug/L	NS					NS				
SW6020	7439-92-1	Lead	T			15	ug/L	11		1	2	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW6020	7439-92-1	Lead	D			15	ug/L	< 1	U	1	2	ug/L	NS					NS				
SW6020	7439-96-5	Manganese	T		32		ug/L	**125**		2	4	ug/L	1.25	J	1	2	ug/L	1.52	J	1	2	ug/L
SW6020	7439-96-5	Manganese	D		32		ug/L	3.95	B	2	4	ug/L	NS					NS				
SW6020	7440-38-2	Arsenic	T	0.045	0.47	10	ug/L	**2.68**		1	2	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-38-2	Arsenic	D	0.045	0.47	10	ug/L	**< 1**	U	1	2	ug/L	NS					NS				
SW6020	7440-39-3	Barium	T		290	2000	ug/L	133		3	6	ug/L	94.7		1.5	3	ug/L	94.1		1.5	3	ug/L
SW6020	7440-39-3	Barium	D		290	2000	ug/L	90.2		3	6	ug/L	NS					NS				
SW6020	7440-48-4	Cobalt	T		0.47		ug/L	**5.54**		1	2	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-48-4	Cobalt	D		0.47		ug/L	**< 1**	U	1	2	ug/L	NS					NS				
SW6020	7782-49-2	Selenium	T		7.8	50	ug/L	1	U	1	2	ug/L	0.5	UL	0.5	1	ug/L	0.5	UL	0.5	1	ug/L
SW6020	7782-49-2	Selenium	D		7.8	50	ug/L	1	U	1	2	ug/L	NS					NS				

							Location ID	40LFMW01					40LFMW01					40LFMW01				
							Sample ID	LFMW01GW061212					LFMW01GW92612					40DUPGW61913				
							Sample Date	6/12/2012					9/26/2012					6/19/2013				
							Sample Type	N					N					FD				
Method	CAS	Chemical	fraction	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6010B	7429-90-5	Aluminum	T		1600		ug/L	74.8	J	50	100	ug/L	**9150**		50	100	ug/L	127	J	100	200	ug/L
SW6010B	7429-90-5	Aluminum	D		1600		ug/L	50	U	50	100	ug/L	92.9	J	50	100	ug/L	< 100	U	100	200	ug/L
SW6010B	7439-89-6	Iron	T		1100		ug/L	120		50	100	ug/L	**8950**		50	100	ug/L	290		50	100	ug/L
SW6010B	7439-89-6	Iron	D		1100		ug/L	50	U	50	100	ug/L	74.1	J	50	100	ug/L	50	U	50	100	ug/L
SW6010B	7439-95-4	Magnesium	T				ug/L	33800		2500	5000	ug/L	51100		250	500	ug/L	30300		250	500	ug/L
SW6010B	7439-95-4	Magnesium	D				ug/L	32700		2500	5000	ug/L	35400		250	500	ug/L	29300		250	500	ug/L
SW6010B	7440-09-7	Potassium	T				ug/L	1740		500	1000	ug/L	3700		500	1000	ug/L	1740		500	1000	ug/L
SW6010B	7440-09-7	Potassium	D				ug/L	1630		500	1000	ug/L	1690		500	1000	ug/L	1620		500	1000	ug/L
SW6010B	7440-23-5	Sodium	T				ug/L	8450		250	500	ug/L	6640		250	500	ug/L	8410		250	500	ug/L
SW6010B	7440-23-5	Sodium	D				ug/L	8120		250	500	ug/L	7100		250	500	ug/L	8490		250	500	ug/L
SW6010B	7440-62-2	Vanadium	T		7.8		ug/L	5	U	5	10	ug/L	**18.1**		5	10	ug/L	**8.64**	J	5	10	ug/L
SW6010B	7440-62-2	Vanadium	D		7.8		ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	**10.9**		5	10	ug/L
SW6010B	7440-70-2	Calcium	T				ug/L	82800		1000	2000	ug/L	105000		100	200	ug/L	75800		250	500	ug/L
SW6010B	7440-70-2	Calcium	D				ug/L	82000		1000	2000	ug/L	85700		100	200	ug/L	78100		250	500	ug/L
SW6020	7439-92-1	Lead	T			15	ug/L	0.5	UL	0.5	1	ug/L	5.46		0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW6020	7439-92-1	Lead	D			15	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW6020	7439-96-5	Manganese	T		32		ug/L	2.18	L	1	2	ug/L	**52.6**		1	2	ug/L	2.48		1	2	ug/L
SW6020	7439-96-5	Manganese	D		32		ug/L	1	UL	1	2	ug/L	1	U	1	2	ug/L	1	U	1	2	ug/L
SW6020	7440-38-2	Arsenic	T	0.045	0.47	10	ug/L	**< 0.5**	U	0.5	1	ug/L	**1.43**		0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-38-2	Arsenic	D	0.045	0.47	10	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-39-3	Barium	T		290	2000	ug/L	65.7	L	1.5	3	ug/L	125		1.5	3	ug/L	61.9		1.5	3	ug/L
SW6020	7440-39-3	Barium	D		290	2000	ug/L	63.4		1.5	3	ug/L	92.6		1.5	3	ug/L	61.4		1.5	3	ug/L
SW6020	7440-48-4	Cobalt	T		0.47		ug/L	**< 0.5**	U	0.5	1	ug/L	**3.14**		0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-48-4	Cobalt	D		0.47		ug/L	**< 0.5**	U	0.5	1	ug/L	**0.903**	J	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7782-49-2	Selenium	T		7.8	50	ug/L	0.726	K	0.5	1	ug/L	1.18		0.5	1	ug/L	0.676	J	0.5	1	ug/L
SW6020	7782-49-2	Selenium	D		7.8	50	ug/L	0.7	J	0.5	1	ug/L	1.06		0.5	1	ug/L	0.523	J	0.5	1	ug/L

							Location ID	40LFMW01					40LFMW01					40LFMW01				
							Sample ID	LFMW01GW61913					LFMW01GW32714					LFMW01GW12214				
							Sample Date	6/19/2013					3/27/2014					12/2/2014				
							Sample Type	N					N					N				
Method	CAS	Chemical	fraction	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6010B	7429-90-5	Aluminum	T		1600		ug/L	145	J	100	200	ug/L	124	J	100	200	ug/L	526		100	200	ug/L
SW6010B	7429-90-5	Aluminum	D		1600		ug/L	100	U	100	200	ug/L	NS					NS				
SW6010B	7439-89-6	Iron	T		1100		ug/L	311		50	100	ug/L	172	J	50	100	ug/L	527		50	100	ug/L
SW6010B	7439-89-6	Iron	D		1100		ug/L	50	U	50	100	ug/L	NS					NS				
SW6010B	7439-95-4	Magnesium	T				ug/L	29200		250	500	ug/L	34600		250	500	ug/L	22300		250	500	ug/L
SW6010B	7439-95-4	Magnesium	D				ug/L	29800		250	500	ug/L	NS					NS				
SW6010B	7440-09-7	Potassium	T				ug/L	1660		500	1000	ug/L	1730		500	1000	ug/L	1290		500	1000	ug/L
SW6010B	7440-09-7	Potassium	D				ug/L	1690		500	1000	ug/L	NS					NS				
SW6010B	7440-23-5	Sodium	T				ug/L	8180		250	500	ug/L	5260		250	500	ug/L	6080	B	250	500	ug/L
SW6010B	7440-23-5	Sodium	D				ug/L	8540		250	500	ug/L	NS					NS				
SW6010B	7440-62-2	Vanadium	T		7.8		ug/L	**9.29**	J	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L
SW6010B	7440-62-2	Vanadium	D		7.8		ug/L	**10.8**		5	10	ug/L	NS					NS				
SW6010B	7440-70-2	Calcium	T				ug/L	75900		250	500	ug/L	92400		2500	5000	ug/L	63900		2500	5000	ug/L
SW6010B	7440-70-2	Calcium	D				ug/L	77700		250	500	ug/L	NS					NS				
SW6020	7439-92-1	Lead	T			15	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L
SW6020	7439-92-1	Lead	D			15	ug/L	0.5	U	0.5	1	ug/L	NS					NS				
SW6020	7439-96-5	Manganese	T		32		ug/L	2.89		1	2	ug/L	2.75	B	1	2	ug/L	3.68	L	1	2	ug/L
SW6020	7439-96-5	Manganese	D		32		ug/L	1	U	1	2	ug/L	NS					NS				
SW6020	7440-38-2	Arsenic	T	0.045	0.47	10	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-38-2	Arsenic	D	0.045	0.47	10	ug/L	**< 0.5**	U	0.5	1	ug/L	NS					NS				
SW6020	7440-39-3	Barium	T		290	2000	ug/L	62.3		1.5	3	ug/L	69.8		1.5	3	ug/L	49.4		1.5	3	ug/L
SW6020	7440-39-3	Barium	D		290	2000	ug/L	57.5		1.5	3	ug/L	NS					NS				
SW6020	7440-48-4	Cobalt	T		0.47		ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-48-4	Cobalt	D		0.47		ug/L	**< 0.5**	U	0.5	1	ug/L	NS					NS				
SW6020	7782-49-2	Selenium	T		7.8	50	ug/L	0.928	J	0.5	1	ug/L	1.49		0.5	1	ug/L	0.738	L	0.5	1	ug/L
SW6020	7782-49-2	Selenium	D		7.8	50	ug/L	1.71	J	0.5	1	ug/L	NS					NS				

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Leve
T-NCSL = Adjusted Noncarcinogenic Screening Leve
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

U = Not Detected. The asscociated number indicates the approximate sample concentratior
B = Not detected substantially above the level reported in laboratory or field blanks
R = Unusable result. Analyte may or may not be present in the sample
J = Analyte present. Reported value may or may not be accurate or precise
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower
L = Analyte present. Reported value may be biased low. Actual value is expected to be highe
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported
NS=Not Sampled because Turbidty was stable at less than or equl to 10 NTUs
Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

KEMRON
ENVIRONMENTAL SERVICES

Table 2

November 2011 Screening Levels for Groundwater Metals Data - Residential Tapwater Pathway

SWMU 40 (RAAP-009)

Radford Army Ammunition Plant

Longterm Monitoring Data Year 4

							Location ID	40MW5					40MW5					40MW5					40MW5				
							Sample ID	40DUPGW112011					40MW5GW112011					40MW5GW030712					40MW5GW061212				
							Sample Date	11/20/2011					11/20/2011					3/7/2012					6/12/2012				
							Sample Type	FD					N					N					N				
Method	CAS	Chemical	fraction	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6010B	7429-90-5	Aluminum	T		1600		ug/L	1540		50	100	ug/L	1890		50	100	ug/L	221		50	100	ug/L	911		50	100	ug/L
SW6010B	7429-90-5	Aluminum	D		1600		ug/L	50	U	50	100	ug/L	50	U	50	100	ug/L	NS					50	U	50	100	ug/L
SW6010B	7439-89-6	Iron	T		1100		ug/L	**1580**	L	50	100	ug/L	**2040**	L	50	100	ug/L	156		50	100	ug/L	950		50	100	ug/L
SW6010B	7439-89-6	Iron	D		1100		ug/L	82	J	50	100	ug/L	74.1	J	50	100	ug/L	NS					50	U	50	100	ug/L
SW6010B	7439-95-4	Magnesium	T				ug/L	31300		250	500	ug/L	32500		250	500	ug/L	33500		250	500	ug/L	34700		2500	5000	ug/L
SW6010B	7439-95-4	Magnesium	D				ug/L	29600		250	500	ug/L	29800		250	500	ug/L	NS					34600		2500	5000	ug/L
SW6010B	7440-09-7	Potassium	T				ug/L	1370		500	1000	ug/L	1370		500	1000	ug/L	1160		500	1000	ug/L	1270		500	1000	ug/L
SW6010B	7440-09-7	Potassium	D				ug/L	1060		500	1000	ug/L	1080		500	1000	ug/L	NS					1240		500	1000	ug/L
SW6010B	7440-23-5	Sodium	T				ug/L	5480		250	500	ug/L	5220		250	500	ug/L	4790		250	500	ug/L	5280		250	500	ug/L
SW6010B	7440-23-5	Sodium	D				ug/L	5330		250	500	ug/L	5350		250	500	ug/L	NS					5170		250	500	ug/L
SW6010B	7440-62-2	Vanadium	T		7.8		ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	**8.74**	J	5	10	ug/L
SW6010B	7440-62-2	Vanadium	D		7.8		ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	NS					5	U	5	10	ug/L
SW6010B	7440-70-2	Calcium	T				ug/L	84800		100	200	ug/L	87200		100	200	ug/L	93400	J	100	200	ug/L	89900		1000	2000	ug/L
SW6010B	7440-70-2	Calcium	D				ug/L	81700		100	200	ug/L	82800		100	200	ug/L	NS					88400		1000	2000	ug/L
SW6020	7439-92-1	Lead	T			15	ug/L	1	U	1	2	ug/L	1	U	1	2	ug/L	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L
SW6020	7439-92-1	Lead	D			15	ug/L	1	U	1	2	ug/L	0.5	U	0.5	1.0	ug/L	NS					0.5	UL	0.5	1	ug/L
SW6020	7439-96-5	Manganese	T		32		ug/L	7.67	B	2	4	ug/L	15.2	B	2	4	ug/L	1.11	J	1	2	ug/L	4.84	L	1	2	ug/L
SW6020	7439-96-5	Manganese	D		32		ug/L	2	U	2	4	ug/L	1	U	1	2	ug/L	NS					1	UL	1	2	ug/L
SW6020	7440-38-2	Arsenic	T	0.045	0.47	10	ug/L	**< 1**	U	1	2	ug/L	**< 1**	U	1	2	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-38-2	Arsenic	D	0.045	0.47	10	ug/L	**< 1**	U	1	2	ug/L	**< 0.5**	U	0.5	1.0	ug/L	NS					**< 0.5**	U	0.5	1	ug/L
SW6020	7440-39-3	Barium	T		290	2000	ug/L	59.9		3	6	ug/L	57.1		3	6	ug/L	57.2		1.5	3	ug/L	56.9	L	1.5	3	ug/L
SW6020	7440-39-3	Barium	D		290	2000	ug/L	53.2		3	6	ug/L	55.4	J	1.5	3.0	ug/L	NS					54.3	L	1.5	3	ug/L
SW6020	7440-48-4	Cobalt	T		0.47		ug/L	**< 1**	U	1	2	ug/L	**< 1**	U	1	2	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-48-4	Cobalt	D		0.47		ug/L	**< 1**	U	1	2	ug/L	**< 0.5**	U	0.5	1.0	ug/L	NS					**< 0.5**	U	0.5	1	ug/L
SW6020	7782-49-2	Selenium	T		7.8	50	ug/L	1.06	J	1	2	ug/L	1.31	K	1	2	ug/L	0.775	L	0.5	1	ug/L	0.784	K	0.5	1	ug/L
SW6020	7782-49-2	Selenium	D		7.8	50	ug/L	1.11	J	1	2	ug/L	1.19	K	0.5	1.0	ug/L	NS					0.847	K	0.5	1	ug/L

			Location ID	40MW5					40MW5					40MW5					40MW5				
			Sample ID	40DUPGW92512					40MW5GW92512					40MW5GW61913					40MW5GW32714				
			Sample Date	9/25/2012					9/25/2012					6/19/2013					3/27/2014				
			Sample Type	FD					N					N					N				
Method	CAS	Chemical	fraction	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6010B	7429-90-5	Aluminum	T	140	J	50	100	ug/L	266	J	50	100	ug/L	100	U	100	200	ug/L	169	J	100	200	ug/L
SW6010B	7429-90-5	Aluminum	D	50	U	50	100	ug/L	50	U	50	100	ug/L	NS					NS				
SW6010B	7439-89-6	Iron	T	123		50	100	ug/L	217		50	100	ug/L	137		50	100	ug/L	125	J	50	100	ug/L
SW6010B	7439-89-6	Iron	D	50	U	50	100	ug/L	50	U	50	100	ug/L	NS					NS				
SW6010B	7439-95-4	Magnesium	T	32500		250	500	ug/L	32000		250	500	ug/L	32500		250	500	ug/L	19000		250	500	ug/L
SW6010B	7439-95-4	Magnesium	D	32100		250	500	ug/L	32300		250	500	ug/L	NS					NS				
SW6010B	7440-09-7	Potassium	T	1260		500	1000	ug/L	1300		500	1000	ug/L	1100		500	1000	ug/L	946	J	500	1000	ug/L
SW6010B	7440-09-7	Potassium	D	1230		500	1000	ug/L	1230		500	1000	ug/L	NS					NS				
SW6010B	7440-23-5	Sodium	T	5270		250	500	ug/L	5730		250	500	ug/L	4590		250	500	ug/L	5370		250	500	ug/L
SW6010B	7440-23-5	Sodium	D	5420		250	500	ug/L	5430		250	500	ug/L	NS					NS				
SW6010B	7440-62-2	Vanadium	T	5	U	5	10	ug/L	5	U	5	10	ug/L	**10.5**		5	10	ug/L	5	U	5	10	ug/L
SW6010B	7440-62-2	Vanadium	D	5	U	5	10	ug/L	5	U	5	10	ug/L	NS					NS				
SW6010B	7440-70-2	Calcium	T	84900		100	200	ug/L	86900		100	200	ug/L	91600		250	500	ug/L	68300		2500	5000	ug/L
SW6010B	7440-70-2	Calcium	D	86100		100	200	ug/L	89200		100	200	ug/L	NS					NS				
SW6020	7439-92-1	Lead	T	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW6020	7439-92-1	Lead	D	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	NS					NS				
SW6020	7439-96-5	Manganese	T	4	B	1	2	ug/L	2.13	B	1	2	ug/L	1.8	J	1	2	ug/L	1.06	B	1	2	ug/L
SW6020	7439-96-5	Manganese	D	1	U	1	2	ug/L	1	U	1	2	ug/L	NS					NS				
SW6020	7440-38-2	Arsenic	T	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-38-2	Arsenic	D	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	NS					NS				
SW6020	7440-39-3	Barium	T	58.1		1.5	3	ug/L	56.2		1.5	3	ug/L	56.9		1.5	3	ug/L	34.1		1.5	3	ug/L
SW6020	7440-39-3	Barium	D	56.3		1.5	3	ug/L	58.7		1.5	3	ug/L	NS					NS				
SW6020	7440-48-4	Cobalt	T	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-48-4	Cobalt	D	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	NS					NS				
SW6020	7782-49-2	Selenium	T	1.02		0.5	1	ug/L	0.845	J	0.5	1	ug/L	0.943	J	0.5	1	ug/L	0.5	U	0.5	1	ug/L
SW6020	7782-49-2	Selenium	D	1.17		0.5	1	ug/L	1.05		0.5	1	ug/L	NS					NS				

			Location ID	40MW5					40MW5					40MW5				
			Sample ID	40DUPGW32714					40MW5GW12214					40DUPGW12214				
			Sample Date	3/27/2014					12/2/2014					12/2/2014				
			Sample Type	FD					N					FD				
Method	CAS	Chemical	fraction	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6010B	7429-90-5	Aluminum	T	366		100	200	ug/L	256		100	200	ug/L	300		100	200	ug/L
SW6010B	7429-90-5	Aluminum	D	NS					NS					NS				
SW6010B	7439-89-6	Iron	T	339	J	50	100	ug/L	155		50	100	ug/L	177		50	100	ug/L
SW6010B	7439-89-6	Iron	D	NS					NS					NS				
SW6010B	7439-95-4	Magnesium	T	19500		250	500	ug/L	13200		250	500	ug/L	12400		250	500	ug/L
SW6010B	7439-95-4	Magnesium	D	NS					NS					NS				
SW6010B	7440-09-7	Potassium	T	1020		500	1000	ug/L	764	J	500	1000	ug/L	817	J	500	1000	ug/L
SW6010B	7440-09-7	Potassium	D	NS					NS					NS				
SW6010B	7440-23-5	Sodium	T	5640		250	500	ug/L	6580	B	250	500	ug/L	6350	B	250	500	ug/L
SW6010B	7440-23-5	Sodium	D	NS					NS					NS				
SW6010B	7440-62-2	Vanadium	T	5	U	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L
SW6010B	7440-62-2	Vanadium	D	NS					NS					NS				
SW6010B	7440-70-2	Calcium	T	72700		2500	5000	ug/L	41400		2500	5000	ug/L	41000		2500	5000	ug/L
SW6010B	7440-70-2	Calcium	D	NS					NS					NS				
SW6020	7439-92-1	Lead	T	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L	0.5	UL	0.5	1	ug/L
SW6020	7439-92-1	Lead	D	NS					NS					NS				
SW6020	7439-96-5	Manganese	T	1.57	B	1	2	ug/L	1	UL	1	2	ug/L	1	UL	1	2	ug/L
SW6020	7439-96-5	Manganese	D	NS					NS					NS				
SW6020	7440-38-2	Arsenic	T	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-38-2	Arsenic	D	NS					NS					NS				
SW6020	7440-39-3	Barium	T	33.2		1.5	3	ug/L	24		1.5	3	ug/L	24.1		1.5	3	ug/L
SW6020	7440-39-3	Barium	D	NS					NS					NS				
SW6020	7440-48-4	Cobalt	T	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-48-4	Cobalt	D	NS					NS					NS				
SW6020	7782-49-2	Selenium	T	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L	0.5	UL	0.5	1	ug/L
SW6020	7782-49-2	Selenium	D	NS					NS					NS				

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Leve
T-NCSL = Adjusted Noncarcinogenic Screening Leve
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

U = Not Detected. The asscociated number indicates the approximate sample concentratior
B = Not detected substantially above the level reported in laboratory or field blanks
R = Unusable result. Analyte may or may not be present in the sample
J = Analyte present. Reported value may or may not be accurate or precise
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower
L = Analyte present. Reported value may be biased low. Actual value is expected to be highe
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported
NS=Not Sampled because Turbidty was stable at less than or equl to 10 NTUs
Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

KEMRON
ENVIRONMENTAL SERVICES

Table 2
November 2011 Screening Levels for Groundwater Metals Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 4

							Location ID	40MW6					40MW6					40MW6					40MW6				
							Sample ID	40MW6GW112111					40MW6GW030712					40DUPGW061212					40MW6GW061212				
							Sample Date	11/21/2011					3/7/2012					6/12/2012					6/12/2012				
							Sample Type	N					N					FD					N				
Method	CAS	Chemical	fraction	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6010B	7429-90-5	Aluminum	T		1600		ug/L	242		50	100	ug/L	210		50	100	ug/L	209		50	100	ug/L	230		50	100	ug/L
SW6010B	7429-90-5	Aluminum	D		1600		ug/L	NS					NS					NS					NS				
SW6010B	7439-89-6	Iron	T		1100		ug/L	323	L	50	100	ug/L	155		50	100	ug/L	238		50	100	ug/L	296		50	100	ug/L
SW6010B	7439-89-6	Iron	D		1100		ug/L	NS					NS					NS					NS				
SW6010B	7439-95-4	Magnesium	T				ug/L	32000		250	500	ug/L	36100		250	500	ug/L	33100		2500	5000	ug/L	34000		2500	5000	ug/L
SW6010B	7439-95-4	Magnesium	D				ug/L	NS					NS					NS					NS				
SW6010B	7440-09-7	Potassium	T				ug/L	1000		500	1000	ug/L	1020		500	1000	ug/L	1050		500	1000	ug/L	1140		500	1000	ug/L
SW6010B	7440-09-7	Potassium	D				ug/L	NS					NS					NS					NS				
SW6010B	7440-23-5	Sodium	T				ug/L	5100		250	500	ug/L	4400		250	500	ug/L	4960		250	500	ug/L	5180		250	500	ug/L
SW6010B	7440-23-5	Sodium	D				ug/L	NS					NS					NS					NS				
SW6010B	7440-62-2	Vanadium	T		7.8		ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	6.42	J	5	10	ug/L	**8.09**	J	5	10	ug/L
SW6010B	7440-62-2	Vanadium	D		7.8		ug/L	NS					NS					NS					NS				
SW6010B	7440-70-2	Calcium	T				ug/L	84500		100	200	ug/L	98400	J	100	200	ug/L	85000		1000	2000	ug/L	85300		1000	2000	ug/L
SW6010B	7440-70-2	Calcium	D				ug/L	NS					NS					NS					NS				
SW6020	7439-92-1	Lead	T			15	ug/L	1	U	1	2	ug/L	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L	0.525	L	0.5	1	ug/L
SW6020	7439-92-1	Lead	D			15	ug/L	NS					NS					NS					NS				
SW6020	7439-96-5	Manganese	T		32		ug/L	2	U	2	4	ug/L	1.09	J	1	2	ug/L	1.82	J	1	2	ug/L	2.93	J	1	2	ug/L
SW6020	7439-96-5	Manganese	D		32		ug/L	NS					NS					NS					NS				
SW6020	7440-38-2	Arsenic	T	0.045	0.47	10	ug/L	**< 1**	U	1	2	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-38-2	Arsenic	D	0.045	0.47	10	ug/L	NS					NS					NS					NS				
SW6020	7440-39-3	Barium	T		290	2000	ug/L	49.9		3	6	ug/L	53.8		1.5	3	ug/L	48.8	L	1.5	3	ug/L	52.2	L	1.5	3	ug/L
SW6020	7440-39-3	Barium	D		290	2000	ug/L	NS					NS					NS					NS				
SW6020	7440-48-4	Cobalt	T		0.47		ug/L	**< 1**	U	1	2	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-48-4	Cobalt	D		0.47		ug/L	NS					NS					NS					NS				
SW6020	7782-49-2	Selenium	T		7.8	50	ug/L	1.28	J	1	2	ug/L	0.5	U	0.5	1	ug/L	0.697	J	0.5	1	ug/L	1.24	J	0.5	1	ug/L
SW6020	7782-49-2	Selenium	D		7.8	50	ug/L	NS					NS					NS					NS				

							Location ID	40MW6					40MW6					40MW6					40MW6				
							Sample ID	40MW6GW92512					40MW6GW61913					40MW6GW32714					40MW6GW12214				
							Sample Date	9/25/2012					6/19/2013					3/27/2014					12/2/2014				
							Sample Type	N					N					N					N				
Method	CAS	Chemical	fraction	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6010B	7429-90-5	Aluminum	T		1600		ug/L	467		50	100	ug/L	378		100	200	ug/L	288		100	200	ug/L	466		100	200	ug/L
SW6010B	7429-90-5	Aluminum	D		1600		ug/L	50	U	50	100	ug/L	NS					NS					NS				
SW6010B	7439-89-6	Iron	T		1100		ug/L	393		50	100	ug/L	478		50	100	ug/L	292	J	50	100	ug/L	451		50	100	ug/L
SW6010B	7439-89-6	Iron	D		1100		ug/L	50	U	50	100	ug/L	NS					NS					NS				
SW6010B	7439-95-4	Magnesium	T				ug/L	33700		250	500	ug/L	33900		250	500	ug/L	7560		250	500	ug/L	6790		250	500	ug/L
SW6010B	7439-95-4	Magnesium	D				ug/L	33500		250	500	ug/L	NS					NS					NS				
SW6010B	7440-09-7	Potassium	T				ug/L	1220		500	1000	ug/L	1240		500	1000	ug/L	738	J	500	1000	ug/L	1120		500	1000	ug/L
SW6010B	7440-09-7	Potassium	D				ug/L	1140		500	1000	ug/L	NS					NS					NS				
SW6010B	7440-23-5	Sodium	T				ug/L	5240		250	500	ug/L	4090		250	500	ug/L	7740	B	250	500	ug/L	7980	B	250	500	ug/L
SW6010B	7440-23-5	Sodium	D				ug/L	5180		250	500	ug/L	NS					NS					NS				
SW6010B	7440-62-2	Vanadium	T		7.8		ug/L	5	U	5	10	ug/L	**10.9**		5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L
SW6010B	7440-62-2	Vanadium	D		7.8		ug/L	5	U	5	10	ug/L	NS					NS					NS				
SW6010B	7440-70-2	Calcium	T				ug/L	88200		100	200	ug/L	89800		250	500	ug/L	23500		250	500	ug/L	22200		250	500	ug/L
SW6010B	7440-70-2	Calcium	D				ug/L	89400		100	200	ug/L	NS					NS					NS				
SW6020	7439-92-1	Lead	T			15	ug/L	0.733	J	0.5	1	ug/L	0.569	J	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L
SW6020	7439-92-1	Lead	D			15	ug/L	0.5	U	0.5	1	ug/L	NS					NS					NS				
SW6020	7439-96-5	Manganese	T		32		ug/L	2.41	B	1	2	ug/L	2.92		1	2	ug/L	1.66	B	1	2	ug/L	2.65	L	1	2	ug/L
SW6020	7439-96-5	Manganese	D		32		ug/L	1.07	B	1	2	ug/L	NS					NS					NS				
SW6020	7440-38-2	Arsenic	T	0.045	0.47	10	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-38-2	Arsenic	D	0.045	0.47	10	ug/L	**< 0.5**	U	0.5	1	ug/L	NS					NS					NS				
SW6020	7440-39-3	Barium	T		290	2000	ug/L	51.4		1.5	3	ug/L	49.1		1.5	3	ug/L	12.7		1.5	3	ug/L	12.2		1.5	3	ug/L
SW6020	7440-39-3	Barium	D		290	2000	ug/L	51.5		1.5	3	ug/L	NS					NS					NS				
SW6020	7440-48-4	Cobalt	T		0.47		ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-48-4	Cobalt	D		0.47		ug/L	**< 0.5**	U	0.5	1	ug/L	NS					NS					NS				
SW6020	7782-49-2	Selenium	T		7.8	50	ug/L	0.943	J	0.5	1	ug/L	1.06		0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L
SW6020	7782-49-2	Selenium	D		7.8	50	ug/L	1.11		0.5	1	ug/L	NS					NS					NS				

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Leve
T-NCSL = Adjusted Noncarcinogenic Screening Leve
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

U = Not Detected. The asscociated number indicates the approximate sample concentratior
B = Not detected substantially above the level reported in laboratory or field blanks
R = Unusable result. Analyte may or may not be present in the sample
J = Analyte present. Reported value may or may not be accurate or precise
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower
L = Analyte present. Reported value may be biased low. Actual value is expected to be highe
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported
NS=Not Sampled because Turbidty was stable at less than or equl to 10 NTUs
Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

Table 2
November 2011 Screening Levels for Groundwater Metals Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 4

							Location ID	40MW7					40MW7					40MW7					40MW7					40MW7					40MW7					ze the				
							Sample ID	40MW7GW112011					40MW7GW030612					40MW7GW601212					40MW7GW92512					40MW7GW61913					40MW7GW32714					40MW7GW12214				
							Sample Date	11/20/2011					3/6/2012					6/12/2012					9/25/2012					6/19/2013					3/27/2014					12/2/2014				
							Sample Type	N					N					N					N					N					N					N				
Method	CAS	Chemical	fraction	CSL	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6010B	7429-90-5	Aluminum	T		1600		ug/L	**8290**		50	100	ug/L	344		50	100	ug/L	70.3	J	50	100	ug/L	**1730**		50	100	ug/L	100	U	100	200	ug/L	100	U	100	200	ug/L	100	U	100	200	ug/L
SW6010B	7429-90-5	Aluminum	D		1600		ug/L	50	U	50	100	ug/L	NS					NS					50	U	50	100	ug/L	NS					NS					NS				
SW6010B	7439-89-6	Iron	T		1100		ug/L	**7950**	L	50	100	ug/L	263		50	100	ug/L	149		50	100	ug/L	**1620**		50	100	ug/L	55.3	J	50	100	ug/L	213	J	50	100	ug/L	198		50	100	ug/L
SW6010B	7439-89-6	Iron	D		1100		ug/L	73.1	J	50	100	ug/L	NS					NS					50	U	50	100	ug/L	NS					NS					NS				
SW6010B	7439-95-4	Magnesium	T				ug/L	61900		250	500	ug/L	36100		250	500	ug/L	36400		2500	5000	ug/L	41100		250	500	ug/L	32200		250	500	ug/L	32600		2500	5000	ug/L	29700		250	500	ug/L
SW6010B	7439-95-4	Magnesium	D				ug/L	32500		250	500	ug/L	NS					NS					36100		250	500	ug/L	NS					NS					NS				
SW6010B	7440-09-7	Potassium	T				ug/L	4250		500	1000	ug/L	1720		500	1000	ug/L	1670		500	1000	ug/L	2130		500	1000	ug/L	1550		500	1000	ug/L	1570		500	1000	ug/L	1550		500	1000	ug/L
SW6010B	7440-09-7	Potassium	D				ug/L	2300		500	1000	ug/L	NS					NS					1770		500	1000	ug/L	NS					NS					NS				
SW6010B	7440-23-5	Sodium	T				ug/L	66700		250	500	ug/L	8540		250	500	ug/L	4030		250	500	ug/L	3510		250	500	ug/L	3990		250	500	ug/L	3660		250	500	ug/L	3810	B	250	500	ug/L
SW6010B	7440-23-5	Sodium	D				ug/L	78300		250	500	ug/L	NS					NS					3360		250	500	ug/L	NS					NS					NS				
SW6010B	7440-62-2	Vanadium	T		7.8		ug/L	**9.26**	J	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L	**9.8**	J	5	10	ug/L	5	U	5	10	ug/L	5	U	5	10	ug/L
SW6010B	7440-62-2	Vanadium	D		7.8		ug/L	5	U	5	10	ug/L	NS					NS					5	U	5	10	ug/L	NS					NS					NS				
SW6010B	7440-70-2	Calcium	T				ug/L	190000		100	200	ug/L	80600	J	100	200	ug/L	77800		1000	2000	ug/L	101000		100	200	ug/L	71300		250	500	ug/L	81500		2500	5000	ug/L	77000		2500	5000	ug/L
SW6010B	7440-70-2	Calcium	D				ug/L	70600		100	200	ug/L	NS					NS					77700		100	200	ug/L	NS					NS					NS				
SW6020	7439-92-1	Lead	T			15	ug/L	9.37		1	2	ug/L	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L	1.61		0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L
SW6020	7439-92-1	Lead	D			15	ug/L	1	U	1	2	ug/L	NS					NS					0.5	U	0.5	1	ug/L	NS					NS					NS				
SW6020	7439-96-5	Manganese	T		32		ug/L	**181**		2	4	ug/L	10.8		1	2	ug/L	6.47	L	1	2	ug/L	26.5		1	2	ug/L	1.76	J	1	2	ug/L	1.88	B	1	2	ug/L	1.35	L	1	2	ug/L
SW6020	7439-96-5	Manganese	D		32		ug/L	23.9	B	2	4	ug/L	NS					NS					3.77	B	1	2	ug/L	NS					NS					NS				
SW6020	7440-38-2	Arsenic	T	0.045	0.47	10	ug/L	**2**	K	1	2	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**0.615**	J	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-38-2	Arsenic	D	0.045	0.47	10	ug/L	**< 1**	U	1	2	ug/L	NS					NS					**< 0.5**	U	0.5	1	ug/L	NS					NS					NS				
SW6020	7440-39-3	Barium	T		290	2000	ug/L	252		3	6	ug/L	145		1.5	3	ug/L	146	L	1.5	3	ug/L	172		1.5	3	ug/L	130		1.5	3	ug/L	118		1.5	3	ug/L	114		1.5	3	ug/L
SW6020	7440-39-3	Barium	D		290	2000	ug/L	75.8		3	6	ug/L	NS					NS					170		1.5	3	ug/L	NS					NS					NS				
SW6020	7440-48-4	Cobalt	T		0.47		ug/L	**3.04**		1	2	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**1.02**		0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L	**< 0.5**	U	0.5	1	ug/L
SW6020	7440-48-4	Cobalt	D		0.47		ug/L	**< 1**	U	1	2	ug/L	NS					NS					**0.825**	J	0.5	1	ug/L	NS					NS					NS				
SW6020	7782-49-2	Selenium	T		7.8	50	ug/L	1.86	K	1	2	ug/L	0.5	UL	0.5	1	ug/L	0.652	K	0.5	1	ug/L	0.848	J	0.5	1	ug/L	0.678	J	0.5	1	ug/L	0.5	U	0.5	1	ug/L	0.5	UL	0.5	1	ug/L
SW6020	7782-49-2	Selenium	D		7.8	50	ug/L	1.81	K	1	2	ug/L	NS					NS					0.913	J	0.5	1	ug/L	NS					NS					NS				

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Leve
T-NCSL = Adjusted Noncarcinogenic Screening Leve
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

U = Not Detected. The asscociated number indicates the approximate sample concentratior
B = Not detected substantially above the level reported in laboratory or field blanks
R = Unusable result. Analyte may or may not be present in the sample
J = Analyte present. Reported value may or may not be accurate or precise
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower
L = Analyte present. Reported value may be biased low. Actual value is expected to be highe
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported
NS=Not Sampled because Turbidty was stable at less than or equl to 10 NTUs
Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

Table 3
November 2011 Screening Levels for Groundwater Perchlorate Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 4

					Location ID	40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01					40LFMW01				
					Sample ID	40LFMW01GW112111					40DUPGW030612					40LFMW01GW030612					LFMW01GW061212					LFMW01GW92612					40DUPGW61913					LFMW01GW61913					LFMW01GW32714					LFMW01GW12214				
					Sample Date	11/21/2011					3/6/2012					3/6/2012					6/12/2012					9/26/2012					6/19/2013					6/19/2013					3/27/2014					12/2/2014				
					Sample Type	N					FD					N					N					N					FD					N					N					N				
Method	CAS	Chemical	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	Int Qual	VQ	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6850	14797-73-0	PERCHLORATE	1.1	15	ug/L	**9.67**	J	0.1	0.2	ug/L	**8.93**		0.1	0.2	ug/L	**8.88**		0.1	0.2	ug/L	**4.81**		0.1	0.2	ug/L	**8.75**		0.1	0.2	ug/L	**4.44**		0.2	0.4	ug/L	**4.38**		0.2	0.4	ug/L	**7.47**		0.1	0.2	ug/L	**3.04**		0.1	0.2	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Leve
T-NCSL = Adjusted Noncarcinogenic Screening Leve
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

U = Not Detected. The asscociated number indicates the approximate sample concentratior
B = Not detected substantially above the level reported in laboratory or field blanks
R = Unusable result. Analyte may or may not be present in the sample
J = Analyte present. Reported value may or may not be accurate or precise
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower
L = Analyte present. Reported value may be biased low. Actual value is expected to be highe
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

Table 3
November 2011 Screening Levels for Groundwater Perchlorate Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 4

					Location ID	40MW5					40MW5					40MW5					40MW5					40MW5				
					Sample ID	40DUPGW112011					40MW5GW112011					40MW5GW030712					40MW5GW061212					40DUPGW92512				
					Sample Date	11/20/2011					11/20/2011					3/7/2012					6/12/2012					9/25/2012				
					Sample Type	FD					N					N					N					FD				
Method	CAS	Chemical	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6850	14797-73-0	PERCHLORATE	1.1	15	ug/L	**1.55**	J	0.1	0.2	ug/L	**1.55**	J	0.1	0.2	ug/L	0.931		0.1	0.2	ug/L	0.986		0.1	0.2	ug/L	**1.81**		0.1	0.2	ug/L

					Location ID	40MW5					40MW5					40MW5					40MW5					40MW5				
					Sample ID	40MW5GW92512					40MW5GW61913					40MW5GW32714					40MW5GW12214					40DUPGW12214				
					Sample Date	9/25/2012					6/19/2013					3/27/2014					12/2/2014					12/2/2014				
					Sample Type	N					N					N					N					FD				
Method	CAS	Chemical	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6850	14797-73-0	PERCHLORATE	1.1	15	ug/L	**1.71**		0.1	0.2	ug/L	0.85		0.1	0.2	ug/L	0.721		0.1	0.2	ug/L	0.883		0.1	0.2	ug/L	0.856		0.1	0.2	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Leve
T-NCSL = Adjusted Noncarcinogenic Screening Leve
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

U = Not Detected. The asscociated number indicates the approximate sample concentratioı
B = Not detected substantially above the level reported in laboratory or field blanks
R = Unusable result. Analyte may or may not be present in the sample
J = Analyte present. Reported value may or may not be accurate or precise
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower
L = Analyte present. Reported value may be biased low. Actual value is expected to be highe
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported

Table 3
November 2011 Screening Levels for Groundwater Perchlorate Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 4

					Location ID	40MW6					40MW6					40MW6					40MW6				
					Sample ID	40MW6GW112111					40MW6GW030712					40DUPGW061212					40MW6GW061212				
					Sample Date	11/21/2011					3/7/2012					6/12/2012					6/12/2012				
					Sample Type	N					N					FD					N				
Method	CAS	Chemical	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6850	14797-73-0	PERCHLORATE	1.1	15	ug/L	0.885	J	0.1	0.2	ug/L	0.526		0.1	0.2	ug/L	0.635		0.1	0.2	ug/L	0.647		0.1	0.2	ug/L

					Location ID	40MW6					40MW6					40MW6					40MW6				
					Sample ID	40MW6GW92512					40MW6GW61913					40MW6GW32714					40MW6GW12214				
					Sample Date	9/25/2012					6/19/2013					3/27/2014					12/2/2014				
					Sample Type	N					N					N					N				
Method	CAS	Chemical	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6850	14797-73-0	PERCHLORATE	1.1	15	ug/L	**1.25**		0.1	0.2	ug/L	0.535		0.1	0.2	ug/L	0.506		0.1	0.2	ug/L	1.03		0.1	0.2	ug/L

Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Leve
T-NCSL = Adjusted Noncarcinogenic Screening Leve
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

U = Not Detected. The asscociated number indicates the approximate sample concentratior
B = Not detected substantially above the level reported in laboratory or field blanks
R = Unusable result. Analyte may or may not be present in the sample
J = Analyte present. Reported value may or may not be accurate or precise
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower
L = Analyte present. Reported value may be biased low. Actual value is expected to be highe
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported

Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

Table 3
November 2011 Screening Levels for Groundwater Perchlorate Data - Residential Tapwater Pathway
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Year 4

					Location ID	40MW7					40MW7					40MW7					40MW7					40MW7					40MW7					40MW7				
					Sample ID	40MW7GW112011					40MW7GW030612					40MW7GW601212					40MW7GW92512					40MW7GW61913					40MW7GW32714					40MW7GW12214				
					Sample Date	11/20/2011					3/6/2012					6/12/2012					9/25/2012					6/19/2013					3/27/2014					12/2/2014				
					Sample Type	N					N					N					N					N					N					N				
Method	CAS	Chemical	T-NCSL	MCL	Units	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	Int Qual	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit	Result	VQ	LOD	LOQ	DL Unit
SW6850	14797-73-0	PERCHLORATE	1.1	15	ug/L	**4.5**	J	0.1	0.2	ug/L	**4.18**		0.1	0.2	ug/L	**3.69**		0.1	0.2	ug/L	**3.66**		0.1	0.2	ug/L	**4.1**		0.1	0.2	ug/L	**3.74**		0.1	0.2	ug/L	**3.14**		0.1	0.2	ug/L

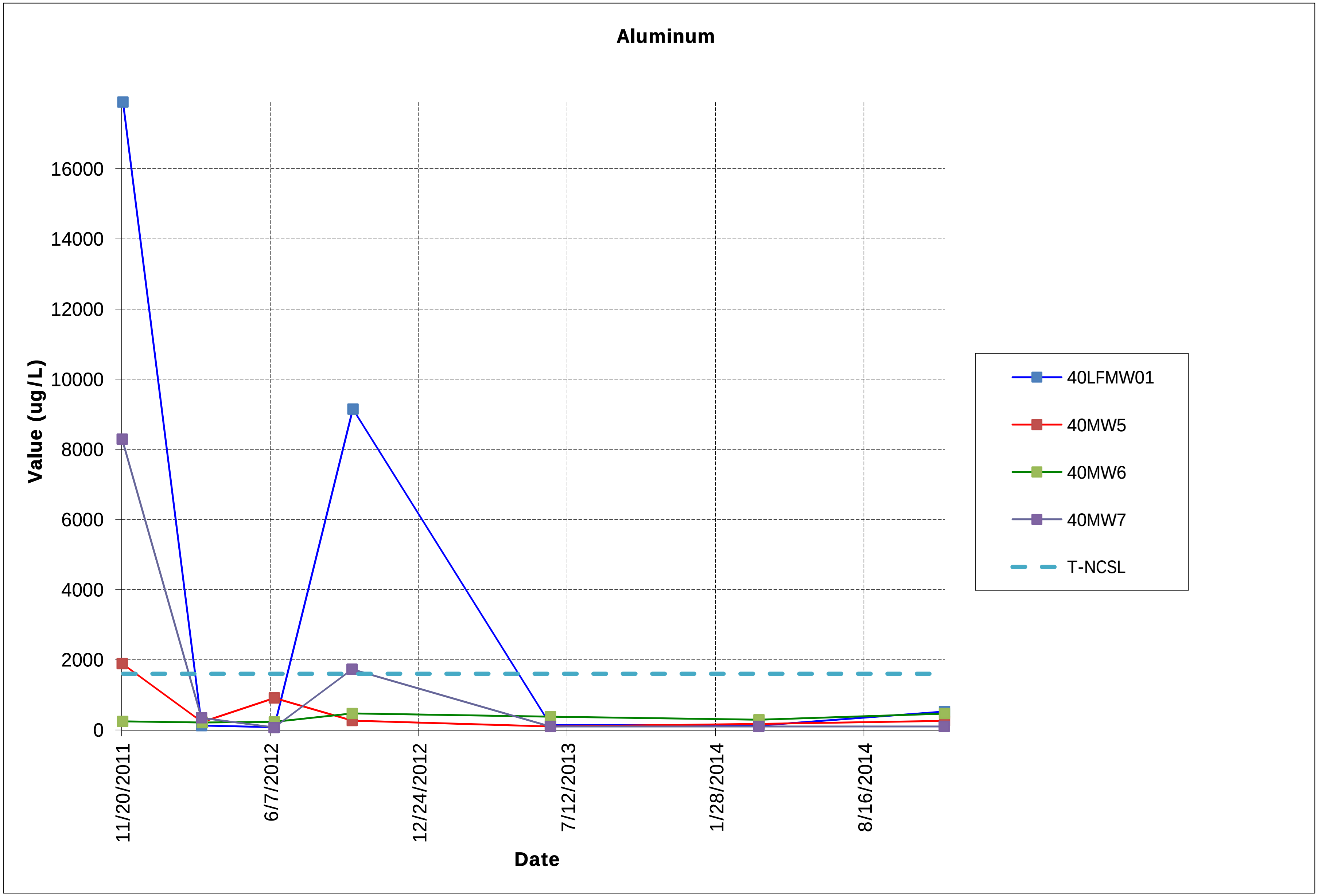
Notes:

CAS = Chemical Abstracts Service
ug/L = Microgram Per Liter
T = Total
D = Dissolved
CSL = Carcinogenic Screening Leve
T-NCSL = Adjusted Noncarcinogenic Screening Leve
MCL = Maximum Contaminant Level
= Lowest Value For Screening
Bold = Exceeds the Carcinogenic or Adjusted Noncarcinogenic Screening Leve
VQ = Validation Qualifier
LOD = Limit of Detection
LOQ = Limit of Quantitation
DL = Detection Limit
N = Normal
FD = Field Duplicate

U = Not Detected. The asscociated number indicates the approximate sample concentratior
B = Not detected substantially above the level reported in laboratory or field blanks
R = Unusable result. Analyte may or may not be present in the sample
J = Analyte present. Reported value may or may not be accurate or precise
K = Analyte present. Reported value may be biased high. Actual value is expected to be lower
L = Analyte present. Reported value may be biased low. Actual value is expected to be highe
UJ = Not detected. Quantitation limit may be inaccurate or imprecise.
UL = The analyte was not detected, and the reported quantitation limit is probably higher than reported

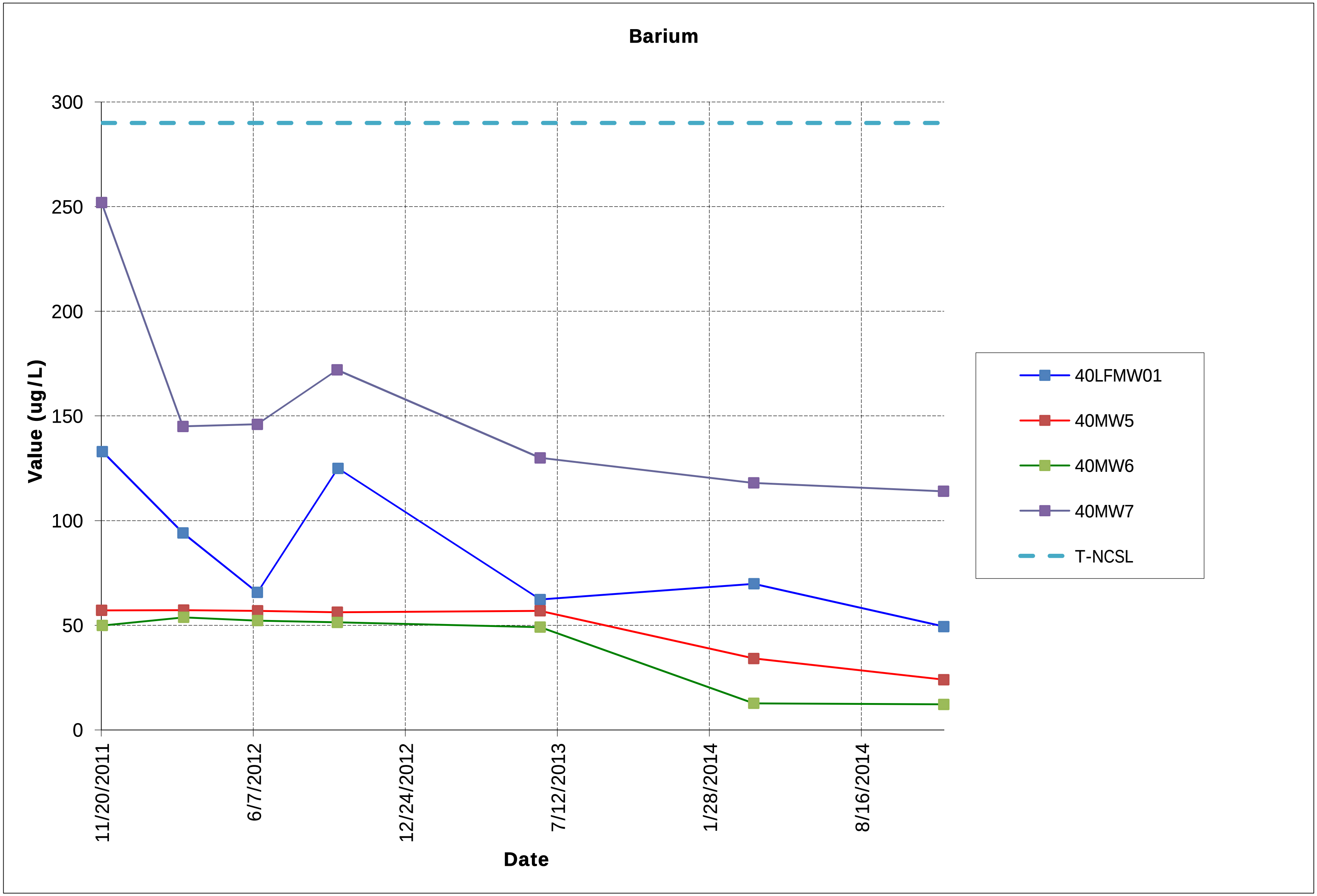
Screening Levels are based on USEPA Region III Risk-Based Concentration values from the November, 2011 RBC Table.

SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Graph



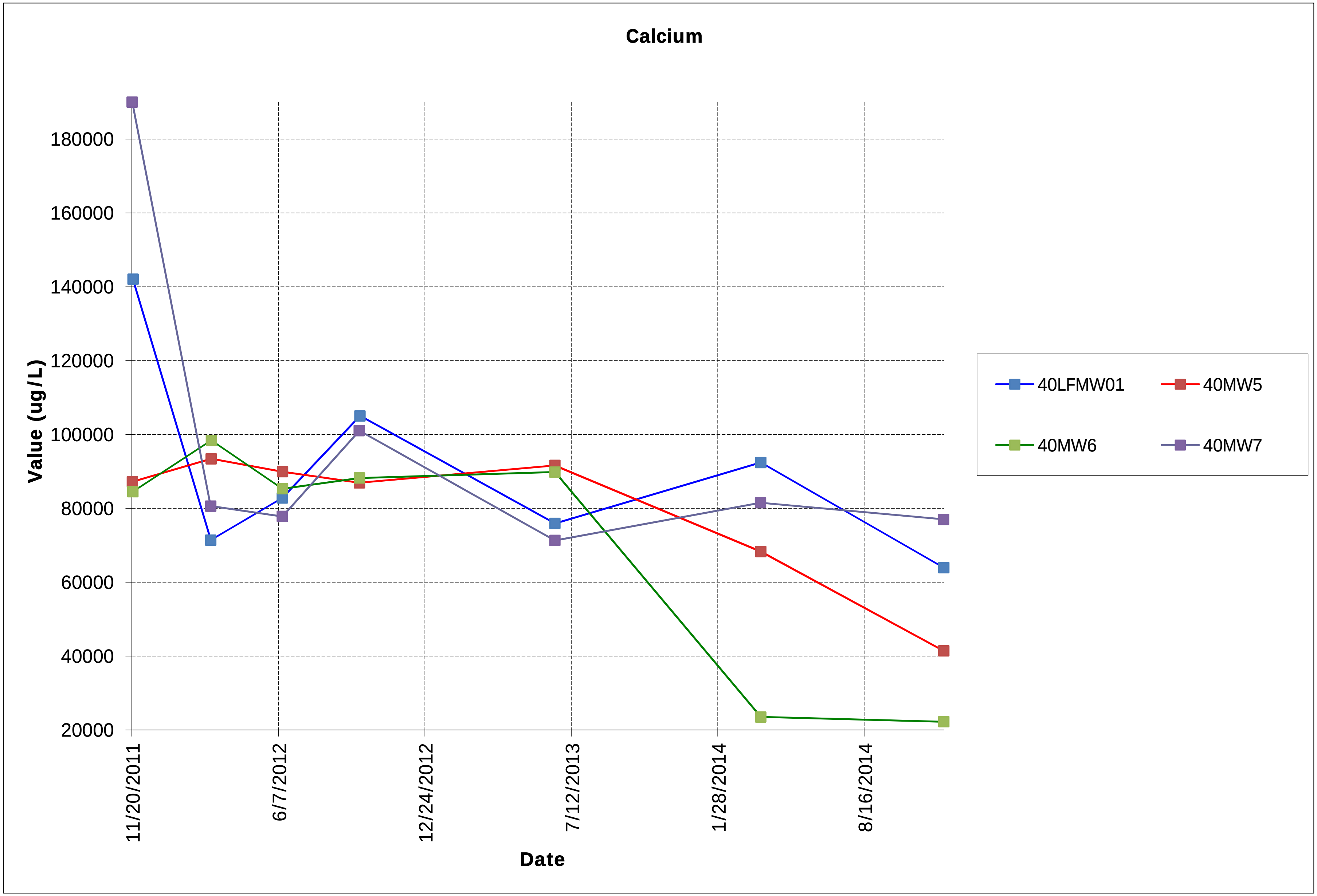
MCL = Maximum Contaminant Level
T-NCSL = Adjusted Noncarcinogenic Screening Level

SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Graph



MCL = Maximum Contaminant Level
T-NCSL = Adjusted Noncarcinogenic Screening Level

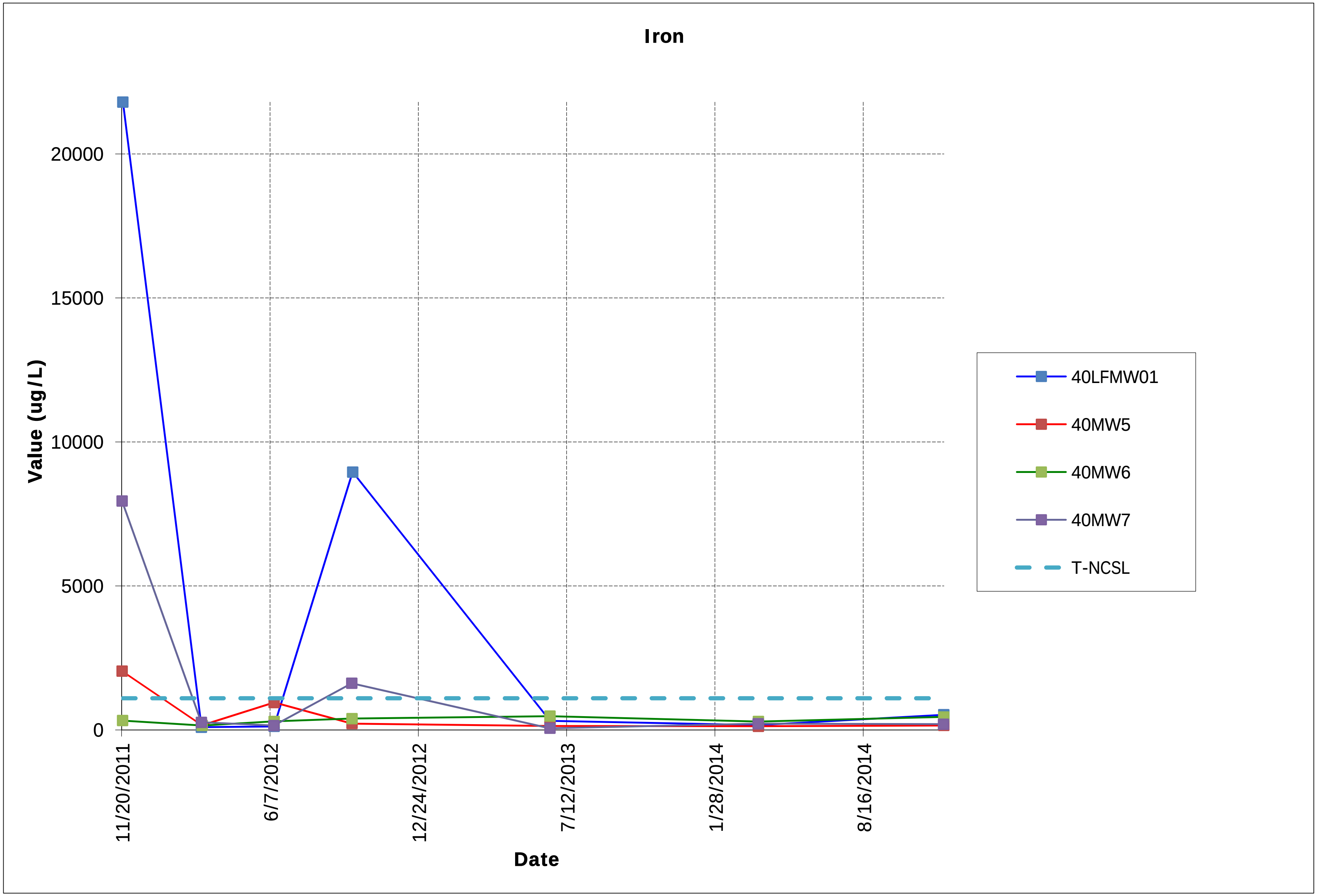
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Graph



MCL = Maximum Contaminant Level

T-NCSL = Adjusted Noncarcinogenic Screening Level

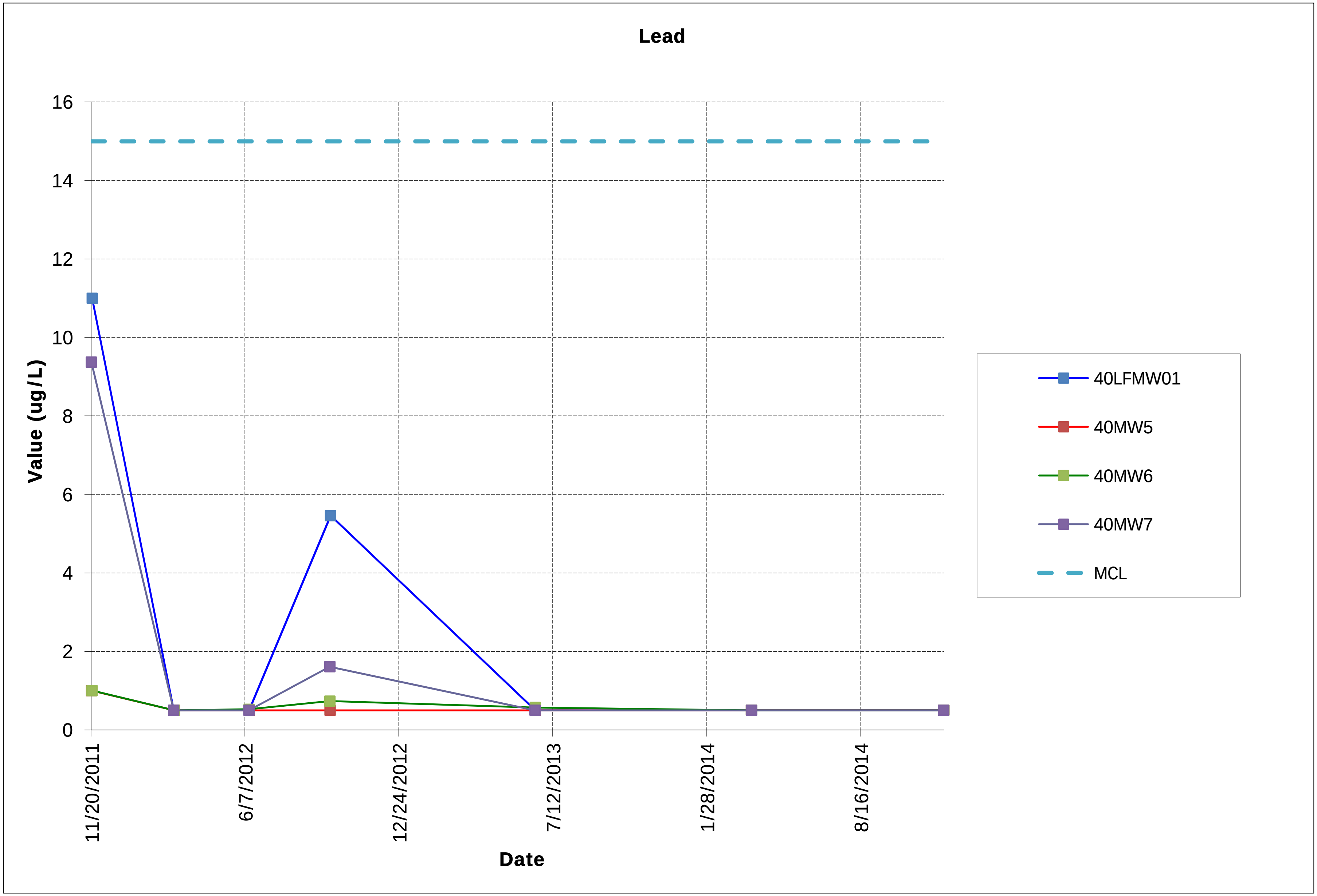
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Graph



MCL = Maximum Contaminant Level

T-NCSL = Adjusted Noncarcinogenic Screening Level

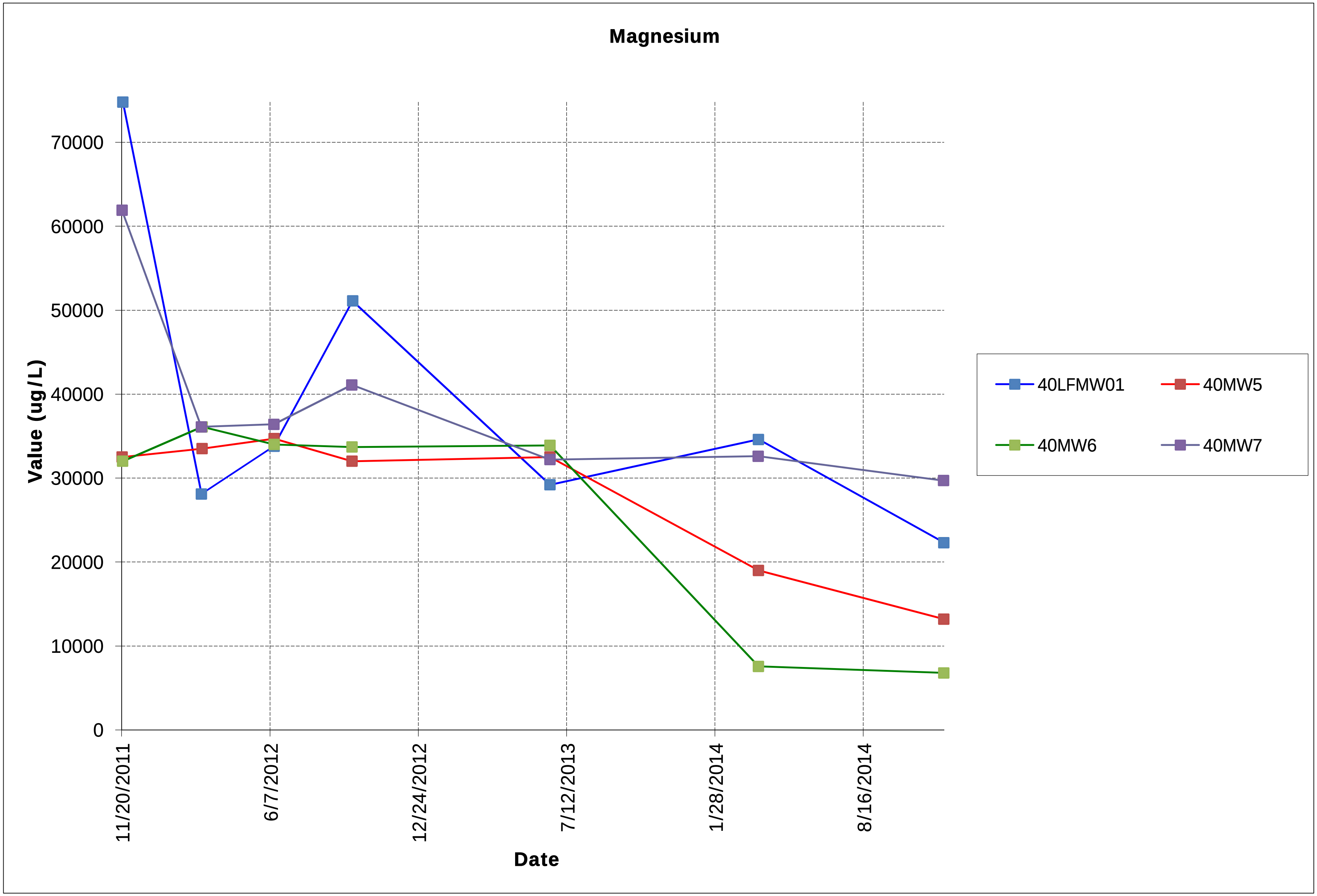
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Graph



MCL = Maximum Contaminant Level

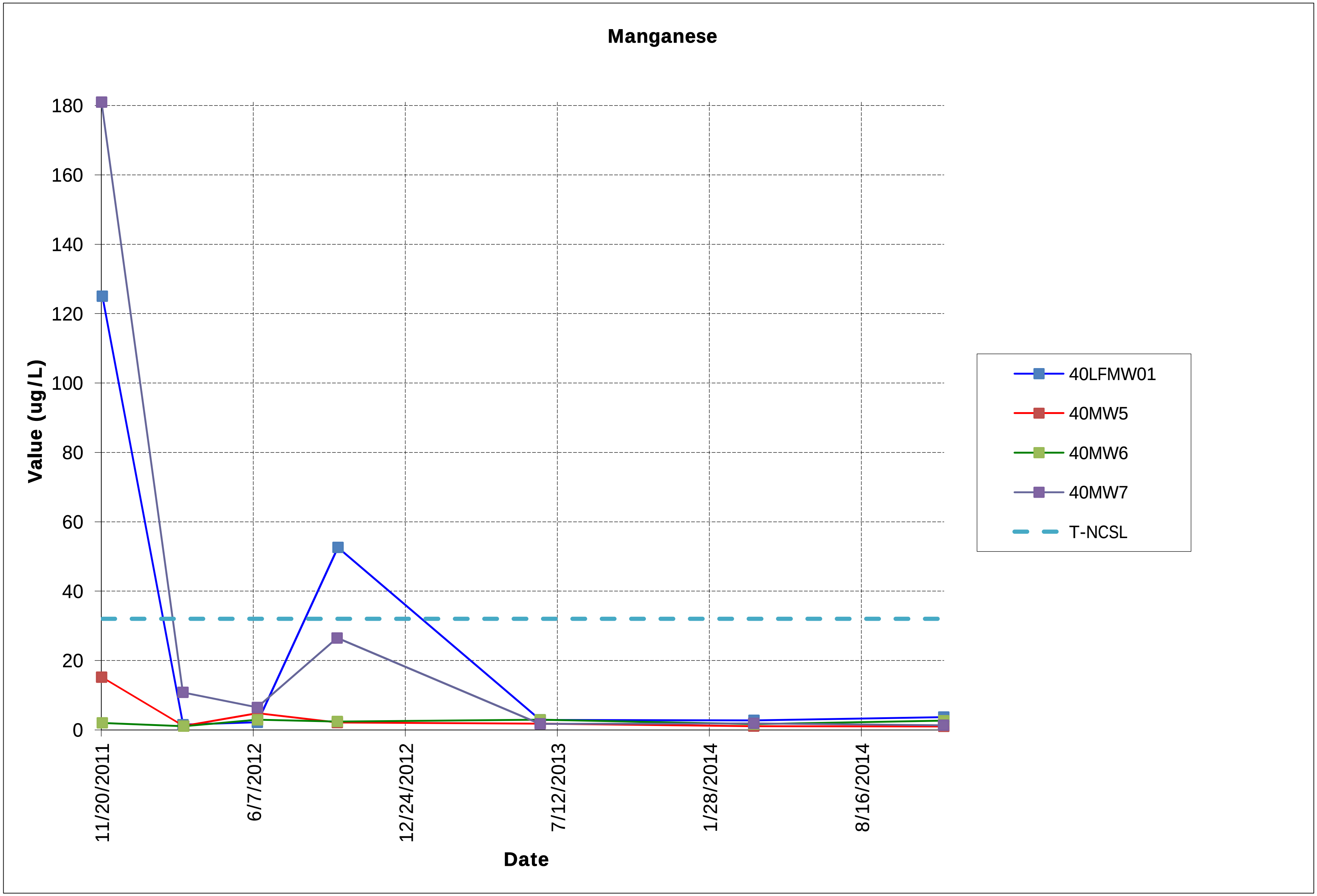
T-NCSL = Adjusted Noncarcinogenic Screening Level

SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Graph



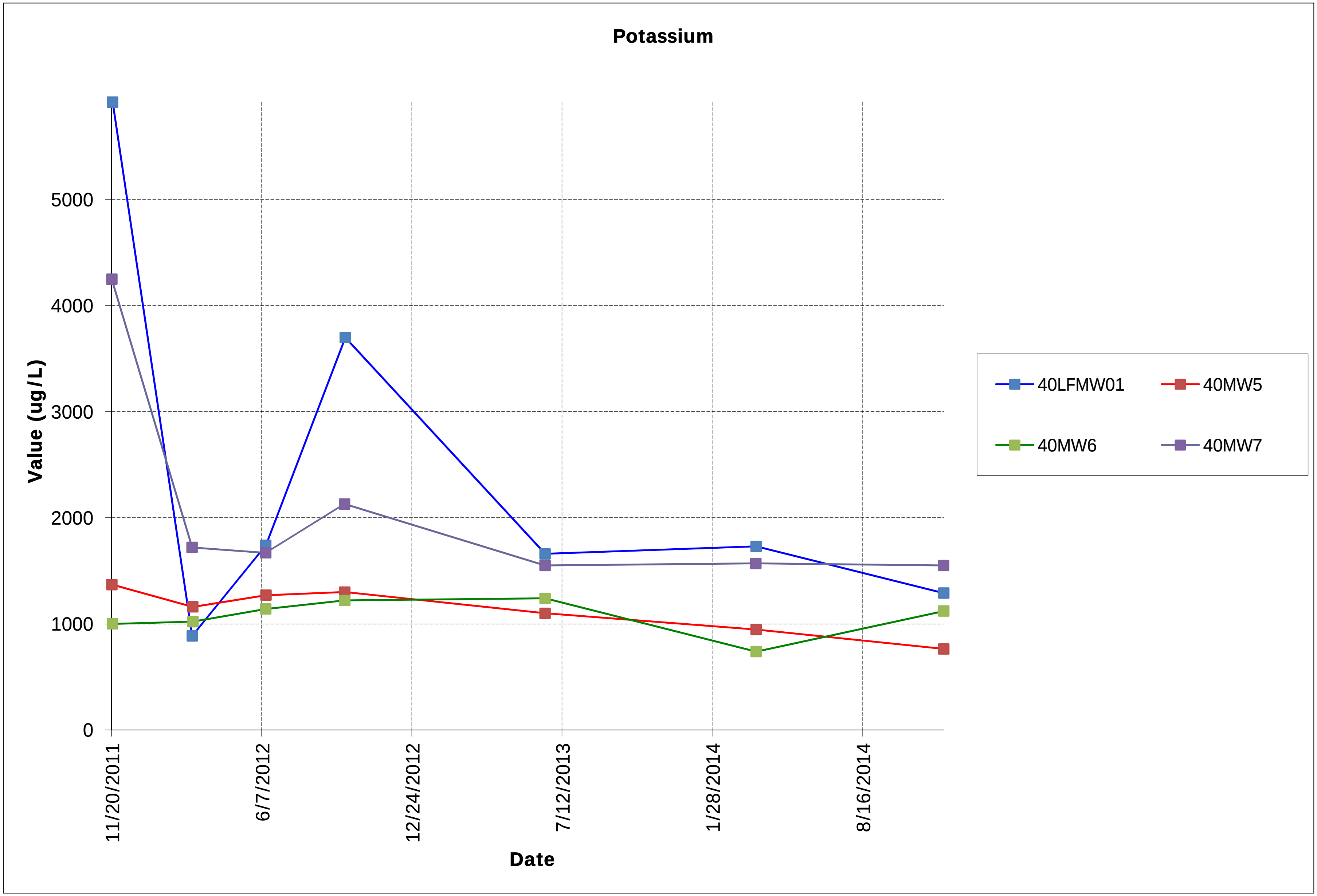
MCL = Maximum Contaminant Level
T-NCSL = Adjusted Noncarcinogenic Screening Level

SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Graph



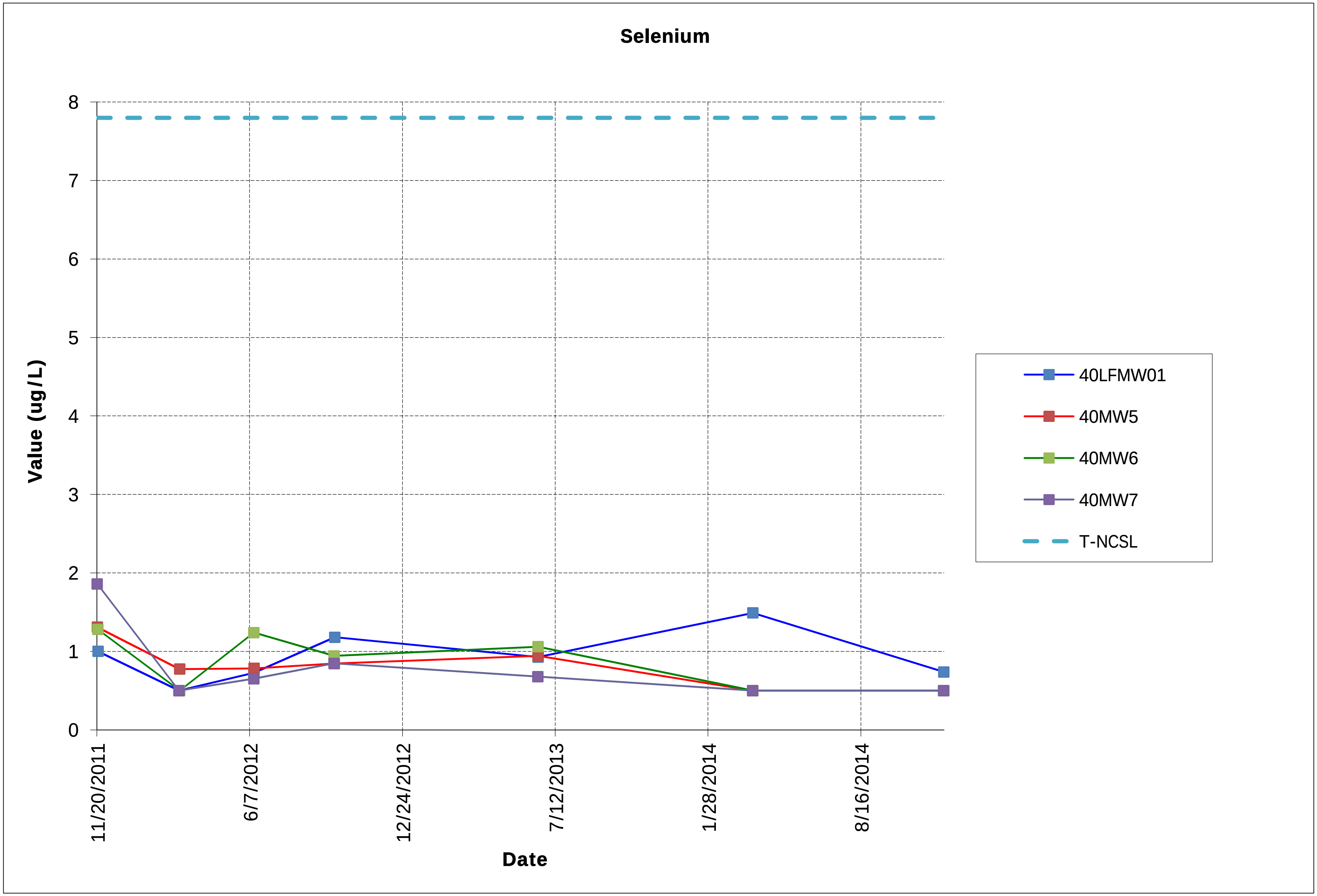
MCL = Maximum Contaminant Level
T-NCSL = Adjusted Noncarcinogenic Screening Level

SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Graph



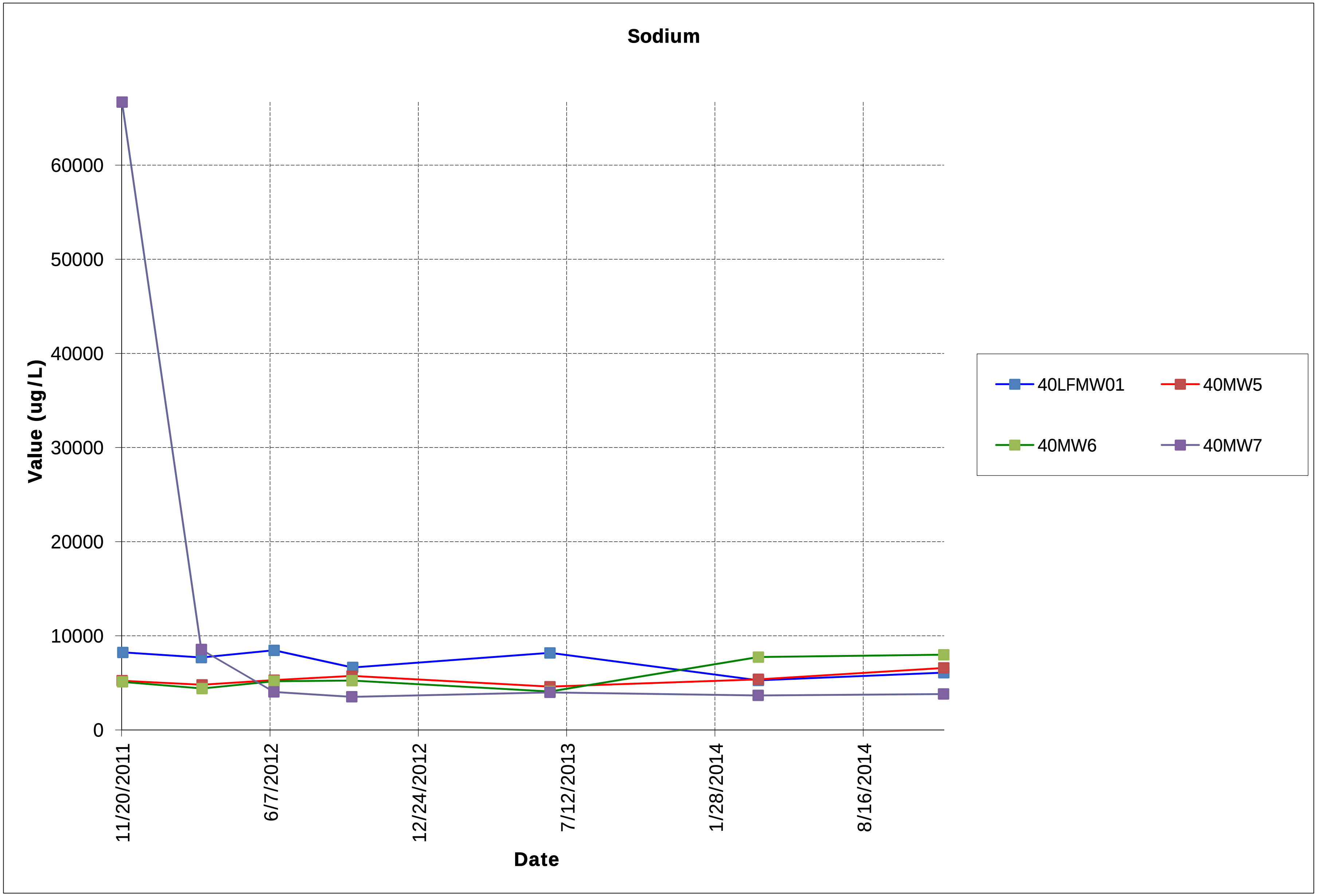
MCL = Maximum Contaminant Level
T-NCSL = Adjusted Noncarcinogenic Screening Level

SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Graph



MCL = Maximum Contaminant Level
T-NCSL = Adjusted Noncarcinogenic Screening Level

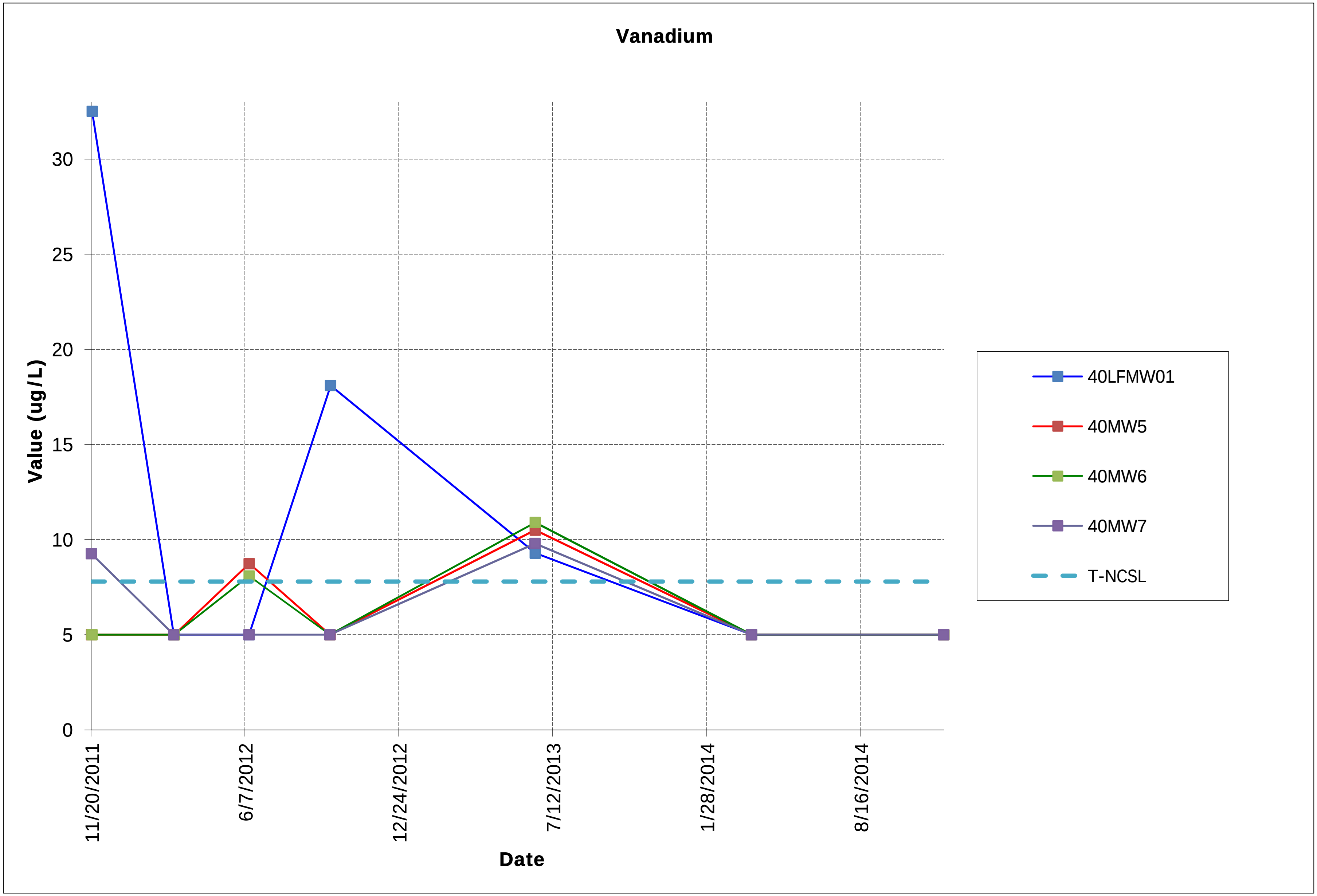
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Graph



MCL = Maximum Contaminant Level

T-NCSL = Adjusted Noncarcinogenic Screening Level

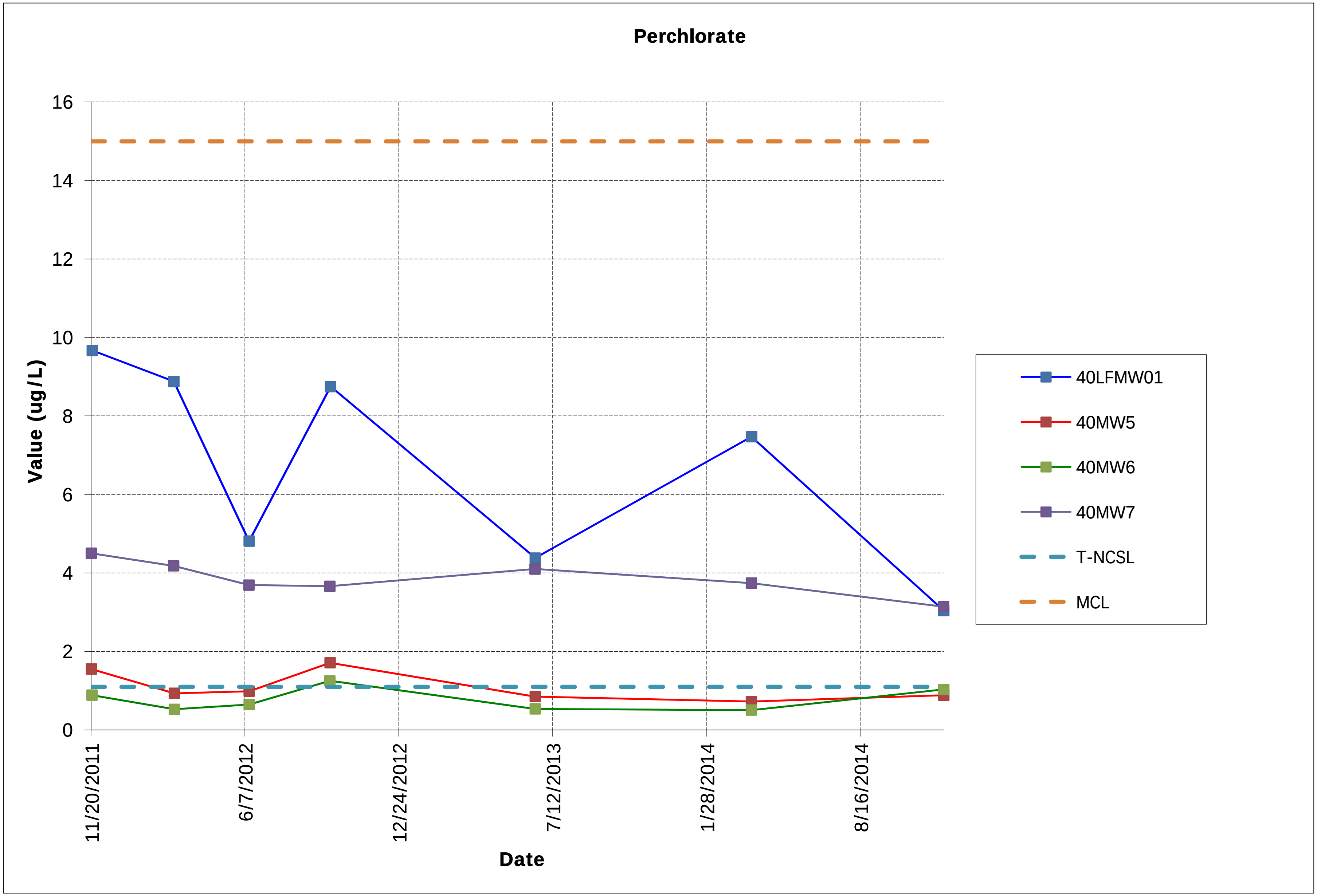
SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Graph



MCL = Maximum Contaminant Level

T-NCSL = Adjusted Noncarcinogenic Screening Level

SWMU 40 (RAAP-009)
Radford Army Ammunition Plant
Longterm Monitoring Data Graph



MCL = Maximum Contaminant Level
T-NCSL = Adjusted Noncarcinogenic Screening Level

RAAP-013/SWMU 49 and RAAP-018/SWMU 48

[This Page Intentionally Left Blank]

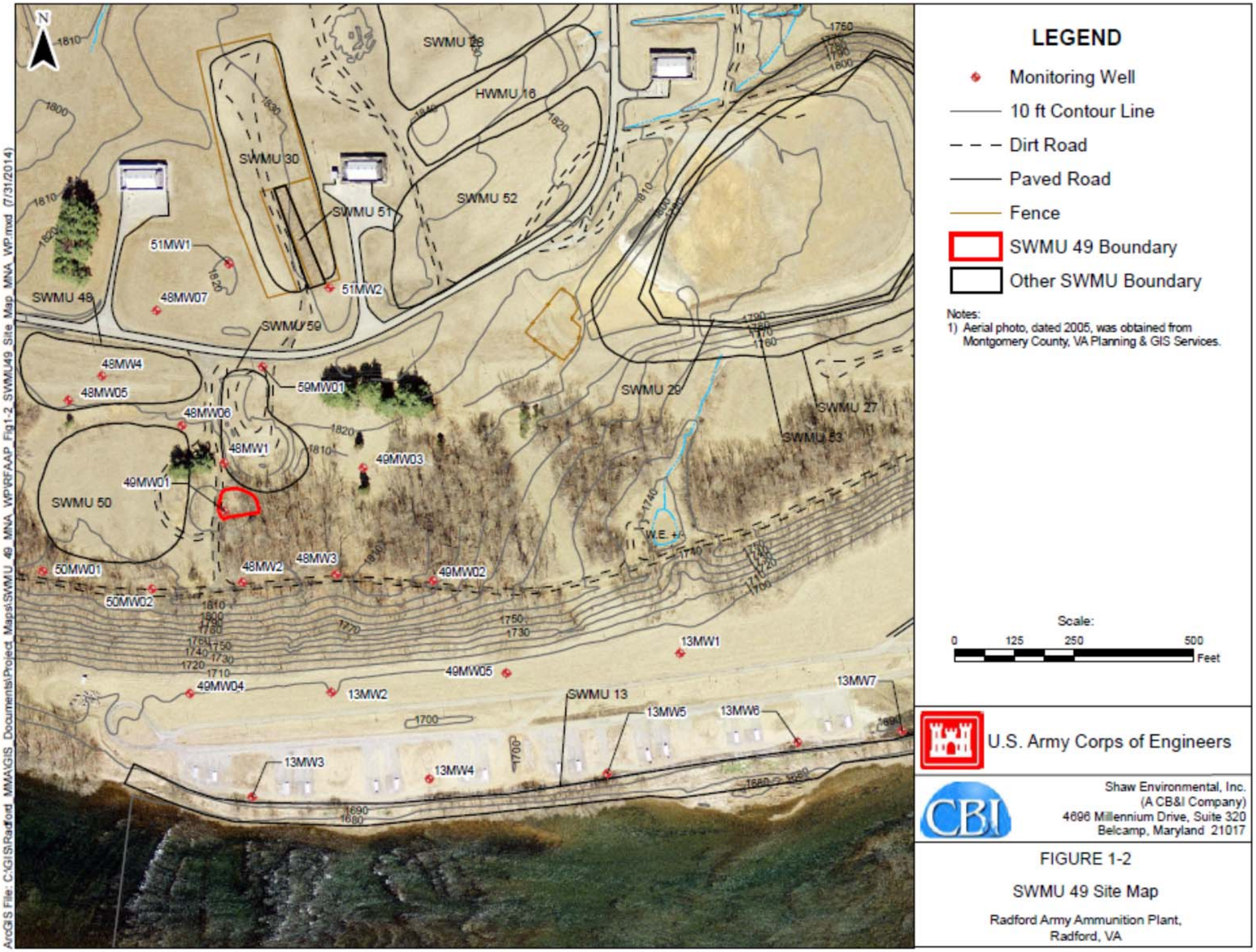
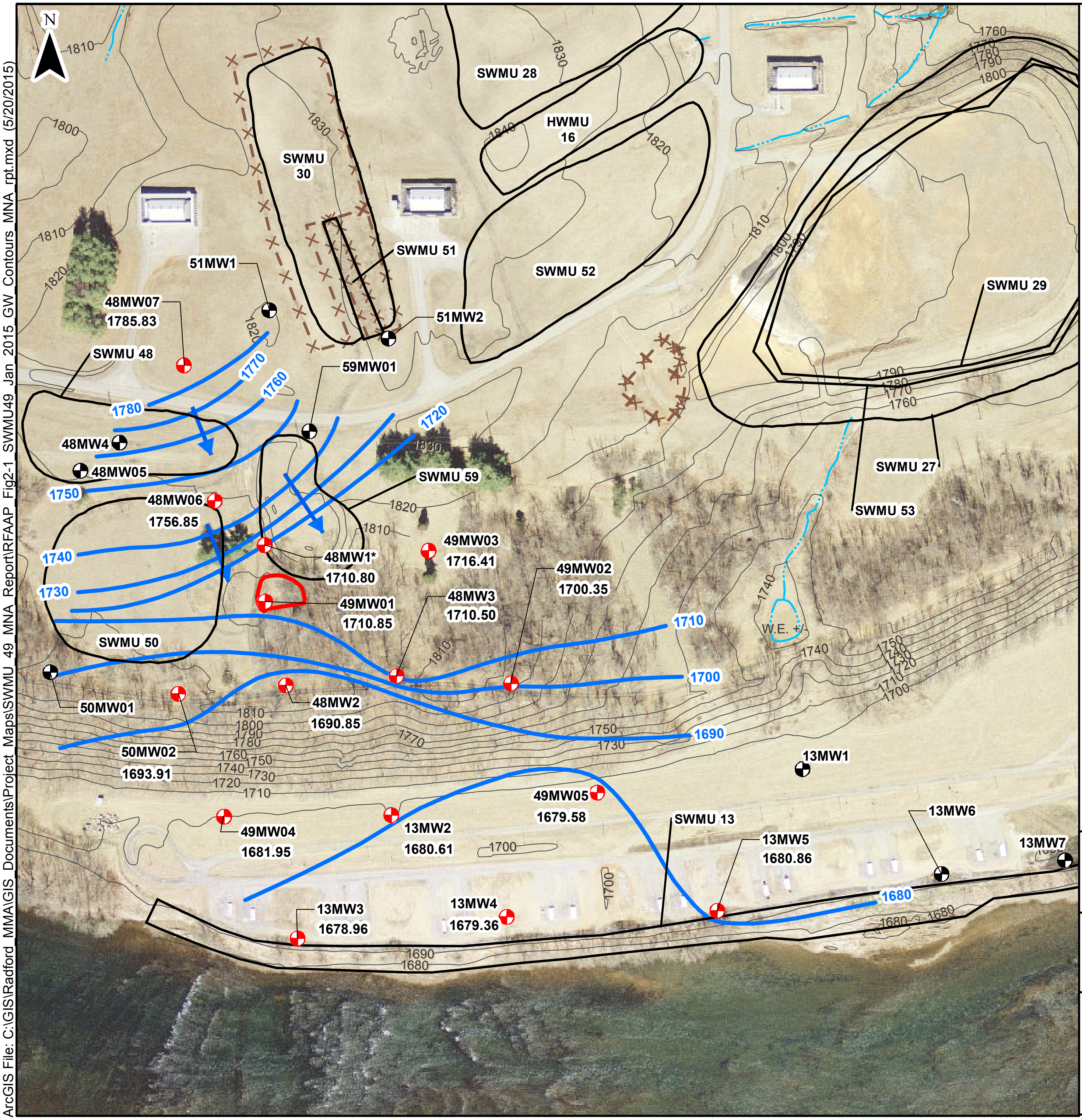


FIGURE 1-2

SWMU 49 Site Map

Radford Army Ammunition Plant,
Radford, VA

ArcGIS File: C:\GIS\Radford MMA\GIS Documents\Project Maps\SWMU 49 MNA Report\RFAAP Fig2-1 SWMU49 Jan 2015 GW Contours MNA rpt.mxd (5/20/2015)



LEGEND

🔴 Monitoring Well (Sampled)

⚫ Monitoring Well (Not Sampled)

× — × - Fence

— 10 ft Contour Line

→ Groundwater Flow Direction

— Groundwater Contour

🟥 SWMU 49 Boundary

⬜ Other SWMU Boundary

Notes:
1) Aerial photo, dated 2005, was obtained from Montgomery County, VA Planning & GIS Services.
2) Water levels (in feet above mean sea level) measured in January 2015.
3) Well 48MW1 was excluded from contouring (see Section 4.1).

Scale:
0 125 250 500
Feet

U.S. Army Corps of Engineers

CB&I Federal Services LLC
4696 Millenium Drive, Suite 320
Belamp, Maryland 21017

FIGURE 2-1
SWMU 49
Potentiometric Surface Map - January 2015
Radford Army Ammunition Plant,
Radford, VA

ArcGIS File: C:\GIS\Radford MMA\GIS Documents\Project Maps\SWMU 49 MNA Report\RFAAP Fig6-1 SWMU49 2015 CTC GW Plume MNA rpt.mxd (5/27/2015)

LEGEND

- 🔴 Monitoring Well (Sampled)
- ● Monitoring Well (Not Sampled)
- ×–×- Fence
- Water Feature
- 10 ft Contour Line
- 🟨 Carbon Tetrachloride Isopleth
- 🟥 SWMU 49 Boundary
- ⬛ Other SWMU Boundary

Notes:
1) Aerial photo, dated 2005, was obtained from Montgomery County, VA Planning & GIS Services.
2) Isopleth concentrations are in ug/L.
3) Sample results obtained in January 2015.

Scale:
0 125 250 500
Feet

U.S. Army Corps of Engineers

CB&I Federal Services LLC
4696 Millennium Drive, Suite 320
Belcamp, Maryland 21017

FIGURE 6-1
SWMU 49
Carbon Tetrachloride Isopleths - January 2015
Radford Army Ammunition Plant,
Radford, VA

LEGEND

🔴 Monitoring Well (Sampled)

⚫ Monitoring Well (Not Sampled)

×–×– Fence

— Water Feature

— 10 ft Contour Line

🟨 Trichloroethene Isopleth

🟥 SWMU 49 Boundary

⬛ Other SWMU Boundary

Notes:
1) Aerial photo, dated 2005, was obtained from Montgomery County, VA Planning & GIS Services.
2) Isopleth concentrations are in ug/L.
3) Sample results obtained in January 2015.

N

Scale:
0 125 250 500 Feet

U.S. Army Corps of Engineers

CB&I Federal Services LLC
4696 Millennium Drive, Suite 320
Belcamp, Maryland 21017

FIGURE 6-2
SWMU 49
Trichloroethene Isopleths - January 2015
Radford Army Ammunition Plant,
Radford, VA

ArcGIS File: C:\GIS\Radford MMA\GIS Documents\Project Maps\SWMU 48 49 RFI\RFAAP Fig6-2 SWMU49 2015 TCE GW Plume MNA rpt.mxd (5/27/2015)

Figure 5-1
Concentrations of CT and TCE in SWMU 49 POC Wells

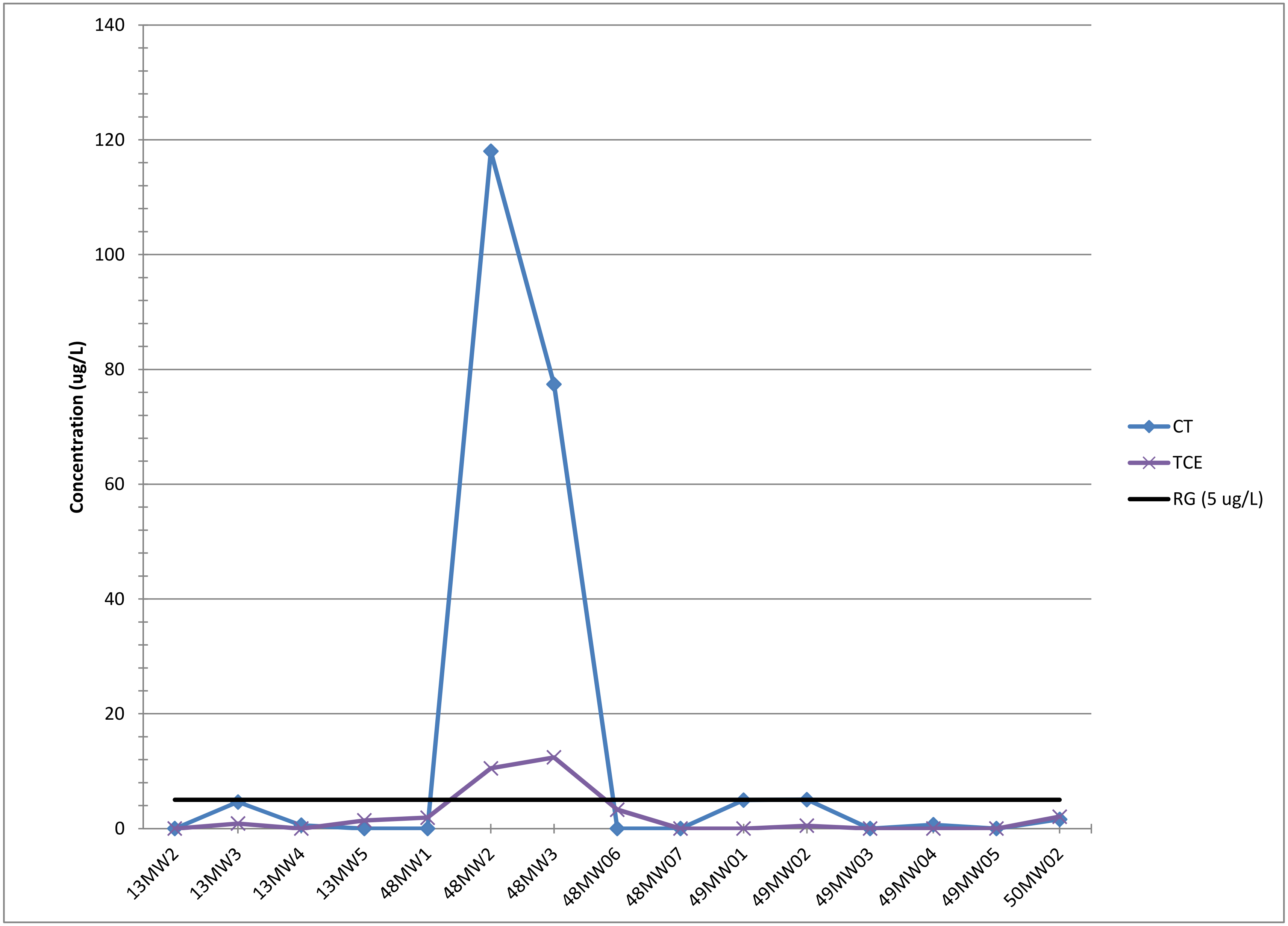


Table 5-1
Analytes Detected in Baseline Monitoring Groundwater Samples
Page 1 of 2

Analyte	Sample ID	13MW2					13MW3					13MW4					13MW5				
	Sample Date	1/26/15					1/26/15					1/26/15					1/26/15				
	RG	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL
VOCs (µg/L)																					
1,1,1-Trichloroethane	na	0.5	U		0.25	0.5	0.5	U		0.25	0.5	0.5	U		0.25	0.5	0.5	U		0.25	0.5
1,1-Dichloroethane	na	0.5	U		0.25	0.5	0.5	U		0.25	0.5	0.5	U		0.25	0.5	0.5	U		0.25	0.5
Acetone	na	5	U		2.5	5	5	U		2.5	5	5	U		2.5	5	5	U		2.5	5
Bromoform	na	0.5	U		0.25	0.5	0.5	U		0.25	0.5	0.5	U		0.25	0.5	0.5	U		0.25	0.5
Bromomethane	na	1	U		0.5	1	1	U		0.5	1	1	U		0.5	1	1	U		0.5	1
Carbon tetrachloride	5	0.5	U		0.25	0.5	4.62			0.25	0.5	0.592	J	J	0.25	0.5	0.5	U		0.25	0.5
Chloroform	na	0.5	U		0.25	0.5	0.47	J	J	0.25	0.5	0.5	U		0.25	0.5	0.5	U		0.25	0.5
cis-1,2-Dichloroethene	na	0.5	U		0.25	0.5	0.5	U		0.25	0.5	0.5	U		0.25	0.5	0.5	U		0.25	0.5
Dibromochloromethane	na	0.5	U		0.25	0.5	0.5	U		0.25	0.5	0.5	U		0.25	0.5	0.5	U		0.25	0.5
Ethylbenzene	na	0.5	U		0.25	0.5	0.5	U		0.25	0.5	0.5	U		0.25	0.5	0.5	U		0.25	0.5
m- & p-Xylene	na	1	U		0.5	1	1	U		0.5	1	1	U		0.5	1	1	U		0.5	1
o-Xylene	na	0.5	U		0.25	0.5	0.5	U		0.25	0.5	0.5	U		0.25	0.5	0.5	U		0.25	0.5
Tetrachloroethene	na	0.5	U		0.25	0.5	0.5	U		0.25	0.5	0.5	U		0.25	0.5	0.5	U		0.25	0.5
Trichloroethene	5	0.5	U		0.25	0.5	0.883	J	J	0.25	0.5	0.5	U		0.25	0.5	1.42			0.25	0.5
Misc. (µg/L)																					
Total Organic Carbon	na	2500	U		1250	2500	2500	U		1250	2500	2500	U		1250	2500	NT				
Chloride	na	2750			170	330	3880			170	330	11500			170	330	NT				
Nitrate (as N)	na	71.5	J	J	33	100	1660			33	100	100	U		33	100	NT				
Sulfate	na	45900			330	1000	126000			330	1000	23800			330	1000	NT				
Methane	na	2	U		1	2	2	U		1	2	2	U		1	2	NT				
Ethene	na	2	U		1	2	2	U		1	2	2	U		1	2	NT				

Analyte	Sample ID	48MW1					48MW2					48MW3					48MW06				
	Sample Date	1/28/15					1/28/15					1/27/15					1/29/15				
	RG	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL
VOCs (µg/L)																					
1,1,1-Trichloroethane	na	0.454	J	J	0.25	0.5	0.5	U		0.25	0.5	0.5	U		0.25	0.5	0.691	DJ	J	0.5	1
1,1-Dichloroethane	na	0.908	J	J	0.25	0.5	0.5	U		0.25	0.5	0.5	U		0.25	0.5	4.28	D		0.5	1
Acetone	na	5	U		2.5	5	5	U		2.5	5	5	XU		2.5	5	27.8	D	B	5	10
Bromoform	na	0.5	U		0.25	0.5	0.5	U		0.25	0.5	0.5	U		0.25	0.5	1	XU		0.5	1
Bromomethane	na	1	U		0.5	1	1	U		0.5	1	1	NU		0.5	1	2	U		1	2
Carbon tetrachloride	5	0.5	XU		0.25	0.5	118	X	J	0.25	0.5	77.4			0.25	0.5	1	XU		0.5	1
Chloroform	na	0.5	U		0.25	0.5	7.46			0.25	0.5	8.37			0.25	0.5	1	U		0.5	1
cis-1,2-Dichloroethene	na	0.914	J	J	0.25	0.5	0.5	U		0.25	0.5	0.5	U		0.25	0.5	4.86	D		0.5	1
Dibromochloromethane	na	0.5	U		0.25	0.5	0.5	U		0.25	0.5	0.5	XU		0.25	0.5	1	U		0.5	1
Ethylbenzene	na	0.5	U		0.25	0.5	0.469	J	J	0.25	0.5	0.5	U		0.25	0.5	1	U		0.5	1
m- & p-Xylene	na	0.535	J	J	0.5	1	1.32	J	J	0.5	1	0.736	J	J	0.5	1	2	U		1	2
o-Xylene	na	0.285	J	J	0.25	0.5	0.919	J	J	0.25	0.5	0.495	J	J	0.25	0.5	1	U		0.5	1
Tetrachloroethene	na	0.5	U		0.25	0.5	0.5	U		0.25	0.5	0.5	U		0.25	0.5	0.709	DJ	J	0.5	1
Trichloroethene	5	1.91			0.25	0.5	10.5			0.25	0.5	12.4			0.25	0.5	3.29	D		0.5	1
Misc. (µg/L)																					
Total Organic Carbon	na	2500	U		1250	2500	2500	U		1250	2500	2500	U		1250	2500	1640	J	J	1250	2500
Chloride	na	3100			170	330	2650			170	330	2220			170	330	9360	D		340	660
Nitrate (as N)	na	1350			33	100	754			33	100	6400			33	100	5880			33	100
Sulfate	na	58000			330	1000	16800			330	1000	29800			330	1000	275000	D		660	2000
Methane	na	2	U		1	2	2	U		1	2	2	U		1	2	2	U		1	2
Ethene	na	2	U		1	2	2	U		1	2	2	U		1	2	2	U		1	2

12 Bold outline indicates an RG exceedance.

RG = Remedial Goal developed for carbon tetrachloride and trichloroethene in CB&I, 2014.
µg/L = micrograms per liter (parts per billion)
CCV = Continuing Calibration Verification
ICV = Initial Calibration Verfication
MDL = Method Detection Limit
MRL = Method Reporting Limit
na = not applicable
NT = Analyte not tested.
VOC = Volatile Organic Compound

Lab Q = Lab Data Qualifiers
D = Sample was run at a dilution.
J = Value <MRL and >MDL and is considered estimated.
N = Matrix Spike/Matrix Spike Duplicate accuracy and/or precision were outside criteria.
U = Analyte not-detected at the method reporting limit.
X = The associated ICV/CCV exceeded the upper control limit.

Val Q = Validation Data Qualifiers
B = Blank contamination. Value detected in sample and associated blank.
J = Estimated concentration.

Table 5-1
Analytes Detected in Baseline Monitoring Groundwater Samples
Page 2 of 2

Analyte	Sample ID	48MW07					49MW01					49MW02					49MW03				
	Sample Date	1/29/15					1/28/15					1/27/15					1/28/15				
	RG	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL
VOCs (µg/L)																					
1,1,1-Trichloroethane	na	0.5	U		0.25	0.5	0.262	J	J	0.25	0.5	1	U		0.5	1	0.5	U		0.25	0.5
1,1-Dichloroethane	na	0.5	U		0.25	0.5	0.5	U		0.25	0.5	1	U		0.5	1	0.5	U		0.25	0.5
Acetone	na	5	U		2.5	5	5	U		2.5	5	14	XDJ	B	5	10	5	U		2.5	5
Bromoform	na	0.5	XU		0.25	0.5	0.5	U		0.25	0.5	1	U		0.5	1	0.5	U		0.25	0.5
Bromomethane	na	1	U		0.5	1	1	U		0.5	1	2	U		1	2	1	U		0.5	1
Carbon tetrachloride	5	0.5	XU		0.25	0.5	4.97	X	J	0.25	0.5	5.05	D		0.5	1	0.5	XU		0.25	0.5
Chloroform	na	0.5	U		0.25	0.5	0.404	J	J	0.25	0.5	1.55	DJ	J	0.5	1	0.5	U		0.25	0.5
cis-1,2-Dichloroethene	na	0.5	U		0.25	0.5	0.5	U		0.25	0.5	1	U		0.5	1	0.5	U		0.25	0.5
Dibromochloromethane	na	0.5	U		0.25	0.5	0.5	U		0.25	0.5	1	XU		0.5	1	0.5	U		0.25	0.5
Ethylbenzene	na	0.5	U		0.25	0.5	0.262	J	J	0.25	0.5	1.13	DJ	J	0.5	1	0.5	U		0.25	0.5
m- & p-Xylene	na	1	U		0.5	1	0.69	J	J	0.5	1	4.06	D		1	2	1	U		0.5	1
o-Xylene	na	0.5	U		0.25	0.5	0.544	J	J	0.25	0.5	2.91	D		0.5	1	0.296	J	J	0.25	0.5
Tetrachloroethene	na	0.5	U		0.25	0.5	0.5	U		0.25	0.5	1	U		0.5	1	0.5	U		0.25	0.5
Trichloroethene	5	0.5	U		0.25	0.5	0.5	U		0.25	0.5	0.501	DJ	J	0.5	1	0.5	U		0.25	0.5
Misc. (µg/L)																					
Total Organic Carbon	na	NT					2500	U		1250	2500	2500	U		1250	2500	NT				
Chloride	na	NT					6030			170	330	3450			170	330	NT				
Nitrate (as N)	na	NT					303			33	100	47.6	J	J	33	100	NT				
Sulfate	na	NT					1000	U		330	1000	26600			330	1000	NT				
Methane	na	NT					2	U		1	2	1.54	J	J	1	2	NT				
Ethene	na	NT					2	U		1	2	1.4	J	J	1	2	NT				

Analyte	Sample ID	49MW04					49MW05					50MW02				
	Sample Date	1/26/15					1/26/15					1/27/15				
	RG	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL	Result	Lab Q	Val Q	MDL	MRL
VOCs (µg/L)																
1,1,1-Trichloroethane	na	0.5	U		0.25	0.5	1	U		0.5	1	0.5	U		0.25	0.5
1,1-Dichloroethane	na	0.5	U		0.25	0.5	1	U		0.5	1	0.313	J	J	0.25	0.5
Acetone	na	5	U		2.5	5	18.6	DJ	B	5	10	5	XU		2.5	5
Bromoform	na	0.5	U		0.25	0.5	1	U		0.5	1	0.5	U		0.25	0.5
Bromomethane	na	1	U		0.5	1	2	U		1	2	1	U		0.5	1
Carbon tetrachloride	5	0.662	J	J	0.25	0.5	1	U		0.5	1	1.62			0.25	0.5
Chloroform	na	1.46			0.25	0.5	1	U		0.5	1	0.5	U		0.25	0.5
cis-1,2-Dichloroethene	na	0.5	U		0.25	0.5	1	U		0.5	1	0.384	J	J	0.25	0.5
Dibromochloromethane	na	0.5	U		0.25	0.5	1	U		0.5	1	0.5	XU		0.25	0.5
Ethylbenzene	na	0.5	U		0.25	0.5	1	U		0.5	1	0.5	U		0.25	0.5
m- & p-Xylene	na	1	U		0.5	1	2	U		1	2	0.804	J	J	0.5	1
o-Xylene	na	0.5	U		0.25	0.5	1	U		0.5	1	0.542	J	J	0.25	0.5
Tetrachloroethene	na	0.5	U		0.25	0.5	1	U		0.5	1	0.311	J	J	0.25	0.5
Trichloroethene	5	0.5	U		0.25	0.5	1	U		0.5	1	2.08			0.25	0.5
Misc. (µg/L)																
Total Organic Carbon	na	2500	U		1250	2500	NT					2500	U		1250	2500
Chloride	na	5160			170	330	NT					7270			170	330
Nitrate (as N)	na	249	J	J	33	100	NT					2060			33	100
Sulfate	na	53600			330	1000	NT					73200			330	1000
Methane	na	2	U		1	2	NT					2	U		1	2
Ethene	na	2	U		1	2	NT					2	U		1	2

12 Bold outline indicates an RG exceedance.

RG = Remedial Goal developed for carbon tetrachloride and trichloroethene in CB&I, 2014.
µg/L = micrograms per liter (parts per billion)
CCV = Continuing Calibration Verification
ICV = Initial Calibration Verfication
MDL = Method Detection Limit
MRL = Method Reporting Limit
na = not applicable
NT = Analyte not tested.
VOC = Volatile Organic Compound

Lab Q = Lab Data Qualifiers
D = Sample was run at a dilution.
J = Value <MRL and >MDL and is considered estimated.
N = Matrix Spike/Matrix Spike Duplicate accuracy and/or precision were outside criteria.
U = Analyte not-detected at the method reporting limit.
X = The associated ICV/CCV exceeded the upper control limit.

Val Q = Validation Data Qualifiers
B = Blank contamination. Value detected in sample and associated blank.
J = Estimated concentration.

Table 5-2
Summary of Analytes Detected in Baseline Monitoring Groundwater Samples

Analyte	RG	# of RG Exceedances	# of Detections	# of Samples	Minimum Concentration	Maximum Concentration	Location of Maximum
VOCs (µg/L)							
1,1,1-Trichloroethane	na	na	3	15	0.262	0.691	48MW06
1,1-Dichloroethane	na	na	3	15	0.313	4.28	48MW06
Acetone	na	na	5	15	5	27.8	48MW06
Bromoform	na	na	2	15	0.5	1	48MW06
Bromomethane	na	na	1	15	1	1	48MW3
Carbon tetrachloride	5	3	12	15	0.5	118	48MW2
Chloroform	na	na	6	15	0.404	8.37	48MW3
cis-1,2-Dichloroethene	na	na	3	15	0.384	4.86	48MW06
Dibromochloromethane	na	na	3	15	0.5	1	49MW02
Ethylbenzene	na	na	3	15	0.262	1.13	49MW02
m- & p-Xylene	na	na	6	15	0.535	4.06	49MW02
o-Xylene	na	na	7	15	0.285	2.91	49MW02
Tetrachloroethene	na	na	2	15	0.311	0.709	48MW06
Trichloroethene	5	2	8	15	0.501	12.4	48MW3
Misc. (µg/L)							
Total Organic Carbon	na	na	1	11	1640	1640	48MW06
Chloride	na	na	11	11	2220	11500	13MW4
Nitrate (as N)	na	na	10	11	47.6	6400	48MW3
Sulfate	na	na	10	11	16800	275000	48MW06
Methane	na	na	1	11	1.54	1.54	49MW02
Ethene	na	na	1	11	1.4	1.4	49MW02

µg/L = micrograms per liter

na = not applicable

RG = Remedial Goal

VOC = Volatile Organic Compound

Table 4-1 SWMU 49 First Quarter Groundwater Elevations

Well	Screen Interval (ft bgs)	Screen Length (ft)	Total Depth (ft)	Water Level (BTOC)	Elevation (TOC)	Water Level (ft amsl)	PID Readings (ppm)
48MW07	62 - 82	20	82	48.04	1833.69	1785.65	PID = 0.0
13MW5	14 - 25	19	25	13.36	1696.40	1683.04	PID = 0.0
49MW03	77 - 117	40	117	104.72	1811.82	1707.10	PID = 0.0
49MW05	16 - 37	19	36.8	19.97	1699.74	1679.77	PID = 0.0
48MW06	58 - 78	20	78	65.82	1822.85	1757.03	PID = 2.0
48MW1	110 - 140	30	140	107.9	1816.42	1708.52	PID = 0.0
48MW2	113 - 134	20	133.7	124.39	1816.27	1691.88	PID = 0.0
48MW3	100 - 120	20	120	97.67	1808.56	1710.89	PID = 0.0
49MW01	90 - 121	31	121	115.56	1826.42	1710.86	PID = 0.0
49MW02	103 - 133	30	133	95.26	1806.29	1711.03	PID = 0.6
50MW02	89 - 119	30	119	115.62	1809.63	1694.01	PID = 0.0
13MW2	19-29	10	29	7.1	1702.62	1695.52	PID = 0.0
13MW3	9 - 19	10	19	13.87	1694.47	1680.60	PID = 0.0
13MW4	14 - 24	10	24	12.33	1696.40	1684.07	PID = 0.0
49MW04	50 - 70	20	72	19.38	1703.00	1683.62	PID = 0.0

Notes:
** Water level does not appear to be representative.*
amsl = above mean sea level
bgs = below ground surface
BTOC = below top of casing
ft = feet/foot
ppm = parts per million
TOC =top of casing

Table 4-2 SWMU 49 Year 1 Quarterly Monitoring Analytical Suite

Well/Sample ID	Frequency	TCL VOCs	Dissolved Gases (Methane, Ethane, Ethene) Perchlorate	MNA Indicator Parameters	Water Quality Parameters
13MW2	Quarterly	X	X	X	X
13MW3	Quarterly	X	X	X	X
13MW4	Quarterly	X	X	X	X
13MW5	Annual	X	X	X	X
48MW1	Quarterly	X	X	X	X
48MW2	Quarterly	X	X	X	X
48MW3	Quarterly	X	X	X	X
48MW06	Quarterly	X	X	X	X
48MW07	Annual	X	X	X	X
49MW01	Quarterly	X	X	X	X
49MW02	Quarterly	X	X	X	X
49MW03	Annual	X	X	X	X
49MW04	Quarterly	X	X	X	X
49MW05	Annual	X	X	X	X
50MW02	Quarterly	X	X	X	X

Notes:
MNA = Monitored Natural Attenuation
TCL =Target compound list
VOC = Volatile organic compound

Table 4-3 SWMU 49 First Quarter Water Quality Parameters

Well ID	pH	Conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Temperature (°C)
48MW07	7.2	196	2.26	7.6	75.0	14.0
13MW5	NS	NS	NS	NS	NS	NS
49MW03	NS	NS	NS	NS	NS	NS
49MW05	NS	NS	NS	NS	NS	NS
48MW06	7.0	0.926	10.40	1.42	195.3	14.35
48MW1	7.58	0.505	4.52	2.6	186.3	14.46
48MW2	7.0	493	512	7.0	53.0	14.0
48MW3	6.92	714	2.50	3.84	39.8	12.94
49MW01	7.45	0.493	35.0	5.18	215.9	14.09
49MW02	7.15	529	17.6	3.74	40.4	13.08
50MW02	6.84	715	25.8	5.18	51.4	12.98
13MW2	6.75	618	1.95	6.26	51.2	14.27
13MW3	6.34	555	1.10	5.53	83.3	16.34
13MW4	6.38	401	3.36	3.96	45.5	15.44
49MW04	7.3	0.636	12.0	9.2	190.2	15.1

Notes:
°C = degrees Celsius
µS/cm = microsiemens per centimeter
mg/L = milligrams per liter
mV = millivolts
NTU = Nephelometric turbidity unit
ORP = Oxidation-reduction potential

Table 4-4 SWMU 49 Second Quarter Groundwater Elevations

Well	Screen Interval (ft bgs)	Screen Length (ft)	Total Depth (ft)	Water Level (BTOC)	Elevation (TOC)	Water Level (ft amsl)	PID Readings (ppm)
48MW07	62 - 82'	20'	82	43.44	1833.69	1790.25	0.0
13MW5	14 - 25'	11	25	15.50	1696.40	1680.90	0.0
49MW03	77 - 117'	40'	117	97.73	1811.82	1714.09	0.0
49MW05	16 - 37	21	36.8	19.15	1699.74	1680.59	0.0
48MW06	58 - 78'	20'	78	62.80	1822.85	1760.05	0.0
48MW1	110 - 140'	30'	140	100.54	1816.42	1715.88	0.0
48MW2	113 - 134'	21	133.7	122.70	1816.27	1693.57	0.1
48MW3	100 - 120'	20'	120	97.60	1808.56	1710.96	0.0
49MW01	90 - 121'	31'	121	114.60	1826.42	1711.82	0.0
49MW02	103 - 133'	30'	133	94.71	1806.29	1711.58	0.1
50MW02	89 - 119'	30'	119	113.39	1809.63	1696.24	0.0
13MW2	19-29	10'	29	20.38	1702.62	1682.24	0.0
13MW3	9 - 19'	10'	19	15.76	1694.47	1678.71	0.0
13MW4	14 - 24'	10'	24	14.03	1696.40	1682.37	0.0
49MW04	50 - 70'	20'	72	19.80	1703.00	1683.20	0.0

Notes:
amsl = above mean sea level
bgs = below ground surface
BTOC = below top of casing
ft = feet/foot
ppm = parts per million
TOC = Top of casing
DTW = Depth to water

Table 4-5 SWMU 49 Second Quarter Water Quality Parameters

Well ID	pH	Conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Temperature (°C)
48MW07	7.33	383.5	2.07	8.88	104.5	12.1
13MW5	6.59	827	0.88	8.84	114.2	13.6
49MW03	6.95	553.0	2.54	12.79	117.2	12.4
49MW05	6.47	972	40.8	5.26	104.6	13.5
48MW06	6.75	1278	25.0	0.54	155.4	12.7
48MW1	7.10	688	7.18	2.27	110.6	12.4
48MW2	6.99	672	39.4	7.94	139.6	11.9
48MW3	6.71	891	1.13	3.81	117.1	11.4
49MW01	7.11	680	87.2	4.97	116.7	12.2
49MW02	6.86	722	15.4	2.23	125.6	11.4
50MW02	6.93	612.2	132	11.57	164.7	9.8
13MW2	6.52	1053	1.32	7.13	83.3	13.5
13MW3	6.32	638.6	0.85	8.37	117.3	11.5
13MW4	6.24	623.2	1.13	7.52	109.1	13.6
49MW04	6.65	811	6.16	2.01	115.6	12.9

Notes:
°C = degrees Celsius
µS/cm = microsiemens per centimeter
mg/L = milligrams per liter
mV = millivolts
NTU = Nephelometric turbidity unit
ORP = Oxidation-reduction potential

Table 4-6 SWMU 49 Third Quarter Groundwater Elevations

Well	Screen Interval (ft bgs)	Screen Length (ft)	Total Depth (ft)	Water Level (BTOC)	Elevation (TOC)	Water Level (ft amsl)	PID Readings (ppm)
48MW07	62 - 82'	20'	82	45.01	1833.69	1788.68	0.0
13MW5	14 - 25'	11	25	16.34	1696.40	1680.06	0.0
49MW03	77 - 117'	40'	117	92.65	1811.82	1719.17	0.0
49MW05	16 - 37	21	36.8	19.77	1699.74	1679.97	0.0
48MW06	58 - 78'	20'	78	63.23	1822.85	1759.62	0.0
48MW1	110 - 140'	30'	140	99.00	1816.42	1717.42	0.0
48MW2	113 - 134'	21	133.7	121.13	1816.27	1695.14	0.0
48MW3	100 - 120'	20'	120	95.90	1808.56	1712.66	0.0
49MW01	90 - 121'	31'	121	111.97	1826.42	1714.45	0.0
49MW02	103 - 133'	30'	133	93.62	1806.29	1712.67	0.0
50MW02	89 - 119'	30'	119	112.03	1809.63	1697.60	0.0
13MW2	19-29	10'	29	20.44	1702.62	1682.18	0.0
13MW3	9 - 19'	10'	19	15.07	1694.47	1679.40	0.0
13MW4	14 - 24'	10'	24	16.44	1696.40	1679.96	0.0
49MW04	50 - 70'	20'	72	19.90	1703.00	1683.10	0.0

Notes:
amsl = above mean sea level
bgs = below ground surface
BTOC = below top of casing
ft = feet/foot
ppm = parts per million
TOC = Top of casing

Table 4-7 SWMU 49 Third Quarter Water Quality Parameters

Well ID	pH	Conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Temperature (°C)
48MW07	NS	NS	NS	NS	NS	NS
13MW5	NS	NS	NS	NS	NS	NS
49MW03	NS	NS	NS	NS	NS	NS
49MW05	NS	NS	NS	NS	NS	NS
48MW06	7.06	873	103	2.81	99.4	13.85
48MW1	7.59	503	3.85	2.36	116.9	12.37
48MW2	6.98	477	111	7.33	104.1	13.82
48MW3	6.86	682	0.94	3.21	102.9	12.62
49MW01	7.60	452	31.1	6.65	117.2	11.01
49MW02	7.02	506	17.9	0.98	85.6	12.93
50MW02	6.91	640	20.1	3.85	93.6	12.68
13MW2	7.11	780	1.49	7.13	117.8	14.52
13MW3	7.05	601	9.88	5.07	128.7	14.44
13MW4	6.83	436	0.76	4.84	127.9	14.33
49MW04	7.31	600	3.02	8.10	111.5	15.50

Notes:
**Readings exhibited very high, unchanging turbidity.*
°C = degrees Celsius
µS/cm = microsiemens per centimeter
mg/L = milligrams per liter
mV = millivolts
NTU = Nephelometric turbidity unit
ORP = Oxidation-reduction potential

Table 4-8 SWMU 49 Fourth Quarter Groundwater Elevations

Well	Screen Interval (ft bgs)	Screen Length (ft)	Total Depth (ft)	Water Level (BTOC)	Elevation (TOC)	Water Level (ft amsl)	PID Readings (ppm)
48MW07	62 - 82'	20'	82	47.74	1833.69	1785.95	0.0
13MW5	14 - 25'	11	25	16.90	1696.40	1679.50	0.0
49MW03	77 - 117'	40'	117	101.82	1811.82	1710.00	0.0
49MW05	16 - 37	21	36.8	20.27	1699.74	1679.47	0.0
48MW06	58 - 78'	20'	78	65.33	1822.85	1757.52	0.0
48MW1	110 - 140'	30'	140	105.38	1816.42	1711.04	0.0
48MW2	113 - 134'	21	133.7	123.36	1816.27	1692.91	11.0
48MW3	100 - 120'	20'	120	96.68	1808.56	1711.88	4.1
49MW01	90 - 121'	31'	121	115.24	1826.42	1711.18	0.0
49MW02	103 - 133'	30'	133	93.96	1806.29	1712.33	4.5
50MW02	89 - 119'	30'	119	114.20	1809.63	1695.43	1.7
13MW2	19-29	10'	29	21.39	1702.62	1681.23	0.0
13MW3	9 - 19'	10'	19	15.36	1694.47	1679.11	0.0
13MW4	14 - 24'	10'	24	16.83	1696.40	1679.57	0.0
49MW04	50 - 70'	20'	72	20.65	1703.00	1682.35	0.0

Notes:
amsl = above mean sea level
bgs = below ground surface
BTOC = below top of casing
ft = feet/foot
ppm = parts per million
TOC = Top of casing

Table 4-9 SWMU 49 Fourth Quarter Water Quality Parameters

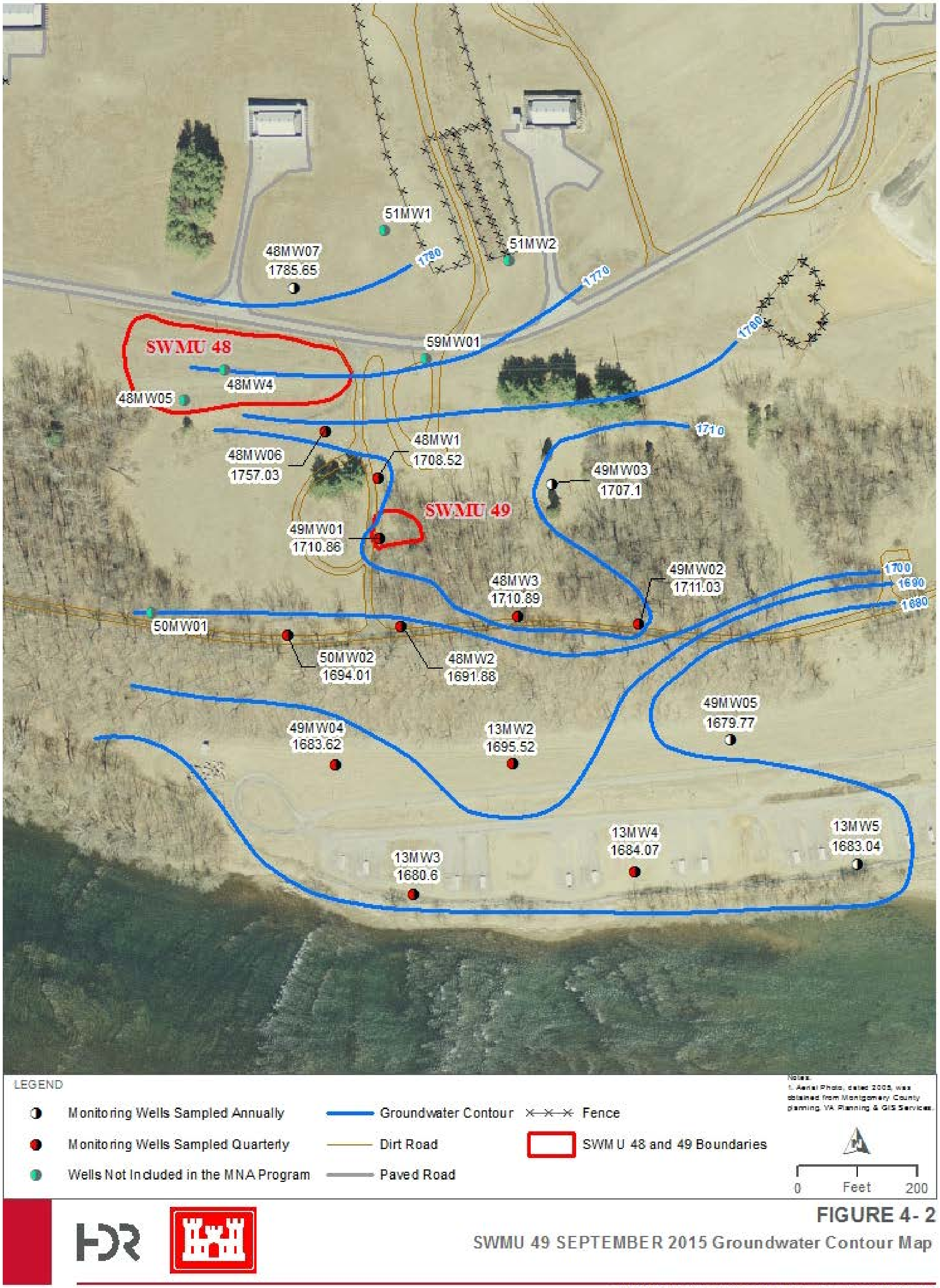
Well ID	pH	Conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Temperature (°C)
48MW07	NS	NS	NS	NS	NS	NS
13MW5	NS	NS	NS	NS	NS	NS
49MW03	NS	NS	NS	NS	NS	NS
49MW05	NS	NS	NS	NS	NS	NS
48MW06	7.26	785	110	1.02	190.7	15.01
48MW1	8.38	633	15.7	2.98	161.3	17.72
48MW2	7.98	495	70.1	6.30	164.0	15.57
48MW3	7.71	731	1.12	3.69	188.2	14.09
49MW01	8.49	471	100	4.50	154.1	14.77
49MW02	7.40	541	2.32	0.54	205.7	14.22
50MW02	7.31	677	35.2	3.56	141.3	15.40
13MW2	6.67	750	1.55	5.76	22.2	15.2
13MW3	7.15	634	2.46	4.57	173.9	20.11
13MW4	7.43	461	8.67	5.15	132.7	15.0
49MW04	8.20	639	4.79	6.33	151.9	16.54

Notes:
°C = degrees Celsius
µS/cm = microsiemens per centimeter
mg/L = milligrams per liter
mV = millivolts
NTU = Nephelometric turbidity unit
ORP = Oxidation-reduction potential

Figure 4-1 SWMU 49 Monitoring Well Sample Locations

This page intentionally left blank

Figure 4-2 SWMU 49 September 2015 Groundwater Contour Map



This page intentionally left blank

Table 4-2 SWMU 49 Year 1 Quarterly Monitoring Analytical Suite

Well/Sample ID	Frequency	TCL VOCs	Dissolved Gases (Methane, Ethane, Ethene) Perchlorate	MNA Indicator Parameters	Water Quality Parameters
13MW2	**Quarterly**	**X**	**X**	**X**	**X**
13MW3	**Quarterly**	**X**	**X**	**X**	**X**
13MW4	**Quarterly**	**X**	**X**	**X**	**X**
13MW5	**Annual**	**X**	**X**	**X**	**X**
48MW1	**Quarterly**	**X**	**X**	**X**	**X**
48MW2	**Quarterly**	**X**	**X**	**X**	**X**
48MW3	**Quarterly**	**X**	**X**	**X**	**X**
48MW06	**Quarterly**	**X**	**X**	**X**	**X**
48MW07	**Annual**	**X**	**X**	**X**	**X**
49MW01	**Quarterly**	**X**	**X**	**X**	**X**
49MW02	**Quarterly**	**X**	**X**	**X**	**X**
49MW03	**Annual**	**X**	**X**	**X**	**X**
49MW04	**Quarterly**	**X**	**X**	**X**	**X**
49MW05	**Annual**	**X**	**X**	**X**	**X**
50MW02	**Quarterly**	**X**	**X**	**X**	**X**

Notes:
MNA = Monitored Natural Attenuation
TCL =Target compound list
VOC = Volatile organic compound

Groundwater samples were collected via low-flow bladder pumps to obtain representative groundwater samples and to minimize investigative derived waste (IDW) purge water. The following procedures were followed during all quarterly groundwater monitoring events:

1. A photoionization detector (PID) reading was taken upon removing the well cap to determine the presence of potentially hazardous levels of volatile gases. The PID readings were collected during the water elevation sweeps and again during sample collection. All PID readings were within acceptable levels.

2. During the water level sweep, depth to water and total depth measurements were recorded to determine the amount of water in the well casing and sand pack.

3. Groundwater samples were collected after all water level elevations had been recorded. The general practice was to lower the bladder pump to a depth where the pump inlet was within the screened interval. Ample hydraulic head was maintained above the pump to insure a sufficient water supply. The pump was connected to a Geocontrol PRO control unit, while the discharge tubing was connected to a YSI 556 water quality flow cell.

4. Monitoring wells were pumped at a rate of approximately 200 milliliters per minute (mL/min). Flow rate was determined by gauging the time it took to fill a 200 mL vial. Water quality parameters were recorded continuously including temperature, pH, DO,

ORP, turbidity, and conductivity. Turbidity was measured using a Hach 2100Q turbidity meter, while concentrations of dissolved ferrous iron were measured in the field using a Hach DR900 test kit via Method 8146.

5. **Table 4-3** presents a summary of the final (stabilized) water quality readings for each well from the first quarter.

Based on the first quarter DO data, aerobic groundwater conditions exist at SWMU 49 (i.e., DO >1 parts per million [ppm]). The DO levels ranged from a low of 1.42 milligrams per liter (mg/L) at monitoring well 48MW06 to a high of 9.2 mg/L at monitoring well 49MW04. ORP measurements ranged from a low of 39.8 millivolts (mV) in monitoring well 48MW3 to a high of 215.9 mV at monitoring well 49MW01. Measurements of pH ranged from a low of 6.34 standard units (SU) at monitoring well 13MW3 to a high of 7.45 at monitoring well 49MW01. Measurements of specific conductance ranged from a low of 0.493 microsiemens per centimeter (µS/cm) at monitoring well 49MW01 to a high of 715 µS/cm at monitoring well 50MW02.

Table 4-3 SWMU 49 First Quarter Water Quality Parameters

Well ID	pH	Conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Temperature (°C)
48MW07	7.2	196	2.26	7.6	75.0	14.0
13MW5	NS	NS	NS	NS	NS	NS
49MW03	NS	NS	NS	NS	NS	NS
49MW05	NS	NS	NS	NS	NS	NS
48MW06	7.0	0.926	10.40	1.42	195.3	14.35
48MW1	7.58	0.505	4.52	2.6	186.3	14.46
48MW2	7.0	493	512	7.0	53.0	14.0
48MW3	6.92	714	2.50	3.84	39.8	12.94
49MW01	7.45	0.493	35.0	5.18	215.9	14.09
49MW02	7.15	529	17.6	3.74	40.4	13.08
50MW02	6.84	715	25.8	5.18	51.4	12.98
13MW2	6.75	618	1.95	6.26	51.2	14.27
13MW3	6.34	555	1.10	5.53	83.3	16.34
13MW4	6.38	401	3.36	3.96	45.5	15.44
49MW04	7.3	0.636	12.0	9.2	190.2	15.1

Notes:
°C = degrees Celsius
µS/cm = microsiemens per centimeter
mg/L = milligrams per liter
mV = millivolts
NTU = Nephelometric turbidity unit
ORP = Oxidation-reduction potential

Prior to sampling, the flow cell was disconnected and the groundwater flow rate was maintained at 200 mL/min during sample collection. Samples were collected, labeled, and packed in ice until shipment to the laboratory. Chain-of-custody (CoC) forms were filled out and shipped with the samples. Copies of the CoC forms are provided in **Appendix B** along with the raw analytical data packages.

4.1.3 Quality Control Samples

Quality control (QC) samples including a duplicate sample and trip, equipment, and temperature blanks were collected during the first monitoring event.

One duplicate sample was collected during the first monitoring event at 48MW06 (duplicate as 49TM01) and analyzed for the full suite of compounds as the parent sample. Further, one matrix spike/matrix spike duplicate (MS/MSD) was collected at monitoring well 48MW2 and analyzed for the full suite of compounds as the parent sample.

One equipment rinse blank sample (100215R1) was collected during the first quarter sampling event. The equipment rinse blank was collected by pouring de-ionized ultra-filtered (DIUF) water over decontaminated sampling equipment and into laboratory supplied bottles. The rinse blank was analyzed for the full suite of compounds as the samples.

One IDW purge water sample (ADW01) was collected and analyzed for pH, chemical oxygen demand (COD), and total metals.

Results of the quality assurance (QA)/QC samples are presented in the raw analytical data package provided in **Appendix B**

4.2 Second Quarter Groundwater Sampling

Groundwater elevation measurements and samples were collected from all 15 POC monitoring wells. The second quarter of groundwater sampling was conducted 13 January through 15 January 2016. Groundwater elevation measurements were collected prior to sampling activities. The locations of monitoring wells sampled during this quarterly event are provided in **Figure 4-1**.

4.2.1 Groundwater Elevation Measurements

Water level elevations were collected during each first year quarterly event from the 15 monitoring wells at SWMU 49 prior to the collection of groundwater samples. **Table 4-4** provides the measured depth to water levels (from the TOC) and groundwater elevations amsl collected on 11 January 2016. **Figure 4-3** presents a groundwater elevation contour map developed from the elevation data collected during this quarterly monitoring event.

Table 4-4 SWMU 49 Second Quarter Groundwater Elevations

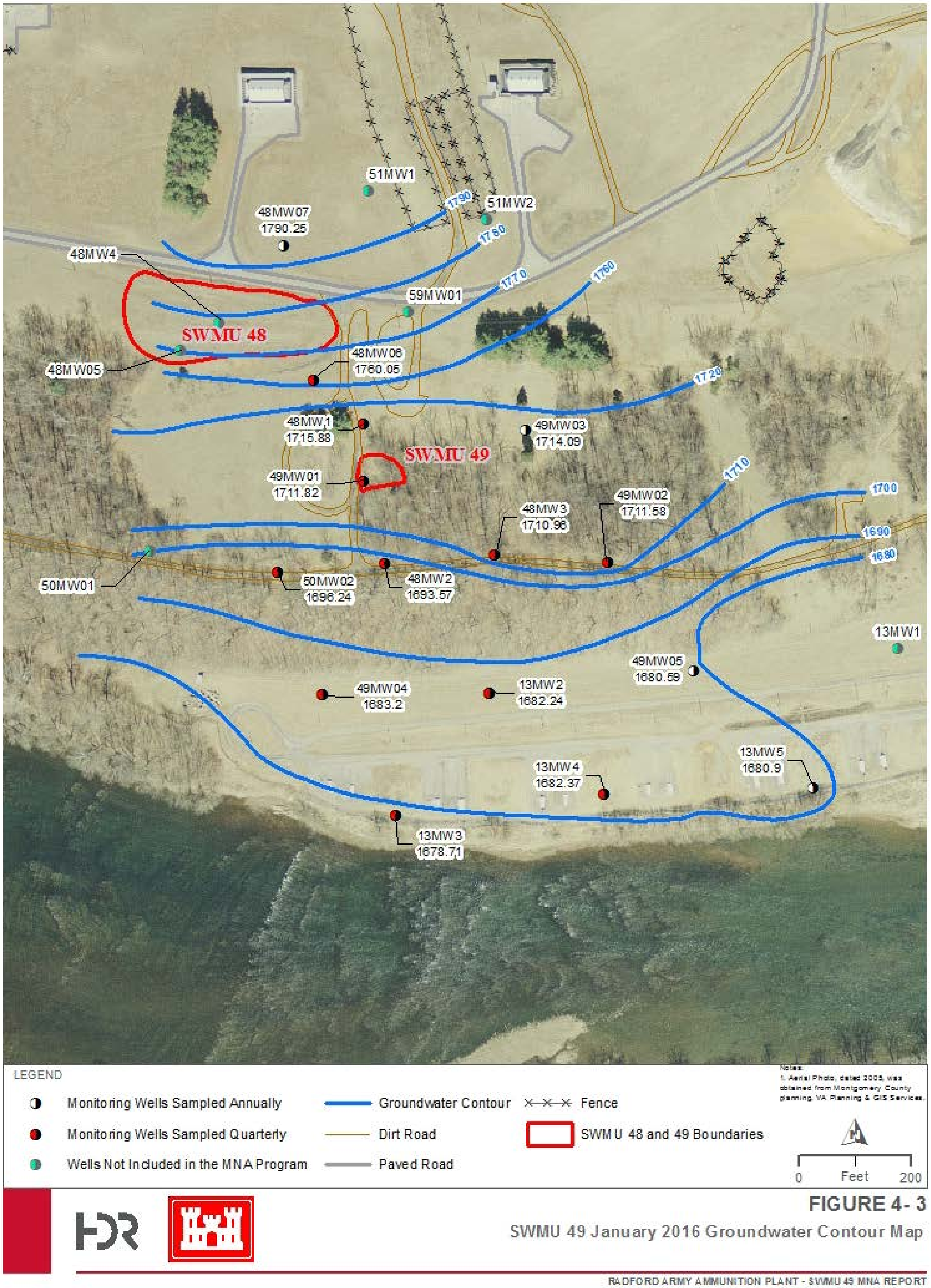
Well	Screen Interval (ft bgs)	Screen Length (ft)	Total Depth (ft)	Water Level (BTOC)	Elevation (TOC)	Water Level (ft amsl)	PID Readings (ppm)
48MW07	62 - 82'	20'	82	43.44	1833.69	1790.25	0.0
13MW5	14 - 25'	11	25	15.50	1696.40	1680.90	0.0
49MW03	77 - 117'	40'	117	97.73	1811.82	1714.09	0.0
49MW05	16 - 37	21	36.8	19.15	1699.74	1680.59	0.0
48MW06	58 - 78'	20'	78	62.80	1822.85	1760.05	0.0
48MW1	110 - 140'	30'	140	100.54	1816.42	1715.88	0.0
48MW2	113 - 134'	21	133.7	122.70	1816.27	1693.57	0.1
48MW3	100 - 120'	20'	120	97.60	1808.56	1710.96	0.0
49MW01	90 - 121'	31'	121	114.60	1826.42	1711.82	0.0
49MW02	103 - 133'	30'	133	94.71	1806.29	1711.58	0.1
50MW02	89 - 119'	30'	119	113.39	1809.63	1696.24	0.0
13MW2	19-29	10'	29	20.38	1702.62	1682.24	0.0
13MW3	9 - 19'	10'	19	15.76	1694.47	1678.71	0.0
13MW4	14 - 24'	10'	24	14.03	1696.40	1682.37	0.0
49MW04	50 - 70'	20'	72	19.80	1703.00	1683.20	0.0

Notes:
amsl = above mean sea level
bgs = below ground surface
BTOC = below top of casing
ft = feet/foot
ppm = parts per million
TOC = Top of casing
DTW = Depth to water

4.2.2 Groundwater Sampling

Groundwater samples were collected from 15 of the 15 POC monitoring wells from 13 January through 15 January 2016. The second quarter monitoring samples were tested for the same analytes as the first quarter, which are presented in **Table 4-2**. In addition, the following MNA indicator parameters were collected: TOC, dissolved ferrous iron, chloride, nitrate, and sulfate. Water quality parameters collected during low flow sampling included pH, temperature, specific conductance, DO, ORP, and turbidity. These parameters are discussed in Section 6.2 regarding the potential for biodegradation in the groundwater at SWMU 49.

Figure 4-3 SWMU 49 January 2016 Groundwater Contour Map



This page intentionally left blank

Groundwater samples were collected applying the same method and approach used during the first quarterly monitoring event: specifically, via low-flow bladder pumps. The sample procedures are provided below.

1. A PID reading was taken upon removing the well cap to determine the presence of potentially hazardous levels of volatile gases. The PID readings were collected during the water elevation sweeps and again during sample collection. All PID readings were within acceptable levels.
2. During the water level sweep, depth to water and total depth measurements were recorded to determine the amount of water in the well casing and sandpack.
3. Groundwater samples were collected after all water level elevations had been recorded. The general practice was to lower the bladder pump to a depth where the pump inlet was within the screened interval. Ample hydraulic head was maintained above the pump to insure a sufficient water supply. The pump was connected to a Geocontrol PRO control unit, while the discharge tubing was connected to a YSI 556 water quality flow cell.
4. Monitoring wells were pumped at a rate of approximately 200 mL/min. Flow rate was determined by gauging the time it took to fill a 200 mL vial. Water quality parameters were recorded continuously including temperature, pH, DO, ORP, turbidity, and conductivity. Turbidity was measured using a Hach 2100Q turbidity meter, while concentrations of dissolved ferrous iron were tested in the field using a Hach DR900 test kit via Method 8146.
5. **Table 4-5** presents a summary of the final (stabilized) water quality readings for each well from the second quarter.

Based on the second quarter DO data, aerobic groundwater conditions exist at SWMU 49 (i.e., DO > 1 ppm) at all but one monitoring well (48MW06). The DO levels ranged from a low of 0.54 mg/L at monitoring well 48MW06 to a high of 11.57 mg/L at monitoring well 50MW02. ORP measurements ranged from a low of 83.3 mV in monitoring well 13MW2 to a high of 155.4 mV at monitoring well 48MW06. Measurements of pH ranged from a low of 6.24 SU at monitoring well 13MW4 to a high of 7.33 SU at monitoring well 48MW07. Measurements of specific conductance ranged from a low of 383.5 μS/cm at monitoring well 48MW07 to a high of 1278 μS/cm at monitoring well 48MW06. Copies of the CoC forms are provided in **Appendix B** along with the raw analytical data packages.

Table 4-5 SWMU 49 Second Quarter Water Quality Parameters

Well ID	pH	Conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Temperature (°C)
48MW07	7.33	383.5	2.07	8.88	104.5	12.1
13MW5	6.59	827	0.88	8.84	114.2	13.6
49MW03	6.95	553.0	2.54	12.79	117.2	12.4
49MW05	6.47	972	40.8	5.26	104.6	13.5
48MW06	6.75	1278	25.0	0.54	155.4	12.7
48MW1	7.10	688	7.18	2.27	110.6	12.4
48MW2	6.99	672	39.4	7.94	139.6	11.9
48MW3	6.71	891	1.13	3.81	117.1	11.4
49MW01	7.11	680	87.2	4.97	116.7	12.2
49MW02	6.86	722	15.4	2.23	125.6	11.4
50MW02	6.93	612.2	132	11.57	164.7	9.8
13MW2	6.52	1053	1.32	7.13	83.3	13.5
13MW3	6.32	638.6	0.85	8.37	117.3	11.5
13MW4	6.24	623.2	1.13	7.52	109.1	13.6
49MW04	6.65	811	6.16	2.01	115.6	12.9

Notes:
°C = degrees Celsius
µS/cm = microsiemens per centimeter
mg/L = milligrams per liter
mV = millivolts
NTU = Nephelometric turbidity unit
ORP = Oxidation-reduction potential

4.2.3 Quality Control Samples

QC samples including a duplicate sample and trip, equipment, and temperature blanks were collected during the second monitoring event.

One duplicate sample was collected during the first monitoring event at 13MW3 (duplicate as 49TM01) and analyzed for the full suite of compounds as the parent sample. Further, one MS/MSD was collected at monitoring well 48MW2 and analyzed for the full suite of compounds as the parent sample.

One equipment rinse blank sample (011516R1) was collected during the second quarter sampling event. The equipment rinse blank was collected by pouring DIUF water over decontaminated sampling equipment and into laboratory supplied bottles. The rinse blank was analyzed for the full suite of compounds as the samples.

One IDW purge water sample (49ADW01) was collected and analyzed for pH, COD, and total metals.

Results of the QA/QC samples are presented in the raw analytical data package provided in **Appendix B**.

4.3 Third Quarter Groundwater Sampling

Groundwater elevation measurements were collected from all 15 POC monitoring wells, while samples were collected from 11 of the 15 wells. The third quarter of groundwater sampling was conducted 12 April through 13 April 2016. Groundwater elevation measurements were collected prior to sampling activities. The locations of monitoring wells sampled during this quarterly event are provided in **Figure 4-1**.

4.3.1 Groundwater Elevation Measurements

Water level elevations were collected during each first year quarterly event from the 15 monitoring wells at SWMU 49 prior to the collection of groundwater samples. **Table 4-6** provides the measured depth to water levels (from the TOC) and groundwater elevations amsl collected on 11 April 2016. **Figure 4-4** presents a groundwater elevation contour map developed from the elevation data collected during this quarterly monitoring event.

Table 4-6 SWMU 49 Third Quarter Groundwater Elevations

Well	Screen Interval (ft bgs)	Screen Length (ft)	Total Depth (ft)	Water Level (BTOC)	Elevation (TOC)	Water Level (ft amsl)	PID Readings (ppm)
48MW07	62 - 82'	20'	82	45.01	1833.69	1788.68	0.0
13MW5	14 - 25'	11	25	16.34	1696.40	1680.06	0.0
49MW03	77 - 117'	40'	117	92.65	1811.82	1719.17	0.0
49MW05	16 - 37	21	36.8	19.77	1699.74	1679.97	0.0
48MW06	58 - 78'	20'	78	63.23	1822.85	1759.62	0.0
48MW1	110 - 140'	30'	140	99.00	1816.42	1717.42	0.0
48MW2	113 - 134'	21	133.7	121.13	1816.27	1695.14	0.0
48MW3	100 - 120'	20'	120	95.90	1808.56	1712.66	0.0
49MW01	90 - 121'	31'	121	111.97	1826.42	1714.45	0.0
49MW02	103 - 133'	30'	133	93.62	1806.29	1712.67	0.0
50MW02	89 - 119'	30'	119	112.03	1809.63	1697.60	0.0
13MW2	19-29	10'	29	20.44	1702.62	1682.18	0.0
13MW3	9 - 19'	10'	19	15.07	1694.47	1679.40	0.0
13MW4	14 - 24'	10'	24	16.44	1696.40	1679.96	0.0
49MW04	50 - 70'	20'	72	19.90	1703.00	1683.10	0.0

Notes:
amsl = above mean sea level
bgs = below ground surface
BTOC = below top of casing
ft = feet/foot
ppm = parts per million
TOC = Top of casing

4.3.2 Groundwater Sampling

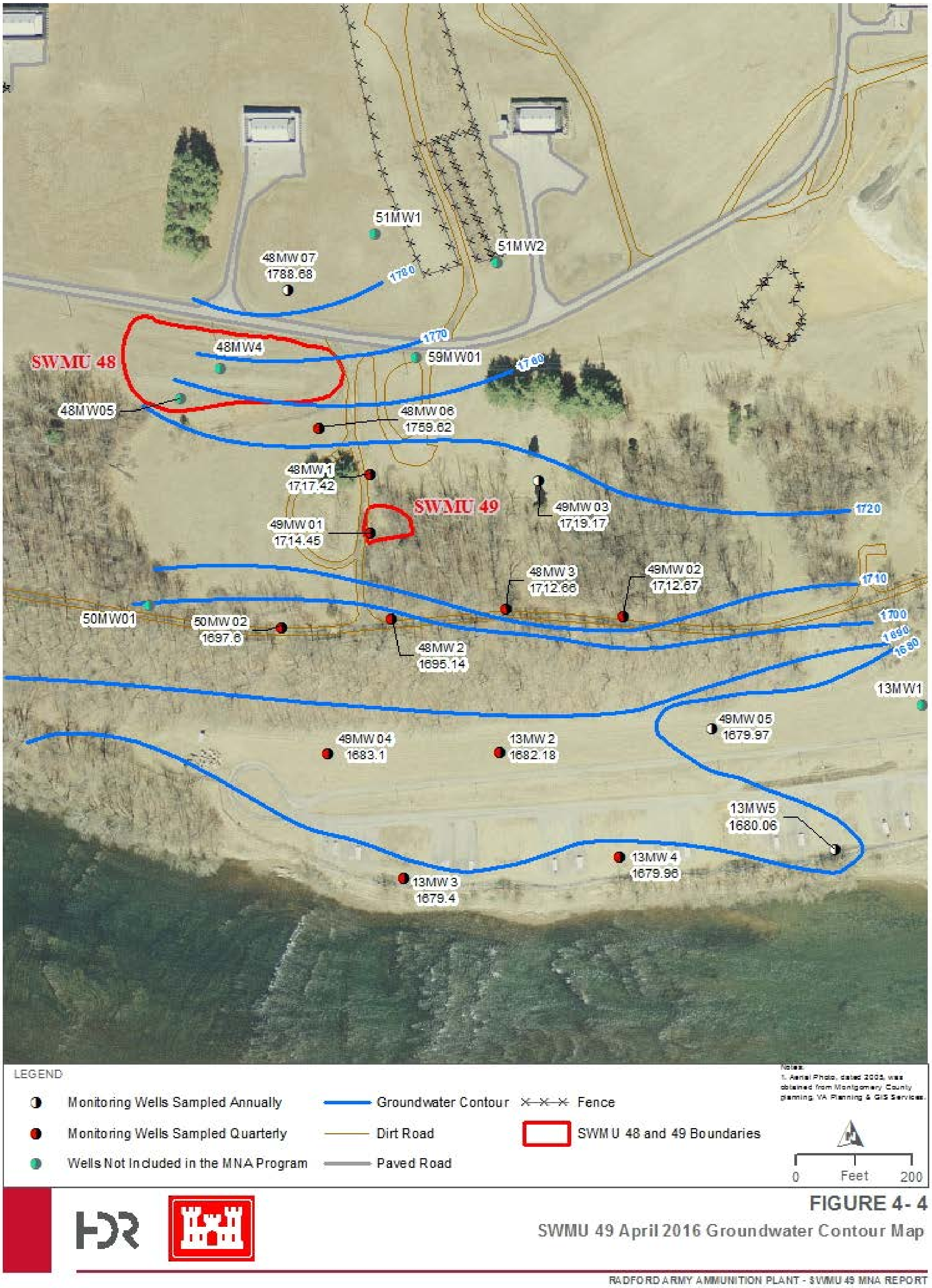
Groundwater samples were collected from 11 of the 15 POC monitoring wells from 12 April through 13 April 2016. The third quarter monitoring samples were tested for the same analytes as the first quarter, which are presented in **Table 4-2**. In addition, the following MNA indicator parameters were collected: TOC, dissolved ferrous iron, chloride, nitrate, and sulfate. Water quality parameters collected during low flow sampling included pH, temperature, specific conductance, DO, ORP, and turbidity. These parameters are discussed in Section 6.2 regarding the potential for biodegradation in the groundwater at SWMU 49.

Groundwater samples were collected applying the same method and approach used during the first quarterly monitoring event: specifically, via low-flow bladder pumps. The sample procedures are provided below.

1. A PID reading was taken upon removing the well cap to determine the presence of potentially hazardous levels of volatile gases. The PID readings were collected during the water elevation sweeps and again during sample collection. All PID readings were within acceptable levels.
2. During the water level sweep, depth to water and total depth measurements were recorded to determine the amount of water in the well casing and sandpack.
3. Groundwater samples were collected after all water level elevations had been recorded. The general practice was to lower the bladder pump to a depth where the pump inlet was within the screened interval. Ample hydraulic head was maintained above the pump to insure a sufficient water supply. The pump was connected to a Geocontrol PRO control unit, while the discharge tubing was connected to a YSI 556 water quality flow cell.
4. Monitoring wells were pumped at a rate of approximately 200 mL/min. Flow rate was determined by gauging the time it took to fill a 200 mL vial. Water quality parameters were recorded continuously including temperature, pH, DO, ORP, turbidity, and conductivity. Turbidity was measured using a Hach 2100Q turbidity meter, while concentrations of dissolved ferrous iron were tested in the field using a Hach DR900 test kit via Method 8146.
5. **Table 4-7** presents a summary of the final (stabilized) water quality readings for each well from the second quarter.

Based on the third quarter DO data, aerobic groundwater conditions exist at SWMU 49 (i.e., DO > 1 ppm) at all but one monitoring well (49MW02). The DO levels ranged from a low of 0.98 mg/L at monitoring well 49MW02 to a high of 8.10 mg/L at monitoring well 49MW04. ORP measurements ranged from a low of 85.6 mV in monitoring well 49MW02 to a high of 128.7 mV at monitoring well 13MW3. Measurements of pH ranged from a low of 6.83 SU at monitoring well 13MW4 to a high of 7.60 SU at monitoring well 49MW01. Measurements of specific conductance ranged from a low of 436 µS/cm at monitoring well 13MW4 to a high of 873 µS/cm at monitoring well 48MW06. Copies of the CoC forms are provided in **Appendix B** along with the raw analytical data packages.

Figure 4-4 SWMU 49 April 2016 Groundwater Contour Map



This page intentionally left blank

Table 4-7 SWMU 49 Third Quarter Water Quality Parameters

Well ID	pH	Conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Temperature (ºC)
48MW07	NS	NS	NS	NS	NS	NS
13MW5	NS	NS	NS	NS	NS	NS
49MW03	NS	NS	NS	NS	NS	NS
49MW05	NS	NS	NS	NS	NS	NS
48MW06	7.06	873	103	2.81	99.4	13.85
48MW1	7.59	503	3.85	2.36	116.9	12.37
48MW2	6.98	477	111	7.33	104.1	13.82
48MW3	6.86	682	0.94	3.21	102.9	12.62
49MW01	7.60	452	31.1	6.65	117.2	11.01
49MW02	7.02	506	17.9	0.98	85.6	12.93
50MW02	6.91	640	20.1	3.85	93.6	12.68
13MW2	7.11	780	1.49	7.13	117.8	14.52
13MW3	7.05	601	9.88	5.07	128.7	14.44
13MW4	6.83	436	0.76	4.84	127.9	14.33
49MW04	7.31	600	3.02	8.10	111.5	15.50

Notes:
**Readings exhibited very high, unchanging turbidity.*
°C = degrees Celsius
µS/cm = microsiemens per centimeter
mg/L = milligrams per liter
mV = millivolts
NTU = Nephelometric turbidity unit
ORP = Oxidation-reduction potential

4.3.3 Quality Control Samples

QC samples including a duplicate sample and trip, equipment, and temperature blanks were collected during the first monitoring event.

One duplicate sample was collected during the first monitoring event at 48MW06 (duplicate as 49TM01) and analyzed for the full suite of compounds as the parent sample. Further, one MS/MSD was collected at monitoring well 48MW3 and analyzed for the full suite of compounds as the parent sample.

One equipment rinse blank sample (041316R1) was collected during the first quarter sampling event. The equipment rinse blank was collected by pouring DIUF water over decontaminated sampling equipment and into laboratory supplied bottles. The rinse blank was analyzed for the full suite of compounds as the samples.

One IDW purge water sample (49ADW01) was collected and analyzed for pH, COD, and total metals.

Results of the QA/QC samples are presented in the raw analytical data package provided in **Appendix B**.

4.4 Fourth Quarter Groundwater Sampling

Groundwater elevation measurements were collected from all 15 POC monitoring wells, while samples were collected from 11 of the 15 wells. The fourth quarter of groundwater sampling was conducted 12 July through 13 July 2016. Groundwater elevation measurements were collected prior to sampling activities. The locations of monitoring wells sampled during this quarterly event are provided in **Figure 4-1**.

4.4.1 Groundwater Elevation Measurements

Water level elevations were collected during each first year quarterly event from the 15 monitoring wells at SWMU 49 prior to the collection of groundwater samples. **Table 4-8** provides the measured depth to water levels (from the TOC) and groundwater elevations amsl collected on 11 July 2016. **Figure 4-5** presents a groundwater elevation contour map developed from the elevation data collected during this quarterly monitoring event.

Table 4-8 SWMU 49 Fourth Quarter Groundwater Elevations

Well	Screen Interval (ft bgs)	Screen Length (ft)	Total Depth (ft)	Water Level (BTOC)	Elevation (TOC)	Water Level (ft amsl)	PID Readings (ppm)
48MW07	62 - 82'	20'	82	47.74	1833.69	1785.95	0.0
13MW5	14 - 25'	11	25	16.90	1696.40	1679.50	0.0
49MW03	77 - 117'	40'	117	101.82	1811.82	1710.00	0.0
49MW05	16 - 37	21	36.8	20.27	1699.74	1679.47	0.0
48MW06	58 - 78'	20'	78	65.33	1822.85	1757.52	0.0
48MW1	110 - 140'	30'	140	105.38	1816.42	1711.04	0.0
48MW2	113 - 134'	21	133.7	123.36	1816.27	1692.91	11.0
48MW3	100 - 120'	20'	120	96.68	1808.56	1711.88	4.1
49MW01	90 - 121'	31'	121	115.24	1826.42	1711.18	0.0
49MW02	103 - 133'	30'	133	93.96	1806.29	1712.33	4.5
50MW02	89 - 119'	30'	119	114.20	1809.63	1695.43	1.7
13MW2	19-29	10'	29	21.39	1702.62	1681.23	0.0
13MW3	9 - 19'	10'	19	15.36	1694.47	1679.11	0.0
13MW4	14 - 24'	10'	24	16.83	1696.40	1679.57	0.0
49MW04	50 - 70'	20'	72	20.65	1703.00	1682.35	0.0

Notes:
amsl = above mean sea level
bgs = below ground surface
BTOC = below top of casing
ft = feet/foot
ppm = parts per million
TOC = Top of casing

Figure 4-5 SWMU 49 July 2016 Groundwater Contour Map

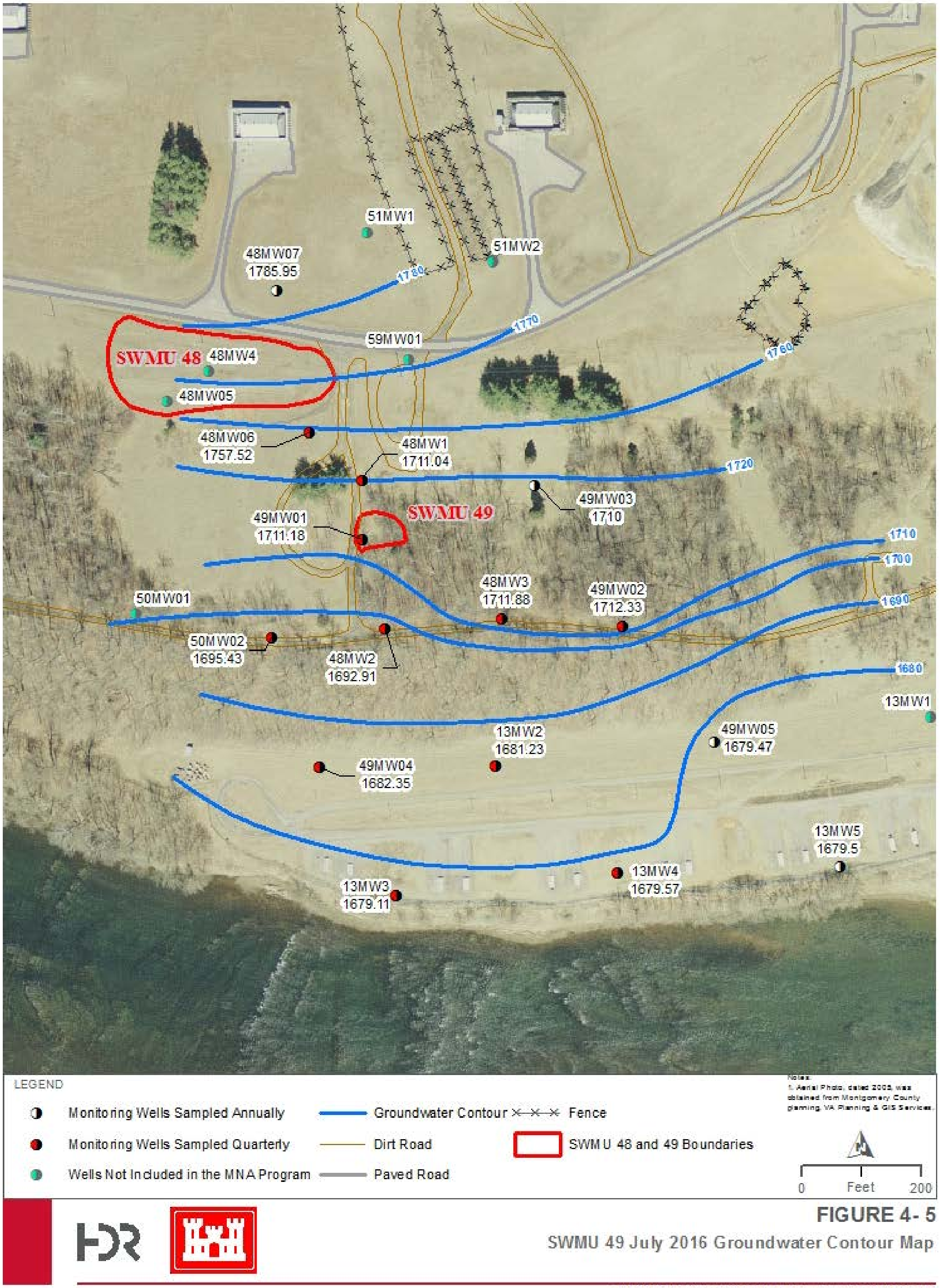


Table 5-1 SWMU 49 Summary of First Quarter Groundwater Samples

Analyte	Units	RG	# of RG Exceedances	# of Detections	# of Samples[1]	Minimum Concentration	Maximum Concentration	Location of Maximum
VOCs								
1,1,1-Trichloroethane	**µg/L**	**na**	0	4	13	0.22	0.71	48MW06
1,1-Dichloroethane	**µg/L**	**na**	0	4	13	0.28	4.6	48MW06
Acetone	**µg/L**	**na**	0	0	13	ND	ND	na
Bromoform	**µg/L**	**na**	0	0	13	ND	ND	na
Bromomethane	**µg/L**	**na**	0	0	13	ND	ND	na
Carbon tetrachloride	**µg/L**	**5**	2	6	13	0.29	71	48MW3
Chloroform	**µg/L**	**na**	0	5	13	0.16	7.5	48MW3
cis-1,2-Dichloroethene	**µg/L**	**na**	0	3	13	0.36	6.6	48MW06
Dibromochloromethane	**µg/L**	**na**	0	0	13	ND	ND	na
Ethylbenzene	**µg/L**	**na**	0	0	13	ND	ND	na
m- & p-Xylene	**µg/L**	**na**	0	0	13	ND	ND	na
o-Xylene	**µg/L**	**na**	0	0	13	ND	ND	na
Tetrachloroethene	**µg/L**	**na**	0	2	13	0.45	0.55	48MW06
Trichloroethene	**µg/L**	**5**	1	7	13	0.65	10	48MW3
Misc.								
Chloride	**mg/L**	**na**	**na**	13	13	1.2	10	48MW06
Ethane	**µg/L**	**na**	**na**	0	13	ND	ND	na
Ethene	**µg/L**	**na**	**na**	0	13	ND	ND	na
Methane	**µg/L**	**na**	**na**	0	13	ND	ND	na
Nitrate (as N)	**mg/L**	**na**	**na**	13	13	0.14	6.3	48MW3
Sulfate	**mg/L**	**na**	**na**	12	13	1.4	140	48MW06
Total Organic Carbon	**mg/L**	**na**	**na**	13	13	5.2	34	50MW02

Notes:
1 = Includes one Duplicate Sample
µg/L = micrograms per liter
mg/L = milligrams per liter
na = not applicable
ND = non detect
RG = Remedial Goal

This page intentionally left blank

Table 5-2 SWMU 49 Detected Analytes In First Quarter Groundwater Sample

Sample ID			48MW07					48MW06					49TM01 (Field Duplicate of 48MW06)					48MW1					48MW2					48MW3					49MW01				
Date Collected			10/1/2015					10/1/2015					10/1/2015					10/1/2015					10/1/2015					10/2/2015					10/1/2015				
Analyte	**Units**	**Remedial Goals [(1)]**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**
VOCs (µg/L)																																					
1,1,1-Trichloroethane	µg/L	na	0.5	U	U	1	0.21	0.71	J	J	1	0.21	0.7	J	J	1	0.21	0.38	J	J	1	0.21	0.5	U	U	1	0.21	0.5	U	U	1	0.21	0.22	J	J	1	0.21
1,1-Dichloroethane	µg/L	na	0.5	U	U	1	0.2	4.6			1	0.2	4.2			1	0.2	0.92	J	J	1	0.2	0.5	U	U	1	0.2	0.5	U	U	1	0.2	0.5	U	U	1	0.2
Acetone	µg/L	na	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5
Bromoform	µg/L	na	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22
Bromomethane	µg/L	na	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5
Carbon tetrachloride	µg/L	5	0.5	U	U	1	0.23	0.5	U	U	1	0.23	0.5	U	U	1	0.23	0.5	U	U	1	0.23	**48**			1	0.23	**71**			1	0.23	3.3			1	0.23
Chloroform	µg/L	na	0.25	U	U	0.5	0.15	0.25	U	U	0.5	0.15	0.25	U	U	0.5	0.15	0.25	U	U	0.5	0.15	4.6			0.5	0.15	7.5			0.5	0.15	0.3	J	J	0.5	0.15
cis-1,2-Dichloroethene	µg/L	na	0.5	U	U	1	0.25	6.4		U	1	0.25	6.6			1	0.25	0.66	J	J	1	0.25	0.5	U	U	1	0.25	0.5	U	U	1	0.25	0.5	U	U	1	0.25
Dibromochloromethane	µg/L	na	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19
Ethylbenzene	µg/L	na	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22
m- & p-Xylene	µg/L	na	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5
o-Xylene	µg/L	na	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24
Tetrachloroethene	µg/L	na	0.5	U	U	1	0.3	0.55	J	J	1	0.3	0.45	J	J	1	0.3	0.5	U	U	1	0.3	0.5	U	U	1	0.3	0.5	U	U	1	0.3	0.5	U	U	1	0.3
Trichloroethene	µg/L	5	0.5	U	U	1	0.21	4.7			1	0.21	4.6			1	0.21	1.8			1	0.21	3.8			1	0.21	**10**			1	0.21	0.5	U	U	1	0.21
Misc.																																					
Chloride	mg/L	na	1.2	J	J	4	1.1	9.9			4	1.1	10			4	1.1	3	J	J	4	1.1	1.7	J	J	4	1.1	2.1	J	J	4	1.1	5.6			4	1.1
Ethene	µg/L	na	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5
Ethane	µg/L	na	0.7	U	U	0.8	0.4	0.7	U	U	0.8	0.4	0.7	U	U	0.8	0.4	0.7	U	U	0.8	0.4	0.7	U	U	0.8	0.4	0.7	U	U	0.8	0.4	0.7	U	U	0.8	0.4
Methane	µg/L	na	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3	0.56	J	JB	0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3
Nitrate (as N)	mg/L	na	0.97		J	0.4	0.08	3.6		J	0.4	0.08	3.7		J	0.4	0.08	1.3		J	0.4	0.08	0.76		J	0.4	0.08	6.3			0.4	0.08	0.39	J	J	0.4	0.08
Sulfate	mg/L	na	1.4	J	J	5	1.3	140			25	6.5	140			25	6.5	48			5	1.3	10			5	1.3	27			5	1.3	2.5	U	U	5	1.3
Total Organic Carbon	mg/L	na	5.2			3	0.5	23			3	0.5	26			3	0.5	12			3	0.5	22	M	J	3	0.5	25			3	0.5	16			3	0.5
MNA																																					
Dissolved Fe^{2+}	mg/L	na	0.05					0.04					0.04					0.03					0.42					0.05					0.22				

Table 5-2 SWMU 49 Detected Analytes In First Quarter Groundwater Sample (Continued)

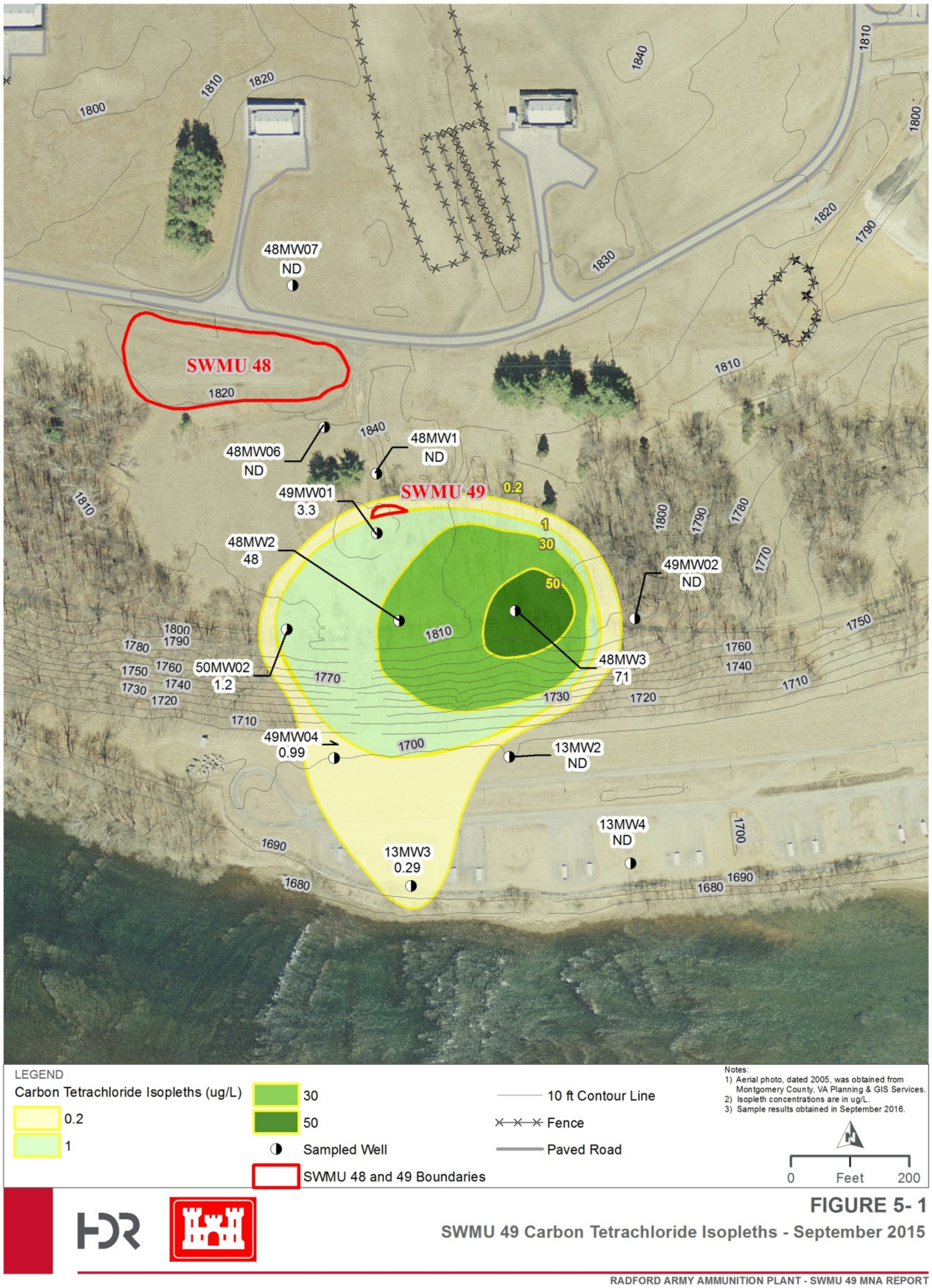
Sample ID			**49MW02**					**50MW02**					**13MW2**					**13MW3**					**13MW4**					**49MW04**				
Date Collected			**10/2/2015**					**10/2/2015**					**10/2/2015**					**10/2/2015**					**10/2/2015**					**9/30/2015**				
Analyte	**Units**	**Remedial Goals (1)**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**
VOCs (µg/L)																																
1,1,1-Trichloroethane	µg/L	na	0.5	U	U	1	0.21	0.5	U	U	1	0.21	0.5	U	U	1	0.21	0.5	U	U	1	0.21	0.5	U	U	1	0.21	0.5	U	U	1	0.21
1,1-Dichloroethane	µg/L	na	0.5	U	U	1	0.2	0.28	J	J	1	0.2	0.5	U	U	1	0.2	0.5	U	U	1	0.2	0.5	U	U	1	0.2	0.5	U	U	1	0.2
Acetone	µg/L	na	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5
Bromoform	µg/L	na	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22
Bromomethane	µg/L	na	1	U	U	2	0.5	1	UZ	UJ	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	UJ	2	0.5
Carbon tetrachloride	µg/L	5	0.5	U	U	1	0.23	1.2			1	0.23	0.5	U	U	1	0.23	0.29	J	J	1	0.23	0.5	U	U	1	0.23	0.99	J	J	1	0.23
Chloroform	µg/L	na	0.25	U	U	0.5	0.15	0.17	J	JB	0.5	0.15	0.25	U	U	0.5	0.15	0.25	U	U	0.5	0.15	0.25	U	U	0.5	0.15	0.16	J	J	0.5	0.15
cis-1,2-Dichloroethene	µg/L	na	0.5	U	U	1	0.25	0.36	J	J	1	0.25	0.5	U	U	1	0.25	0.5	U	U	1	0.25	0.5	U	U	1	0.25	0.5	U	U	1	0.25
Dibromochloromethane	µg/L	na	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19
Ethylbenzene	µg/L	na	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22
m- & p-Xylene	µg/L	na	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5
o-Xylene	µg/L	na	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24
Tetrachloroethene	µg/L	na	0.5	U	U	1	0.3	0.5	U	U	1	0.3	0.5	U	U	1	0.3	0.5	U	U	1	0.3	0.5	U	U	1	0.3	0.5	U	U	1	0.3
Trichloroethene	µg/L	5	0.5	U	U	1	0.21	1.3			1	0.21	0.5	U	U	1	0.21	0.5	U	U	1	0.21	0.65	J	J	1	0.21	0.5	U	U	1	0.21
Misc.																																
Chloride	mg/L	na	1.3	J	J	4	1.1	6.7			4	1.1	3.1	J	J	4	1.1	2.9	J	J	4	1.1	5.1			4	1.1	4.8			4	1.1
Ethene	µg/L	na	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5
Ethane	µg/L	na	0.7	U	U	0.8	0.4	0.7	U	U	0.8	0.4	0.7	U	U	0.8	0.4	0.7	U	U	0.8	0.4	0.7	U	U	0.8	0.4	0.7	U	U	0.8	0.4
Methane	µg/L	na	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3
Nitrate (as N)	mg/L	na	0.14	J	JB	0.4	0.08	2.2			0.4	0.08	0.38	J	J	0.4	0.08	0.31	J	J	0.4	0.08	0.42			0.4	0.08	0.52		B	0.4	0.08
Sulfate	mg/L	na	19			5	1.3	66			5	1.3	41			5	1.3	41	M		5	1.3	33			5	1.3	43			5	1.3
Total Organic Carbon	mg/L	na	15			3	0.5	34			3	0.5	26			3	0.5	23			3	0.5	23			3	0.5	17			3	0.5
MNA																																
Dissolved Fe^{2+}	mg/L	na	0.15					0.22					0.02					0.00					0.02					0.03				

Notes:
(1) Remedial Goals developed in Draft SWMU 48/49 RFI Report (CB&I, 2014a).
Exceedances denoted by bold font.
mg/L = milligrams per liter (parts per million)
µg/L = micrograms per liter (parts per billion)
RL = Reporting Limit
MDL = Method Detection Limit
na = not applicable; remedial goal not established for analyte at SWMU 49
Lab Q = Lab Data Qualifiers
Val Q = Validation Data Qualifiers

Data Qualifiers

B = Analyte detected in associated Method Blank.
J = Estimated value.
M = Matrix Spike and/or Matrix Spike Duplicate recovery outside acceptance limits.
U = Analyte concentration was not above the detection level.

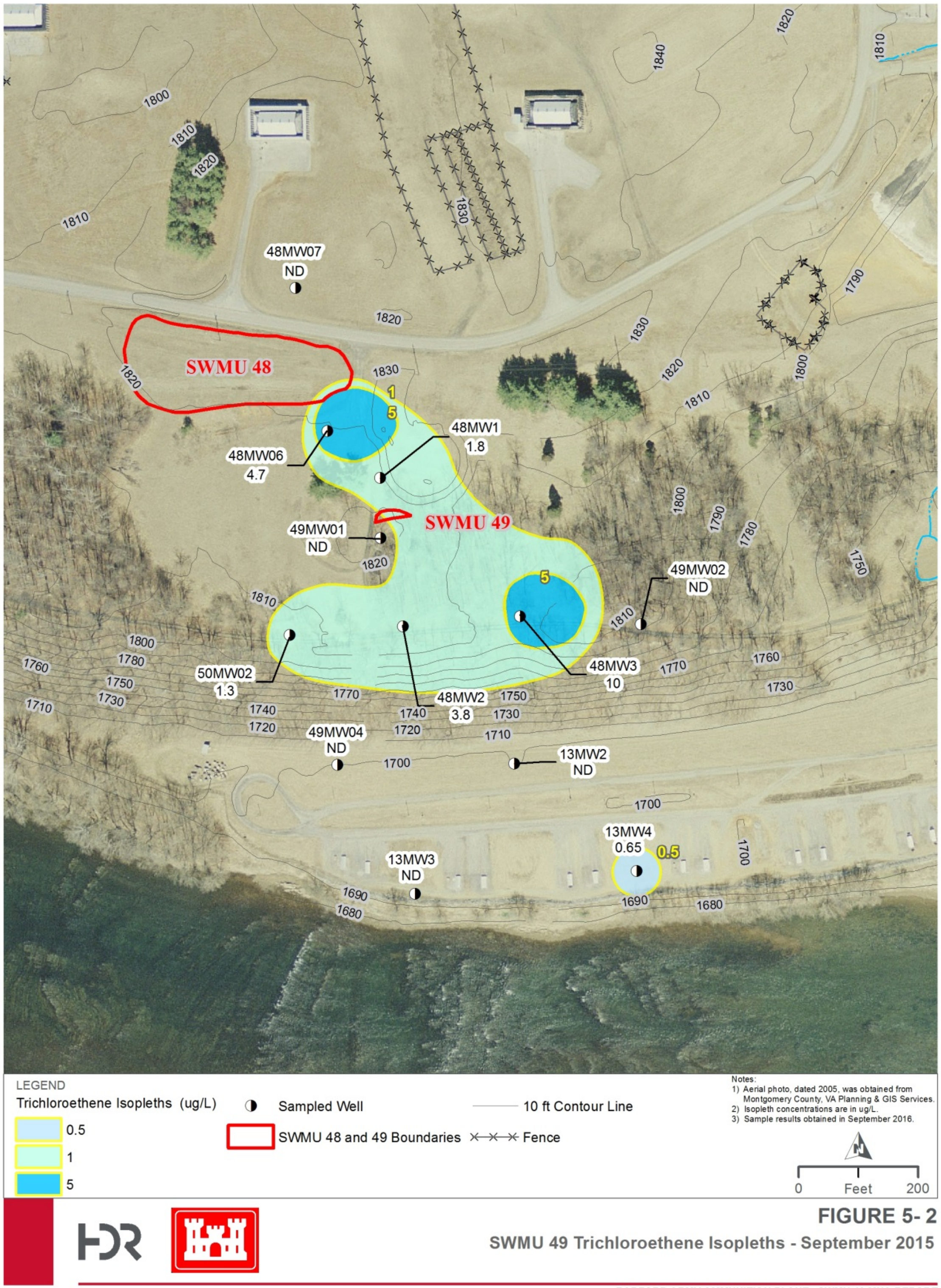
Figure 5-1 SWMU 49 Carbon Tetrachloride Isopleths - September 2015



Notes:
1) Aerial photo, dated 2005, was obtained from Montgomery County, VA Planning & GIS Services.
2) Isopleth concentrations are in ug/L.
3) Sample results obtained in September 2016.

This page intentionally left blank

Figure 5-2 SWMU 49 Trichloroethene Isopleths - September 2015



Notes:
1) Aerial photo, dated 2005, was obtained from Montgomery County, VA Planning & GIS Services.
2) Isopleth concentrations are in ug/L.
3) Sample results obtained in September 2016.

This page intentionally left blank

Table 5-3 SWMU 49 Summary of Second Quarter Groundwater Samples

Analyte	Units	RG	# of RG Exceedances	# of Detections	# of Samples	Minimum Concentration	Maximum Concentration	Location of Maximum
VOCs								
1,1,1-Trichloroethane	**µg/L**	**na**	**na**	2	16	0.46	1.2	48MW06
1,1-Dichloroethane	**µg/L**	**na**	**na**	3	16	0.5	5.3	48MW06
Acetone	**µg/L**	**na**	**na**	0	16	ND	ND	na
Bromoform	**µg/L**	**na**	**na**	0	16	ND	ND	na
Bromomethane	**µg/L**	**na**	**na**	0	16	ND	ND	na
Carbon tetrachloride	**µg/L**	**5**	2	7	16	0.56	66	48MW2
Chloroform	**µg/L**	**na**	**na**	5	16	0.4	7.5	48MW3
cis-1,2-Dichloroethene	**µg/L**	**na**	**na**	2	16	0.75	8.1	48MW06
Dibromochloromethane	**µg/L**	**na**	**na**	0	16	ND	ND	na
Ethylbenzene	**µg/L**	**na**	**na**	0	16	ND	ND	na
m- & p-Xylene	**µg/L**	**na**	**na**	0	16	ND	ND	na
o-Xylene	**µg/L**	**na**	**na**	0	16	ND	ND	na
Tetrachloroethene	**µg/L**	**na**	**na**	1	16	0.87	0.87	48MW06
Trichloroethene	**µg/L**	**5**	3	8	16	0.82	9.7	48MW3
Misc.								
Chloride	**mg/L**	**na**	**na**	16	16	1.2	15	49MW05
Ethene	**µg/L**	**na**	**na**	0	16	ND	ND	na
Ethane	**µg/L**	**na**	**na**	0	16	ND	ND	na
Methane	**µg/L**	**na**	**na**	2	16	0.73	4.3	50MW02
Nitrate (as N)	**mg/L**	**na**	**na**	16	16	0.098	6.8	48MW3
Sulfate	**mg/L**	**na**	**na**	15	16	1.4	210	48MW06
Total Organic Carbon	**mg/L**	**na**	**na**	15	16	0.64	2.7	48MW06

Notes:
µg/L = micrograms per liter
mg/L = milligrams per liter
na = not applicable
ND = non detect
RG = Remedial Goal

This page intentionally left blank

Table 5-4 SWMU 49 Detected Analytes in Second Quarter Groundwater Samples

Sample ID			**48MW07**					**13MW5**					**49MW03**					**49MW05**					**48MW06**					**48MW1**					**48MW2**				
Date Collected			**1/14/2016**					**1/13/2016**					**1/14/2016**					**1/13/2016**					**1/14/2016**					**1/14/2016**					**1/15/2016**				
Analyte	**Units**	**Remedial Goals (1)**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**
VOCs (µg/L)																																					
1,1,1-Trichloroethane	µg/L	na	0.5	U	U	1	0.21	0.5	U	U	1	0.21	0.5	U	U	1	0.21	0.5	U	U	1	0.21	1.2			1	0.21	0.46	J	J	1	0.21	0.5	U	U	1	0.21
1,1-Dichloroethane	µg/L	na	0.5	U	U	1	0.2	0.5	U	U	1	0.2	0.5	U	U	1	0.2	0.5	U	U	1	0.2	5.3			1	0.2	0.96	J	J	1	0.2	0.5	U	U	1	0.2
Acetone	µg/L	na	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	UY	UJ	20	5
Bromoform	µg/L	na	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22
Bromomethane	µg/L	na	1	UZ	U	2	0.5	1	UZ	UJ	2	0.5	1	UZ	UJ	2	0.5	1	UZ	UJ	2	0.5	1	UZ	U	2	0.5	1	UZ	UJ	2	0.5	1	UY,M,Z	UJ	2	0.5
Carbon tetrachloride	µg/L	5	0.5	U	U	1	0.23	0.5	U	U	1	0.23	0.5	U	U	1	0.23	0.5	U	U	1	0.23	0.5	U	U	1	0.23	0.5	U	U	1	0.23	**66**			1	0.23
Chloroform	µg/L	na	0.25	U	U	0.5	0.15	0.25	U	U	0.5	0.15	0.25	U	U	0.5	0.15	0.25	U	U	0.5	0.15	0.25	U	U	0.5	0.15	0.25	U	U	0.5	0.15	5.9			0.5	0.15
cis-1,2-Dichloroethene	µg/L	na	0.5	U	U	1	0.25	0.5	U	U	1	0.25	0.5	U	U	1	0.25	0.5	U	U	1	0.25	8.1			1	0.25	0.75	J	J	1	0.25	0.5	U	U	1	0.25
Dibromochloromethane	µg/L	na	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19
Ethylbenzene	µg/L	na	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22
m- & p-Xylene	µg/L	na	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5
o-Xylene	µg/L	na	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24
Tetrachloroethene	µg/L	na	0.5	U	U	1	0.3	0.5	U	U	1	0.3	0.5	U	U	1	0.3	0.5	U	U	1	0.3	0.87	J	J	1	0.3	0.5	U	U	1	0.3	0.5	U	U	1	0.3
Trichloroethene	µg/L	5	0.5	U	U	1	0.21	0.5	U	U	1	0.21	0.5	U	U	1	0.21	0.5	U	U	1	0.21	**5.9**			1	0.21	2.3			1	0.21	**7.9**			1	0.21
Misc.																																					
Chloride	mg/L	na	1.2	J	J	4	1.1	3.9	J	J	4	1.1	7		B	4	1.1	15		B	4	1.1	11		B	4	1.1	3.5	J	J	4	1.1	3.1	J	J	4	1.1
Ethene	µg/L	na	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5
Ethane	µg/L	na	0.7	U	U	0.8	0.4	0.7	U	U	0.8	0.4	0.7	U	U	0.8	0.4	0.7	U	U	0.8	0.4	0.7	U	U	0.8	0.4	0.7	U	U	0.8	0.4	0.7	U	U	0.8	0.4
Methane	µg/L	na	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3	0.73			0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3
Nitrate (as N)	mg/L	na	0.99			0.4	0.08	0.51			0.4	0.08	1.3			0.4	0.08	0.21	J	J	0.4	0.08	6.7		B	0.4	0.08	1.4			0.4	0.08	0.93			0.4	0.08
Sulfate	mg/L	na	1.4	J	J	5	1.3	69			5	1.3	3	J	J	5	1.3	62			5	1.3	210			50	13	56			5	1.3	14			5	1.3
Total Organic Carbon	mg/L	na	1.5	J	J	3	0.5	1.4	J	J	3	0.5	0.68	J	J	3	0.5	2	J	J	3	0.5	2.7	J	J	3	0.5	1.8	J	J	3	0.5	1.6	JY	J	3	0.5
MNA																																					
Dissolved Fe^{2+}	mg/L	na	0.00					0.00					0.00					0.38					0.08					0.00					0.13				

Table 5-4 SWMU 49 Detected Analytes in Second Quarter Groundwater Samples (Continued)

Sample ID			48MW3					49MW01					49MW02					50MW02					13MW2					13MW3					49TM01 (Field Duplicate of 13MW3)				
Date Collected			1/15/2016					1/14/2016					1/15/2016					1/15/2016					1/13/2016					1/13/2016					1/13/2016				
Analyte	**Units**	**Remedial Goals $^{(1)}$**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**
VOCs (µg/L)																																					
1,1,1-Trichloroethane	µg/L	na	0.5	U	U	1	0.21	0.5	U	U	1	0.21	0.5	U	U	1	0.21	0.5	U	U	1	0.21	0.5	U	U	1	0.21	0.5	U	U	1	0.21	0.5	U	U	1	0.21
1,1-Dichloroethane	µg/L	na	0.5	U	U	1	0.2	0.5	U	U	1	0.2	0.5	U	U	1	0.2	0.5	J	J	1	0.2	0.5	U	U	1	0.2	0.5	U	U	1	0.2	0.5	U	U	1	0.2
Acetone	µg/L	na	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5
Bromoform	µg/L	na	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22
Bromomethane	µg/L	na	1	UZ	UJ	2	0.5	1	UZ	UJ	2	0.5	1	UZ	UJ	2	0.5	1	UZ	UJ	2	0.5	1	UZ	UJ	2	0.5	1	UZ	UJ	2	0.5	1	UZ	UJ	2	0.5
Carbon tetrachloride	µg/L	5	**62**			1	0.23	3.1			1	0.23	0.5	U	U	1	0.23	0.56	J	J	1	0.23	0.5	U	U	1	0.23	3.8	U	U	1	0.23	4.1		U	1	0.23
Chloroform	µg/L	na	7.5			0.5	0.15	0.4	J	J	0.5	0.15	0.25	U	U	0.5	0.15	0.25	U	U	0.5	0.15	0.25	U	U	0.5	0.15	0.53		J	0.5	0.15	0.55		U	0.5	0.15
cis-1,2-Dichloroethene	µg/L	na	0.5	U	U	1	0.25	0.5	U	U	1	0.25	0.5	U	U	1	0.25	0.5	U	U	1	0.25	0.5	U	U	1	0.25	0.5	U	U	1	0.25	0.5	U	U	1	0.25
Dibromochloromethane	µg/L	na	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19
Ethylbenzene	µg/L	na	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22
m- & p-Xylene	µg/L	na	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5
o-Xylene	µg/L	na	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24
Tetrachloroethene	µg/L	na	0.5	U	U	1	0.3	0.5	U	U	1	0.3	0.5	U	U	1	0.3	0.5	U	U	1	0.3	0.5	U	U	1	0.3	0.5	U	U	1	0.3	0.5	U	U	1	0.3
Trichloroethene	µg/L	5	**9.7**			1	0.21	0.5	U	U	1	0.21	0.5	U	U	1	0.21	1.1			1	0.21	0.5	U	U	1	0.21	0.82	J	J	1	0.21	0.94	J	J	1	0.21
Misc.																																					
Chloride	mg/L	na	3	J	J	4	1.1	5.9		B	4	1.1	1.9	J	J	4	1.1	8.2		B	4	1.1	6.9		B	4	1.1	4.3			4	1.1	4.3			4	1.1
Ethene	µg/L	na	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5
Ethane	µg/L	na	0.7	U	U	0.8	0.4	0.7	U	U	0.8	0.4	0.7	U	U	0.8	0.4	0.7	U	U	0.8	0.4	0.7	U	U	0.8	0.4	0.7	U	U	0.8	0.4	0.7	U	U	0.8	0.4
Methane	µg/L	na	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3	4.3		B	0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3
Nitrate (as N)	mg/L	na	6.8		B	0.4	0.08	0.39	J	J	0.4	0.08	0.098	J	J	0.4	0.08	2.4			0.4	0.08	0.23	J	J	0.4	0.08	1.8		B	0.4	0.08	1.8		B	0.4	0.08
Sulfate	mg/L	na	27			5	1.3	2.5	U	U	5	1.3	20			5	1.3	68		B	5	1.3	67			25	6.5	100			25	6.5	99			25	6.5
Total Organic Carbon	mg/L	na	0.64	J	J	3	0.5	0.88	J	J	3	0.5	0.64	J	J	3	0.5	1.5	U	U	3	0.5	2.5	J	J	3	0.5	1.9	J	J	3	0.5	2.2	J	J	3	0.5
MNA																																					
Dissolved Fe^{2+}	mg/L	na	0.00					0.74					0.09					1.06					0.00					0.00					0.00				

Table 5-4 SWMU 49 Detected Analytes in Second Quarter Groundwater Samples (Continued)

Sample ID			13MW4					49MW04				
Date Collected			1/13/2016					1/13/2016				
Analyte	Units	Remedial Goals $^{(1)}$	Result	Lab Q	Val Q	RL	MDL	Result	Lab Q	Val Q	RL	MDL
VOCs (µg/L)												
1,1,1-Trichloroethane	µg/L	na	0.5	U	U	1	0.21	0.5	U	U	1	0.21
1,1-Dichloroethane	µg/L	na	0.5	U	U	1	0.2	0.5	U	U	1	0.2
Acetone	µg/L	na	10	U	U	20	5	10	U	U	20	5
Bromoform	µg/L	na	0.5	U	U	1	0.22	0.5	U	U	1	0.22
Bromomethane	µg/L	na	1	UZ	UJ	2	0.5	1	UZ	UJ	2	0.5
Carbon tetrachloride	µg/L	5	0.5	U	U	1	0.23	0.94	J	J	1	0.23
Chloroform	µg/L	na	0.25	U	U	0.5	0.15	0.25	U	U	0.5	0.15
cis-1,2-Dichloroethene	µg/L	na	0.5	U	U	1	0.25	0.5	U	U	1	0.25
Dibromochloromethane	µg/L	na	0.5	U	U	1	0.19	0.5	U	U	1	0.19
Ethylbenzene	µg/L	na	0.5	U	U	1	0.22	0.5	U	U	1	0.22
m- & p-Xylene	µg/L	na	1	U	U	2	0.5	1	U	U	2	0.5
o-Xylene	µg/L	na	0.5	U	U	1	0.24	0.5	U	U	1	0.24
Tetrachloroethene	µg/L	na	0.5	U	U	1	0.3	0.5	U	U	1	0.3
Trichloroethene	µg/L	5	1.1		U	1	0.21	0.5	U	U	1	0.21
Misc.												
Chloride	mg/L	na	3.9	J	J	4	1.1	5.2			4	1.1
Ethene	µg/L	na	1	U	U	1.1	0.5	1	U	U	1.1	0.5
Ethane	µg/L	na	0.7	U	U	0.8	0.4	0.7	U	U	0.8	0.4
Methane	µg/L	na	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3
Nitrate (as N)	mg/L	na	0.46			0.4	0.08	0.52			0.4	0.08
Sulfate	mg/L	na	37			5	1.3	48			5	1.3
Total Organic Carbon	mg/L	na	2	J	J	3	0.5	1.9	J	J	3	0.5
MNA												
Dissolved Fe^{2+}			0.00					0.00				

Notes:

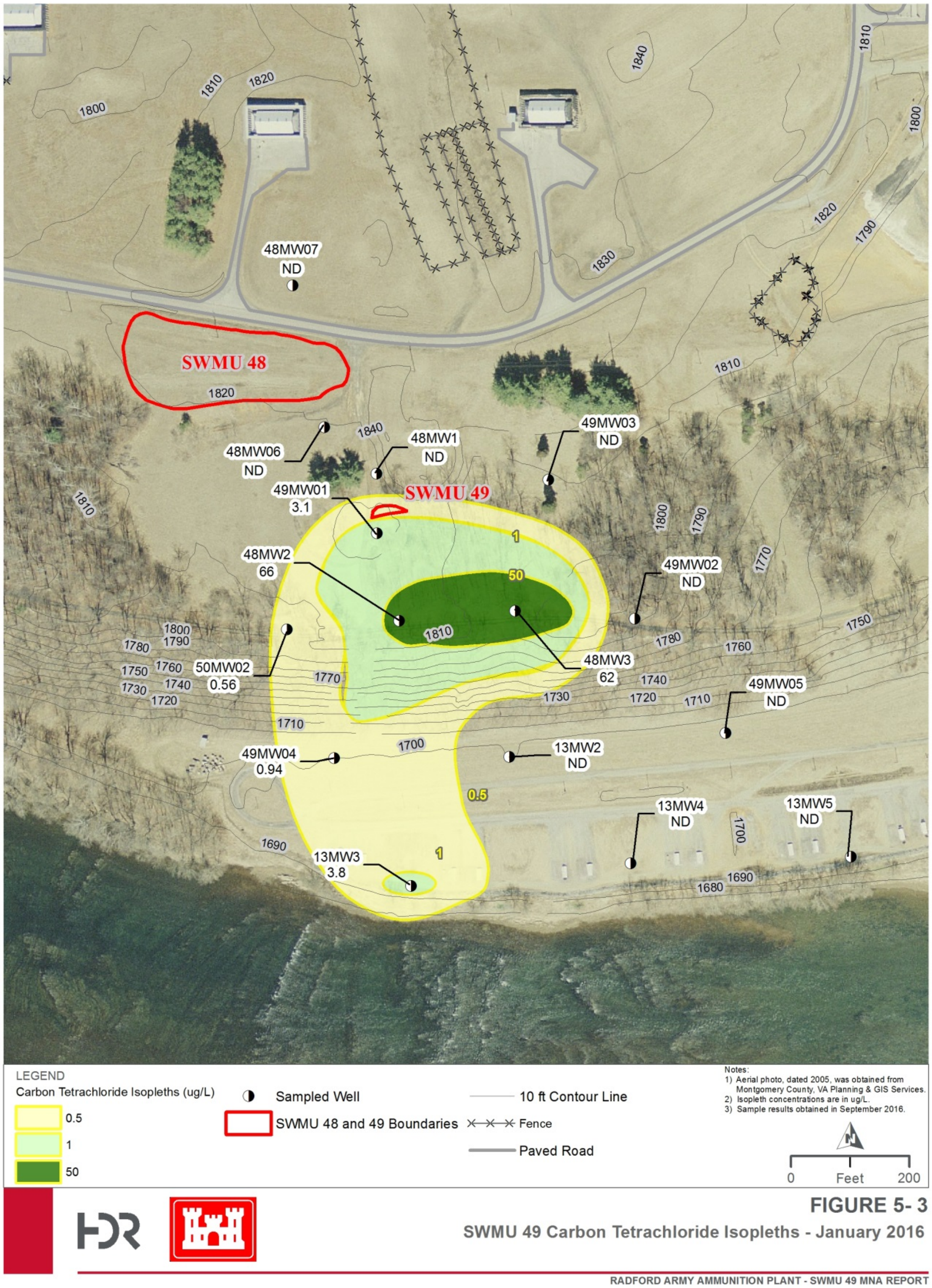
(1) Remedial Goals developed in Draft SWMU 48/49 RFI Report (CB&I, 2014a).
Exceedances denoted by bold font.
mg/L = milligrams per liter (parts per million)
µg/L = micrograms per liter (parts per billion)
RL = Reporting Limit
MDL = Method Detection Limit
na = not applicable; remedial goal not established for analyte at SWMU 49
ND = non detect
Lab Q = Lab Data Qualifiers
Val Q = Validation Data Qualifiers

Data Qualifiers

B = Analyte detected in associated Method Blank.
J = Estimated value.
M = Matrix Spike and/or Matrix Spike Duplicate recovery outside acceptance limits.
P = Concentration of analyte differs more than 40% between primary and confirmation analysis.
U = Analyte concentration was not above the detection level.
Y = Replicate/Duplicate precision outside acceptance limits.

This page intentionally left blank

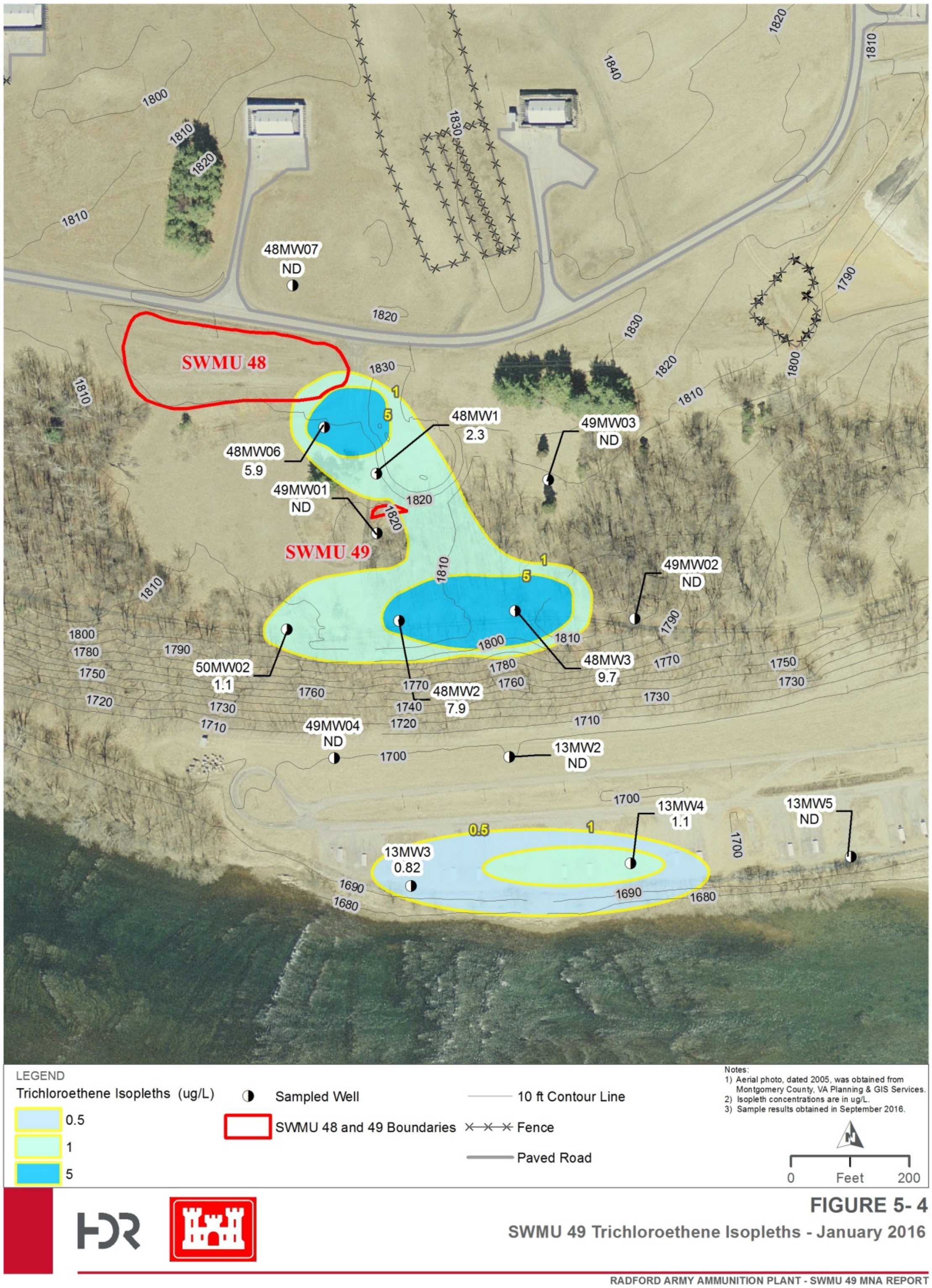
Figure 5-3 SWMU 49 Carbon Tetrachloride Isopleths - January 2016



Notes:
1) Aerial photo, dated 2005, was obtained from Montgomery County, VA Planning & GIS Services.
2) Isopleth concentrations are in ug/L.
3) Sample results obtained in September 2016.

This page intentionally left blank

Figure 5-4 SWMU 49 Trichloroethene Isopleths - January 2016



Notes:
1) Aerial photo, dated 2005, was obtained from Montgomery County, VA Planning & GIS Services.
2) Isopleth concentrations are in ug/L.
3) Sample results obtained in September 2016.

This page intentionally left blank

Table 5-5 SWMU 49 Summary of Third Quarter Groundwater Samples

Analyte	Units	RG	# of RG Exceedances	# of Detections	# of Samples	Minimum Concentration	Maximum Concentration	Location of Maximum
VOCs								
1,1,1-Trichloroethane	**µg/L**	**na**	**na**	4	12	0.27	1.3	48MW06
1,1-Dichloroethane	**µg/L**	**na**	**na**	4	12	0.47	5.3	48MW06
Acetone	**µg/L**	**na**	**na**	0	12	ND	ND	na
Bromoform	**µg/L**	**na**	**na**	0	12	ND	ND	na
Bromomethane	**µg/L**	**na**	**na**	0	12	ND	ND	na
Carbon tetrachloride	**µg/L**	**5**	3	6	12	0.73	73	48MW3
Chloroform	**µg/L**	**na**	**na**	5	12	0.17	8.2	48MW3
cis-1,2-Dichloroethene	**µg/L**	**na**	**na**	4	12	0.59	8.2	48MW06
Dibromochloromethane	**µg/L**	**na**	**na**	0	12	ND	ND	na
Ethylbenzene	**µg/L**	**na**	**na**	0	12	ND	ND	na
m- & p-Xylene	**µg/L**	**na**	**na**	0	12	ND	ND	na
o-Xylene	**µg/L**	**na**	**na**	0	12	ND	ND	na
Tetrachloroethene	**µg/L**	**na**	**na**	2	12	0.73	0.8	48MW06
Trichloroethene	**µg/L**	**5**	3	8	12	0.8	10	48MW3
Misc.								
Chloride	**mg/L**	**na**	**na**	12	12	2.1	11	48MW06
Ethene	**µg/L**	**na**	**na**	0	12	ND	ND	na
Ethane	**µg/L**	**na**	**na**	0	12	ND	ND	na
Methane	**µg/L**	**na**	**na**	1	12	0.39	0.39	48MW1
Nitrate (as N)	**mg/L**	**na**	**na**	12	12	0.13	6.3	48MW3
Sulfate	**mg/L**	**na**	**na**	11	12	6.2	150	48MW06
Total Organic Carbon	**mg/L**	**na**	**na**	8	12	0.57	3.3	13MW2

Notes:
µg/L = micrograms per liter
mg/L = milligrams per liter
na = not applicable
ND = non detect

This page intentionally left blank

Table 5-6 SWMU 49 Detected Analytes in Third Quarter Groundwater Samples

Sample ID			48MW06					49TM01 (Field Duplicate of 48MW06)					48MW1					48MW2					48MW3					49MW01					49MW02				
Date Collected			**4/12/2016**					**4/12/2016**					**4/13/2016**					**4/12/2016**					**4/12/2016**					**4/13/2016**					**4/12/2016**				
Analyte	**Units**	**Remedial Goals $^{(1)}$**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**
VOCs (µg/L)																																					
1,1,1-Trichloroethane	µg/L	na	1.2			1.0	0.21	1.3			1.0	0.21	0.42	J	J	1.0	0.21	0.50	U	U	1.0	0.21	0.50	U	U	1.0	0.21	0.50	U	U	1.0	0.21	0.50	U	U	1.0	0.21
1,1-Dichloroethane	µg/L	na	5.2			1.0	0.2	5.3			1.0	0.20	1.1			1.0	0.20	0.50	U	U	1.0	0.20	0.50	U	U	1.0	0.20	0.50	U	U	1.0	0.20	0.50	U	U	1.0	0.20
Acetone	µg/L	na	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5
Bromoform	µg/L	na	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22
Bromomethane	µg/L	na	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5
Carbon tetrachloride	µg/L	5	0.50	U	U	1.0	0.23	0.50	U	U	1.0	0.23	0.50	U	U	1.0	0.23	**32**			1.0	0.23	**73**			1.0	0.23	3.0			1.0	0.23	0.50	U	U	1.0	0.23
Chloroform	µg/L	na	0.25	U	U	0.50	0.15	0.25	U	U	0.50	0.15	0.25	U	U	0.50	0.15	3.2			0.50	0.15	8.2			0.50	0.15	0.35	J	J	0.50	0.15	0.25	U	U	0.50	0.15
cis-1,2-Dichloroethene	µg/L	na	8.1			1.0	0.25	8.2			1.0	0.25	0.89	J	J	1.0	0.25	0.50	U	U	1.0	0.25	0.50	U	U	1.0	0.25	0.50	U	U	1.0	0.25	0.50	U	U	1.0	0.25
Dibromochloromethane	µg/L	na	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19
Ethylbenzene	µg/L	na	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22
m- & p-Xylene	µg/L	na	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5
o-Xylene	µg/L	na	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24
Tetrachloroethene	µg/L	na	0.73	J	J	1.0	0.30	0.80	J	J	1.0	0.30	0.50	U	U	1.0	0.30	0.50	U	U	1.0	0.30	0.50	U	U	1.0	0.30	0.50	U	U	1.0	0.30	0.50	U	U	1.0	0.30
Trichloroethene	µg/L	5	**5.9**			1.0	0.21	**6.3**			1.0	0.21	2.2			1.0	0.21	2.3			1.0	0.21	**10**			1.0	0.21	0.50	U	U	1.0	0.21	0.50	U	U	1.0	0.21
Misc.																																					
Chloride	mg/L	na	11			4	1.1	11			4	1.1	4.3			4	1.1	2.5	J	J	4	1.1	2.5	JM	J	4	1.1	6	M	J	4	1.1	2.1	J	J	4	1.1
Ethene	µg/L	na	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5
Ethane	µg/L	na	0.70	U	U	0.80	0.40	0.70	U	U	0.80	0.40	0.70	U	U	0.80	0.40	0.70	U	U	0.80	0.40	0.70	U	U	0.80	0.40	0.70	U	U	0.80	0.40	0.70	U	U	0.80	0.40
Methane	µg/L	na	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3	0.39	J	J	0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3
Nitrate (as N)	mg/L	na	3.7			0.4	0.08	3.7			0.4	0.08	1.7			0.4	0.08	0.81			0.4	0.08	6.3			0.4	0.08	0.38	JM	J	0.4	0.08	0.13	J	J	0.4	0.08
Sulfate	mg/L	na	140			15	3.9	150			15	3.9	56			5	1.3	6.2			5	1.3	28			5	1.3	2.5	U	U	5	1.3	20			5	1.3
Total Organic Carbon	mg/L	na	1.8	J	J	3	0.5	1.1	J	J	3	0.5	1.5	U	UJ	3	0.5	1.5	U	U	3	0.5	1.5	JY	J	3	0.5	1.5	U	U	3	0.5	0.98	J	J	3	0.5
MNA																																					
Dissolved Fe^{2+}	mg/L	na	0.24					0.24					0.09					0.51					0.07					0.72					0.00				

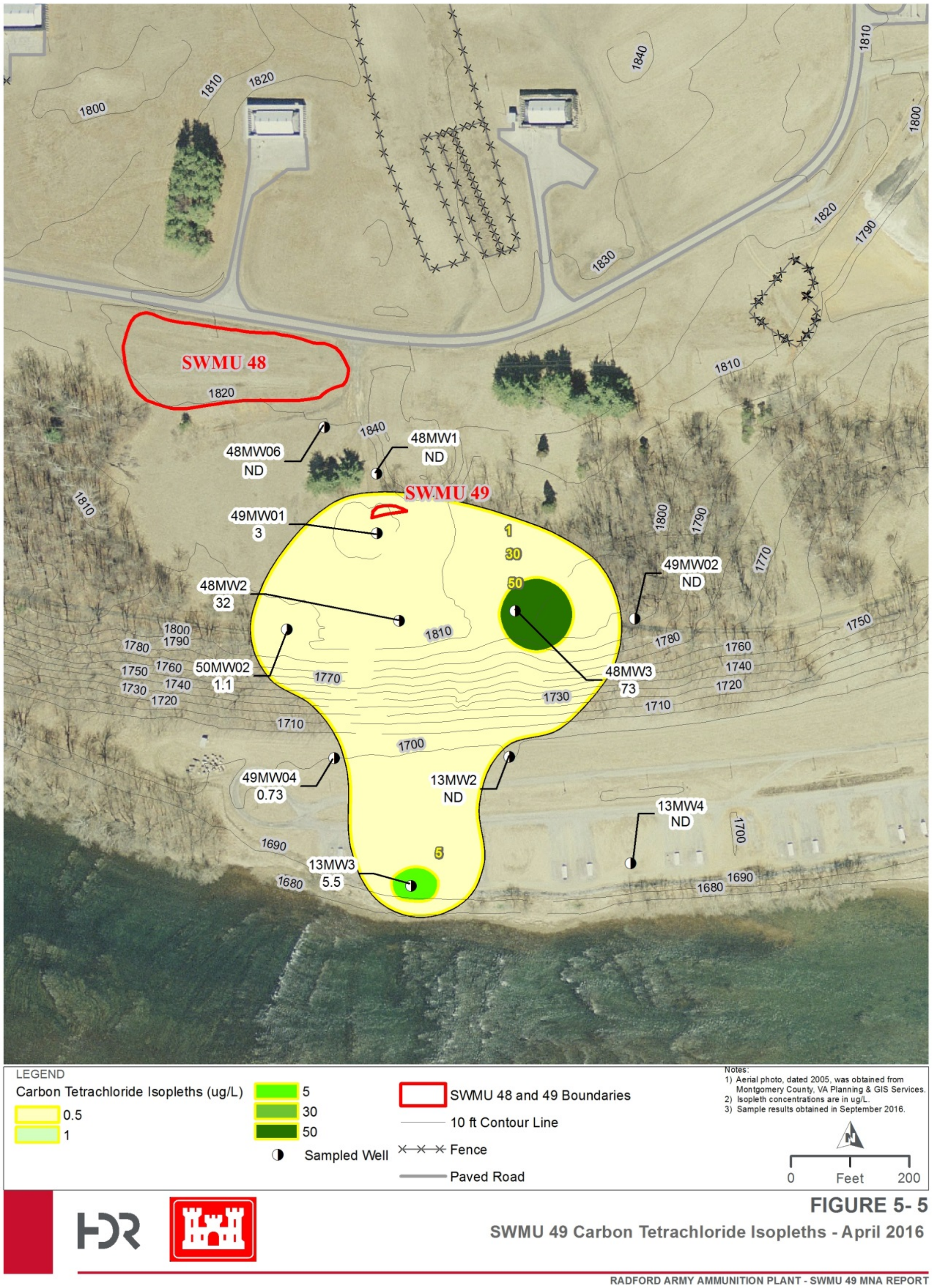
Table 5-6 SWMU 49 Detected Analytes in Third Quarter Groundwater Samples (Continued)

Sample ID			50MW02					13MW2					13MW3					13MW4					49MW04				
Date Collected			4/12/2016					4/13/2016					4/13/2016					4/13/2016					4/13/2016				
Analyte	Units	Remedial Goals (1)	Result	Lab Q	Val Q	RL	MDL	Result	Lab Q	Val Q	RL	MDL	Result	Lab Q	Val Q	RL	MDL	Result	Lab Q	Val Q	RL	MDL	Result	Lab Q	Val Q	RL	MDL
VOCs (µg/L)																											
1,1,1-Trichloroethane	µg/L	na	0.27	J	J	1.0	0.21	0.50	U	U	1.0	0.21	0.50	U	U	1.0	0.21	0.50	U	U	1.0	0.21	0.50	U	U	1.0	0.21
1,1-Dichloroethane	µg/L	na	0.47	J	J	1.0	0.20	0.50	U	U	1.0	0.20	0.50	U	U	1.0	0.20	0.50	U	U	1.0	0.20	0.50	U	U	1.0	0.20
Acetone	µg/L	na	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5
Bromoform	µg/L	na	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22
Bromomethane	µg/L	na	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5
Carbon tetrachloride	µg/L	5	1.1			1.0	0.23	0.50	U	U	1.0	0.23	**5.5**			1.0	0.23	0.50	U	U	1.0	0.23	0.73	J	J	1.0	0.23
Chloroform	µg/L	na	0.17	J	J	0.50	0.15	0.25	U	U	0.50	0.15	0.51			0.50	0.15	0.25	U	U	0.50	0.15	0.25	U	U	0.50	0.15
cis-1,2-Dichloroethene	µg/L	na	0.59	J	J	1.0	0.25	0.50	U	U	1.0	0.25	0.50	U	U	1.0	0.25	0.50	U	U	1.0	0.25	0.50	U	U	1.0	0.25
Dibromochloromethane	µg/L	na	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19
Ethylbenzene	µg/L	na	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22
m- & p-Xylene	µg/L	na	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5
o-Xylene	µg/L	na	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24
Tetrachloroethene	µg/L	na	0.50	U	U	1.0	0.30	0.50	U	U	1.0	0.30	0.50	U	U	1.0	0.30	0.50	U	U	1.0	0.30	0.50	U	U	1.0	0.30
Trichloroethene	µg/L	5	1.9			1.0	0.21	0.50	U	U	1.0	0.21	1.0			1.0	0.21	0.80	J	J	1.0	0.21	0.50	U	U	1.0	0.21
Misc.																											
Chloride	mg/L	na	9.1			4	1.1	8.9			4	1.1	4.5			4	1.1	3.8	J	J	4	1.1	5.3			4	1.1
Ethene	µg/L	na	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5
Ethane	µg/L	na	0.70	U	U	0.80	0.40	0.70	U	U	0.80	0.40	0.70	U	U	0.80	0.40	0.70	U	U	0.80	0.40	0.70	U	U	0.80	0.40
Methane	µg/L	na	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3
Nitrate (as N)	mg/L	na	2.8			0.4	0.08	0.18	J	J	0.4	0.08	1.5			0.4	0.08	0.46			0.4	0.08	0.39	J	J	0.4	0.08
Sulfate	mg/L	na	64			5	1.3	63			5	1.3	110			10	2.6	36			5	1.3	48			5	1.3
Total Organic Carbon	mg/L	na	1.2	J	J	3	0.5	3.3			3	0.5	1.5	U	U	3	0.5	0.57	J	J	3	0.5	1	J	J	3	0.5
MNA																											
Dissolved Fe^{2+}	mg/L	na	0.16					0.11					0.04					0.03					0.13				

Notes:
(1) Remedial Goals developed in Draft SWMU 48/49 RFI Report (CB&I, 2014a). Exceedances denoted by bold font.
mg/L = milligrams per liter (parts per million)
µg/L = micrograms per liter (parts per billion)
RL = Reporting Limit
MDL = Method Detection Limit
na = not applicable; remedial goal not established for analyte at SWMU 49
ND = non detect
Lab Q = Lab Data Qualifiers
Val Q = Validation Data Qualifiers

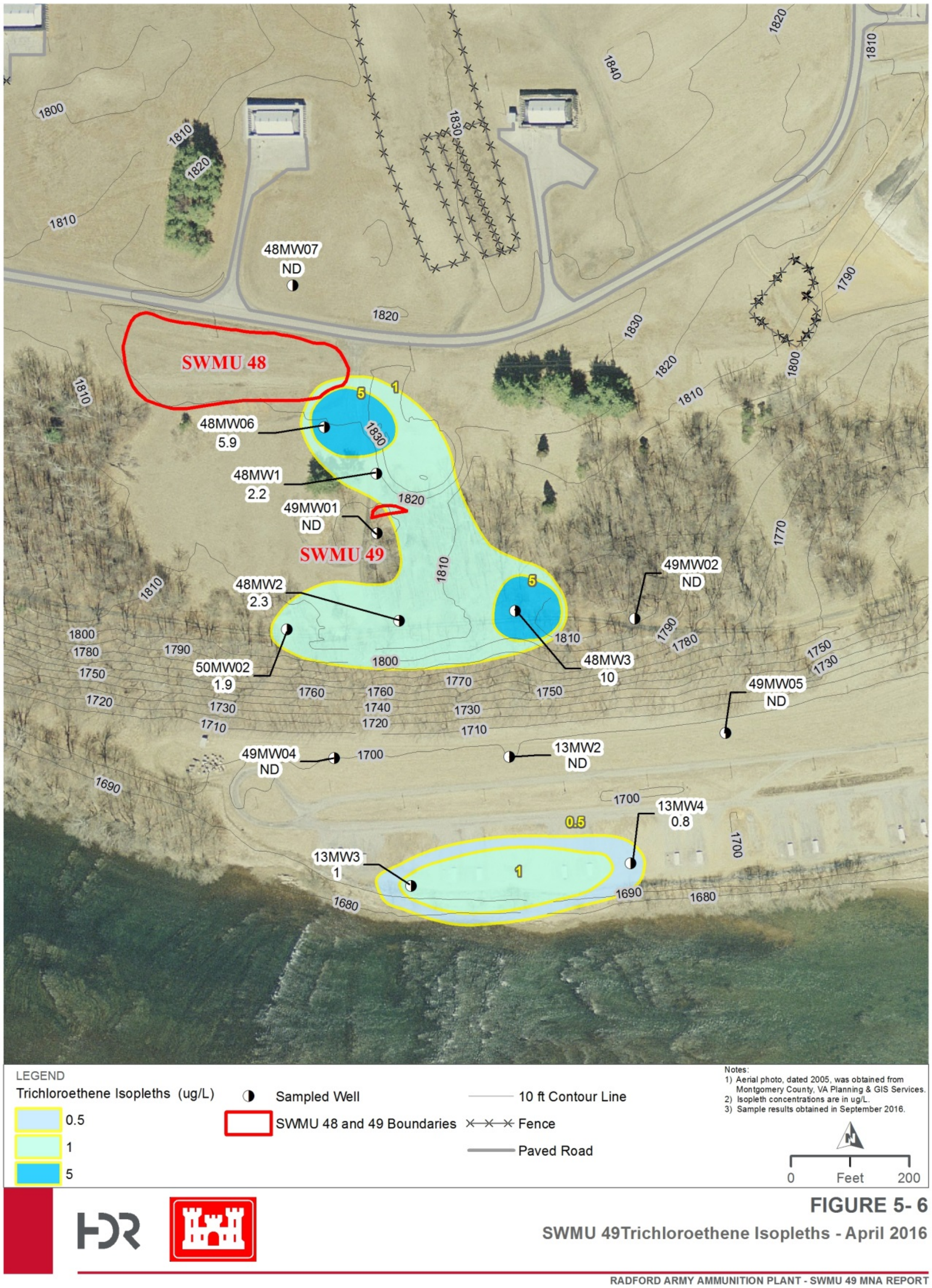
Data Qualifiers
B = Analyte detected in associated Method Blank.
J = Estimated value.
M = Matrix Spike and/or Matrix Spike Duplicate recovery outside acceptance limits.
P = Concentration of analyte differs more than 40% between primary and confirmation analysis.
U = Analyte concentration was not above the detection level.
Y = Replicate/Duplicate precision outside acceptance limits.

Figure 5-5 SWMU 49 Carbon Tetrachloride Isopleths - April 2016



This page intentionally left blank

Figure 5-6 SWMU 49 Trichloroethene Isopleths - April 2016



This page intentionally left blank

Table 5-7 SWMU 49 Summary of Fourth Quarter Groundwater Samples

Analyte	Units	RG	# of RG Exceedances	# of Detections	# of Samples	Minimum Concentration	Maximum Concentration	Location of Maximum
VOCs								
1,1,1-Trichloroethane	**µg/L**	**na**	**na**	5	13	0.24	0.57	48MW06
1,1-Dichloroethane	**µg/L**	**na**	**na**	5	13	0.39	2.4	48MW06
Acetone	**µg/L**	**na**	**na**	0	13	ND	ND	na
Bromoform	**µg/L**	**na**	**na**	0	13	ND	ND	na
Bromomethane	**µg/L**	**na**	**na**	0	13	ND	ND	na
Carbon tetrachloride	**µg/L**	**5**	2	7	13	0.61	64	48MW3
Chloroform	**µg/L**	**na**	**na**	6	13	0.18	7.1	48MW3
cis-1,2-Dichloroethene	**µg/L**	**na**	**na**	5	13	0.4	3	48MW06
Dibromochloromethane	**µg/L**	**na**	**na**	0	13	ND	ND	na
Ethylbenzene	**µg/L**	**na**	**na**	0	13	ND	ND	na
m- & p-Xylene	**µg/L**	**na**	**na**	0	13	ND	ND	na
o-Xylene	**µg/L**	**na**	**na**	0	13	ND	ND	na
Tetrachloroethene	**µg/L**	**na**	**na**	2	13	0.37	0.6	48MW1
Trichloroethene	**µg/L**	**5**	1	8	13	0.94	10	48MW3
Misc.								
Chloride	**mg/L**	**na**	**na**	13	13	2	11	48MW1 & 48MW06
Ethene	**µg/L**	**na**	**na**	0	13	ND	ND	na
Ethane	**µg/L**	**na**	**na**	0	13	ND	ND	na
Methane	**µg/L**	**na**	**na**	2	13	0.31	0.43	50MW02
Nitrate (as N)	**mg/L**	**na**	**na**	13	13	0.14	7.6	48MW3
Sulfate	**mg/L**	**na**	**na**	13	13	1.4	140	48MW06
Total Organic Carbon	**mg/L**	**na**	**na**	12	13	0.67	1.1	48MW06 & 48MW3

Notes:
µg/L = micrograms per liter
mg/L = milligrams per liter
na = not applicable
ND = non detect
RG = Remedial Goal

This page intentionally left blank

Table 5-8 SWMU 49 Detected Analytes in Fourth Quarter Groundwater Samples

Sample ID			48MW06					49TM01 (Field Duplicate of 48MW06)					48MW1					48MW2					48MW3					49MW01					49MW02				
Date Collected			7/12/2016					7/12/2016					7/12/2016					7/13/2016					7/13/2016					7/12/2016					7/13/2016				
Analyte	Units	Remedial Goals (1)	Result	Lab Q	Val Q	RL	MDL	Result	Lab Q	Val Q	RL	MDL	Result	Lab Q	Val Q	RL	MDL	Result	Lab Q	Val Q	RL	MDL	Result	Lab Q	Val Q	RL	MDL	Result	Lab Q	Val Q	RL	MDL	Result	Lab Q	Val Q	RL	MDL
VOCs (μg/L)																																					
1,1,1-Trichloroethane	μg/L	na	0.57	J	J	1.0	0.21	0.36	J	J	1.0	0.21	0.54	J	J	1.0	0.21	0.50	U	U	1.0	0.21	0.50	U	U	1.0	0.21	0.50	U	U	1.0	0.21	0.50	U	U	1.0	0.21
1,1-Dichloroethane	μg/L	na	2.4			1.0	0.20	2.2			1.0	0.20	0.98	J	J	1.0	0.20	0.50	U	U	1.0	0.20	0.50	U	U	1.0	0.20	0.50	U	U	1.0	0.20	0.50	U	U	1.0	0.20
Acetone	μg/L	na	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5
Bromoform	μg/L	na	0.5	U	UJ	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22
Bromomethane	μg/L	na	1	UZ	U	2	0.5	1	UZ	U	2	0.5	1	UZ	U	2	0.5	1	UZ	U	2	0.5	1	UZ	U	2	0.5	1	UZ	U	2	0.5	1	UZ	U	2	0.5
Carbon tetrachloride	μg/L	5	0.50	U	U	1.0	0.23	0.50	U	U	1.0	0.23	0.50	U	U	1.0	0.23	**38**			1.0	0.23	**64**			1.0	0.23	1.8			1.0	0.23	0.50	U	U	1.0	0.20
Chloroform	μg/L	na	0.25	U	U	0.50	0.15	0.25	U	U	0.50	0.15	0.25	U	U	0.50	0.15	3.5			0.50	0.15	7.1			0.50	0.15	0.44	J	J	0.50	0.15	0.25	U	U	0.50	0.15
cis-1,2-Dichloroethene	μg/L	na	0.73	J	J	1.0	0.25	3.0		J	1.0	0.25	1.1			1.0	0.25	0.50	U	U	1.0	0.25	0.50	U	U	1.0	0.25	0.50	U	U	1.0	0.25	0.50	U	U	1.0	0.25
Dibromochloromethane	μg/L	na	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19
Ethylbenzene	μg/L	na	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22
m- & p-Xylene	μg/L	na	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5
o-Xylene	μg/L	na	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24
Tetrachloroethene	μg/L	na	0.50	U	U	1.0	0.30	0.37	J	J	1.0	0.30	0.60	J	J	1.0	0.30	0.50	U	U	1.0	0.30	0.50	U	U	1.0	0.30	0.50	U	U	1.0	0.30	0.50	U	U	1.0	0.30
Trichloroethene	μg/L	5	0.50	U	UJ	1.0	0.21	2.2		J	1.0	0.21	3.3			1.0	0.21	3.9			1.0	0.21	**10**			1.0	0.21	0.50	U	U	1.0	0.21	0.50	U	U	1.0	0.21
Misc.																																					
Chloride	mg/L	na	11			4	1.1	11			4	1.1	11	M	J	4	1.1	3.1	J	J	4	1.1	3.3	J	J	4	1.1	6.7			4	1.1	2	J	J	4	1.1
Ethene	μg/L	na	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5
Ethane	μg/L	na	0.70	U	U	0.80	0.40	0.70	U	U	0.80	0.40	0.70	U	U	0.80	0.40	0.70	U	U	0.80	0.40	0.70	U	U	0.80	0.40	0.70	U	U	0.80	0.40	0.70	U	U	0.80	0.40
Methane	μg/L	na	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3
Nitrate (as N)	mg/L	na	3			0.4	0.08	3.1			0.4	0.08	2.7			0.4	0.08	1			0.4	0.08	7.6			0.4	0.08	0.46			0.4	0.08	0.14	J	J	0.4	0.08
Sulfate	mg/L	na	130			25	6.5	140			25	6.5	73			25	6.5	12			5	1.3	31			5	1.3	1.4	J	J	5	1.3	21			5	1.3
Total Organic Carbon	mg/L	na	0.98	J	J	3	0.5	1.1	J	J	3	0.5	0.71	J	J	3	0.5	0.81	J	J	3	0.5	1.1	J	J	3	0.5	1.5	U	U	3	0.5	0.67	J	J	3	0.5
MNA																																					
Dissolved Fe^{2+}	mg/L	na	0.40					0.40					0.01					0.75					0.04					0.33					0.06				

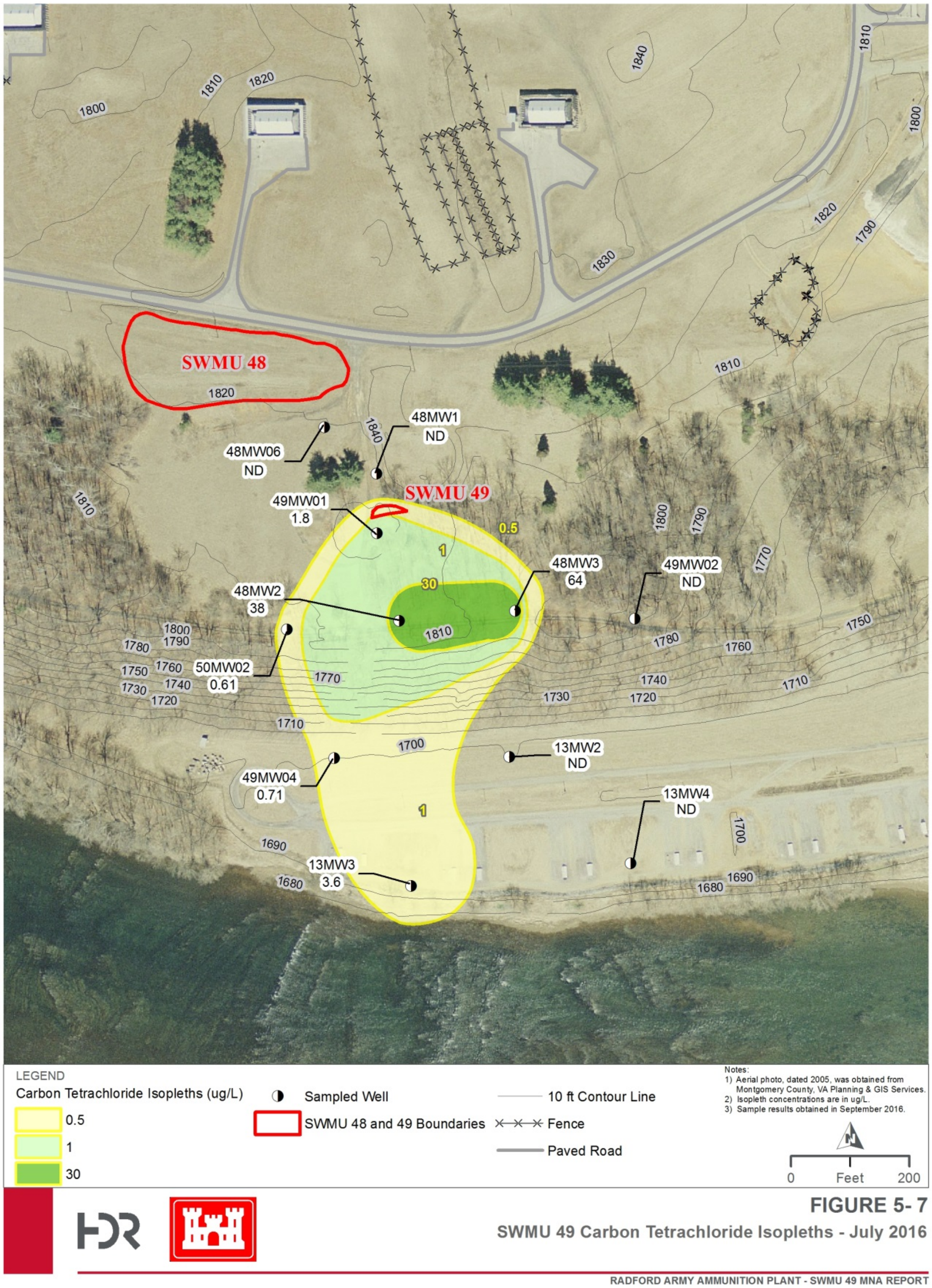
Table 5-8 SWMU 49 Detected Analytes in Fourth Quarter Groundwater Samples (Continued)

Sample ID			**50MW02**					**49TM02 (Field Duplicate of 50MW02)**					**13MW2**					**13MW3**					**13MW4**					**49MW04**				
Date Collected			**7/12/2016**					**7/12/2016**					**7/13/2016**					**7/12/2016**					**7/12/2016**					**7/13/2016**				
Analyte	**Units**	**Remedial Goals (1)**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**
VOCs (μg/L)																																
1,1,1-Trichloroethane	μg/L	na	0.25	J	J	1.0	0.21	0.24	J	J	1.0	0.21	0.50	U	U	1.0	0.21	0.50	U	U	1.0	0.21	0.50	U	U	1.0	0.21	0.50	U	U	1.0	0.21
1,1-Dichloroethane	μg/L	na	0.39	J	J	1.0	0.20	0.41	J	J	1.0	0.20	0.50	U	U	1.0	0.20	0.50	U	U	1.0	0.20	0.50	U	U	1.0	0.23	0.50	U	U	1.0	0.20
Acetone	μg/L	na	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5	10	U	U	20	5
Bromoform	μg/L	na	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22
Bromomethane	μg/L	na	1	UZ	U	2	0.5	1	UZ	U	2	0.5	1	UZ	U	2	0.5	1	UZ	U	2	0.5	1	UZ	U	2	0.5	1	UZ	U	2	0.5
Carbon tetrachloride	μg/L	5	0.61	J	J	1.0	0.23	0.73	J	J	1.0	0.23	0.50	U	U	1.0	0.23	3.6			1.0	0.23	0.50	U	U	1.0	0.23	0.71	J	J	1.0	0.23
Chloroform	μg/L	na	0.19	J	J	0.50	0.15	0.18	J	J	0.50	0.15	0.25	U	U	0.50	0.15	0.58			0.50	0.15	0.25	U	U	0.50	0.15	0.25	U	U	0.50	0.15
cis-1,2-Dichloroethene	μg/L	na	0.40	J	J	1.0	0.25	0.48	J	J	1.0	0.25	0.50	U	U	1.0	0.25	0.50	U	U	1.0	0.25	0.50	U	U	1.0	0.25	0.50	U	U	1.0	0.25
Dibromochloromethane	μg/L	na	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19	0.5	U	U	1	0.19
Ethylbenzene	μg/L	na	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22	0.5	U	U	1	0.22
m- & p-Xylene	μg/L	na	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5	1	U	U	2	0.5
o-Xylene	μg/L	na	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24	0.5	U	U	1	0.24
Tetrachloroethene	μg/L	na	0.50	U	U	1.0	0.30	0.50	U	U	1.0	0.30	0.50	U	U	1.0	0.30	0.50	U	U	1.0	0.30	0.50	U	U	1.0	0.30	0.50	U	U	1.0	0.30
Trichloroethene	μg/L	5	1.7			1.0	0.21	1.7			1.0	0.21	0.50	U	U	1.0	0.21	0.94	J	J	1.0	0.21	2.1			1.0	0.21	0.50	U	U	1.0	0.21
Misc.																																
Chloride	mg/L	na	9.2			4	1.1	9.1			4	1.1	5.5			4	1.1	4.5			4	1.1	6.2			4	1.1	5.9			4	1.1
Ethene	μg/L	na	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5	1	U	U	1.1	0.5
Ethane	μg/L	na	0.70	U	U	0.80	0.40	0.70	U	U	0.80	0.40	0.70	U	U	0.80	0.40	0.70	U	U	0.80	0.40	0.70	U	U	0.80	0.40	0.70	U	U	0.80	0.40
Methane	μg/L	na	0.43	J	J	0.7	0.3	0.31	J	J	0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3	0.6	U	U	0.7	0.3
Nitrate (as N)	mg/L	na	2.5			0.4	0.08	2.6			0.4	0.08	0.16	J	J	0.4	0.08	1.4			0.4	0.08	0.89			0.4	0.08	0.44			0.4	0.08
Sulfate	mg/L	na	68			5	1.3	68			5	1.3	46			5	1.3	120			25	6.5	48			5	1.3	54			5	1.3
Total Organic Carbon	mg/L	na	0.9	J	J	3	0.5	0.7	J	J	3	0.5	0.8	J	J	3	0.5	0.94	J	J	3	0.5	1	J	J	3	0.5	0.86	J	J	3	0.5
MNA																																
Dissolved Fe^{2+}	mg/L	na	0.08					0.08					0.07					0.05					0.02					0.07				

Notes:
(1) Remedial Goals developed in Draft SWMU 48/49 RFI Report (CB&I, 2014a). Exceedances denoted by bold font.
mg/L = milligrams per liter (parts per million)
μg/L = micrograms per liter (parts per billion)
RL = Reporting Limit
MDL = Method Detection Limit
na = not applicable; remedial goal not established for analyte at SWMU 49
ND = non detect
Lab Q = Lab Data Qualifiers
Val Q = Validation Data Qualifiers

Data Qualifiers
B = Analyte detected in associated Method Blank.
J = Estimated value.
M = Matrix Spike and/or Matrix Spike Duplicate recovery outside acceptance limits.
P = Concentration of analyte differs more than 40% between primary and confirmation analysis.
U = Analyte concentration was not above the detection level.
Y = Replicate/Duplicate precision outside acceptance limits.

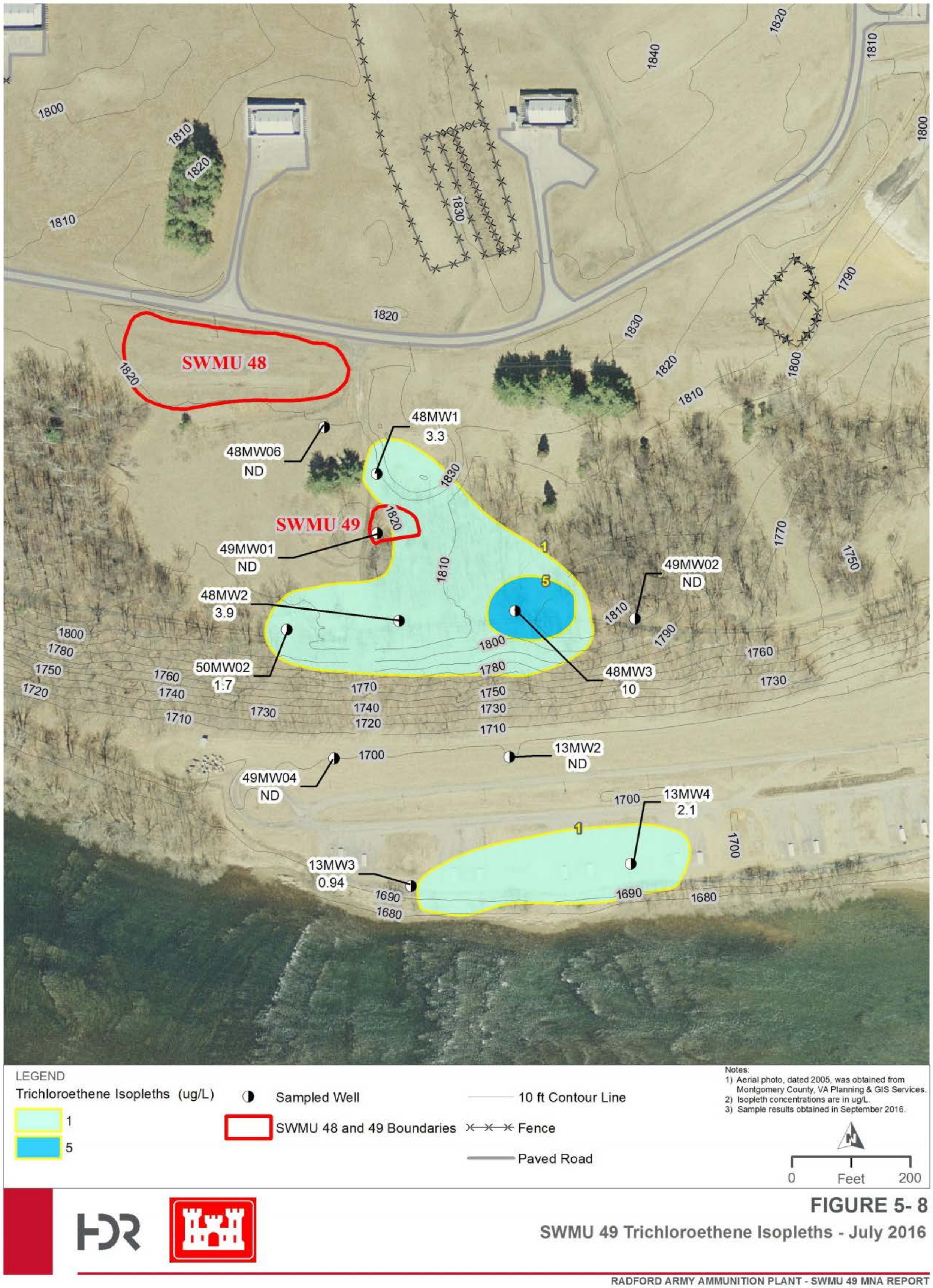
Figure 5-7 SWMU 49 Carbon Tetrachloride Isopleths - July 2016



Notes:
1) Aerial photo, dated 2005, was obtained from Montgomery County, VA Planning & GIS Services.
2) Isopleth concentrations are in ug/L.
3) Sample results obtained in September 2016.

This page intentionally left blank

Figure 5-8 SWMU 49 Trichloroethene Isopleths - July 2016



This page intentionally left blank

48MW2 CT Concentrations

Data Summary Table

Date of Sample	1/27/2015	10/1/2015	1/14/2016	4/12/2016	7/13/2016
Carbon Tetrachloride	118	48	66	42	38

All results expressed in micrograms per liter.

Mann-Kendall Assessment

	48	66	42	38	#(-)	#(+)	#(0)
118	-70	-52	-76	-80	4	0	0
48		18	-6	-10	2	1	0
66			-24	-28	2	0	0
42				-4	1	0	0
					9	1	0

Mann-Kendall Trend Test for Small Sample Size

S	-8
n	5
p	0.042
α	0.1

H_o: No Trend

H_a: Upward Trend

Reject H_o if $S>0$ and $p<\alpha$

No Trend.

H_o: No Trend

H_a: Downward Trend

Reject H_o if $S<0$ and $p<\alpha$

Downward Trend.

48MW2 TCE Concentrations

Data Summary Table

Date of Sample	1/27/2015	10/1/2015	1/14/2016	4/12/2016	7/13/2016
Carbon Tetrachloride	10.5	3.8	7.9	2.3	3.9

All results expressed in micrograms per liter.

Mann-Kendall Assessment

	3.8	7.9	2.3	3.9	#(-)	#(+)	#(0)
10.5	-6.7	-2.6	-8.2	-6.6	4	0	0
3.8		4.1	-1.5	0.1	1	2	0
7.9			-5.6	-4	2	0	0
2.3				1.6	0	1	0
					7	3	0

Mann-Kendall Trend Test for Small Sample Size

S	-4
n	5
p	0.242
α	0.1

H_o: No Trend

H_a: Upward Trend

Reject H_o if $S>0$ and $p<\alpha$

No Trend.

H_o: No Trend

H_a: Downward Trend

Reject H_o if $S<0$ and $p<\alpha$

No Trend.

48MW3 CT Concentrations

Data Summary Table

Date of Sample	1/27/2015	10/1/2015	1/14/2016	4/12/2016	7/13/2016
Carbon Tetrachloride	77.4	71	62	73	64

All results expressed in micrograms per liter.

Mann-Kendall Assessment

	71	62	73	64	#(-)	#(+)	#(0)
77.4	-6.4	-15.4	-4.4	-13.4	4	0	0
71		-9	2	-7	2	1	0
62			11	2	0	2	0
73				-9	1	0	0
					7	3	0

Mann-Kendall Trend Test for Small Sample Size

S	-4
n	5
p	0.242
α	0.1

H_o: No Trend

H_a: Upward Trend

Reject H_o if $S>0$ and $p<\alpha$

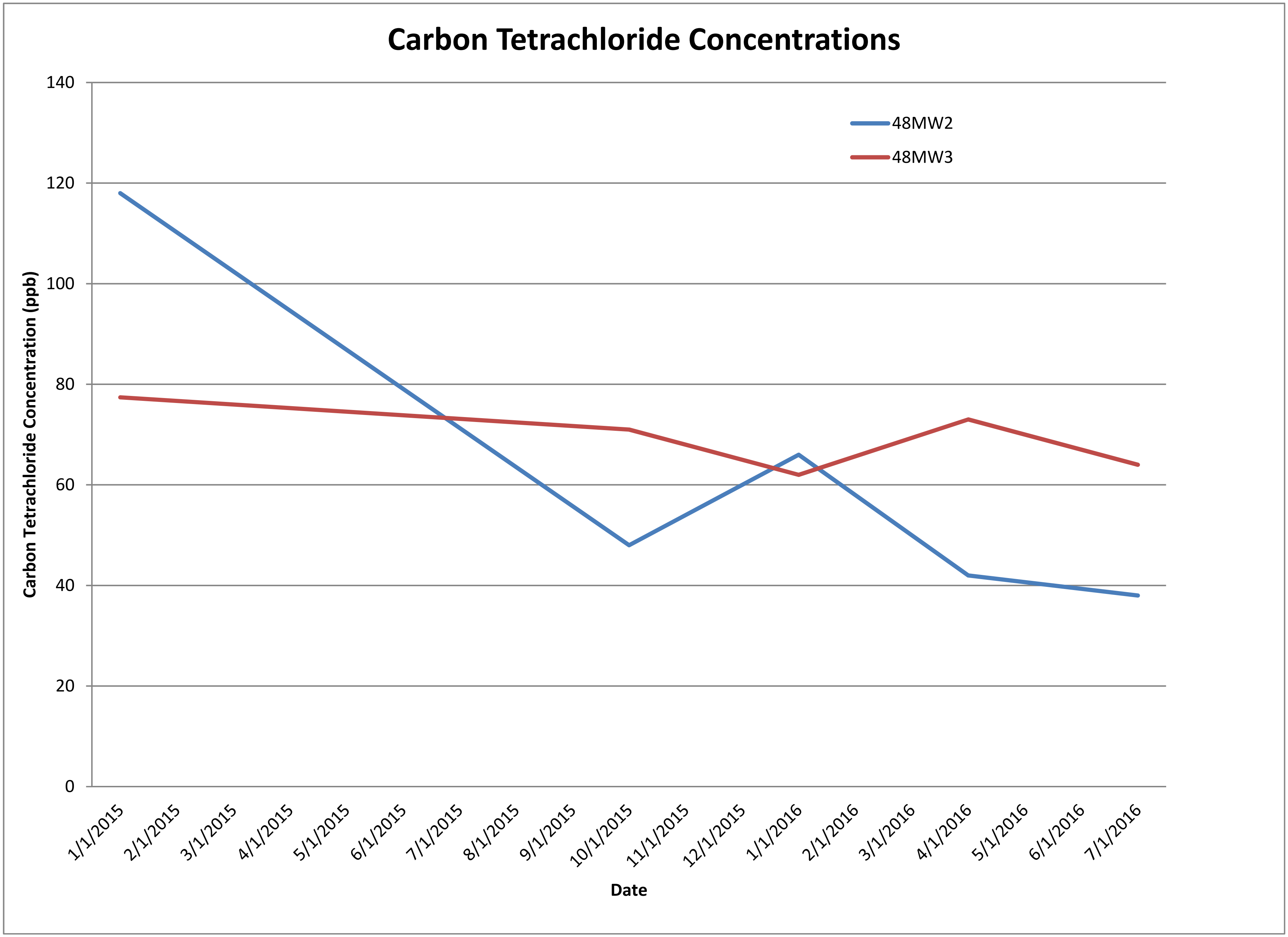
No Trend.

H_o: No Trend

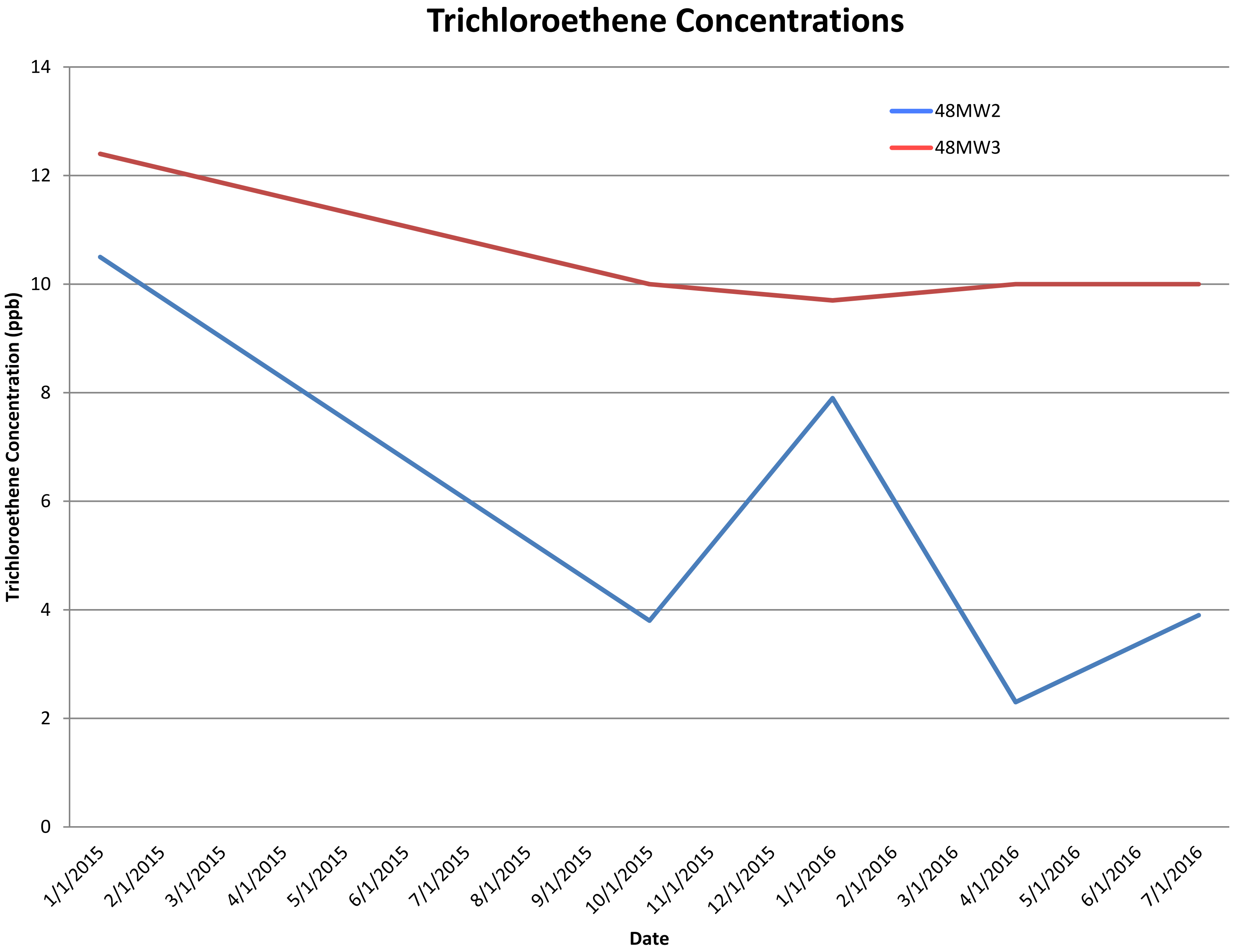
H_a: Downward Trend

Reject H_o if $S<0$ and $p<\alpha$

No Trend.



Carbon Tetrachloride Concentrations
48MW2
48MW3
Carbon Tetrachloride Concentration (ppb)
0
20
40
60
80
100
120
140
1/1/2015
2/1/2015
3/1/2015
4/1/2015
5/1/2015
6/1/2015
7/1/2015
8/1/2015
9/1/2015
10/1/2015
11/1/2015
12/1/2015
1/1/2016
2/1/2016
3/1/2016
4/1/2016
5/1/2016
6/1/2016
7/1/2016
Date


Trichloroethene Concentrations
Trichloroethene Concentration (ppb)
14
12
10
8
6
4
2
0
48MW2
48MW3
1/1/2015
2/1/2015
3/1/2015
4/1/2015
5/1/2015
6/1/2015
7/1/2015
8/1/2015
9/1/2015
10/1/2015
11/1/2015
12/1/2015
1/1/2016
2/1/2016
3/1/2016
4/1/2016
5/1/2016
6/1/2016
7/1/2016
Date

RAAP-014/SWMU 54

[This Page Intentionally Left Blank]

Table 6-2 Water Quality Parameters for Groundwater Performance Monitoring at SWMU 54

Well ID	54MW1	2	3	4	5	6	7	8	9	10	11	12	13	14
SWMU 54 First Quarter (July 2011) Water Quality Parameters														
pH	7.7	6.36	6.86	7.19	6.36	7.33	6.6	6.98	6.29	7.13	7.14	6.67	6.75	7.23
Conductivity (mS/cm)	0.357	0.526	0.491	0.949	0.371	0.449	0.419	0.544	0.535	1.68	0.651	0.568	0.676	0.582
Turbidity (NTU)	5.6	0	1.5	1.9	3	0.2	0	4.6	6	89.8	62.6	100	94	16.9
Dissolved Oxygen (mg/L)	4.86	2.35	4.71	0	4.87	0.68	3.91	3.53	1.23	0.51	0	3.52	0.9	1.06
ORP (mV)	130	178	121	-18	178	110	170	134	198	67	96	152	29	73
Temperature (°C)	14.12	17.07	19.82	15.52	19.88	19.32	18.87	17.86	14.3	25.19	14.94	18.38	20.09	23.76
Dissolved Manganese	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.1	<0.05	0.2	<0.05	0.05	<0.05	0.65	<0.05
Dissolved Ferrous Iron (mg/L)	<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
Nitrate (mg/L)	25.2	1.09	0.967	0	0.613	0	0.119	0.639	0.233	0	0	2.79	0.439	0.242
Sulfate (mg/L)	27.1	39.8	23.6	329	15.1	27.4	61.5	40	62.2	167	93.6	38.1	38.8	33.6
TOC (mg/L)	3.9	3.51	7.26	2.51	6.14	1.95	3.17	6.05	5.1	1.61	5.97	2.64	2.55	6.73
SWMU 54 Second Quarter (October 2011) Water Quality Parameters														
pH	7.49	7.02	7.05	7.27	6.78	7.49	7.3	7.09	7.2	6.83	7.31	6.7	7.05	7.16
Conductivity (mS/cm)	0.432	0.56	0.674	0.912	0.502	0.305	0.734	0.541	0.562	0.677	0.654	0.523	0.831	0.568
Turbidity (NTU)	164	167	160	81.1	231	107	155	104	79.9	236	685	69	--	157
Dissolved Oxygen (mg/L)	0	0	0	2.44	2.68	3.8	0.1	0.05	0.06	0	0	1.72	0.37	0
ORP (mV)	102	117	107	-15	143	122	66	151	146	82	-13	144	126	73
Temperature (°C)	18.04	14.77	14.16	14.32	15.48	13.18	18.01	14.94	14.75	14.75	13.73	14.81	14.63	14.93
Dissolved Manganese (mg/L)	<0.05	<0.05	0.1	0.05	0.1	0.05	0.4	0.05	0.2	0.15	0.3	<0.05	0.35	0.05
Dissolved Ferrous Iron (mg/L)	<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
Nitrate (mg/L)	0	0.394	0.357	0	0.568	0.167	0	0.514	0.184	0.388	0	2	0.21	0.202
Sulfate (mg/L)	27.1	27	44.4	210	17.4	7.06	216	39.9	46.9	96.7	119	31.8	90.2	34.1
TOC (mg/L)	3.9	3.2	3.22	1.38	1.88	2.68	1.31	7.47	6.78	6.98	3.22	4.71	3.31	4.64
SWMU 54 Third Quarter (January 2011) Water Quality Parameters														
pH	7.59	7.48	7.4	7.36	7.15	7.53	7.43	7.08	7.4	7.46	7.59	6.09	7.45	7.48
Conductivity (mS/cm)	0.498	0.662	0.762	1.11	0.628	0.305	0.905	0.492	0.674	0.707	0.763	0.595	0.687	0.651
Turbidity (NTU)	8.9	15.3	19.2	55.6	32.1	72.4	26.8	66.7	36.8	1.1	6.8	---	226	0
Dissolved Oxygen (mg/L)	0	0	0	0	7.81	12.01	0	16.65	8.48	6.06	5.09	4.02	7.63	1.66
ORP (mV)	100	33	24	5	121	191	3	104	111	118	101	186	25	61
Temperature (°C)	13.2	13.91	13.26	13.04	13.58	11.93	12.73	9.72	9.65	11.16	11.4	12.86	11.53	12.91
Dissolved Manganese (mg/L)	<0.05	<0.05	0.1	0.05	0.1	0.05	0.4	0.05	0.2	0.15	0.3	<0.05	0.35	0.05
Dissolved Ferrous Iron (mg/L)	<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
Nitrate (mg/L)	0	0.609	0	0	0.578	0.158	0	0.401	0.174	0.572	0.158	1.94	0.237	0.241
Sulfate (mg/L)	26.3	28.2	73.7	480	20.3	4.55	249	41.5	62.5	72.7	93	37.6	53.9	32.2
TOC (mg/L)	2.1	1.8	2.39	1.16	1.42	1.94	2.38	1.66	2.78	1.66	6.71	5.09	6.63	1.68

Table 6-2 Water Quality Parameters for Groundwater Performance Monitoring at SWMU 54 (Continued)

Well ID	54MW1	2	3	4	5	6	7	8	9	10	11	12	13	14
SWMU 54 Fourth Quarter (April 2012) Water Quality Parameters														
pH	5.42	5.19	5.38	5.33	4.99	5.76	5.57	5.38	5.46	5.48	5.59	5.05	5.32	5.5
Conductivity (mS/cm)	0.958	1.12	1.46	0.001	0.891	0.73	1.58	1.21	1.26	1.73	1.4	1.35	0.981	1.2
Turbidity (NTU)	2.5	4.4	2.4	125	70.1	318	38	3.4	65.3	30.8	94.7	37	312	36
Dissolved Oxygen (mg/L)	7.36	7.18	2.24	23.45	10.47	6.49	2.01	7.43	11.29	2.83	5.8	9.44	7.1	5.55
ORP (mV)	-30	236	225	180	168	132	162	134	145	61	36	267	116	149
Temperature (°C)	13.37	12.44	12.02	11.56	20.98	19.09	12.57	14.69	14.21	15.5	14.11	12.67	15.52	12.69
Dissolved Manganese (mg/L)	<0.05	<0.05	0.1	0.5	<0.05	0.05	0.4	0.05	0.2	0.1	0.3	<0.05	0.35	<0.05
Dissolved Ferrous Iron (mg/L)	<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
Nitrate (mg/L)	0	1.33	0	0	0.677	0.129	0.231	0.483	0.139	0	0	2.65	0.294	0.386
Sulfate (mg/L)	34.9	34.9	80	432	14	14.9	69.4	40.1	56	221	104	37.9	35.4	29.3
TOC (mg/L)	1.8	1.57	1.18	1.82	2.33	5.46	0.99	2.36	3.01	2.4	2.68	2.34	3.51	1.09
SWMU 54 Fifth Quarter (August 2012) Water Quality Parameters														
pH	7.08	6.94	6.71	7.05	6.71	7.47	7.03	6.87	6.84	6.71	7.06	6.61	6.97	7.05
Conductivity (mS/cm)	0.395	0.722	0.644	0.968	0.58	0.363	0.817	0.599	0.752	0.693	0.715	0.665	0.697	0.625
Turbidity (NTU)	4.1	43	19	14	23	0	7.4	19	5.2	0.8	10.8	48	95	9.2
Dissolved Oxygen (mg/L)	5.34	0	0	0.23	3.96	4.84	0	2.78	0.56	0.4	0	0.33	1.75	0
ORP (mV)	212	65	209	-33	200	134	128	125	-10	47	-22	226	135	-13
Temperature (°C)	13.89	13.49	12.93	15.06	13.44	16.52	13.66	13.7	14.09	13.93	13.64	13.71	16.12	14.08
Dissolved Manganese (mg/L)	<0.05	<0.05	0.05	0.05	<0.05	0.05	0.05	0.05	0.2	0.05	0.05	<0.05	0.3	<0.05
Dissolved Ferrous Iron (mg/L)	<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
Nitrate (mg/L)	0.600	0.190	0.613	3.00	0.728	0.120	3.00	0.581	1.80	0.594	1.80	1.06	0.681	0.214
Sulfate (mg/L)	26.1	95.5	23.8	378	18.0	15.7	186	41.8	87.2	102	97.6	27.0	38.2	31.8
TOC (mg/L)	0.721	2.00	2.00	1.10	2.00	1.00	1.02	2.00	2.00	1.37	2.00	2.00	1.05	2.04
SWMU 54 Sixth Quarter (November 2012) Water Quality Parameters														
pH	7.63	7.21	6.97	7.03	6.99	Dry	7.31	7.23	7.23	7.29	7.28	7.6	5.72	7.3
Conductivity (mS/cm)	0.443	0.62	0.561	1.01	0.612	Dry	0.826	0.628	0.784	0.779	0.698	0.635	0.918	0.6
Turbidity (NTU)	2.9	11.4	0.2	17	5.5	Dry	46	3.9	27.7	4.7	2.5	2.4	35	43
Dissolved Oxygen (mg/L)	1.44	0.86	4.09	1	1.01	Dry	0.56	2.71	1.14	0.38	1.1	0.26	0.95	0.45
ORP (mV)	148	141	145	72	167	Dry	59	101	-28	43	117	135	209	100
Temperature (°C)	10.03	13.43	12.22	11.27	11.21	Dry	10.83	11.98	11.35	13.61	12.95	13.99	12.26	10.61
Dissolved Manganese (mg/L)	0.05	0.05	0.05	0.05	0.05	Dry	0.05	0.05	0.2	0.05	0.05	0.1	0.3	0.05
Dissolved Ferrous Iron (mg/L)	<0.2	<0.2	<0.2	<0.2	<0.2	Dry	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Nitrate (mg/L)	0.600	0.327	0.656	3.00	0.944	Dry	1.80	0.403	1.80	0.381	0.600	2.86	0.369	0.600
Sulfate (mg/L)	31.3	35.4	22.9	403	21.5	Dry	179	60.3	199	151	99.1	49.8	76.7	39.0
TOC (mg/L)	1.96	2.68	3.29	2.93	4.31	Dry	3.72	4.90	6.73	5.55	5.88	3.41	2.00	2.12

Table 6-2 Water Quality Parameters for Groundwater Performance Monitoring at SWMU 54 (Continued)

Well ID	54MW1	2	3	4	5	6	7	8	9	10	11	12	13	14
SWMU 54 Seventh Quarter (February 2013) Water Quality Parameters														
pH	**7.85**	**6.89**	**6.76**	**7.52**	**6.56**	**7.08**	**7.4**	**7.03**	**7.04**	**6.69**	**7.09**	**6.36**	**6.96**	**7.45**
Conductivity (mS/cm)	**0.465**	**0.682**	**0.504**	**1.01**	**0.417**	**0.293**	**0.474**	**0.498**	**0.487**	**0.542**	**0.687**	**0.464**	**0.37**	**0.619**
Turbidity (NTU)	**0**	**20**	**9**	**16**	**0**	**44.3**	**16**	**9.2**	**10.9**	**13.2**	**2**	**14.2**	**6.8**	**1.2**
Dissolved Oxygen (mg/L)	**0.71**	**1.43**	**6.97**	**0.53**	**9.19**	**9.28**	**2.83**	**5.36**	**8.28**	**2.97**	**0.58**	**1.27**	**8.39**	**0.47**
ORP (mV)	**-5**	**156**	**171**	**-56**	**168**	**72**	**12**	**168**	**194**	**125**	**169**	**168**	**158**	**56**
Temperature (°C)	**12.17**	**8.28**	**11.98**	**12.09**	**11.18**	**13.15**	**11.48**	**9.89**	**9.74**	**11.22**	**10.14**	**10.31**	**7.98**	**12.26**
Dissolved Manganese (mg/L)	**0.05**	**<0.05**	**0.1**	**0.05**	**<0.05**	**0.05**	**0.1**	**0.05**	**0.2**	**0.1**	**0.25**	**<0.05**	**0.2**	**<0.05**
Dissolved Ferrous Iron (mg/L)	**<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**
Nitrate (mg/L)	**0.600**	**0.315**	**0.423**	**3.00**	**0.636**	**0.209**	**0.205**	**0.336**	**0.510**	**0.477**	**0.346**	**1.95**	**0.501**	**0.600**
Sulfate (mg/L)	**27.1**	**36.8**	**25.3**	**340**	**15.5**	**4.29**	**34.2**	**44.6**	**117**	**70.1**	**120**	**35.8**	**23.1**	**41.1**
TOC (mg/L)	**1.19**	**0.916**	**1.07**	**1.35**	**1.00**	**1.50**	**0.791**	**1.00**	**2.09**	**1.14**	**1.88**	**1.21**	**0.683**	**1.46**
SWMU 54 Eighth Quarter (May 2013) Water Quality Parameters														
pH	**7.38**	**6.52**	**7.06**	**7.51**	**6.83**	**7.33**	**7.41**	**7.47**	**7.95**	**6.94**	**7.59**	**6.78**	**6.97**	**7.31**
Conductivity (mS/cm)	**0.398**	**0.315**	**0.499**	**1.021**	**0.4**	**0.494**	**0.674**	**0.596**	**0.521**	**0.537**	**0.592**	**0.665**	**0.44**	**0.608**
Turbidity (NTU)	**1.2**	**0.2**	**1.4**	**6.2**	**8.9**	**7.1**	**0.5**	**1.6**	**5.2**	**1.4**	**0.3**	**3.8**	**0.2**	**6.4**
Dissolved Oxygen (mg/L)	**4.13**	**2.74**	**3.55**	**1.05**	**3.28**	**1.29**	**3.24**	**0.4**	**7.58**	**2.43**	**1.17**	**2.54**	**1.4**	**4.13**
ORP (mV)	**122**	**254.3**	**273.6**	**257.1**	**283.1**	**128.4**	**282.7**	**255.1**	**244.2**	**287.8**	**255.8**	**292.4**	**284**	**296.5**
Temperature (°C)	**13.43**	**12.22**	**13.31**	**11.73**	**12.2**	**13.48**	**12.74**	**13.32**	**11.12**	**12.89**	**12.42**	**13.28**	**12.84**	**13.42**
Dissolved Manganese (mg/L)	**<0.05**	**0.05**	**0.05**	**0.05**	**<0.05**	**<0.05**	**0.05**	**0.05**	**0.1**	**0.05**	**0.05**	**<0.05**	**0.15**	**0.05**
Dissolved Ferrous Iron (mg/L)	**<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**
Nitrate (mg/L)	**0.368**	**0.988**	**0.911**	**3.00**	**1.60**	**0.600**	**1.10**	**0.600**	**0.637**	**0.740**	**0.647**	**4.03**	**1.05**	**0.543**
Sulfate (mg/L)	**26.1**	**24.1**	**29.0**	**329**	**15.7**	**14.0**	**137**	**41.1**	**96.7**	**48.8**	**89.4**	**47.6**	**29.2**	**37.0**
TOC (mg/L)	**0.949**	**1.68**	**1.36**	**0.619**	**1.06**	**2.41**	**0.793**	**1.00**	**1.38**	**1.00**	**0.635**	**1.36**	**0.817**	**0.583**
SWMU 54 Ninth Quarter (August 2013) Water Quality Parameters														
pH	**7.82**	**6.91**	**6.75**	**6.96**	**6.28**	**Dry**	**6.71**	**6.95**	**7.12**	**6.48**	**7.04**	**6.36**	**6.57**	**6.84**
Conductivity (mS/cm)	**0.452**	**0.592**	**0.617**	**0.937**	**0.333**	**Dry**	**0.478**	**0.559**	**0.419**	**0.496**	**0.637**	**0.491**	**0.351**	**0.554**
Turbidity (NTU)	**3**	**0**	**0**	**0**	**0**	**Dry**	**7.2**	**0**	**6.1**	**0**	**0**	**7.0**	**0**	**0**
Dissolved Oxygen (mg/L)	**0.136**	**0.8**	**1.69**	**0.39**	**6.28**	**Dry**	**2.4**	**0.67**	**2.36**	**0.86**	**4.65**	**2.85**	**6.57**	**0.52**
ORP (mV)	**223.2**	**84**	**96**	**-18**	**129**	**Dry**	**86**	**42**	**-13**	**35**	**68**	**91**	**146**	**50**
Temperature (°C)	**14.51**	**15.25**	**15.08**	**13.22**	**15.49**	**Dry**	**13.05**	**13.4**	**13.25**	**14.51**	**13.46**	**15.7**	**13.89**	**13.21**
Dissolved Manganese (mg/L)	**0.05**	**NM**	**<0.05**	**0.05**	**0.05**	**Dry**	**<0.05**	**<0.05**	**0.05**	**<0.05**	**0.05**	**0.05**	**0.15**	**0.05**
Dissolved Ferrous Iron (mg/L)	**<0.2**	**NM**	**<0.2**	**<0.2**	**<0.2**	**Dry**	**<0.2**	**<0.2**	**0.2**	**<0.2**	**<0.2**	**<0.2**	**<0.2**	**<0.2**
Nitrate (mg/L)	**<0.600**	**0.326**	**0.521**	**<0.600**	**0.849**	**Dry**	**<0.600**	**0.273**	**0.194**	**0.206**	**0.12**	**4.8**	**0.591**	**0.29**
Sulfate (mg/L)	**26.7**	**30.8**	**26.1**	**322**	**15.0**	**Dry**	**27.3**	**38.0**	**39.2**	**44.3**	**91.8**	**39.6**	**23.3**	**28.2**
TOC (mg/L)	**3.32**	**1.5**	**1.11**	**2.7**	**0.91**	**Dry**	**0.822**	**2.30**	**4.17**	**4.28**	**3.11**	**3.27**	**2.35**	**3.64**

Table 6-2 Water Quality Parameters for Groundwater Performance Monitoring at SWMU 54 (Continued)

Well ID	54MW1	2	3	4	5	6	7	8	9	10	11	12	13	14
SWMU 54 Tenth Quarter (November 2013) Water Quality Parameters														
pH	--	7.45	--	--	--	--	--	--	--	6.89	--	NM	7.29	--
Conductivity (mS/cm)	--	0.635	--	--	--	--	--	--	--	0.615	--	0.469	0.643	--
Turbidity (NTU)	--	0	--	--	--	--	--	--	--	0	--	4.6	0.4	--
Dissolved Oxygen (mg/L)	--	2.7	--	--	--	--	--	--	--	2.45	--	1.17	1.32	--
ORP (mV)	--	51	--	--	--	--	--	--	--	18	--	108	25	--
Temperature (°C)	--	14.09	--	--	--	--	--	--	--	15.25	--	14.96	15.96	--
Dissolved Manganese (mg/L)	--	<0.05	--	--	--	--	--	--	--	<0.05	--	0.05	0.05	--
Dissolved Ferrous Iron (mg/L)	--	<0.2	--	--	--	--	--	--	--	<0.2	--	<0.2	<0.2	--
Nitrate (mg/L)	--	0.25	--	--	--	--	--	--	--	0.670	--	1.1	0.45	--
Sulfate (mg/L)	--	29.0	--	--	--	--	--	--	--	57.0	--	26.0	39.0	--
TOC (mg/L)	--	2.5	--	--	--	--	--	--	--	0.68	--	0.5	<0.50	--
SWMU 54 Eleventh Quarter (February 2014) Water Quality Parameters														
pH	8.1	--	--	--	--	--	--	--	--	6.89	--	7.21	7.21	--
Conductivity (mS/cm)	0.41	--	--	--	--	--	--	--	--	0.587	--	0.643	0.481	--
Turbidity (NTU)	0	--	--	--	--	--	--	--	--	0	--	3.8	14	--
Dissolved Oxygen (mg/L)	1.32	--	--	--	--	--	--	--	--	1.43	--	0.7	2.09	--
ORP (mV)	127	--	--	--	--	--	--	--	--	153	--	150	142	--
Temperature (°C)	12.34	--	--	--	--	--	--	--	--	13.2	--	14.11	12.04	--
Dissolved Manganese (mg/L)	<0.05	--	--	--	--	--	--	--	--	<0.05	--	<0.05	0.05	--
Dissolved Ferrous Iron (mg/L)	<0.2	--	--	--	--	--	--	--	--	0.2	--	0.2	<0.2	--
Nitrate (mg/L)	<0.025	--	--	--	--	--	--	--	--	0.470	--	3.1	0.44	--
Sulfate (mg/L)	30.00	--	--	--	--	--	--	--	--	89.0	--	36.0	31.0	--
TOC (mg/L)	1.00	--	--	--	--	--	--	--	--	0.53	--	1.00	<0.50	--
SWMU 54 Twelfth Quarter (May 2014) Water Quality Parameters														
pH	7.79	--	--	--	--	--	--	--	--	6.93	--	NM	NM	--
Conductivity (mS/cm)	0.469	--	--	--	--	--	--	--	--	0.582	--	0.453	0.47	--
Turbidity (NTU)	3	--	--	--	--	--	--	--	--	3.8	--	10	9	--
Dissolved Oxygen (mg/L)	1.65	--	--	--	--	--	--	--	--	1.56	--	2.25	1.14	--
ORP (mV)	222.3	--	--	--	--	--	--	--	--	127.4	--	272.1	71.3	--
Temperature (°C)	16.61	--	--	--	--	--	--	--	--	12.81	--	14.61	16.57	--
Dissolved Manganese (mg/L)	0.05	--	--	--	--	--	--	--	--	0.1	--	0.1	0.05	--
Dissolved Ferrous Iron (mg/L)	0.2	--	--	--	--	--	--	--	--	<0.2	--	0.2	0.2	--
Nitrate (mg/L)	0.031	--	--	--	--	--	--	--	--	0.330	--	1.6	0.41	--
Sulfate (mg/L)	29.0	--	--	--	--	--	--	--	--	58.0	--	31.0	27.0	--
TOC (mg/L)	51.0	--	--	--	--	--	--	--	--	62.0	--	<0.50	<0.50	--

Table 6-2 Water Quality Parameters for Groundwater Performance Monitoring at SWMU 54 (Continued)

Well ID	**54MW1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
SWMU 54 Thirteenth Quarter (September 2015) Water Quality Parameters														
pH	6.7	--	--	--	--	--	--	--	--	6.8	--	5.4	6.69	--
Conductivity (mS/cm)	0.471	--	--	--	--	--	--	--	--	329	--	0.557	0.529	--
Turbidity (NTU)	0.65	--	--	--	--	--	--	--	--	30.7	--	2.66	1.00	--
Dissolved Oxygen (mg/L)	0.75	--	--	--	--	--	--	--	--	8.2	--	6.0	6.53	--
ORP (mV)	180	--	--	--	--	--	--	--	--	71	--	264	198.0	--
Temperature (°C)	14.14	--	--	--	--	--	--	--	--	15.8	--	14.8	14.83	--
Dissolved Manganese (mg/L)	0.087	--	--	--	--	--	--	--	--	0.081	--	0.066	0.081	--
Dissolved Ferrous Iron (mg/L)	0	--	--	--	--	--	--	--	--	0.11	--	0.07	0.11	--
Nitrate (mg/L)	0.14	--	--	--	--	--	--	--	--	0.25	--	0.92	0.5	--
Sulfate (mg/L)	25	--	--	--	--	--	--	--	--	23	--	24	26	--
TOC (mg/L)	4.1	--	--	--	--	--	--	--	--	8.1	--	8.3	13	--
SWMU 54 Fourteenth Quarter (February 2014) Water Quality Parameters														
pH	7.60	--	--	--	--	--	--	--	--	6.16	--	6.79	7.01	--
Conductivity (mS/cm)	2.8	--	--	--	--	--	--	--	--	0.54	--	589.5	324.0	--
Turbidity (NTU)	0.78	--	--	--	--	--	--	--	--	0.88	--	5.8	7.99	--
Dissolved Oxygen (mg/L)	9.89	--	--	--	--	--	--	--	--	6.70	--	8.6	8.74	--
ORP (mV)	76.2	--	--	--	--	--	--	--	--	89.3	--	92.4	73.2	--
Temperature (°C)	9.6	--	--	--	--	--	--	--	--	12.7	--	12.4	11.6	--
Dissolved Manganese (mg/L)	0.063	--	--	--	--	--	--	--	--	0.054	--	0.030	0.063	--
Dissolved Ferrous Iron (mg/L)	0	--	--	--	--	--	--	--	--	0.0	--	0.10	0.05	--
Nitrate (mg/L)	0.15	--	--	--	--	--	--	--	--	0.45	--	2.5	0.46	--
Sulfate (mg/L)	26	--	--	--	--	--	--	--	--	76	--	45	20	--
TOC (mg/L)	1.5	--	--	--	--	--	--	--	--	0.97	--	1.8	1.8	--
SWMU 54 Fifteenth Quarter (May 2014) Water Quality Parameters														
pH	7.61	--	--	--	--	--	--	--	--	6.71	--	6.44	6.77	--
Conductivity (mS/cm)	440	--	--	--	--	--	--	--	--	602	--	353	229	--
Turbidity (NTU)	0.3	--	--	--	--	--	--	--	--	3.74	--	5.7	1.16	--
Dissolved Oxygen (mg/L)	4	--	--	--	--	--	--	--	--	0.61	--	5.8	6.86	--
ORP (mV)	51	--	--	--	--	--	--	--	--	73.5	--	93.4	76.8	--
Temperature (°C)	12.01	--	--	--	--	--	--	--	--	13.4	--	14.32	13.52	--
Dissolved Manganese (mg/L)	0.021	--	--	--	--	--	--	--	--	0.057	--	0.020	0.025	--
Dissolved Ferrous Iron (mg/L)	0.02	--	--	--	--	--	--	--	--	0.03	--	0.04	0.02	--
Nitrate (mg/L)	0.14	--	--	--	--	--	--	--	--	0.18	--	1.3	0.43	--
Sulfate (mg/L)	29	--	--	--	--	--	--	--	--	83	--	27	19	--
TOC (mg/L)	4.2	--	--	--	--	--	--	--	--	8.9	--	6.8	0.68	--

Table 6-2 Water Quality Parameters for Groundwater Performance Monitoring at SWMU 54 (Continued)

Well ID	54MW1	2	3	4	5	6	7	8	9	10	11	12	13	14
SWMU 54 Sixteenth Quarter (November 2013) Water Quality Parameters														
pH	6.82	--	--	--	--	--	--	--	--	7.39	--	6.32	7.27	--
Conductivity (mS/cm)	619	--	--	--	--	--	--	--	--	775	--	499	473.0	--
Turbidity (NTU)	4.62	--	--	--	--	--	--	--	--	5.36	--	6.50	0.72	--
Dissolved Oxygen (mg/L)	3.14	--	--	--	--	--	--	--	--	0.37	--	4.60	2.09	--
ORP (mV)	-10.1	--	--	--	--	--	--	--	--	109	--	8.2	12.0	--
Temperature (°C)	16.56	--	--	--	--	--	--	--	--	13.79	--	14.33	15.2	--
Dissolved Manganese (mg/L)	0.062	--	--	--	--	--	--	--	--	0.048	--	0.033	0.031	--
Dissolved Ferrous Iron (mg/L)	0.14	--	--	--	--	--	--	--	--	0.02	--	0.02	0.00	--
Nitrate (mg/L)	0.15	--	--	--	--	--	--	--	--	0.47	--	0.81	0.60	--
Sulfate (mg/L)	29	--	--	--	--	--	--	--	--	93	--	25	36	--
TOC (mg/L)	0.92	--	--	--	--	--	--	--	--	0.58	--	1.2	0.78	--

Notes:
-- = Wells eliminated from monitoring program
°C = degrees Celsius
mg/L =- milligrams per liter
mS/cm = milliseimens per centimeter
NM = not measured
NTU = Nephelometric Turbidity Unit mV - millivolts

This page intentionally left blank

Table 5-1 SWMU 54 Summary of Thirteenth Groundwater Samples

Analyte	Units	RG	# of RG Exceedances	# of Detections	# of Samples(1)	Minimum Concentration	Maximum Concentration	Location of Maximum
Explosives								
1,3-Dinitrobenzene	**µg/L**	**na**	na	0	5	ND	ND	na
2,4,6-Trinitrotoluene	**µg/L**	**7.82**	1	4	5	5.4	11	54MW12
DNT Mixture*	**µg/L**	**0.932**	0	0	5	ND	ND	na
2,4-Dinitrotoluene	**µg/L**	**na**	na	0	5	ND	ND	na
2,6-Dinitrotoluene	**µg/L**	**na**	na	4	5	1.2	4.2	54MW12
2-Amino-4,6-dinitrotoluene	**µg/L**	**na**	na	0	5	ND	ND	na
2-Nitrotoluene	**µg/L**	**na**	na	4	5	0.8	2.5	54MW10, SWMU54TM, 54MW12
4-Amino-2,6-dinitrotoluene	**µg/L**	**na**	na	4	5	1.9	3.9	54MW12
RDX	**µg/L**	**6.1**	0	0	5	ND	ND	na
DNX	**µg/L**	**na**	na	0	5	ND	ND	na
MNX	**µg/L**	**na**	na	0	5	ND	ND	na
TNX	**µg/L**	**na**	na	0	5	ND	ND	na
Misc.								
Perchlorate	**µg/L**	**10.9**	0	2	5	0.27	0.737	54MW12
Chlorate	**µg/L**	**na**	na	0	5	ND	ND	na
Chlorite	**µg/L**	**na**	na	0	5	ND	ND	na
Chloride	**mg/L**	**na**	na	5	5	2.8	6.2	54MW10
Nitrate (as N)	**mg/L**	**na**	na	5	5	0.14	0.92	54MW12
Sulfate	**mg/L**	**na**	na	5	5	23	26	54MW13
Total Inorganic Carbon	**mg/L**	**na**	na	5	5	30	62	54MW12
Total Organic Carbon	**mg/L**	**na**	na	5	5	4.1	13	54MW13

Notes:
[1] One sample was a duplicate
na = not applicable
ND = non detect

Table 5-2 SWMU 54 Detected Analytes in Thirteenth Quarter Groundwater Samples

Sample ID			**54MW1**					**54MW10**					**SWMU54TM (Field Duplicate 54MW10)**				
Date Collected			**9/30/2015**					**9/30/2015**					**9/30/2015**				
Analyte	**Units**	**Remedial Goals (1)**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**
Explosives																	
1,3-Dinitrobenzene	**µg/L**	**na**	0.3	U	U	0.5	0.1	0.3	U	UJ	0.5	0.1	0.32	U	U	0.54	0.11
2,4,6-Trinitrotoluene	**µg/L**	**7.82**	0.3	U	U	1	0.11	6.6		J	1	0.11	5.4			1.1	0.12
DNT Mixture*	**µg/L**	**0.932**	0.6	U	U	1.5	0.27	0.6	U	UJ	1.5	0.27	0.64	U	U	1.64	0.29
2,4-Dinitrotoluene	**µg/L**	**na**	0.3	U	U	1	0.15	0.3	U	UJ	1	0.15	0.32	U	U	1.1	0.16
2,6-Dinitrotoluene	**µg/L**	**na**	0.3	U	U	0.5	0.12	0.3	U	UJ	0.5	0.12	0.32	U	U	0.54	0.13
2-Amino-4,6-dinitrotoluene	**µg/L**	**na**	0.3	U	U	0.5	0.12	3.2		J	0.5	0.12	2.9			0.54	0.13
2-Nitrotoluene	**µg/L**	**na**	0.4	U	U	2	0.2	0.4	U	UJ	2	0.2	0.43	U	U	2.2	0.22
4-Amino-2,6-dinitrotoluene	**µg/L**	**na**	0.3	U	U	0.5	0.14	2.5		J	0.5	0.14	2.5			0.54	0.15
RDX	**µg/L**	**6.1**	0.3	U	U	0.5	0.09	2.1	P	J	0.5	0.09	1.9			0.54	0.097
DNX	**µg/L**	**na**	0.2	U	U	0.4	0.09	0.2	U	U	0.4	0.09	0.22	U	U	0.43	0.097
MNX	**µg/L**	**na**	0.1	U	U	0.2	0.03	0.1	U	U	0.2	0.03	0.11	U	U	0.22	0.032
TNX	**µg/L**	**na**	0.2	U	U	0.4	0.1	0.2	U	U	0.4	0.1	0.22	U	U	0.43	0.11
Misc.																	
Perchlorate	**µg/L**	**10.9**	0.2	U	U		0.1	0.2	U	U		0.1	0.2	U	U		0.1
Chlorate	**µg/L**	**na**	ND					ND					ND				
Chlorite	**µg/L**	**na**	ND					ND					ND				
Chloride	**mg/L**	**na**	2.8	J	J	4	1.1	6.2			4	1.1	6.1			4	1.1
Nitrate (as N)	**mg/L**	**na**	0.14	J	J	0.4	0.08	0.25	J	J	0.4	0.08	0.26	J	J	0.4	0.08
Sulfate	**mg/L**	**na**	25			5	1.3	23			5	1.3	24			5	1.3
Total Inorganic Carbon	**mg/L**	**na**	53			3	0.5	30			3	0.5	31			3	0.5
Total Organic Carbon	**mg/L**	**na**	4.1			3	0.5	8.1			3	0.5	6.9			3	0.5
MNA																	
Dissolved Fe^{2+}	**mg/L**	**na**	0					0.11					0.11				
Dissolved Mn	**mg/L**	**na**	0.087					0.081					0.081				

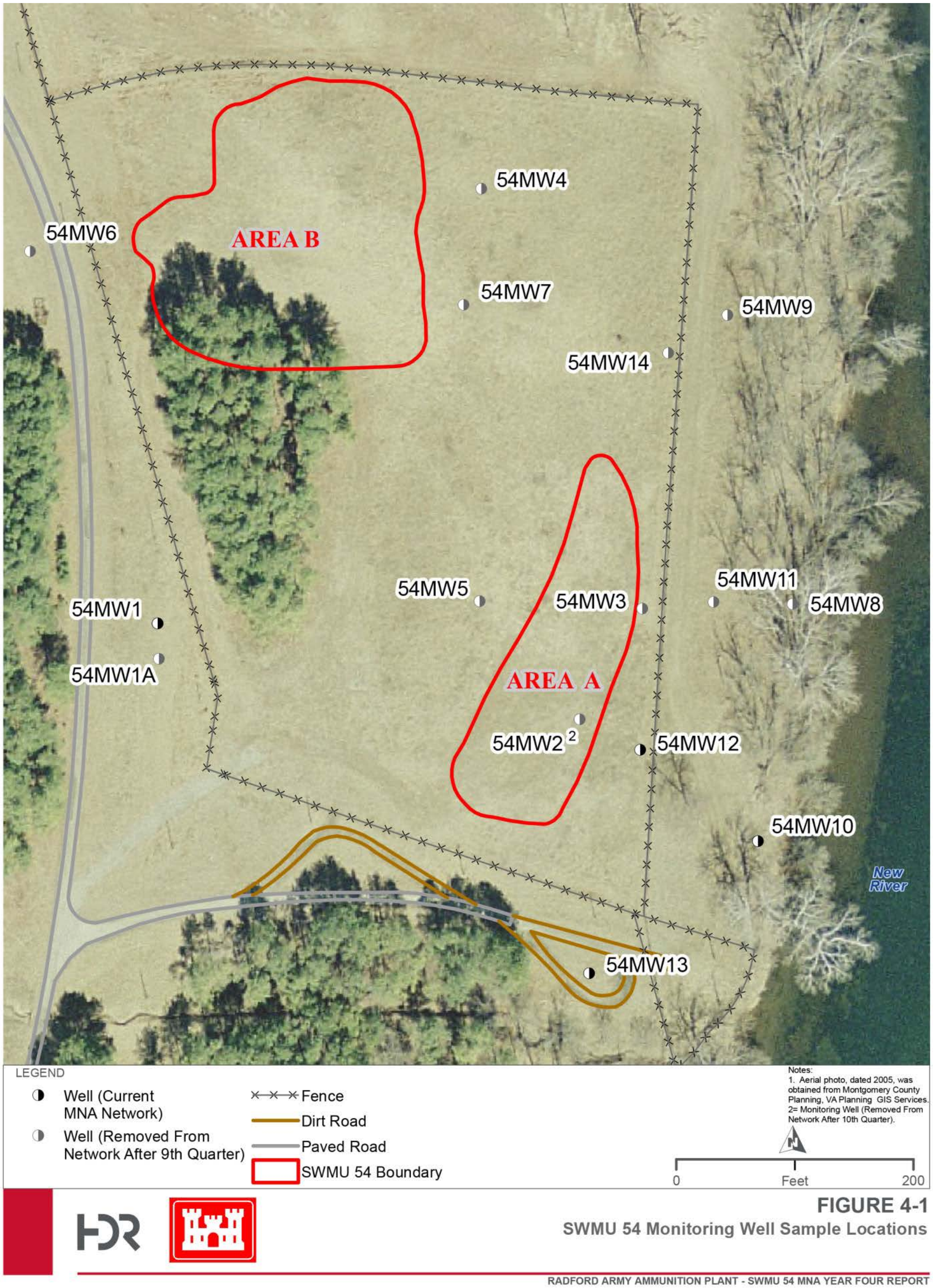
Table 5-2 SWMU 54 Detected Analytes in Thirteenth Quarter Groundwater Samples (Continued)

Sample ID			54MW12					54MW13				
Date Collected			9/30/2015					9/30/2015				
Analyte	Units	Remedial Goals (1)	Result	Lab Q	Val Q	RL	MDL	Result	Lab Q	Val Q	RL	MDL
Explosives												
1,3-Dinitrobenzene	µg/L	na	0.3	UM,Y	UJ	0.5	0.1	0.3	U	UJ	0.5	0.1
2,4,6-Trinitrotoluene	µg/L	**7.82**	11			1	0.11	5.4		J	1	0.11
DNT Mixture*	µg/L	**0.932**	0.6	UM,Y	UJ	1.5	0.27	0.6	U	UJ	1.5	0.27
2,4-Dinitrotoluene	µg/L	na	0.3	UM,Y	UJ	1	0.15	0.3	U	UJ	1	0.15
2,6-Dinitrotoluene	µg/L	na	0.3	UM,Y	UJ	0.5	0.12	0.3	U	UJ	0.5	0.12
2-Amino-4,6-dinitrotoluene	µg/L	na	4.2	M	J	0.5	0.12	1.2		J	0.5	0.12
2-Nitrotoluene	µg/L	na	0.4	UM,Y	UJ	2	0.2	0.4	U	UJ	2	0.2
4-Amino-2,6-dinitrotoluene	µg/L	na	2.5	M,Y	J	0.5	0.14	0.8		J	0.5	0.14
RDX	µg/L	**6.1**	3.9	P		0.5	0.09	2.6	P	J	0.5	0.09
DNX	µg/L	na	0.2	U	U	0.4	0.09	0.2	U	U	0.4	0.09
MNX	µg/L	na	0.1	U	U	0.2	0.03	0.1	U	U	0.2	0.03
TNX	µg/L	na	0.2	U	U	0.4	0.1	0.2	U	U	0.4	0.1
Misc.												
Perchlorate	µg/L	**10.9**	0.737		J		0.1	0.27	J	J		0.1
Chlorate	µg/L	na	ND					ND				
Chlorite	µg/L	na	ND					ND				
Chloride	mg/L	na	5.1			4	1.1	4.8			4	1.1
Nitrate (as N)	mg/L	na	0.92			0.4	0.08	0.5			0.4	0.08
Sulfate	mg/L	na	24	M		5	1.3	26			5	1.3
Total Inorganic Carbon	mg/L	na	62		J	3	0.5	55			3	0.5
Total Organic Carbon	mg/L	na	8.3	Y	J	3	0.5	13			3	0.5
MNA												
Dissolved Fe^{2+}	mg/L	na	0.07					0.11				
Dissolved Mn	mg/L	na	0.066					0.081				

Notes:
(1) Remedial Goals developed in SWMU 54 RFI/CMS Report, Final Document (URS, 2008). Exceedances denoted by bold font.
µg/L = micrograms per liter (parts per billion)
mg/L = milligrams per liter (parts per million)
MDL = Method Detection Limit
na = not applicable; remedial goal not established for analyte at SWMU 54
ND = non detect
RL = Reporting Limit
Lab Q = Lab Data Qualifiers
Val Q = Validation Data Qualifiers

Date Qualifiers:
B = Analyte detected in associated Method Blank.
J = Estimated value.
M = Matrix Spike and/or Matrix Spike Duplicate recovery outside acceptance limits.
P = Concentration of analyte differs more than 40% between primary and confirmation analysis.
U = Analyte concentration was not above the detection level.
Y = Replicate/Duplicate precision outside acceptance limits.

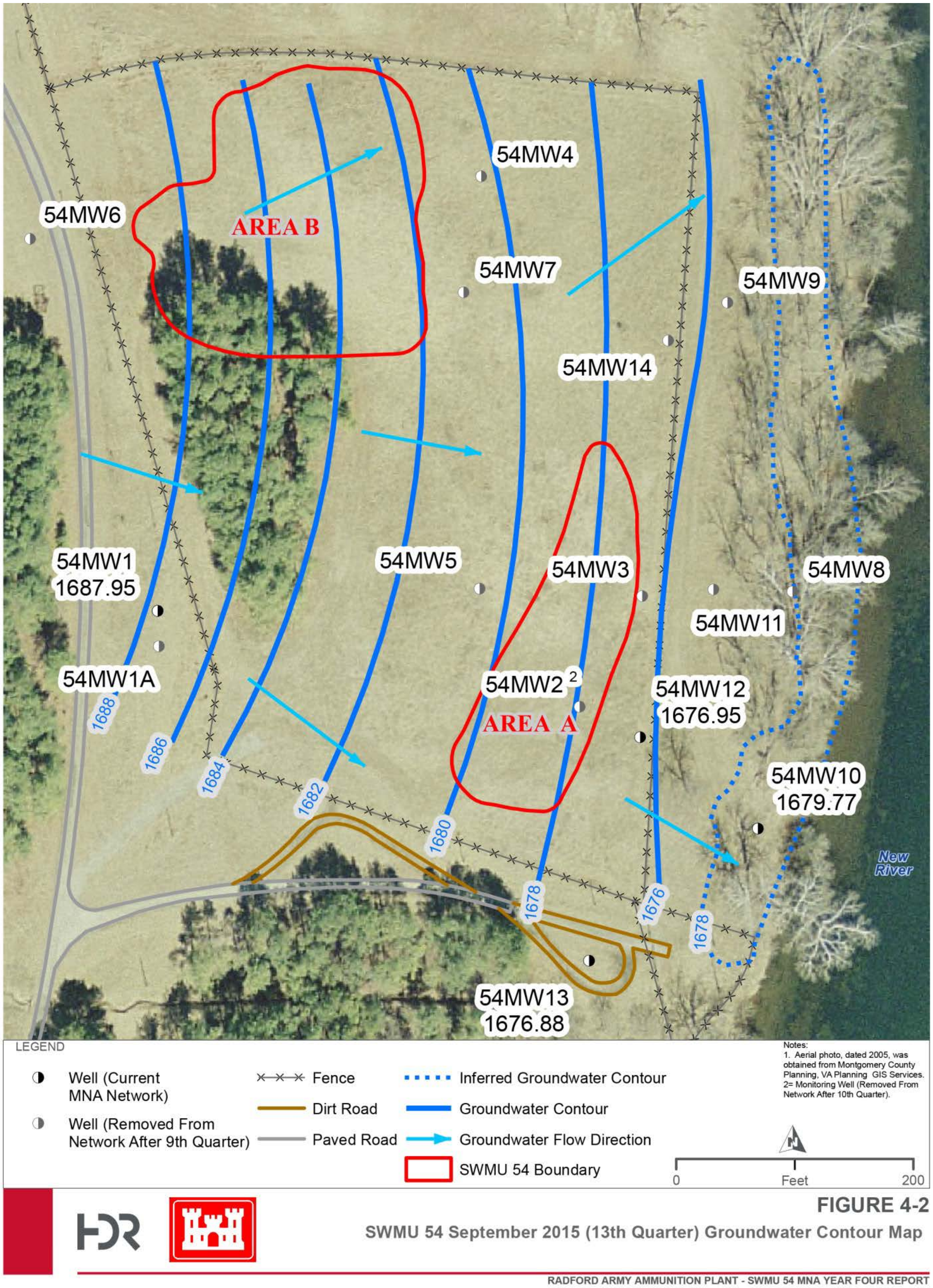
Figure 4-1 SWMU 54 Monitoring Well Sample Locations



Notes:
1. Aerial photo, dated 2005, was obtained from Montgomery County Planning, VA Planning GIS Services.
2= Monitoring Well (Removed From Network After 10th Quarter).

This page intentionally left blank

Figure 4-2 SWMU 54 September 2015 (13th Quarter) Groundwater Contour Map



Notes:
1. Aerial photo, dated 2005, was obtained from Montgomery County Planning, VA Planning GIS Services.
2= Monitoring Well (Removed From Network After 10th Quarter).

This page intentionally left blank

Table 5-7 SWMU 54 Summary of Sixteenth Quarter Groundwater Samples

	RG	# of RG Exceedances	# of Detections	# of Samples	Minimum Concentration	Maximum Concentration	Location of Maximum
Explosives (µg/L)							
1,3-Dinitrobenzene	**na**	na	0	5	ND	ND	na
2,4,6-Trinitrotoluene	**7.82**	3	4	5	7.4	30.3	54MW10
DNT Mixture*	**0.932**	na	0	5	ND	ND	na
2,4-Dinitrotoluene	**na**	na	0	5	ND	ND	na
2,6-Dinitrotoluene	**0.932**	0	0	5	ND	ND	na
2-Amino-4,6-dinitrotoluene	**na**	na	4	5	1.7	5.6	54MW12
2-Nitrotoluene	**na**	na	0	5	ND	ND	na
4-Amino-2,6-dinitrotoluene	**na**	na	4	5	1.2	2.8	54MW12
RDX	**6.1**	2	4	5	.37	7.5	54MW10
DNX	**na**	na	0	5	ND	ND	na
MNX	**na**	na	0	5	ND	ND	na
TNX	**na**	na	0	5	ND	ND	na
Misc.							
Perchlorate	**10.9**	0	4	5	.33	.89	54MW10
Chlorate	**na**	na	0	5	ND	ND	na
Chlorite	**na**	na	0	5	ND	ND	na
Chloride	**na**	na	5	5	2.8	6.4	54MW12
Nitrate (as N)	**na**	na	4	5	.47	.81	54MW12
Sulfate	**na**	na	5	5	25	93	54MW10
Total Inorganic Carbon	**na**	na	5	5	59	87	54MW10
Total Organic Carbon	**na**	na	5	5	.58	1.2	54MW12

Notes:
na = not applicable
ND = non detect

Table 5-8 SWMU 54 Detected Analytes in Sixteenth Quarter Groundwater Samples

Sample ID			**54MW1**					**54MW10**					**54TM10 (Field Duplicate 54MW10)**				
Date Collected			**7/11/2016**					**7/11/2016**					**7/11/2016**				
Analyte	**Units**	**Remedial Goals $^{(1)}$**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**
Explosives																	
1,3-Dinitrobenzene	**µg/L**	**na**	**0.1**	U	U	0.2	0.082	0.1	U	U	0.2	0.08	0.11	U	U	0.21	0.085
2,4,6-Trinitrotoluene	**µg/L**	**7.82**	**0.10**	U	U	0.20	0.082	24.2			0.40	0.16	30.3			0.43	0.17
DNT Mixture	**µg/L**	**0.932**	**0.2**	U	U	0.4	0.164	0.2	U	U	0.4	0.16	0.22	U	U	0.42	0.17
2,4-Dinitrotoluene	**µg/L**	**na**	**0.10**	U	U	0.20	0.082	0.10	U	U	0.20	0.08	0.11	U	U	0.21	0.085
2,6-Dinitrotoluene	**µg/L**	**na**	**0.10**	U	U	0.20	0.082	0.10	U	U	0.20	0.08	0.11	U	U	0.21	0.085
2-Amino-4,6-dinitrotoluene	**µg/L**	**na**	**0.10**	U	U	0.20	0.082	1.9		J+	0.20	0.080	2.3		J+	0.21	0.085
2-Nitrotoluene	**µg/L**	**na**	**0.10**	U	U	0.20	0.082	0.10	U	U	0.20	0.080	0.11	U	U	0.21	0.085
4-Amino-2,6-dinitrotoluene	**µg/L**	**na**	**0.10**	U	U	0.20	0.082	2.0			0.20	0.080	2.1			0.21	0.085
RDX	**µg/L**	**6.1**	**0.10**	U	U	0.20	0.082	6.6			0.20	0.080	7.5			0.21	0.085
DNX	**µg/L**	**na**	**0.1**	U	U	0.20	0.082	0.10	U	U	0.20	0.080	0.11	U	U	0.21	0.085
MNX	**µg/L**	**na**	**0.1**	U	U	0.20	0.082	0.10	U	U	0.20	0.080	0.11	U	U	0.21	0.085
TNX	**µg/L**	**na**	**0.1**	U	U	0.20	0.082	0.10	U	U	0.20	0.080	0.11	U	U	0.21	0.085
Misc.																	
Perchlorate	**µg/L**	**10.9**	**0.10**	U	U	0.20	0.050	0.84			0.20	0.050	0.89			0.20	0.050
Chlorate	**µg/L**	**na**	**10**	U	U	10	1.9	10	U	U	10	1.9	10	U	U	10	1.9
Chlorite	**µg/L**	**na**	**10**	U	U	10	5.7	10	U	U	10	5.7	10	U	U	10	5.7
Chloride	**mg/L**	**na**	**2.8**	J	J	4.0	1.1	4.9			4.0	1.1	5.0			4.0	1.1
Nitrate (as N)	**mg/L**	**na**	**0.15**	U	U	0.40	0.080	0.47			0.40	0.080	0.51			0.40	0.080
Sulfate	**mg/L**	**na**	**29**			5.0	1.3	93			25	6.5	87			25	6.5
Total Inorganic Carbon	**mg/L**	**na**	**59**			3.0	0.50	87			3.0	0.50	87			3.0	0.50
Total Organic Carbon	**mg/L**	**na**	**0.92**	J	J	3.0	0.50	0.58	J	J	3.0	0.50	0.77	J	J	3.0	0.50
MNA																	
Dissolved Fe^{2+}	**mg/L**	**na**	**0.14**					0.02					0.02				
Dissolved Mn	**mg/L**	**na**	**0.062**					0.048					0.048				

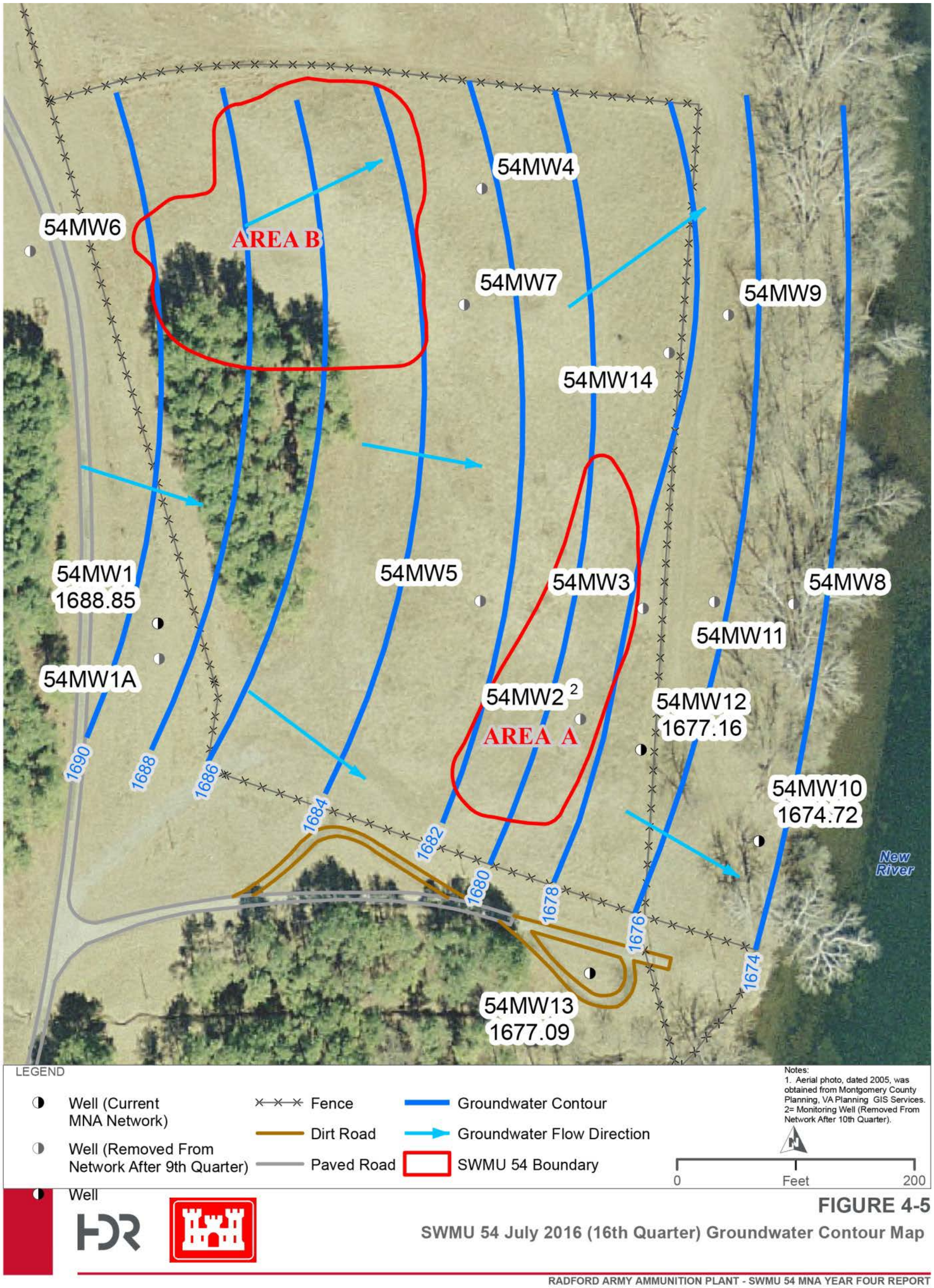
Table 5-8 SWMU 54 Detected Analytes in Sixteenth Quarter Groundwater Samples (Continued)

Sample ID			**54MW12**					**54MW13**				
Date Collected			**7/11/2016**					**9/30/2015**				
Analyte	**Units**	**Remedial Goals (1)**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**
Explosives												
1,3-Dinitrobenzene	**µg/L**	na	0.1	U	U	0.2	0.08	0.10	U	U	0.20	0.080
2,4,6-Trinitrotoluene	**µg/L**	7.82	7.4			0.20	0.080	13.9		J-	0.20	0.080
DNT Mixture	**µg/L**	0.932	0.2	U	U	0.4	0.16	0.2	U	U	0.4	0.16
2,4-Dinitrotoluene	**µg/L**	na	0.10	U	U	0.20	0.08	0.10	U	U	0.20	0.080
2,6-Dinitrotoluene	**µg/L**	na	0.10	U	U	0.20	0.08	0.10	U	U	0.20	0.080
2-Amino-4,6-dinitrotoluene	**µg/L**	na	5.6		J+	0.20	0.080	1.7		J+	0.20	0.080
2-Nitrotoluene	**µg/L**	na	0.10	U	U	0.20	0.080	0.10	U	U	0.20	0.080
4-Amino-2,6-dinitrotoluene	**µg/L**	na	2.8			0.20	0.080	1.2			0.20	0.080
RDX	**µg/L**	6.1	0.37			0.20	0.080	0.86			0.20	0.080
DNX	**µg/L**	na	0.10	U	U	0.20	0.080	0.10	U	U	0.20	0.080
MNX	**µg/L**	na	0.10	U	U	0.20	0.080	0.10	U	U	0.20	0.080
TNX	**µg/L**	na	0.10	U	U	0.20	0.080	0.10	U	U	0.20	0.080
Misc.												
Perchlorate	**µg/L**	10.9	0.56			0.20	0.050	0.33			0.20	0.050
Chlorate	**µg/L**	na	10	U	U	10	1.9	10	U	UJ	10	1.9
Chlorite	**µg/L**	na	10	U	U	10	5.7	10	U	UJ	10	5.7
Chloride	**mg/L**	na	6.4		J-	4.0	1.1	5.7	M	J-	4.0	1.1
Nitrate (as N)	**mg/L**	na	0.81			0.40	0.080	0.60			0.40	0.080
Sulfate	**mg/L**	na	25			5.0	1.3	36	M		5.0	1.3
Total Inorganic Carbon	**mg/L**	na	60	Y		3.0	0.50	72			3.0	0.50
Total Organic Carbon	**mg/L**	na	1.2	J	J	3.0	0.50	0.78	J	J	3.0	0.50
MNA												
Dissolved Fe^{2+}	**mg/L**	na	0.02					0.00				
Dissolved Mn	**mg/L**	na	0.033					0.031				

Notes:
(1) Remedial Goals developed in SWMU 54 RFI/CMS Report, Final Document (URS, 2008). Exceedances denoted by bold font.
µg/L = micrograms per liter (parts per billion)
mg/L = milligrams per liter (parts per million)
MDL = Method Detection Limit
na = not applicable; remedial goal not established for analyte at SWMU 54
ND = non detect
RL = Reporting Limit
Lab Q = Lab Data Qualifiers
Val Q = Validation Data Qualifiers

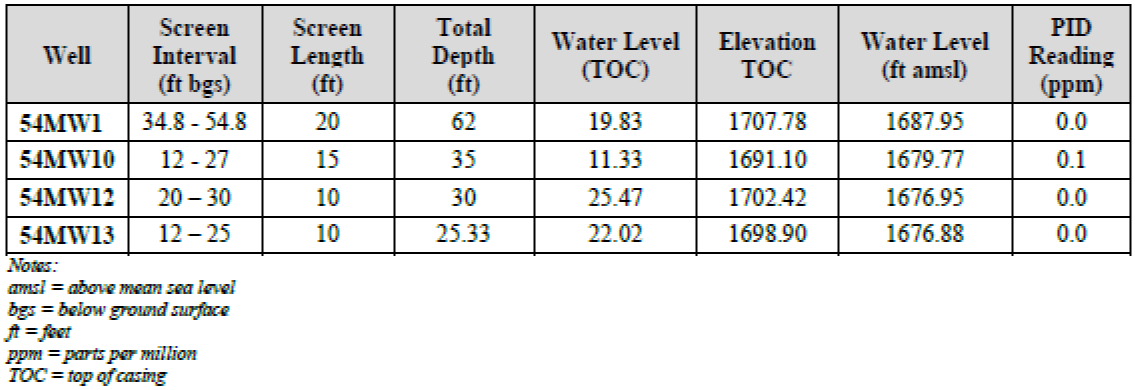
Date Qualifiers:
B = Analyte detected in associated Method Blank.
J = Estimated value.
M = Matrix Spike and/or Matrix Spike Duplicate recovery outside acceptance limits.
P = Concentration of analyte differs more than 40% between primary and confirmation analysis.
U = Analyte concentration was not above the detection level.
Y = Replicate/Duplicate precision outside acceptance limits.

Figure 4-5 SWMU 54 July 2016 (16th Quarter) Groundwater Contour Map



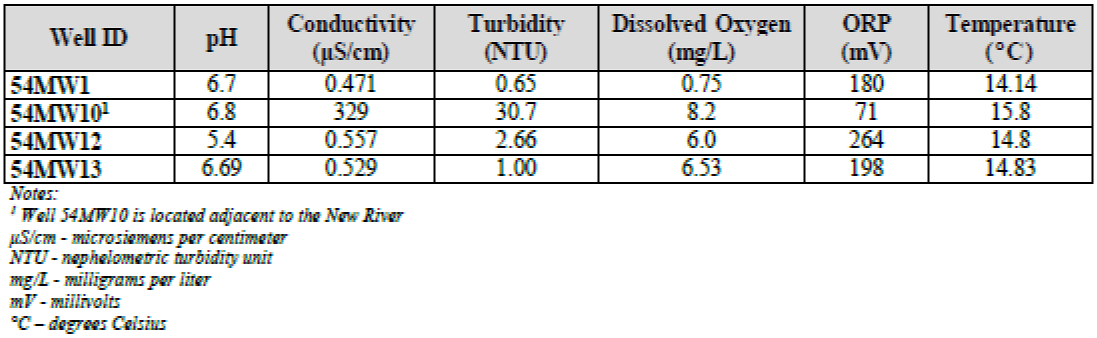
This page intentionally left blank

September 2015



Well	Screen Interval (ft bgs)	Screen Length (ft)	Total Depth (ft)	Water Level (TOC)	Elevation TOC	Water Level (ft amsl)	PID Reading (ppm)
54MW1	34.8 - 54.8	20	62	19.83	1707.78	1687.95	0.0
54MW10	12 - 27	15	35	11.33	1691.10	1679.77	0.1
54MW12	20 – 30	10	30	25.47	1702.42	1676.95	0.0
54MW13	12 – 25	10	25.33	22.02	1698.90	1676.88	0.0

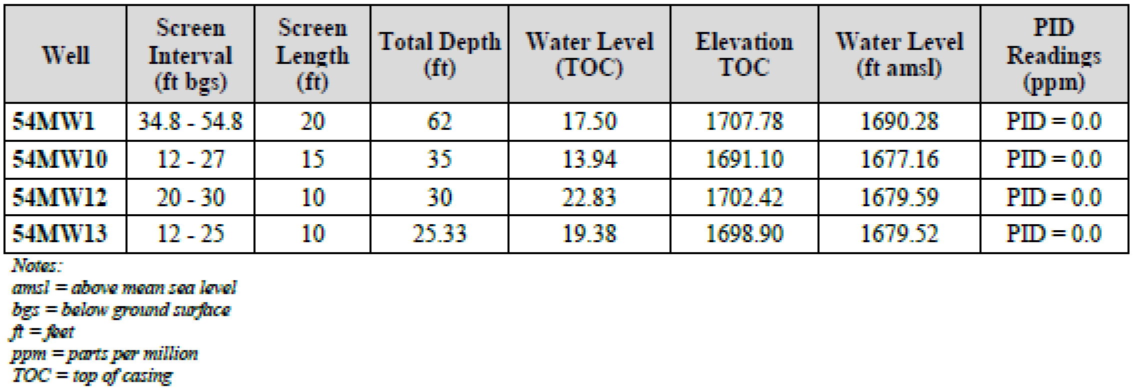
Notes:
amsl = above mean sea level
bgs = below ground surface
ft = feet
ppm = parts per million
TOC = top of casing



Well ID	pH	Conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Temperature (°C)
54MW1	6.7	0.471	0.65	0.75	180	14.14
54MW10[1]	6.8	329	30.7	8.2	71	15.8
54MW12	5.4	0.557	2.66	6.0	264	14.8
54MW13	6.69	0.529	1.00	6.53	198	14.83

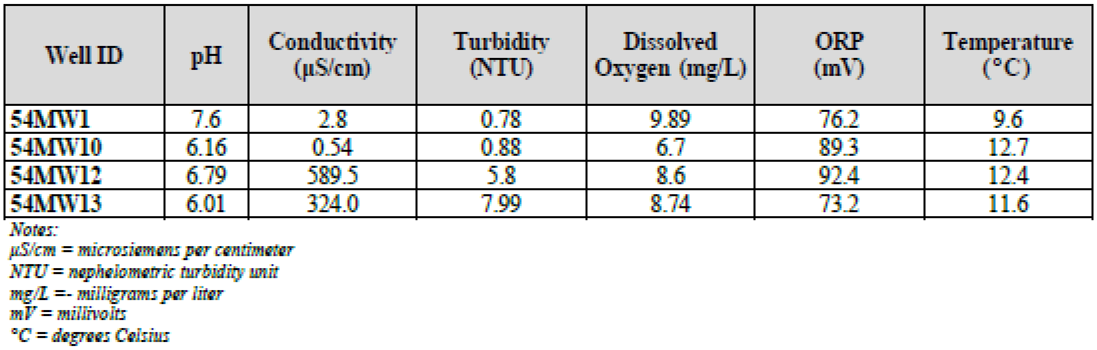
Notes:
[1] Well 54MW10 is located adjacent to the New River
µS/cm - microsiemens per centimeter
NTU - nephelometric turbidity unit
mg/L - milligrams per liter
mV - millivolts
°C – degrees Celsius

January 2016



Well	Screen Interval (ft bgs)	Screen Length (ft)	Total Depth (ft)	Water Level (TOC)	Elevation TOC	Water Level (ft amsl)	PID Readings (ppm)
54MW1	34.8 - 54.8	20	62	17.50	1707.78	1690.28	PID = 0.0
54MW10	12 - 27	15	35	13.94	1691.10	1677.16	PID = 0.0
54MW12	20 - 30	10	30	22.83	1702.42	1679.59	PID = 0.0
54MW13	12 - 25	10	25.33	19.38	1698.90	1679.52	PID = 0.0

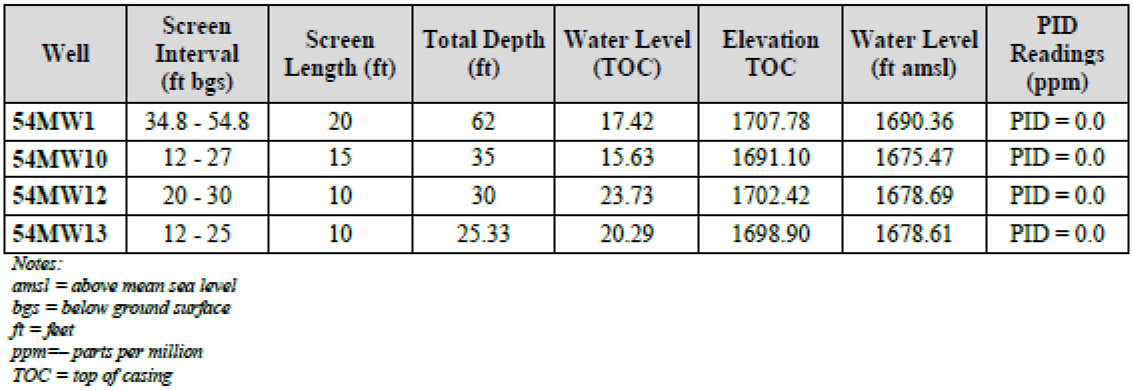
Notes:
amsl = above mean sea level
bgs = below ground surface
ft = feet
ppm = parts per million
TOC = top of casing



Well ID	pH	Conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Temperature (°C)
54MW1	7.6	2.8	0.78	9.89	76.2	9.6
54MW10	6.16	0.54	0.88	6.7	89.3	12.7
54MW12	6.79	589.5	5.8	8.6	92.4	12.4
54MW13	6.01	324.0	7.99	8.74	73.2	11.6

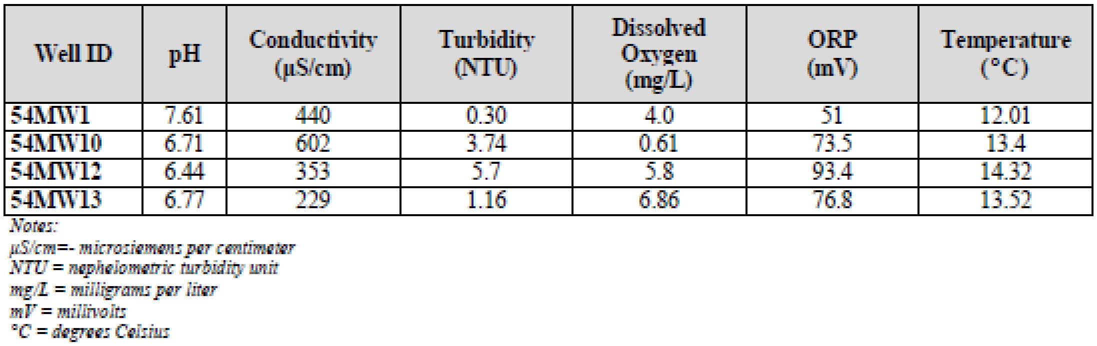
Notes:
µS/cm = microsiemens per centimeter
NTU = nephelometric turbidity unit
mg/L =- milligrams per liter
mV = millivolts
°C = degrees Celsius

April 2016



Well	Screen Interval (ft bgs)	Screen Length (ft)	Total Depth (ft)	Water Level (TOC)	Elevation TOC	Water Level (ft amsl)	PID Readings (ppm)
54MW1	34.8 - 54.8	20	62	17.42	1707.78	1690.36	PID = 0.0
54MW10	12 - 27	15	35	15.63	1691.10	1675.47	PID = 0.0
54MW12	20 - 30	10	30	23.73	1702.42	1678.69	PID = 0.0
54MW13	12 - 25	10	25.33	20.29	1698.90	1678.61	PID = 0.0

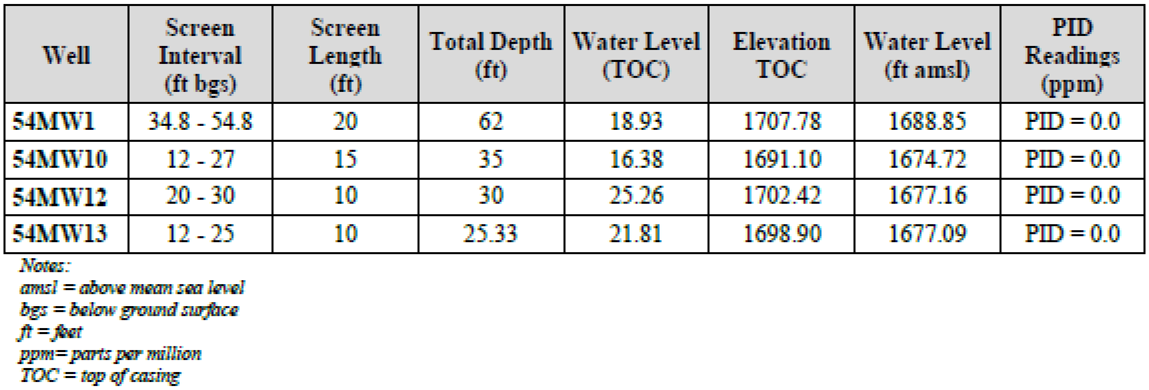
Notes:
amsl = above mean sea level
bgs = below ground surface
ft = feet
ppm=– parts per million
TOC = top of casing



Well ID	pH	Conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Temperature (°C)
54MW1	7.61	440	0.30	4.0	51	12.01
54MW10	6.71	602	3.74	0.61	73.5	13.4
54MW12	6.44	353	5.7	5.8	93.4	14.32
54MW13	6.77	229	1.16	6.86	76.8	13.52

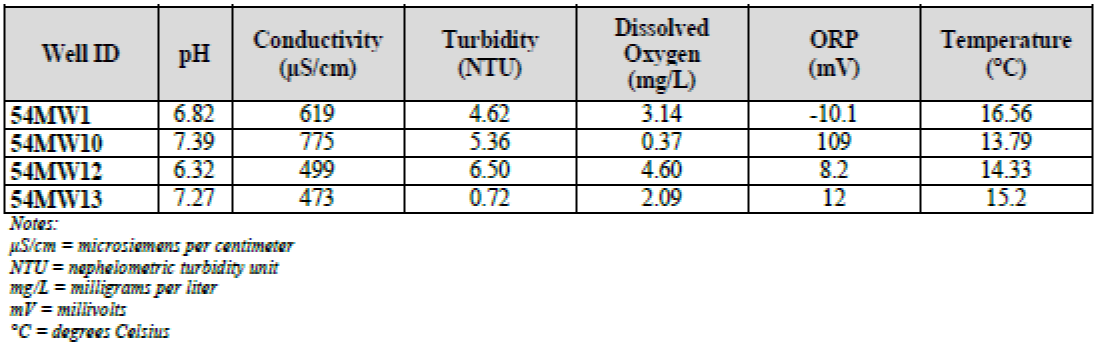
Notes:
µS/cm=- microsiemens per centimeter
NTU = nephelometric turbidity unit
mg/L = milligrams per liter
mV = millivolts
°C = degrees Celsius

July 2016



Well	Screen Interval (ft bgs)	Screen Length (ft)	Total Depth (ft)	Water Level (TOC)	Elevation TOC	Water Level (ft amsl)	PID Readings (ppm)
54MW1	34.8 - 54.8	20	62	18.93	1707.78	1688.85	PID = 0.0
54MW10	12 - 27	15	35	16.38	1691.10	1674.72	PID = 0.0
54MW12	20 - 30	10	30	25.26	1702.42	1677.16	PID = 0.0
54MW13	12 - 25	10	25.33	21.81	1698.90	1677.09	PID = 0.0

Notes:
amsl = above mean sea level
bgs = below ground surface
ft = feet
ppm= parts per million
TOC = top of casing



Well ID	pH	Conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	ORP (mV)	Temperature (°C)
54MW1	6.82	619	4.62	3.14	-10.1	16.56
54MW10	7.39	775	5.36	0.37	109	13.79
54MW12	6.32	499	6.50	4.60	8.2	14.33
54MW13	7.27	473	0.72	2.09	12	15.2

Notes:
µS/cm = microsiemens per centimeter
NTU = nephelometric turbidity unit
mg/L = milligrams per liter
mV = millivolts
°C = degrees Celsius

Table 5-3 SWMU 54 Summary of Fourteenth Quarter Groundwater Samples

	RG	# of RG Exceedances	# of Detections	# of Samples[(1)]	Minimum Concentration	Maximum Concentration	Location of Maximum
Explosives (µg/L)							
1,3-Dinitrobenzene	**na**	na	0	5	ND	ND	na
2,4,6-Trinitrotoluene	**7.82**	1	4	5	1.4	110.0	54MW12
DNT Mixture	**0.932**	0	0	5	0.6	0.6	54MW10
2,4-Dinitrotoluene	**na**	na	0	5	ND	ND	na
2,6-Dinitrotoluene	**na**	na	0	5	ND	ND	na
2-Amino-4,6-dinitrotoluene	**na**	na	4	5	0.44	13.0	54MW12
2-Nitrotoluene	**na**	na	0	5	ND	ND	na
4-Amino-2,6-dinitrotoluene	**na**	na	4	5	0.76	0.78	54MW10
RDX	**6.1**	1	4	5	0.54	30.0	54MW12
DNX	**na**	na	1	5	0.72	0.72	54MW12
MNX	**na**	na	0	5	ND	ND	na
TNX	**na**	na	0	5	ND	ND	na
Misc. (µg/L)							
Perchlorate	**10.9**	0	4	5	0.216	8.85	54MW12
Chlorate	**na**	na	0	5	ND	ND	na
Chlorite	**na**	na	0	5	ND	ND	na
Chloride	**na**	na	5	5	2.5	6.0	54MW12
Nitrate (as N)	**na**	na	4	5	0.45	2.5	54MW12
Sulfate	**na**	na	5	5	20.0	76.0	54MW10
Total Inorganic Carbon	**na**	na	5	5	46.0	91.0	54MW12
Total Organic Carbon	**na**	na	5	5	0.97	1.8	54MW12

Notes:
[1] One sample was a duplicate
na = not applicable
ND = non detect

Table 5-4 SWMU 54 Detected Analytes in Fourteenth Quarter Groundwater Samples

Sample ID			**54MW1**					**54MW10**					**SWMU54TM (Field Duplicate 54MW10)**				
Date Collected			**1/12/2016**					**1/11/2016**					**1/11/2016**				
Analyte	**Units**	**Remedial Goals (1)**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**
Explosives																	
1,3-Dinitrobenzene	**µg/L**	**na**	0.30	U	UJ	0.50	0.10	0.30	U	UJ	0.50	0.10	0.30	U	UJ	0.50	0.10
2,4,6-Trinitrotoluene	**µg/L**	**7.82**	0.30	U	UJ	1.0	0.11	4.1		J	1.0	0.11	4.3		J	1.0	0.11
DNT Mixture	**µg/L**	**0.932**	0.60	U	UJ	1.50	0.27	0.60	U	UJ	1.50	0.27	0.60	U	UJ	1.50	0.27
2,4-Dinitrotoluene	**µg/L**	**na**	0.30	U	UJ	1.0	0.15	0.30	U	UJ	1.0	0.15	0.30	U	UJ	1.0	0.15
2,6-Dinitrotoluene	**µg/L**	**na**	0.30	U	UJ	0.50	0.12	0.30	U	UJ	0.50	0.12	0.30	U	UJ	0.50	0.12
2-Amino-4,6-dinitrotoluene	**µg/L**	**na**	0.30	U	UJ	0.50	0.12	1.2		J	0.50	0.12	1.3		J	0.50	0.12
2-Nitrotoluene	**µg/L**	**na**	0.40	U	UJ	2.0	0.20	0.40	U	UJ	2.0	0.20	0.40	U	UJ	2.0	0.20
4-Amino-2,6-dinitrotoluene	**µg/L**	**na**	0.30	U	UJ	0.50	0.14	0.78		J	0.50	0.14	0.76		J	0.50	0.14
RDX	**µg/L**	**6.1**	0.30	U	UJ	0.50	0.090	3.1	P	J	0.50	0.090	3.2	P	J	0.50	0.090
DNX	**µg/L**	**na**	0.20	U	UJ	0.40	0.090	0.20	U	UJ	0.40	0.090	0.20	U	UJ	0.40	0.090
MNX	**µg/L**	**na**	0.10	U	UJ	0.20	0.030	0.10	U	UJ	0.20	0.030	0.10	U	UJ	0.20	0.030
TNX	**µg/L**	**na**	0.20	U	UJ	0.40	0.10	0.20	U	UJ	0.40	0.10	0.20	U	UJ	0.40	0.10
Misc.																	
Perchlorate	**µg/L**	**10.9**	0.200	U	U	0.40	0.10	0.326	J	J	0.40	0.10	0.284	J	J	0.400	0.100
Chlorate	**µg/L**	**na**	0.360	U	U	10.0	0.36	0.360	U	U	10.0	0.36	0.360	U	U	10.0	0.360
Chlorite	**µg/L**	**na**	0.720	U	U	10.0	0.72	0.720	U	U	10.0	0.72	0.720	U	U	10.0	0.720
Chloride	**mg/L**	**na**	2.6	J	J	4.0	1.1	4.6		J	4.0	1.1	4.6	M		4.0	1.1
Nitrate (as N)	**mg/L**	**na**	0.15	U	U	0.40	0.08	0.45			0.40	0.08	0.46			0.40	0.080
Sulfate	**mg/L**	**na**	26			5.0	1.3	76			25	6.5	73			25	6.5
Total Inorganic Carbon	**mg/L**	**na**	61		J	3.0	0.50	77			3.0	0.50	81			3.0	0.50
Total Organic Carbon	**mg/L**	**na**	1.5	U	U	3.0	0.50	0.97	J	J	3.0	0.50	1.1	J	J	3.0	0.50
MNA																	
Dissolved Fe^{2}+	**mg/L**	**na**	0					0.0					0.0				
Dissolved Mn	**mg/L**	**na**	0.063					0.054					0.054				

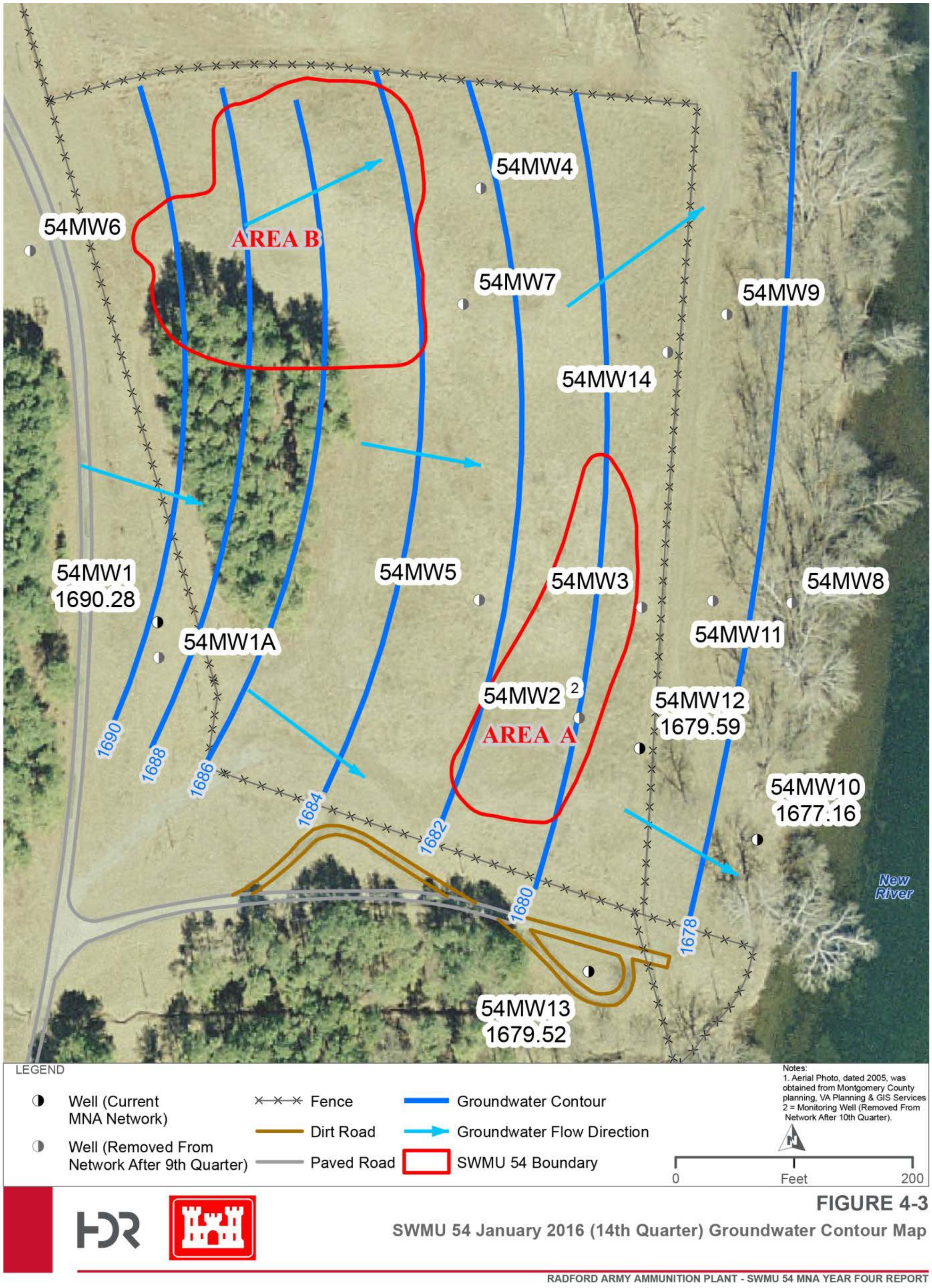
Table 5-4 SWMU 54 Detected Analytes in Fourteenth Quarter Groundwater Samples (Continued)

Sample ID			54MW12					54MW13				
Date Collected			1/12/2016					1/12/2016				
Analyte	Units	Remedial Goals $^{(1)}$	Result	Lab Q	Val Q	RL	MDL	Result	Lab Q	Val Q	RL	MDL
Explosives												
1,3-Dinitrobenzene	µg/L	na	0.30	U	UJ	0.50	0.10	0.30	U	UJ	0.50	0.10
2,4,6-Trinitrotoluene	µg/L	**7.82**	110	M	J	10	1.1	1.4		J	1.0	0.11
DNT Mixture	µg/L	**0.932**	0.60	U	UJ	1.50	0.27	0.60	U	UJ	1.50	0.27
2,4-Dinitrotoluene	µg/L	na	0.30	U	UJ	1.0	0.15	0.30	U	UJ	1.0	0.15
2,6-Dinitrotoluene	µg/L	na	0.30	U	UJ	0.50	0.12	0.30	U	UJ	0.50	0.12
2-Amino-4,6-dinitrotoluene	µg/L	na	13		J	0.50	0.12	0.44	J	J	0.50	0.12
2-Nitrotoluene	µg/L	na	0.40	U	UJ	2.0	0.20	0.40	U	UJ	2.0	0.20
4-Amino-2,6-dinitrotoluene	µg/L	na	0.30	UM	UJ	0.50	0.14	0.30	U	UJ	0.50	0.14
RDX	µg/L	**6.1**	30	M,P	J	5.0	0.90	0.54		J	0.50	0.090
DNX	µg/L	na	0.72	P,M	J	0.40	0.090	0.20	U	UJ	0.40	0.090
MNX	µg/L	na	0.10	UY	UJ	0.20	0.030	0.10	U	UJ	0.20	0.030
TNX	µg/L	na	0.20	UP,M	UJ	0.40	0.10	0.20	U	UJ	0.40	0.10
Misc.												
Perchlorate	µg/L	**10.9**	8.85		J	0.400	0.100	0.216	J	J	0.400	0.100
Chlorate	µg/L	na	0.360	U	U	10.0	0.360	0.360	U	U	10.0	0.360
Chlorite	µg/L	na	0.720	U	U	10.0	0.720	0.720	U	U	10.0	0.720
Chloride	mg/L	na	6.0			4.0	1.1	2.5	J	J	4.0	1.1
Nitrate (as N)	mg/L	na	2.5		B	0.40	0.080	0.46			0.40	0.080
Sulfate	mg/L	na	45			5.0	1.3	20			5.0	1.3
Total Inorganic Carbon	mg/L	na	91	M	J	3.0	0.50	46		J	3.0	0.50
Total Organic Carbon	mg/L	na	1.8	JY	J	3.0	0.50	1.8	J	J	3.0	0.50
MNA												
Dissolved Fe^{2+}	mg/L	na	0.10					0.05				
Dissolved Mn	mg/L	na	0.030					0.063				

Notes:
(1) Remedial Goals developed in SWMU 54 RFI/CMS Report, Final Document (URS, 2008). Exceedances denoted by bold font.
µg/L = micrograms per liter (parts per billion)
mg/L = milligrams per liter (parts per million)
MDL = Method Detection Limit
na = not applicable; remedial goal not established for analyte at SWMU 54
ND = non detect
RL = Reporting Limit
Lab Q = Lab Data Qualifiers
Val Q = Validation Data Qualifiers

Date Qualifiers:
B = Analyte detected in associated Method Blank.
J = Estimated value.
M = Matrix Spike and/or Matrix Spike Duplicate recovery outside acceptance limits.
P = Concentration of analyte differs more than 40% between primary and confirmation analysis.
U = Analyte concentration was not above the detection level.
Y = Replicate/Duplicate precision outside acceptance limits.

Figure 4-3 SWMU 54 January 2016 (14th Quarter) Groundwater Contour Map



This page intentionally left blank

Table 5-5 SWMU 54 Summary of Fifteenth Quarter Groundwater Samples

Analyte	Units	RG	# of RG Exceedances	# of Detections	# of Samples [(1)]	Minimum Concentration	Maximum Concentration	Location of Maximum
Explosives								
1,3-Dinitrobenzene	**µg/L**	**na**	na	0	5	ND	ND	na
2,4,6-Trinitrotoluene	**µg/L**	**7.82**	1	3	5	.79	11	54MW12
DNT Mixture*	**µg/L**	**0.932**	0	0	5	ND	ND	na
2,4-Dinitrotoluene	**µg/L**	**na**	na	0	5	ND	ND	na
2,6-Dinitrotoluene	**µg/L**	**na**	na	0	5	ND	ND	na
2-Amino-4,6-dinitrotoluene	**µg/L**	**na**	na	3	5	.25	4.3	54MW12
2-Nitrotoluene	**µg/L**	**na**	na	0	5	ND	ND	na
4-Amino-2,6-dinitrotoluene	**µg/L**	**na**	na	3	5	.23	2.7	54MW12
RDX	**µg/L**	**6.1**	0	3	5	.17	2.5	54MW12
DNX	**µg/L**	**na**	na	0	5	ND	ND	na
MNX	**µg/L**	**na**	na	0	5	ND	ND	na
TNX	**µg/L**	**na**	na	0	5	ND	ND	na
Misc.								
Perchlorate	**µg/L**	**10.9**	0	3	5	.082	1.2	54MW12
Chlorate	**µg/L**	**na**	na	0	5	ND	ND	na
Chlorite	**µg/L**	**na**	na	0	5	ND	ND	na
Chloride	**mg/L**	**na**	na	5	5	1.6	4.4	54MW10
Nitrate (as N)	**mg/L**	**na**	na	5	5	.14	1.3	54MW12
Sulfate	**mg/L**	**na**	na	5	5	26	83	54MW10
Total Inorganic Carbon	**mg/L**	**na**	na	5	5	27	56	54MW10
Total Organic Carbon	**mg/L**	**na**	na	5	5	.68	8.9	54MW10

Notes:
[1] One sample was a duplicate
na = not applicable
ND = non detect

Table 5-6 SWMU 54 Detected Analytes in Fifteenth Quarter Groundwater Samples

Sample ID			54MW1					54TM1 (Field Duplicate 54MW1)					54MW10				
Date Collected			**4/14/2016**					**4/14/2016**					**4/14/2016**				
Analyte	**Units**	**Remedial Goals (1)**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**
Explosives																	
1,3-Dinitrobenzene	**µg/L**	**na**	0.32	U	UJ	0.53	0.11	0.32	U	UJ	0.53	0.11	0.32	U	UJ	0.53	0.11
2,4,6-Trinitrotoluene	**µg/L**	**7.82**	0.32	U	UJ	1.1	0.12	0.32	U	UJ	1.1	0.12	2.7		J	1.1	0.12
DNT Mixture	**µg/L**	**0.932**	0.64	U	UJ	1.63	0.29	0.64	U	UJ	1.63	0.29	0.64	U	UJ	1.63	0.29
2,4-Dinitrotoluene	**µg/L**	**na**	0.32	U	UJ	1.1	0.16	0.32	U	UJ	1.1	0.16	0.32	U	UJ	1.1	0.16
2,6-Dinitrotoluene	**µg/L**	**na**	0.32	U	UJ	0.53	0.13	0.32	U	UJ	0.53	0.13	0.32	U	UJ	0.53	0.13
2-Amino-4,6-dinitrotoluene	**µg/L**	**na**	0.32	U	UJ	0.53	0.13	0.32	U	UJ	0.53	0.13	0.42	J	J	0.53	0.13
2-Nitrotoluene	**µg/L**	**na**	0.43	U	UJ	2.1	0.21	0.42	U	UJ	2.1	0.21	0.42	U	UJ	2.1	0.21
4-Amino-2,6-dinitrotoluene	**µg/L**	**na**	0.32	U	UJ	0.53	0.15	0.32	U	UJ	0.53	0.15	0.49	J	J	0.53	0.15
RDX	**µg/L**	**6.1**	0.32	U	UJ	0.53	0.096	0.32	U	UJ	0.53	0.095	1.8		J	0.53	0.095
DNX	**µg/L**	**na**	0.10	U	UJ	0.21	0.083	0.10	U	UJ	0.20	0.080	0.10	U	UJ	0.20	0.081
MNX	**µg/L**	**na**	0.10	U	UJ	0.21	0.083	0.10	U	UJ	0.20	0.080	0.10	U	UJ	0.20	0.081
TNX	**µg/L**	**na**	0.10	U	UJ	0.21	0.083	0.10	U	UJ	0.20	0.080	0.10	U	UJ	0.20	0.081
Misc.																	
Perchlorate	**µg/L**	**10.9**	0.10	U	U	0.20	0.050	0.10	U	U	0.20	0.050	0.082	J	J	0.20	0.050
Chlorate	**µg/L**	**na**	10	U	U	10		10	U	U	10		10	U	U	10	
Chlorite	**µg/L**	**na**	10	U	U	10		10	U	U	10		10	U	U	10	
Chloride	**mg/L**	**na**	2.4	J	J	4.0	1.1	2.3	J	J	4.0	1.1	4.4			4.0	1.1
Nitrate (as N)	**mg/L**	**na**	0.14	J	J	0.40	0.080	0.14	J	J	0.40	0.080	0.18	J	J	0.40	0.080
Sulfate	**mg/L**	**na**	29			5.0	1.3	26			5.0	1.3	83			5.0	1.3
Total Inorganic Carbon	**mg/L**	**na**	51			3.0	0.50	51			3.0	0.50	56			3.0	0.50
Total Organic Carbon	**mg/L**	**na**	4.2			3.0	0.50	4.0			3.0	0.50	8.9			3.0	0.50
MNA																	
Dissolved Fe^{2+}	**mg/L**	**na**	0.02					0.02					0.03				
Dissolved Mn	**mg/L**	**na**	0.021					0.021					0.057				

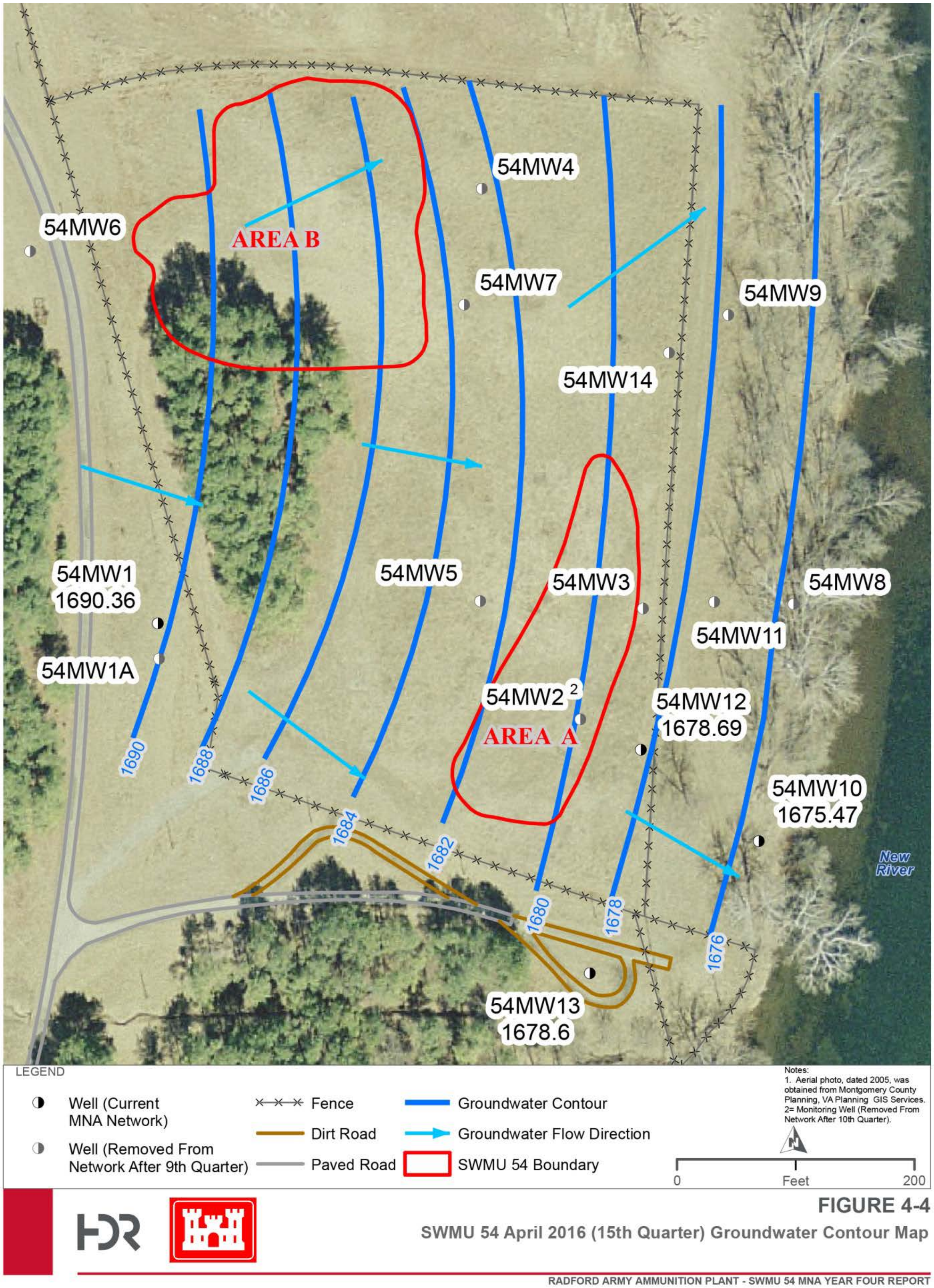
Table 5-6 SWMU 54 Detected Analytes in Fifteenth Quarter Groundwater Samples (Continued)

Sample ID			**54MW12**					**54MW13**				
Date Collected			**4/14/2016**					**4/14/2016**				
Analyte	**Units**	**Remedial Goals (1)**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**	**Result**	**Lab Q**	**Val Q**	**RL**	**MDL**
Explosives												
1,3-Dinitrobenzene	**µg/L**	**na**	0.31	U	UJ	0.52	0.10	0.30	U	UJ	0.51	0.10
2,4,6-Trinitrotoluene	**µg/L**	**7.82**	11		J	1.0	0.11	0.79	J	J	1.0	0.11
DNT Mixture	**µg/L**	**0.932**	0.62	U	UJ	1.52	0.27	0.60	U	UJ	1.51	0.27
2,4-Dinitrotoluene	**µg/L**	**na**	0.31	U	UJ	1.0	0.15	0.30	U	UJ	1.0	0.15
2,6-Dinitrotoluene	**µg/L**	**na**	0.31	U	UJ	0.52	0.12	0.30	U	UJ	0.51	0.12
2-Amino-4,6-dinitrotoluene	**µg/L**	**na**	4.3		J	0.52	0.12	0.25	J	J	0.51	0.12
2-Nitrotoluene	**µg/L**	**na**	0.41	U	UJ	2.1	0.21	0.40	U	UJ	2.0	0.20
4-Amino-2,6-dinitrotoluene	**µg/L**	**na**	2.7		J	0.52	0.14	0.23	J	J	0.51	0.14
RDX	**µg/L**	**6.1**	2.5		J	0.52	0.093	0.17	J	J	0.51	0.091
DNX	**µg/L**	**na**	0.10	U	UJ	0.20	0.080	0.10	U	UJ	0.20	0.080
MNX	**µg/L**	**na**	0.10	U	UJ	0.20	0.080	0.10	U	UJ	0.20	0.080
TNX	**µg/L**	**na**	0.10	U	UJ	0.20	0.080	0.10	U	UJ	0.20	0.080
Misc.												
Perchlorate	**µg/L**	**10.9**	1.2		J	0.20	0.050	0.18	J	J	0.20	0.050
Chlorate	**µg/L**	**na**	10	U	U	10		10	U	U	10	
Chlorite	**µg/L**	**na**	10	U	UJ	10		10	U	U	10	
Chloride	**mg/L**	**na**	4.3			4.0	1.1	1.6	J	J	4.0	1.1
Nitrate (as N)	**mg/L**	**na**	1.3			0.40	0.080	0.43			0.40	0.080
Sulfate	**mg/L**	**na**	27	M	J	5.0	1.3	19			5.0	1.3
Total Inorganic Carbon	**mg/L**	**na**	39			3.0	0.50	27			3.0	0.50
Total Organic Carbon	**mg/L**	**na**	6.8			3.0	0.50	0.68	J	J	3.0	0.50
MNA												
Dissolved Fe^{2+}	**mg/L**	**na**	0.04					0.02				
Dissolved Mn	**mg/L**	**na**	0.020					0.025				

Notes:
(1) Remedial Goals developed in SWMU 54 RFI/CMS Report, Final Document (URS, 2008). Exceedances denoted by bold font.
µg/L = micrograms per liter (parts per billion)
mg/L = milligrams per liter (parts per million)
MDL = Method Detection Limit
na = not applicable; remedial goal not established for analyte at SWMU 54
ND = non detect
RL = Reporting Limit
Lab Q = Lab Data Qualifiers
Val Q = Validation Data Qualifiers

Date Qualifiers:
B = Analyte detected in associated Method Blank.
J = Estimated value.
M = Matrix Spike and/or Matrix Spike Duplicate recovery outside acceptance limits.
P = Concentration of analyte differs more than 40% between primary and confirmation analysis.
U = Analyte concentration was not above the detection level.
Y = Replicate/Duplicate precision outside acceptance limits.

Figure 4-4 SWMU 54 April 2016 (15th Quarter) Groundwater Contour Map



Notes:
1. Aerial photo, dated 2005, was obtained from Montgomery County Planning, VA Planning GIS Services.
2= Monitoring Well (Removed From Network After 10th Quarter).

This page intentionally left blank

Table 6-1 Analytical Results for Groundwater Performance Monitoring at SWMU 54

Parameter	Remediation Goal (RG)	July 2011 (Q1)	October 2011 (Q2)	January 2012 (Q3)	April 2012 (Q4)	August 2012 (Q5)	November 2012 (Q6)	February 2013 (Q7)	May 2013 (Q8)	August 2013 (Q9)	November 2013 (Q10)	February 2014 (Q11)	May 2014 (Q12)	September 2015 (Q13)	January 2016 (Q14)	April 2016 (Q15)	July 2016 (Q16)
54MW1																	
2,4,6-TNT	**7.82**	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND
RDX	**6.1**	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND
DNT Mixture	**0.932**	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND
Perchlorate	**10.9**	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND
54MW2																	
2,4,6-TNT	**7.82**	2.1	0.9	2.08	2.66	ND	ND	ND	0.749	0.974	0.46	--	--	--	--	--	--
RDX	**6.1**	0.572	ND	ND	0.384	ND	ND	ND	ND	ND	0.075	--	--	--	--	--	--
DNT Mixture	**0.932**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--
Perchlorate	**10.9**	3.07	0.547	1.91	4.02	ND	0.842	1.41	1.82	1	0.26	--	--	--	--	--	--
54MW3																	
2,4,6-TNT	**7.82**	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--
RDX	**6.1**	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--
DNT Mixture	**0.932**	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--
Perchlorate	**10.9**	0.53	0.18	ND	ND	0.405	0.303	0.309	0.59	0.446	--	--	--	--	--	--	--
54MW4																	
2,4,6-TNT	**7.82**	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	--	--	--	--
RDX	**6.1**	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	--	--	--	--
DNT Mixture	**0.932**	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	--	--	--	--
Perchlorate	**10.9**	ND	ND	ND	ND	ND	0.141	ND	ND	ND	-	-	-	--	--	--	--
54MW5																	
2,4,6-TNT	**7.82**	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--
RDX	**6.1**	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--
DNT Mixture	**0.932**	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--
Perchlorate	**10.9**	0.311	0.393	0.313	0.301	0.42	0.28	0.255	0.309	0.389	--	--	--	--	--	--	--
54MW6																	
2,4,6-TNT	**7.82**	ND	ND	ND	ND	ND	Dry	ND	ND	Dry	--	--	--	--	--	--	--
RDX	**6.1**	ND	ND	ND	ND	ND	Dry	ND	ND	Dry	--	--	--	--	--	--	--
DNT Mixture	**0.932**	ND	ND	ND	ND	ND	Dry	ND	ND	Dry	--	--	--	--	--	--	--
Perchlorate	**10.9**	ND	0.127	0.159	ND	0.175	Dry	0.16	0.171	Dry	--	--	--	--	--	--	--
54MW7																	
2,4,6-TNT	**7.82**	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--
RDX	**6.1**	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--
DNT Mixture	**0.932**	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--
Perchlorate	**10.9**	0.321	ND	ND	0.365	ND	0.103	0.162	0.103	0.37	--	--	--	--	--	--	--
54MW8																	
2,4,6-TNT	**7.82**	0.928	0.433	ND	0.301	ND	ND	ND	ND	ND	--	--	--	--	--	--	--
RDX	**6.1**	0.761	0.567	0.493	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--
DNT Mixture	**0.932**	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--
Perchlorate	**10.9**	ND	0.408	0.355	0.388	0.392	0.286	0.484	0.118	0.334	--	--	--	--	--	--	--
54MW9																	
2,4,6-TNT	**7.82**	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--
RDX	**6.1**	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--
DNT Mixture	**0.932**	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--
Perchlorate	**10.9**	ND	0.229	0.262	0.217	ND	ND	1.07	0.923	0.327	--	--	--	--	--	--	--
54MW10																	
2,4,6-TNT	**7.82**	0.305	5.84	4.05	ND	**9.17**	1.59	1.88	0.637	ND	**50**	**13**	**11**	6.6	4.1	2.7	**24.2**
RDX	**6.1**	ND	3.24	2.95	ND	**7.84**	1.35	2.36	1.29	2.23	**21**	5.3	**8.7**	2.1	3.1	1.8	**6.6**
DNT Mixture	**0.932**	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.2	0.068	0.13	ND	ND	ND	ND
Perchlorate	**10.9**	ND	0.325	0.258	ND	3.74	0.344	0.832	0.835	0.365	2.3	0.42	0.44	ND	0.326	0.082	.84

Reporting Limits: Nominal reporting limits, before adjustments for dilutions, were below the regulatory criteria noted in the project QAPP.

Table 6-1 Analytical Results for Groundwater Performance Monitoring at SWMU 54 (Continued)

Parameter	Remediation Goal (RG)	July 2011 (Q1)	October 2011 (Q2)	January 2012 (Q3)	April 2012 (Q4)	August 2012 (Q5)	November 2012 (Q6)	February 2013 (Q7)	May 2013 (Q8)	August 2013 (Q9)	November 2013 (Q10)	February 2014 (Q11)	May 2014 (Q12)	September 2015 (Q13)	January 2016 (Q14)	April 2016 (Q15)	July 2016 (Q16)
54MW11																	
2,4,6-TNT	**7.82**	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--
RDX	**6.1**	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--
DNT Mixture	**0.932**	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--
Perchlorate	**10.9**	ND	ND	0.239	ND	ND	ND	0.263	0.43	0.132	--	--	--	--	--	--	--
54MW12																	
2,4,6-TNT	**7.82**	**15.9**	**16.1**	**19.4**	**48**	**10.1**	7.62	6.29	**108**	**65.9**	**17**	**29**	**10**	**11**	**110**	**11**	7.4
RDX	**6.1**	ND	**9.77**	**13.2**	**18.4**	1.95	**6.59**	3.79	**25**	**14.6**	0.54	**8.7**	2	3.9	**30**	0.62	.37
DNT Mixture	**0.932**	ND	ND	ND	0.381	ND	ND	ND	ND	ND	0.2	0.31	0.93	ND	ND	ND	ND
Perchlorate	**10.9**	ND	0.726	10.5	**22.8**	2	5.31	2.98	**22.7**	9.88	1.1	4	1.7	0.737	8.85	1.2	.56
54MW13																	
2,4,6-TNT	**7.82**	ND	4.09	0.699	0.979	**9.4**	0.843	0.318	4.91	3.81	**9.8**	2.5	5.8	5.4	1.4	0.79	**13.9**
RDX	**6.1**	ND	2.59	0.614	1.14	4.77	0.855	0.642	3.2	1.46	4	0.88	2.5	2.6	0.54	0.17	.86
DNT Mixture	**0.932**	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.11	ND	0.099	ND	ND	ND	ND
Perchlorate	**10.9**	ND	0.244	0.206	0.243	0.627	0.308	0.313	0.64	0.477	0.43	0.32	0.37	0.270	0.216	0.18	.33
54MW14																	
2,4,6-TNT	**7.82**	0.928	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--
RDX	**6.1**	0.761	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--
DNT Mixture	**0.932**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--
Perchlorate	**10.9**	ND	ND	0.215	0.181	0.214	0.24	ND	ND	0.195	0.456	--	--	--	--	--	--

Figure 5-5 SWMU 54: 54MW1 Explosives Concentrations Q1 through Q16

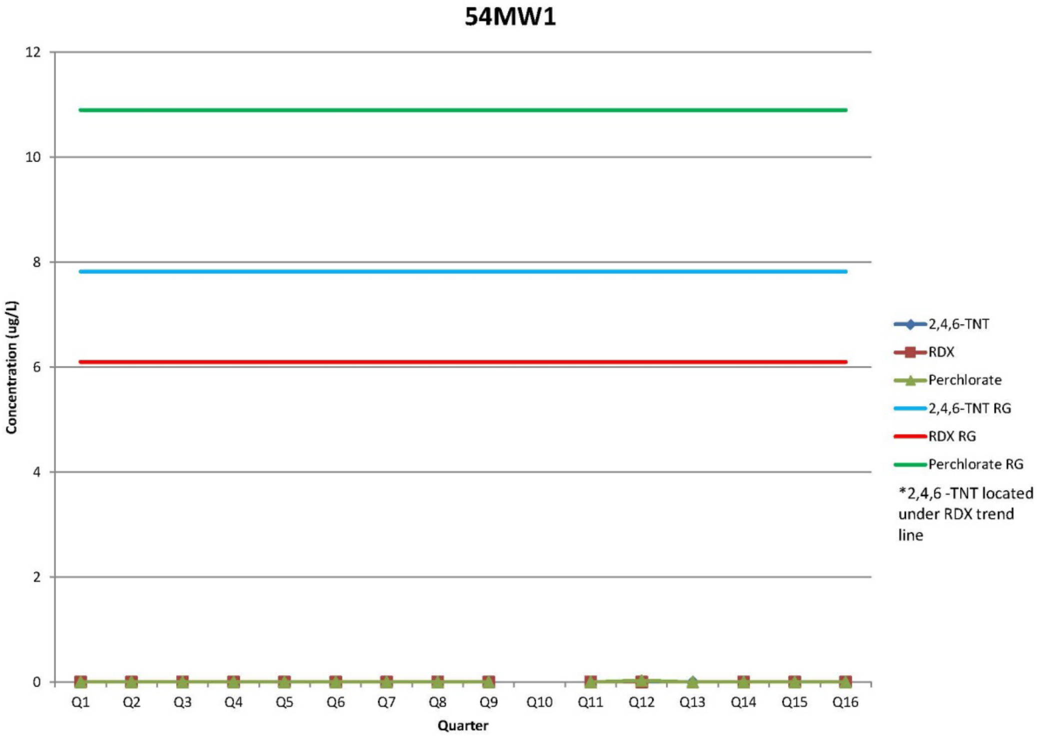


Figure 5-6 SWMU 54: 54MW10 Explosives Concentrations Q1 through Q16

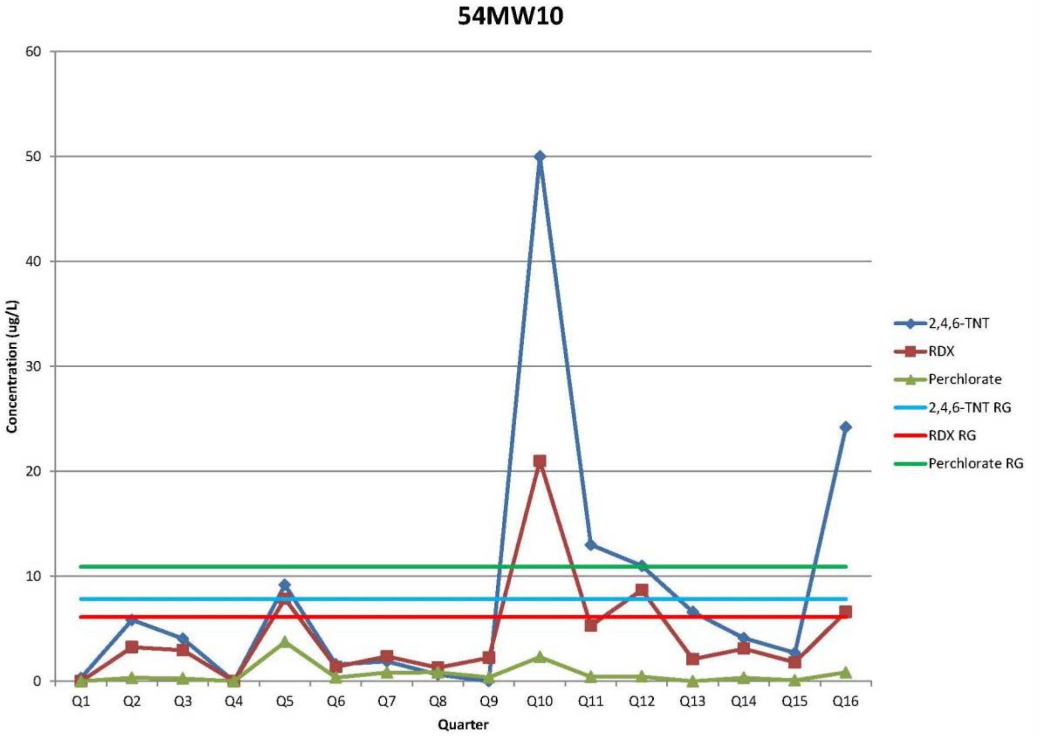


Figure 5-7 SWMU54: 54MW12 Explosives Concentrations Q1 through Q16

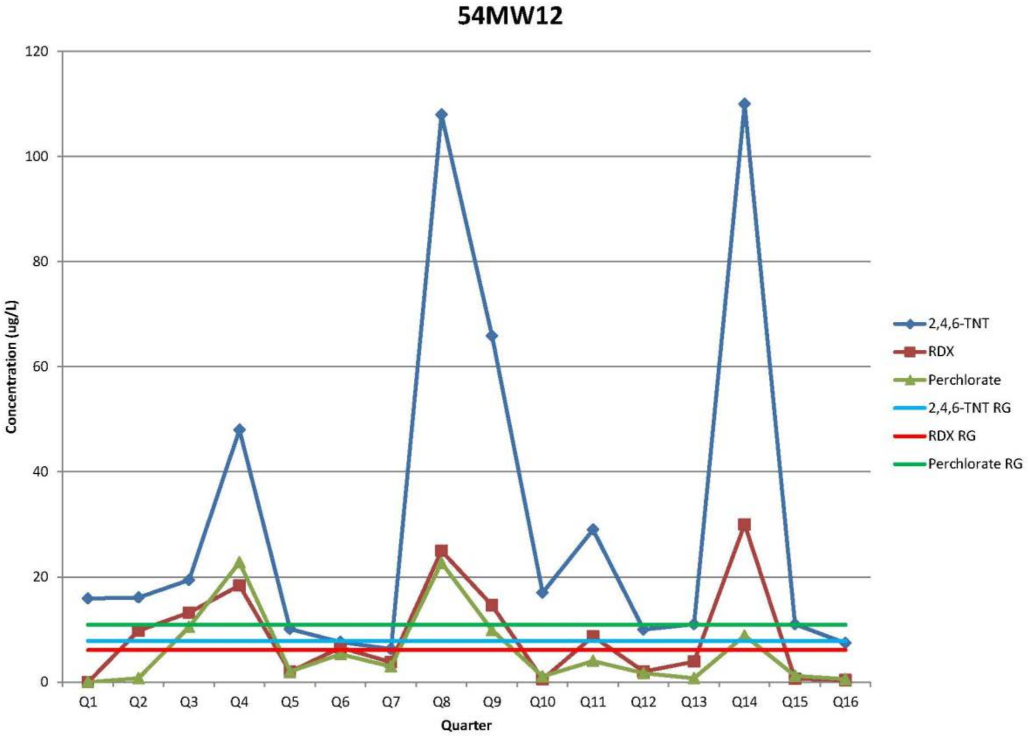


Figure 5-8 SWMU 54: 54MW13. Explosives Concentrations Q1 through Q16

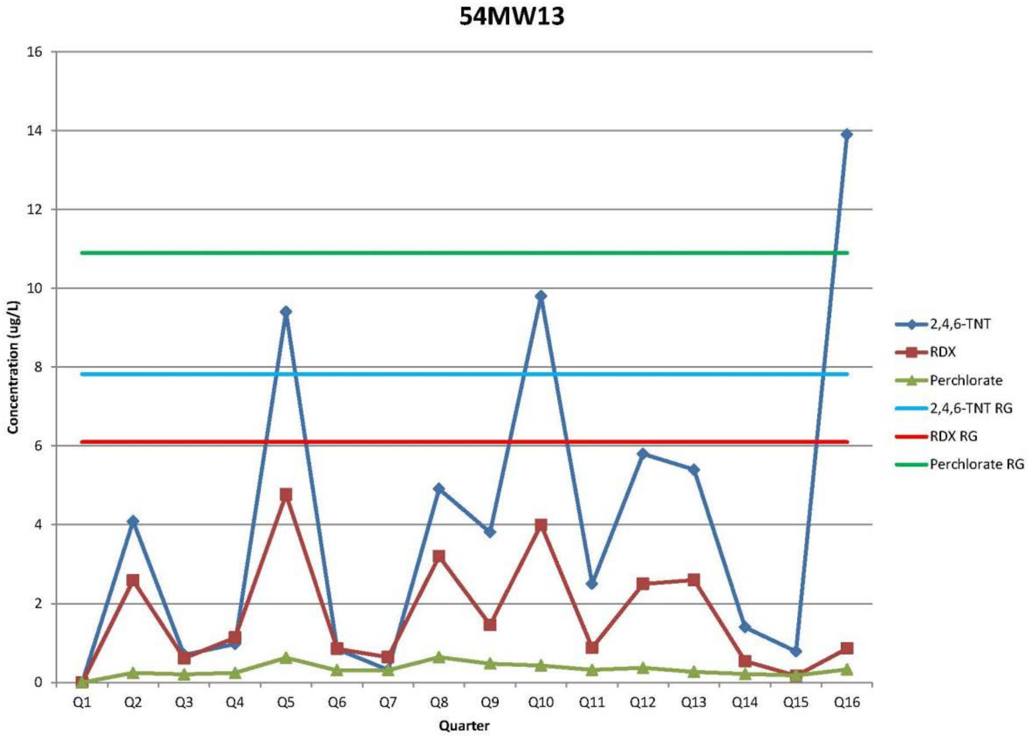


Figure 5-9 SWMU 54: 54MW1 2,4,6-TNT to Amino-DNT Correlation

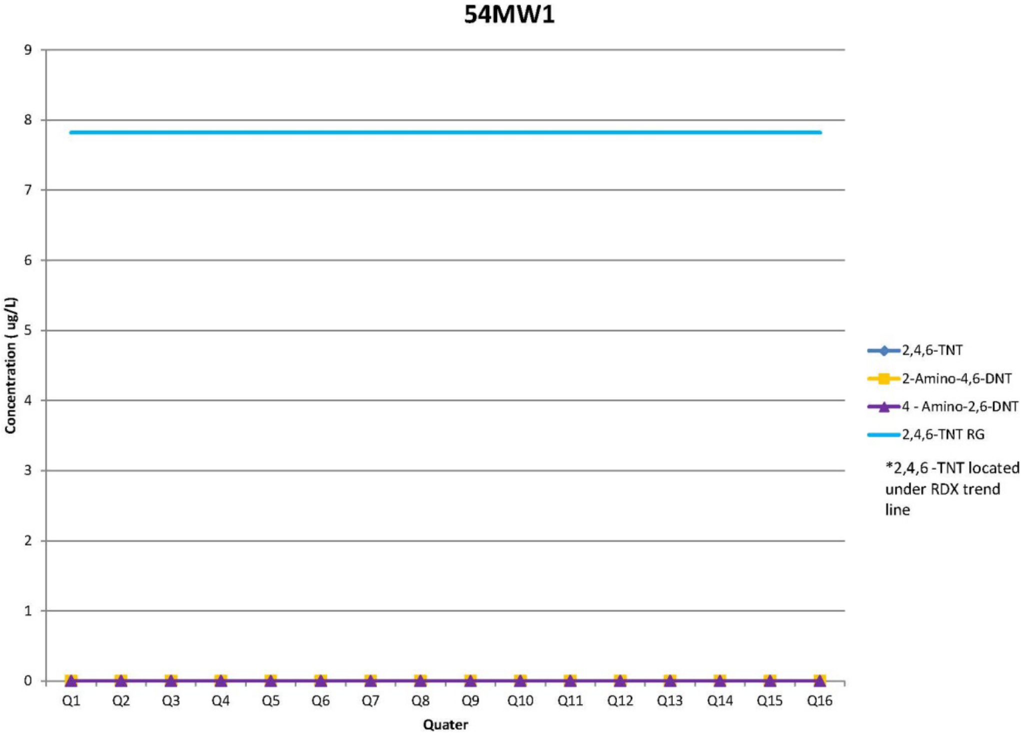


Figure 5-10 SWMU 54: 54MW10 2,4,6-TNT to Amino-DNT Correlation

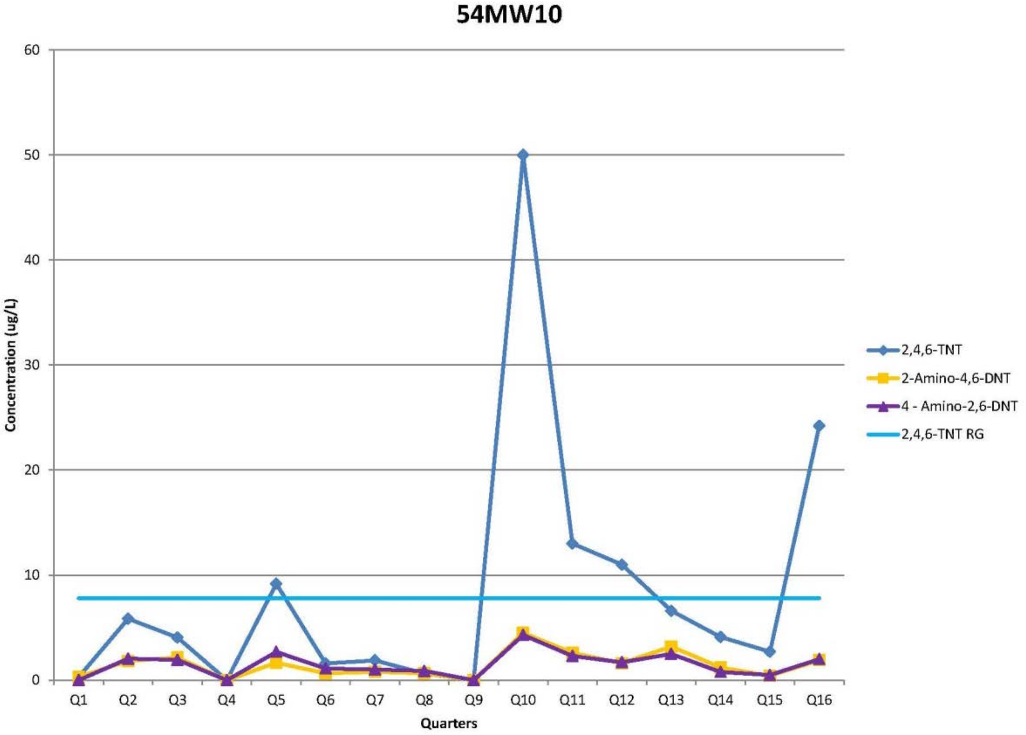


Figure 5-11 SWMU 54: 54MW12 2,4,6-TNT to Amino-DNT Correlation

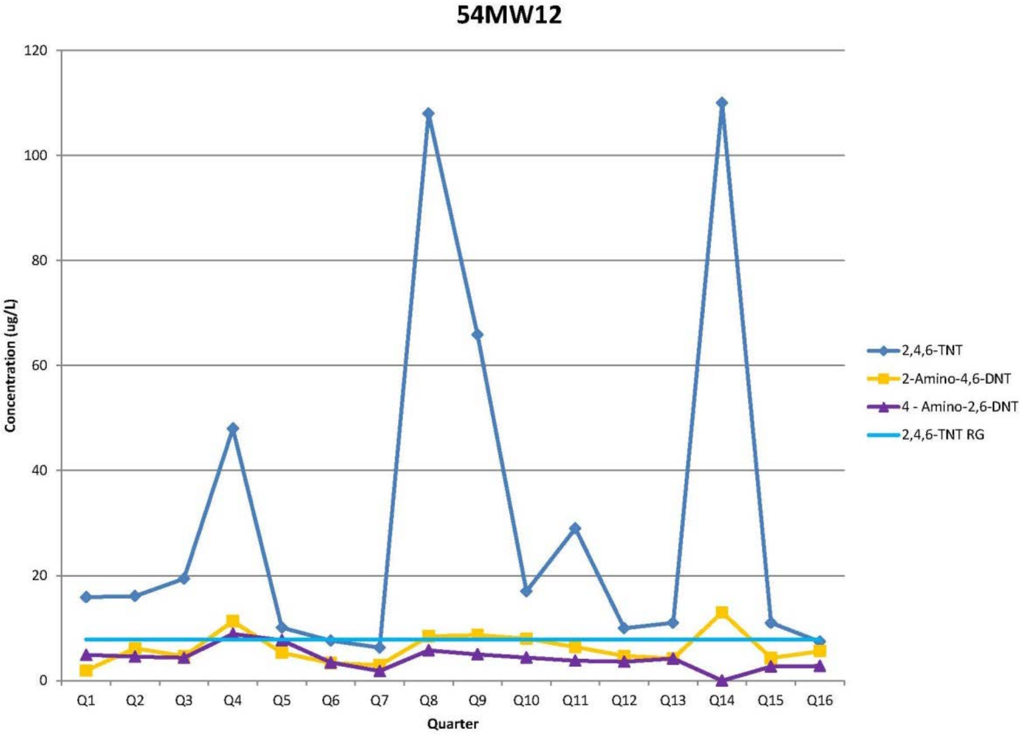
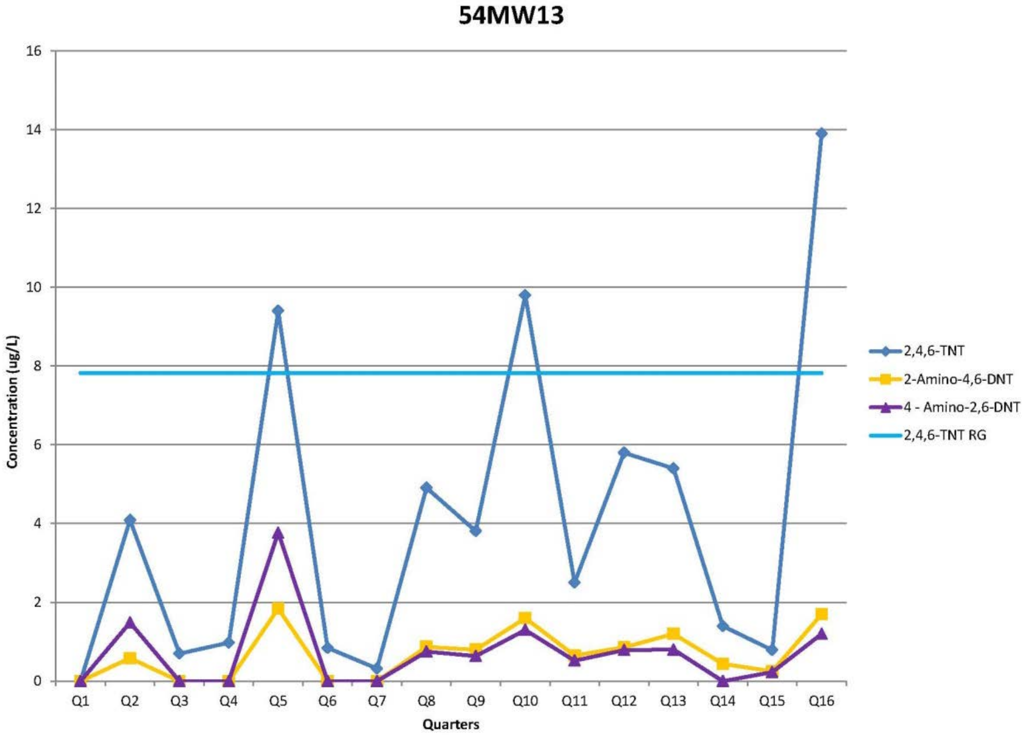


Figure 5-12 SWMU 54: 54MW13 2,4,6-TNT to Amino-DNT Correlation



54MW10

Sample Date	July-11	October-11	January-12	April-12	August-12	November-12	Feb-13	March-13	May-13	August-13	November-13	February-14	May-14	September-15	January-16	April-16	July-16
TNT concentration (µg/L)	7.82	15.9	16.1	19.4	48	10.1	7.62	6.29	108	65.9	17	29	10	11	110	11	7.4

Mann-Kendall Assessment, Normal Approximation, 90% Confidence Level

	15.9	16.1	19.4	48	10.1	7.62	6.29	108	65.9	17	29	10	11	110	11	7.4	#(-)	#(+)	#(0)
7.82	8.08	8.28	11.58	40.18	2.28	-0.2	-1.53	100.18	58.08	9.18	21.18	2.18	3.18	102.18	3.18	-0.42	3	13	0
15.9		0.2	3.5	32.1	-5.8	-8.28	-9.61	92.1	50	1.1	13.1	-5.9	-4.9	94.1	-4.9	-8.5	7	8	0
16.1			3.3	31.9	-6	-8.48	-9.81	91.9	49.8	0.9	12.9	-6.1	-5.1	93.9	-5.1	-8.7	7	7	0
19.4				28.6	-9.3	-11.78	-13.11	88.6	46.5	-2.4	9.6	-9.4	-8.4	90.6	-8.4	-12	8	5	0
48					-37.9	-40.38	-41.71	60	17.9	-31	-19	-38	-37	62	-37	-40.6	9	3	0
10.1						-2.48	-3.81	97.9	55.8	6.9	18.9	-0.1	0.9	99.9	0.9	-2.7	4	7	0
7.62							-1.33	100.38	58.28	9.38	21.38	2.38	3.38	102.38	3.38	-0.22	2	8	0
6.29								101.71	59.61	10.71	22.71	3.71	4.71	103.71	4.71	1.11	0	9	0
108									-42.1	-91	-79	-98	-97	2	-97	-100.6	7	1	0
65.9										-48.9	-36.9	-55.9	-54.9	44.1	-54.9	-58.5	6	1	0
17											12	-7	-6	93	-6	-9.6	4	2	0
29												-19	-18	81	-18	-21.6	4	1	0
10													1	100	1	-2.6	1	3	0
11														99	0	-3.6	1	1	1
110															-99	-102.6	2	0	0
11																-3.6	1	0	0
																	66	69	1

S	3
n	17
g	1
w_1	2
V(S)	588.33
z	0.08
$Z_{1-\alpha}$	1.28
α	0.1

H_o: No Trend

H_a: Decreasing Trend

Reject H_o if z< -Z(0.9)

No Trend.

H_o: No Trend

H_a: Increasing Trend

Reject H_o if z> Z(0.9)

No Trend.

RAAP-042/HWMU 5

[This Page Intentionally Left Blank]

TABLE 1
HWMU-5
GROUNDWATER ELEVATIONS - 2013
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

MONITORING WELL ID	ELEVATION TOP OF WELL	APRIL 29, 2013		OCTOBER 28, 2013	
		DTW	GW ELEV	DTW	GW ELEV
5W8B	1789.58	13.90	1775.68	14.02	1775.56
5W5B	1775.13	8.42	1766.71	9.36	1765.77
5W7B	1774.78	8.61	1766.17	9.08	1765.70
5WC21	1774.43	8.77	1765.66	9.32	1765.11
5WC22	1774.45	8.70	1765.75	9.19	1765.26
5WC23	1773.84	8.10	1765.74	8.62	1765.22
5W12A	1772.46	10.28	1762.18	11.65	1760.81
S5W5	1772.31	7.56	1764.75	8.26	1764.05
S5W7	1776.08	10.90	1765.18	11.07	1765.01
5W9A	1762.20	0.85	1761.35	2.48	1759.72
5W10A	1771.40	12.27	1759.13	14.88	1756.52
5W11A	1766.20	8.87	1757.33	13.28	1752.92
5WC11	1788.92	15.42	1773.50	15.85	1773.07
5WC12	1788.96	15.13	1773.83	15.40	1773.56
5WCA	1779.05	12.27	1766.78	13.22	1765.83
S5W6	1771.43	6.40	1765.03	7.15	1764.28
S5W8	1783.68	11.35	1772.33	10.97	1772.71

NOTES:

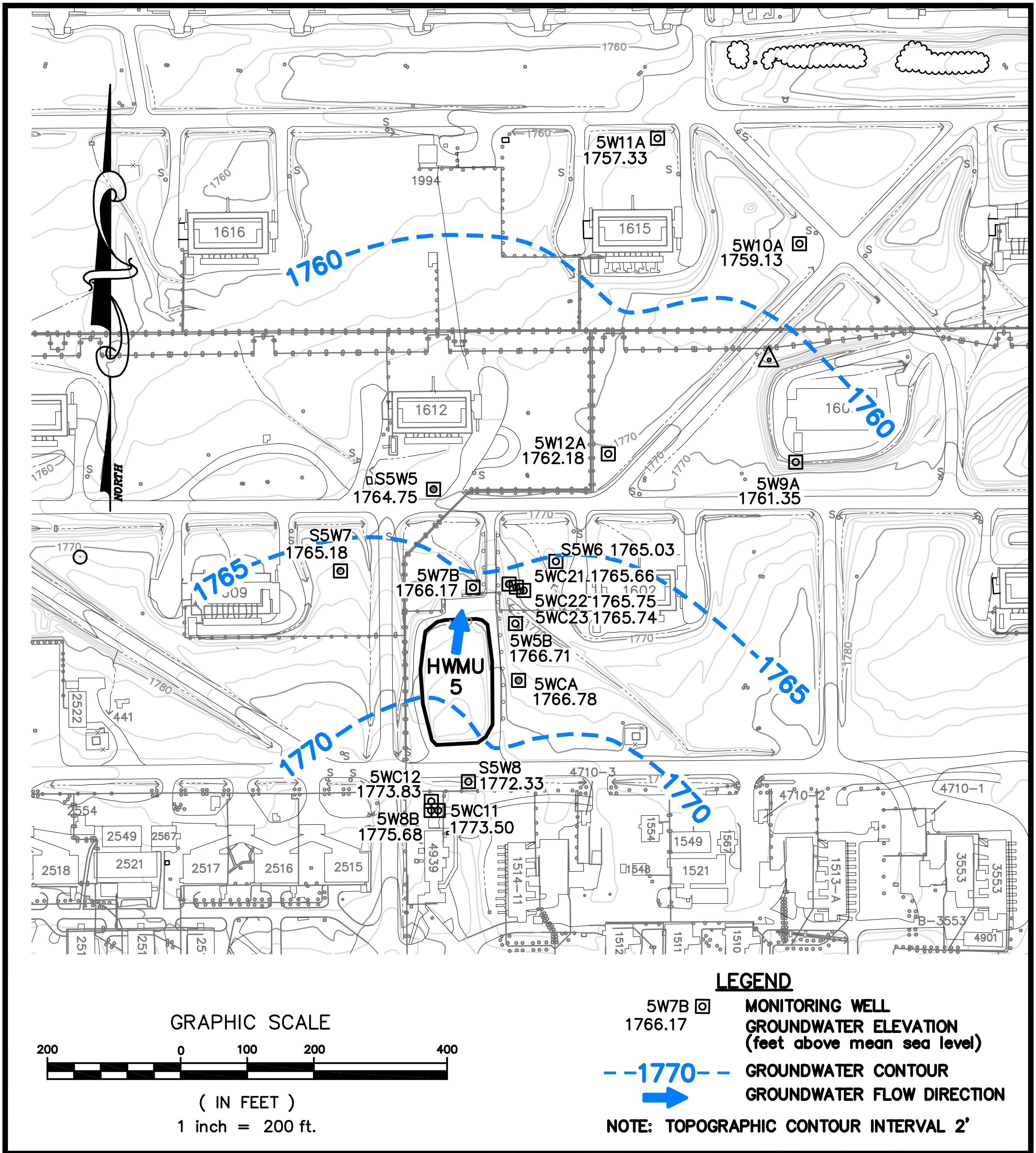
DTW: Depth to water from top of casing.

GW ELEV: Groundwater elevation.

All elevations in feet above mean sea level.

APPENDIX A-1

HWMU-5 POTENTIOMETRIC SURFACE MAPS
SECOND QUARTER 2013
FOURTH QUARTER 2013



P:\B03\200\B03204\B03204-11\CAD\B03204-11_HWMU-5.dwg Jul 25, 2013 1:15pm

HWMU-5 POTENTIOMETRIC SURFACE MAP (APRIL 29, 2013)

RADFORD ARMY AMMUNITION PLANT

RADFORD, VIRGINIA

SCALE: 1"=200'

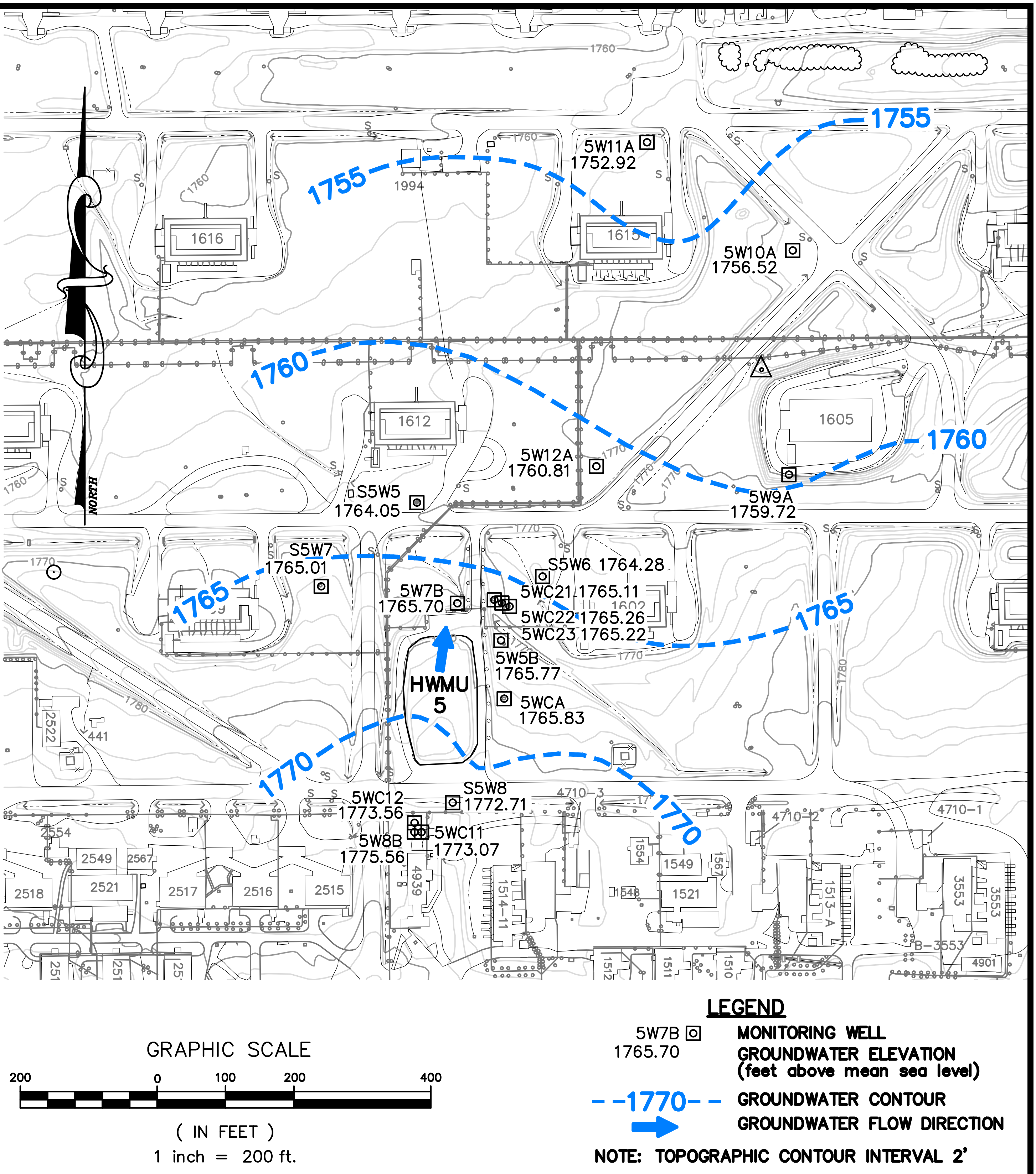
PLAN NO. B03204-11

Draper Aden Associates
Engineering ✦ Surveying ✦ Environmental Services
2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291
Richmond, VA
Charlottesville, VA
Hampton Roads, VA

DESIGNED	SN
DRAWN	DLD
CHECKED	MDL
DATE	07-22-13

FIGURE

1



HWMU-5 POTENTIOMETRIC SURFACE MAP (OCTOBER 28, 2013)

RADFORD ARMY AMMUNITION PLANT

RADFORD, VIRGINIA

SCALE: 1"=200'

PLAN NO. B03204-11

Draper Aden Associates

Engineering ✦ Surveying ✦ Environmental Services

2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291

Richmond, VA
Charlottesville, VA
Hampton Roads, VA

DESIGNED	SN
DRAWN	DLD
CHECKED	MDL
DATE	04/21/14

FIGURE

1

P:\B03\200\B03204\B03204-12P\CAD\B03204-12_HWMU-5.dwg Apr 22, 2014 11:42am

APPENDIX A-2

HWMU-5 2013 LABORATORY ANALYTICAL RESULTS
GROUNDWATER CORRECTIVE ACTION TARGETED CONSTITUENTS
GPS AND SEMIANNUAL MONITORING LIST

Summary of Semiannual Target Analyte Monitoring Results Appendix J
Corrective Action Monitoring Plan - Targeted Constituents
Hazardous Waste Management Unit 5
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 5W8B

Analyte/Quarter	5W8B Q	5W5B Q	5W7B Q	5WC21 Q	5WC22 Q	5WC23 Q	5W12A Q	QL	Permit QL	GPS	DL	Permit DL	UNIT	Method
Cobalt						*CAS #* 7440-48-4								
Second Quarter 2013	U	U	2.94 J	70.3	4.52 J	2.38 J	U	5	5	7	1	1	UG/L	6020A
Fourth Quarter 2013	1.01 J	U	2.23 J	90.5	6.87	2.13 J	U	5	5	7	1	1	ug/l	6020A
1,1-Dichloroethene						*CAS #* 75-35-4								
Second Quarter 2013	U	U	U	U	U	U	U	1	1	7	0.4	0.44	ug/l	8260C
Fourth Quarter 2013	U	U	U	U	U	U	U	1	1	7	0.4	0.44	ug/l	8260C
cis-1,2-Dichloroethene						*CAS #* 156-59-2								
Second Quarter 2013	U	U	U	U	U	U	U	1	1	70	0.1	0.1	ug/l	8260C
Fourth Quarter 2013	U	U	U	U	U	U	U	1	1	70	0.1	0.1	ug/l	8260C
trans-1,2-Dichloroethene						*CAS #* 156-60-5								
Second Quarter 2013	U	U	U	U	U	U	U	1	1	100	0.8	0.8	ug/l	8260C
Fourth Quarter 2013	U	U	U	U	U	U	U	1	1	100	0.8	0.8	ug/l	8260C
Trichloroethene						*CAS #* 79-01-6								
Second Quarter 2013	U	0.5 J	U	6.8	3.2	5.0	U	1	1	5	0.2	0.177	ug/l	8260C
Fourth Quarter 2013	U	0.5 J	U	5.9	3.7	3.7	U	1	1	5	0.2	0.177	ug/l	8260C
Vinyl chloride						*CAS #* 75-01-4								
Second Quarter 2013	U J	U J	U J	U J	U J	U J	U J	1	1	2	0.1	0.1	ug/l	8260C
Fourth Quarter 2013	U	U	U	U	U	U	U	1	1	2	0.1	0.1	ug/l	8260C

See last page of this report for definitions.

Summary of Semiannual Target Analyte Monitoring Results Appendix J
Corrective Action Monitoring Plan - Targeted Constituents
Hazardous Waste Management Unit 5
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 5W8B

Analyte/Quarter	*5W8B Q*	*5W5B Q*	*5W7B Q*	*5WC21 Q*	*5WC22 Q*	*5WC23 Q*	*5W12A Q*	*QL*	*Permit QL*	*GPS*	*DL*	*Permit DL*	*UNIT*	*Method*

Definitions:

Results are reported to the permit detection limit.

QL Denotes laboratory quantitation limit.
Permit QL Denotes permit quantitation limit.
DL Denotes laboratory detection limit.
Permit DL Denotes permit detection limit.
U denotes not detected at or above the permit detection limit or QL.
UA denotes not detected at or above the adjusted detection limit or adjusted QL.
J Denotes result is estimated. When used with "U" (i.e., "UJ"), denotes analyte not detected at or above the detection limit or QL and detection limit and QL are estimated. When used with "UA" (i.e., "UAJ"), denotes analyte not detected at or above adjusted detection limit and adjusted detection limit and QL are estimated.
UN Denotes analyte concentration is less than the QL and/or five times the blank concentration. Not reliably detected due to blank contamination.
R Denotes result rejected.
Q Denotes data validation qualifier. **X** Denotes mass spectral confirmation not obtained-result suspect.

CAS# Denotes Chemical Abstract Services registration number.
GPS Denotes Groundwater Protection Standards listed in Appendix J of Module VI-Groundwater Corrective Action & Monitoring Program for Unit 5 (approved by the VDEQ in the Final Class 3 Hazardous Waste Permit Modification dated November 5, 2009 and modified Sept 27, 2011) which was incorporated into the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002). The first Corrective Action Monitoring Event occurred Second Quarter 2010.
"–" denotes not sampled.

Comprehensive Data Validation Report

Sample/Blind Field Duplicate Results Greater Than the Quantitation Limit

Facility: HWMU-5 Monitoring Event: Fourth Quarter 2013

Analyte	Sample ID	Laboratory Result (ug/L)	Q	Validated Result (ug/L)	Q	QL (ug/L)	Validation Notes
Method: 6020A							
Laboratory: CompuChem, a Division of Liberty Analytical, Cary, NC							
Cobalt	5WC21	90.5		90.5		5	No action taken.
	5WDUP	86.3		86.3		5	No action taken. Field duplicate of 5WC21. RPD 4.8.
Method: 8260C							
Laboratory: Eurofins Lancaster Labortories Environmental, Lancaster, PA							
Trichloroethene	5WC21	5.9		5.9		1	No action taken.
	5WDUP	5.8		5.8		1	No action taken. Field duplicate of 5WC21. RPD 1.7.

Definitions:

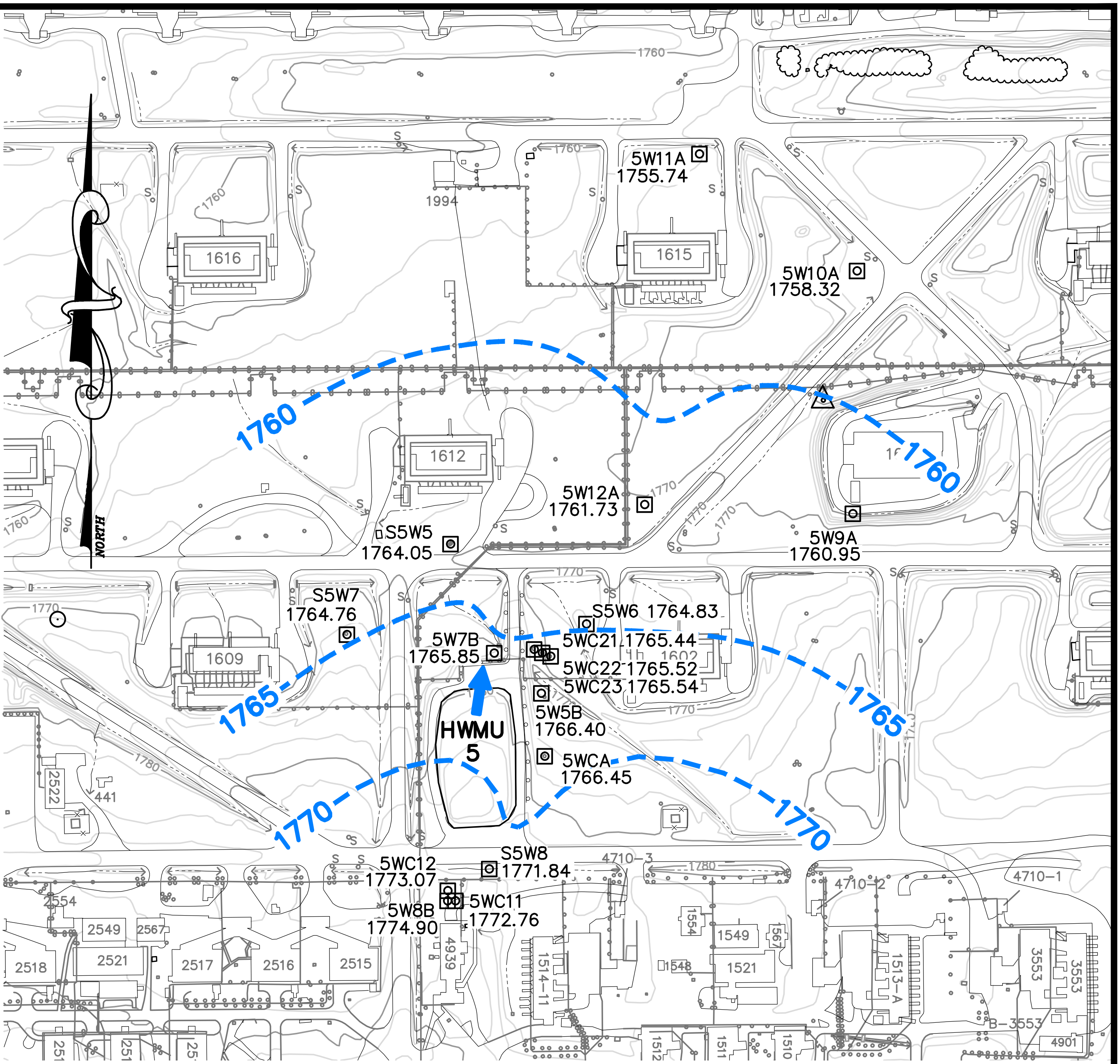
Data Validation Qualifiers:

QL Denotes permit quantitation limit. **Q** Denotes data qualifier.

J Denotes analyte reported at or above quantitation limit and associated result is estimated.

APPENDIX A-1

HWMU-5 POTENTIOMETRIC SURFACE MAPS
SECOND QUARTER 2014
FOURTH QUARTER 2014



GRAPHIC SCALE

200 0 100 200 400

(IN FEET)

1 inch = 200 ft.

LEGEND

5W7B ⊡ 1765.85	MONITORING WELL GROUNDWATER ELEVATION (feet above mean sea level)
- -1770- -	GROUNDWATER CONTOUR
➡	GROUNDWATER FLOW DIRECTION

NOTE: TOPOGRAPHIC CONTOUR INTERVAL 2'

HWMU-5 POTENTIOMETRIC SURFACE MAP (APRIL 21, 2014)

RADFORD ARMY AMMUNITION PLANT

RADFORD, VIRGINIA

SCALE: 1"=200'

PLAN NO. B03204-12

Draper Aden Associates

Engineering ✦ Surveying ✦ Environmental Services

2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291

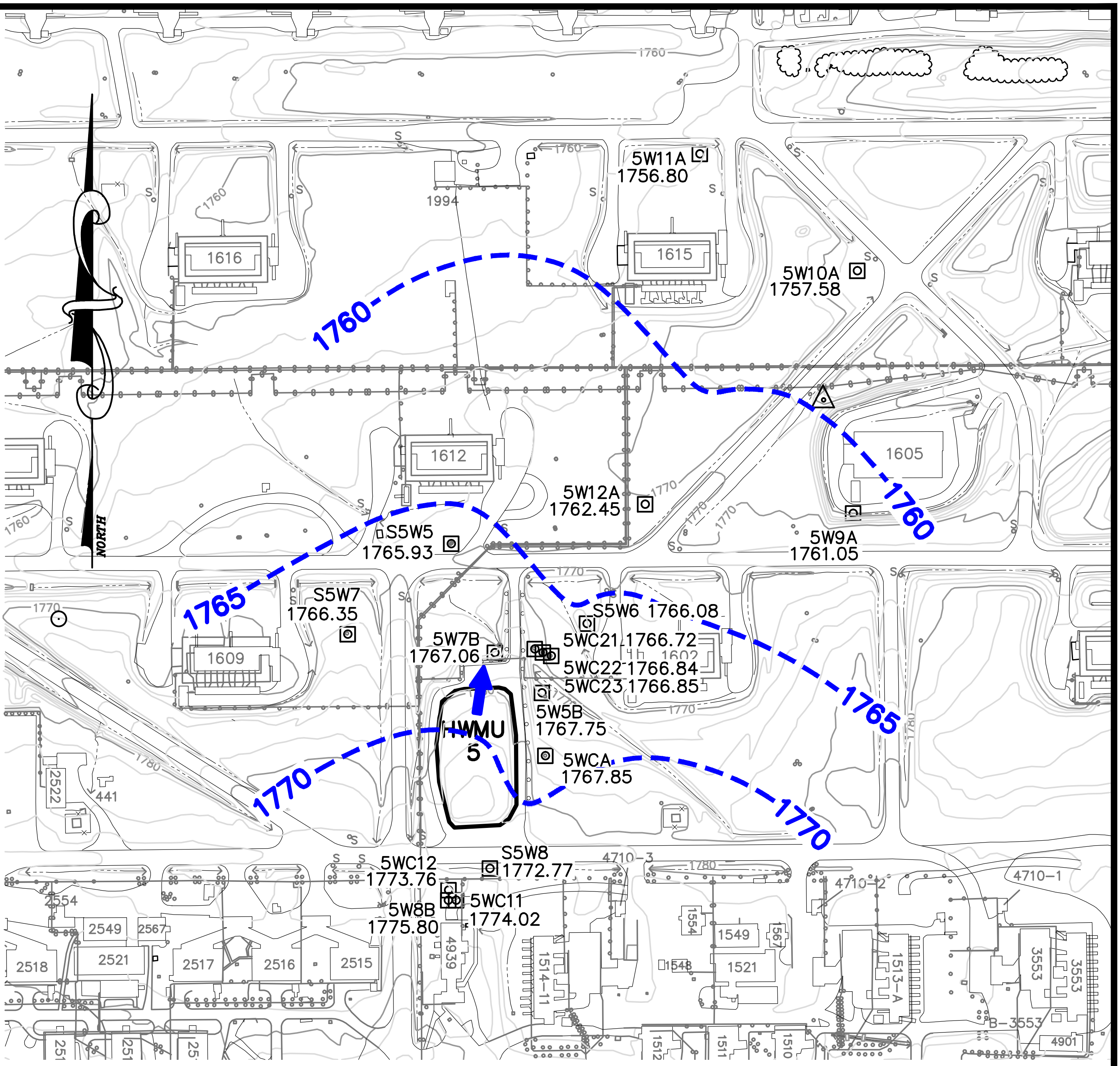
Richmond, VA
Charlottesville, VA
Hampton Roads, VA

DESIGNED	SN
DRAWN	DLD
CHECKED	MDL
DATE	06/06/2014

FIGURE

1

P:\B03\200\B03204\B03204-12\CAD\B03204-12_HWMU-5.dwg Jun 06, 2014 10:29am



GRAPHIC SCALE

200 0 100 200 400

(IN FEET)

1 inch = 200 ft.

LEGEND

5W7B ⊡ 1767.06	**MONITORING WELL** **GROUNDWATER ELEVATION** **(feet above mean sea level)**
- -1770- - -	**GROUNDWATER CONTOUR**
➡	**GROUNDWATER FLOW DIRECTION**

NOTE: TOPOGRAPHIC CONTOUR INTERVAL 2'

HWMU-5 POTENTIOMETRIC SURFACE MAP (OCTOBER 14, 2014)

RADFORD ARMY AMMUNITION PLANT

RADFORD, VIRGINIA

SCALE: 1"=200'

PLAN NO. B03204-12

Draper Aden Associates

Engineering • Surveying • Environmental Services

2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291

Richmond, VA
Charlottesville, VA
Hampton Roads, VA
Coats, NC

DESIGNED SN
DRAWN DLD
CHECKED MDL
DATE 02/11/15

FIGURE

1

P:\B03\200\B03204\B03204-12\CAD\B03204-12_HWMU-5 OCT 2014.dwg Feb 12, 2015 8:29am

APPENDIX A-2

HWMU-5 2014 LABORATORY ANALYTICAL RESULTS
GROUNDWATER CORRECTIVE ACTION TARGETED CONSTITUENTS
GPS AND SEMIANNUAL MONITORING LIST

Summary of Semiannual Target Analyte Monitoring Results Appendix J
Corrective Action Monitoring Plan - Targeted Constituents
Hazardous Waste Management Unit 5
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 5W8B

Analyte/Quarter	*5W8B Q*	*5W5B Q*	*5W7B Q*	*5WC21 Q*	*5WC22 Q*	*5WC23 Q*	*5W12A Q*	*QL*	*Permit QL*	*GPS*	*DL*	*Permit DL*	*UNIT*	*Method*
Cobalt						*CAS #* 7440-48-4								
Fourth Quarter 2014	U	U	3.18 J	63	4.26 J	2 J	U	5	5	7	1	1	ug/l	6020A
1,1-Dichloroethene						*CAS #* 75-35-4								
Fourth Quarter 2014	U	U	U	U	U	U	U	0.5	1	7	0.1	0.44	ug/l	8260C
cis-1,2-Dichloroethene						*CAS #* 156-59-2								
Fourth Quarter 2014	U	U	U	U	U	U	U	0.5	1	70	0.1	0.1	ug/l	8260C
trans-1,2-Dichloroethene						*CAS #* 156-60-5								
Fourth Quarter 2014	U	U	U	U	U	U	U	0.5	1	100	0.1	0.8	ug/l	8260C
Trichloroethene						*CAS #* 79-01-6								
Fourth Quarter 2014	U	U	U	3.9	4.2	5.2	U	0.5	1	5	0.1	0.177	ug/l	8260C
Vinyl chloride						*CAS #* 75-01-4								
Fourth Quarter 2014	U	U	U	U	U	U	U	0.5	1	2	0.1	0.1	ug/l	8260C

Summary of Semiannual Target Analyte Monitoring Results Appendix J
Corrective Action Monitoring Plan - Targeted Constituents
Hazardous Waste Management Unit 5
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 5W8B

Analyte/Quarter	*5W8B Q*	*5W5B Q*	*5W7B Q*	*5WC21 Q*	*5WC22 Q*	*5WC23 Q*	*5W12A Q*	*QL*	*Permit QL*	*GPS*	*DL*	*Permit DL*	*UNIT*	*Method*

Definitions:

Results are reported to the permit detection limit.

QL Denotes laboratory quantitation limit.
Permit QL Denotes permit quantitation limit.
DL Denotes laboratory detection limit.
Permit DL Denotes permit detection limit.
U denotes not detected at or above the permit detection limit or QL.
UA denotes not detected at or above the adjusted detection limit or adjusted QL.
J Denotes result is estimated. When used with "U" (i.e., "UJ"), denotes analyte not detected at or above the detection limit or QL and detection limit and QL are estimated. When used with "UA" (i.e., "UAJ"), denotes analyte not detected at or above adjusted detection limit and adjusted detection limit and QL are estimated.
UN Denotes analyte concentration is less than the QL and/or five times the blank concentration. Not reliably detected due to blank contamination.
R Denotes result rejected.
Q Denotes data validation qualifier. **X** Denotes mass spectral confirmation not obtained-result suspect.

CAS# Denotes Chemical Abstract Services registration number.
GPS Denotes Groundwater Protection Standards (2014) listed in Appendix J of Module VI-Groundwater Corrective Action & Monitoring Program for Unit 5 (approved by the VDEQ in the Final Class 3 Hazardous Waste Permit Modification dated November 5, 2009 and modified Sept 27, 2011) which was incorporated into the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002). The first Corrective Action Monitoring Event occurred Second Quarter 2010.
"–" denotes not sampled.

APPENDIX A-3

HWMU-5 2014 LABORATORY ANALYTICAL RESULTS GROUNDWATER CORRECTIVE ACTION ANNUAL MONITORING LIST

Summary of Annual Target Analyte Monitoring Results - Appendix K
Corrective Action Monitoring Plan - Targeted Constituents
Hazardous Waste Management Unit 5
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 5W8B

Analyte/Quarter	*5W8B*	*Q*	*5W5B*	*Q*	*5W7B*	*Q*	*5WC21*	*Q*	*5WC22*	*Q*	*5WC23*	*Q*	*QL*	*Permit QL*	*GPS*	*DL*	*Permit DL*	*UNIT*	*Method*
Antimony											*CAS #* 7440-36-0								
Second Quarter 2014	-		U		U		U		U		U		2	1	6	0.4	0.4	ug/l	6020A
Arsenic											*CAS #* 7440-38-2								
Second Quarter 2014	-		U		U		U		U		U		10	10	10	2	2	ug/l	6020A
Barium											*CAS #* 7440-39-3								
Second Quarter 2014	-		27		32.7		12.7		31.6		24		10	10	2,000	1	1	ug/l	6020A
Beryllium											*CAS #* 7440-41-7								
Second Quarter 2014	-		U		U		0.997	J	U		U		1	1	4	0.2	0.2	ug/l	6020A
Cadmium											*CAS #* 7440-43-9								
Second Quarter 2014	-		U		U		0.514	J	0.289	J	U		1	1	5	0.2	0.2	ug/l	6020A
Chromium											*CAS #* 7440-47-3								
Second Quarter 2014	-		U		U		4.74	J	U		U		5	5	100	1	1	ug/l	6020A
Cobalt											*CAS #* 7440-48-4								
Second Quarter 2014	U		U		2.23	J	62.3		13.9		2.97	J	5	5	7	1	1	ug/l	6020A
Copper											*CAS #* 7440-50-8								
Second Quarter 2014	-		U		1.33	J	3.77	J	U		U		5	5	1,300	1	1	ug/l	6020A
Lead											*CAS #* 7439-92-1								
Second Quarter 2014	-		U		0.63	J	0.279	J	U		U		1	1	15	0.2	0.2	ug/l	6020A
Mercury											*CAS #* 7439-97-6								
Second Quarter 2014	-		U		U		U		U		U		2	2	2	0.2	0.2	ug/l	7470A
Nickel											*CAS #* 7440-02-0								
Second Quarter 2014	-		U		U		30.9		7.71	J	5.65	J	10	10	313	2	2	ug/l	6020A
Selenium											*CAS #* 7782-49-2								
Second Quarter 2014	-		U		U		U		U		U		10	10	50	3	3	ug/l	6020A
Silver											*CAS #* 7440-22-4								
Second Quarter 2014	-		U		U		U		U		U		2	2	78.25	0.2	0.2	ug/l	6020A
Thallium											*CAS #* 7440-28-0								
Second Quarter 2014	-		U		U		U		U		U		1	1	2	0.2	0.2	ug/l	6020A
Vanadium											*CAS #* 7440-62-2								
Second Quarter 2014	-		U		U		1.89	J	U		U		10	10	109.55	1	1	ug/l	6020A

See last page of this report for definitions.

Summary of Annual Target Analyte Monitoring Results - Appendix K
Corrective Action Monitoring Plan - Targeted Constituents

Hazardous Waste Management Unit 5
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 5W8B

Analyte/Quarter	*5W8B*	*Q*	*5W5B*	*Q*	*5W7B*	*Q*	*5WC21*	*Q*	*5WC22*	*Q*	*5WC23*	*Q*	*QL*	*Permit QL*	*GPS*	*DL*	*Permit DL*	*UNIT*	*Method*
Zinc											*CAS #* 7440-66-6								
Second Quarter 2014	-		U		5.37	J	36.6	J	U		U		10	10	4,695	3	3	ug/l	6020A
Acetone											*CAS #* 67-64-1								
Second Quarter 2014	-		U		U		U		U		U		10	10	8,750.2	3	3	ug/l	8260C
bis(2-Ethylhexyl)phthalate											*CAS #* 117-81-7								
Second Quarter 2014	-		U		U		U		U		U		5	6	10	0.57	1.5	ug/l	8270D
2-Butanone											*CAS #* 78-93-3								
Second Quarter 2014	-		U		U		U		U		U		10	10	2,667.6	1	1	ug/l	8260C
Chloroform											*CAS #* 67-66-3								
Second Quarter 2014	-		1.1	J	19	J	0.6	J	0.7	J	0.9	J	1	1	80	0.1	0.1	ug/l	8260C
Dichlorodifluoromethane											*CAS #* 75-71-8								
Second Quarter 2014	-		U		U		U		U		U		1	1	142.27	0.3	0.28	ug/l	8260C
1,2-Dichloroethane											*CAS #* 107-06-2								
Second Quarter 2014	-		U		U		U		U		U		1	1	5	0.1	0.147	ug/l	8260C
Diethyl ether											*CAS #* 60-29-7								
Second Quarter 2014	-		U		U		2.5	J	4.5	J	16		12	12	7,300	0.4	0.39	ug/l	8260C
Diethyl phthalate											*CAS #* 84-66-2								
Second Quarter 2014	-		U		U		U		U		U		5	10	12,520	0.52	0.5	ug/l	8270D
2,4-Dinitrotoluene											*CAS #* 121-14-2								
Second Quarter 2014	-		U		U		U		U		U		5	10	31.3	0.84	0.6	ug/l	8270D
2,6-Dinitrotoluene											*CAS #* 606-20-2								
Second Quarter 2014	-		U		U		U		U		U		5	10	15.65	0.75	0.7	ug/l	8270D
Methylene chloride											*CAS #* 75-09-2								
Second Quarter 2014	-		U		U		U		U		U		1	1	5	0.2	0.182	ug/l	8260C
o-Nitroaniline											*CAS #* 88-74-4								
Second Quarter 2014	-		U		U		U		U		1.8	J	10	10	110	1.5	0.7	ug/l	8270D
p-Nitroaniline											*CAS #* 100-01-6								
Second Quarter 2014	-		U		U		U		U		U		10	20	20	2.7	1.3	ug/l	8270D
Nitrobenzene											*CAS #* 98-95-3								
Second Quarter 2014	-		U		U		U		U		U		5	10	10	1.3	0.8	ug/l	8270D

Summary of Annual Target Analyte Monitoring Results - Appendix K
Corrective Action Monitoring Plan - Targeted Constituents

Hazardous Waste Management Unit 5
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 5W8B

Analyte/Quarter	*5W8B Q*	*5W5B Q*	*5W7B Q*	*5WC21 Q*	*5WC22 Q*	*5WC23 Q*	*QL*	*Permit QL*	*GPS*	*DL*	*Permit DL*	*UNIT*	*Method*
Toluene						*CAS #* 108-88-3							
Second Quarter 2014	-	U	U	U	U	U	1	1	1,000	0.1	0.1	ug/l	8260C
Xylenes (Total)						*CAS #* 1330-20-7							
Second Quarter 2014	-	U	U	U	U	U	3	3	10,000	0.2	0.208	ug/l	8260C

Definitions:

Results are reported to the Permit Detection Limit.
First Corrective Action Monitoring Event Second Quarter 2010:

QL: Denotes laboratory quantitation limit.
Permit QL: Denotes permit quantitation limit.
DL: Denotes laboratory detection limit.
Permit DL: Denotes permit detection limit.
U: Denotes not detected at or above the permit detection limit or QL.
UA: Denotes not detected at or above the adjusted detection limit or adjusted QL.
J: Denotes result is estimated. When used with "U" (i.e., "UJ"), denotes analyte not detected at or above the detection limit or QL and detection limit and QL are estimated. When used with "UA" (i.e., "UAJ"), denotes analyte not detected at or above adjusted detection limit and adjusted detection limit and QL are estimated.
UN: Denotes analyte concentration is less than the QL and/or five times the blank concentration. Not reliably detected due to blank contamination.
R: Denotes result rejected.
Q: Denotes data validation qualifier.
X: Denotes mass spectral confirmation not obtained - result suspect.

CAS#: Denotes Chemical Abstract Services registration number.
GPS: Denotes Groundwater Protection Standards listed in Appendix K of Module VI-Groundwater Corrective Action & Monitoring Program for Unit 5 (approved by the VDEQ in the Final Class 3 Hazardous Waste Permit Modification dated November 5, 2009) which was incorporated into the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002).
"–": Denotes not sampled.

TABLE 1
HWMU-5
GROUNDWATER ELEVATIONS - 2014
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

MONITORING WELL ID	ELEVATION TOP OF WELL	APRIL 21, 2014		OCTOBER 14, 2014	
		DTW	GW ELEV	DTW	GW ELEV
5W8B	1789.58	14.68	1774.90	13.78	1775.80
5W5B	1775.13	8.73	1766.40	7.38	1767.75
5W7B	1774.78	8.93	1765.85	7.72	1767.06
5WC21	1774.43	8.99	1765.44	7.71	1766.72
5WC22	1774.45	8.93	1765.52	7.61	1766.84
5WC23	1773.84	8.30	1765.54	6.99	1766.85
5W12A	1772.46	10.73	1761.73	10.01	1762.45
S5W5	1772.31	8.26	1764.05	6.38	1765.93
S5W7	1776.08	11.32	1764.76	9.73	1766.35
5W9A	1762.20	1.25	1760.95	1.15	1761.05
5W10A	1771.40	13.08	1758.32	13.82	1757.58
5W11A	1766.20	10.46	1755.74	9.40	1756.80
5WC11	1788.92	16.16	1772.76	14.90	1774.02
5WC12	1788.96	15.89	1773.07	15.20	1773.76
5WCA	1779.05	12.60	1766.45	11.20	1767.85
S5W6	1771.43	6.60	1764.83	5.35	1766.08
S5W8	1783.68	11.84	1771.84	10.91	1772.77

NOTES:

DTW: Depth to water from top of casing.

GW ELEV: Groundwater elevation.

All elevations in feet above mean sea level.

TABLE 1
HWMU-5
GROUNDWATER ELEVATIONS - 2015
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

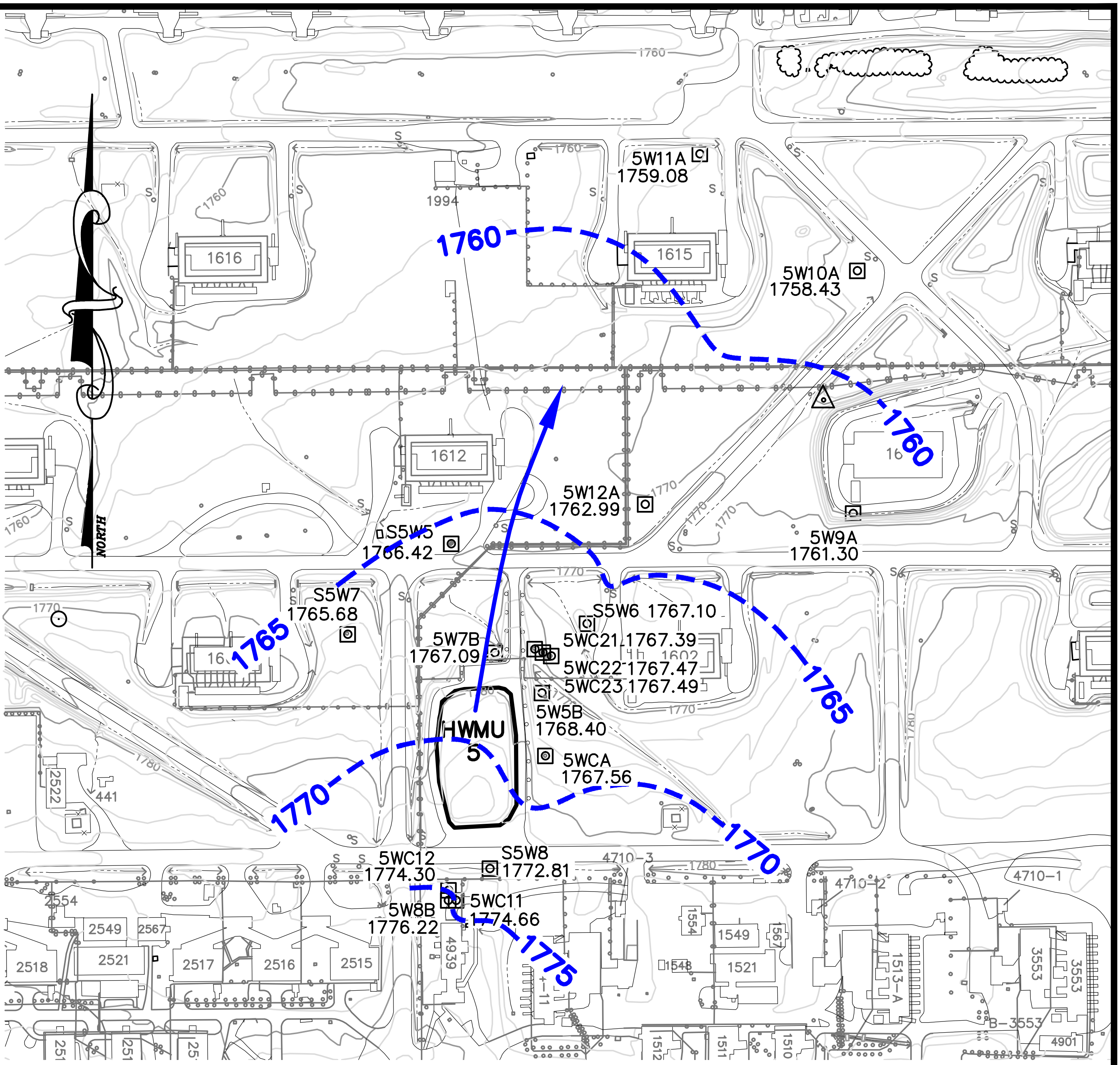
MONITORING WELL ID	ELEVATION TOP OF WELL	APRIL 20, 2015		OCTOBER 19, 2015	
		DTW	GW ELEV	DTW	GW ELEV
5W8B	1789.58	13.36	1776.22	14.99	1774.59
5W5B	1775.13	6.73	1768.40	9.14	1765.99
5W7B	1774.78	7.69	1767.09	9.20	1765.58
5WC21	1774.43	7.04	1767.39	9.31	1765.12
5WC22	1774.45	6.98	1767.47	9.27	1765.18
5WC23	1773.84	6.35	1767.49	8.66	1765.18
5W12A	1772.46	9.47	1762.99	11.96	1760.50
S5W5	1772.31	5.89	1766.42	8.28	1764.03
S5W7	1776.08	10.40	1765.68	12.10	1763.98
5W9A	1762.20	0.90	1761.30	2.01	1760.19
5W10A	1771.40	12.97	1758.43	13.91	1757.49
5W11A	1766.20	7.12	1759.08	11.27	1754.93
5WC11	1788.92	14.26	1774.66	16.01	1772.91
5WC12	1788.96	14.66	1774.30	16.37	1772.59
5WCA	1779.05	11.49	1767.56	12.88	1766.17
S5W6	1771.43	4.33	1767.10	7.04	1764.39
S5W8	1783.68	10.87	1772.81	12.02	1771.66

NOTES:

DTW: Depth to water from top of casing.

GW ELEV: Groundwater elevation.

All elevations in feet above mean sea level.



GRAPHIC SCALE

200 0 100 200 400

(IN FEET)

1 inch = 200 ft.

LEGEND

5W7B ⊡ 1767.09	**MONITORING WELL** **GROUNDWATER ELEVATION** **(feet above mean sea level)**
- -1770- -	**GROUNDWATER CONTOUR**
➡	**GROUNDWATER FLOW DIRECTION**

NOTE: TOPOGRAPHIC CONTOUR INTERVAL 2'

HWMU-5 POTENTIOMETRIC SURFACE MAP (APRIL 20, 2015)
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

SCALE: 1"=200'

PLAN NO. B03204-13

Draper Aden Associates
Engineering • Surveying • Environmental Services

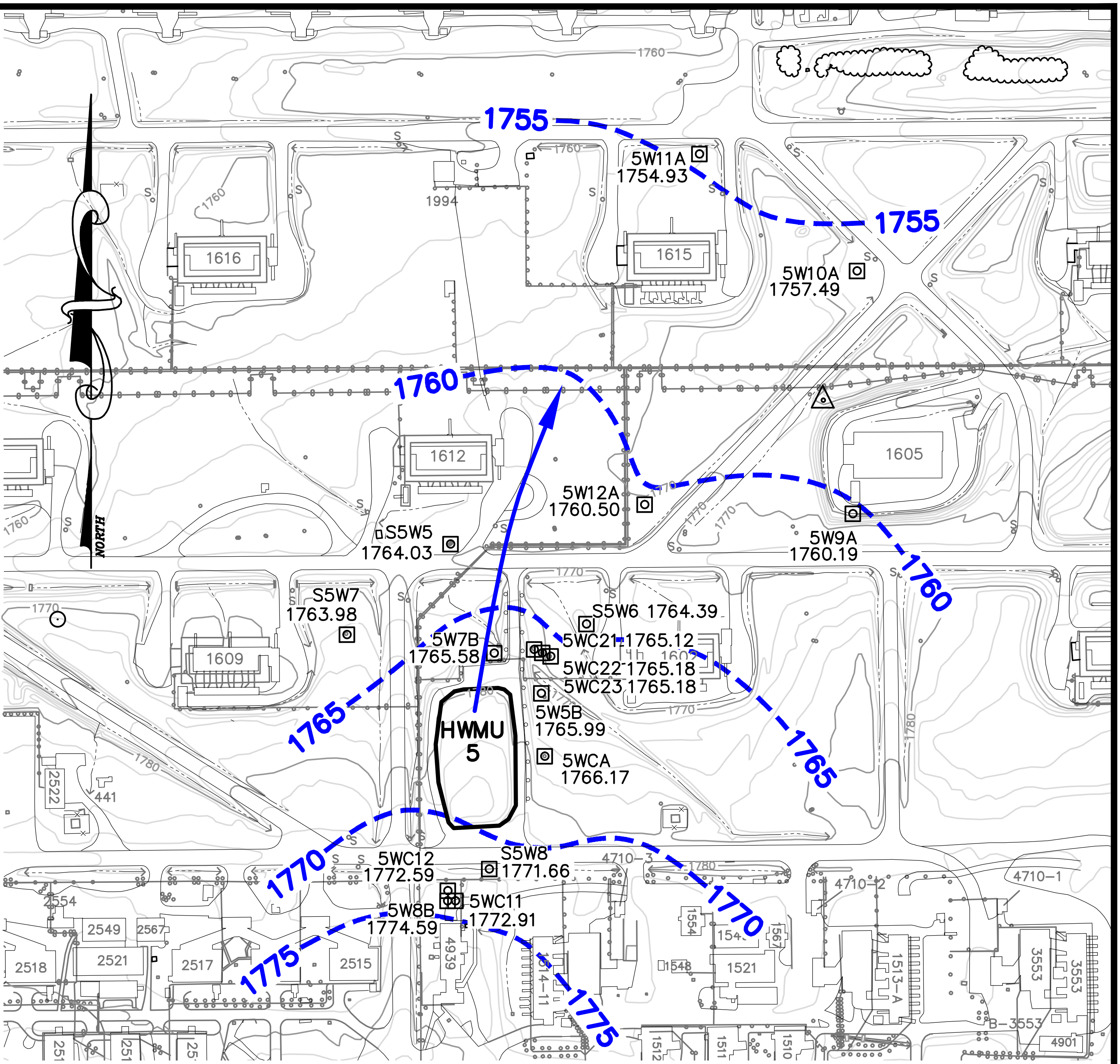
2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291

Richmond, VA
Charlottesville, VA
Hampton Roads, VA
Coats, NC

DESIGNED SN
DRAWN DLD
CHECKED MDL
DATE 06/29/15

FIGURE
1

P:\B03\200\B03204\B03204-13\CAD\B03204-13_HWMU-5 APR 2015.dwg Jul 20, 2015 1:39pm



GRAPHIC SCALE

200 0 100 200 400

(IN FEET)

1 inch = 200 ft.

LEGEND

5W7B ◙ 1765.58	MONITORING WELL GROUNDWATER ELEVATION (feet above mean sea level)
- -1770- -	GROUNDWATER CONTOUR
➡	GROUNDWATER FLOW DIRECTION

NOTE: TOPOGRAPHIC CONTOUR INTERVAL 2'

HWMU-5 POTENTIOMETRIC SURFACE MAP (OCTOBER 19, 2015)

RADFORD ARMY AMMUNITION PLANT

RADFORD, VIRGINIA

SCALE: 1"=200'

PLAN NO. B03204-13A

Draper Aden Associates

Engineering • Surveying • Environmental Services

2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291

Richmond, VA
Charlottesville, VA
Hampton Roads, VA
Coats, NC

DESIGNED	WMD
DRAWN	DLD
CHECKED	MDL
DATE	12/01/15

FIGURE

1

P:\B03\200\B03204\B03204-13\CAD\B03204-13_HWMU-5 OCT 2015.dwg Jan 26, 2016 9:58am

APPENDIX A-2

HWMU-5 2015 LABORATORY ANALYTICAL RESULTS
GROUNDWATER CORRECTIVE ACTION TARGETED CONSTITUENTS
GPS AND SEMIANNUAL MONITORING LIST

Summary of Semiannual Target Analyte Monitoring Results Appendix J
Corrective Action Monitoring Plan - Targeted Constituents
Hazardous Waste Management Unit 5
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 5W8B

Analyte/Quarter	5W8B Q	5W5B Q	5W7B Q	5WC21 Q	5WC22 Q	5WC23 Q	5W12A Q	QL	Permit QL	GPS	DL	Permit DL	UNIT	Method
Cobalt						CAS # 7440-48-4								
Second Quarter 2015	U	U	2.34 J	64.9	17	11.1	U	5	5	7	1	1	ug/l	6020A
Fourth Quarter 2015	U	U	2.25 J	75.2	23.9	7.08	U	5	5	7	1	1	ug/l	6020A
1,1-Dichloroethene						CAS # 75-35-4								
Second Quarter 2015	U	U	U	U	U	U	U	1	1	7	0.4	0.44	ug/l	8260C
Fourth Quarter 2015	U	U	U	U	U	U	U	1	1	7	0.4	0.44	ug/l	8260C
cis-1,2-Dichloroethene						CAS # 156-59-2								
Second Quarter 2015	U	U	U	U	U	U	U	1	1	70	0.1	0.1	ug/l	8260C
Fourth Quarter 2015	U	U	U	U	U	U	U	1	1	70	0.1	0.1	ug/l	8260C
trans-1,2-Dichloroethene						CAS # 156-60-5								
Second Quarter 2015	U	U	U	U	U	U	U	1	1	100	0.8	0.8	ug/l	8260C
Fourth Quarter 2015	U	U	U	U	U	U	U	1	1	100	0.8	0.8	ug/l	8260C
Trichloroethene						CAS # 79-01-6								
Second Quarter 2015	U	U	U	3.2	3.5	4.6	U	1	1	5	0.2	0.177	ug/l	8260C
Fourth Quarter 2015	U	U	U	2.9	3.3	4.4	U	1	1	5	0.2	0.177	ug/l	8260C
Vinyl chloride						CAS # 75-01-4								
Second Quarter 2015	U	U	U	U	U	U	U	1	1	2	0.1	0.1	ug/l	8260C
Fourth Quarter 2015	U J	U J	U J	U J	U J	U J	U J	1	1	2	0.1	0.1	ug/l	8260C

See last page of this report for definitions.

Summary of Semiannual Target Analyte Monitoring Results Appendix J
Corrective Action Monitoring Plan - Targeted Constituents

Hazardous Waste Management Unit 5
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 5W8B

Analyte/Quarter	5W8B Q	5W5B Q	5W7B Q	5WC21 Q	5WC22 Q	5WC23 Q	5W12A Q	QL	Permit QL	GPS	DL	Permit DL	UNIT	Method

Definitions:

Results are reported to the permit detection limit.

QL Denotes laboratory quantitation limit.
Permit QL Denotes permit quantitation limit.
DL Denotes laboratory detection limit.
Permit DL Denotes permit detection limit.
U denotes not detected at or above the permit detection limit or QL.
UA denotes not detected at or above the adjusted detection limit or adjusted QL.
J Denotes result is estimated. When used with "U" (i.e., “UJ”), denotes analyte not detected at or above the detection limit or QL and detection limit and QL are estimated. When used with "UA" (i.e., “UAJ”), denotes analyte not detected at or above adjusted detection limit and adjusted detection limit and QL are estimated.
UN Denotes analyte concentration is less than the QL and/or five times the blank concentration. Not reliably detected due to blank contamination.
R Denotes result rejected.
Q Denotes data validation qualifier. **X** Denotes mass spectral confirmation not obtained-result suspect.

CAS# Denotes Chemical Abstract Services registration number.
GPS Denotes Groundwater Protection Standards (2014) listed in Appendix J of Module VI-Groundwater Corrective Action & Monitoring Program for Unit 5 (approved by the VDEQ in the Post-Closure Care Permit for Hazardous Waste Units 5 and 16 (October 4, 2002, reissued August 16, 2014).
The first Corrective Action Monitoring Event occurred Second Quarter 2010.
“–“ denotes not sampled.

Note:

APPENDIX A-3

HWMU-5 2015 LABORATORY ANALYTICAL RESULTS
GROUNDWATER CORRECTIVE ACTION ANNUAL MONITORING LIST

Summary of Annual Target Analyte Monitoring Results - Appendix K
Corrective Action Monitoring Plan - Targeted Constituents

Hazardous Waste Management Unit 5
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 5W8B

Analyte/Quarter	5W8B Q	5W5B Q	5W7B Q	5WC21 Q	5WC22 Q	5WC23 Q	QL	Permit QL	GPS	DL	Permit DL	UNIT	Method
Antimony						*CAS #* 7440-36-0							
Second Quarter 2015	-	U	U	U	U	U	2	1	6	0.4	0.4	ug/l	6020A
Arsenic						*CAS #* 7440-38-2							
Second Quarter 2015	-	U	U	U	U	U	10	10	10	2	2	ug/l	6020A
Barium						*CAS #* 7440-39-3							
Second Quarter 2015	-	26	40.3	13.6	31.3	34.3	10	10	2,000	1	1	ug/l	6020A
Beryllium						*CAS #* 7440-41-7							
Second Quarter 2015	-	U	U	0.912 J	U	U	1	1	4	0.2	0.2	ug/l	6020A
Cadmium						*CAS #* 7440-43-9							
Second Quarter 2015	-	U	U	0.548 J	0.315 J	0.318 J	1	1	5	0.2	0.2	ug/l	6020A
Chromium						*CAS #* 7440-47-3							
Second Quarter 2015	-	U	U	4.17 J	U	2.87 J	5	5	100	1	1	ug/l	6020A
Cobalt						*CAS #* 7440-48-4							
Second Quarter 2015	U	U	2.34 J	64.9	17	11.1	5	5	7	1	1	ug/l	6020A
Fourth Quarter 2015	U	U	2.25 J	75.2	23.9	7.08	5	5	7	1	1	ug/l	6020A
Copper						*CAS #* 7440-50-8							
Second Quarter 2015	-	1.64 J	1.52 J	3.93 J	U	2.98 J	5	5	1,300	1	1	ug/l	6020A
Lead						*CAS #* 7439-92-1							
Second Quarter 2015	-	0.774 J	0.603 J	U	0.202 J	0.827 J	1	1	15	0.2	0.2	ug/l	6020A
Mercury						*CAS #* 7439-97-6							
Second Quarter 2015	-	U	U	U	U	U	2	2	2	0.2	0.2	ug/l	7470A
Nickel						*CAS #* 7440-02-0							
Second Quarter 2015	-	2.15 J	U	33.9	7.22 J	8.86 J	10	10	300	2	2	ug/l	6020A
Selenium						*CAS #* 7782-49-2							
Second Quarter 2015	-	U	U	U	U	U	10	10	50	3	3	ug/l	6020A
Silver						*CAS #* 7440-22-4							
Second Quarter 2015	-	U	U	U	U	U	2	2	71	0.2	0.2	ug/l	6020A
Thallium						*CAS #* 7440-28-0							
Second Quarter 2015	-	0.318 J	U	U	U	U	1	1	2	0.2	0.2	ug/l	6020A
Vanadium						*CAS #* 7440-62-2							
Second Quarter 2015	-	U	U	1.26 J	U	3.76 J	10	10	63	1	1	ug/l	6020A

See last page of this report for definitions.

Summary of Annual Target Analyte Monitoring Results - Appendix K
Corrective Action Monitoring Plan - Targeted Constituents

Hazardous Waste Management Unit 5
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 5W8B

Analyte/Quarter	5W8B Q	5W5B Q	5W7B Q	5WC21 Q	5WC22 Q	5WC23 Q	QL	Permit QL	GPS	DL	Permit DL	UNIT	Method
Zinc						*CAS #* 7440-66-6							
Second Quarter 2015	-	7.11 J	16.7	30.3	6.89 J	12.1	10	10	4700	3	3	ug/l	6020A
Acetone						*CAS #* 67-64-1							
Second Quarter 2015	-	12	U	U	U	U	10	10	12000	3	3	ug/l	8260C
bis(2-Ethylhexyl)phthalate						*CAS #* 117-81-7							
Second Quarter 2015	-	U	U	U	U	U	6	6	10	1.5	1.5	ug/l	8270D
2-Butanone						*CAS #* 78-93-3							
Second Quarter 2015	-	U	U	U	U	U	10	10	4900	1	1	ug/l	8260C
Chloroform						*CAS #* 67-66-3							
Second Quarter 2015	-	1.2 J	25 J	1.1 J	0.6 J	0.8 J	1	1	80	0.1	0.1	ug/l	8260C
Dichlorodifluoromethane						*CAS #* 75-71-8							
Second Quarter 2015	-	U	U	U	U	U	1	1	190	0.3	0.28	ug/l	8260C
1,2-Dichloroethane						*CAS #* 107-06-2							
Second Quarter 2015	-	U	U	U	U	U	1	1	5	0.1	0.147	ug/l	8260C
Diethyl ether						*CAS #* 60-29-7							
Second Quarter 2015	-	U	U	1.4 J	4.5 J	11 J	12	12	7,300	0.4	0.39	ug/l	8260C
Diethyl phthalate						*CAS #* 84-66-2							
Second Quarter 2015	-	U	U	U	U	U	10	10	11000	0.52	0.5	ug/l	8270D
2,4-Dinitrotoluene						*CAS #* 121-14-2							
Second Quarter 2015	-	U	U	3 J	2.8 J	2.8 J	10	10	10	0.84	0.6	ug/l	8270D
2,6-Dinitrotoluene						*CAS #* 606-20-2							
Second Quarter 2015	-	U	U	U	U	U	10	10	10	0.75	0.7	ug/l	8270D
Methylene chloride						*CAS #* 75-09-2							
Second Quarter 2015	-	U	U	U	U	U	1	1	5	0.2	0.182	ug/l	8260C
o-Nitroaniline						*CAS #* 88-74-4							
Second Quarter 2015	-	U	U	U	U	U	10	10	150	1.5	0.7	ug/l	8270D
p-Nitroaniline						*CAS #* 100-01-6							
Second Quarter 2015	-	U	U	U	U	U	20	20	20	2.7	1.3	ug/l	8270D
Nitrobenzene						*CAS #* 98-95-3							
Second Quarter 2015	-	U	U	U	U	U	10	10	10	1.3	0.8	ug/l	8270D

See last page of this report for definitions.

Summary of Annual Target Analyte Monitoring Results - Appendix K
Corrective Action Monitoring Plan - Targeted Constituents

Hazardous Waste Management Unit 5
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 5W8B

Analyte/Quarter	5W8B Q	5W5B Q	5W7B Q	5WC21 Q	5WC22 Q	5WC23 Q	QL	Permit QL	GPS	DL	Permit DL	UNIT	Method
Toluene						CAS # 108-88-3							
Second Quarter 2015	-	U	U	U	U	U	1	1	1,000	0.1	0.1	ug/l	8260C
Xylenes (Total)						CAS # 1330-20-7							
Second Quarter 2015	-	U	U	U	U	U	3	3	10,000	0.2	0.208	ug/l	8260C

Definitions:

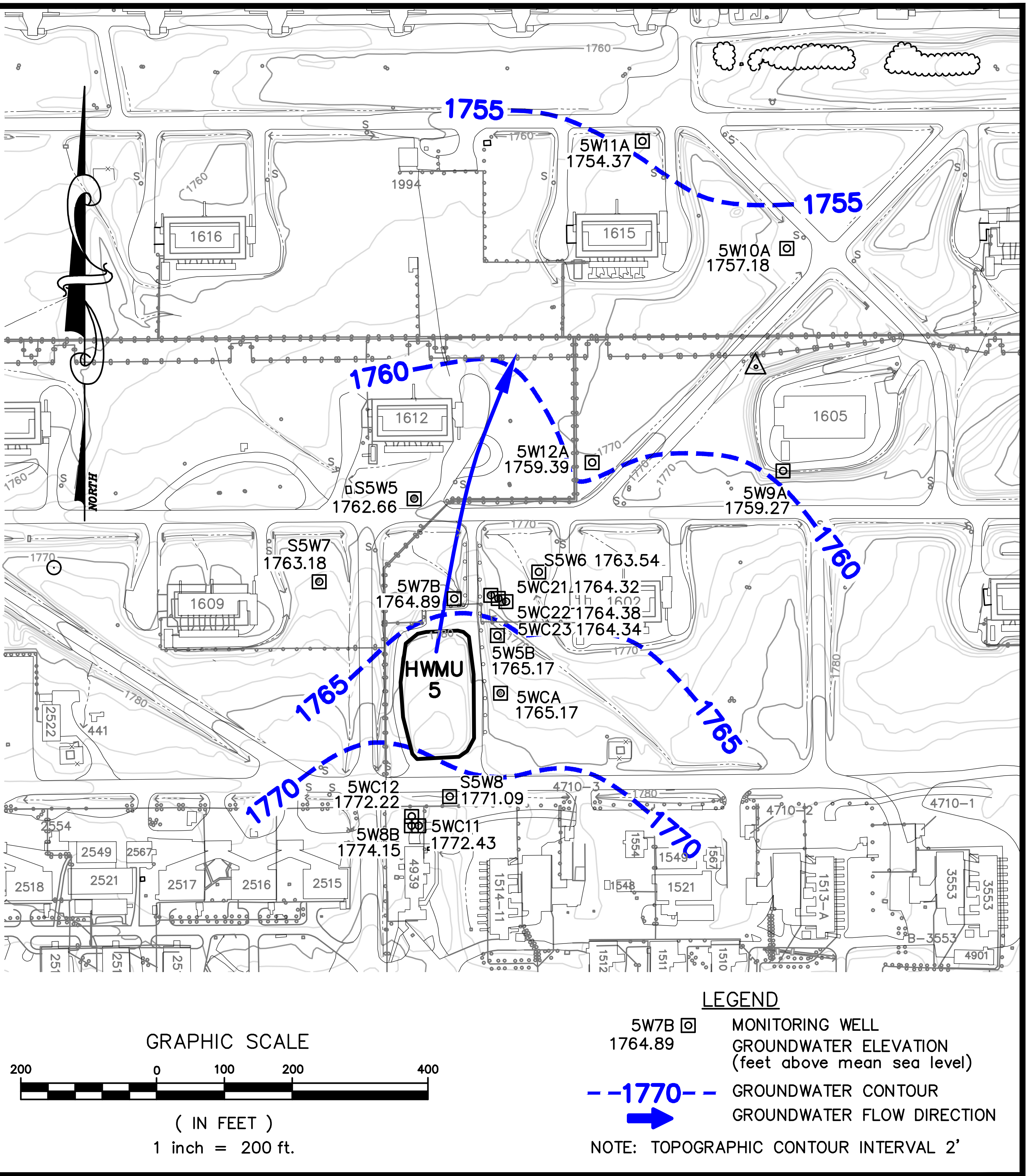
Results are reported to the Permit Detection Limit.
First Corrective Action Monitoring Event Second Quarter 2010:

QL: Denotes laboratory quantitation limit.
Permit QL: Denotes permit quantitation limit.
DL: Denotes laboratory detection limit.
Permit DL: Denotes permit detection limit.
U: Denotes not detected at or above the permit detection limit or QL.
UA: Denotes not detected at or above the adjusted detection limit or adjusted QL.
J: Denotes result is estimated. When used with "U" (i.e., “UJ”), denotes analyte not detected at or above the detection limit or QL and detection limit and QL are estimated. When used with "UA" (i.e., “UAJ”), denotes analyte not detected at or above adjusted detection limit and adjusted detection limit and QL are estimated.
UN: Denotes analyte concentration is less than the QL and/or five times the blank concentration. Not reliably detected due to blank contamination.
R: Denotes result rejected.
Q: Denotes data validation qualifier.
X: Denotes mass spectral confirmation not obtained - result suspect.

CAS#: Denotes Chemical Abstract Services registration number.
GPS: Denotes Groundwater Protection Standards listed in Appendix K of Module VI-Groundwater Corrective Action & Monitoring Program for Unit 5 (approved by the VDEQ and incorporated into the Final Hazardous Waste Post-Closure Permit for Hazardous Waste Units 5 and 16 (original effective date October 4, 2002 and reissued August 16, 2014)
“–“: Denotes not sampled.

APPENDIX A-1

HWMU-5 POTENTIOMETRIC SURFACE MAPS
SECOND QUARTER 2016
FOURTH QUARTER 2016



HWMU-5 POTENTIOMETRIC SURFACE MAP (APRIL 25, 2016)

RADFORD ARMY AMMUNITION PLANT

RADFORD, VIRGINIA

SCALE: 1"=200'

PLAN NO. B03204-16

Draper Aden Associates
Engineering • Surveying • Environmental Services

2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291

Richmond, VA
Charlottesville, VA
Hampton Roads, VA

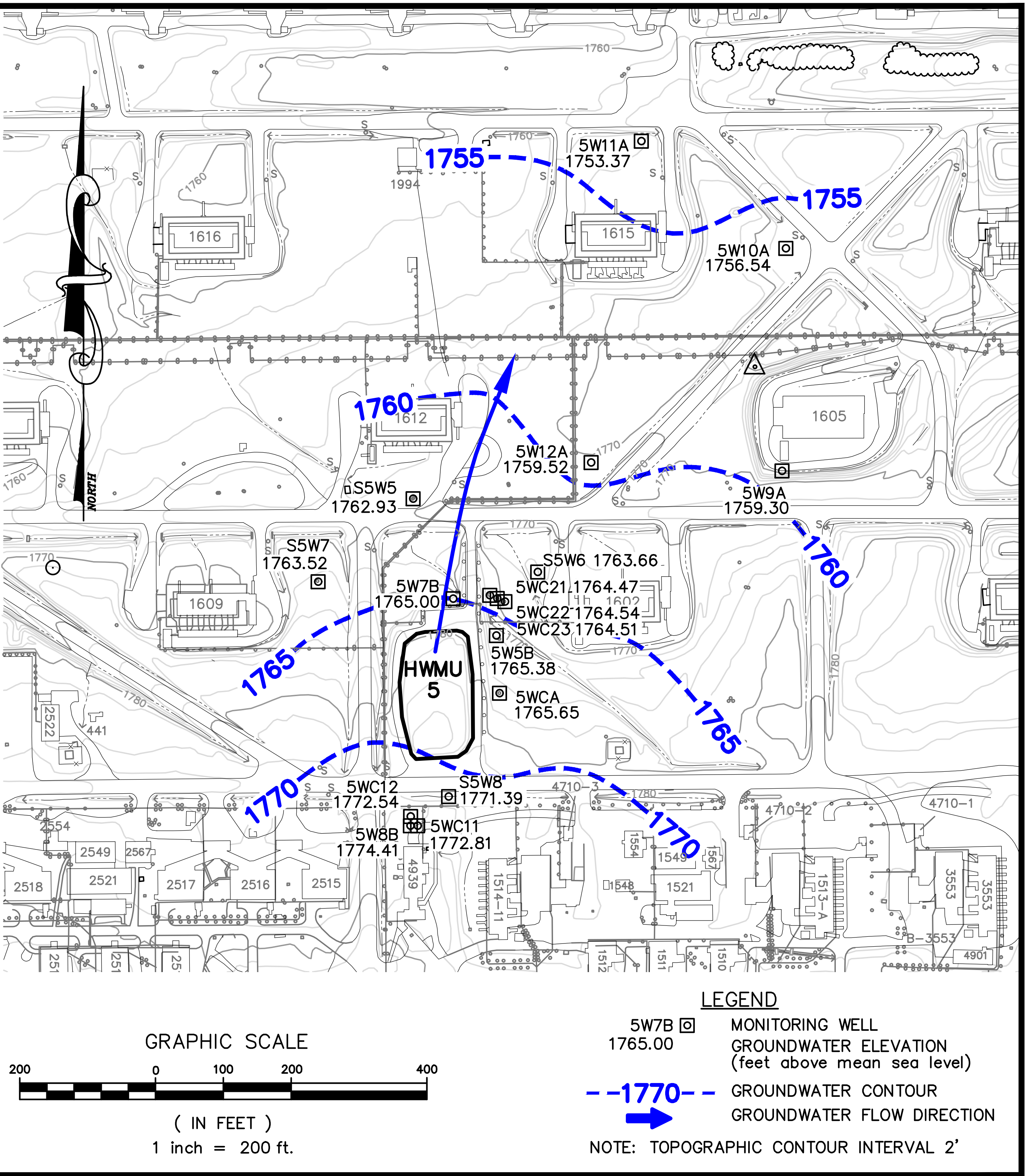
Coats, NC
Fayetteville, NC
Northern Virginia

DESIGNED	WMD
DRAWN	DLD
CHECKED	MDL
DATE	07/19/16

FIGURE

1

P:\B03\200\B03204\B03204-16\CAD\B03204-16_HWMU-5 April 2016.dwg Jul 22, 2016 8:46am



HWMU-5 POTENTIOMETRIC SURFACE MAP (OCTOBER 19, 2016)

RADFORD ARMY AMMUNITION PLANT

RADFORD, VIRGINIA

SCALE: 1"=200'

PLAN NO. B03204-16

Draper Aden Associates
Engineering • Surveying • Environmental Services
2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291
Richmond, VA
Charlottesville, VA
Hampton Roads, VA
Coats, NC
Fayetteville, NC
Northern Virginia

DESIGNED	WMD
DRAWN	DLD
CHECKED	MDL
DATE	01/04/17

FIGURE

1

P:\B03\200\B03204\B03204-16\CAD\B03204-16_HWMU-5 October 2016.dwg Jan 10, 2017 1:59pm

APPENDIX A-2

HWMU-5 2016 LABORATORY ANALYTICAL RESULTS
GROUNDWATER CORRECTIVE ACTION TARGETED CONSTITUENTS
GPS AND SEMIANNUAL MONITORING LIST

Summary of Semiannual Target Analyte Monitoring Results Appendix J
Corrective Action Monitoring Plan - Targeted Constituents

Hazardous Waste Management Unit 5
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 5W8B

Analyte/Quarter	5W8B Q	5W5B Q	5W7B Q	5WC21 Q	5WC22 Q	5WC23 Q	5W12A Q	QL	Permit QL	GPS	DL	Permit DL	UNIT	Method
Cobalt						*CAS #* 7440-48-4								
Second Quarter 2016	U	U	1.4 J	61.6	11.4	3.1 J	U	5	5	7	1	1	ug/l	6020A
Fourth Quarter 2016	U	U	1.5 J	71.6	6.9	2.2 J	U	5	5	7	1	1	ug/l	6020A
1,1-Dichloroethene						*CAS #* 75-35-4								
Second Quarter 2016	U	U	U	U	U	U	U	1	1	7	0.4	0.44	ug/l	8260C
Fourth Quarter 2016	U	U	U	U	U	U	U	1	1	7	0.4	0.44	ug/l	8260C
cis-1,2-Dichloroethene						*CAS #* 156-59-2								
Second Quarter 2016	U	U	U	U	U	U	U	1	1	70	0.1	0.1	ug/l	8260C
Fourth Quarter 2016	U	U	U	U	U	U	U	1	1	70	0.1	0.1	ug/l	8260C
trans-1,2-Dichloroethene						*CAS #* 156-60-5								
Second Quarter 2016	U	U	U	U	U	U	U	1	1	100	0.8	0.8	ug/l	8260C
Fourth Quarter 2016	U	U	U	U	U	U	U	1	1	100	0.8	0.8	ug/l	8260C
Trichloroethene						*CAS #* 79-01-6								
Second Quarter 2016	U	U	U	3.5 J	3.8 J	3.9 J	U	1	1	5	0.2	0.177	ug/l	8260C
Fourth Quarter 2016	U	0.3 J	U	2.6	2.9	3.1	U	1	1	5	0.2	0.177	ug/l	8260C
Vinyl chloride						*CAS #* 75-01-4								
Second Quarter 2016	U J	U J	U J	U J	U J	U J	U J	1	1	2	0.1	0.1	ug/l	8260C
Fourth Quarter 2016	U J	U J	U J	U J	U J	U J	U J	1	1	2	0.1	0.1	ug/l	8260C

See last page of this report for definitions.

Analyte/Quarter	5W8B Q	5W5B Q	5W7B Q	5WC21 Q	5WC22 Q	5WC23 Q	5W12A Q	QL	Permit QL	GPS	DL	Permit DL	UNIT	Method

Definitions:

Results are reported to the permit detection limit.

QL Denotes laboratory quantitation limit.
Permit QL Denotes permit quantitation limit.
DL Denotes laboratory detection limit.
Permit DL Denotes permit detection limit.
U denotes not detected at or above the permit detection limit or QL.
UA denotes not detected at or above the adjusted detection limit or adjusted QL.
J Denotes result is estimated. When used with "U" (i.e., “UJ”), denotes analyte not detected at or above the detection limit or QL and detection limit and QL are estimated. When used with "UA" (i.e., “UAJ”), denotes analyte not detected at or above adjusted detection limit and adjusted detection limit and QL are estimated.
UN Denotes analyte concentration is less than the QL and/or five times the blank concentration. Not reliably detected due to blank contamination.
R Denotes result rejected.
Q Denotes data validation qualifier. **X** Denotes mass spectral confirmation not obtained-result suspect.

CAS# Denotes Chemical Abstract Services registration number.
GPS Denotes Groundwater Protection Standards (2014) listed in Appendix J of Module VI-Groundwater Corrective Action & Monitoring Program for Unit 5 (approved by the VDEQ in the Post-Closure Care Permit for Hazardous Waste Units 5 and 16 (October 4, 2002, reissued August 16, 2014).
The first Corrective Action Monitoring Event occurred Second Quarter 2010.
“–“ denotes not sampled.

Note:

APPENDIX A-3

HWMU-5 2016 LABORATORY ANALYTICAL RESULTS GROUNDWATER CORRECTIVE ACTION ANNUAL MONITORING LIST

Summary of Annual Target Analyte Monitoring Results - Appendix K
Corrective Action Monitoring Plan - Targeted Constituents

Hazardous Waste Management Unit 5
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 5W8B

Analyte/Quarter	*5W8B Q*	*5W5B Q*	*5W7B Q*	*5WC21 Q*	*5WC22 Q*	*5WC23 Q*	*QL*	*Permit QL*	*GPS*	*DL*	*Permit DL*	*UNIT*	*Method*
Antimony						*CAS #* 7440-36-0							
Second Quarter 2016	-	U	U	U	U	U	2	2	6	0.4	0.4	ug/l	6020A
Arsenic						*CAS #* 7440-38-2							
Second Quarter 2016	-	U	U	U	U	U	4	10	10	2	2	ug/l	6020A
Barium						*CAS #* 7440-39-3							
Second Quarter 2016	-	32.3	44.8	13.8	33.6	22.9	4	10	2,000	1	1	ug/l	6020A
Beryllium						*CAS #* 7440-41-7							
Second Quarter 2016	-	U	U	1	U	U	1	1	4	0.2	0.2	ug/l	6020A
Cadmium						*CAS #* 7440-43-9							
Second Quarter 2016	-	U	U	0.43 J	0.25 J	U	1	1	5	0.2	0.2	ug/l	6020A
Chromium						*CAS #* 7440-47-3							
Second Quarter 2016	-	U	U	3.6 J	U	U	4	5	100	1	1	ug/l	6020A
Cobalt						*CAS #* 7440-48-4							
Second Quarter 2016	U	U	1.4 J	61.6	11.4	3.1 J	5	5	7	1	1	ug/l	6020A
Fourth Quarter 2016	U	U	1.5 J	71.6	6.9	2.2 J	5	5	7	1	1	ug/l	6020A
Copper						*CAS #* 7440-50-8							
Second Quarter 2016	-	1.3 J	1.1 J	3.1 J	U	U	4	5	1,300	1	1	ug/l	6020A
Lead						*CAS #* 7439-92-1							
Second Quarter 2016	-	0.53 J	0.76 J	U	U	U	2	2	15	0.2	0.2	ug/l	6020A
Mercury						*CAS #* 7439-97-6							
Second Quarter 2016	-	U	U	U	U	U	2	2	2	0.2	0.2	ug/l	7470A
Nickel						*CAS #* 7440-02-0							
Second Quarter 2016	-	U	U	32.9	5.6	2.9 J	4	10	300	2	2	ug/l	6020A
Selenium						*CAS #* 7782-49-2							
Second Quarter 2016	-	U	U	U	U	U	4	10	50	3	3	ug/l	6020A
Silver						*CAS #* 7440-22-4							
Second Quarter 2016	-	U	U	U	U	U	1	2	71	0.2	0.2	ug/l	6020A
Thallium						*CAS #* 7440-28-0							
Second Quarter 2016	-	U	U	U	U	U	1	1	2	0.2	0.2	ug/l	6020A
Vanadium						*CAS #* 7440-62-2							
Second Quarter 2016	-	U	U	U	U	U	10	10	63	1	1	ug/l	6020A

See last page of this report for definitions.

Summary of Annual Target Analyte Monitoring Results - Appendix K
Corrective Action Monitoring Plan - Targeted Constituents

Hazardous Waste Management Unit 5
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 5W8B

Analyte/Quarter	*5W8B Q*	*5W5B Q*	*5W7B Q*	*5WC21 Q*	*5WC22 Q*	*5WC23 Q*	*QL*	*Permit QL*	*GPS*	*DL*	*Permit DL*	*UNIT*	*Method*
Zinc						*CAS #* *7440-66-6*							
Second Quarter 2016	-	U	6.1 J	27.1 J	U	U	30	30	4700	3	7.3	ug/l	6020A
Acetone						*CAS #* *67-64-1*							
Second Quarter 2016	-	U	U	U	U	U	10	10	12000	3	3	ug/l	8260C
bis(2-Ethylhexyl)phthalate						*CAS #* *117-81-7*							
Second Quarter 2016	-	U	U	U	U	U	6	6	10	1.5	1.5	ug/l	8270D
2-Butanone						*CAS #* *78-93-3*							
Second Quarter 2016	-	U	U	U	U	U	10	10	4900	1	1	ug/l	8260C
Chloroform						*CAS #* *67-66-3*							
Second Quarter 2016	-	2.3	34	1.1	0.9 J	0.9 J	1	1	80	0.1	0.1	ug/l	8260C
Dichlorodifluoromethane						*CAS #* *75-71-8*							
Second Quarter 2016	-	U	U	U	U	U	1	1	190	0.3	0.28	ug/l	8260C
1,2-Dichloroethane						*CAS #* *107-06-2*							
Second Quarter 2016	-	U	U	U	U	U	1	1	5	0.1	0.147	ug/l	8260C
Diethyl ether						*CAS #* *60-29-7*							
Second Quarter 2016	-	U	U	1.6 J	3.6 J	4.8 J	12	12	7,300	0.4	0.39	ug/l	8260C
Diethyl phthalate						*CAS #* *84-66-2*							
Second Quarter 2016	-	U	U	U	U	U	10	10	11000	0.5	0.5	ug/l	8270D
2,4-Dinitrotoluene						*CAS #* *121-14-2*							
Second Quarter 2016	-	U	U	1 J	0.7 J	0.8 J	10	10	10	0.6	0.6	ug/l	8270D
2,6-Dinitrotoluene						*CAS #* *606-20-2*							
Second Quarter 2016	-	U	U	U	U	U	10	10	10	0.7	0.7	ug/l	8270D
Methylene chloride						*CAS #* *75-09-2*							
Second Quarter 2016	-	U	0.3 J	U	U	U	1	1	5	0.2	0.182	ug/l	8260C
o-Nitroaniline						*CAS #* *88-74-4*							
Second Quarter 2016	-	U	U	0.8 J	2 J	2 J	10	10	150	0.7	0.7	ug/l	8270D
p-Nitroaniline						*CAS #* *100-01-6*							
Second Quarter 2016	-	U	U	U	U	U	20	20	20	1.3	1.3	ug/l	8270D
Nitrobenzene						*CAS #* *98-95-3*							
Second Quarter 2016	-	U	U	1 J	1 J	1 J	10	10	10	0.8	0.8	ug/l	8270D

See last page of this report for definitions.

Summary of Annual Target Analyte Monitoring Results - Appendix K
Corrective Action Monitoring Plan - Targeted Constituents

Hazardous Waste Management Unit 5
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 5W8B

Analyte/Quarter	*5W8B Q*	*5W5B Q*	*5W7B Q*	*5WC21 Q*	*5WC22 Q*	*5WC23 Q*	*QL*	*Permit QL*	*GPS*	*DL*	*Permit DL*	*UNIT*	*Method*
Toluene *CAS #* 108-88-3													
Second Quarter 2016	-	U	U	U	U	U	1	1	1,000	0.1	0.1	ug/l	8260C
Xylenes (Total) *CAS #* 1330-20-7													
Second Quarter 2016	-	U	U	U	U	U	3	3	10,000	0.2	0.208	ug/l	8260C

Definitions:

Results are reported to the Permit Detection Limit.
First Corrective Action Monitoring Event Second Quarter 2010:

QL: Denotes laboratory quantitation limit.
Permit QL: Denotes permit quantitation limit. (Class 1 Permit Modification Nov 2016).
DL: Denotes laboratory detection limit.
Permit DL: Denotes permit detection limit.
U: Denotes not detected at or above the permit detection limit or QL.
UA: Denotes not detected at or above the adjusted detection limit or adjusted QL.
J: Denotes result is estimated. When used with "U" (i.e., “UJ”), denotes analyte not detected at or above the detection limit or QL and detection limit and QL are estimated. When used with "UA" (i.e., “UAJ”), denotes analyte not detected at or above adjusted detection limit and adjusted detection limit and QL are estimated.
UN: Denotes analyte concentration is less than the QL and/or five times the blank concentration. Not reliably detected due to blank contamination.
R: Denotes result rejected.
Q: Denotes data validation qualifier.
X: Denotes mass spectral confirmation not obtained - result suspect.

CAS#: Denotes Chemical Abstract Services registration number.
GPS: Denotes Groundwater Protection Standards listed in Appendix K of Module VI-Groundwater Corrective Action & Monitoring Program for Unit 5 (approved by the VDEQ and incorporated into the Final Hazardous Waste Post-Closure Permit for Hazardous Waste Units 5 and 16 (original effective date October 4, 2002 and reissued August 16, 2014)
“–“: Denotes not sampled.

TABLE 1
HWMU-5
GROUNDWATER ELEVATIONS - 2016
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

MONITORING WELL ID	ELEVATION TOP OF WELL	APRIL 25, 2016		OCTOBER 19, 2016	
		DTW	GW ELEV	DTW	GW ELEV
5W8B	1789.58	15.43	1774.15	15.17	1774.41
5W5B	1775.13	9.96	1765.17	9.75	1765.38
5W7B	1774.78	9.89	1764.89	9.78	1765.00
5WC21	1774.43	10.11	1764.32	9.96	1764.47
5WC22	1774.45	10.07	1764.38	9.91	1764.54
5WC23	1773.84	9.50	1764.34	9.33	1764.51
5W12A	1772.46	13.07	1759.39	12.94	1759.52
S5W5	1772.31	9.65	1762.66	9.38	1762.93
S5W7	1776.08	12.90	1763.18	12.56	1763.52
5W9A	1762.20	2.93	1759.27	2.90	1759.30
5W10A	1771.40	14.22	1757.18	14.86	1756.54
5W11A	1766.20	11.83	1754.37	12.83	1753.37
5WC11	1788.92	16.49	1772.43	16.11	1772.81
5WC12	1788.96	16.74	1772.22	16.42	1772.54
5WCA	1779.05	13.88	1765.17	13.40	1765.65
S5W6	1771.43	7.89	1763.54	7.77	1763.66
S5W8	1783.68	12.59	1771.09	12.29	1771.39

NOTES:

DTW: Depth to water from top of casing.

GW ELEV: Groundwater elevation.

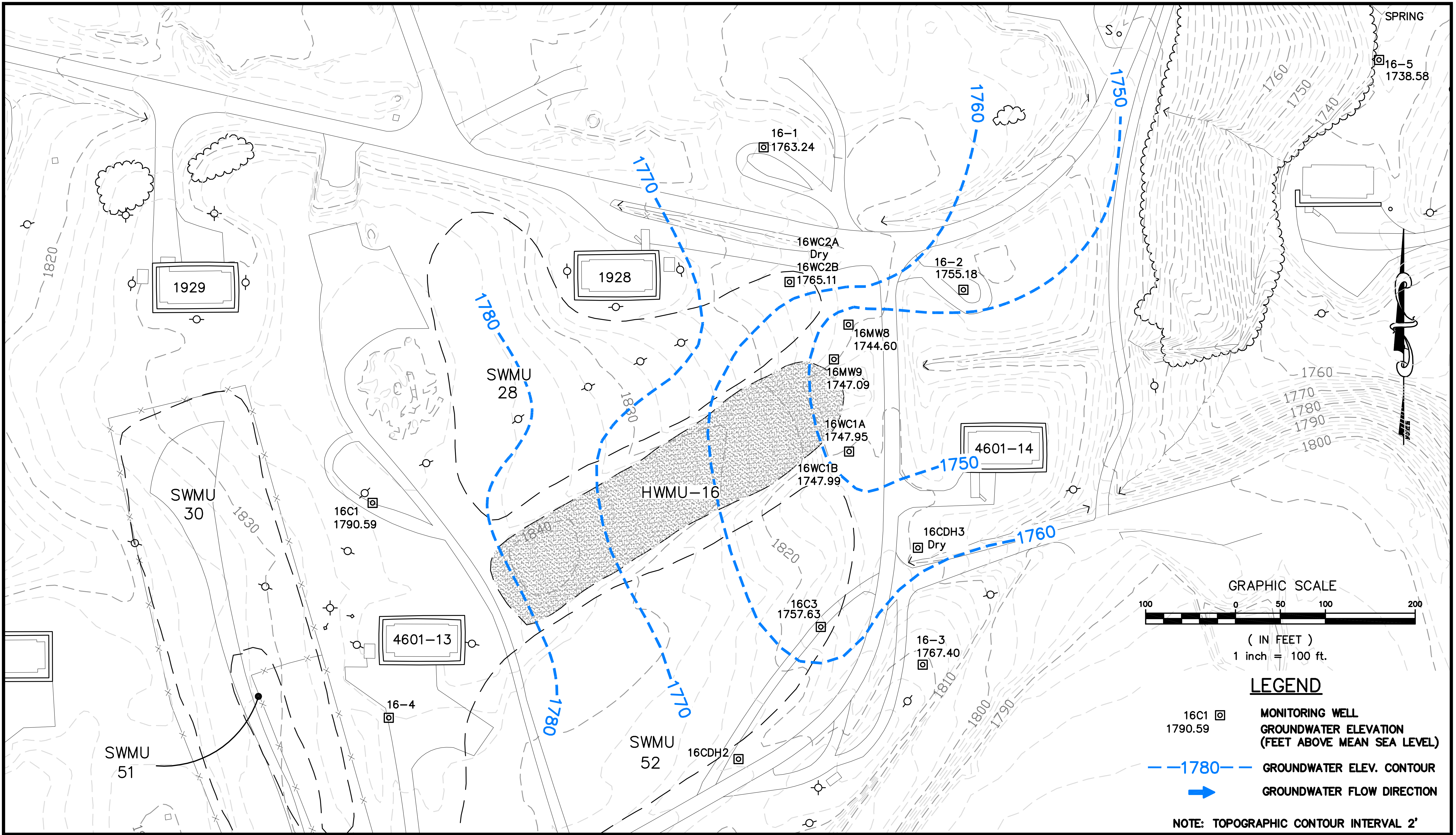
All elevations in feet above mean sea level.

RAAP-039/HWMU 16

[This Page Intentionally Left Blank]

APPENDIX C-1

HWMU-16 POTENTIOMETRIC SURFACE MAPS
SECOND QUARTER 2013
FOURTH QUARTER 2013



Draper Aden Associates
Engineering ✦ Surveying ✦ Environmental Services

2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291

Richmond, VA
Charlottesville, VA
Hampton Roads, VA

DESIGNED RGM
DRAWN DLD
CHECKED SN
DATE 07/22/13

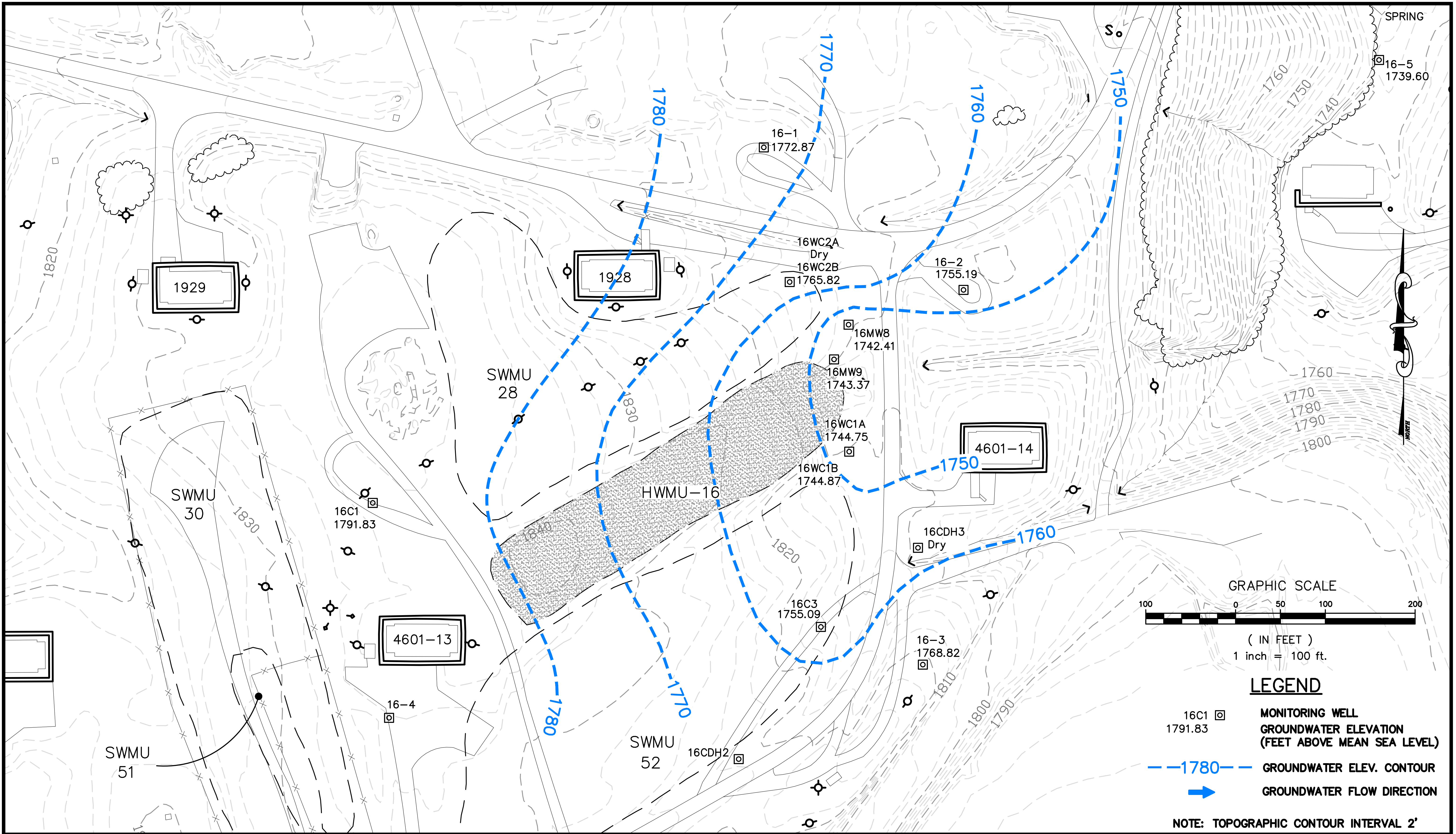
HWMU-16 POTENTIOMETRIC SURFACE MAP (APRIL 23, 2013)
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

SCALE: 1"=100'

PLAN NO. B03204-11

FIGURE
3

P:\B03200\B03204-11\CAD\B03204-11_HWMU-16.dwg Jul 25, 2013 1:10pm



Draper Aden Associates
Engineering ✦ Surveying ✦ Environmental Services
2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291
Richmond, VA
Charlottesville, VA
Hampton Roads, VA

DESIGNED	RGM
DRAWN	DLD
CHECKED	SN
DATE	04/21/14

HWMU-16 POTENTIOMETRIC SURFACE MAP (OCTOBER 22, 2013)
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

SCALE: 1"=100'

PLAN NO. B03204-11

FIGURE
3

P:\B03200\B03204\B03204-12P\CAD\B03204-11_HWMU-16.dwg Apr 22, 2014 11:19am

APPENDIX C-2

HWMU-16 2013 LABORATORY ANALYTICAL RESULTS POINT OF COMPLIANCE WELLS

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 ***All Results in ug/L.***

Analtye/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*QL*	*GPS*	*Method*
Antimony					*CAS #*	*7440-36-0*		
Second Quarter 2013	U	U	U	U	U	1	6	6020A
Arsenic					*CAS #*	*7440-38-2*		
Second Quarter 2013	U	U	U	U	U	10	10	6020A
Fourth Quarter 2013	U	U	U	U	U	10	10	6020A
Barium					*CAS #*	*7440-39-3*		
Second Quarter 2013	194	127	536	263	133	10	2000	6020A
Fourth Quarter 2013	171	121	560	262	110	10	2000	6020A
Beryllium					*CAS #*	*7440-41-7*		
Second Quarter 2013	U	0.263 J	U	U	U	1	4	6020A
Fourth Quarter 2013	U	U	U	U	U	1	4	6020A
Cadmium					*CAS #*	*7440-43-9*		
Second Quarter 2013	U	0.245 J	U	U	U	1	5	6020A
Fourth Quarter 2013	U	U	U	U	U	1	5	6020A
Chromium					*CAS #*	*7440-47-3*		
Second Quarter 2013	U	U	U	U	1.54 J	5	100	6020A
Fourth Quarter 2013	U	U	U	U	U	5	100	6020A
Cobalt					*CAS #*	*7440-48-4*		
Second Quarter 2013	U	1.13 J	3.59 J	4.5 J	U	5	5	6020A
Fourth Quarter 2013	U	U	U	U	33.4	5	5	6020A
Copper					*CAS #*	*7440-50-8*		
Second Quarter 2013	U	5.28	U	U	1.52 J	5	1300	6020A
Fourth Quarter 2013	U	10.8	U	U	U	5	1300	6020A
Lead					*CAS #*	*7439-92-1*		
Second Quarter 2013	U	0.522 J	U	U	U	1	15	6020A
Fourth Quarter 2013	U	U	U	U	U	1	15	6020A
Mercury					*CAS #*	*7439-97-6*		
Second Quarter 2013	U	U	U	U	0.6 J	2	2	7470A
Fourth Quarter 2013	U J	U J	U J	U J	U J	2	2	7470A
Nickel					*CAS #*	*7440-02-0*		
Second Quarter 2013	3.25 J	3.66 J	13.6	8.37 J	U	10	313	6020A
Fourth Quarter 2013	U	U	13.8	U	11.6	10	313	6020A
Selenium					*CAS #*	*7782-49-2*		
Second Quarter 2013	U	U	U	U	U	5	50	6020A
Silver					*CAS #*	*7440-22-4*		
Second Quarter 2013	U	U	U	U	U	1	78.25	6020A
Thallium					*CAS #*	*7440-28-0*		
Second Quarter 2013	U	U	U	U	U	1	-	6020A
Tin					*CAS #*	*7440-31-5*		
Second Quarter 2013	U	U	U	U	U	50	-	6010C
Vanadium					*CAS #*	*7440-62-2*		
Second Quarter 2013	U	U	U	U	U	10	151	6020A
Fourth Quarter 2013	U	U	U	U	U	10	151	6020A
Zinc					*CAS #*	*7440-66-6*		
Second Quarter 2013	U	28	U	7.15 J	5.21 J	10	4695	6020A
Fourth Quarter 2013	U	36.2	U	U	U	10	4695	6020A
Sulfide					*CAS #*	*18496-25-8*		
Second Quarter 2013	U	U	U	U	U	3000	-	9034
Cyanide					*CAS #*	*57-12-5*		
Second Quarter 2013	U	U	U	U	U	20	-	9012B
Acenaphthene					*CAS #*	*83-32-9*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Acenaphthylene					*CAS #*	*208-96-8*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Acetone					*CAS #*	*67-64-1*		
Second Quarter 2013	U	U	U	U	U	10	223.57	8260C

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 *All Results in ug/L.*

Analtye/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*QL*	*GPS*	*Method*
Acetonitrile					*CAS #*	*75-05-8*		
Second Quarter 2013	U	U	U	U	U	100	-	8260C
Acetophenone					*CAS #*	*98-86-2*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
2-Acetylaminofluorene					*CAS #*	*53-96-3*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Acrolein					*CAS #*	*107-02-8*		
Second Quarter 2013	U J	U J	U J	U J	U J	25	-	8260C
Acrylonitrile					*CAS #*	*107-13-1*		
Second Quarter 2013	U	U	U	U	U	10	-	8260C
Aldrin					*CAS #*	*309-00-2*		
Second Quarter 2013	U	U	U	U	U	0.025	-	8081B
Allyl chloride					*CAS #*	*107-05-1*		
Second Quarter 2013	U	U	U	U	U	10	-	8260C
4-Aminobiphenyl					*CAS #*	*92-67-1*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Aniline					*CAS #*	*62-53-3*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Anthracene					*CAS #*	*120-12-7*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Aramite					*CAS #*	*140-57-8*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Benzene					*CAS #*	*71-43-2*		
Second Quarter 2013	0.3 J	U	0.2 J	U	U	1	5	8260C
Fourth Quarter 2013	U	U	U	U	U	1	5	8260C
Benzo[a]anthracene					*CAS #*	*56-55-3*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Benzo[b]fluoranthene					*CAS #*	*205-99-2*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Benzo[k]fluoranthene					*CAS #*	*207-08-9*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Benzo[ghi]perylene					*CAS #*	*191-24-2*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Benzo(a)pyrene					*CAS #*	*50-32-8*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
1,4-Benzenediamine					*CAS #*	*106-50-3*		
Second Quarter 2013	U J	U J	U J	U J	U J	7.5	-	8270D
Benzyl alcohol					*CAS #*	*100-51-6*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
alpha-BHC					*CAS #*	*319-84-6*		
Second Quarter 2013	U	U	U	U	U	0.025	-	8081B
beta-BHC					*CAS #*	*319-85-7*		
Second Quarter 2013	U	U	U	U	U	0.025	-	8081B
delta-BHC					*CAS #*	*319-86-8*		
Second Quarter 2013	0.0034J	U	U	U	U	0.025	-	8081B
gamma-BHC					*CAS #*	*58-89-9*		
Second Quarter 2013	0.0020J	U	U	U	U	0.025	-	8081B
bis(2-Chloroethoxy)methane					*CAS #*	*111-91-1*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
bis(2-Chloroethyl)ether					*CAS #*	*111-44-4*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
bis(2-Chloro-1-methylethyl)ether					*CAS #*	*108-60-1*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
bis(2-Ethylhexyl)phthalate					*CAS #*	*117-81-7*		
Second Quarter 2013	U	U	U	U	U	5	10	8270D
Bromobenzene					*CAS #*	*108-86-1*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 ***All Results in ug/L.***

Analtye/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*QL*	*GPS*	*Method*
Bromochloromethane					*CAS #*	*74-97-5*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
Bromodichloromethane					*CAS #*	*75-27-4*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
Bromoform					*CAS #*	*75-25-2*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
4-Bromophenyl phenyl ether					*CAS #*	*101-55-3*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
2-Butanone					*CAS #*	*78-93-3*		
Second Quarter 2013	U	U	U	U	U	10	2667.6	8260C
Fourth Quarter 2013	U	U	U	U	U	10	2667.6	8260C
n-Butyl alcohol					*CAS #*	*71-36-3*		
Second Quarter 2013	U	U	U	U	U	50	-	8260C
tert-Butyl alcohol					*CAS #*	*75-65-0*		
Second Quarter 2013	U	U	U	U	U	200	-	8260C
n-Butylbenzene					*CAS #*	*104-51-8*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
sec-Butylbenzene					*CAS #*	*135-98-8*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
tert-Butylbenzene					*CAS #*	*98-06-6*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
Butyl benzyl phthalate					*CAS #*	*85-68-7*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Carbon disulfide					*CAS #*	*75-15-0*		
Second Quarter 2013	U	U	U	U	U	10	-	8260C
Carbon tetrachloride					*CAS #*	*56-23-5*		
Second Quarter 2013	U	U	U	U	U	1	5	8260C
Fourth Quarter 2013	U	U	U	U	U	1	5	8260C
Chlordane					*CAS #*	*57-74-9*		
Second Quarter 2013	U	U	U	U	U	0.8	-	8081B
p-Chloroaniline					*CAS #*	*106-47-8*		
Second Quarter 2013	U	U	U	U	U	10	-	8270D
Chlorobenzene					*CAS #*	*108-90-7*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
Chlorobenzilate					*CAS #*	*510-15-6*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
p-Chloro-m-cresol					*CAS #*	*59-50-7*		
Second Quarter 2013	U	U	U	U	U	10	-	8270D
Chloroethane					*CAS #*	*75-00-3*		
Second Quarter 2013	5	U	2.4	0.7 J	U	1	1293.39	8260C
Fourth Quarter 2013	4.9	U	2.9	1	U	1	1293.39	8260C
Chloroform					*CAS #*	*67-66-3*		
Second Quarter 2013	U	U	U	U	U	1	80	8260C
2-Chloroethyl vinyl ether					*CAS #*	*110-75-8*		
Second Quarter 2013	U J	U J	U J	U J	U J	20	-	8260C
2-Chloronaphthalene					*CAS #*	*91-58-7*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
2-Chlorophenol					*CAS #*	*95-57-8*		
Second Quarter 2013	U	U	U	U	U	10	-	8270D
4-Chlorophenyl phenyl ether					*CAS #*	*7005-72-3*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Chloroprene					*CAS #*	*126-99-8*		
Second Quarter 2013	U	U	U	U	U	10	-	8260C
2-Chlorotoluene					*CAS #*	*95-49-8*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
4-Chlorotoluene					*CAS #*	*106-43-4*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 — *All Results in ug/L.*

Analtye/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	QL	GPS	Method
Chrysene					*CAS #*	*218-01-9*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Cyclohexane					*CAS #*			
Second Quarter 2013	U	U	U	U	U	1	-	8260C
2,4-Dichlorophenoxyacetic acid					*CAS #*	*94-75-7*		
Second Quarter 2013	U	U	U	U	U	5	-	8151A
4,4'-DDD					*CAS #*	*72-54-8*		
Second Quarter 2013	U	U	U	U	U	0.05	-	8081B
4,4'-DDE					*CAS #*	*72-55-9*		
Second Quarter 2013	U	U	U	U	U	0.05	-	8081B
4,4'-DDT					*CAS #*	*50-29-3*		
Second Quarter 2013	U	U	U	U	U	0.05	-	8081B
Diallate					*CAS #*	*2303-16-4*		
Second Quarter 2013	U	U	U	U	U	10	-	8270D
Dibenz(a,h)anthracene					*CAS #*	*53-70-3*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Dibenzofuran					*CAS #*	*132-64-9*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Dibromochloromethane					*CAS #*	*124-48-1*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
1,2-Dibromo-3-chloropropane					*CAS #*	*96-12-8*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
1,2-Dibromoethane					*CAS #*	*106-93-4*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
Di-n-butyl phthalate					*CAS #*	*84-74-2*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
1,2-Dichlorobenzene					*CAS #*	*95-50-1*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
1,3-Dichlorobenzene					*CAS #*	*541-73-1*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
1,4-Dichlorobenzene					*CAS #*	*106-46-7*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
3,3'-Dichlorobenzidine					*CAS #*	*91-94-1*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
trans-1,4-Dichloro-2-butene					*CAS #*	*110-57-6*		
Second Quarter 2013	U J	U J	U J	U	U	10	-	8260C
Dichlorodifluoromethane					*CAS #*	*75-71-8*		
Second Quarter 2013	0.3 J	U J	U J	U J	U J	1	142.3	8260C
Fourth Quarter 2013	U J	U J	U J	U J	U J	1	142.3	8260C
1,1-Dichloroethane					*CAS #*	*75-34-3*		
Second Quarter 2013	8.6	0.3 J	8	2.3	0.2 J	1	9.5	8260C
Fourth Quarter 2013	8.9	U	8.8	3.1	U	1	9.5	8260C
1,2-Dichloroethane					*CAS #*	*107-06-2*		
Second Quarter 2013	U J	U J	U J	U	U	1	5	8260C
1,1-Dichloroethene					*CAS #*	*75-35-4*		
Second Quarter 2013	0.4 J	U	U	U	U	1	-	8260C
trans-1,2-Dichloroethene					*CAS #*	*156-60-5*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
2,4-Dichlorophenol					*CAS #*	*120-83-2*		
Second Quarter 2013	U	U	U	U	U	10	-	8270D
2,6-Dichlorophenol					*CAS #*	*87-65-0*		
Second Quarter 2013	U	U	U	U	U	10	-	8270D
1,2-Dichloropropane					*CAS #*	*78-87-5*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
1,3-Dichloropropane					*CAS #*	*142-28-9*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 *All Results in ug/L.*

Analtye/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	QL	GPS	Method
2,2-Dichloropropane					*CAS #*	*594-20-7*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
1,1-Dichloropropene					*CAS #*	*563-58-6*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
cis-1,3-Dichloropropene					*CAS #*	*10061-01-5*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
trans-1,3-Dichloropropene					*CAS #*	*10061-02-6*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
Dieldrin					*CAS #*	*60-57-1*		
Second Quarter 2013	U	U	U	U	U	0.05	-	8081B
Diethyl ether					*CAS #*	*60-29-7*		
Second Quarter 2013	48 J	8.3 J	39 J	11 J	1.5 J	13	7300	8260C
Fourth Quarter 2013	39	U	48	13	U	12.5	7300	8260C
Diethyl phthalate					*CAS #*	*84-66-2*		
Second Quarter 2013	U	U	0.62 J	U	U	5	11000	8270D
Fourth Quarter 2013	U	U	U	U	U	5	11000	8270D
O,O-Diethyl O-2-pyrazinyl					*CAS #*	*297-97-2*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Dimethoate					*CAS #*	*60-51-5*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Dimethyl ether					*CAS #*	*115-10-6*		
Second Quarter 2013	U N	U N	U N	U N	U N	13	17	8260C
Fourth Quarter 2013	U	U	U	U	U	12.5	17	8260C
p-(Dimethylamino)azobenzene					*CAS #*	*60-11-7*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
7,12-Dimethylbenz[a]anthracene					*CAS #*	*57-97-6*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
3,3'-Dimethylbenzidine					*CAS #*	*119-93-7*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
a,a-Dimethylphenethylamine					*CAS #*	*122-09-8*		
Second Quarter 2013	U J	U J	U J	U J	U J	15	-	8270D
2,4-Dimethylphenol					*CAS #*	*105-67-9*		
Second Quarter 2013	U J	U J	U J	U J	U J	10	-	8270D
Dimethyl phthalate					*CAS #*	*131-11-3*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
m-Dinitrobenzene					*CAS #*	*99-65-0*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
4,6-Dinitro-o-cresol					*CAS #*	*534-52-1*		
Second Quarter 2013	U J	U J	U J	U J	U J	10	-	8270D
2,4-Dinitrophenol					*CAS #*	*51-28-5*		
Second Quarter 2013	U	U	U	U	U	10	-	8270D
2,4-Dinitrotoluene					*CAS #*	*121-14-2*		
Second Quarter 2013	U	U	U	U	U	10	31.3	8270D
Fourth Quarter 2013	U	U	U	U	U	10	31.3	8270D
2,6-Dinitrotoluene					*CAS #*	*606-20-2*		
Second Quarter 2013	U	U	U	U	U	10	15.65	8270D
Fourth Quarter 2013	U	U	U	U	U	10	15.65	8270D
Dinoseb					*CAS #*	*88-85-7*		
Second Quarter 2013	U J	U J	U J	U J	U J	2.5	-	8151A
Di-n-octyl phthalate					*CAS #*	*117-84-0*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
1,4-Dioxane					*CAS #*	*123-91-1*		
Second Quarter 2013	U	U	U	U J	U J	200	-	8260C
Diphenylamine					*CAS #*	*122-39-4*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Disulfoton					*CAS #*	*298-04-4*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 ***All Results in ug/L.***

Analtye/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*QL*	*GPS*	*Method*
Endosulfan I					*CAS #*	*959-98-8*		
Second Quarter 2013	U	U	U	U	U	0.025	-	8081B
Endosulfan II					*CAS #*	*33213-65-9*		
Second Quarter 2013	U	U	U	U	U	0.05	-	8081B
Endosulfan sulfate					*CAS #*	*1031-07-8*		
Second Quarter 2013	U	U	U	U	U	0.05	-	8081B
Endrin					*CAS #*	*72-20-8*		
Second Quarter 2013	U	U	U	U	U	0.05	-	8081B
Ethyl acetate					*CAS #*	*141-78-6*		
Second Quarter 2013	U J	U J	U J	U J	U J	10	-	8260C
Endrin aldehyde					*CAS #*	*7421-93-4*		
Second Quarter 2013	U	U	U	U	U	0.05	-	8081B
Ethanol					*CAS #*	*64-17-5*		
Second Quarter 2013	U	U	U	U	U	250	-	8260C
Ethylbenzene					*CAS #*	*100-41-4*		
Second Quarter 2013	U	U	U	U	U	1	700	8260C
Fourth Quarter 2013	U	U	U	U	U	1	700	8260C
Ethyl methacrylate					*CAS #*	*97-63-2*		
Second Quarter 2013	U	U	U	U	U	10	-	8260C
Ethyl methanesulfonate					*CAS #*	*62-50-0*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Ethylene oxide					*CAS #*	*75-21-8*		
Second Quarter 2013	U J	U J	U J	U J	U J	100	-	8260B
Famphur					*CAS #*	*52-85-7*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Fluoranthene					*CAS #*	*206-44-0*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Fluorene					*CAS #*	*86-73-7*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Heptachlor					*CAS #*	*76-44-8*		
Second Quarter 2013	0.0029J	U	U	U	U	0.025	-	8081B
Heptachlor epoxide					*CAS #*	*1024-57-3*		
Second Quarter 2013	U	U	U	U	U	0.025	-	8081B
Hexachlorobenzene					*CAS #*	*118-74-1*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Hexachlorobutadiene					*CAS #*	*87-68-3*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
Hexachlorocyclopentadiene					*CAS #*	*77-47-4*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Hexachloroethane					*CAS #*	*67-72-1*		
Second Quarter 2013	U	U	U	U	U	10	-	8260C
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Hexachlorophene					*CAS #*	*70-30-4*		
Second Quarter 2013	U J	U J	U J	U J	U J	100	-	8270D
Hexachloropropene					*CAS #*	*1888-71-7*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
2-Hexanone					*CAS #*	*591-78-6*		
Second Quarter 2013	U J	U J	U J	U	U	10	-	8260C
Indeno[1,2,3-cd]pyrene					*CAS #*	*193-39-5*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Isobutyl alcohol					*CAS #*	*78-83-1*		
Second Quarter 2013	U	U	U	U	U	200	-	8260C
Isodrin					*CAS #*	*465-73-6*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Isophorone					*CAS #*	*78-59-1*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 All Results in ug/L.

Analtye/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	QL	GPS	Method
Isopropylbenzene					*CAS #*	*98-82-8*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
Isopropylether					*CAS #*	*108-20-3*		
Second Quarter 2013	U	U	U	U	U	10	-	8260C
4-Isopropyltoluene					*CAS #*	*99-87-6*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
Isosafrole					*CAS #*	*120-58-1*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Kepone					*CAS #*	*143-50-0*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Methacrylonitrile					*CAS #*	*126-98-7*		
Second Quarter 2013	U	U	U	U	U	100	-	8260C
Methapyrilene					*CAS #*	*91-80-5*		
Second Quarter 2013	U J	U J	U J	U J	U J	5	-	8270D
Methoxychlor					*CAS #*	*72-43-5*		
Second Quarter 2013	U	U	U	U	U	0.25	-	8081B
Bromomethane					*CAS #*	*74-83-9*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
Chloromethane					*CAS #*	*74-87-3*		
Second Quarter 2013	U	U	U	U	U	1	1.4	8260C
Fourth Quarter 2013	U	U	U	U	U	1	1.4	8260C
3-Methylcholanthrene					*CAS #*	*56-49-5*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Iodomethane					*CAS #*	*74-88-4*		
Second Quarter 2013	U	U	U	U	U	10	-	8260C
Methyl methacrylate					*CAS #*	*80-62-6*		
Second Quarter 2013	U	U	U	U	U	10	-	8260C
Methyl methane sulfonate					*CAS #*	*66-27-3*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
2-Methylnaphthalene					*CAS #*	*91-57-6*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Methyl parathion					*CAS #*	*298-00-0*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
4-Methyl-2-pentanone					*CAS #*	*108-10-1*		
Second Quarter 2013	U	U	U	U	U	10	-	8260C
2-Methylphenol					*CAS #*	*95-48-7*		
Second Quarter 2013	U	U	U	U	U	10	-	8270D
3 & 4-Methylphenol					*CAS #*	*m 108-39-4*	*p 106-44-5*	
Second Quarter 2013	U	U	U	U	U	10	-	8270D
Methyl tert-butyl ether					*CAS #*	*1634-04-4*		
Second Quarter 2013	U	U	U	U	U	10	-	8260C
Dibromomethane					*CAS #*	*74-95-3*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
Methylene chloride					*CAS #*	*75-09-2*		
Second Quarter 2013	4.7	U	U	U	U	1	13.95	8260C
Fourth Quarter 2013	4.2	U	U	U	U	1	13.95	8260C
Naphthalene					*CAS #*	*91-20-3*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
1,4-Naphthoquinone					*CAS #*	*130-15-4*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
1-Naphthylamine					*CAS #*	*134-32-7*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
2-Naphthylamine					*CAS #*	*91-59-8*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
o-Nitroaniline					*CAS #*	*88-74-4*		
Second Quarter 2013	U	U	U	U	U	10	-	8270D

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 ***All Results in ug/L.***

Analtye/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*QL*	*GPS*	*Method*
m-Nitroaniline					*CAS #*	*99-09-2*		
Second Quarter 2013	U	U	U	U	U	10	-	8270D
p-Nitroaniline					*CAS #*	*100-01-6*		
Second Quarter 2013	U	U	U	U	U	10	-	8270D
Nitrobenzene					*CAS #*	*98-95-3*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
o-Nitrophenol					*CAS #*	*88-75-5*		
Second Quarter 2013	U	U	U	U	U	10	-	8270D
p-Nitrophenol					*CAS #*	*100-02-7*		
Second Quarter 2013	U	U	U	U	U	10	-	8270D
4-Nitroquinoline-1-oxide					*CAS #*	*56-57-5*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
N-Nitrosodi-n-butylamine					*CAS #*	*924-16-3*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
N-Nitrosodiethylamine					*CAS #*	*55-18-5*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
N-Nitrosodimethylamine					*CAS #*	*62-75-9*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
N-Nitrosodiphenylamine					*CAS #*	*86-30-6*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
N-Nitrosodipropylamine					*CAS #*	*621-64-7*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
N-Nitrosomethylethylamine					*CAS #*	*10595-95-6*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
N-Nitrosomorpholine					*CAS #*	*59-89-2*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
N-Nitrosopiperidine					*CAS #*	*100-75-4*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
N-Nitrosopyrrolidine					*CAS #*	*930-55-2*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
5-Nitroso-o-toluidine					*CAS #*	*99-55-8*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Parathion					*CAS #*	*56-38-2*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Pentachlorobenzene					*CAS #*	*608-93-5*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Pentachloroethane					*CAS #*	*76-01-7*		
Second Quarter 2013	U	U	U	U	U	10	-	8260C
Pentachloronitrobenzene					*CAS #*	*82-68-8*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Pentachlorophenol					*CAS #*	*87-86-5*		
Second Quarter 2013	U	U	U	U	U	10	-	8270D
Phenacetin					*CAS #*	*62-44-2*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Phenanthrene					*CAS #*	*85-01-8*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Phenol					*CAS #*	*108-95-2*		
Second Quarter 2013	U	U	U	U	U	10	-	8270D
Total Recoverable Phenolics					*CAS #*			
Second Quarter 2013	U	U	U	U	U	40	-	9066
Phorate					*CAS #*	*298-02-2*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
2-Picoline					*CAS #*	*931-19-1*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Pronamide					*CAS #*	*23950-58-5*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 All Results in ug/L.

Analtye/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	QL	GPS	Method
1-Propanol					*CAS #*	*71-23-8*		
Second Quarter 2013	U J	U J	U J	U J	U J	100	-	8260B
2-Propanol					*CAS #*	*67-63-0*		
Second Quarter 2013	U	U	U	U	U	100	-	8260C
Propionitrile					*CAS #*	*107-12-0*		
Second Quarter 2013	U	U	U	U	U	100	-	8260C
n-Propylbenzene					*CAS #*	*103-65-1*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
Pyrene					*CAS #*	*129-00-0*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Pyridine					*CAS #*	*110-86-1*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Safrole					*CAS #*	*94-59-7*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Silvex					*CAS #*	*93-72-1*		
Second Quarter 2013	U	U	U	U	U	1	-	8151A
Styrene					*CAS #*	*100-42-5*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
Sulfotep					*CAS #*	*3689-24-5*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
2,4,5-Trichlorophenoxyacetic acid					*CAS #*	*93-76-5*		
Second Quarter 2013	U	U	U	U	U	1	-	8151A
1,2,4,5-Tetrachlorobenzene					*CAS #*	*95-94-3*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
1,1,1,2-Tetrachloroethane					*CAS #*	*630-20-6*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
1,1,2,2-Tetrachloroethane					*CAS #*	*79-34-5*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
Tetrachloroethene					*CAS #*	*127-18-4*		
Second Quarter 2013	0.4 J	U	U	U	U	1	5	8260C
Fourth Quarter 2013	U	U	U	U	U	1	5	8260C
Tetrahydrofuran					*CAS #*	*109-99-9*		
Second Quarter 2013	18 J	U	U	U	U	25	-	8260C
2,3,4,6-Tetrachlorophenol					*CAS #*	*58-90-2*		
Second Quarter 2013	U	U	U	U	U	10	-	8270D
Toluene					*CAS #*	*108-88-3*		
Second Quarter 2013	U	U	U	U	U	1	1000	8260C
Fourth Quarter 2013	U	U	U	U	U	1	1000	8260C
o-Toluidine					*CAS #*	*95-53-4*		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Toxaphene					*CAS #*	*8001-35-2*		
Second Quarter 2013	U	U	U	U	U	2.5	-	8081B
1,2,3-Trichlorobenzene					*CAS #*	*87-61-6*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
1,2,4-Trichlorobenzene					*CAS #*	*120-82-1*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
1,1,1-Trichloroethane					*CAS #*	*71-55-6*		
Second Quarter 2013	0.8 J	U	U	U	U	1	200	8260C
Fourth Quarter 2013	U	U	U	U	U	1	200	8260C
1,1,2-Trichloroethane					*CAS #*	*79-00-5*		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
Trichloroethene					*CAS #*	*79-01-6*		
Second Quarter 2013	0.3 J	U	U	U	U	1	5	8260C
Fourth Quarter 2013	U	U	U	U	U	1	5	8260C
Trichlorofluoromethane					*CAS #*	*75-69-4*		
Second Quarter 2013	U	U	U	U	U	1	469.5	8260C
Fourth Quarter 2013	U	U	U	U	U	1	469.5	8260C

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 All Results in ug/L.

Analtye/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	QL	GPS	Method
2,4,5-Trichlorophenol					CAS #	95-95-4		
Second Quarter 2013	U	U	U	U	U	10	-	8270D
2,4,6-Trichlorophenol					CAS #	88-06-2		
Second Quarter 2013	U	U	U	U	U	10	-	8270D
1,2,3-Trichloropropane					CAS #	96-18-4		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
1,1,2-Trichloro-1,2,2-Trifluoroethane					CAS #	76-13-1		
Second Quarter 2013	U	U	U	U	U	1	59000	8260C
Fourth Quarter 2013	U	U	U	U	U	1	59000	8260C
O,O,O-Triethyl phosphorothioate					CAS #	126-68-1		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
1,2,4-Trimethylbenzene					CAS #	95-63-6		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
1,3,5-Trimethylbenzene					CAS #	108-67-8		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
sym-Trinitrobenzene					CAS #	99-35-4		
Second Quarter 2013	U	U	U	U	U	5	-	8270D
Vinyl acetate					CAS #	108-05-4		
Second Quarter 2013	U	U	U	U	U	10	-	8260C
Vinyl chloride					CAS #	75-01-4		
Second Quarter 2013	U	U	U	U	U	1	-	8260C
Xylenes (Total)					CAS #	1330-20-7		
Second Quarter 2013	U	U	U	U	U	3	10000	8260C
Fourth Quarter 2013	U	U	U	U	U	3	10000	8260C

Analtye/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*QL*	*GPS*	*Method*

Definitions:

The following definitions apply to results reported for Appendix IX monitoring events.
All Appendix IX monitoring results for compliance wells are reported to the detection limit.

Appendix IX Monitoring Events: 3Q2003, 2Q-2004, 2Q-2005, 3Q2006, 2Q2007, 2Q2008, 2Q2009, 2Q 2010, 2Q 2011, 2Q 2012, 2Q2013

QL Denotes permit required quantitation limit.
U denotes not detected at or above the detection limit.
UA denotes not detected at or above the adjusted detection limit.
J Denotes result is estimated. When used with "U" (i.e., “UJ”), denotes analyte not detected at or above the detection limit and detection limit and QL are estimated. When used with "UA" (i.e., “UAJ”), denotes analyte not detected at or above adjusted detection limit and adjusted detection limit and QL are estimated.
UN Denotes analyte concentration is less than the quantitation limit and/or five times the blank concentration. Not reliably detected due to blank contamination. This qualifier used only for Appendix IX monitoring event when compliance well results are reported to at or above the project detection limit.
R Denotes result rejected.
Q Denotes data validation qualifier. **X** Denotes mass spectral confirmation not obtained-result suspect.
Background Denotes background concentrations listed in Appendix F to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002), where applicable.
CAS# Denotes Chemical Abstract Services registration number.
GPS Denotes Groundwater Protection Standards listed in Appendix G to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002) (revised September 27, 2011).
NS denotes not sampled. **NA** denotes not analyzed.
“–“ denotes not detected (pre-2nd Quarter 2003) or not available / not sampled (beginning 2nd Quarter 2003).

The following definitions apply to results reported for non-Appendix IX monitoring events.
All non-Appendix IX monitoring results for compliance wells are reported at or above the quantitation limit.

QL Denotes permit required quantitation limit.
U Denotes analyte not detected at or above QL.
UA Denotes analyte not detected at or above adjusted sample QL.
J Denotes result is estimated. When used with "U" (i.e., “**UJ**”), denotes analyte not detected at or above QL and QL is estimated. When used with "UA" (i.e., “**UAJ**”), denotes analyte not detected at or above adjusted QL and adjusted QL is estimated.
R Denotes result rejected.
Q Denotes data validation qualifier.
Background Denotes background concentrations listed in Appendix F to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002), (revised September 27, 2011), where applicable.
CAS# Denotes Chemical Abstract Services registration number.
GPS Denotes Groundwater Protection Standards listed in Appendix G to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002) (revised September 27, 2011).

NOTE:

Fourth Quarter 2008:
Due to laboratory error all HWMU 16 samples were analyzed using Method 8260B 5 ml purge instead of a 25 ml purge which resulted in a higher QL. For these samples, all results were evaluated to the detection limit, which is comparable to the permit QL. Results below the laboratory QL but at or above the permit QL are reported and qualified as estimated.
Second Quarter 2009:
Verification event 6/11/2009 - 16MW8 for acetone. Verification result reported as not detected.
4/ 2010 event -Per DEQ, tin analyzed by Method 6010B instead of Method 6020. Verification event: 16MW9 1,1-dichloroethene and benzene. 16WC1B 4,4-DDD. Verification result reported as not detected.
Verification event 6/27/2012 – 16WC1A for cobalt. Verification result reported.

Comprehensive Data Validation Report

Sample/Blind Field Duplicate Results Greater Than the Quantitation Limit

Facility: HWMU-16 Monitoring Event: Fourth Quarter 2013

Analyte	Sample ID	Laboratory Result (ug/L)	Q	Validated Result (ug/L)	Q	QL (ug/L)	Validation Notes
Method: 6020A							
Laboratory: CompuChem, a Division of Liberty Analytical, Cary, NC							
Barium	16WC1A	262		262		10	No action taken.
	16WDUP	263		263		10	No action taken. Field duplicate of 16WC1A. RPD <10.
Method: 8260C							
Laboratory: Eurofins Lancaster Laboratories Environmental, Lancaster, PA							
Chloroethane	16WC1A	1		1		1	No action taken.
	16WDUP	1		1		1	No action taken. Field duplicate of 16WC1A. RPD <10.
1,1-Dichloroethane	16WC1A	3.1		3.1		1	No action taken.
	16WDUP	3.2		3.2		1	No action taken. Field duplicate of 16WC1A. RPD <10.
Diethyl ether	16WC1A	13		13		12.5	No action taken.
	16WDUP	14		14		12.5	No action taken. Field duplicate of 16WC1A. RPD <10.

Definitions:

Data Validation Qualifiers:

QL Denotes permit quantitation limit. **Q** Denotes data qualifier.

J Denotes analyte reported at or above quantitation limit and associated result is estimated.

Comprehensive Data Validation Report

Sample/Blind Field Duplicate Results Greater Than the Quantitation Limit

Facility: HWMU-16 Monitoring Event: Second Quarter 2013

Analyte	Sample ID	Laboratory Result (ug/L)	Q	Validated Result (ug/L)	Q	QL (ug/L)	Validation Notes
Method: 6020A							
Laboratory: CompuChem, a Division of Liberty Analytical, Cary, NC							
Barium	16WC1A	263		263		10	No action taken.
	16WDUP	278		278		10	No action taken. Field duplicate of 16C1A. RPD <10.
Method: 8260C							
Laboratory: Eurofins Lancaster, Lancaster, PA							
1,1-Dichloroethane	16WC1A	2.3		2.3		1	No action taken.
	16WDUP	2.5		2.5		1	No action taken. Field duplicate of 16C1A. RPD <10.

Definitions:

Data Validation Qualifiers:

QL Denotes permit quantitation limit. Q Denotes data qualifier.

J Denotes analyte reported at or above quantitation limit and associated result is estimated.

APPENDIX C-3

HWMU-16 2013 LABORATORY ANALYTICAL RESULTS PLUME MONITORING WELLS

Target Analyte Monitoring Results At Or Above Permit Quantitation Limit
HWMU-16 Plume Monitoring Wells

Radford Army Ammunition Plant, Radford, Virginia

All Results in ug/L.

Upgradient well = 16C1

Analtye/Quarter	*16C1*	*Q*	*16-1*	*Q*	*16-2*	*Q*	*16-3*	*Q*	*16-5*	*Q*	*16WC2B*	*Q*	*16SPRING*	*Q*	*QL*	*Background*	*Method*
Arsenic											*CAS # 7440-38-2*						
Second Quarter 2013	U		U		U		U		U		U		U		10	1	6020A
Fourth Quarter 2013	U		U		U		U		U		U		U		10	1	6020A
Barium											*CAS # 7440-39-3*						
Second Quarter 2013	194		220		240		728		165		114		234		10	175.4	6020A
Fourth Quarter 2013	171		167		232		763		174		117		208		10	175.4	6020A
Beryllium											*CAS # 7440-41-7*						
Second Quarter 2013	U		U		U		U		U		U		U		1	0.7	6020A
Fourth Quarter 2013	U		U		U		U		U		U		U		1	0.7	6020A
Cadmium											*CAS # 7440-43-9*						
Second Quarter 2013	U		U		U		U		U		U		U		1	0.2	6020A
Fourth Quarter 2013	U		U		U		U		U		U		U		1	0.2	6020A
Chromium											*CAS # 7440-47-3*						
Second Quarter 2013	U		U		U		U		U		U		U		5	6.2	6020A
Fourth Quarter 2013	U		U		U		U		U		U		U		5	6.2	6020A
Cobalt											*CAS # 7440-48-4*						
Second Quarter 2013	U		U		U		U		U		U		U		5	5	6020A
Fourth Quarter 2013	U		U		U		U		U		U		U		5	5	6020A
Copper											*CAS # 7440-50-8*						
Second Quarter 2013	U		U		U		U		U		U		U		5	13	6020A
Fourth Quarter 2013	U		U		U		U		U		U		U		5	13	6020A
Lead											*CAS # 7439-92-1*						
Second Quarter 2013	U		U		U		U		U		U		U		1	10	6020A
Fourth Quarter 2013	U		U		U		U		U		U		U		1	10	6020A
Mercury											*CAS # 7439-97-6*						
Second Quarter 2013	U		U		U		U		U		U		U		2	0.2	7470A
Fourth Quarter 2013	U	J	U	J	U	J	U	J	U	J	U	J	U	J	2	0.2	7470A
Nickel											*CAS # 7440-02-0*						
Second Quarter 2013	3.25	J	U		U		U		U		U		U		10	16	6020A
Fourth Quarter 2013	U		U		U		U		U		U		U		10	16	6020A
Vanadium											*CAS # 7440-62-2*						
Second Quarter 2013	U		U		U		U		U		U		U		10	151	6020A
Fourth Quarter 2013	U		U		U		U		U		U		U		10	151	6020A
Zinc											*CAS # 7440-66-6*						
Second Quarter 2013	U		U		U		U		U		U		U		10	51	6020A
Fourth Quarter 2013	U		U		U		U		U		U		U		10	51	6020A
Benzene											*CAS # 71-43-2*						
Second Quarter 2013	0.3	J	U		U		U		U		U		U		1	1	8260C
Fourth Quarter 2013	U		U		U		U		U		U		U		1	1	8260C
2-Butanone											*CAS # 78-93-3*						
Second Quarter 2013	U		U		U		U		U		U		U		10	1.1	8260C
Fourth Quarter 2013	U		U		U		U		U		U		U		10	1.1	8260C
Carbon tetrachloride											*CAS # 56-23-5*						
Second Quarter 2013	U		U		U		U		U		U		U		1	0.2	8260C
Fourth Quarter 2013	U		U		U		U		U		U		U		1	0.2	8260C
Chloroethane											*CAS # 75-00-3*						
Second Quarter 2013	5		U		U		U		U		U		U		1	20.7	8260C
Fourth Quarter 2013	4.9		U		U		U		U		U		U		1	20.7	8260C

See last page of this report for definitions.

Target Analyte Monitoring Results At Or Above Permit Quantitation Limit
HWMU-16 Plume Monitoring Wells

Radford Army Ammunition Plant, Radford, Virginia

All Results in ug/L.

Upgradient well = 16C1

Analtye/Quarter	*16C1*	*Q*	*16-1*	*Q*	*16-2*	*Q*	*16-3*	*Q*	*16-5*	*Q*	*16WC2B*	*Q*	*16SPRING*	*Q*	*QL*	*Background*	*Method*
Dichlorodifluoromethane											*CAS # 75-71-8*						
Second Quarter 2013	0.3	J	U	J	U	J	U	J	U	J	U	J	U	J	1	46.5	8260C
Fourth Quarter 2013	U	J	U	J	U	J	U	J	U	J	U	J	U	J	1	46.5	8260C
1,1-Dichloroethane											*CAS # 75-34-3*						
Second Quarter 2013	8.6		U		U		U		U		U		U		1	9.5	8260C
Fourth Quarter 2013	8.9		U		U		U		U		U		U		1	9.5	8260C
Diethyl ether											*CAS # 60-29-7*						
Second Quarter 2013	48	J	U	J	U	J	U	J	U	J	U	J	U	J	13	75.5	8260C
Fourth Quarter 2013	39		U		U		U		U		U		U		12.5	75.5	8260C
Diethyl phthalate											*CAS # 84-66-2*						
Second Quarter 2013	U		-		-		-		-		-		-		5	5	8270D
Fourth Quarter 2013	U		U		U		U		U		U		U		5	5	8270D
Dimethyl ether											*CAS # 115-10-6*						
Second Quarter 2013	U	N	U		U		U		U		U		U		13	17.0	8260C
Fourth Quarter 2013	U		U		U		U		U		U		U		12.5	17.0	8260C
2,4-Dinitrotoluene											*CAS # 121-14-2*						
Second Quarter 2013	U		U		U		U		U		U		U		10	10	8270D
Fourth Quarter 2013	U		U		U		U		U		U		U		10	10	8270D
2,6-Dinitrotoluene											*CAS # 606-20-2*						
Second Quarter 2013	U		U		U		U		U		U		U		10	10	8270D
Fourth Quarter 2013	U		U		U		U		U		U		U		10	10	8270D
Ethylbenzene											*CAS # 100-41-4*						
Second Quarter 2013	U		U		U		U		U		U		U		1	0.1	8260C
Fourth Quarter 2013	U		U		U		U		U		U		U		1	0.1	8260C
Chloromethane											*CAS # 74-87-3*						
Second Quarter 2013	U		U		U		U		U		U		U		1	0.3	8260C
Fourth Quarter 2013	U		U		U		U		U		U		U		1	0.3	8260C
Methylene chloride											*CAS # 75-09-2*						
Second Quarter 2013	4.7		U		U		U		U		U		U		1	13.95	8260C
Fourth Quarter 2013	4.2		U		U		U		U		U		U		1	13.95	8260C
Tetrachloroethene											*CAS # 127-18-4*						
Second Quarter 2013	0.4	J	U		U		U		U		U		U		1	0.7	8260C
Fourth Quarter 2013	U		U		U		U		U		U		U		1	0.7	8260C
Toluene											*CAS # 108-88-3*						
Second Quarter 2013	U		U		U		U		U		U		U		1	0.1	8260C
Fourth Quarter 2013	U		U		U		U		U		U		U		1	0.1	8260C
1,1,1-Trichloroethane											*CAS # 71-55-6*						
Second Quarter 2013	0.8	J	U		U		U		U		U		U		1	9.2	8260C
Fourth Quarter 2013	U		U		U		U		U		U		U		1	9.2	8260C
Trichloroethene											*CAS # 79-01-6*						
Second Quarter 2013	0.3	J	U		U		U		U		U		U		1	0.1	8260C
Fourth Quarter 2013	U		U		U		U		U		U		U		1	0.1	8260C
Trichlorofluoromethane											*CAS # 75-69-4*						
Second Quarter 2013	U		U		U		U		U		U		U		1	11.3	8260C
Fourth Quarter 2013	U		U		U		U		U		U		U		1	11.3	8260C
1,1,2-Trichloro-1,2,2-Trifluoroethane											*CAS # 76-13-1*						
Second Quarter 2013	U		U		U		U		U		U		U		1	1.2	8260C
Fourth Quarter 2013	U		U		U		U		U		U		U		1	1.2	8260C

See last page of this report for definitions.

Target Analyte Monitoring Results At Or Above Permit Quantitation Limit
HWMU-16 Plume Monitoring Wells

Radford Army Ammunition Plant, Radford, Virginia

All Results in ug/L.

Upgradient well = 16C1

Analtye/Quarter	*16C1 Q*	*16-1 Q*	*16-2 Q*	*16-3 Q*	*16-5 Q*	*16WC2B Q*	*16SPRING Q*	*QL*	*Background*	*Method*
Xylenes (Total)						*CAS # 1330-20-7*				
Second Quarter 2013	U	U	U	U	U	U	U	3	0.2	8260C
Fourth Quarter 2013	U	U	U	U	U	U	U	3	0.2	8260C

Definitions:

All plume monitoring well results reported to at or above the permit quantitation limit except for the upgradient well during the Appendix IX monitoring Event. During this event, results for the upgradient well are reported to the detection limit.

Q Denotes data validation qualifier.
QL Denotes permit required quantitation limit.
U Denotes analyte not detected at or above QL.
UA Denotes analyte not detected at or above adjusted sample QL.
J Denotes result is estimated. When used with "U" (i.e., "**UJ**"), denotes analyte not detected at or above QL and QL is estimated. When used with "UA" (i.e., "**UAJ**"), denotes analyte not detected at or above adjusted QL and adjusted QL is estimated.
UN Denotes analyte concentration is less than the quantiation limit and five times the blank concentration. Not reliably detected due to blank contamination. This qualifier used only for Appendix IX monitoring event when compliance well results are reported to at or above the project detection limit.
R Denotes result rejected.
Background Denotes background concentrations listed in Appendix F to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002), revised September 27, 2011.
CAS# Denotes Chemical Abstract Services registration number.
GPS Denotes groundwater protection standard.

NS denotes not sampled. **NA** denotes not analyzed. "–"denotes not detected (pre-2nd Quarter 2003) or not available / not sampled (beginning 2nd Quarter 2003).

Notes:
4Q2004. No data for 16-1 8270C-semivolatiles. Well dry-insufficient sample volume.
4Q2006 - No data for 16-1; well dry.
4Q2008- No data for 16-1; well dry.
2Q2009- No data for 16-1; well dry.

NOTE:
Fourth Quarter 2008
Due to laboratory error all HWMU 16 samples were analyzed using Method 8260B 5 ml purge instead of a 25 ml purge which resulted in a higher QL. For these samples, all results were evaluated to the detection limit, which is comparable to the permit QL. Results below the laboratory QL but at or above the permit QL are reported and qualified as estimated.

APPENDIX C-4

ESTABLISHED BACKGROUND VALUES AND COMPUTATIONS FOR HWMU-16

- It was not understood why the majority of fluorescein detections were considered false positive detections. The basis of this observation is unclear considering a lack of background and laboratory confirmation results.

- It was not apparent why certain samples were selected for laboratory confirmation and others were not. There was no apparent consistency in the selection of samples for laboratory confirmation.

- Samples were submitted for confirmation laboratory analyses three months or more following the collection of the samples in the field. No information was provided regarding the custody and/or storage of the samples. The samples were submitted to the analytical laboratory with incomplete chain-of-custody (COC), and the COC documentation was not completed by the laboratory.

In summary, the data from the study do not provide the basis for meaningful interpretation. Any attempt to formulate conclusions from the data as presented regarding the presence of preferred or predominant groundwater flow patterns is not warranted or recommended.

3.3 HWMU-16 GROUNDWATER MONITORING ANALYTE LIST

The groundwater monitoring analyte list for HWMU-16 is presented **in Table 1 (Appendix B)**. The list represents the subset of the constituents listed in Appendix III of 40 CFR Part 261 that previously have been detected in the groundwater and/or that are reasonably expected to be in or derived from waste contained in HWMU-16. As discussed in Section 3.5.2 below, 12 inorganic constituents and two explosive/propellant constituents have been detected in the groundwater monitoring network for HWMU-16 at statistically significant concentrations above the Unit's calculated background concentrations. The inorganic constituents may be derived from the aquifer formation materials; however, the two explosive/propellant constituents (2,4-Dinitrotoluene and 2,6-Dinitrotoluene) are byproducts of wastes derived from explosives. Therefore, the two explosive/propellant constituents detected could only be from HWMU-16.

The concentration limits established for the hazardous constituents also are listed in **Table 1**. The concentration limits represent either background concentrations calculated for the constituents in this GWQAR, Maximum Concentrations of Constituents for Ground-water Protection listed in Table 1 of 40 CFR 264.94, USEPA Drinking Water Standard Maximum Contaminant Levels (MCLs), or alternate concentration limits (ACLs) established by the VDEQ (July 1998). Certain organic constituents on the list do not have USEPA MCLs or VDEQ ACLs; they also do not have calculated background concentrations because they have not been detected in the Unit's upgradient well. Therefore, the concentration limits for these constituents are equal to their respective method detection limits.

As Alliant discussed with the VDEQ in the past, the reliability of previous laboratory analytical data - particularly dissolved metals data - appeared to be questionable in some cases. In an April 9, 1996 letter to C. Jake (Alliant), the VDEQ agreed that only total metals concentrations in groundwater would be measured, as described in a USEPA Region III guidance on groundwater sampling in karst terrain. Therefore, all references to metals concentrations in this GWQAR refer to total metals concentrations.

3.4 HWMU-16 GROUNDWATER BACKGROUND CONCENTRATIONS

Background concentrations were calculated for each constituent in the groundwater monitoring program using the analytical data from 1996 through 1998 for upgradient well 16C1.

The background concentration calculations were based on site wide 95% confidence, 95% coverage upper prediction intervals. The calculated background concentrations are listed in **Table 2 (Appendix B)**. The background concentrations were used to construct the outermost closing contours on the Isoconcentration Maps (**Appendix A**).

3.5 HWMU-16 STATISTICAL ANALYSIS

Statistical evaluations for HWMU-16 are performed annually and submitted to the VDEQ in accordance with the annual reporting requirements specified in 40 CFR 265.94. As part of this GWQAR, statistical evaluations were performed on Fourth Quarter 1998 analytical data in accordance with the procedures and guidance provided in the following documents:

- Title 40 of the Code of Federal Regulations, 40 CFR 264.97 and 264.98;
- VDEQ Guidance for statistical analysis titled "Data Analysis Plan," undated;
- Interim Final Guidance for Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, USEPA, April 1989;
- Addendum to Interim Final Guidance for Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, USEPA, July 1992; and
- Statistical Methods for Groundwater Monitoring, Gibbons, R.D., 1994.

Statistical threshold values were computed for the 54 constituents for which HWMU-16 is currently monitored based on the concentrations of those constituents in upgradient (background) well 16C1. All data starting with First Quarter 1996 to Fourth Quarter 1998 were used for this purpose. The 1996 through 1998 monitoring data have been submitted previously to the VDEQ by Alliant in quarterly monitoring reports; therefore, the data are not listed in this GWQAR. Statistical comparisons were performed for the Fourth Quarter 1998 data set. Comparison statistical analyses were performed for all constituents which were detected in any downgradient well during that event.

3.5.1 Background Data and Statistical Comparisons

Statistical analyses were performed using the analytical results from upgradient well 16C1 data as background data. Based on the percentage of non-detects and the distribution of the background data, methods of statistical comparisons varied. Background average, standard deviation and other descriptive statistical data were computed for all constituents and are presented in **Appendix C**.

The constituents listed below were 100% non-detected in the background data. The background threshold levels (BTLs) for these constituents were established as equal to their detection limits (DL). Detections of these constituents in the downgradient wells during Fourth Quarter 1998 were compared to these BTLs.

Background Threshold Level (BTL) = Detection Limit (DL)

Parameter	Sample Size	% Non-Detects	DL (μg/l)	BTL (μg/l)
Antimony	12	100	3	3
Arsenic	12	100	1	1
Bromoform	12	100	0.3	0.3
Carbon tetrachloride	12	100	0.2	0.2
Chlorobenzene	12	100	0.1	0.1
Chloromethane	12	100	0.3	0.3
Cyanide	12	100	10	10

Background Threshold Level (BTL) = Detection Limit (DL)				
Parameter	**Sample Size**	**% Non-Detects**	**DL (µg/l)**	**BTL (µg/l)**
Di-n-butyl phthalate	12	100	5	5
1,2-Dichloroethane	12	100	0.1	0.1
trans-1,2-Dichloroethene	12	100	0.1	0.1
1,4-Dichlorobenzene	12	100	0.1	0.1
Ethylbenzene	12	100	0.1	0.1
Mercury	12	100	0.2	0.2
Methyl ethyl ketone	12	100	1.1	1.1
Selenium	12	100	1	1
1,1,2,2-Tetrachloroethane	12	100	0.3	0.3
1,1,2-Trichloroethane	12	100	0.5	0.5
Trichloroethene	12	100	0.1	0.1
Toluene	12	100	0.1	0.1
2378-TCDF	12	100	0.0485 ppt	0.0485 ppt
12378-PECDF	12	100	0.0439 ppt	0.0439 ppt
23478-PECDF	12	100	0.0417 ppt	0.0417 ppt
123478-HXCDF	12	100	0.0390 ppt	0.0390 ppt
123678-HXCDF	12	100	0.0377 ppt	0.0377 ppt
234678-HXCDF	12	100	0.0428 ppt	0.0428 ppt
123789-HXCDF	12	100	0.0415 ppt	0.0415 ppt
1234678-HPCDF	12	100	0.0615 ppt	0.0615 ppt
1234789-HPCDF	12	100	0.0709 ppt	0.0709 ppt
OCDF	12	100	0.1307 ppt	0.1307 ppt

Non-parametric prediction intervals were computed for all of the constituents for which the data from background well 16C1 satisfied one of the following two criteria, per VDEQ regulations and guidance as well as USEPA guidance:

- Percentage of non-detects was greater than or equal to 50 and less than 100; or
- Percentage of non-detects was less than 50, but data was not normally distributed in original or log-transformed mode.

The background threshold levels for these constituents were set as equal to their upper prediction limits (UPLs). The background and relevant statistical data for these constituents are summarized below. The confidence level and false positive rate were calculated based on the number of background data points available and number of future comparisons. For all constituents, the confidence level was determined to be equal to 0.933, and the false positive rate was equal to 0.067. Since the upper control limit of a non-parametric interval cannot be adjusted for multiple comparisons and inadequate number of background data, the number of resampling events required was adjusted to account for the high error rates inherent in those situations. The number of confirmation resamples required for all constituents is 2. The background and relevant statistical data for these constituents are summarized below. Associated statistical computations are presented in **Appendix C**.

BTL = Upper Prediction Limit of Non-parametric Prediction Interval w/false positive rate=0.067				
Parameter	**Sample Size**	**% Non-Detects**	**DL (µg/l)**	**BTL (µg/l)**
Beryllium	12	75	0.2	0.7
Cadmium	12	75	0.1	0.2
Cobalt	12	75	1	5
Copper	12	50	1	13
1,1-Dichloroethane	12	0	0.2	9.5
2,4-Dinitrotoluene	12	92	0.08	0.10

BTL = Upper Prediction Limit of Non-parametric Prediction Interval w/false positive rate=0.067

Parameter	Sample Size	% Non-Detects	DL (µg/l)	BTL (µg/l)
2,6-Dinitrotoluene	12	75	0.08	0.11
Lead	12	42	1	10
Nickel	12	92	15	16
Silver	12	75	0.2	0.5
Thallium	12	67	1	6
TOC	12	75	1000	7000
1,1,1-Trichloroethane	12	17	0.3	9.2
Vanadium	12	83	4	151
Vinyl Chloride	12	92	0.1	0.1
Xylene (total)	12	92	0.1	0.2
Zinc	12	50	5	51

Chromium exhibited normally distributed data (excluding non-detects) with between 25% and 50% non-detects in the background well. The mean and standard deviation of the background data for chromium were adjusted using Cohen's Maximum Likelihood Estimator Method (1959, 1961). A one-sided parametric prediction interval was then computed for chromium based on the adjusted mean and standard deviation. The Upper Prediction Limit was set as the BTL for chromium. The background and relevant statistical data for chromium are summarized below. Cohen's adjustment computations and prediction interval computations are presented in **Appendix C**.

BTL = Upper Prediction Limit of Prediction Interval w/false positive rate=0.05
Original Mean = 3.54, Original SD = 1.933
Adjusted Mean = 3.642. Adjusted SD = 1.95

Parameter	Sample Size	% Non-Detects	DL (µg/l)	BTL (µg/l)
Chromium	12	25	1	6.2

The following constituents exhibited normally distributed background data with less than 25% non-detects. One sided parametric prediction intervals were computed on the background data for all of these constituents. The UPLs for these constituents were set as their respective BTLs, with one exception. For pH, a two-sided parametric prediction interval was computed; therefore, the BTL for pH consisted of a range between the lower prediction limit (LPL) and the upper prediction limit. The background concentration calculations were based on a site wide 95% confidence, 95% coverage upper prediction intervals. When adjusted for multiple comparisons of the background data, the minimum required false positive rate was below 1% (0.01). A 99% confidence level (0.01 false positive rate) was used for all individual comparisons, which with the most conservative assumptions provided a site-wide false positive rate of >0.05 for all constituents. The background and relevant statistical data for these constituents are summarized below. The prediction interval computations for these constituents are presented in **Appendix C**.

BTL = UPL of one-sided Prediction Interval (exception pH) w/site-wide false positive rate>0.05
(individual comparisons false positive rate=0.01)
BTL for pH = LPL – UPL of two-sided Prediction Interval

Parameter	Sample Size	% Non-Detects	DL (µg/l)	BTL (µg/l)
Barium	12	0	2	175.4
Dichlorodifluoromethane	12	8	0.3	46.5
Tetrachloroethene	12	17	0.1	0.7
TOX	12	17	5	42.2

<table>
<tr><th colspan="5">BTL = UPL of one-sided Prediction Interval (exception pH) w/site-wide false positive rate>0.05
(individual comparisons false positive rate=0.01)
BTL for pH = LPL – UPL of two-sided Prediction Interval</th></tr>
<tr><th>Parameter</th><th>Sample Size</th><th>% Non-Detects</th><th>DL (µg/l)</th><th>BTL (µg/l)</th></tr>
<tr><td>Trichlorofluoromethane</td><td>12</td><td>0</td><td>0.5</td><td>11.3</td></tr>
<tr><td>Specific Conductivity</td><td>8</td><td>0</td><td>1 µS/cm</td><td>672 µS/cm</td></tr>
<tr><td>pH</td><td>8</td><td>0</td><td>0.1 pH units</td><td>5.7 to 7.9 pH units</td></tr>
</table>

3.5.2 Results of Statistical Comparisons

The following table lists the constituents which were detected during the Fourth Quarter 1998 event at concentrations exceeding their respective background threshold levels (BTLs), and the downgradient wells in which they were detected.

Parameter	Monitoring Well(s)
Arsenic	16-5, 16WC2B
Barium	16-2, 16-3, 16-5, 16WC1A, 16WC1B, 16WC2B, 16SPRING
Beryllium	16WC1B, 16WC2B
Cadmium	16WC1B
Chromium	16-3, 16-5, 16WC1B, 16WC2B
Cobalt	16-5, 16WC1B, 16WC2B
Copper	16-5, 16WC1B, 16WC2B
Lead	16WC1B
Mercury	16WC1B
Nickel	16-5, 16WC1A, 16WC2B
Selenium	16-5, 16WC1B, 16WC2B
Zinc	16WC1B
2,4-Dinitrotoluene	16-3, 16-5, 16WC1B, 16WC2B, 16SPRING
2,6-Dinitrotoluene	16WC1A, 16WC1B

Any HWMU-16 target constituents not listed above were not detected in the downgradient monitoring wells at concentrations exceeding their respective BTLs.

3.6 HWMU-16 PLUME DELINEATIONS

In accordance with VDEQ instructions presented during the May 19, 1999 meeting between Alliant and the VDEQ, Isoconcentration Maps were produced to depict constituent plumes in the groundwater beneath the site (**Appendix A**). In order to evaluate the shape and position of constituent plumes over time, historical Isoconcentration Maps were developed using the historical maximum concentrations for the constituents monitored at the site for the time periods of 1992 through 1995 and 1996 through 1998. The historical maximum concentrations for these time periods are listed in **Tables** 3 and 4, respectively (**Appendix B**).

Groundwater analytical data collected prior to 1992 were not included in the evaluation of historical maximum concentrations. The data collected prior to 1992 are considered unreliable due to "order-of-magnitude" variations in parameter concentrations from quarter to quarter, as well as a general lack of laboratory QA/QC. Additionally, the groundwater monitoring analyte lists prior to 1992 did not include many of the parameters on the current groundwater monitoring analyte list for HWMU-16.

TABLE 2
HWMU-16
Calculated Background Values

Constituent	Background Concentration (µg/l unless otherwise noted)
Antimony	3
Arsenic	1
Barium	175.4
Beryllium	0.7
Cadmium	0.2
Chromium	6.2
Cobalt	5
Copper	13
Lead	10
Mercury	0.2
Nickel	16
Selenium	1
Silver	0.5
Thallium	6
Vanadium	151
Zinc	51
Bromoform	0.3
Carbon Tetrachloride	0.2
Chlorobenzene	0.1
Chloromethane	0.3
1,4-Dichlorobenzene	0.1
Dichlorodifluoromethane	46.5
1,1-Dichloroethane	9.5
1,2-Dichloroethane	0.1
trans-1,2-Dichloroethene	0.1
Ethylbenzene	0.1
Methyl Ethyl Ketone	1.1
1,1,2,2-Tetrachloroethane	0.3
Tetrachloroethene	0.7
Toluene	0.1
1,1,1-Trichloroethane	9.2
1,1,2-Trichloroethane	0.5
Trichloroethene	0.1
Trichlorofluoromethane	11.3
Vinyl Chloride	0.1
Xylenes (total)	0.2

TABLE 2
HWMU-16
Calculated Background Values

Constituent	Background Concentration (μg/l unless otherwise noted)
Di-n-butylphthalate	5
2,4-Dinitrotoluene	0.10
2,6-Dinitrotoluene	0.11
2378-TCDF	0.0485 ppt
12378-PECDF	0.0439 ppt
23478-PECDF	0.0417 ppt
123478-HXCDF	0.0390 ppt
123678-HXCDF	0.0377 ppt
234678-HXCDF	0.0428 ppt
123789-HXCDF	0.0415 ppt
1234678-HPCDF	0.0615 ppt
1234789-HPCDF	0.0709 ppt
OCDF	0.1307 ppt
Cyanide	10
Total Organic Carbon (x4)	7000
Total Organic Halides (x4)	42.2
Specific Conductivity	672 μS/cm
pH	5.7 to 7.9 pH units

Appendix IX Constituents Detected Since Permit Issuance
HWMUs 5, 7, 10, and 16
Radford Army Ammunition Plant

Unit	Quarter Initially Detected	Constituent	Background--Calculated or QL?	Background (ug/L)	GPS Required? (261 Appendix VIII)	Proposed GPS (ug/L)	Source
HMWU-5	Fourth Quarter 2003	Chromium	QL	5	yes	100	USEPA MCL
		Diethyl Ether	QL	12	no	NA	NA
		2-Nitroaniline	QL	20	no	NA	NA
		4-Nitroaniline	QL	20	yes	20	Background/QL
		Nitrobenzene	QL	10	yes	10	Background/QL
	Third Quarter 2006	Dichlorodifluoromethane	QL	1	yes	125.2	VDEQ ACL
HWMU-7	Third Quarter 2003	Copper	Calculated	49	no	NA	NA
	Second Quarter 2004	Zinc	Calculated	217	no	NA	NA
HWMU-10	First Quarter 2003	Cobalt	QL	5	no	NA	NA
	Second Quarter 2003	Vanadium	QL	10	no	NA	NA
	Second Quarter 2005	Acetone	QL	10	no	NA	NA
		2-Propanol	QL	50	no	NA	NA
HWMU-16	Second Quarter 2003	Chloroethane	Calculated	20.7	yes	20.7	Background/QL
		Diethyl Ether	Calculated	75.5	no	NA	NA
		Dimethyl Ether	Calculated	17.0	no	NA	NA
	Third Quarter 2003	Methylene Chloride	Calculated	13.95	no*	NA	NA
	Second Quarter 2004	1,1,2-Trichloro-1,2,2-trifluoroethane	Calculated	1.2	no*	NA	NA

HWMU-5: The additional Appendix IX constituents detected in the downgradient point of compliance wells were not detected above their respective Quantitation Limits (QLs) in the upgradient well. As a result, background concentrations for those constituents were set as equal to their respective QLs. In accordance with the Permit (Condition V.J.1.g.), GPS are proposed for those additional Appendix IX constituents that are listed in Appendix VIII of 40 CFR Part 261 (chromium, 4-nitroaniline, nitrobenzene, and dichlorodifluoromethane). No GPS are proposed for the additional Appendix IX constituents that are not listed in Appendix VIII of 40 CFR Part 261 (diethyl ether and 2-nitroaniline).

HWMU-7: Background concentrations for the additional Appendix IX constituents detected in the downgradient point of compliance wells (copper and zinc) were previously calculated and submitted to the VDEQ in the August 1998 ***Groundwater Quality Assessment Report for HWMU-7*** prepared by ERM, Inc. In accordance with the Permit (Condition V.J.2.g.), no GPS are proposed for the additional Appendix IX constituents (copper and zinc), as they are not listed in Appendix VIII of 40 CFR Part 261.

HWMU-10: The additional Appendix IX constituents detected in the downgradient point of compliance wells were not detected above their respective Quantitation Limits (QLs) in the upgradient well. As a result, background concentrations for those constituents were set as equal to their respective QLs. In accordance with the Permit (Condition V.J.3.g.), no GPS are proposed for the additional Appendix IX constituents (cobalt, vanadium, acetone, and 2-propanol), as they are not listed in Appendix VIII of 40 CFR Part 261.

HWMU-16: Background concentrations for additional Appendix IX constituents chloroethane, diethyl ether, dimethyl ether, and methylene chloride were calculated using data collected from upgradient well 16C1 during the period from Third Quarter 2003 through Third Quarter 2004. The background concentration for additional Appendix IX constituent 1,1,2-trichloro-1,2,2-trifluoroethane was calculated using data collected from upgradient well 16C1 during the period from Second Quarter 2004 through Third Quarter 2006.
In accordance with the Permit (Condition V.J.4.g.), GPS are proposed for additional Appendix IX constituents that are listed in Appendix VIII of 40 CFR Part 261 (chloroethane). No GPS are proposed for the additional Appendix IX constituents that are not listed in Appendix VIII of 40 CFR Part 261 (diethyl ether and dimethyl ether).
*Methylene chloride and 1,1,2-trichloro-1,2,2-trifluoroethane should not be added to the Groundwater Monitoring List for HWMU-16, as these constituents were only detected in the upgradient well for the Unit, and not in the downgradient point of compliance wells.

Statistical Computations – RAAP HWMU-16 – 1,1,2-Trichloro-1,2,2-Trifluoroethane

In accordance with the facility permit and VHWMR, statistical background concentration is being established for 1,1,1-Trichloro-1,2,2-Trifluoroethane. Inter-well upper prediction limits (UPL) were calculated on the background data for this target parameter in accordance with the facility permit and VHWMR (40 CFR 264.97(h)). Background data for this target parameter consisted of all data for the background well 16C1 collected from 2nd quarter 2004 through 3rd quarter 2006.

Discussion of Tests for Normality

The power of a statistical tool to account for false positive and false negative results, while accurately detecting true statistical variations for a facility under scrutiny depends on numerous factors, one of which is the distribution of the data. A great number of statistical tools are based on the assumption that data are normally distributed. Hence the distribution of the sample population for parameters evaluated under this statistical analysis is first determined. Sample populations are tested for normal distribution using several normality tests. "Groundwater Information Tracking System with Statistical Analysis Capability" (GRITS/STAT) v5.0 was the software used to run these statistical tests. GRITS/STAT is an analytical software package provided by the USEPA. The distributions of the data sets were verified in the original mode as well as in log-transformed mode. The normality of the data set was evaluated using the Shapiro-Wilk test for normality.

Discussion of Prediction Interval Tests

Normality tests are performed prior to running parametric tests (tests that require that the data be normal). Results of the normality tests show that the background data for 1,1,2-Trichloro-1,2,2-Trifluoroethane is non-normally distributed. Non-parametric UPL (NUPL) was constructed on the background data for this parameter. The confidence levels of NUPLs are typically approximate and estimated to be around 91%.

Summary of UPL

Parameter	Background Data Distribution	Type of UPL	Multiple Comparisons/year	UPL (µg/l)
1,1,2-Trichloro-1,2,2-Trifluoroethane	Non-Normal	NUPL	N/A	1.2

Statistical Computations – RAAP HWMU-16

In accordance with the facility permit and VHWMR, statistical background concentrations are being established for the four new target parameters chloroethane, diethyl ether, dimethyl ether and methylene chloride. These four target parameters were added to the facility monitoring program during the 3rd quarter 2003 monitoring event. Inter-well upper prediction limits (UPL) were calculated on the background data for the target parameters in accordance with the facility permit and VHWMR (40 CFR 264.97(h)). Background data for these target parameters consisted of all data for the background well 16C1 collected from 3rd quarter 2003 through 3rd quarter 2004.

Discussion of Tests for Normality

The power of a statistical tool to account for false positive and false negative results, while accurately detecting true statistical variations for a facility under scrutiny depends on numerous factors, one of which is the distribution of the data. A great number of statistical tools are based on the assumption that data are normally distributed. Hence the distribution of the sample population for parameters evaluated under this statistical analysis is first determined. Sample populations were tested for normal distribution using several normality tests. "Groundwater Information Tracking System with Statistical Analysis Capability" (GRITS/STAT) v5.0 was the software used to run these statistical tests. GRITS/STAT is an analytical software package provided by the USEPA. The distributions of the data sets were verified in the original mode as well as in log-transformed mode. The normality of the data sets was evaluated using the Shapiro-Wilk test for normality.

Discussion of Prediction Interval Tests

Normality tests are performed prior to running parametric tests (tests that require that the data be normal). A 99% confidence parametric inter-well UPL was computed for each of the four target parameters that showed normally distributed background data. Results of the normality tests show that the background data for chloroethane, diethyl ether and methylene chloride are normally distributed, and the background data for dimethyl ether is non-normally distributed. Non-parametric UPL (NUPL) was constructed on the background data for dimethyl ether, and parametric UPLs (PUPL) were constructed on the background data for chloroethane, diethyl ether and methylene chloride. No adjustments to the error rates were made to the NUPLs for multiple comparisons. Adjustment for 10 comparisons per year (considering 10 compliance monitoring wells at the facility and 4 quarters of data for each year, and considering historic detects, 10 is considered a representative number for multiple comparisons per year) was made to the PUPLs. The confidence levels of NUPLs are well less than 95%. Any statistically significant increase (SSI) must be confirmed by verification sampling.

Summary of UPLs

Parameter	Background Data Distribution	Type of UPL	Multiple Comparisons/year	UPL (µg/l)
Chloroethane	Normal	PUPL	10	20.7
Diethyl ether	Normal	NUPL	10	75.5
Dimethyl ether	Non-normal	PUPL	N/A	17.0
Methylene Chloride	Normal	PUPL	10	13.95

RAAP-HWMU-16 - Statistical Analysis - Notes

1) Y2K Correction dates are as shown in table below.

Actual Event	Date Used in Stat Software
2000-Qtr1	12/13/1999
2000-Qtr2	12/14/1999
2000-Qtr3	12/15/1999
2000-Qtr4	12/16/1999
2001-Qtr1	12/17/1999
2003-Qtr3	12/18/1999
2003-Qtr4	12/19/1999
2004-Qtr1	12/20/1999
2004-Qtr2	12/21/1999
2004-Qtr3	12/22/1999

Interwell Tests:

2) Background data for target parameters chloroethane, diethyl ether, dimethyl ether and methylene chloride were evaluated using Shapiro-Wilk test. Background data showed normal distribution for chloroethane, diethyl ether and methylene chloride. Parametric interwell 99% confidence upper prediction limits were computed for parameters with normally distributed background data. Dimethyl ether background data was non-normally distributed. Therefore non-parametric Upper Prediction Limit (UPL) was computed for dimethyl ether.

3) No adjustments for multiple comparisons could be made for non-parametric UPLs. Adjustments were made to the parametric UPLs for 10 future comparisons per year to account for multiple compliance monitoring wells and quarterly event data.
Any Statistically significant increase (SSI) must be confirmed by verification sampling.

E:\Ross Work\Radford AAP Archives\HWMU-16\[HWMU16StatDate correction.xls]Sheet1

```
Normality Tests

Report Printed: 02-02-2005  13:49

  Facility:RAAPHWMU16   Haz. Waste Unit 16 - RAAP

   Address:

     City:Radford              ST:VA Zip:24141
    County:PULASKI

    Contact:
     Phone:(   )  -

 Permit Type:Detection


 Constituent:ClEthane Chloroethane

  CAS Number:   75-00-3
        MCL:     0.000 ppb
        ACL:     0.000 ppb
Detect Limit:     2.000 ppb

  Start Date:Mar 31 1996
   End Date:Dec 22 1999


Normality Test on Observations for wells listed below:

Well:16C1      Position:Upgradient  Observations:5


    Scale     Minimum     Maximum        Mean     Std Dev
 Original:      1.000       6.400       4.340      2.078
      Log:      0.000       1.856       1.303      0.749


Pooled Statistics
     Observations:     5

     Statistic     Original       Log
                    Scale       Scale
        Mean:        4.340       1.303
      Std Dev:       2.078       0.749
     Skewness:      -0.810      -1.296*
     Kurtosis:     -0.555     -0.011
      Minimum:        1.000       0.000
      Maximum:        6.400       1.856
          CV:       0.479      0.575


Shapiro-Wilk Statistics

          Test  5% Critical  1% Critical
  Scale Statistic      Value        Value
Original:   0.9037      0.7620      0.6860
```

```
    Log:   0.7615*     0.7620      0.6860

* Indicates statistically significant evidence of non-normality.
GRIT/STAT Version 5.0
```

Parametric Prediction Interval
Report Printed February 2,2005

Facility:Haz. Waste Unit 16 - RAAP
Parameter:Chloroethane(CAS Number:75-00-3)

ONE-TAILED UPPER PARAMETRIC PREDICTION INTERVAL

Observations (n): 5
Shapiro-Wilk (W): 0.9037
Critical W,α=0.01: 0.6860
Mean: 4.340 ppb
Std Dev: 2.078 ppb
DF: 4
Conf. Level (1-α): ~~0.95~~00 0.99
Future Samples (k): 10
$t_{\left[1-\frac{\alpha}{k}\right]}$: 7.1732
Kappa: 7.8579

UL: 20.669 ppb
LL: -∞

Report Produced by GRITS/STAT 5.01

```
Normality Tests

Report Printed: 02-02-2005  13:49

  Facility:RAAPHWMU16   Haz. Waste Unit 16 - RAAP

   Address:

      City:Radford            ST:VA Zip:24141
    County:PULASKI

    Contact:
      Phone:(   )  -

 Permit Type:Detection


 Constituent:DEthEth  Diethyl ether

  CAS Number:     - -
        MCL:      0.000 ppb
        ACL:      0.000 ppb
Detect Limit:     24.000 ppb

  Start Date:Mar 31 1996
    End Date:Dec 22 1999



Normality Test on Observations for wells listed below:

Well:16C1     Position:Upgradient  Observations:5


    Scale     Minimum     Maximum       Mean     Std Dev
 Original:     12.000      30.000     21.200      6.907
      Log:      2.485       3.401      3.007      0.355


Pooled Statistics
     Observations:     5

     Statistic    Original      Log
                   Scale       Scale
        Mean:      21.200      3.007
      Std Dev:      6.907      0.355
     Skewness:     -0.122     -0.491
     Kurtosis:     -1.140     -1.024
      Minimum:     12.000      2.485
      Maximum:     30.000      3.401
          CV:       0.326      0.118


Shapiro-Wilk Statistics

            Test  5% Critical  1% Critical
  Scale Statistic     Value       Value
Original:   0.9768    0.7620      0.6860
```

```
    Log:   0.9507      0.7620      0.6860

* Indicates statistically significant evidence of non-normality.
GRIT/STAT Version 5.0
```

Parametric Prediction Interval

Report Printed February 2,2005

Facility:Haz. Waste Unit 16 - RAAP
Parameter:Diethyl ether(CAS Number:- -)

ONE-TAILED UPPER PARAMETRIC PREDICTION INTERVAL

Observations (n): 5
Shapiro-Wilk (W): 0.9768
Critical W,α=0.01: 0.6860
Mean: 21.200 ppb
Std Dev: 6.907 ppb
DF: 4
Conf. Level (1-α): ~~0.9500~~ 0.99
Future Samples (k): 10
$t_{\left[1-\frac{\alpha}{k}\right]}$: 7.1732
Kappa: 7.8579

UL: 75.470 ppb
LL: $-\infty$

Normality Tests

Report Printed: 02-02-2005 13:53

Facility:RAAPHWMU16 Haz. Waste Unit 16 - RAAP

Address:

City:Radford ST:VA Zip:24141
County:PULASKI

Contact:
Phone:( ) -

Permit Type:Detection

Constituent:DMethEth Dimethyl ether

CAS Number: - -
MCL: 0.000 ppb
ACL: 0.000 ppb
Detect Limit: 24.000 ppb

Start Date:Mar 31 1996
End Date:Dec 22 1999

Normality Test on Observations for wells listed below:

Well:16C1 Position:Upgradient Observations:5

Scale	Minimum	Maximum	Mean	Std Dev
Original:	12.000	17.000	13.000	2.236
Log:	2.485	2.833	2.555	0.156

Pooled Statistics
Observations: 5

Statistic	Original Scale	Log Scale
Mean:	13.000	2.555
Std Dev:	2.236	0.156
Skewness:	1.500*	1.500*
Kurtosis:	0.250	0.250
Minimum:	12.000	2.485
Maximum:	17.000	2.833
CV:	0.172	0.061

Shapiro-Wilk Statistics

Scale	Test Statistic	5% Critical Value	1% Critical Value
Original:	0.5521*	0.7620	0.6860

Log: 0.5521* 0.7620 0.6860

* Indicates statistically significant evidence of non-normality.
GRIT/STAT Version 5.0

Nonparametric Prediction Interval
Report Printed February 2,2005

Facility:Haz. Waste Unit 16 - RAAP
Parameter:Dimethyl ether(CAS Number:- -)

ONE-TAILED UPPER PARAMETRIC PREDICTION INTERVAL

Observations (n):	5
Conf. Level (1-α):	33.330%

UL: 17.000 ppb
LL: 0.000

Normality Tests

Report Printed: 02-02-2005 13:54

Facility:RAAPHWMU16 Haz. Waste Unit 16 - RAAP

Address:

City:Radford ST:VA Zip:24141
County:PULASKI

Contact:
Phone:( ) -

Permit Type:Detection

Constituent:MeCl Dichloromethane (Methylene chloride)

CAS Number: 75-09-2
MCL: 0.000 ppb
ACL: 0.000 ppb
Detect Limit: 2.000 ppb

Start Date:Mar 31 1996
End Date:Dec 22 1999

Normality Test on Observations for wells listed below:

Well:16C1 Position:Upgradient Observations:5

Scale	Minimum	Maximum	Mean	Std Dev
Original:	4.100	6.800	5.800	1.037
Log:	1.411	1.917	1.743	0.197

Pooled Statistics
Observations: 5

Statistic	Original Scale	Log Scale
Mean:	5.800	1.743
Std Dev:	1.037	0.197
Skewness:	-0.925	-1.088*
Kurtosis:	-0.436	-0.263
Minimum:	4.100	1.411
Maximum:	6.800	1.917
CV:	0.179	0.113

Shapiro-Wilk Statistics

Scale	Test Statistic	5% Critical Value	1% Critical Value
Original:	0.8964	0.7620	0.6860

```
    Log:    0.8519       0.7620       0.6860

* Indicates statistically significant evidence of non-normality.
GRIT/STAT Version 5.0
```

Parametric Prediction Interval
Report Printed February 2,2005

Facility:Haz. Waste Unit 16 - RAAP
Parameter:Dichloromethane (Methylene chloride(CAS Number:75-09-2)

ONE-TAILED UPPER PARAMETRIC PREDICTION INTERVAL

Observations (n): 5
Shapiro-Wilk (W): 0.8964
Critical W,α=0.01: 0.6860
Mean: 5.800 ppb
Std Dev: 1.037 ppb
DF: 4
Conf. Level (1-α): ~~0.9500~~ 0.99
Future Samples (k): 10
$t_{\left[1-\frac{\alpha}{k}\right]}$: 7.1732
Kappa: 7.8579

UL: 13.947 ppb
LL: $-\infty$

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 ***All Results in ug/L.***

Analyte/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*QL*	*GPS*	*Method*
Chloroethane					*CAS #*	*75-00-3*		
Third Quarter 2003	6.4	U	4.8	U	U	1	20.7	8260B
Fourth Quarter 2003	5.7	U	2.6	1.1	U	1	20.7	8260B
First Quarter 2004	U J	U J	U J	U J	U J	1	20.7	8260B
Second Quarter 2004	4.4	U	2.4	0.63 J	U	1	20.7	8260B
Third Quarter 2004	4.2	U	2	U	U	1	20.7	8260B
Fourth Quarter 2004	4.9	U	2.5	U	U	1	20.7	8260B
First Quarter 2005	7.6 J	U J	3.7 J	U J	U J	1	20.7	8260B
Second Quarter 2005	U J	U	U J	U	U	1	20.7	8260B
Third Quarter 2005	4.7 J	U J	U	U J	U J	1	20.7	8260B
Fourth Quarter 2005	4.6 J	U	2.6 J	U	U	1	20.7	8260B
First Quarter 2006	5.3	U	U	U	U	1	20.7	8260B
Second Quarter 2006	5 J	U	2 J	U	U	1	20.7	8260B
Third Quarter 2006	5	U	0.7 J	0.7 J	U	1	20.7	8260B
Fourth Quarter 2006	5.8	U	1	U	U	1	20.7	8260B
First Quarter 2007	6.1	U	1	U	U	1	20.7	8260B
Second Quarter 2007	5.2	U	1.4	U	U	1	20.7	8260B
Diethyl ether					*CAS #*	*60-29-7*		
Third Quarter 2003	12 J	U	12 J	U	U	12	-	8260B
Fourth Quarter 2003	30	U	14	U	U	12	-	8260B
First Quarter 2004	24	U	U	U	U	12	-	8260B
Second Quarter 2004	23 J	U J	13 J	U J	U J	12	-	8260B
Third Quarter 2004	17	U	U	U	U	12	-	8260B
Fourth Quarter 2004	24	U J	U	U	U J	12	-	8260B
First Quarter 2005	29	U	14	U	U	12	-	8260B
Second Quarter 2005	20	U J	9.2	U J	U J	12	-	8260B
Third Quarter 2005	30	U	15	U	U	12	-	8260B
Fourth Quarter 2005	25	U	18	U	U	12	-	8260B
First Quarter 2006	19	U	U	U	U	12	-	8260B
Second Quarter 2006	17	U	U	U	U	12.5	-	8260B
Third Quarter 2006	33	1.5 J	4.3 J	4.6 J	U	12.5	-	8260B
Fourth Quarter 2006	20	U	U	U	U	12.5	-	8260B
First Quarter 2007	21	U	U	U	U	12.5	-	8260B
Second Quarter 2007	17 J	1.5 J	5.7 J	2.1 J	U J	12.5	-	8260B
Dimethyl ether					*CAS #*	*115-10-6*		
Third Quarter 2003	6.6 J	U	9.9 J	U	U	12	-	8260B
Fourth Quarter 2003	U	U	U	U	U	12	-	8260B
First Quarter 2004	17 J	U J	13 J	U J	U J	12	-	8260B
Second Quarter 2004	U J	U J	6.6 J	U J	U J	12	-	8260B
Third Quarter 2004	U J	U J	U J	U J	U J	12	-	8260B
Fourth Quarter 2004	16 J	U J	12 J	U	U J	12	-	8260B
First Quarter 2005	26	U	25	U	U	12	-	8260B
Second Quarter 2005	15	U	14	U	U	12	-	8260B
Third Quarter 2005	13	U	U	U	U	12	-	8260B
Fourth Quarter 2005	U	U	U	U	U	12	-	8260B
First Quarter 2006	U	U	U	U	U	12	-	8260B
Second Quarter 2006	U	U	U	U	U	12.5	-	8260B
Third Quarter 2006	11 J	U J	3.2 J	2.8 J	U J	12.5	-	8260B
Fourth Quarter 2006	U	U	U	U	U	12.5	-	8260B
First Quarter 2007	U	U	U	U	U	12.5	-	8260B
Second Quarter 2007	11 J	U	7 J	2.6 J	1.2 J	12.5	-	8260B

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 *All Results in ug/L.*

Analtye/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*QL*	*GPS*	*Method*
Methylene chloride					*CAS #*	75-09-2		
Third Quarter 2003	4.1	U	U	U	U	1	13.95	8260B
Fourth Quarter 2003	6.8	U	U	U	U	1	13.95	8260B
First Quarter 2004	6.4	U	U	U	U	1	13.95	8260B
Second Quarter 2004	5.7	U	U	U	U	1	13.95	8260B
Third Quarter 2004	6	U A	U A	U A	U A	1	13.95	8260B
Fourth Quarter 2004	6.4	U	U	U	U	1	13.95	8260B
First Quarter 2005	6.8 J	U	U	U	U	1	13.95	8260B
Second Quarter 2005	6.3	U	U	U	U	1	13.95	8260B
Third Quarter 2005	6.2	U	U	U	U	1	13.95	8260B
Fourth Quarter 2005	4.7	U	U	U	U	1	13.95	8260B
First Quarter 2006	4.9	U	U	U	U	1	13.95	8260B
Second Quarter 2006	7	U	U	U	U	1	13.95	8260B
Third Quarter 2006	U N	U N	U N	U N	U N	1	13.95	8260B
Fourth Quarter 2006	U A	U	U	U A	U	1	13.95	8260B
First Quarter 2007	6.3	U	U	U	U	1	13.95	8260B
Second Quarter 2007	3.4	U	U	U	U	1	13.95	8260B
1,1,2-Trichloro-1,2,2-Trifluoroethane					*CAS #*	76-13-1		
Third Quarter 2003	U	U	U	U	U	1	-	8260B
Second Quarter 2004	1.2	U J	U J	U J	U J	1	-	8260B
Third Quarter 2004	U	U	U	U	U	1	-	8260B
Fourth Quarter 2004	U	U	U	U	U	1	-	8260B
First Quarter 2005	1	U	U	U	U	1	-	8260B
Second Quarter 2005	U	U	U	U	U	1	-	8260B
Third Quarter 2005	U	U	U	U	U	1	-	8260B
Fourth Quarter 2005	U	U	U	U	U	1	-	8260B
First Quarter 2006	U	U	U	U	U	1	-	8260B
Second Quarter 2006	U	U	U	U	U	1	-	8260B
Third Quarter 2006	U	U	U	U	U	1	-	8260B
Fourth Quarter 2006	U	U	U	U	U	1	-	8260B
First Quarter 2007	U	U	U	U	U	1	-	8260B
Second Quarter 2007	U	U	U	U	U	1	-	8260B

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 *All Results in ug/L.*

Analtye/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*QL*	*GPS*	*Method*

Definitions: QL Denotes permit required quantitation limit. **U** Denotes analyte not detected at or above QL. **UA** Denotes analyte not detected at or above adjusted sample QL. **J** Denotes associated result is estimated. When used with "U" (i.e., "**UJ**"), denotes analyte not detected at or above QL and QL is estimated. When used with "UA" (i.e., "**UAJ**"), denotes analyte not detected at or above adjusted QL and adjusted QL is estimated. **UN** Denotes analyte concentration is less than the quantiation limit and five times the blank concentration. Not reliably detected due to blank contamination. This qualifier used only for Appendix IX monitoring event when results are reported to at or above the project detection limit. **R** Denotes result rejected. **Q** Denotes data validation qualifier. **CAS#** Denotes Chemical Abstract Services registration number. **X** Denotes mass spectral confirmation not obtained-result suspect.

GPS Denotes Groundwater Protection Standards listed in Appendix G to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002).
NS denotes not sampled. **NA** denotes not analyzed. "–" denotes not detected (pre-2nd Quarter 2003) or not available / not sampled (beginning 2nd Quarter 2003).

Notes:
-Appendix IX Groundwater Monitoring Events:
Third Quarter 2003, Second Quarter 2004, Second Quarter 2005, Third Quarter 2006, Second Quarter 2007
For Appendix IX monitoring events, all results evaluated to detection limit. See laboratory data deliverable for detection limit.

-9/30/2003: Verification sampling event for 16C1 (heptachlor) and 16C1B (Endrin). Verification results: all results reported not detected to detection limit. Original results 0.067 µg/l and 0.39 µg/l, respectively. Confirmation results reported in this table.
-9/30/2003: Verification sampling event for 16C1 (chloroethane, ethyl ether, methyl ether, methylene chloride) and 16MW9 (chloroethane, ethyl ether, methyl ether). Verification results: all results confirmed original analysis. Original results reported in this table.
-June 21, 2004: Verification event for 8260B 16C1 (1,1-dichloroethene and 1,1,2-trichloro-1,2,2-trifluoroethane).
Verification results: all not detected except 1,1,2-trichloro-1,2,2-trifluoroethane added to quarterly analyte list beginning 3Q 2004.
Due to laboratory error, Appendix IX results for semivolatiles (Method 8270C) will be presented in 3Q 2004. Verification event results for 16WC1B and 16C1 (8081A) -- all verification results were not confirmed.
-07/27-28/2005. Verification event for 16WC1B (Mercury Method 7470A.) Not detected in verification sample.
Also, verification event for 16C1, 16WC1B-8081A. and 16C1, 16MW9, 16WC1A-ethanol. All verification results not detected. Verification results used.
-06/19/2007. Verification event for 16WC1B and 16MW9 thallium Not detected in verification sample. Verification results used.

From: Flint, Jeremy <Jeremy.Flint@ATK.COM>
Sent: Friday, January 20, 2012 2:23 PM
To: Powers, Loretta
Cc: Janet Frazier; Kathy Olsen; Mike Lawless; Ross Miller
Subject: FW: VA1210020730, RAAP, Additional App. IX GW Mont Results PCC HWMU 5,7,10,16, Final Notification

Loretta,
Please file the attached e-mail as an answer to ATK letter number 11-815-106

Thank You
Jeremy Flint
Lead Compliance Engineer
Environmental Affairs Department
Alliant Techsystems Inc.
P.O. Box 1
Radford, VA 24143
Phone: 540 - 639 - 7668
Fax: 540 - 639 - 8109
"Together Everyone Accomplishes More." (TEAM)

From: Maiden, Vince (DEQ) [mailto:Vincent.Maiden@deq.virginia.gov]
Sent: Friday, January 20, 2012 10:26 AM
To: Flint, Jeremy
Cc: McKenna, Jim; Schneider, Jutta (DEQ)
Subject: VA1210020730, RAAP, Additional App. IX GW Mont Results PCC HWMU 5,7,10,16, Final Notification

Jeremy:

The Department has received the referenced August 1, 2011 document. The notification indicates the benzene was confirmed in 16MW and recommended that this contituent be added to the compliance monitoring list for HWMU-16. In addition, the facility recommeded that the background for benzene be estalished at the LOQ of 1µg/l and the groundwater protection standard be set at 5µg/l based on the MCL. The Department agrees with the recommedations. It appears that these changes were included in the permit renewal application dated September 15, 2011. The Department will formally address those changes along with others in the permit renewal process. If you have any questions please feel free to contact me.

Vincent Maiden
Corrective Action Project Manager
Virginia Department of Environmental Quality
Office of Remediation Programs
629 East Main Street or P.O. Box 1105
Richmond, VA 23218 Richmond, VA 23219
(276) 676-4867
Vincent.Maiden@deq.virginia.gov

TABLE 3
HWMU-16
GROUNDWATER ELEVATIONS - 2013
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

MONITORING WELL ID	ELEVATION TOP OF WELL	APRIL 23, 2013		OCTOBER 22, 2013	
		DTW	GW ELEV	DTW	GW ELEV
16C1	1840.14	49.55	1790.59	48.31	1791.83
16MW8	1815.82	71.22	1744.60	73.41	1742.41
16MW9	1808.88	61.79	1747.09	65.51	1743.37
16WC1A	1812.61	64.66	1747.95	67.86	1744.75
16WC1B	1812.95	64.96	1747.99	68.08	1744.87
16-1	1815.82	52.58	1763.24	42.95	1772.87
16-2	1810.99	55.81	1755.18	55.80	1755.19
16-3	1824.77	57.37	1767.40	55.95	1768.82
16-5	1742.60	4.02	1738.58	3.00	1739.60
16WC2B	1818.71	53.60	1765.11	52.89	1765.82
16WC2A	1820.05	DRY	DRY	DRY	DRY
16C3	1822.22	64.59	1757.63	67.13	1755.09
16CDH3	1825.60	DRY	DRY	DRY	DRY
SPRING	na	na	na	na	na

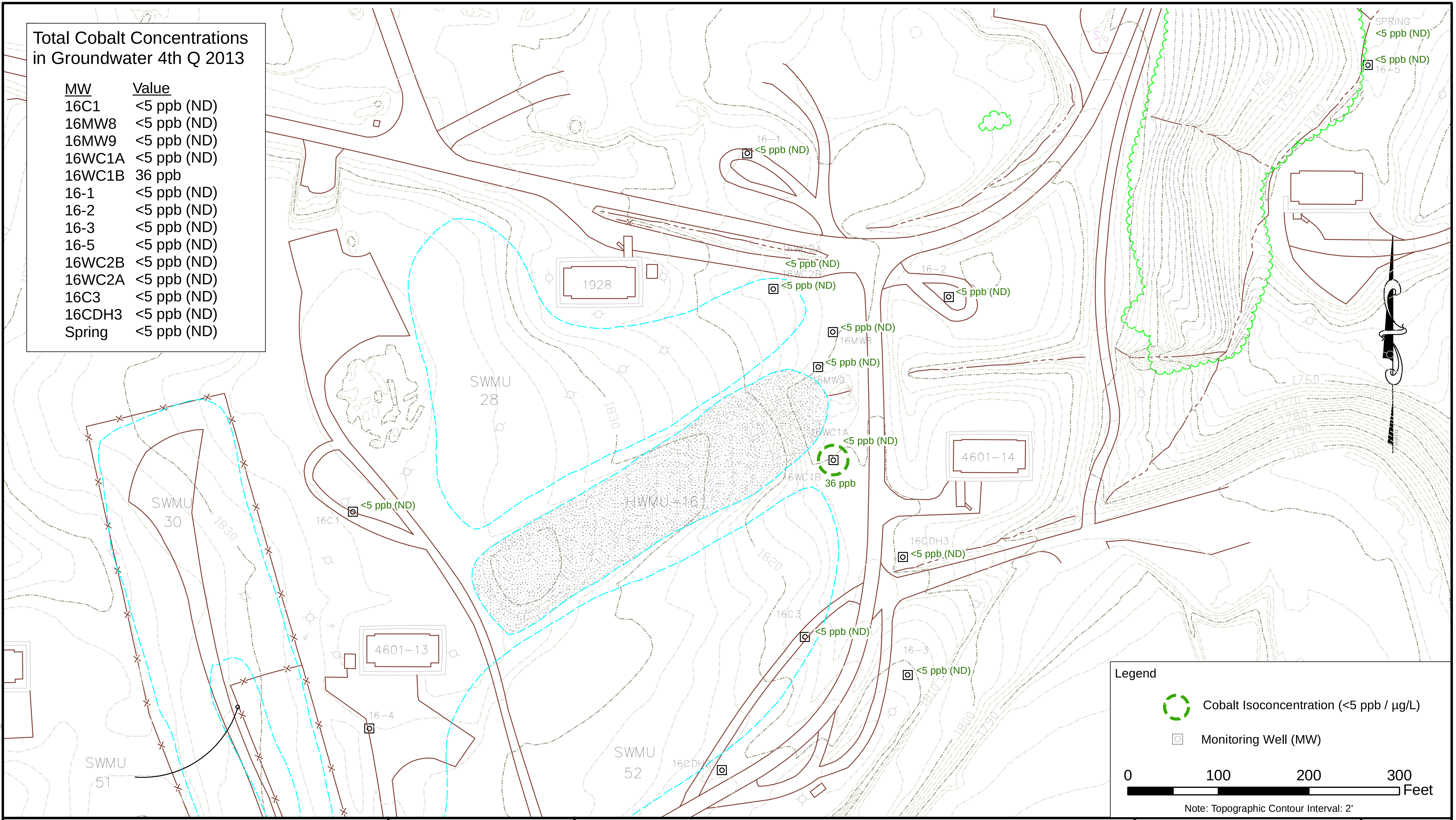
NOTES:

DTW: Depth to water from top of casing.

GW ELEV: Groundwater elevation.

All elevations in feet above mean sea level.

na: Not applicable.



Total Cobalt Concentrations in Groundwater 4th Q 2013

MW	Value
16C1	<5 ppb (ND)
16MW8	<5 ppb (ND)
16MW9	<5 ppb (ND)
16WC1A	<5 ppb (ND)
16WC1B	36 ppb
16-1	<5 ppb (ND)
16-2	<5 ppb (ND)
16-3	<5 ppb (ND)
16-5	<5 ppb (ND)
16WC2B	<5 ppb (ND)
16WC2A	<5 ppb (ND)
16C3	<5 ppb (ND)
16CDH3	<5 ppb (ND)
Spring	<5 ppb (ND)

Legend

◌ Cobalt Isoconcentration (<5 ppb / µg/L)

☐ Monitoring Well (MW)

0 100 200 300 Feet

Note: Topographic Contour Interval: 2'

Draper Aden Associates
Engineering • Surveying • Environmental Services
2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291

Richmond, VA
Charlottesville, VA
Hampton Roads, VA

DESIGNED	RGM
DRAWN	DLD/SMF
CHECKED	SN
DATE	01-14-14

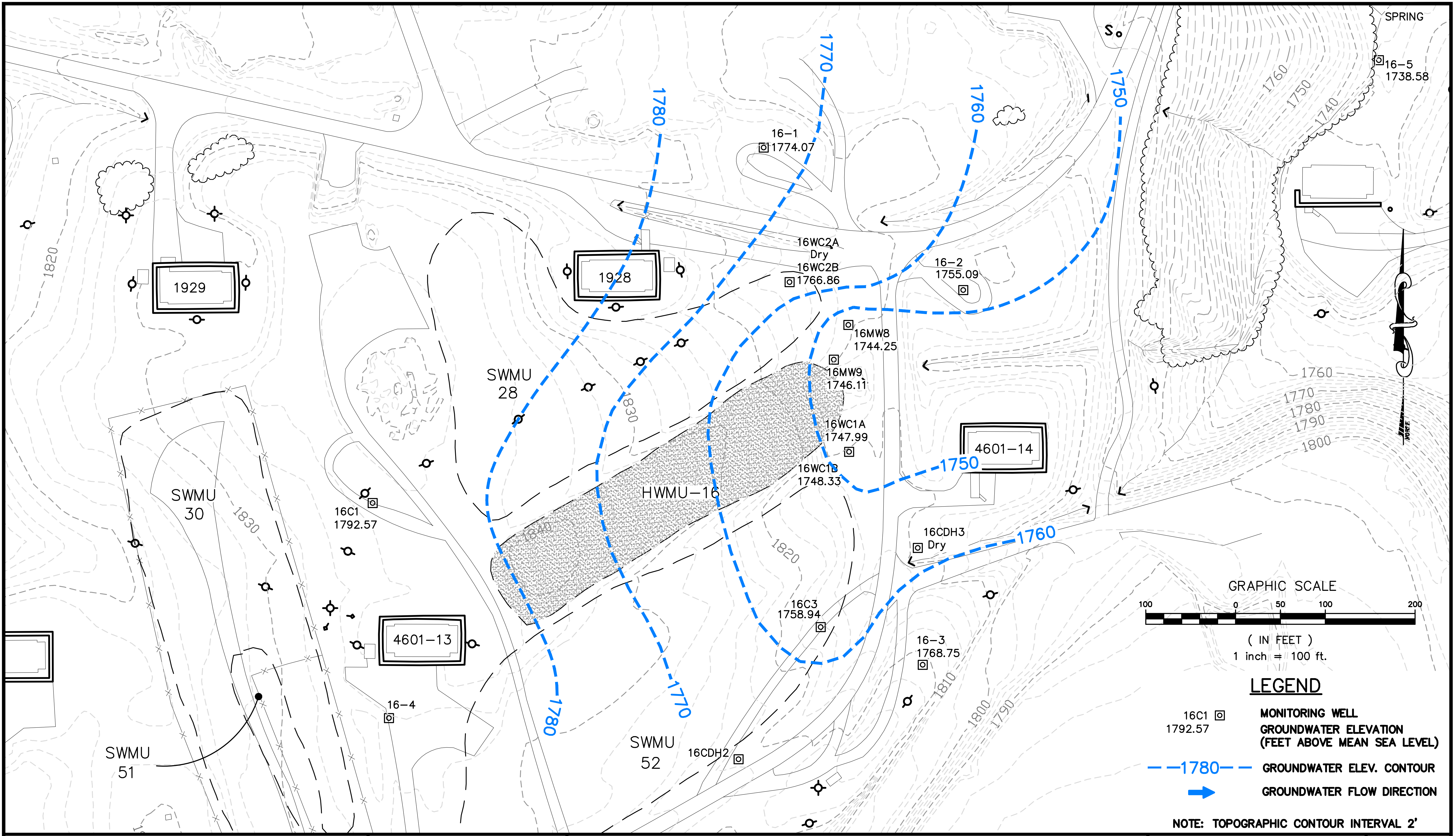
HWMU-16 Total Cobalt Concentrations in Groundwater 4th Q 2013
RADFORD ARMY AMUNITION PLANT
Radford, Virginia

SCALE: 1" = 100'

PLAN NO. B03204-11

FIGURE
1

Path: P:\B03200\B03204\B03204-11\CAD\B03204-11 HWMU-16 Cobalt Concentrations.mxd



Draper Aden Associates
Engineering ✦ Surveying ✦ Environmental Services
2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291
Richmond, VA
Charlottesville, VA
Hampton Roads, VA

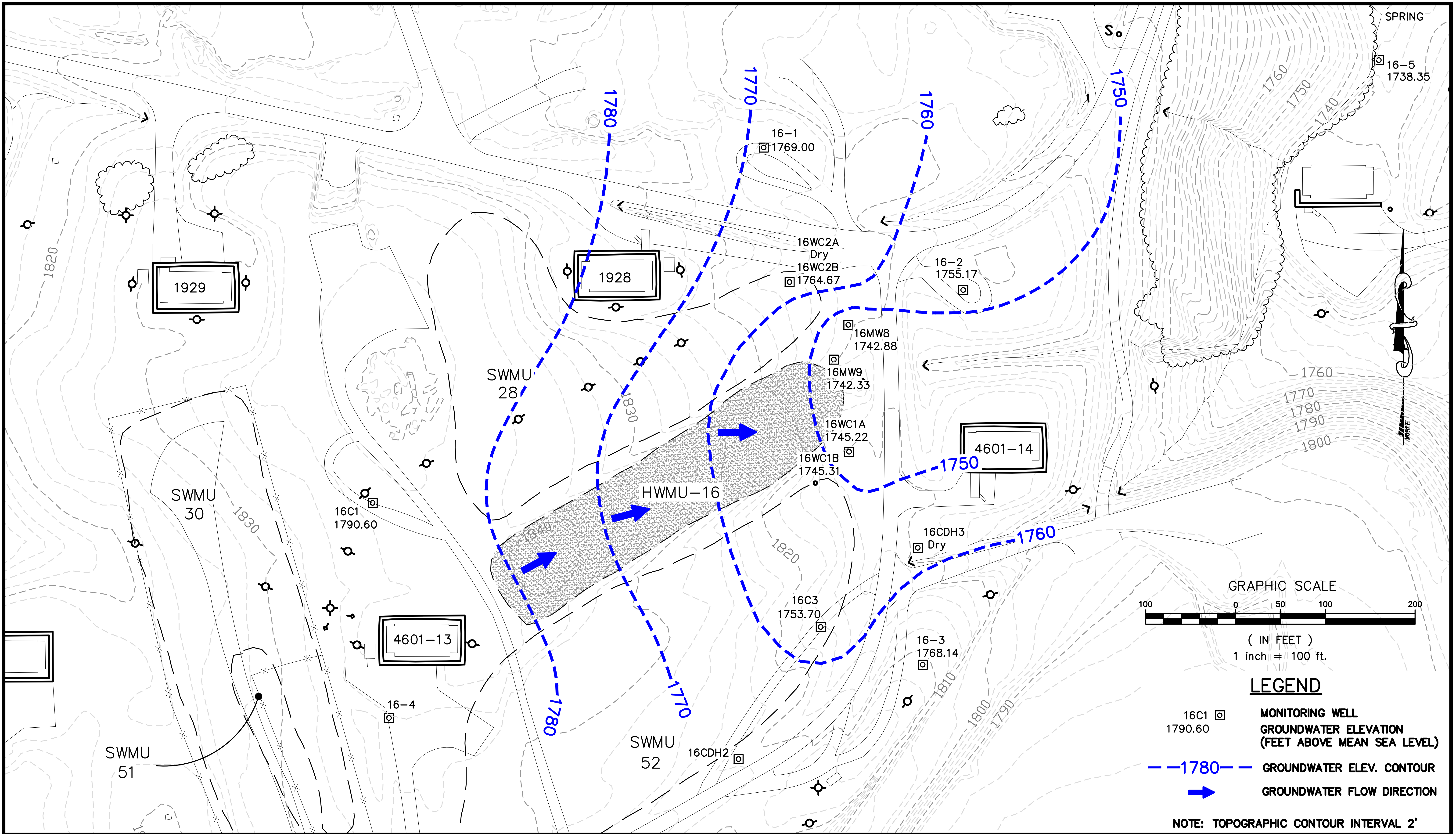
DESIGNED	RGM
DRAWN	DLD
CHECKED	SN
DATE	06/06/2014

HWMU-16 POTENTIOMETRIC SURFACE MAP - APRIL 23, 2014
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

SCALE: 1"=100'
PLAN NO. B03204-12

FIGURE
2

P:\B03200\B03204\B03204-12\CAD\B03204-12_HWMU-16.dwg Jun 17, 2014 12:22pm



Draper Aden Associates

Engineering • Surveying • Environmental Services

2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291

Richmond, VA
Charlottesville, VA
Hampton Roads, VA
Coats, NC

DESIGNED	RGM
DRAWN	DLD
CHECKED	SN
DATE	02/11/15

HWMU-16 POTENTIOMETRIC SURFACE MAP - OCTOBER 21, 2014
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

SCALE: 1"=100'

PLAN NO. B03204-12

FIGURE
2

P:\B03200\B03204\B03204-12\CAD\B03204-12_HWMU-16 OCT 2014.dwg Feb 12, 2015 8:32am

APPENDIX B-2

HWMU-16 2014 LABORATORY ANALYTICAL RESULTS
POINT OF COMPLIANCE WELLS

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells 2Q2014
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 All Results in ug/L.

Analtye/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	QL	GPS	Method
Antimony					CAS #	7440-36-0		
Second Quarter 2014	U	U	U	U	U	1	6	6020A
Arsenic					CAS #	7440-38-2		
Second Quarter 2014	U	U	U	U	U	10	10	6020A
Barium					CAS #	7440-39-3		
Second Quarter 2014	159	123	579	274	111	10	2000	6020A
Beryllium					CAS #	7440-41-7		
Second Quarter 2014	U	0.253 J	U	U	U	1	4	6020A
Cadmium					CAS #	7440-43-9		
Second Quarter 2014	U	0.22 J	U	U	U	1	5	6020A
Chromium					CAS #	7440-47-3		
Second Quarter 2014	U	U	U	U	U	5	100	6020A
Cobalt					CAS #	7440-48-4		
Second Quarter 2014	U	2.47 J	4.49 J	4.7 J	46.8	5	5	6020A
Copper					CAS #	7440-50-8		
Second Quarter 2014	U	9.44	U	U	2.17 J	5	1300	6020A
Lead					CAS #	7439-92-1		
Second Quarter 2014	U	0.604 J	U	U	U	1	15	6020A
Mercury					CAS #	7439-97-6		
Second Quarter 2014	U	U	U	U	U	2	2	7470A
Nickel					CAS #	7440-02-0		
Second Quarter 2014	4.65 J	5.17 J	16.8	8.1 J	9.35 J	10	313	6020A
Selenium					CAS #	7782-49-2		
Second Quarter 2014	U	U	U	U	U	5	50	6020A
Silver					CAS #	7440-22-4		
Second Quarter 2014	U	U	U	U	U	1	78.25	6020A
Thallium					CAS #	7440-28-0		
Second Quarter 2014	U	U	U	U	U	1	-	6020A
Tin					CAS #	7440-31-5		
Second Quarter 2014	U	U	U	U	U	50	-	6010C
Vanadium					CAS #	7440-62-2		
Second Quarter 2014	U	U	U	U	U	10	151	6020A
Zinc					CAS #	7440-66-6		
Second Quarter 2014	U	35.1	U	6.7 J	10.2	10	4695	6020A
Sulfide					CAS #	18496-25-8		
Second Quarter 2014	U J	U J	U J	U J	U J	3000	-	9034
Cyanide					CAS #	57-12-5		
Second Quarter 2014	U	U	U	U	U	20	-	9012B
Acenaphthene					CAS #	83-32-9		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Acenaphthylene					CAS #	208-96-8		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Acetone					CAS #	67-64-1		
Second Quarter 2014	U	U	U	U	U	10	223.57	8260C
Acetonitrile					CAS #	75-05-8		
Second Quarter 2014	U	U	U	U	U	100	-	8260C
Acetophenone					CAS #	98-86-2		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
2-Acetylaminofluorene					CAS #	53-96-3		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Acrolein					CAS #	107-02-8		
Second Quarter 2014	U J	U J	U J	U J	U J	25	-	8260C
Acrylonitrile					CAS #	107-13-1		
Second Quarter 2014	U	U	U	U	U	10	-	8260C
Aldrin					CAS #	309-00-2		
Second Quarter 2014	U	U	U	U	U	0.025	-	8081B

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells 2Q 2104
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 **All Results in ug/L.**

Analtye/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	QL	GPS	Method
Allyl chloride					CAS #	107-05-1		
Second Quarter 2014	U	U	U	U	U	10	-	8260C
4-Aminobiphenyl					CAS #	92-67-1		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Aniline					CAS #	62-53-3		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Anthracene					CAS #	120-12-7		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Aramite					CAS #	140-57-8		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Benzene					CAS #	71-43-2		
Second Quarter 2014	0.3 J	U	0.3 J	0.1 J	U	1	5	8260C
Benzo[a]anthracene					CAS #	56-55-3		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Benzo[b]fluoranthene					CAS #	205-99-2		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Benzo[k]fluoranthene					CAS #	207-08-9		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Benzo[ghi]perylene					CAS #	191-24-2		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Benzo(a)pyrene					CAS #	50-32-8		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
1,4-Benzenediamine					CAS #	106-50-3		
Second Quarter 2014	U J	U J	U J	U J	U J	10	-	8270D
Benzyl alcohol					CAS #	100-51-6		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
alpha-BHC					CAS #	319-84-6		
Second Quarter 2014	U	U	U	U	U	0.025	-	8081B
beta-BHC					CAS #	319-85-7		
Second Quarter 2014	U	U	U	U	U	0.025	-	8081B
delta-BHC					CAS #	319-86-8		
Second Quarter 2014	U	U	U	U	U	0.025	-	8081B
gamma-BHC					CAS #	58-89-9		
Second Quarter 2014	U	U	U	U	U	0.025	-	8081B
bis(2-Chloroethoxy)methane					CAS #	111-91-1		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
bis(2-Chloroethyl)ether					CAS #	111-44-4		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
bis(2-Chloro-1-methylethyl)ether					CAS #	108-60-1		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
bis(2-Ethylhexyl)phthalate					CAS #	117-81-7		
Second Quarter 2014	U	U	U	U	U	5	10	8270D
Bromobenzene					CAS #	108-86-1		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
Bromochloromethane					CAS #	74-97-5		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
Bromodichloromethane					CAS #	75-27-4		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
Bromoform					CAS #	75-25-2		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
4-Bromophenyl phenyl ether					CAS #	101-55-3		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
2-Butanone					CAS #	78-93-3		
Second Quarter 2014	U	U	U	U	U	10	2667.6	8260C
n-Butyl alcohol					CAS #	71-36-3		
Second Quarter 2014	U	U	U	U	U	50	-	8260C

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells 2Q 2014
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 ***All Results in ug/L.***

Analtye/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*QL*	*GPS*	*Method*
tert-Butyl alcohol					*CAS #*	*75-65-0*		
Second Quarter 2014	U	U	U	U	U	200	-	8260C
n-Butylbenzene					*CAS #*	*104-51-8*		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
sec-Butylbenzene					*CAS #*	*135-98-8*		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
tert-Butylbenzene					*CAS #*	*98-06-6*		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
Butyl benzyl phthalate					*CAS #*	*85-68-7*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Carbon disulfide					*CAS #*	*75-15-0*		
Second Quarter 2014	U	U	U	U	U	10	-	8260C
Carbon tetrachloride					*CAS #*	*56-23-5*		
Second Quarter 2014	U	U	U	U	U	1	5	8260C
Chlordane					*CAS #*	*57-74-9*		
Second Quarter 2014	U	U	U	U	U	0.8	-	8081B
p-Chloroaniline					*CAS #*	*106-47-8*		
Second Quarter 2014	U	U	U	U	U	10	-	8270D
Chlorobenzene					*CAS #*	*108-90-7*		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
Chlorobenzilate					*CAS #*	*510-15-6*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
p-Chloro-m-cresol					*CAS #*	*59-50-7*		
Second Quarter 2014	U	U	U	U	U	10	-	8270D
Chloroethane					*CAS #*	*75-00-3*		
Second Quarter 2014	4.8	U	2.9	1 J	U	1	1293.39	8260C
Chloroform					*CAS #*	*67-66-3*		
Second Quarter 2014	U	U	U	U	U	1	80	8260C
2-Chloroethyl vinyl ether					*CAS #*	*110-75-8*		
Second Quarter 2014	U J	U J	U J	U J	U J	20	-	8260C
2-Chloronaphthalene					*CAS #*	*91-58-7*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
2-Chlorophenol					*CAS #*	*95-57-8*		
Second Quarter 2014	U	U	U	U	U	10	-	8270D
4-Chlorophenyl phenyl ether					*CAS #*	*7005-72-3*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Chloroprene					*CAS #*	*126-99-8*		
Second Quarter 2014	U	U	U	U	U	10	-	8260C
2-Chlorotoluene					*CAS #*	*95-49-8*		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
4-Chlorotoluene					*CAS #*	*106-43-4*		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
Chrysene					*CAS #*	*218-01-9*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Cyclohexane					*CAS #*			
Second Quarter 2014	U	U	U	U	U	1	-	8260C
2,4-Dichlorophenoxyacetic acid					*CAS #*	*94-75-7*		
Second Quarter 2014	U	U	U	U	U	5	-	8151A
4,4'-DDD					*CAS #*	*72-54-8*		
Second Quarter 2014	U	U	U	U	U	0.05	-	8081B
4,4'-DDE					*CAS #*	*72-55-9*		
Second Quarter 2014	U	U	U	U	U	0.05	-	8081B
4,4'-DDT					*CAS #*	*50-29-3*		
Second Quarter 2014	U N	U N	U N	U N	U	0.05	-	8081B
Diallate					*CAS #*	*2303-16-4*		
Second Quarter 2014	U	U	U	U	U	10	-	8270D

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells 2Q 2014
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 **All Results in ug/L.**

Analtye/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	QL	GPS	Method
Dibenz(a,h)anthracene					CAS #	53-70-3		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Dibenzofuran					CAS #	132-64-9		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Dibromochloromethane					CAS #	124-48-1		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
1,2-Dibromo-3-chloropropane					CAS #	96-12-8		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
1,2-Dibromoethane					CAS #	106-93-4		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
Di-n-butyl phthalate					CAS #	84-74-2		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
1,2-Dichlorobenzene					CAS #	95-50-1		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
1,3-Dichlorobenzene					CAS #	541-73-1		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
1,4-Dichlorobenzene					CAS #	106-46-7		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
3,3'-Dichlorobenzidine					CAS #	91-94-1		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
trans-1,4-Dichloro-2-butene					CAS #	110-57-6		
Second Quarter 2014	U J	U J	U J	U J	U J	10	-	8260C
Dichlorodifluoromethane					CAS #	75-71-8		
Second Quarter 2014	U	U	U	U	U	1	142.3	8260C
1,1-Dichloroethane					CAS #	75-34-3		
Second Quarter 2014	8	0.3 J	9.5	2.9	U	1	9.5	8260C
1,2-Dichloroethane					CAS #	107-06-2		
Second Quarter 2014	U	U	U	U	U	1	5	8260C
1,1-Dichloroethene					CAS #	75-35-4		
Second Quarter 2014	0.3 J	U	0.3 J	U	U	1	-	8260C
trans-1,2-Dichloroethene					CAS #	156-60-5		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
2,4-Dichlorophenol					CAS #	120-83-2		
Second Quarter 2014	U	U	U	U	U	10	-	8270D
2,6-Dichlorophenol					CAS #	87-65-0		
Second Quarter 2014	U	U	U	U	U	10	-	8270D
1,2-Dichloropropane					CAS #	78-87-5		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
1,3-Dichloropropane					CAS #	142-28-9		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
2,2-Dichloropropane					CAS #	594-20-7		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
1,1-Dichloropropene					CAS #	563-58-6		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
cis-1,3-Dichloropropene					CAS #	10061-01-5		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
trans-1,3-Dichloropropene					CAS #	10061-02-6		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
Dieldrin					CAS #	60-57-1		
Second Quarter 2014	U	U	U	U	U	0.05	-	8081B
Diethyl ether					CAS #	60-29-7		
Second Quarter 2014	38 J	7.4 J	52 J	13	U	13	7300	8260C
Diethyl phthalate					CAS #	84-66-2		
Second Quarter 2014	U	U	1 J	U	U	5	11000	8270D
O,O-Diethyl O-2-pyrazinyl					CAS #	297-97-2		
Second Quarter 2014	U	U	U	U	U	5	-	8270D

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells 2Q 2014
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 *All Results in ug/L.*

Analtye/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	QL	GPS	Method
Dimethoate					CAS #	60-51-5		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Dimethyl ether					CAS #	115-10-6		
Second Quarter 2014	9.4 J	0.3 J	0.9 J	0.9 J	0.2 J	13	17	8260C
p-(Dimethylamino)azobenzene					CAS #	60-11-7		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
7,12-Dimethylbenz[a]anthracene					CAS #	57-97-6		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
3,3'-Dimethylbenzidine					CAS #	119-93-7		
Second Quarter 2014	U J	U J	U J	U J	U J	5	-	8270D
a,a-Dimethylphenethylamine					CAS #	122-09-8		
Second Quarter 2014	U	U	U	U	U	15	-	8270D
2,4-Dimethylphenol					CAS #	105-67-9		
Second Quarter 2014	U	U	U	U	U	10	-	8270D
Dimethyl phthalate					CAS #	131-11-3		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
m-Dinitrobenzene					CAS #	99-65-0		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
4,6-Dinitro-o-cresol					CAS #	534-52-1		
Second Quarter 2014	U	U	U	U	U	10	-	8270D
2,4-Dinitrophenol					CAS #	51-28-5		
Second Quarter 2014	U	U	U	U	U	10	-	8270D
2,4-Dinitrotoluene					CAS #	121-14-2		
Second Quarter 2014	U	U	U	U	U	5	31.3	8270D
2,6-Dinitrotoluene					CAS #	606-20-2		
Second Quarter 2014	U	U	U	U	U	5	15.65	8270D
Dinoseb					CAS #	88-85-7		
Second Quarter 2014	U	U	U	U	U	2.5	-	8151A
Di-n-octyl phthalate					CAS #	117-84-0		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
1,4-Dioxane					CAS #	123-91-1		
Second Quarter 2014	U	U	U	U	U	200	-	8260C
Diphenylamine					CAS #	122-39-4		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Disulfoton					CAS #	298-04-4		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Endosulfan I					CAS #	959-98-8		
Second Quarter 2014	U	U	U	U	U	0.025	-	8081B
Endosulfan II					CAS #	33213-65-9		
Second Quarter 2014	U	U	U	U	U	0.05	-	8081B
Endosulfan sulfate					CAS #	1031-07-8		
Second Quarter 2014	U	U	U	U	U	0.05	-	8081B
Endrin					CAS #	72-20-8		
Second Quarter 2014	U	U	U	U	U	0.05	-	8081B
Ethyl acetate					CAS #	141-78-6		
Second Quarter 2014	U	U	U	U	U	10	-	8260C
Endrin aldehyde					CAS #	7421-93-4		
Second Quarter 2014	U	U	U	U	U	0.05	-	8081B
Ethanol					CAS #	64-17-5		
Second Quarter 2014	U	U	U	U	U	250	-	8260C
Ethylbenzene					CAS #	100-41-4		
Second Quarter 2014	U	U	U	U	U	1	700	8260C
Ethyl methacrylate					CAS #	97-63-2		
Second Quarter 2014	U	U	U	U	U	10	-	8260C
Ethyl methanesulfonate					CAS #	62-50-0		
Second Quarter 2014	U	U	U	U	U	5	-	8270D

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells 2Q 2014
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 *All Results in ug/L.*

Analtye/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*QL*	*GPS*	*Method*
Ethylene oxide					*CAS #*	*75-21-8*		
Second Quarter 2014	U J	U J	U J	U J	U J	100	-	8260C
Famphur					*CAS #*	*52-85-7*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Fluoranthene					*CAS #*	*206-44-0*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Fluorene					*CAS #*	*86-73-7*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Heptachlor					*CAS #*	*76-44-8*		
Second Quarter 2014	U	U	U	U	U	0.025	-	8081B
Heptachlor epoxide					*CAS #*	*1024-57-3*		
Second Quarter 2014	U	U	U	U	U	0.025	-	8081B
Hexachlorobenzene					*CAS #*	*118-74-1*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Hexachlorobutadiene					*CAS #*	*87-68-3*		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
Hexachlorocyclopentadiene					*CAS #*	*77-47-4*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Hexachloroethane					*CAS #*	*67-72-1*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Second Quarter 2014	U	U	U	U	U	10	-	8260C
Hexachlorophene					*CAS #*	*70-30-4*		
Second Quarter 2014	U	U	U	U	U	100	-	8270D
Hexachloropropene					*CAS #*	*1888-71-7*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
2-Hexanone					*CAS #*	*591-78-6*		
Second Quarter 2014	U	U	U	U	U	10	-	8260C
Indeno[1,2,3-cd]pyrene					*CAS #*	*193-39-5*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Isobutyl alcohol					*CAS #*	*78-83-1*		
Second Quarter 2014	U	U	U	U	U	200	-	8260C
Isodrin					*CAS #*	*465-73-6*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Isophorone					*CAS #*	*78-59-1*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Isopropylbenzene					*CAS #*	*98-82-8*		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
Isopropylether					*CAS #*	*108-20-3*		
Second Quarter 2014	U	U	U	U	U	10	-	8260C
4-Isopropyltoluene					*CAS #*	*99-87-6*		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
Isosafrole					*CAS #*	*120-58-1*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Kepone					*CAS #*	*143-50-0*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Methacrylonitrile					*CAS #*	*126-98-7*		
Second Quarter 2014	U	U	U	U	U	100	-	8260C
Methapyrilene					*CAS #*	*91-80-5*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Methoxychlor					*CAS #*	*72-43-5*		
Second Quarter 2014	U	U	U	U	U	0.25	-	8081B
Bromomethane					*CAS #*	*74-83-9*		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
Chloromethane					*CAS #*	*74-87-3*		
Second Quarter 2014	U	U	U	U	U	1	1.4	8260C
3-Methylcholanthrene					*CAS #*	*56-49-5*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells 2Q 2014
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 **All Results in ug/L.**

Analtye/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	QL	GPS	Method
Iodomethane					CAS #	74-88-4		
Second Quarter 2014	U	U	U	U	U	10	-	8260C
Methyl methacrylate					CAS #	80-62-6		
Second Quarter 2014	U	U	U	U	U	10	-	8260C
Methyl methane sulfonate					CAS #	66-27-3		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
2-Methylnaphthalene					CAS #	91-57-6		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Methyl parathion					CAS #	298-00-0		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
4-Methyl-2-pentanone					CAS #	108-10-1		
Second Quarter 2014	U	U	U	U	U	10	-	8260C
2-Methylphenol					CAS #	95-48-7		
Second Quarter 2014	U	U	U	U	U	10	-	8270D
3 & 4-Methylphenol					CAS #	m 108-39-4	p 106-44-5	
Second Quarter 2014	U	U	U	U	U	10	-	8270D
Methyl tert-butyl ether					CAS #	1634-04-4		
Second Quarter 2014	U	U	U	U	U	10	-	8260C
Dibromomethane					CAS #	74-95-3		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
Methylene chloride					CAS #	75-09-2		
Second Quarter 2014	3.9	U	U	U	U	1	13.95	8260C
Naphthalene					CAS #	91-20-3		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
1,4-Naphthoquinone					CAS #	130-15-4		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
1-Naphthylamine					CAS #	134-32-7		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
2-Naphthylamine					CAS #	91-59-8		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
o-Nitroaniline					CAS #	88-74-4		
Second Quarter 2014	U	U	U	U	U	10	-	8270D
m-Nitroaniline					CAS #	99-09-2		
Second Quarter 2014	U	U	U	U	U	10	-	8270D
p-Nitroaniline					CAS #	100-01-6		
Second Quarter 2014	U	U	U	U	U	10	-	8270D
Nitrobenzene					CAS #	98-95-3		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
o-Nitrophenol					CAS #	88-75-5		
Second Quarter 2014	U	U	U	U	U	10	-	8270D
p-Nitrophenol					CAS #	100-02-7		
Second Quarter 2014	U	U	U	U	U	10	-	8270D
4-Nitroquinoline-1-oxide					CAS #	56-57-5		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
N-Nitrosodi-n-butylamine					CAS #	924-16-3		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
N-Nitrosodiethylamine					CAS #	55-18-5		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
N-Nitrosodimethylamine					CAS #	62-75-9		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
N-Nitrosodiphenylamine					CAS #	86-30-6		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
N-Nitrosodipropylamine					CAS #	621-64-7		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
N-Nitrosomethylethylamine					CAS #	10595-95-6		
Second Quarter 2014	U	U	U	U	U	5	-	8270D

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells 2Q 2014
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 *All Results in ug/L.*

Analtye/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*QL*	*GPS*	*Method*
N-Nitrosomorpholine					*CAS #*	*59-89-2*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
N-Nitrosopiperidine					*CAS #*	*100-75-4*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
N-Nitrosopyrrolidine					*CAS #*	*930-55-2*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
5-Nitroso-o-toluidine					*CAS #*	*99-55-8*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Parathion					*CAS #*	*56-38-2*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Pentachlorobenzene					*CAS #*	*608-93-5*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Pentachloroethane					*CAS #*	*76-01-7*		
Second Quarter 2014	U	U	U	U	U	10	-	8260C
Pentachloronitrobenzene					*CAS #*	*82-68-8*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Pentachlorophenol					*CAS #*	*87-86-5*		
Second Quarter 2014	U	U	U	U	U	10	-	8270D
Phenacetin					*CAS #*	*62-44-2*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Phenanthrene					*CAS #*	*85-01-8*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Phenol					*CAS #*	*108-95-2*		
Second Quarter 2014	U	U	U	U	U	10	-	8270D
Total Recoverable Phenolics					*CAS #*			
Second Quarter 2014	U	U	U	U	U	40	-	9066
Phorate					*CAS #*	*298-02-2*		
Second Quarter 2014	U J	U J	U J	U J	U J	5	-	8270D
2-Picoline					*CAS #*	*931-19-1*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Pronamide					*CAS #*	*23950-58-5*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
1-Propanol					*CAS #*	*71-23-8*		
Second Quarter 2014	U J	U J	U J	U J	U J	100	-	8260C
2-Propanol					*CAS #*	*67-63-0*		
Second Quarter 2014	U	U	U	U	U	100	-	8260C
Propionitrile					*CAS #*	*107-12-0*		
Second Quarter 2014	U	U	U	U	U	100	-	8260C
n-Propylbenzene					*CAS #*	*103-65-1*		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
Pyrene					*CAS #*	*129-00-0*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Pyridine					*CAS #*	*110-86-1*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Safrole					*CAS #*	*94-59-7*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Silvex					*CAS #*	*93-72-1*		
Second Quarter 2014	U	U	U	U	U	2.5	-	8151A
Styrene					*CAS #*	*100-42-5*		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
Sulfotep					*CAS #*	*3689-24-5*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
2,4,5-Trichlorophenoxyacetic acid					*CAS #*	*93-76-5*		
Second Quarter 2014	U	U	U	U	U	2.5	-	8151A
1,2,4,5-Tetrachlorobenzene					*CAS #*	*95-94-3*		
Second Quarter 2014	U	U	U	U	U	5	-	8270D

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells 2Q 2014
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 **All Results in ug/L.**

Analtye/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	QL	GPS	Method
1,1,1,2-Tetrachloroethane					CAS #	630-20-6		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
1,1,2,2-Tetrachloroethane					CAS #	79-34-5		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
Tetrachloroethene					CAS #	127-18-4		
Second Quarter 2014	0.4 J	U	U	0.1 J	U	1	5	8260C
Tetrahydrofuran					CAS #	109-99-9		
Second Quarter 2014	15 J	U	U	U	U	25	-	8260C
2,3,4,6-Tetrachlorophenol					CAS #	58-90-2		
Second Quarter 2014	U	U	U	U	U	10	-	8270D
Toluene					CAS #	108-88-3		
Second Quarter 2014	U	U	U	U	U	1	1000	8260C
o-Toluidine					CAS #	95-53-4		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Toxaphene					CAS #	8001-35-2		
Second Quarter 2014	U	U	U	U	U	2.5	-	8081B
1,2,3-Trichlorobenzene					CAS #	87-61-6		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
1,2,4-Trichlorobenzene					CAS #	120-82-1		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
1,1,1-Trichloroethane					CAS #	71-55-6		
Second Quarter 2014	0.4 J	U	U	U	U	1	200	8260C
1,1,2-Trichloroethane					CAS #	79-00-5		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
Trichloroethene					CAS #	79-01-6		
Second Quarter 2014	0.3 J	U	U	U	U	1	5	8260C
Trichlorofluoromethane					CAS #	75-69-4		
Second Quarter 2014	U	U	U	U	U	1	469.5	8260C
2,4,5-Trichlorophenol					CAS #	95-95-4		
Second Quarter 2014	U	U	U	U	U	10	-	8270D
2,4,6-Trichlorophenol					CAS #	88-06-2		
Second Quarter 2014	U	U	U	U	U	10	-	8270D
1,2,3-Trichloropropane					CAS #	96-18-4		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
1,1,2-Trichloro-1,2,2-Trifluoroethane					CAS #	76-13-1		
Second Quarter 2014	U	U	U	U	U	1	59000	8260C
O,O,O-Triethyl phosphorothioate					CAS #	126-68-1		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
1,2,4-Trimethylbenzene					CAS #	95-63-6		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
1,3,5-Trimethylbenzene					CAS #	108-67-8		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
sym-Trinitrobenzene					CAS #	99-35-4		
Second Quarter 2014	U	U	U	U	U	5	-	8270D
Vinyl acetate					CAS #	108-05-4		
Second Quarter 2014	U	U	U	U	U	10	-	8260C
Vinyl chloride					CAS #	75-01-4		
Second Quarter 2014	U	U	U	U	U	1	-	8260C
Xylenes (Total)					CAS #	1330-20-7		
Second Quarter 2014	U	U	U	U	U	3	10000	8260C

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells 2Q 2104
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 ***All Results in ug/L.***

Analtye/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*QL*	*GPS*	*Method*

Definitions:

The following definitions apply to results reported for Appendix IX monitoring events.
All Appendix IX monitoring results for compliance wells are reported to the detection limit.

Appendix IX Monitoring Events: 3Q2003, 2Q-2004, 2Q-2005, 3Q2006, 2Q2007, 2Q2008, 2Q2009, 2Q 2010, 2Q 2011, 2Q 2012, 2Q2013, 2Q2014

QL Denotes permit required quantitation limit.
U denotes not detected at or above the detection limit.
UA denotes not detected at or above the adjusted detection limit.
J Denotes result is estimated. When used with "U" (i.e., “UJ”), denotes analyte not detected at or above the detection limit and detection limit and QL are estimated. When used with "UA" (i.e., “UAJ”), denotes analyte not detected at or above adjusted detection limit and adjusted detection limit and QL are estimated.
UN Denotes analyte concentration is less than the quantitation limit and/or five times the blank concentration. Not reliably detected due to blank contamination. This qualifier used only for Appendix IX monitoring event when compliance well results are reported to at or above the project detection limit.
R Denotes result rejected.
Q Denotes data validation qualifier. **X** Denotes mass spectral confirmation not obtained-result suspect.
Background Denotes background concentrations listed in Appendix F to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002), where applicable.
CAS# Denotes Chemical Abstract Services registration number.
GPS Denotes Groundwater Protection Standards listed in Appendix G to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002) (revised September 27, 2011).
NS denotes not sampled. **NA** denotes not analyzed.
“–“ denotes not detected (pre-2nd Quarter 2003) or not available / not sampled (beginning 2nd Quarter 2003).

The following definitions apply to results reported for non-Appendix IX monitoring events.
All non-Appendix IX monitoring results for compliance wells are reported at or above the quantitation limit.

QL Denotes permit required quantitation limit.
U Denotes analyte not detected at or above QL.
UA Denotes analyte not detected at or above adjusted sample QL.
J Denotes result is estimated. When used with "U" (i.e., “**UJ**”), denotes analyte not detected at or above QL and QL is estimated. When used with "UA" (i.e., “**UAJ**”), denotes analyte not detected at or above adjusted QL and adjusted QL is estimated.
R Denotes result rejected.
Q Denotes data validation qualifier.
Background Denotes background concentrations listed in Appendix F to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002), (revised September 27, 2011), where applicable.
CAS# Denotes Chemical Abstract Services registration number.
GPS Denotes Groundwater Protection Standards listed in Appendix G to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002) (revised September 27, 2011).

NOTE:

Fourth Quarter 2008:
Due to laboratory error all HWMU 16 samples were analyzed using Method 8260B 5 ml purge instead of a 25 ml purge which resulted in a higher QL. For these samples, all results were evaluated to the detection limit, which is comparable to the permit QL. Results below the laboratory QL but at or above the permit QL are reported and qualified as estimated.
Second Quarter 2009:
Verification event 6/11/2009 - 16MW8 for acetone. Verification result reported as not detected.
4/ 2010 event -Per DEQ, tin analyzed by Method 6010B instead of Method 6020. Verification event: 16MW9 1,1-dichloroethene and benzene. 16WC1B 4,4-DDD. Verification result reported as not detected.
Verification event 6/27/2012 – 16WC1A for cobalt. Verification result reported.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 All Results in ug/L.

Analtye/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	QL	GPS	Method
Arsenic					CAS #	7440-38-2		
Fourth Quarter 2014	U	U	U	U	U	10	10	6020A
Barium					CAS #	7440-39-3		
Fourth Quarter 2014	200	125	519	231	138	10	2000	6020A
Beryllium					CAS #	7440-41-7		
Fourth Quarter 2014	U	U	U	U	U	1	4	6020A
Cadmium					CAS #	7440-43-9		
Fourth Quarter 2014	U	U	U	U	U	1	5	6020A
Chromium					CAS #	7440-47-3		
Fourth Quarter 2014	U	U	U	U	U	5	100	6020A
Cobalt					CAS #	7440-48-4		
Fourth Quarter 2014	U	U	U	U	13.4	5	5	6020A
Copper					CAS #	7440-50-8		
Fourth Quarter 2014	U	25.6	U	U	U	5	1300	6020A
Lead					CAS #	7439-92-1		
Fourth Quarter 2014	U	1.1	U	U	U	1	15	6020A
Mercury					CAS #	7439-97-6		
Fourth Quarter 2014	U	U	U	U	U	2	2	7470A
Nickel					CAS #	7440-02-0		
Fourth Quarter 2014	U	U	13.9	U	U	10	300	6020A
Vanadium					CAS #	7440-62-2		
Fourth Quarter 2014	U	U	U	U	U	10	151	6020A
Zinc					CAS #	7440-66-6		
Fourth Quarter 2014	U	56.1	U	U	U	10	4700	6020A
Benzene					CAS #	71-43-2		
Fourth Quarter 2014	U	U	U	U	U	1	5	8260C
2-Butanone					CAS #	78-93-3		
Fourth Quarter 2014	U	U	U	U	U	10	4900	8260C
Carbon tetrachloride					CAS #	56-23-5		
Fourth Quarter 2014	U	U	U	U	U	1	5	8260C
Chloroethane					CAS #	75-00-3		
Fourth Quarter 2014	4.6	U	2.4	U	U	1	21000	8260C
Dichlorodifluoromethane					CAS #	75-71-8		
Fourth Quarter 2014	U	U	U	U	U	1	190	8260C
1,1-Dichloroethane					CAS #	75-34-3		
Fourth Quarter 2014	8.2	U	7.3	1.7	U	1	9.5	8260C
1,1-Dichloroethene					CAS #	75-35-4		
Fourth Quarter 2014	U	U	U	U	U	1	7	8260C
Diethyl ether					CAS #	60-29-7		
Fourth Quarter 2014	44.3	U	42.4	U	U	12.5	7300	8260C
Diethyl phthalate					CAS #	84-66-2		
Fourth Quarter 2014	U	U	U	U	U	5	11000	8270D
Dimethyl ether					CAS #	115-10-6		
Fourth Quarter 2014	U	U	U	U	U	12.5	17	8260C
2,4-Dinitrotoluene					CAS #	121-14-2		
Fourth Quarter 2014	U	U	U	U	U	5	10	8270D
2,6-Dinitrotoluene					CAS #	606-20-2		
Fourth Quarter 2014	U	U	U	U	U	5	10	8270D
Ethylbenzene					CAS #	100-41-4		
Fourth Quarter 2014	U	U	U	U	U	1	700	8260C
Chloromethane					CAS #	74-87-3		
Fourth Quarter 2014	U	U	U	U	U	1	190	8260C
Methylene chloride					CAS #	75-09-2		
Fourth Quarter 2014	3.4	U	U	U	U	1	13.95	8260C
Tetrachloroethene					CAS #	127-18-4		
Fourth Quarter 2014	U	U	U	U	U	1	5	8260C

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 *All Results in ug/L.*

Analtye/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	QL	GPS	Method
Toluene					*CAS #*	*108-88-3*		
Fourth Quarter 2014	U	U	U	U	U	1	1000	8260C
1,1,1-Trichloroethane					*CAS #*	*71-55-6*		
Fourth Quarter 2014	U	U	U	U	U	1	200	8260C
Trichloroethene					*CAS #*	*79-01-6*		
Fourth Quarter 2014	U	U	U	U	U	1	5	8260C
Trichlorofluoromethane					*CAS #*	*75-69-4*		
Fourth Quarter 2014	U	U	U	U	U	1	1000	8260C
1,1,2-Trichloro-1,2,2-Trifluoroethane					*CAS #*	*76-13-1*		
Fourth Quarter 2014	U	U	U	U	U	1	59000	8260C
Xylenes (Total)					*CAS #*	*1330-20-7*		
Fourth Quarter 2014	U	U	U	U	U	3	10000	8260C

See last page of this report for definitions.

Definitions:

The following definitions apply to results reported for Appendix IX monitoring events.
All Appendix IX monitoring results for compliance wells are reported to the detection limit.

***Appendix IX Monitoring Events:** 3Q2003, 2Q-2004, 2Q-2005, 3Q2006, 2Q2007, 2Q2008, 2Q2009, 2Q 2010, 2Q 2011, 2Q 2012, 2Q2013, 2Q2014*

QL Denotes permit required quantitation limit.
U denotes not detected at or above the detection limit.
UA denotes not detected at or above the adjusted detection limit.
J Denotes result is estimated. When used with "U" (i.e., “UJ”), denotes analyte not detected at or above the detection limit and detection limit and QL are estimated. When used with "UA" (i.e., “UAJ”), denotes analyte not detected at or above adjusted detection limit and adjusted detection limit and QL are estimated.
UN Denotes analyte concentration is less than the quantitation limit and/or five times the blank concentration. Not reliably detected due to blank contamination. This qualifier used only for Appendix IX monitoring event when compliance well results are reported to at or above the project detection limit.
R Denotes result rejected.
Q Denotes data validation qualifier. **X** Denotes mass spectral confirmation not obtained-result suspect.
Background Denotes background concentrations listed in Appendix F to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002), where applicable.
CAS# Denotes Chemical Abstract Services registration number.
GPS Denotes Groundwater Protection Standards listed in Appendix G to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002) (rev 9/11)(rev 8/2014)
NS denotes not sampled. **NA** denotes not analyzed.
“–“ denotes not detected (pre-2nd Quarter 2003) or not available / not sampled (beginning 2nd Quarter 2003).

The following definitions apply to results reported for non-Appendix IX monitoring events.
All non-Appendix IX monitoring results for compliance wells are reported at or above the quantitation limit.

QL Denotes permit required quantitation limit.
U Denotes analyte not detected at or above QL.
UA Denotes analyte not detected at or above adjusted sample QL.
J Denotes result is estimated. When used with "U" (i.e., “**UJ**”), denotes analyte not detected at or above QL and QL is estimated. When used with "UA" (i.e., “**UAJ**”), denotes analyte not detected at or above adjusted QL and adjusted QL is estimated.
R Denotes result rejected.
Q Denotes data validation qualifier.
Background Denotes background concentrations listed in Appendix F to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002), (revised September 27, 2011), where applicable.
CAS# Denotes Chemical Abstract Services registration number.
GPS Denotes Groundwater Protection Standards listed in Appendix G to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002) (rev 9/11, rev 8/14)

NOTE:

Fourth Quarter 2008:
Due to laboratory error all HWMU 16 samples were analyzed using Method 8260B 5 ml purge instead of a 25 ml purge which resulted in a higher QL. For these samples, all results were evaluated to the detection limit, which is comparable to the permit QL. Results below the laboratory QL but at or above the permit QL are reported and qualified as estimated.
Second Quarter 2009:
Verification event 6/11/2009 - 16MW8 for acetone. Verification result reported as not detected.
4/ 2010 event -Per DEQ, tin analyzed by Method 6010B instead of Method 6020. Verification event: 16MW9 1,1-dichloroethene and benzene. 16WC1B 4,4-DDD. Verification result reported as not detected.
Verification event 6/27/2012 – 16WC1A for cobalt. Verification result reported.

APPENDIX B-3

HWMU-16 2014 LABORATORY ANALYTICAL RESULTS
PLUME MONITORING WELLS

Target Analyte Monitoring Results At Or Above Permit Quantitation Limit 2Q2014 HWMU-16 Plume Monitoring Wells

Radford Army Ammunition Plant, Radford, Virginia

All Results in ug/L.

Upgradient well = 16C1

Analtye/Quarter	*16C1 Q*	*16-1 Q*	*16-2 Q*	*16-3 Q*	*16-5 Q*	*16WC2B Q*	*16SPRING Q*	*QL*	*Background*	*Method*
Arsenic						*CAS # 7440-38-2*				
Second Quarter 2014	U	U	U	U	U	U	U	10	1	6020A
Barium						*CAS # 7440-39-3*				
Second Quarter 2014	159	147	206	707	164	114	198	10	175.4	6020A
Beryllium						*CAS # 7440-41-7*				
Second Quarter 2014	U	U	U	U	U	U	U	1	0.7	6020A
Cadmium						*CAS # 7440-43-9*				
Second Quarter 2014	U	U	U	U	U	U	U	1	0.2	6020A
Chromium						*CAS # 7440-47-3*				
Second Quarter 2014	U	U	U	U	U	U	U	5	6.2	6020A
Cobalt						*CAS # 7440-48-4*				
Second Quarter 2014	U	U	U	U	U	U	U	5	5	6020A
Copper						*CAS # 7440-50-8*				
Second Quarter 2014	U	U	U	U	U	U	U	5	13	6020A
Lead						*CAS # 7439-92-1*				
Second Quarter 2014	U	U	U	U	U	U	U	1	10	6020A
Mercury						*CAS # 7439-97-6*				
Second Quarter 2014	U	U	U	U	U	U	U	2	0.2	7470A
Nickel						*CAS # 7440-02-0*				
Second Quarter 2014	4.65 J	U	U	U	U	U	U	10	16	6020A
Vanadium						*CAS # 7440-62-2*				
Second Quarter 2014	U	U	U	U	U	U	U	10	151	6020A
Zinc						*CAS # 7440-66-6*				
Second Quarter 2014	U	U	U	U	U	U	U	10	51	6020A
Benzene						*CAS # 71-43-2*				
Second Quarter 2014	0.3 J	U	U	U	U	U	U	1	1	8260C
2-Butanone						*CAS # 78-93-3*				
Second Quarter 2014	U	U	U	U	U	U	U	10	1.1	8260C
Carbon tetrachloride						*CAS # 56-23-5*				
Second Quarter 2014	U	U	U	U	U	U	U	1	0.2	8260C
Chloroethane						*CAS # 75-00-3*				
Second Quarter 2014	4.8	U	U	U	U	U	U	1	20.7	8260C
Dichlorodifluoromethane						*CAS # 75-71-8*				
Second Quarter 2014	U	U	U	U	U	U	U	1	46.5	8260C
1,1-Dichloroethane						*CAS # 75-34-3*				
Second Quarter 2014	8	U	U	U	U	U	U	1	9.5	8260C
Diethyl ether						*CAS # 60-29-7*				
Second Quarter 2014	38 J	U	U	U	U	U	U	13	75.5	8260C
Diethyl phthalate						*CAS # 84-66-2*				
Second Quarter 2014	U	U	U	U	U	U	U	5	5	8270D
Dimethyl ether						*CAS # 115-10-6*				
Second Quarter 2014	9.4 J	U	U	U	U	U	U	13	17.0	8260C
2,4-Dinitrotoluene						*CAS # 121-14-2*				
Second Quarter 2014	U	U	U	U	U	U	U	5	10	8270D
2,6-Dinitrotoluene						*CAS # 606-20-2*				
Second Quarter 2014	U	U	U	U	U	U	U	5	10	8270D

See last page of this report for definitions.

Target Analyte Monitoring Results At Or Above Permit Quantitation Limit 2Q 2014
HWMU-16 Plume Monitoring Wells

Radford Army Ammunition Plant, Radford, Virginia

All Results in ug/L.

Upgradient well = 16C1

Analtye/Quarter	*16C1 Q*	*16-1 Q*	*16-2 Q*	*16-3 Q*	*16-5 Q*	*16WC2B Q*	*16SPRING Q*	*QL*	*Background*	*Method*
Ethylbenzene						*CAS # 100-41-4*				
Second Quarter 2014	U	U	U	U	U	U	U	1	0.1	8260C
Chloromethane						*CAS # 74-87-3*				
Second Quarter 2014	U	U	U	U	U	U	U	1	0.3	8260C
Methylene chloride						*CAS # 75-09-2*				
Second Quarter 2014	3.9	U	U	U	U	U	U	1	13.95	8260C
Tetrachloroethene						*CAS # 127-18-4*				
Second Quarter 2014	0.4 J	U	U	U	U	U	U	1	0.7	8260C
Toluene						*CAS # 108-88-3*				
Second Quarter 2014	U	U	U	U	U	U	U	1	0.1	8260C
1,1,1-Trichloroethane						*CAS # 71-55-6*				
Second Quarter 2014	0.4 J	U	U	U	U	U	U	1	9.2	8260C
Trichloroethene						*CAS # 79-01-6*				
Second Quarter 2014	0.3 J	U	U	U	U	U	U	1	0.1	8260C
Trichlorofluoromethane						*CAS # 75-69-4*				
Second Quarter 2014	U	U	U	U	U	U	U	1	11.3	8260C
1,1,2-Trichloro-1,2,2-Trifluoroethane						*CAS # 76-13-1*				
Second Quarter 2014	U	U	U	U	U	U	U	1	1.2	8260C
Xylenes (Total)						*CAS # 1330-20-7*				
Second Quarter 2014	U	U	U	U	U	U	U	3	0.2	8260C

See last page of this report for definitions.

Target Analyte Monitoring Results At Or Above Permit Quantitation Limit 2Q2014
HWMU-16 Plume Monitoring Wells

Radford Army Ammunition Plant, Radford, Virginia

All Results in ug/L.

Upgradient well = 16C1

Analtye/Quarter	*16C1 Q*	*16-1 Q*	*16-2 Q*	*16-3 Q*	*16-5 Q*	*16WC2B Q*	*16SPRING Q*	*QL*	*Background*	*Method*

Definitions:

All plume monitoring well results reported to at or above the permit quantitation limit except for the upgradient well during the Appendix IX monitoring Event. During this event, results for the upgradient well are reported to the detection limit.

Q Denotes data validation qualifier.
QL Denotes permit required quantitation limit.
U Denotes analyte not detected at or above QL.
UA Denotes analyte not detected at or above adjusted sample QL.
J Denotes result is estimated. When used with "U" (i.e., "**UJ**"), denotes analyte not detected at or above QL and QL is estimated. When used with "UA" (i.e., "**UAJ**"), denotes analyte not detected at or above adjusted QL and adjusted QL is estimated.
UN Denotes analyte concentration is less than the quantiation limit and five times the blank concentration. Not reliably detected due to blank contamination. This qualifier used only for Appendix IX monitoring event when compliance well results are reported to at or above the project detection limit.
R Denotes result rejected.
Background Denotes background concentrations listed in Appendix F to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002), revised September 27, 2011.
CAS# Denotes Chemical Abstract Services registration number.
GPS Denotes groundwater protection standard.

NS denotes not sampled. **NA** denotes not analyzed. "–"denotes not detected (pre-2nd Quarter 2003) or not available / not sampled (beginning 2nd Quarter 2003).

Notes:
4Q2004. No data for 16-1 8270C-semivolatiles. Well dry-insufficient sample volume.
4Q2006 - No data for 16-1; well dry.
4Q2008- No data for 16-1; well dry.
2Q2009- No data for 16-1; well dry.

NOTE:
Fourth Quarter 2008
Due to laboratory error all HWMU 16 samples were analyzed using Method 8260B 5 ml purge instead of a 25 ml purge which resulted in a higher QL. For these samples, all results were evaluated to the detection limit, which is comparable to the permit QL. Results below the laboratory QL but at or above the permit QL are reported and qualified as estimated.

Target Analyte Monitoring Results At Or Above Permit Quantitation Limit HWMU-16 Plume Monitoring Wells

Radford Army Ammunition Plant, Radford, Virginia

All Results in ug/L.

Upgradient well = 16C1

Analtye/Quarter	*16C1 Q*	*16-2 Q*	*16-3 Q*	*16-5 Q*	*16WC2B Q*	*16SPRING Q*	*QL*	*Background*	*Method*
Arsenic						*CAS #7440-38-2*			
Fourth Quarter 2014	U	U	U	U	U	U	10	1	6020A
Barium						*CAS #7440-39-3*			
Fourth Quarter 2014	200	242	745	171	116	219	10	175.4	6020A
Beryllium						*CAS #7440-41-7*			
Fourth Quarter 2014	U	U	U	U	U	U	1	0.7	6020A
Cadmium						*CAS #7440-43-9*			
Fourth Quarter 2014	U	U	U	U	U	U	1	0.2	6020A
Chromium						*CAS #7440-47-3*			
Fourth Quarter 2014	U	U	U	U	U	U	5	6.2	6020A
Cobalt						*CAS #7440-48-4*			
Fourth Quarter 2014	U	U	U	U	U	U	5	5	6020A
Copper						*CAS #7440-50-8*			
Fourth Quarter 2014	U	U	U	U	U	U	5	13	6020A
Lead						*CAS #7439-92-1*			
Fourth Quarter 2014	U	U	U	U	U	U	1	10	6020A
Mercury						*CAS #7439-97-6*			
Fourth Quarter 2014	U	U	U	U	U	U	2	0.2	7470A
Nickel						*CAS #7440-02-0*			
Fourth Quarter 2014	U	U	U	U	U	U	10	16	6020A
Vanadium						*CAS #7440-62-2*			
Fourth Quarter 2014	U	U	U	U	U	U	10	151	6020A
Zinc						*CAS #7440-66-6*			
Fourth Quarter 2014	U	U	U	U	U	U	10	51	6020A
Benzene						*CAS #71-43-2*			
Fourth Quarter 2014	U	U	U	U	U	U	1	1	8260C
2-Butanone						*CAS #78-93-3*			
Fourth Quarter 2014	U	U	U	U	U	U	10	1.1	8260C
Carbon tetrachloride						*CAS #56-23-5*			
Fourth Quarter 2014	U	U	U	U	U	U	1	0.2	8260C
Chloroethane						*CAS #75-00-3*			
Fourth Quarter 2014	4.6	U	U	U	U	U	1	20.7	8260C
Dichlorodifluoromethane						*CAS #75-71-8*			
Fourth Quarter 2014	U	U	U	U	U	U	1	46.5	8260C
1,1-Dichloroethane						*CAS #75-34-3*			
Fourth Quarter 2014	8.2	U	U	U	U	U	1	9.5	8260C
1,1-Dichloroethene						*CAS #75-35-4*			
Fourth Quarter 2014	U	U	U	U	U	U	1	1	8260C
Diethyl ether						*CAS #60-29-7*			
Fourth Quarter 2014	44.3	U	U	U	U	U	12.5	75.5	8260C
Diethyl phthalate						*CAS #84-66-2*			
Fourth Quarter 2014	U	U	U	U	U	U	5	5	8270D
Dimethyl ether						*CAS #115-10-6*			
Fourth Quarter 2014	U	U	U	U	U	U	12.5	17.0	8260C
2,4-Dinitrotoluene						*CAS #121-14-2*			
Fourth Quarter 2014	U	U	U	U	U	U	5	10	8270D

Target Analyte Monitoring Results At Or Above Permit Quantitation Limit
HWMU-16 Plume Monitoring Wells

Radford Army Ammunition Plant, Radford, Virginia

All Results in ug/L.

Upgradient well = 16C1

Analtye/Quarter	16C1 Q	16-2 Q	16-3 Q	16-5 Q	16WC2B Q	16SPRING Q	QL	Background	Method
2,6-Dinitrotoluene						CAS #606-20-2			
Fourth Quarter 2014	U	U	U	U	U	U	5	10	8270D
Ethylbenzene						CAS #100-41-4			
Fourth Quarter 2014	U	U	U	U	U	U	1	0.1	8260C
Chloromethane						CAS #74-87-3			
Fourth Quarter 2014	U	U	U	U	U	U	1	0.3	8260C
Methylene chloride						CAS #75-09-2			
Fourth Quarter 2014	3.4	U	U	U	U	U	1	13.95	8260C
Tetrachloroethene						CAS #127-18-4			
Fourth Quarter 2014	U	U	U	U	U	U	1	0.7	8260C
Toluene						CAS #108-88-3			
Fourth Quarter 2014	U	U	U	U	U	U	1	0.1	8260C
1,1,1-Trichloroethane						CAS #71-55-6			
Fourth Quarter 2014	U	U	U	U	U	U	1	9.2	8260C
Trichloroethene						CAS #79-01-6			
Fourth Quarter 2014	U	U	U	U	U	U	1	0.1	8260C
Trichlorofluoromethane						CAS #75-69-4			
Fourth Quarter 2014	U	U	U	U	U	U	1	11.3	8260C
1,1,2-Trichloro-1,2,2-Trifluoroethane						CAS #76-13-1			
Fourth Quarter 2014	U	U	U	U	U	U	1	1.2	8260C
Xylenes (Total)						CAS #1330-20-7			
Fourth Quarter 2014	U	U	U	U	U	U	3	0.2	8260C

Target Analyte Monitoring Results At Or Above Permit Quantitation Limit
HWMU-16 Plume Monitoring Wells

Radford Army Ammunition Plant, Radford, Virginia

All Results in ug/L.

Upgradient well = 16C1

Analtye/Quarter	*16C1 Q*	*16-2 Q*	*16-3 Q*	*16-5 Q*	*16WC2B Q*	*16SPRING Q*	*QL*	*Background*	*Method*

Definitions:

All plume monitoring well results reported to at or above the permit quantitation limit except for the upgradient well during the Appendix IX monitoring Event. During this event, results for the upgradient well are reported to the detection limit.

Q Denotes data validation qualifier.
QL Denotes permit required quantitation limit.
U Denotes analyte not detected at or above QL.
UA Denotes analyte not detected at or above adjusted sample QL.
J Denotes result is estimated. When used with "U" (i.e., "**UJ**"), denotes analyte not detected at or above QL and QL is estimated. When used with "UA" (i.e., "**UAJ**"), denotes analyte not detected at or above adjusted QL and adjusted QL is estimated.
UN Denotes analyte concentration is less than the quantiation limit and five times the blank concentration. Not reliably detected due to blank contamination. This qualifier used only for Appendix IX monitoring event when compliance well results are reported to at or above the project detection limit.
R Denotes result rejected.
Background Denotes background concentrations listed in Appendix F to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002), revised September 27, 2011.
CAS# Denotes Chemical Abstract Services registration number.
GPS Denotes groundwater protection standard. (2014)

NS denotes not sampled. **NA** denotes not analyzed. "–"denotes not detected (pre-2nd Quarter 2003) or not available / not sampled (beginning 2nd Quarter 2003).

Notes:
4Q2004. No data for 16-1 8270C-semivolatiles. Well dry-insufficient sample volume.
4Q2006 - No data for 16-1; well dry.
4Q2008- No data for 16-1; well dry.
2Q2009- No data for 16-1; well dry.

NOTE:
Fourth Quarter 2008
Due to laboratory error all HWMU 16 samples were analyzed using Method 8260B 5 ml purge instead of a 25 ml purge which resulted in a higher QL. For these samples, all results were evaluated to the detection limit, which is comparable to the permit QL. Results below the laboratory QL but at or above the permit QL are reported and qualified as estimated.

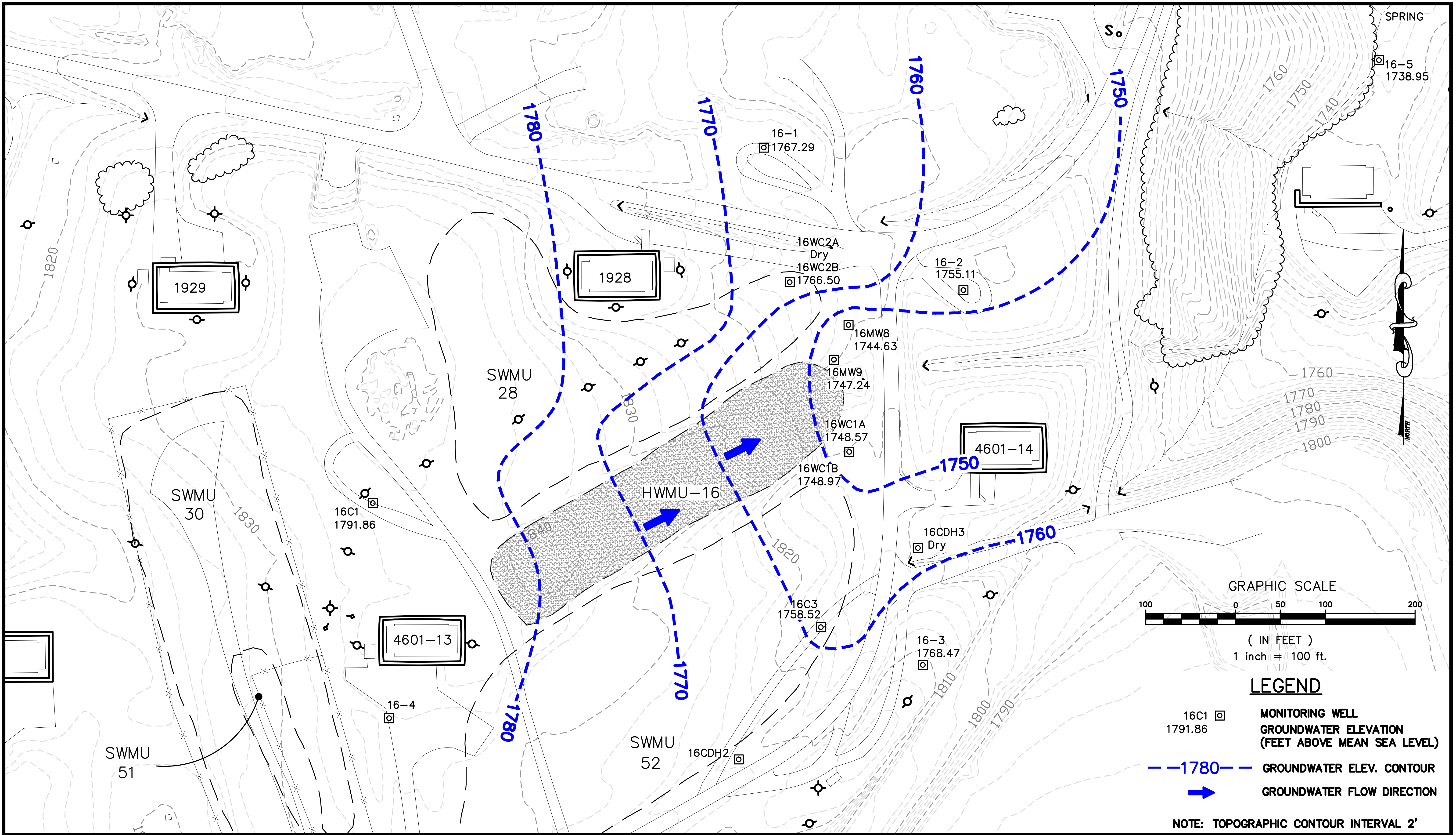
TABLE 2
HWMU-16
GROUNDWATER ELEVATIONS - 2014
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

MONITORING WELL ID	ELEVATION TOP OF WELL	APRIL 23, 2014		OCTOBER 21, 2014	
		DTW	GW ELEV	DTW	GW ELEV
16C1	1840.14	47.57	1792.57	49.54	1790.60
16MW8	1815.82	71.57	1744.25	72.94	1742.88
16MW9	1808.88	62.77	1746.11	66.55	1742.33
16WC1A	1812.61	64.62	1747.99	67.39	1745.22
16WC1B	1812.95	64.62	1748.33	67.64	1745.31
16-1	1815.82	41.75	1774.07	46.82	1769.00
16-2	1810.99	55.90	1755.09	55.82	1755.17
16-3	1824.77	56.02	1768.75	56.63	1768.14
16-5	1742.60	4.02	1738.58	4.25	1738.35
16WC2B	1818.71	51.85	1766.86	54.04	1764.67
16WC2A	1820.05	DRY	DRY	DRY	DRY
16C3	1822.22	63.28	1758.94	68.52	1753.70
16CDH3	1825.60	DRY	DRY	DRY	DRY
SPRING	na	na	na	na	na

NOTES:
DTW: Depth to water from top of casing.
GW ELEV: Groundwater elevation.
All elevations in feet above mean sea level.
na: Not applicable.

APPENDIX B-1

HWMU-16 POTENTIOMETRIC SURFACE MAPS
SECOND QUARTER 2015
FOURTH QUARTER 2015



P:\B03\200\B03204\B03204-13\CAD\B03204-13_HWMU-16 APR 2015.dwg Jun 29, 2015 2:59pm

Draper Aden Associates
Engineering • Surveying • Environmental Services
2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291

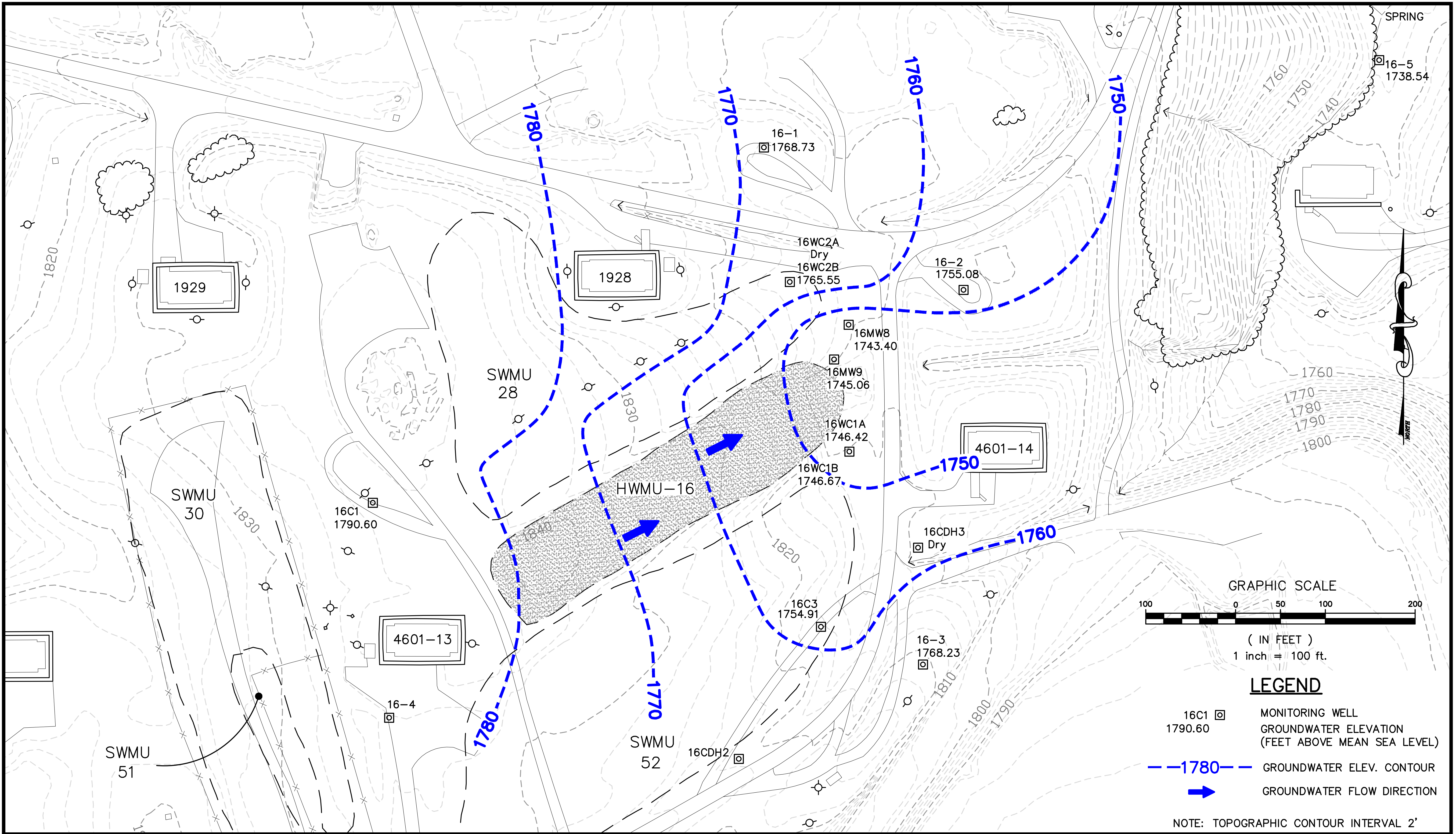
Richmond, VA
Charlottesville, VA
Hampton Roads, VA
Coats, NC

DESIGNED RGM
DRAWN DLD
CHECKED SN
DATE 06/29/2015

HWMU-16 POTENTIOMETRIC SURFACE MAP - APRIL 21, 2015
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

SCALE: 1"=100'
PLAN NO. B03204-13

FIGURE
2



Draper Aden Associates

Engineering • Surveying • Environmental Services

2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291

Richmond, VA
Charlottesville, VA
Hampton Roads, VA
Coats, NC

DESIGNED	WMD
DRAWN	DLD
CHECKED	SN
DATE	12/02/2015

HWMU-16 POTENTIOMETRIC SURFACE MAP - OCTOBER 13, 2015
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

SCALE: 1"=100'

PLAN NO. B03204-13A

FIGURE 2

P:\B03200\B03204\B03204-13\CAD\B03204-13_HWMU-16 OCT 2015.dwg Dec 02, 2015 1:45pm

APPENDIX B-2

HWMU-16 2015 LABORATORY ANALYTICAL RESULTS
POINT OF COMPLIANCE WELLS

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 *All Results in ug/L.*

Analtye/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*QL*	*GPS*	*Method*
Antimony					*CAS #*	*7440-36-0*		
Second Quarter 2015	U	U	U	U	U	2	-	6020A
Arsenic					*CAS #*	*7440-38-2*		
Second Quarter 2015	U	U	U	U	U	10	10	6020A
Fourth Quarter 2015	U	U	U	U	U	10	10	6020A
Barium					*CAS #*	*7440-39-3*		
Second Quarter 2015	167	139	561	257	130	10	2000	6020A
Fourth Quarter 2015	201	141	554	239	145	10	2000	6020A
Beryllium					*CAS #*	*7440-41-7*		
Second Quarter 2015	U	0.341 J	U	U	U	1	4	6020A
Fourth Quarter 2015	U	U	U	U	U	1	4	6020A
Cadmium					*CAS #*	*7440-43-9*		
Second Quarter 2015	U	0.235 J	U	U	0.251 J	1	5	6020A
Fourth Quarter 2015	U	U	U	U	U	1	5	6020A
Chromium					*CAS #*	*7440-47-3*		
Second Quarter 2015	U	U	U	U	U	5	100	6020A
Fourth Quarter 2015	U	U	U	U	U	5	100	6020A
Cobalt					*CAS #*	*7440-48-4*		
Second Quarter 2015	U	1.25 J	4.84 J	4.3 J	22.3	5	5	6020A
Fourth Quarter 2015	U	U	U	5.38	17	5	5	6020A
Copper					*CAS #*	*7440-50-8*		
Second Quarter 2015	U	16.9	U	U	U	5	1300	6020A
Fourth Quarter 2015	U	10.9	U	U	U	5	1300	6020A
Lead					*CAS #*	*7439-92-1*		
Second Quarter 2015	U	0.769 J	U	U	U	1	15	6020A
Fourth Quarter 2015	U	U	U	U	U	1	15	6020A
Mercury					*CAS #*	*7439-97-6*		
Second Quarter 2015	U	U	U	U	U	2	2	7470A
Fourth Quarter 2015	U	U	U	U	U	2	2	7470A
Nickel					*CAS #*	*7440-02-0*		
Second Quarter 2015	4.99 J	4.21 J	18.7	8.44 J	7 J	10	300	6020A
Fourth Quarter 2015	U	U	15.3	U	U	10	300	6020A
Selenium					*CAS #*	*7782-49-2*		
Second Quarter 2015	U	U	U	U	U	5	-	6020A
Silver					*CAS #*	*7440-22-4*		
Second Quarter 2015	U J	U J	U J	U J	U J	1	-	6020A
Thallium					*CAS #*	*7440-28-0*		
Second Quarter 2015	U	U	U	U	U	1	-	6020A
Vanadium					*CAS #*	*7440-62-2*		
Second Quarter 2015	U	U	U	U	U	10	151	6020A
Fourth Quarter 2015	U	U	U	U	U	10	151	6020A
Zinc					*CAS #*	*7440-66-6*		
Second Quarter 2015	3.13 J	54.9	U	5.31 J	8.29 J	10	4700	6020A
Fourth Quarter 2015	U	31.1	U	U	U	10	4700	6020A
Cyanide					*CAS #*	*57-12-5*		
Second Quarter 2015	U	U	U	U	U	20	-	9012B
Acenaphthene					*CAS #*	*83-32-9*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Acenaphthylene					*CAS #*	*208-96-8*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Acetone					*CAS #*	*67-64-1*		
Second Quarter 2015	U	U	U	U	U	10	-	8260C
Acetonitrile					*CAS #*	*75-05-8*		
Second Quarter 2015	U	U	U	U	U	100	-	8260C
Acetophenone					*CAS #*	*98-86-2*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 **All Results in ug/L.**

Analtye/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	QL	GPS	Method
2-Acetylaminofluorene					CAS #	53-96-3		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Acrolein					CAS #	107-02-8		
Second Quarter 2015	U J	U J	U J	U J	U J	25	-	8260C
Acrylonitrile					CAS #	107-13-1		
Second Quarter 2015	U	U	U	U	U	10	-	8260C
Allyl chloride					CAS #	107-05-1		
Second Quarter 2015	U	U	U	U	U	10	-	8260C
4-Aminobiphenyl					CAS #	92-67-1		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Aniline					CAS #	62-53-3		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Anthracene					CAS #	120-12-7		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Aramite					CAS #	140-57-8		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Benzene					CAS #	71-43-2		
Second Quarter 2015	0.3 J	U	0.3 J	0.1 J	U	1	5	8260C
Fourth Quarter 2015	U	U	U	U	U	1	5	8260C
Benzo[a]anthracene					CAS #	56-55-3		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Benzo[b]fluoranthene					CAS #	205-99-2		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Benzo[k]fluoranthene					CAS #	207-08-9		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Benzo[ghi]perylene					CAS #	191-24-2		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Benzo(a)pyrene					CAS #	50-32-8		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
1,4-Benzenediamine					CAS #	106-50-3		
Second Quarter 2015	U J	U J	U J	U J	U J	10	-	8270D
Benzyl alcohol					CAS #	100-51-6		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
bis(2-Chloroethoxy)methane					CAS #	111-91-1		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
bis(2-Chloroethyl)ether					CAS #	111-44-4		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
bis(2-Chloro-1-methylethyl)ether					CAS #	108-60-1		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
bis(2-Ethylhexyl)phthalate					CAS #	117-81-7		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Bromodichloromethane					CAS #	75-27-4		
Second Quarter 2015	U	U	U	U	U	1	-	8260C
Bromoform					CAS #	75-25-2		
Second Quarter 2015	U	U	U	U	U	1	-	8260C
4-Bromophenyl phenyl ether					CAS #	101-55-3		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
2-Butanone					CAS #	78-93-3		
Second Quarter 2015	U	U	U	U	U	10	4900	8260C
Fourth Quarter 2015	U	U	U	U	U	10	4900	8260C
Butyl benzyl phthalate					CAS #	85-68-7		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Carbon disulfide					CAS #	75-15-0		
Second Quarter 2015	U	U	U	U	U	10	-	8260C
Carbon tetrachloride					CAS #	56-23-5		
Second Quarter 2015	U	U	U	U	U	1	5	8260C
Fourth Quarter 2015	U	U	U	U	U	1	5	8260C

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 ***All Results in ug/L.***

Analtye/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*QL*	*GPS*	*Method*
p-Chloroaniline					*CAS #*	*106-47-8*		
Second Quarter 2015	U	U	U	U	U	10	-	8270D
Chlorobenzilate					*CAS #*	*510-15-6*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
p-Chloro-m-cresol					*CAS #*	*59-50-7*		
Second Quarter 2015	U	U	U	U	U	10	-	8270D
Chloroethane					*CAS #*	*75-00-3*		
Second Quarter 2015	4.9	U	2.7	0.9 J	U	1	21000	8260C
Fourth Quarter 2015	4.8	U	2.5	U	U	1	21000	8260C
Chloroform					*CAS #*	*67-66-3*		
Second Quarter 2015	U	U	U	U	U	1	-	8260C
2-Chloronaphthalene					*CAS #*	*91-58-7*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
2-Chlorophenol					*CAS #*	*95-57-8*		
Second Quarter 2015	U	U	U	U	U	10	-	8270D
4-Chlorophenyl phenyl ether					*CAS #*	*7005-72-3*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Chloroprene					*CAS #*	*126-99-8*		
Second Quarter 2015	U	U	U	U	U	10	-	8260C
Chrysene					*CAS #*	*218-01-9*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Diallate					*CAS #*	*2303-16-4*		
Second Quarter 2015	U	U	U	U	U	10	-	8270D
Dibenz(a,h)anthracene					*CAS #*	*53-70-3*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Dibenzofuran					*CAS #*	*132-64-9*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Dibromochloromethane					*CAS #*	*124-48-1*		
Second Quarter 2015	U	U	U	U	U	1	-	8260C
1,2-Dibromo-3-chloropropane					*CAS #*	*96-12-8*		
Second Quarter 2015	U	U	U	U	U	1	-	8260C
1,2-Dibromoethane					*CAS #*	*106-93-4*		
Second Quarter 2015	U	U	U	U	U	1	-	8260C
Di-n-butyl phthalate					*CAS #*	*84-74-2*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
1,2-Dichlorobenzene					*CAS #*	*95-50-1*		
Second Quarter 2015	U	U	U	U	U	1	-	8260C
1,3-Dichlorobenzene					*CAS #*	*541-73-1*		
Second Quarter 2015	U	U	U	U	U	1	-	8260C
1,4-Dichlorobenzene					*CAS #*	*106-46-7*		
Second Quarter 2015	U	U	U	U	U	1	-	8260C
3,3'-Dichlorobenzidine					*CAS #*	*91-94-1*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
trans-1,4-Dichloro-2-butene					*CAS #*	*110-57-6*		
Second Quarter 2015	U J	U J	U J	U J	U J	10	-	8260C
Dichlorodifluoromethane					*CAS #*	*75-71-8*		
Second Quarter 2015	0.2 J	U	U	U	U	1	190	8260C
Fourth Quarter 2015	U	U	U	U	U	1	190	8260C
1,1-Dichloroethane					*CAS #*	*75-34-3*		
Second Quarter 2015	7.6	0.3 J	7.9	2.4	U	1	9.5	8260C
Fourth Quarter 2015	7.7	U	7.4	1.8	U	1	9.5	8260C
1,2-Dichloroethane					*CAS #*	*107-06-2*		
Second Quarter 2015	U	U	U	U	U	1	-	8260C
1,1-Dichloroethene					*CAS #*	*75-35-4*		
Second Quarter 2015	0.3 J	U	U	U	U	1	7	8260C
Fourth Quarter 2015	U	U	U	U	U	1	7	8260C

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 *All Results in ug/L.*

Analtye/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*QL*	*GPS*	*Method*
trans-1,2-Dichloroethene					*CAS #*	*156-60-5*		
Second Quarter 2015	U	U	U	U	U	1	-	8260C
2,4-Dichlorophenol					*CAS #*	*120-83-2*		
Second Quarter 2015	U	U	U	U	U	10	-	8270D
2,6-Dichlorophenol					*CAS #*	*87-65-0*		
Second Quarter 2015	U	U	U	U	U	10	-	8270D
1,2-Dichloropropane					*CAS #*	*78-87-5*		
Second Quarter 2015	U	U	U	U	U	1	-	8260C
1,3-Dichloropropane					*CAS #*	*142-28-9*		
Second Quarter 2015	U	U	U	U	U	1	-	8260C
trans-1,3-Dichloropropene					*CAS #*	*10061-02-6*		
Second Quarter 2015	U	U	U	U	U	1	-	8260C
Diethyl ether					*CAS #*	*60-29-7*		
Second Quarter 2015	44 J	7.7 J	50 J	14 J	U J	13	7300	8260C
Fourth Quarter 2015	55 J	13 J	50 J	16 J	U J	12.5	7300	8260C
Diethyl phthalate					*CAS #*	*84-66-2*		
Second Quarter 2015	U	U	0.89 J	U	U	5	11000	8270D
Fourth Quarter 2015	U	U	U	U	U	5	11000	8270D
O,O-Diethyl O-2-pyrazinyl					*CAS #*	*297-97-2*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Dimethoate					*CAS #*	*60-51-5*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Dimethyl ether					*CAS #*	*115-10-6*		
Second Quarter 2015	11 J	0.3 J	1.1 J	1 J	0.2 J	13	17	8260C
Fourth Quarter 2015	U J	U J	U J	U J	U J	12.5	17	8260C
p-(Dimethylamino)azobenzene					*CAS #*	*60-11-7*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
7,12-Dimethylbenz[a]anthracene					*CAS #*	*57-97-6*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
3,3'-Dimethylbenzidine					*CAS #*	*119-93-7*		
Second Quarter 2015	U J	U J	U J	U J	U J	5	-	8270D
a,a-Dimethylphenethylamine					*CAS #*	*122-09-8*		
Second Quarter 2015	U J	U J	U J	U J	U J	15	-	8270D
2,4-Dimethylphenol					*CAS #*	*105-67-9*		
Second Quarter 2015	U	U	U	U	U	10	-	8270D
Dimethyl phthalate					*CAS #*	*131-11-3*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
m-Dinitrobenzene					*CAS #*	*99-65-0*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
4,6-Dinitro-o-cresol					*CAS #*	*534-52-1*		
Second Quarter 2015	U	U	U	U	U	10	-	8270D
2,4-Dinitrophenol					*CAS #*	*51-28-5*		
Second Quarter 2015	U	U	U	U	U	10	-	8270D
2,4-Dinitrotoluene					*CAS #*	*121-14-2*		
Second Quarter 2015	U	U	U	U	U	10	10	8270D
Fourth Quarter 2015	U	U	U	U	U	10	10	8270D
2,6-Dinitrotoluene					*CAS #*	*606-20-2*		
Second Quarter 2015	U	U	U	U	U	10	10	8270D
Fourth Quarter 2015	U	U	U	U	U	10	10	8270D
Di-n-octyl phthalate					*CAS #*	*117-84-0*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
1,4-Dioxane					*CAS #*	*123-91-1*		
Second Quarter 2015	U	U	U	U	U	200	-	8260C
Diphenylamine					*CAS #*	*122-39-4*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 ***All Results in ug/L.***

Analtye/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*QL*	*GPS*	*Method*
Disulfoton					*CAS #*	*298-04-4*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Ethylbenzene					*CAS #*	*100-41-4*		
Second Quarter 2015	U	U	U	U	U	1	700	8260C
Fourth Quarter 2015	U	U	U	U	U	1	700	8260C
Ethyl methacrylate					*CAS #*	*97-63-2*		
Second Quarter 2015	U	U	U	U	U	10	-	8260C
Ethyl methanesulfonate					*CAS #*	*62-50-0*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Famphur					*CAS #*	*52-85-7*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Fluoranthene					*CAS #*	*206-44-0*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Fluorene					*CAS #*	*86-73-7*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Hexachlorobenzene					*CAS #*	*118-74-1*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Hexachlorobutadiene					*CAS #*	*87-68-3*		
Second Quarter 2015	U	U	U	U	U	1	-	8260C
Hexachlorocyclopentadiene					*CAS #*	*77-47-4*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Hexachloroethane					*CAS #*	*67-72-1*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Second Quarter 2015	U	U	U	U	U	10	-	8260C
Hexachlorophene					*CAS #*	*70-30-4*		
Second Quarter 2015	U	U	U	U	U	100	-	8270D
Hexachloropropene					*CAS #*	*1888-71-7*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
2-Hexanone					*CAS #*	*591-78-6*		
Second Quarter 2015	U J	U J	U J	U J	U J	10	-	8260C
Indeno[1,2,3-cd]pyrene					*CAS #*	*193-39-5*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Isobutyl alcohol					*CAS #*	*78-83-1*		
Second Quarter 2015	U	U	U	U	U	200	-	8260C
Isodrin					*CAS #*	*465-73-6*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Isophorone					*CAS #*	*78-59-1*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Isosafrole					*CAS #*	*120-58-1*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Kepone					*CAS #*	*143-50-0*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Methacrylonitrile					*CAS #*	*126-98-7*		
Second Quarter 2015	U	U	U	U	U	100	-	8260C
Methapyrilene					*CAS #*	*91-80-5*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Bromomethane					*CAS #*	*74-83-9*		
Second Quarter 2015	U	U	U	U	U	1	-	8260C
Chloromethane					*CAS #*	*74-87-3*		
Second Quarter 2015	U	U	U	U	U	1	190	8260C
Fourth Quarter 2015	U	U	U	U	U	1	190	8260C
3-Methylcholanthrene					*CAS #*	*56-49-5*		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Iodomethane					*CAS #*	*74-88-4*		
Second Quarter 2015	U	U	U	U	U	10	-	8260C
Methyl methacrylate					*CAS #*	*80-62-6*		
Second Quarter 2015	U	U	U	U	U	10	-	8260C

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 ***All Results in ug/L.***

Analtye/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*QL*	*GPS*	*Method*
Methyl methane sulfonate					*CAS #*	***66-27-3***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
2-Methylnaphthalene					*CAS #*	***91-57-6***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Methyl parathion					*CAS #*	***298-00-0***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
4-Methyl-2-pentanone					*CAS #*	***108-10-1***		
Second Quarter 2015	U	U	U	U	U	10	-	8260C
2-Methylphenol					*CAS #*	***95-48-7***		
Second Quarter 2015	U	U	U	U	U	10	-	8270D
3 & 4-Methylphenol					*CAS #*	***m 108-39-4***	***p 106-44-5***	
Second Quarter 2015	U	U	U	U	U	10	-	8270D
Dibromomethane					*CAS #*	***74-95-3***		
Second Quarter 2015	U	U	U	U	U	1	-	8260C
Methylene chloride					*CAS #*	***75-09-2***		
Second Quarter 2015	2.6	U	U	U	U	1	13.95	8260C
Fourth Quarter 2015	1.7	U	U	U	U	1	13.95	8260C
Naphthalene					*CAS #*	***91-20-3***		
Second Quarter 2015	U	U	U	U	U	1	-	8260C
1,4-Naphthoquinone					*CAS #*	***130-15-4***		
Second Quarter 2015	U J	U J	U J	U J	U J	5	-	8270D
1-Naphthylamine					*CAS #*	***134-32-7***		
Second Quarter 2015	U J	U J	U J	U J	U J	5	-	8270D
2-Naphthylamine					*CAS #*	***91-59-8***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
o-Nitroaniline					*CAS #*	***88-74-4***		
Second Quarter 2015	U	U	U	U	U	10	-	8270D
m-Nitroaniline					*CAS #*	***99-09-2***		
Second Quarter 2015	U	U	U	U	U	10	-	8270D
p-Nitroaniline					*CAS #*	***100-01-6***		
Second Quarter 2015	U J	U J	U J	U J	U J	10	-	8270D
Nitrobenzene					*CAS #*	***98-95-3***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
o-Nitrophenol					*CAS #*	***88-75-5***		
Second Quarter 2015	U	U	U	U	U	10	-	8270D
p-Nitrophenol					*CAS #*	***100-02-7***		
Second Quarter 2015	U	U	U	U	U	10	-	8270D
4-Nitroquinoline-1-oxide					*CAS #*	***56-57-5***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
N-Nitrosodi-n-butylamine					*CAS #*	***924-16-3***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
N-Nitrosodiethylamine					*CAS #*	***55-18-5***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
N-Nitrosodimethylamine					*CAS #*	***62-75-9***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
N-Nitrosodiphenylamine					*CAS #*	***86-30-6***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
N-Nitrosodipropylamine					*CAS #*	***621-64-7***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
N-Nitrosomethylethylamine					*CAS #*	***10595-95-6***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
N-Nitrosomorpholine					*CAS #*	***59-89-2***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
N-Nitrosopiperidine					*CAS #*	***100-75-4***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
N-Nitrosopyrrolidine					*CAS #*	***930-55-2***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 ***All Results in ug/L.***

Analtye/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*QL*	*GPS*	*Method*
5-Nitroso-o-toluidine					*CAS #*	***99-55-8***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Parathion					*CAS #*	***56-38-2***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Pentachlorobenzene					*CAS #*	***608-93-5***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Pentachloroethane					*CAS #*	***76-01-7***		
Second Quarter 2015	U	U	U	U	U	10	-	8260C
Pentachloronitrobenzene					*CAS #*	***82-68-8***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Pentachlorophenol					*CAS #*	***87-86-5***		
Second Quarter 2015	U	U	U	U	U	10	-	8270D
Phenacetin					*CAS #*	***62-44-2***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Phenanthrene					*CAS #*	***85-01-8***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Phenol					*CAS #*	***108-95-2***		
Second Quarter 2015	U	U	U	U	U	10	-	8270D
Phorate					*CAS #*	***298-02-2***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
2-Picoline					*CAS #*	***931-19-1***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Pronamide					*CAS #*	***23950-58-5***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
2-Propanol					*CAS #*	***67-63-0***		
Second Quarter 2015	U	U	U	U	U	100	-	8260C
Propionitrile					*CAS #*	***107-12-0***		
Second Quarter 2015	U	U	U	U	U	100	-	8260C
Pyrene					*CAS #*	***129-00-0***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Pyridine					*CAS #*	***110-86-1***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Safrole					*CAS #*	***94-59-7***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Styrene					*CAS #*	***100-42-5***		
Second Quarter 2015	U	U	U	U	U	1	-	8260C
Sulfotep					*CAS #*	***3689-24-5***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
1,2,4,5-Tetrachlorobenzene					*CAS #*	***95-94-3***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
1,1,1,2-Tetrachloroethane					*CAS #*	***630-20-6***		
Second Quarter 2015	U	U	U	U	U	1	-	8260C
1,1,2,2-Tetrachloroethane					*CAS #*	***79-34-5***		
Second Quarter 2015	U	U	U	U	U	1	-	8260C
Tetrachloroethene					*CAS #*	***127-18-4***		
Second Quarter 2015	0.3 J	U	U	U	U	1	5	8260C
Fourth Quarter 2015	U	U	U	U	U	1	5	8260C
Tetrahydrofuran					*CAS #*	***109-99-9***		
Second Quarter 2015	14 J	U	U	U	U	25	-	8260C
2,3,4,6-Tetrachlorophenol					*CAS #*	***58-90-2***		
Second Quarter 2015	U	U	U	U	U	10	-	8270D
Toluene					*CAS #*	***108-88-3***		
Second Quarter 2015	U	U	U	U	U	1	1000	8260C
Fourth Quarter 2015	U	U	U	U	U	1	1000	8260C
o-Toluidine					*CAS #*	***95-53-4***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 ***All Results in ug/L.***

Analtye/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*QL*	*GPS*	*Method*
1,2,4-Trichlorobenzene					*CAS #*	***120-82-1***		
Second Quarter 2015	U	U	U	U	U	1	-	8260C
1,1,1-Trichloroethane					*CAS #*	***71-55-6***		
Second Quarter 2015	0.3 J	U	U	U	U	1	200	8260C
Fourth Quarter 2015	U	U	U	U	U	1	200	8260C
1,1,2-Trichloroethane					*CAS #*	***79-00-5***		
Second Quarter 2015	U	U	U	U	U	1	-	8260C
Trichloroethene					*CAS #*	***79-01-6***		
Second Quarter 2015	0.3 J	U	U	U	U	1	5	8260C
Fourth Quarter 2015	U	U	U	U	U	1	5	8260C
Trichlorofluoromethane					*CAS #*	***75-69-4***		
Second Quarter 2015	U	U	U	U	U	1	1000	8260C
Fourth Quarter 2015	U	U	U	U	U	1	1000	8260C
2,4,5-Trichlorophenol					*CAS #*	***95-95-4***		
Second Quarter 2015	U	U	U	U	U	10	-	8270D
2,4,6-Trichlorophenol					*CAS #*	***88-06-2***		
Second Quarter 2015	U	U	U	U	U	10	-	8270D
1,2,3-Trichloropropane					*CAS #*	***96-18-4***		
Second Quarter 2015	U	U	U	U	U	1	-	8260C
1,1,2-Trichloro-1,2,2-Trifluoroethane					*CAS #*	***76-13-1***		
Second Quarter 2015	U	U	U	U	U	1	59000	8260C
Fourth Quarter 2015	U	U	U	U	U	1	59000	8260C
O,O,O-Triethyl phosphorothioate					*CAS #*	***126-68-1***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
sym-Trinitrobenzene					*CAS #*	***99-35-4***		
Second Quarter 2015	U	U	U	U	U	5	-	8270D
Vinyl acetate					*CAS #*	***108-05-4***		
Second Quarter 2015	U	U	U	U	U	10	-	8260C
Vinyl chloride					*CAS #*	***75-01-4***		
Second Quarter 2015	U	U	U	U	U	1	-	8260C
Xylenes (Total)					*CAS #*	***1330-20-7***		
Second Quarter 2015	U	U	U	U	U	3	10000	8260C
Fourth Quarter 2015	U	U	U	U	U	3	10000	8260C

Definitions:

The following definitions apply to results reported for Appendix IX monitoring events. All Appendix IX monitoring results for compliance wells are reported to the detection limit.

Appendix IX Monitoring Events: 3Q2003, 2Q-2004, 2Q-2005, 3Q2006, 2Q2007, 2Q2008, 2Q2009, 2Q 2010, 2Q 2011, 2Q 2012, 2Q2013, 2Q2014, 2Q2015

QL Denotes permit required quantitation limit.
U denotes not detected at or above the detection limit.
UA denotes not detected at or above the adjusted detection limit.
J Denotes result is estimated. When used with "U" (i.e., “UJ”), denotes analyte not detected at or above the detection limit and detection limit and QL are estimated. When used with "UA" (i.e., “UAJ”), denotes analyte not detected at or above adjusted detection limit and adjusted detection limit and QL are estimated.
UN Denotes analyte concentration is less than the quantitation limit and/or five times the blank concentration. Not reliably detected due to blank contamination. This qualifier used only for Appendix IX monitoring event when compliance well results are reported to at or above the project detection limit.
R Denotes result rejected.
Q Denotes data validation qualifier. **X** Denotes mass spectral confirmation not obtained-result suspect.
Background Denotes background concentrations listed in Appendix F to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5 and 16 (rev 2014), where applicable.
CAS# Denotes Chemical Abstract Services registration number.
GPS Denotes Groundwater Protection Standards listed in Appendix G to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5 and 16 (October 4, 2002) (revised 2014).
NS denotes not sampled. **NA** denotes not analyzed.
“–“ denotes not detected (pre-2nd Quarter 2003) or not available / not sampled (beginning 2nd Quarter 2003).

The following definitions apply to results reported for non-Appendix IX monitoring events. All non-Appendix IX monitoring results for compliance wells are reported at or above the quantitation limit.

QL Denotes permit required quantitation limit.
U Denotes analyte not detected at or above QL.
UA Denotes analyte not detected at or above adjusted sample QL.
J Denotes result is estimated. When used with "U" (i.e., “**UJ**”), denotes analyte not detected at or above QL and QL is estimated. When used with "UA" (i.e., “**UAJ**”), denotes analyte not detected at or above adjusted QL and adjusted QL is estimated.
R Denotes result rejected.
Q Denotes data validation qualifier.
Background Denotes background concentrations listed in Appendix F to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5 and 16 (October 4, 2002), (revised 2014), where applicable.
CAS# Denotes Chemical Abstract Services registration number.
GPS Denotes Groundwater Protection Standards listed in Appendix G to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5 and 16 (October 4, 2002) (revised 2014).

APPENDIX B-3

HWMU-16 2015 LABORATORY ANALYTICAL RESULTS PLUME MONITORING WELLS

Target Analyte Monitoring Results At Or Above Permit Quantitation Limit
HWMU-16 Plume Monitoring Wells

Radford Army Ammunition Plant, Radford, Virginia

All Results in ug/L.

Upgradient well = 16C1

Analtye/Quarter	*16C1*	*Q*	*16-2*	*Q*	*16-3*	*Q*	*16-5*	*Q*	*16WC2B*	*Q*	*16SPRING*	*Q*	*QL*	*Background*	*Method*
Arsenic											*CAS #7440-38-2*				
Second Quarter 2015	U		U		U		U		U		U		10	1	6020A
Fourth Quarter 2015	U		U		U		U		U		U		10	1	6020A
Barium											*CAS #7440-39-3*				
Second Quarter 2015	167		207		695		163		116		195		10	175.4	6020A
Fourth Quarter 2015	201		231		755		182		120		219		10	175.4	6020A
Beryllium											*CAS #7440-41-7*				
Second Quarter 2015	U		U		U		U		U		U		1	0.7	6020A
Fourth Quarter 2015	U		U		U		U		U		U		1	0.7	6020A
Cadmium											*CAS #7440-43-9*				
Second Quarter 2015	U		U		U		U		U		U		1	0.2	6020A
Fourth Quarter 2015	U		U		U		U		U		U		1	0.2	6020A
Chromium											*CAS #7440-47-3*				
Second Quarter 2015	U		U		U		U		U		U		5	6.2	6020A
Fourth Quarter 2015	U		U		U		U		U		U		5	6.2	6020A
Cobalt											*CAS #7440-48-4*				
Second Quarter 2015	U		U		U		U		U		U		5	5	6020A
Fourth Quarter 2015	U		U		U		U		U		U		5	5	6020A
Copper											*CAS #7440-50-8*				
Second Quarter 2015	U		U		U		U		U		U		5	13	6020A
Fourth Quarter 2015	U		U		U		U		U		U		5	13	6020A
Lead											*CAS #7439-92-1*				
Second Quarter 2015	U		U		U		U		U		U		1	10	6020A
Fourth Quarter 2015	U		U		U		U		U		U		1	10	6020A
Mercury											*CAS #7439-97-6*				
Second Quarter 2015	U		U		U		U		U		U		2	0.2	7470A
Fourth Quarter 2015	U		U		U		U		U		U		2	0.2	7470A
Nickel											*CAS #7440-02-0*				
Second Quarter 2015	4.99	J	U		U		U		U		U		10	16	6020A
Fourth Quarter 2015	U		U		U		U		U		U		10	16	6020A
Vanadium											*CAS #7440-62-2*				
Second Quarter 2015	U		U		U		U		U		U		10	151	6020A
Fourth Quarter 2015	U		U		U		U		U		U		10	151	6020A
Zinc											*CAS #7440-66-6*				
Second Quarter 2015	3.13	J	U		U		U		U		U		10	51	6020A
Fourth Quarter 2015	U		14.1		12.9		U		U		U		10	51	6020A
Benzene											*CAS #71-43-2*				
Second Quarter 2015	0.3	J	U		U		U		U		U		1	1	8260C
Fourth Quarter 2015	U		U		U		U		U		U		1	1	8260C
2-Butanone											*CAS #78-93-3*				
Second Quarter 2015	U		U		U		U		U		U		10	1.1	8260C
Fourth Quarter 2015	U		U		U		U		U		U		10	1.1	8260C
Carbon tetrachloride											*CAS #56-23-5*				
Second Quarter 2015	U		U		U		U		U		U		1	0.2	8260C
Fourth Quarter 2015	U		U		U		U		U		U		1	0.2	8260C
Chloroethane											*CAS #75-00-3*				
Second Quarter 2015	4.9		U		U		U		U		U		1	20.7	8260C
Fourth Quarter 2015	4.8		U		U		U		U		U		1	20.7	8260C

See last page of this report for definitions.

Target Analyte Monitoring Results At Or Above Permit Quantitation Limit
HWMU-16 Plume Monitoring Wells

Radford Army Ammunition Plant, Radford, Virginia

All Results in ug/L.

Upgradient well = 16C1

Analtye/Quarter	*16C1*	*Q*	*16-2*	*Q*	*16-3*	*Q*	*16-5*	*Q*	*16WC2B*	*Q*	*16SPRING*	*Q*	*QL*	*Background*	*Method*
Dichlorodifluoromethane											*CAS #75-71-8*				
Second Quarter 2015	0.2	J	U		U		U		U		U		1	46.5	8260C
Fourth Quarter 2015	U		U		U		U		U		U		1	46.5	8260C
1,1-Dichloroethane											*CAS #75-34-3*				
Second Quarter 2015	7.6		U		U		U		U		U		1	9.5	8260C
Fourth Quarter 2015	7.7		U		U		U		U		U		1	9.5	8260C
1,1-Dichloroethene											*CAS #75-35-4*				
Second Quarter 2015	0.3	J	U		U		U		U		U		1	1	8260C
Fourth Quarter 2015	U		U		U		U		U		U		1	1	8260C
Diethyl ether											*CAS #60-29-7*				
Second Quarter 2015	44	J	U	J	U	J	U	J	U	J	U	J	13	75.5	8260C
Fourth Quarter 2015	55	J	U	J	U	J	U	J	U	J	U	J	12.5	75.5	8260C
Diethyl phthalate											*CAS #84-66-2*				
Second Quarter 2015	U		U		U		U		U		U		5	5	8270D
Fourth Quarter 2015	U		U		U		U		U		U		5	5	8270D
Dimethyl ether											*CAS #115-10-6*				
Second Quarter 2015	11	J	U		U		U		U		U		13	17.0	8260C
Fourth Quarter 2015	U	J	U	J	U	J	U	J	U	J	U	J	12.5	17.0	8260C
2,4-Dinitrotoluene											*CAS #121-14-2*				
Second Quarter 2015	U		U		U		U		U		U		10	10	8270D
Fourth Quarter 2015	U		U		U		U		U		U		10	10	8270D
2,6-Dinitrotoluene											*CAS #606-20-2*				
Second Quarter 2015	U		U		U		U		U		U		10	10	8270D
Fourth Quarter 2015	U		U		U		U		U		U		10	10	8270D
Ethylbenzene											*CAS #100-41-4*				
Second Quarter 2015	U		U		U		U		U		U		1	0.1	8260C
Fourth Quarter 2015	U		U		U		U		U		U		1	0.1	8260C
Chloromethane											*CAS #74-87-3*				
Second Quarter 2015	U		U		U		U		U		U		1	0.3	8260C
Fourth Quarter 2015	U		U		U		U		U		U		1	0.3	8260C
Methylene chloride											*CAS #75-09-2*				
Second Quarter 2015	2.6		U		U		U		U		U		1	13.95	8260C
Fourth Quarter 2015	1.7		U		U		U		U		U		1	13.95	8260C
Tetrachloroethene											*CAS #127-18-4*				
Second Quarter 2015	0.3	J	U		U		U		U		U		1	0.7	8260C
Fourth Quarter 2015	U		U		U		U		U		U		1	0.7	8260C
Toluene											*CAS #108-88-3*				
Second Quarter 2015	U		U		U		U		U		U		1	0.1	8260C
Fourth Quarter 2015	U		U		U		U		U		U		1	0.1	8260C
1,1,1-Trichloroethane											*CAS #71-55-6*				
Second Quarter 2015	0.3	J	U		U		U		U		U		1	9.2	8260C
Fourth Quarter 2015	U		U		U		U		U		U		1	9.2	8260C
Trichloroethene											*CAS #79-01-6*				
Second Quarter 2015	0.3	J	U		U		U		U		U		1	0.1	8260C
Fourth Quarter 2015	U		U		U		U		U		U		1	0.1	8260C
Trichlorofluoromethane											*CAS #75-69-4*				
Second Quarter 2015	U		U		U		U		U		U		1	11.3	8260C
Fourth Quarter 2015	U		U		U		U		U		U		1	11.3	8260C

See last page of this report for definitions.

Target Analyte Monitoring Results At Or Above Permit Quantitation Limit
HWMU-16 Plume Monitoring Wells

Radford Army Ammunition Plant, Radford, Virginia

All Results in ug/L.

Upgradient well = 16C1

Analtye/Quarter	*16C1 Q*	*16-2 Q*	*16-3 Q*	*16-5 Q*	*16WC2B Q*	*16SPRING Q*	*QL*	*Background*	*Method*
1,1,2-Trichloro-1,2,2-Trifluoroethane						*CAS #76-13-1*			
Second Quarter 2015	U	U	U	U	U	U	1	1.2	8260C
Fourth Quarter 2015	U	U	U	U	U	U	1	1.2	8260C
Xylenes (Total)						*CAS #1330-20-7*			
Second Quarter 2015	U	U	U	U	U	U	3	0.2	8260C
Fourth Quarter 2015	U	U	U	U	U	U	3	0.2	8260C

Definitions:

All plume monitoring well results reported to at or above the permit quantitation limit except for the upgradient well during the Appendix IX monitoring Event. During this event, results for the upgradient well are reported to the detection limit.

Q Denotes data validation qualifier.
QL Denotes permit required quantitation limit.
U Denotes analyte not detected at or above QL.
UA Denotes analyte not detected at or above adjusted sample QL.
J Denotes result is estimated. When used with "U" (i.e., "**UJ**"), denotes analyte not detected at or above QL and QL is estimated. When used with "UA" (i.e., "**UAJ**"), denotes analyte not detected at or above adjusted QL and adjusted QL is estimated.
UN Denotes analyte concentration is less than the quantiation limit and five times the blank concentration. Not reliably detected due to blank contamination. This qualifier used only for Appendix IX monitoring event when compliance well results are reported to at or above the project detection limit.
R Denotes result rejected.
Background Denotes background concentrations listed in Appendix F to Attachment 3 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5, 7, 10, and 16 (October 4, 2002), revised July 17, 2014).
CAS# Denotes Chemical Abstract Services registration number.
GPS Denotes groundwater protection standard. (2014)

NS denotes not sampled. **NA** denotes not analyzed. "–"denotes not detected (pre-2nd Quarter 2003) or not available / not sampled (beginning 2nd Quarter 2003).

Notes:
4Q2004. No data for 16-1 8270C-semivolatiles. Well dry-insufficient sample volume.
4Q2006 - No data for 16-1; well dry.
4Q2008- No data for 16-1; well dry.
2Q2009- No data for 16-1; well dry.

NOTE:
Fourth Quarter 2008
Due to laboratory error all HWMU 16 samples were analyzed using Method 8260B 5 ml purge instead of a 25 ml purge which resulted in a higher QL. For these samples, all results were evaluated to the detection limit, which is comparable to the permit QL. Results below the laboratory QL but at or above the permit QL are reported and qualified as estimated.

TABLE 2
HWMU-16
GROUNDWATER ELEVATIONS - 2015
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

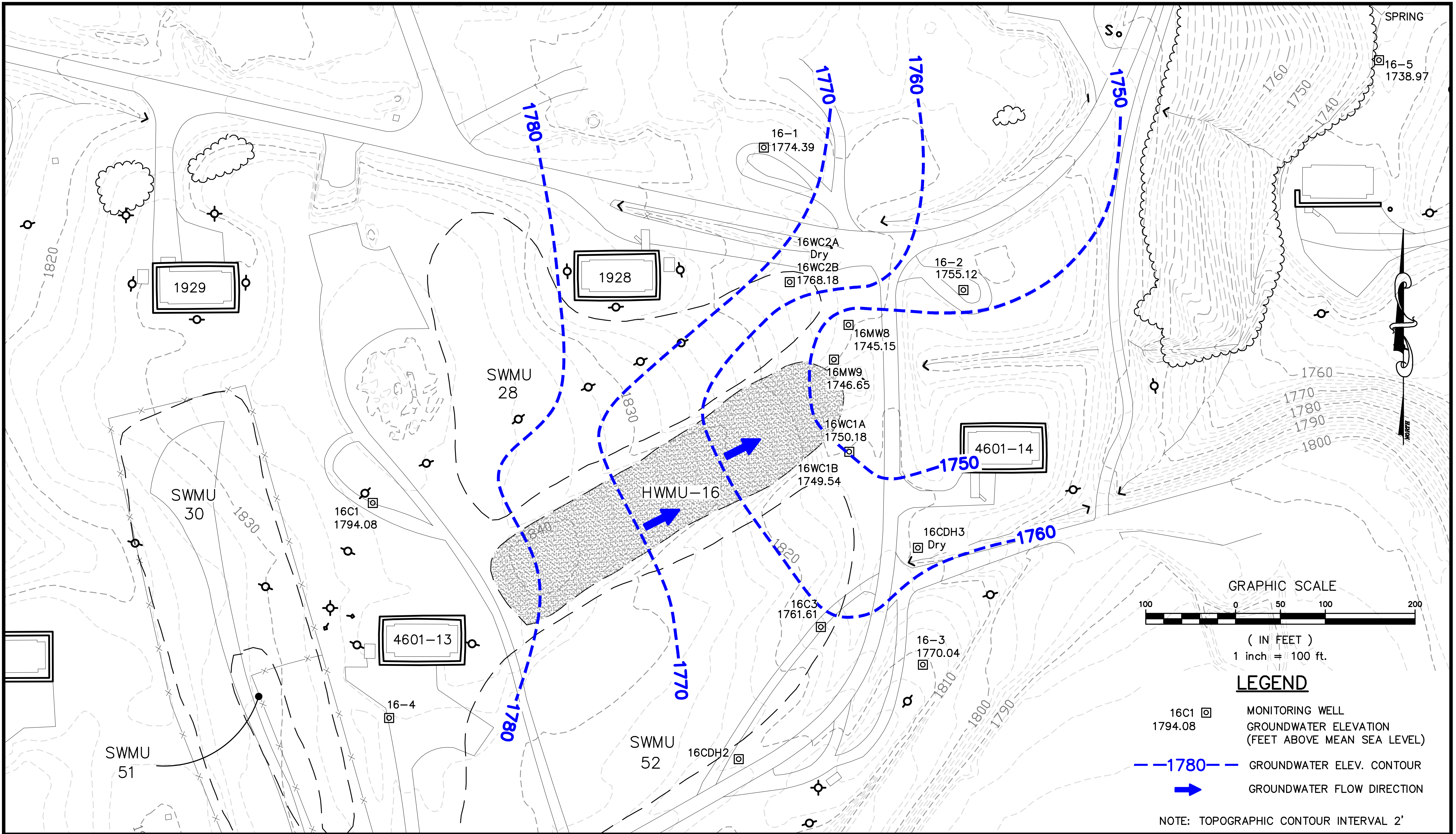
MONITORING WELL ID	ELEVATION TOP OF WELL	APRIL 21, 2015		OCTOBER 13, 2015	
		DTW	GW ELEV	DTW	GW ELEV
16C1	1840.14	48.28	1791.86	49.54	1790.60
16MW8	1815.82	71.19	1744.63	72.42	1743.40
16MW9	1808.88	61.64	1747.24	63.82	1745.06
16WC1A	1812.61	64.04	1748.57	66.19	1746.42
16WC1B	1812.95	63.98	1748.97	66.28	1746.67
16-1	1815.82	48.53	1767.29	47.09	1768.73
16-2	1810.99	55.88	1755.11	55.91	1755.08
16-3	1824.77	56.30	1768.47	56.54	1768.23
16-5	1742.60	3.65	1738.95	4.06	1738.54
16WC2B	1818.71	52.21	1766.50	53.16	1765.55
16WC2A	1820.05	DRY	DRY	DRY	DRY
16C3	1822.22	63.70	1758.52	67.31	1754.91
16CDH3	1825.60	DRY	DRY	DRY	DRY
SPRING	na	na	na	na	na

NOTES:

DTW: Depth to water from top of casing.
GW ELEV: Groundwater elevation.
All elevations in feet above mean sea level.
na: Not applicable.

APPENDIX B-1

HWMU-16 POTENTIOMETRIC SURFACE MAPS
SECOND QUARTER 2016
FOURTH QUARTER 2016



Draper Aden Associates

Engineering • Surveying • Environmental Services

2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291

Richmond, VA
Charlottesville, VA
Hampton Roads, VA

Coats, NC
Fayetteville, NC
Northern Virginia

DESIGNED	WMD
DRAWN	DLD
CHECKED	MDL
DATE	07/19/2016

HWMU-16 POTENTIOMETRIC SURFACE MAP - APRIL 26, 2016

RADFORD ARMY AMMUNITION PLANT

RADFORD, VIRGINIA

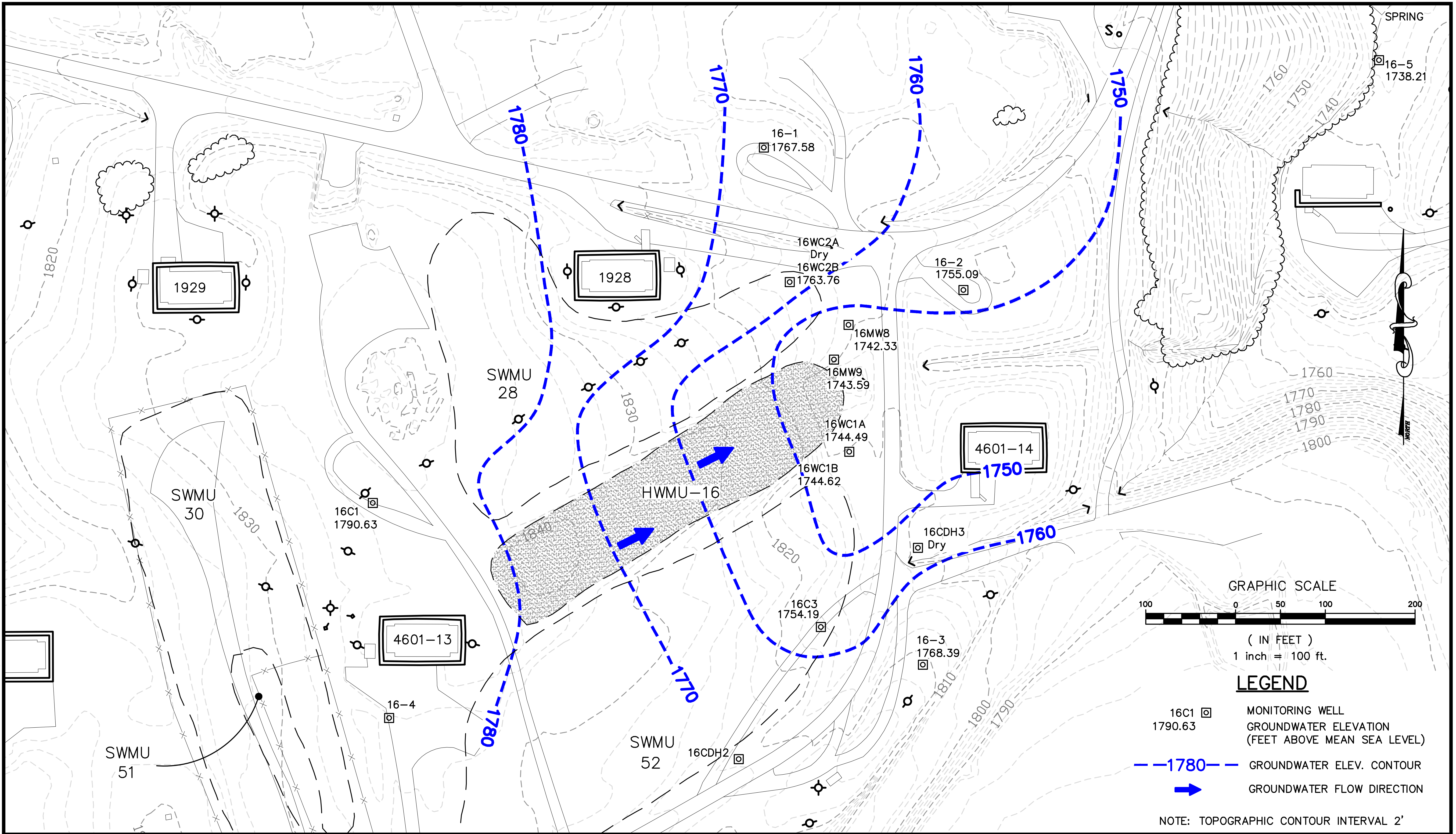
SCALE: 1"=100'

PLAN NO. B03204-16

FIGURE

2

P:\B03200\B03204\B03204-16\CAD\B03204-13_HWMU-16 April 2016.dwg Jul 19, 2016 3:05pm



P:\B03\200\B03204\B03204-16\CAD\B03204-13_HWMU-16 October 2016.dwg Jan 04, 2017 2:54pm

Draper Aden Associates

Engineering • Surveying • Environmental Services

2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291

Richmond, VA
Charlottesville, VA
Hampton Roads, VA

Coats, NC
Fayetteville, NC
Northern Virginia

DESIGNED	WMD
DRAWN	DLD
CHECKED	MDL
DATE	01/04/2017

HWMU-16 POTENTIOMETRIC SURFACE MAP - OCTOBER 24, 2016
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

SCALE: 1"=100'

PLAN NO. B03204-16

FIGURE
2

APPENDIX B-2

HWMU-16 2016 LABORATORY ANALYTICAL RESULTS POINT OF COMPLIANCE WELLS

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 *All Results in ug/L.*

Analtye/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*QL*	*GPS*	*Method*
Antimony					*CAS #*	*7440-36-0*		
Second Quarter 2016	U	U	U	U	U	2	-	6020A
Arsenic					*CAS #*	*7440-38-2*		
Second Quarter 2016	U	U	U	U	U	10	10	6020A
Fourth Quarter 2016	U	U	U	U	U	10	10	6020A
Barium					*CAS #*	*7440-39-3*		
Second Quarter 2016	140	120	590	330	120	10	2000	6020A
Fourth Quarter 2016	200	130	520	310	130	10	2000	6020A
Beryllium					*CAS #*	*7440-41-7*		
Second Quarter 2016	0.52 J	0.54 J	0.23 J	0.3 J	U	1	4	6020A
Fourth Quarter 2016	U	U	U	U	U	1	4	6020A
Cadmium					*CAS #*	*7440-43-9*		
Second Quarter 2016	0.42 J	0.4 J	U	0.26 J	0.23 J	1	5	6020A
Fourth Quarter 2016	U	U	U	U	U	1	5	6020A
Chromium					*CAS #*	*7440-47-3*		
Second Quarter 2016	U	U	U	U	U	5	100	6020A
Fourth Quarter 2016	U	U	U	U	U	5	100	6020A
Cobalt					*CAS #*	*7440-48-4*		
Second Quarter 2016	U	4 J	5.5	4.9 J	35	5	5	6020A
Fourth Quarter 2016	U	U	U	6	15	5	5	6020A
Copper					*CAS #*	*7440-50-8*		
Second Quarter 2016	U	6.5	U	U	U	5	1300	6020A
Fourth Quarter 2016	U	31	U	U	U	5	1300	6020A
Lead					*CAS #*	*7439-92-1*		
Second Quarter 2016	U	0.36 J	U	U	U	1	15	6020A
Fourth Quarter 2016	U	2.7	U	U	U	2	15	6020A
Mercury					*CAS #*	*7439-97-6*		
Second Quarter 2016	U	U	U	U	U	2	2	7470A
Fourth Quarter 2016	U	U	U	U	U	2	2	7470A
Nickel					*CAS #*	*7440-02-0*		
Second Quarter 2016	3.9 J	6.1 J	15	7.6 J	7.2 J	10	300	6020A
Fourth Quarter 2016	U	U	14	11	U	10	300	6020A
Selenium					*CAS #*	*7782-49-2*		
Second Quarter 2016	U	U	U	U	U	5	-	6020A
Silver					*CAS #*	*7440-22-4*		
Second Quarter 2016	U	U	U	U	U	1	-	6020A
Thallium					*CAS #*	*7440-28-0*		
Second Quarter 2016	U	U	U	U	U	1	-	6020A
Vanadium					*CAS #*	*7440-62-2*		
Second Quarter 2016	U	U	U	U	U	10	151	6020A
Fourth Quarter 2016	U N	U N	U N	U N	U N	10	151	6020A
Zinc					*CAS #*	*7440-66-6*		
Second Quarter 2016	U	27	U	U	U	10	4700	6020A
Fourth Quarter 2016	U	130	U	U	U	30	4700	6020A
Cyanide					*CAS #*	*57-12-5*		
Second Quarter 2016	U	U	U	U	U	20	-	9012B
Acenaphthene					*CAS #*	*83-32-9*		
Second Quarter 2016	U	U	U	U	U	0	-	8270D
Acenaphthylene					*CAS #*	*208-96-8*		
Second Quarter 2016	U	U	U	U	U	0	-	8270D
Acetone					*CAS #*	*67-64-1*		
Second Quarter 2016	U	U	U	U	U	10	-	8260C
Acetonitrile					*CAS #*	*75-05-8*		
Second Quarter 2016	U	U	U	U	U	100	-	8260C
Acetophenone					*CAS #*	*98-86-2*		
Second Quarter 2016	U	U	U	U	U	1	-	8270D

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 *All Results in ug/L.*

Analyte/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*QL*	*GPS*	*Method*
2-Acetylaminofluorene					*CAS #*	*53-96-3*		
Second Quarter 2016	U	U	U	U	U	5	-	8270D
Acrolein					*CAS #*	*107-02-8*		
Second Quarter 2016	U J	U J	U J	U J	U J	25	-	8260C
Acrylonitrile					*CAS #*	*107-13-1*		
Second Quarter 2016	U J	U J	U J	U J	U J	10	-	8260C
Allyl chloride					*CAS #*	*107-05-1*		
Second Quarter 2016	U	U	U	U	U	10	-	8260C
4-Aminobiphenyl					*CAS #*	*92-67-1*		
Second Quarter 2016	U J	U J	U J	U J	U J	1	-	8270D
Aniline					*CAS #*	*62-53-3*		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
Anthracene					*CAS #*	*120-12-7*		
Second Quarter 2016	U	U	U	U	U	0	-	8270D
Aramite					*CAS #*	*140-57-8*		
Second Quarter 2016	U J	U J	U J	U J	U J	15	-	8270D
Benzene					*CAS #*	*71-43-2*		
Second Quarter 2016	0.3 J	U	0.4 J	0.4 J	U	1	5	8260C
Fourth Quarter 2016	U	U	U	U	U	1	5	8260C
Benzo[a]anthracene					*CAS #*	*56-55-3*		
Second Quarter 2016	U	U	U	U	U	0	-	8270D
Benzo[b]fluoranthene					*CAS #*	*205-99-2*		
Second Quarter 2016	U	U	U	U	U	0	-	8270D
Benzo[k]fluoranthene					*CAS #*	*207-08-9*		
Second Quarter 2016	U	U	U	U	U	0	-	8270D
Benzo[ghi]perylene					*CAS #*	*191-24-2*		
Second Quarter 2016	U	U	U	U	U	0	-	8270D
Benzo(a)pyrene					*CAS #*	*50-32-8*		
Second Quarter 2016	U	U	U	U	U	0	-	8270D
1,4-Benzenediamine					*CAS #*	*106-50-3*		
Second Quarter 2016	U	U	U	U	U	300	-	8270D
Benzyl alcohol					*CAS #*	*100-51-6*		
Second Quarter 2016	U	U	U	U	U	15	-	8270D
bis(2-Chloroethoxy)methane					*CAS #*	*111-91-1*		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
bis(2-Chloroethyl)ether					*CAS #*	*111-44-4*		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
bis(2-Chloro-1-methylethyl)ether					*CAS #*	*108-60-1*		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
bis(2-Ethylhexyl)phthalate					*CAS #*	*117-81-7*		
Second Quarter 2016	U	U	U	U	U	5	-	8270D
Bromodichloromethane					*CAS #*	*75-27-4*		
Second Quarter 2016	U	U	U	U	U	1	-	8260C
Bromoform					*CAS #*	*75-25-2*		
Second Quarter 2016	U	U	U	U	U	1	-	8260C
4-Bromophenyl phenyl ether					*CAS #*	*101-55-3*		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
2-Butanone					*CAS #*	*78-93-3*		
Second Quarter 2016	U	U	U	U	U	10	4900	8260C
Fourth Quarter 2016	U J	U	U J	U J	U J	10	4900	8260C
Butyl benzyl phthalate					*CAS #*	*85-68-7*		
Second Quarter 2016	U	U	U	U	U	5	-	8270D
Carbon disulfide					*CAS #*	*75-15-0*		
Second Quarter 2016	U	U	U	U	U	10	-	8260C
Carbon tetrachloride					*CAS #*	*56-23-5*		
Second Quarter 2016	U	U	U	U	U	1	5	8260C
Fourth Quarter 2016	U	U	U	U	U	1	5	8260C

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 ***All Results in ug/L.***

Analtye/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*QL*	*GPS*	*Method*
p-Chloroaniline					*CAS #*	*106-47-8*		
Second Quarter 2016	U	U	U	U	U	4	-	8270D
Chlorobenzilate					*CAS #*	*510-15-6*		
Second Quarter 2016	U	U	U	U	U	10	-	8270D
p-Chloro-m-cresol					*CAS #*	*59-50-7*		
Second Quarter 2016	U	U	U	U	U J	1	-	8270D
Chloroethane					*CAS #*	*75-00-3*		
Second Quarter 2016	4.9	U	3.3	2.4	U	1	21000	8260C
Fourth Quarter 2016	3.9	U	2	1.1	U	1	21000	8260C
Chloroform					*CAS #*	*67-66-3*		
Second Quarter 2016	U	U	U	U	U	1	-	8260C
2-Chloronaphthalene					*CAS #*	*91-58-7*		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
2-Chlorophenol					*CAS #*	*95-57-8*		
Second Quarter 2016	U	U	U	U	U J	1	-	8270D
4-Chlorophenyl phenyl ether					*CAS #*	*7005-72-3*		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
Chloroprene					*CAS #*	*126-99-8*		
Second Quarter 2016	U	U	U	U	U	10	-	8260C
Chrysene					*CAS #*	*218-01-9*		
Second Quarter 2016	U	U	U	U	U	0	-	8270D
Diallate					*CAS #*	*2303-16-4*		
Second Quarter 2016	U	U	U	U	U	5	-	8270D
Dibenz(a,h)anthracene					*CAS #*	*53-70-3*		
Second Quarter 2016	U	U	U	U	U	0	-	8270D
Dibenzofuran					*CAS #*	*132-64-9*		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
Dibromochloromethane					*CAS #*	*124-48-1*		
Second Quarter 2016	U	U	U	U	U	1	-	8260C
1,2-Dibromo-3-chloropropane					*CAS #*	*96-12-8*		
Second Quarter 2016	U J	U J	U J	U J	U J	1	-	8260C
1,2-Dibromoethane					*CAS #*	*106-93-4*		
Second Quarter 2016	U	U	U	U	U	1	-	8260C
Di-n-butyl phthalate					*CAS #*	*84-74-2*		
Second Quarter 2016	U	U	U	U	U	5	-	8270D
1,2-Dichlorobenzene					*CAS #*	*95-50-1*		
Second Quarter 2016	U	U	U	U	U	1	-	8260C
1,3-Dichlorobenzene					*CAS #*	*541-73-1*		
Second Quarter 2016	U	U	U	U	U	1	-	8260C
1,4-Dichlorobenzene					*CAS #*	*106-46-7*		
Second Quarter 2016	U	U	U	U	U	1	-	8260C
3,3'-Dichlorobenzidine					*CAS #*	*91-94-1*		
Second Quarter 2016	U	U	U	U	U	5	-	8270D
trans-1,4-Dichloro-2-butene					*CAS #*	*110-57-6*		
Second Quarter 2016	U J	U J	U J	U J	U J	10	-	8260C
Dichlorodifluoromethane					*CAS #*	*75-71-8*		
Second Quarter 2016	U	U	U	U	U	1	190	8260C
Fourth Quarter 2016	U J	U	U J	U J	U J	1	190	8260C
1,1-Dichloroethane					*CAS #*	*75-34-3*		
Second Quarter 2016	6	0.3 J	9.1	6	U	1	9.5	8260C
Fourth Quarter 2016	6.7	U	6.9	3.6	U	1	9.5	8260C
1,2-Dichloroethane					*CAS #*	*107-06-2*		
Second Quarter 2016	U	U	U	U	U	1	-	8260C
1,1-Dichloroethene					*CAS #*	*75-35-4*		
Second Quarter 2016	0.3 J	U	0.3 J	U	U	1	7	8260C
Fourth Quarter 2016	U	U	U	U	U	1	7	8260C

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 *All Results in ug/L.*

Analyte/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	QL	GPS	Method
trans-1,2-Dichloroethene					CAS #	156-60-5		
Second Quarter 2016	U	U	U	U	U	1	-	8260C
2,4-Dichlorophenol					CAS #	120-83-2		
Second Quarter 2016	U	U	U	U	U J	1	-	8270D
2,6-Dichlorophenol					CAS #	87-65-0		
Second Quarter 2016	U	U	U	U	U J	1	-	8270D
1,2-Dichloropropane					CAS #	78-87-5		
Second Quarter 2016	U	U	U	U	U	1	-	8260C
1,3-Dichloropropane					CAS #	142-28-9		
Second Quarter 2016	U	U	U	U	U	1	-	8260C
trans-1,3-Dichloropropene					CAS #	10061-02-6		
Second Quarter 2016	U	U	U	U	U	1	-	8260C
Diethyl ether					CAS #	60-29-7		
Second Quarter 2016	33	12 J	70	28	U	13	7300	8260C
Fourth Quarter 2016	51	U	54	24	U	13	7300	8260C
Diethyl phthalate					CAS #	84-66-2		
Second Quarter 2016	U	U	U	U	U	5	11000	8270D
Fourth Quarter 2016	U	U	U	U	U	5	11000	8270D
O,O-Diethyl O-2-pyrazinyl					CAS #	297-97-2		
Second Quarter 2016	U	U	U	U	U	5	-	8270D
Dimethoate					CAS #	60-51-5		
Second Quarter 2016	U	U	U	U	U	10	-	8270D
Dimethyl ether					CAS #	115-10-6		
Second Quarter 2016	7.8 J	0.6 J	0.8 J	4.9 J	0.3 J	13	17	8260C
Fourth Quarter 2016	U	U	U	U	U	13	17	8260C
p-(Dimethylamino)azobenzene					CAS #	60-11-7		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
7,12-Dimethylbenz[a]anthracene					CAS #	57-97-6		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
3,3'-Dimethylbenzidine					CAS #	119-93-7		
Second Quarter 2016	U	U	U	U	U	75	-	8270D
a,a-Dimethylphenethylamine					CAS #	122-09-8		
Second Quarter 2016	U J	U J	U J	U J	U J	50	-	8270D
2,4-Dimethylphenol					CAS #	105-67-9		
Second Quarter 2016	U	U	U	U	U J	1	-	8270D
Dimethyl phthalate					CAS #	131-11-3		
Second Quarter 2016	U	U	U	U	U	5	-	8270D
m-Dinitrobenzene					CAS #	99-65-0		
Second Quarter 2016	U	U	U	U	U	5	-	8270D
4,6-Dinitro-o-cresol					CAS #	534-52-1		
Second Quarter 2016	U	U	U	U	U J	15	-	8270D
2,4-Dinitrophenol					CAS #	51-28-5		
Second Quarter 2016	U J	U J	U J	U J	U J	30	-	8270D
2,4-Dinitrotoluene					CAS #	121-14-2		
Second Quarter 2016	U	U	U	U	U	10	10	8270D
Fourth Quarter 2016	U	U	U	U	U	10	10	8270D
2,6-Dinitrotoluene					CAS #	606-20-2		
Second Quarter 2016	U	U	U	U	U	10	10	8270D
Fourth Quarter 2016	U	U	U	U	U	10	10	8270D
Di-n-octyl phthalate					CAS #	117-84-0		
Second Quarter 2016	U	U	U	U	U	5	-	8270D
1,4-Dioxane					CAS #	123-91-1		
Second Quarter 2016	U	U	U	U	U	200	-	8260C
Disulfoton					CAS #	298-04-4		
Second Quarter 2016	U	U	U	U	U	50	-	8270D

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 ***All Results in ug/L.***

Analtye/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*QL*	*GPS*	*Method*
Ethylbenzene					*CAS #*	*100-41-4*		
Second Quarter 2016	U	U	U	U	U	1	700	8260C
Fourth Quarter 2016	U	U	U	U	U	1	700	8260C
Ethyl methacrylate					*CAS #*	*97-63-2*		
Second Quarter 2016	U	U	U	U	U	10	-	8260C
Ethyl methanesulfonate					*CAS #*	*62-50-0*		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
Famphur					*CAS #*	*52-85-7*		
Second Quarter 2016	U	U	U	U	U	50	-	8270D
Fluoranthene					*CAS #*	*206-44-0*		
Second Quarter 2016	U	U	U	U	U	0	-	8270D
Fluorene					*CAS #*	*86-73-7*		
Second Quarter 2016	U	U	U	U	U	0	-	8270D
Hexachlorobenzene					*CAS #*	*118-74-1*		
Second Quarter 2016	U	U	U	U	U	0	-	8270D
Hexachlorobutadiene					*CAS #*	*87-68-3*		
Second Quarter 2016	U	U	U	U	U	1	-	8260C
Hexachlorocyclopentadiene					*CAS #*	*77-47-4*		
Second Quarter 2016	U	U	U	U	U	15	-	8270D
Hexachloroethane					*CAS #*	*67-72-1*		
Second Quarter 2016	U	U	U	U	U	5	-	8270D
Second Quarter 2016	U	U	U	U	U	10	-	8260C
Hexachlorophene					*CAS #*	*70-30-4*		
Second Quarter 2016	U J	U J	U J	U J	U J	8.9	-	8270D
Hexachloropropene					*CAS #*	*1888-71-7*		
Second Quarter 2016	U	U	U	U	U	5	-	8270D
2-Hexanone					*CAS #*	*591-78-6*		
Second Quarter 2016	U	U	U	U	U	10	-	8260C
Indeno[1,2,3-cd]pyrene					*CAS #*	*193-39-5*		
Second Quarter 2016	U	U	U	U	U	0	-	8270D
Isobutyl alcohol					*CAS #*	*78-83-1*		
Second Quarter 2016	U	U	U	U	U	200	-	8260C
Isodrin					*CAS #*	*465-73-6*		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
Isophorone					*CAS #*	*78-59-1*		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
Isosafrole					*CAS #*	*120-58-1*		
Second Quarter 2016	U	U	U	U	U	5	-	8270D
Kepone					*CAS #*	*143-50-0*		
Second Quarter 2016	U	U	U	U	U	50	-	8270D
Methacrylonitrile					*CAS #*	*126-98-7*		
Second Quarter 2016	U J	U J	U J	U J	U J	100	-	8260C
Methapyrilene					*CAS #*	*91-80-5*		
Second Quarter 2016	U	U	U	U	U	50	-	8270D
Bromomethane					*CAS #*	*74-83-9*		
Second Quarter 2016	U	U	U	U	U	1	-	8260C
Chloromethane					*CAS #*	*74-87-3*		
Second Quarter 2016	U	U	U	U	U	1	190	8260C
Fourth Quarter 2016	U J	U	U J	U J	U J	1	190	8260C
3-Methylcholanthrene					*CAS #*	*56-49-5*		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
Iodomethane					*CAS #*	*74-88-4*		
Second Quarter 2016	U	U	U	U	U	10	-	8260C
Methyl methacrylate					*CAS #*	*80-62-6*		
Second Quarter 2016	U J	U J	U J	U J	U J	10	-	8260C
Methyl methane sulfonate					*CAS #*	*66-27-3*		
Second Quarter 2016	U	U	U	U	U	5	-	8270D

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 **All Results in ug/L.**

Analtye/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	QL	GPS	Method
2-Methylnaphthalene					CAS #	91-57-6		
Second Quarter 2016	U	U	U	U	U	0	-	8270D
Methyl parathion					CAS #	298-00-0		
Second Quarter 2016	U	U	U	U	U	5	-	8270D
4-Methyl-2-pentanone					CAS #	108-10-1		
Second Quarter 2016	U J	U J	U J	U J	U J	10	-	8260C
2-Methylphenol					CAS #	95-48-7		
Second Quarter 2016	U	U	U	U	U J	1	-	8270D
3 & 4-Methylphenol					CAS #	m 108-39-4	p 106-44-5	
Second Quarter 2016	U	U	U	U	U J	1	-	8270D
Dibromomethane					CAS #	74-95-3		
Second Quarter 2016	U	U	U	U	U	1	-	8260C
Methylene chloride					CAS #	75-09-2		
Second Quarter 2016	1.8	U	U	0.4 J	U	1	13.95	8260C
Fourth Quarter 2016	1.7	U	U	U	U	1	13.95	8260C
Naphthalene					CAS #	91-20-3		
Second Quarter 2016	U J	U J	U J	U J	U J	1	-	8260C
1,4-Naphthoquinone					CAS #	130-15-4		
Second Quarter 2016	U J	U J	U J	U J	U J	60	-	8270D
1-Naphthylamine					CAS #	134-32-7		
Second Quarter 2016	U	U	U	U	U	15	-	8270D
2-Naphthylamine					CAS #	91-59-8		
Second Quarter 2016	U	U	U	U	U	15	-	8270D
o-Nitroaniline					CAS #	88-74-4		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
m-Nitroaniline					CAS #	99-09-2		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
p-Nitroaniline					CAS #	100-01-6		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
Nitrobenzene					CAS #	98-95-3		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
o-Nitrophenol					CAS #	88-75-5		
Second Quarter 2016	U	U	U	U	U J	1	-	8270D
p-Nitrophenol					CAS #	100-02-7		
Second Quarter 2016	U	U	U	U	U J	30	-	8270D
4-Nitroquinoline-1-oxide					CAS #	56-57-5		
Second Quarter 2016	U J	U J	U J	U J	U J	60	-	8270D
N-Nitrosodi-n-butylamine					CAS #	924-16-3		
Second Quarter 2016	U	U	U	U	U	5	-	8270D
N-Nitrosodiethylamine					CAS #	55-18-5		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
N-Nitrosodimethylamine					CAS #	62-75-9		
Second Quarter 2016	U	U	U	U	U	5	-	8270D
N-Nitrosodiphenylamine					CAS #	86-30-6		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
N-Nitrosodipropylamine					CAS #	621-64-7		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
N-Nitrosomethylethylamine					CAS #	10595-95-6		
Second Quarter 2016	U	U	U	U	U	5	-	8270D
N-Nitrosomorpholine					CAS #	59-89-2		
Second Quarter 2016	U	U	U	U	U	5	-	8270D
N-Nitrosopiperidine					CAS #	100-75-4		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
N-Nitrosopyrrolidine					CAS #	930-55-2		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
5-Nitroso-o-toluidine					CAS #	99-55-8		
Second Quarter 2016	U	U	U	U	U	1	-	8270D

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 *All Results in ug/L.*

Analtye/Quarter	16C1	16MW8	16MW9	16WC1A	16WC1B	QL	GPS	Method
Parathion					CAS #	56-38-2		
Second Quarter 2016	U	U	U	U	U	5	-	8270D
Pentachlorobenzene					CAS #	608-93-5		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
Pentachloroethane					CAS #	76-01-7		
Second Quarter 2016	U	U	U	U	U	10	-	8260C
Pentachloronitrobenzene					CAS #	82-68-8		
Second Quarter 2016	U	U	U	U	U	5	-	8270D
Pentachlorophenol					CAS #	87-86-5		
Second Quarter 2016	U	U	U	U	U J	5	-	8270D
Phenacetin					CAS #	62-44-2		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
Phenanthrene					CAS #	85-01-8		
Second Quarter 2016	U	U	U	U	U	0	-	8270D
Phenol					CAS #	108-95-2		
Second Quarter 2016	U	U	U	U	U J	1	-	8270D
Phorate					CAS #	298-02-2		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
2-Picoline					CAS #	931-19-1		
Second Quarter 2016	U	U	U	U	U	5	-	8270D
Pronamide					CAS #	23950-58-5		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
2-Propanol					CAS #	67-63-0		
Second Quarter 2016	U	U	U	U	U	100	-	8260C
Propionitrile					CAS #	107-12-0		
Second Quarter 2016	U	U	U	U	U	100	-	8260C
Pyrene					CAS #	129-00-0		
Second Quarter 2016	U	U	U	U	U	0	-	8270D
Pyridine					CAS #	110-86-1		
Second Quarter 2016	U	U	U	U	U	5	-	8270D
Safrole					CAS #	94-59-7		
Second Quarter 2016	U	U	U	U	U	5	-	8270D
Styrene					CAS #	100-42-5		
Second Quarter 2016	U	U	U	U	U	1	-	8260C
Sulfotep					CAS #	3689-24-5		
Second Quarter 2016	U	U	U	U	U	8.9	-	8270D
1,2,4,5-Tetrachlorobenzene					CAS #	95-94-3		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
1,1,1,2-Tetrachloroethane					CAS #	630-20-6		
Second Quarter 2016	U	U	U	U	U	1	-	8260C
1,1,2,2-Tetrachloroethane					CAS #	79-34-5		
Second Quarter 2016	U	U	U	U	U	1	-	8260C
Tetrachloroethene					CAS #	127-18-4		
Second Quarter 2016	0.3 J	U	U	0.3 J	U	1	5	8260C
Fourth Quarter 2016	U	U	U	U	U	1	5	8260C
Tetrahydrofuran					CAS #	109-99-9		
Second Quarter 2016	13 J	U	U J	4.6 J	U J	25	3400	8260C
Fourth Quarter 2016	U J	U	U J	U J	U J	25	3400	8260C
2,3,4,6-Tetrachlorophenol					CAS #	58-90-2		
Second Quarter 2016	U	U	U	U	U J	1	-	8270D
Toluene					CAS #	108-88-3		
Second Quarter 2016	U	U	U	U	U	1	1000	8260C
Fourth Quarter 2016	U	U	U	U	U	1	1000	8260C
o-Toluidine					CAS #	95-53-4		
Second Quarter 2016	U	U	U	U	U	1	-	8270D
1,2,4-Trichlorobenzene					CAS #	120-82-1		
Second Quarter 2016	U	U	U	U	U	1	-	8260C

See last page of this report for definitions.

Target Analyte Monitoring Results - HWMU-16 Point of Compliance Wells
Radford Army Ammunition Plant, Radford, Virginia

Upgradient well = 16C1 *All Results in ug/L.*

Analtye/Quarter	*16C1*	*16MW8*	*16MW9*	*16WC1A*	*16WC1B*	*QL*	*GPS*	*Method*
1,1,1-Trichloroethane					*CAS #*	*71-55-6*		
Second Quarter 2016	0.2 J	U	U	U	U	1	200	8260C
Fourth Quarter 2016	U	U	U	U	U	1	200	8260C
1,1,2-Trichloroethane					*CAS #*	*79-00-5*		
Second Quarter 2016	U	U	U	U	U	1	-	8260C
Trichloroethene					*CAS #*	*79-01-6*		
Second Quarter 2016	0.3 J	U	U	0.2 J	U	1	5	8260C
Fourth Quarter 2016	U	U	U	U	U	1	5	8260C
Trichlorofluoromethane					*CAS #*	*75-69-4*		
Second Quarter 2016	U	U	U	U	U	1	1000	8260C
Fourth Quarter 2016	U	U	U	U	U	1	1000	8260C
2,4,5-Trichlorophenol					*CAS #*	*95-95-4*		
Second Quarter 2016	U	U	U	U	U J	1	-	8270D
2,4,6-Trichlorophenol					*CAS #*	*88-06-2*		
Second Quarter 2016	U	U	U	U	U J	1	-	8270D
1,2,3-Trichloropropane					*CAS #*	*96-18-4*		
Second Quarter 2016	U	U	U	U	U	1	-	8260C
1,1,2-Trichloro-1,2,2-Trifluoroethane					*CAS #*	*76-13-1*		
Second Quarter 2016	U	U	U	U	U	1	59000	8260C
Fourth Quarter 2016	U	U	U	U	U	1	59000	8260C
O,O,O-Triethyl phosphorothioate					*CAS #*	*126-68-1*		
Second Quarter 2016	U	U	U	U	U	5	-	8270D
sym-Trinitrobenzene					*CAS #*	*99-35-4*		
Second Quarter 2016	U	U	U	U	U	15	-	8270D
Vinyl acetate					*CAS #*	*108-05-4*		
Second Quarter 2016	U	U	U	U	U	10	-	8260C
Vinyl chloride					*CAS #*	*75-01-4*		
Second Quarter 2016	U	U	U	U	U	1	-	8260C
Xylenes (Total)					*CAS #*	*1330-20-7*		
Second Quarter 2016	U	U	U	U	U	3	10000	8260C
Fourth Quarter 2016	U	U	U	U	U	3	10000	8260C

See last page of this report for definitions.

Definitions:

The following definitions apply to results reported for Appendix IX monitoring events.
All Appendix IX monitoring results for compliance wells are reported to the detection limit.

Appendix IX Monitoring Events: 3Q2003, 2Q-2004, 2Q-2005, 3Q2006, 2Q2007, 2Q2008, 2Q2009, 2Q 2010, 2Q 2011, 2Q 2012, 2Q2013, 2Q2014, 2Q2015, 2Q2016

QL Denotes permit required quantitation limit.
U denotes not detected at or above the detection limit.
UA denotes not detected at or above the adjusted detection limit.
J Denotes result is estimated. When used with "U" (i.e., “UJ”), denotes analyte not detected at or above the detection limit and detection limit and QL are estimated. When used with "UA" (i.e., “UAJ”), denotes analyte not detected at or above adjusted detection limit and adjusted detection limit and QL are estimated.
UN Denotes analyte concentration is less than the quantitation limit and/or five times the blank concentration. Not reliably detected due to blank contamination. This qualifier used only for Appendix IX monitoring event when compliance well results are reported to at or above the project detection limit.
R Denotes result rejected.
Q Denotes data validation qualifier. **X** Denotes mass spectral confirmation not obtained-result suspect.
Background Denotes background concentrations listed in Appendix F to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5 and 16 (rev 2014, 2016), where applicable.
CAS# Denotes Chemical Abstract Services registration number.
GPS Denotes Groundwater Protection Standards listed in Appendix G to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5 and 16 (October 4, 2002) (revised 2014, 2016).
NS denotes not sampled. **NA** denotes not analyzed.
“–“ denotes not detected (pre-2nd Quarter 2003) or not available / not sampled (beginning 2nd Quarter 2003).

Notes:

Verification event performed June 16, 2016 for:
Cyanide, cobalt, tetrahydrofuran and vinyl chloride – see validation report for details

The following definitions apply to results reported for non-Appendix IX monitoring events.
All non-Appendix IX monitoring results for compliance wells are reported at or above the quantitation limit.

QL Denotes permit required quantitation limit.
U Denotes analyte not detected at or above QL.
UA Denotes analyte not detected at or above adjusted sample QL.
J Denotes result is estimated. When used with "U" (i.e., “**UJ**”), denotes analyte not detected at or above QL and QL is estimated. When used with "UA" (i.e., “**UAJ**”), denotes analyte not detected at or above adjusted QL and adjusted QL is estimated.
UN Denotes analyte concentration is less than five times the blank concentration. Not reliably detected due to blank contamination.
R Denotes result rejected.
Q Denotes data validation qualifier.
Background Denotes background concentrations listed in Appendix F to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5 and 16 (October 4, 2002), (revised 2014, 2016), where applicable.
CAS# Denotes Chemical Abstract Services registration number.
GPS Denotes Groundwater Protection Standards listed in Appendix G to Attachment 5 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5 and 16 (October 4, 2002) (revised 2014, 2016).

APPENDIX B-3

HWMU-16 2016 LABORATORY ANALYTICAL RESULTS
PLUME MONITORING WELLS

Target Analyte Monitoring Results At Or Above Permit Quantitation Limit HWMU-16 Plume Monitoring Wells

Radford Army Ammunition Plant, Radford, Virginia

All Results in ug/L.

Upgradient well = 16C1

Analtye/Quarter	*16C1*	*Q*	*16-2*	*Q*	*16-3*	*Q*	*16-5*	*Q*	*16WC2B*	*Q*	*16SPRING*	*Q*	*QL*	*Background*	*Method*
Arsenic											*CAS #7440-38-2*				
Second Quarter 2016	U		U		U		U		U		U		10	1	6020A
Fourth Quarter 2016	U		U		U		U		U		U		10	1	6020A
Barium											*CAS #7440-39-3*				
Second Quarter 2016	140		180		750		160		110		180		10	175.4	6020A
Fourth Quarter 2016	200		240		770		170		110		210		10	175.4	6020A
Beryllium											*CAS #7440-41-7*				
Second Quarter 2016	0.52	J	U		U		U		U		U		1	0.7	6020A
Fourth Quarter 2016	U		U		U		U		U		U		1	0.7	6020A
Cadmium											*CAS #7440-43-9*				
Second Quarter 2016	0.42	J	U		U		U		U		U		1	0.2	6020A
Fourth Quarter 2016	U		U		U		U		U		U		1	0.2	6020A
Chromium											*CAS #7440-47-3*				
Second Quarter 2016	U		U		U		U		U		U		5	6.2	6020A
Fourth Quarter 2016	U		U		U		U		U		U		5	6.2	6020A
Cobalt											*CAS #7440-48-4*				
Second Quarter 2016	U		U		U		U		U		U		5	5	6020A
Fourth Quarter 2016	U		U		U		U		U		U		5	5	6020A
Copper											*CAS #7440-50-8*				
Second Quarter 2016	U		U		U		U		U		U		5	13	6020A
Fourth Quarter 2016	U		U		U		U		U		U		5	13	6020A
Lead											*CAS #7439-92-1*				
Second Quarter 2016	U		U		U		U		U		U		1	10	6020A
Fourth Quarter 2016	U		U		U		U		U		U		2	10	6020A
Mercury											*CAS #7439-97-6*				
Second Quarter 2016	U		U		U		U		U		U		2	0.2	7470A
Fourth Quarter 2016	U		U		U		U		U		U		2	0.2	7470A
Nickel											*CAS #7440-02-0*				
Second Quarter 2016	3.9	J	U		U		U		U		U		10	16	6020A
Fourth Quarter 2016	U		U		U		U		U		U		10	16	6020A
Vanadium											*CAS #7440-62-2*				
Second Quarter 2016	U		U		U		U		U		U		10	151	6020A
Fourth Quarter 2016	U	N	U	N	U	N	U	N	U	N	U	N	10	151	6020A
Zinc											*CAS #7440-66-6*				
Second Quarter 2016	U		U		U		U		U		U		10	51	6020A
Fourth Quarter 2016	U		U		U		U		U		U		30	51	6020A
Benzene											*CAS #71-43-2*				
Second Quarter 2016	0.3	J	U		U		U		U		U		1	1	8260C
Fourth Quarter 2016	U		U		U		U		U		U		1	1	8260C
2-Butanone											*CAS #78-93-3*				
Second Quarter 2016	U		U		U		U		U		U		10	1.1	8260C
Fourth Quarter 2016	U	J	U	J	U	J	U	J	U	J	U	J	10	1.1	8260C
Carbon tetrachloride											*CAS #56-23-5*				
Second Quarter 2016	U		U		U		U		U		U		1	0.2	8260C
Fourth Quarter 2016	U		U		U		U		U		U		1	0.2	8260C
Chloroethane											*CAS #75-00-3*				
Second Quarter 2016	4.9		U		U		U		U		U		1	20.7	8260C
Fourth Quarter 2016	3.9		U		U		U		U		U		1	20.7	8260C

See last page of this report for definitions.

Target Analyte Monitoring Results At Or Above Permit Quantitation Limit
HWMU-16 Plume Monitoring Wells

Radford Army Ammunition Plant, Radford, Virginia

All Results in ug/L.

Upgradient well = 16C1

Analtye/Quarter	*16C1*	*Q*	*16-2*	*Q*	*16-3*	*Q*	*16-5*	*Q*	*16WC2B*	*Q*	*16SPRING*	*Q*	*QL*	*Background*	*Method*
Dichlorodifluoromethane											*CAS #75-71-8*				
Second Quarter 2016	U		U		U		U		U		U		1	46.5	8260C
Fourth Quarter 2016	U	J	U	J	U	J	U	J	U	J	U	J	1	46.5	8260C
1,1-Dichloroethane											*CAS #75-34-3*				
Second Quarter 2016	6		U		U		U		U		U		1	9.5	8260C
Fourth Quarter 2016	6.7		U		U		U		U		U		1	9.5	8260C
1,1-Dichloroethene											*CAS #75-35-4*				
Second Quarter 2016	0.3	J	U		U		U		U		U		1	1	8260C
Fourth Quarter 2016	U		U		U		U		U		U		1	1	8260C
Diethyl ether											*CAS #60-29-7*				
Second Quarter 2016	33		U		U		U		U		U		13	75.5	8260C
Fourth Quarter 2016	51		U		U		U		U		U		13	75.5	8260C
Diethyl phthalate											*CAS #84-66-2*				
Second Quarter 2016	U		U		U		U		U		U		5	5	8270D
Fourth Quarter 2016	U		U		U		U		U		U		5	5	8270D
Dimethyl ether											*CAS #115-10-6*				
Second Quarter 2016	7.8	J	U		U		U		U		U		13	17.0	8260C
Fourth Quarter 2016	U		U		U		U		U		U		13	17.0	8260C
2,4-Dinitrotoluene											*CAS #121-14-2*				
Second Quarter 2016	U		U		U		U		U		U		10	10	8270D
Fourth Quarter 2016	U		U		U		U		U		U		10	10	8270D
2,6-Dinitrotoluene											*CAS #606-20-2*				
Second Quarter 2016	U		U		U		U		U		U		10	10	8270D
Fourth Quarter 2016	U		U		U		U		U		U		10	10	8270D
Ethylbenzene											*CAS #100-41-4*				
Second Quarter 2016	U		U		U		U		U		U		1	0.1	8260C
Fourth Quarter 2016	U		U		U		U		U		U		1	0.1	8260C
Chloromethane											*CAS #74-87-3*				
Second Quarter 2016	U		U		U		U		U		U		1	0.3	8260C
Fourth Quarter 2016	U	J	U	J	U	J	U	J	U	J	U	J	1	0.3	8260C
Methylene chloride											*CAS #75-09-2*				
Second Quarter 2016	1.8		U		U		U		U		U		1	13.95	8260C
Fourth Quarter 2016	1.7		U		U		U		U		U		1	13.95	8260C
Tetrachloroethene											*CAS #127-18-4*				
Second Quarter 2016	0.3	J	U		U		U		U		U		1	0.7	8260C
Fourth Quarter 2016	U		U		U		U		U		U		1	0.7	8260C
Tetrahydrofuran											*CAS #109-99-9*				
Second Quarter 2016	13	J	-		-		-		-		-		25	25	8260C
Fourth Quarter 2016	U	J	U	J	U	J	U	J	U	J	U	J	25	25	8260C
Toluene											*CAS #108-88-3*				
Second Quarter 2016	U		U		U		U		U		U		1	0.1	8260C
Fourth Quarter 2016	U		U		U		U		U		U		1	0.1	8260C
1,1,1-Trichloroethane											*CAS #71-55-6*				
Second Quarter 2016	0.2	J	U		U		U		U		U		1	9.2	8260C
Fourth Quarter 2016	U		U		U		U		U		U		1	9.2	8260C
Trichloroethene											*CAS #79-01-6*				
Second Quarter 2016	0.3	J	U		U		U		U		U		1	0.1	8260C
Fourth Quarter 2016	U		U		U		U		U		U		1	0.1	8260C

See last page of this report for definitions.

Target Analyte Monitoring Results At Or Above Permit Quantitation Limit
HWMU-16 Plume Monitoring Wells

Radford Army Ammunition Plant, Radford, Virginia

All Results in ug/L.

Upgradient well = 16C1

Analtye/Quarter	*16C1 Q*	*16-2 Q*	*16-3 Q*	*16-5 Q*	*16WC2B Q*	*16SPRING Q*	*QL*	*Background*	*Method*
Trichlorofluoromethane						*CAS #75-69-4*			
Second Quarter 2016	U	U	U	U	U	U	1	11.3	8260C
Fourth Quarter 2016	U	U	U	U	U	U	1	11.3	8260C
1,1,2-Trichloro-1,2,2-Trifluoroethane						*CAS #76-13-1*			
Second Quarter 2016	U	U	U	U	U	U	1	1.2	8260C
Fourth Quarter 2016	U	U	U	U	U	U	1	1.2	8260C
Xylenes (Total)						*CAS #1330-20-7*			
Second Quarter 2016	U	U	U	U	U	U	3	0.2	8260C
Fourth Quarter 2016	U	U	U	U	U	U	3	0.2	8260C

Definitions:

All plume monitoring well results reported to at or above the permit quantitation limit except for the upgradient well during the Appendix IX monitoring Event. During the Appendix IX monitoring event, results for the upgradient well are reported to the

Q Denotes data validation qualifier.
QL Denotes permit required quantitation limit.
U Denotes analyte not detected at or above QL.
UA Denotes analyte not detected at or above adjusted sample QL.
J Denotes result is estimated. When used with "U" (i.e., "**UJ**"), denotes analyte not detected at or above QL and QL is estimated. When used with "UA" (i.e., "**UAJ**"), denotes analyte not detected at or above adjusted QL and adjusted QL is estimated.
UN Denotes analyte concentration is less than five times the blank concentration. Not reliably detected due to blank contamination.
R Denotes result rejected.
Background Denotes background concentrations listed in Appendix F to Attachment 3 in the Final Hazardous Waste Post-Closure Care Permit for Hazardous Waste Units 5 and 16 (October 4, 2002), revised July 17, 2014, rev December 1, 2016).
CAS# Denotes Chemical Abstract Services registration number.
GPS Denotes groundwater protection standard. (2016)

NS denotes not sampled. **NA** denotes not analyzed. "–"denotes not detected (pre-2nd Quarter 2003) or not available / not sampled (beginning 2nd Quarter 2003).

Notes:
4Q2004. No data for 16-1 8270C-semivolatiles. Well dry-insufficient sample volume.
4Q2006 - No data for 16-1; well dry.
4Q2008- No data for 16-1; well dry.
2Q2009- No data for 16-1; well dry.

NOTE:
Fourth Quarter 2008
Due to laboratory error all HWMU 16 samples were analyzed using Method 8260B 5 ml purge instead of a 25 ml purge which resulted in a higher QL. For these samples, all results were evaluated to the detection limit, which is comparable to the permit QL. Results below the laboratory QL but at or above the permit QL are reported and qualified as estimated.

TABLE 2
HWMU-16
GROUNDWATER ELEVATIONS - 2016
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

MONITORING WELL ID	ELEVATION TOP OF WELL	APRIL 26, 2016		OCTOBER 24, 2016	
		DTW	GW ELEV	DTW	GW ELEV
16C1	1840.14	46.06	1794.08	49.51	1790.63
16MW8	1815.82	70.67	1745.15	73.49	1742.33
16MW9	1808.88	62.23	1746.65	65.29	1743.59
16WC1A	1812.61	62.43	1750.18	68.12	1744.49
16WC1B	1812.95	63.41	1749.54	68.33	1744.62
16-1	1815.82	41.43	1774.39	48.24	1767.58
16-2	1810.99	55.87	1755.12	55.90	1755.09
16-3	1824.77	54.73	1770.04	56.38	1768.39
16-5	1742.60	3.63	1738.97	4.39	1738.21
16WC2B	1818.71	50.53	1768.18	54.95	1763.76
16WC2A	1820.05	DRY	DRY	DRY	DRY
16C3	1822.22	60.61	1761.61	68.03	1754.19
16CDH3	1825.60	DRY	DRY	DRY	DRY
SPRING	na	na	na	na	na

NOTES:

DTW: Depth to water from top of casing.
GW ELEV: Groundwater elevation.
All elevations in feet above mean sea level.
na: Not applicable.

ATTACHMENT 10

RFAAP Inspection Forms

[This Page Intentionally Left Blank]

DUP 6057F (Rev. Lev. 0, 11/1/2000)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 5
EPA Permit No. VA1210020730
Date of Inspection 6 / 10 / 2013 Time of Inspection 7 : 45 [✓ AM]/ PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (2)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alber

Company: BAE Systems OSI

Date remedial action completed: ____________ Remedial action approved by: ____________

DUP 6057F (Rev. Lev. 0, 11/1/2000)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 7
EPA Permit No. VA1210020730
Date of Inspection 06 / 10 / 2015 Time of Inspection 8 : 00 [✓ AM] PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (2)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems OSI

Date remedial action completed: ______ Remedial action approved by: ______

DUP 6057F (Rev. Lev. 0, 11/1/2000)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 10
EPA Permit No. VA1210020730
Date of Inspection 06 / 10 / 2013 Time of Inspection 8 : 15 [✓ AM] PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (2)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action:

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems OSI

Date remedial action completed: Remedial action approved by:

DUP 6057F (Rev. Lev. 0, 11/1/2000)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 16
EPA Permit No. VA1210020730
Date of Inspection 06 / 10 / 2013 Time of Inspection 8 : 30 [✓ AM] PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (2)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action:

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems OSI

Date remedial action completed: Remedial action approved by:

DUP 6057F (Rev. Lev. 0, 11/1/2000)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 5
EPA Permit No. VA1210020730
Date of Inspection 8 / 8 / 2013 Time of Inspection 09 : 30 [✓ AM] PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (2)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ____________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems OSI

Date remedial action completed: __________ Remedial action approved by: __________

DUP 6057F (Rev. Lev. 0, 11/1/2000)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 7
EPA Permit No. VA1210020730
Date of Inspection 8 / 8 / 2013 Time of Inspection 09 : 50 [✓ AM]/PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (2)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: __________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems OSI

Date remedial action completed: __________ Remedial action approved by: __________

DUP 6057F (Rev. Lev. 0, 11/1/2000)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 10
EPA Permit No. VA1210020730
Date of Inspection 8 / 8 /2013 Time of Inspection 10 : 15 [✓ AM]/PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2” in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (2)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: __________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems OSI

Date remedial action completed: __________ Remedial action approved by: __________

DUP 6057F (Rev. Lev. 0, 11/1/2000)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 16
EPA Permit No. VA1210020730
Date of Inspection 8 / 8 / 2013 Time of Inspection 10 : 40 [✓ AM] PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (2)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems OSI

Date remedial action completed: ____________ Remedial action approved by: ____________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 5
EPA Permit No. VA1210020730
Date of Inspection 3 / 18 / 2015 Time of Inspection 9 : 30 [✓ AM]/ PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ____________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems OSI

Date remedial action completed: ____________ Remedial action approved by: ____________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 7
EPA Permit No. VA1210020730
Date of Inspection 3 / 18 / 2015 Time of Inspection 10 : 00 [✓ AM]/ PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems OSI

Date remedial action completed: ______ Remedial action approved by: ______

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 10
EPA Permit No. VA1210020730
Date of Inspection 3 / 18 / 2015 Time of Inspection 10 : 30 [✓ AM]/ PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ____________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems OSI

Date remedial action completed: ____________ Remedial action approved by: ____________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 16
EPA Permit No. VA1210020730
Date of Inspection 3 / 18 / 2015 Time of Inspection 10 : 50 [✓ AM] PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ____________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems OSI

Date remedial action completed: ____________ Remedial action approved by: ____________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: RFAAP
HWMU Facility No. 5
EPA Permit No. VA1210020730
Date of Inspection 9 / 18 / 2014 Time of Inspection 7 : 30 [✓ AM]/ PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems

Date remedial action completed: ______ Remedial action approved by: ______

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: RFAAP
HWMU Facility No. 7
EPA Permit No. VA1210020730
Date of Inspection 9 / 18 / 2014 Time of Inspection 7 : 50 [✓ AM]/PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt alberts

Company: BAE Systems

Date remedial action completed: ______________ Remedial action approved by: ____________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: RFAAP
HWMU Facility No. 10
EPA Permit No. VA1210020730
Date of Inspection 9 / 18 / 2014 Time of Inspection 8 : 15 [✓ AM]/PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: __________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems

Date remedial action completed: __________ Remedial action approved by: __________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: RFAAP
HWMU Facility No. 16
EPA Permit No. VA1210020730
Date of Inspection 9 / 18 / 14 Time of Inspection 8 : 40 [✓ AM]/ PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts
Company: BAE Systems

Date remedial action completed: ______ Remedial action approved by: ______

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 5
EPA Permit No. VA1210020730
Date of Inspection 09 / 18 / 15 Time of Inspection 11 : 00 [✓ AM]/PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______________________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Albert

Company: BAE Systems

Date remedial action completed: ______________ Remedial action approved by: ____________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 7
EPA Permit No. VA1210020730
Date of Inspection 09 / 18 / 15 Time of Inspection 11 : 20 [✓ AM]/PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______________________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems

Date remedial action completed: ______________ Remedial action approved by: ____________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 10
EPA Permit No. VA1210020730
Date of Inspection 09 / 18 / 15 Time of Inspection 11 : 40 [✓ AM]/ PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2” in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______________________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems

Date remedial action completed: ______________ Remedial action approved by: ____________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 16
EPA Permit No. VA1210020730
Date of Inspection 09/18/15 Time of Inspection 12:00 AM/[✓ PM]
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ____________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt alberts

Company: BAE Systems

Date remedial action completed: __________ Remedial action approved by: __________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: RFAAP
HWMU Facility No. 5
EPA Permit No. VA1210020730
Date of Inspection 12 / 22 / 2014 Time of Inspection 11 : 00 [✓ AM]/ PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______________________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems

Date remedial action completed: _______________ Remedial action approved by: ____________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: RFAAP
HWMU Facility No. 7
EPA Permit No. VA1210020730
Date of Inspection 12 / 22 / 14 Time of Inspection 11 : 30 [✓ AM]/ PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action:

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Albert

Company: BAE Systems

Date remedial action completed: Remedial action approved by:

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: RFAAP
HWMU Facility No. 10
EPA Permit No. VA1210020730
Date of Inspection 12 / 22 / 14 Time of Inspection 12 : 00 AM [✓ PM]
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems

Date remedial action completed: ______________ Remedial action approved by: ____________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: RFAAP
HWMU Facility No. 16
EPA Permit No. VA1210020730
Date of Inspection 12 / 22 / 14 Time of Inspection 12 : 30 AM/ [✓ PM]
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2” in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts
Company: BAE Systems

Date remedial action completed: ______________ Remedial action approved by: ______________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 5
EPA Permit No. VA1210020730
Date of Inspection 6 / 24 / 2014 Time of Inspection 8 : 00 [✓ AM]/PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems OSI

Date remedial action completed: ____________ Remedial action approved by: ____________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 7
EPA Permit No. VA1210020730
Date of Inspection 6 / 24 / 2014 Time of Inspection 8 : 20 [✓ AM]/PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems OSI

Date remedial action completed: ______________ Remedial action approved by: ______________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 10
EPA Permit No. VA1210020730
Date of Inspection 6 / 24 / 2014 Time of Inspection 08 : 40 [✓ AM]/PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems OSI

Date remedial action completed: ______________ Remedial action approved by: ____________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 16
EPA Permit No. VA1210020730
Date of Inspection 6 / 24 / 2014 Time of Inspection 09 : 00 [✓ AM]/ PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE System OSI

Date remedial action completed: ____________ Remedial action approved by: ____________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 5
EPA Permit No. VA1210020730
Date of Inspection 06 / 25 / 2015 Time of Inspection 4 : 00 AM/ [✓ PM]
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems

Date remedial action completed: ____________ Remedial action approved by: ____________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 7
EPA Permit No. VA1210020730
Date of Inspection 6 /25 /15 Time of Inspection 4 : 20 AM/[✓ PM]
Reason for Inspection: [✓ Quarterly]/Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ________________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts
Company: BAE Systems

Date remedial action completed: ____________ Remedial action approved by: ____________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 10
EPA Permit No. VA1210020730
Date of Inspection 6/25/15 Time of Inspection 4 : 40 AM [✓ PM]
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______________________

Printed Name of Inspector: Matt Alberts
Signature of Inspector: Matt Alberts
Company: BAE Systems
Date remedial action completed: ______________
Remedial action approved by: ______________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 16
EPA Permit No. VA1210020730
Date of Inspection 6 / 25 / 2015 Time of Inspection 5 : 00 AM/[✓ PM]
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	**INSPECT FOR**	**DEFICIENCIES NOTED**	**REMEDIAL ACTION REQUIRED**
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______________________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts
Company: BAE Systems
Date remedial action completed: ____________ Remedial action approved by: ____________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 5
EPA Permit No. VA1210020730
Date of Inspection 11 / 30 / 15 Time of Inspection 11 : 45 [✓ AM]/PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: __________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems

Date remedial action completed: __________ Remedial action approved by: __________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 16
EPA Permit No. VA1210020730
Date of Inspection 11 / 30 / 15 Time of Inspection 11 : 10 [✓ AM]/PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems

Date remedial action completed: ____________ Remedial action approved by: ____________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 7
EPA Permit No. VA 1210020730
Date of Inspection 11 / 30 / 15 Time of Inspection 12 : 00 AM [✓ PM]
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ____

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems

Date remedial action completed: ________________ Remedial action approved by: ____________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 10
EPA Permit No. VA1210020730
Date of Inspection 11 / 30 / 15 Time of Inspection 12 : 15 AM/[✓ PM]
Reason for Inspection: [✓ Quarterly]/Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems

Date remedial action completed: ______________ Remedial action approved by: ______________

DUP 6057F
Rev. 0 (7/2012)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 5
EPA Permit No. VA1210020730
Date of Inspection 03 / 21 / 13 Time of Inspection 10 : 00 [✓ AM] PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (2)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems OSI

Date remedial action completed: ______ Remedial action approved by: ______

DUP 6057F
Rev. 0 (7/2012)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 7
EPA Permit No. VA1210020730
Date of Inspection 3 / 21 / 13 Time of Inspection 9 : 45 [✓ AM]/PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (2)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ____________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems OSI

Date remedial action completed: ____________ Remedial action approved by: ____________

DUP 6057F
Rev. 0 (7/2012)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 10
EPA Permit No. VA1210020730
Date of Inspection 03/21/13 Time of Inspection 9 : 30 [✓ AM] PM
Reason for Inspection: [✓ Quarterly]/Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (2)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action:

Printed Name of Inspector: Matt Alberts
Signature of Inspector: Matt Alberts
Company: BAE Systems OSI

Date remedial action completed:
Remedial action approved by:

DUP 6057F
Rev. 0 (7/2012)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Rad
HWMU Facility No. 16
EPA Permit No. VA1210020730
Date of Inspection 03/21/15 Time of Inspection 9 : 15 [✓ AM]/ PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (2)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems OSI

Date remedial action completed: ____________ Remedial action approved by: ____________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 5
EPA Permit No. VA1210020730
Date of Inspection 12 / 2 / 2013 Time of Inspection 09 : 00 [✓ AM]/PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	None	

Date and nature of repairs or remedial action: ____________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems

Date remedial action completed: ____________ Remedial action approved by: ____________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
SWMU MJA ~~HWMU~~ Facility No. 7
EPA Permit No. VA1210020730
Date of Inspection 12 / 2 / 2013 Time of Inspection 09 : 20 [✓ AM] PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	NA	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems

Date remedial action completed: ______________ Remedial action approved by: ____________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 10
EPA Permit No. VA1210020730
Date of Inspection 12 / 2 / 2013 Time of Inspection 09 : 45 [✓ AM] PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______________________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Albers

Company: BAE Systems

Date remedial action completed: ______________ Remedial action approved by: ____________

DUP 6057F
Rev. 1 (8/2013)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 16
EPA Permit No. VA 1210020730
Date of Inspection 12 / 2 /2013 Time of Inspection 10 : 05 [✓ AM]/PM
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (3)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ________________

Printed Name of Inspector: Matt alberts Signature of Inspector: Matt alberts

Company: BAE Systems

Date remedial action completed: ________ Remedial action approved by: ________

DUP 6057F (Rev. Lev. 0, 11/1/2000)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 5
EPA Permit No. VA1210020730
Date of Inspection 3 /27 /14 Time of Inspection 2 : 00 AM/[✓ PM]
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (2)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ______________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems OSI

Date remedial action completed: ____________ Remedial action approved by: ____________

DUP 6057F (Rev. Lev. 0, 11/1/2000)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 7
EPA Permit No. VA1210020730
Date of Inspection 3 /27/ 14 Time of Inspection 2 : 20 AM/[✓ PM]
Reason for Inspection: [✓ Quarterly]/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (2)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action: ____________________

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts
Company: BAE Systems OSI

Date remedial action completed: __________ Remedial action approved by: __________

DUP 6057F (Rev. Lev. 0, 11/1/2000)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 10
EPA Permit No. VA1210020730
Date of Inspection 3 / 27 / 14 Time of Inspection 2 : 45 AM [✓ PM]
Reason for Inspection: [✓ Quarterly]/Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (2)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action:

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts
Company: BAE Systems OSI

Date remedial action completed: Remedial action approved by:

DUP 6057F (Rev. Lev. 0, 11/1/2000)

INSPECTION OF CLOSED HAZARDOUS WASTE MANAGEMENT FACILITIES

Name of Hazardous Waste Management Facility: Radford Army Ammunition Plant
HWMU Facility No. 16
EPA Permit No. VA 1210020730
Date of Inspection 3 / 27 / 14 Time of Inspection 3 : 10 AM [✓ PM]
Reason for Inspection: Quarterly/ Major rainfall event (2" in 8 hr period)/ catastrophic event

ITEM	INSPECT FOR	DEFICIENCIES NOTED	REMEDIAL ACTION REQUIRED
Final Soil Cover	• Erosion • Settlement, Subsidence, or Displacement • Pooling	none	
Vegetative Cover	• Dead vegetation, or inadequate growth • Presence of trees, shrubs, or deep rooted vegetation • Need to fertilize, irrigate, or cut grass	none	
PVC Liner	• Liner exposed	none	
Peripheral Drainage Swales	• Erosion • Subsidence • Pooling	none	
Stormwater Drainage Areas	• Erosion • Subsidence • Vegetation growth • Accumulated sediment	none	
Security	• Access road in place • Warning signs legible and in place • Fences not breached and no visible damage	none	
Monitoring Wells • Outer protective casing • Well caps and locks • Concrete pad • Inner cap and riser	• Casing in good condition • In place and functioning • Cracks or settlement • Intact and functioning	none	
Benchmarks (2)	• Monuments present and visible • Damage to monument	none	

Date and nature of repairs or remedial action:

Printed Name of Inspector: Matt Alberts Signature of Inspector: Matt Alberts

Company: BAE Systems OSI

Date remedial action completed: Remedial action approved by: