Draft Phase II Remedial Investigation Study for RVAAP-03 Open Demolition Area #1 Ravenna Army Ammunition Plant Ravenna, Ohio

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The pupose of this Draft Phase II Remedial Investigation Study is to define the nature and extent of chemical contamination, identify chemicals of potential concern (COPCs) and evaluate potential risks to human health and the environment.

15. SUBJECT TERMS

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Notice is hereby given that an independent technical review has been conducted that is appropriate to the level of risk and complexity inherent in the project. During the independent technical review, compliance with established policy, principles, and procedures, utilizing justified and valid assumptions, was verified. This included review of data quality objectives; technical assumptions; methods, procedures and materials to be used; the appropriateness of data used and level of data obtained; and reasonableness of the results, including whether the product meets customer's needs consistent with law and existing Corps policy.

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Acronyms and Abbreviations

°F	degrees Fahrenheit
AMEC	AMEC Earth & Environmental, Inc.
AOC	area of concern
ARARs	applicable or relevant and appropriate requirements
ARNG	Army National Guard
atm-m^3/mol	atmospheres cubic meters per mole
bgs	below ground surface
BHC	benzene hexachloride
BMPs	Best Management Practices
BRACD	Base Realignment and Closure Division
BSV	background screening value
Camp Ravenna	Camp Ravenna Joint Military Training Center
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CMCOPC	contaminant migration chemical of potential concern
COC	chemical of concern
COI	chemical of interest
COPC	chemical of potential concern
COPEC	chemical of potential ecological concern
CSM	conceptual site model
cy	cubic yards
DAF	dilution attenuation factor
DERR	Division of Emergency and Remedial Response
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DGM	digital geophysical mapping
DNT	dinitrotoluene
DOD	U.S. Department of Defense
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
ESA	Endangered Species Act
ESV	Ecological Screening Value
EU	exposure unit
FR	Federal Register
FS	Feasibility Study
FSAP	Facility-Wide Sampling and Analysis Plan
ft.	feet
FWCUG	Facility-Wide Cleanup Goal
HAP	hazardous air pollutant

Acronyms and Abbreviations (continued)

HLC	Henry's Law constant
HHRA	human health risk assessment
HI	hazard index
HMX	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
HQ	hazard quotient
INRMP	Integrated Natural Resources Management Plan
IRA	Interim Removal Action
IRP	Installation Restoration Program
ISM	incremental sampling method
K_d	soil-water partition coefficient
K_{oc}	organic carbon normalized soil-water partition coefficient
K_{ow}	octanol-water partition coefficient
LDR	land disposal restriction
m	meter(s)
MC	munition constituents
MD	munitions debris
MEC	munitions and explosives of concern
MKM	MKM Engineers, Inc.
mg/kg	milligram(s) per kilogram
MMRP	Military Munitions Response Program
MS	matrix spike
MSD	matrix spike duplicate
msl	mean sea level
NACA	National Advisory Committee for Aeronautics
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	no further action
NPL	National Priorities List
NTA	NACA Test Area
OAC	Ohio Administrative Code
OB/OD	open burn/open detonation
ODA1	Open Demolition Area #1, RVAAP-03
ODNR	Ohio Department of Natural Resources
OHARNG	Ohio Army National Guard
Ohio EPA	Ohio Environmental Protection Agency
PAH	polycyclic aromatic hydrocarbon
PBT	persistent, bioaccumulative, and toxic
PCB	polychlorinated biphenyl
polytanks	polyethylene tanks
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control

Acronyms and Abbreviations (continued)

RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
RG	remedial goal
RGO	remedial goal objective
RI	Remedial Investigation
ROD	Record of Decision
RRSE	Relative Risk Site Evaluation
RSL	Regional Screening Level
RSSL	Risk-Based Soil Screening Level
RVAAP	Former Ravenna Army Ammunition Plant
SAIC	Science Applications International Corporation
SESOIL	Seasonal Soil Compartment
Shaw	Shaw Environmental & Infrastructure, Inc.
SHERP	Safety, Health, and Emergency Response Plan
SLERA	screening-level ecological risk assessment
SRC	site-related contaminant
SSL	Soil Screening Level
SSSL	Site-Specific Soil Screening Level
SVOC	semivolatile organic compound
TAL	Target Analyte List
TBC	to be considered
TC	toxicity characteristic
TCLP	toxicity characteristic leaching procedure
T&E	threatened and endangered
TNT	trinitrotoluene
U.S.	United States
UCL	upper confidence limit
USACE	U.S. Army Corps of Engineers
USACHPPM	U.S. Army Center for Health Promotion and Preventative Medicine
USATHMA	U.S. Army Toxic and Hazardous Materials Agency
USC	U.S. Code
UXO	unexploded ordnance
VOC	volatile organic compound

EXECUTIVE SUMMARY

This Phase II Remedial Investigation (RI) was originally prepared by Shaw Environmental & Infrastructure, Inc. (A CB&I Company) (Shaw) for the United States Army Corps of Engineers, Louisville District (USACE) under Contract No. W912QR-08-D-0013. Due to delays in the overall cleanup program at the former Ravenna Army Ammunition Plant (RVAAP) that were unrelated to Shaw's performance, Shaw could not complete this document before the Contract ended. Therefore, USACE has revised and completed this document for submission to the Army National Guard. In addition, the human health risk assessment originally completed in the RI by Shaw, did not include the modifications to the human health risk assessment as required in the "Final Technical Memorandum: Land Uses and Revised Risk

Assessment Process for the Former Ravenna Army Ammunition Plant (Risk Assessment Technical Memo) (RVAAP Installation Restoration Program, Portage/Trumbull Counties, Ohio (Army National Guard Directorate, 2014)." Therefore, the human health risk assessment was updated to account for changes in the Risk Assessment Technical Memo and the primary work for this RI was unchanged. For example, no new samples were taken by the USACE. No new laboratory analysis were completed by USACE. Only the human health risk assessment section of the RI was fully updated and revised by USACE.

This RI defines the extent of contamination in soil, evaluates potential risks to human health and the environment, and develops and screens remedial action alternatives resulting from historical operations at Open Demolition Area #1, RVAAP-03 (ODA1) at the former Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio. This study does not address any munitions and explosives of concern (MEC) issues that may remain at ODA1.

Since the AOC is classified as an operational range, this RI only addresses and makes recommendations for chemicals, including munition constituents - (MC components such as explosives and propellants) under the IRP. Management and maintenance of MEC at the site will follow Department of Defense (DOD) safety procedures and policies as they relate to operational ranges. Use or entry on the AOC will be compliant with DOD safety procedures and policies and must be preapproved by Camp Ravenna. Since this AOC is an operational range, MEC issues are not required to be investigated under the Military Munitions Response Program (MMRP) and will be addressed in the future if the operational range is no longer used and is closed as directed under DOD Directive 5134.01 and DoD Instruction 4715.7. Operational Ranges are actively managed by the DOD proponent under range management and other DOD policies. Management and closure are not relative to the IRP and have separate Regulations and policies that mandate their use, sustainability, and clearance such as

DOD Instruction 3200.16. Additional Army Regulations and policies such as the management of natural resources for management of operational ranges exist. Operational ranges may pose challenges and considerations of potential hazards similarly to those under the IRP, but the DOD has Regulations and policies that fully address these concerns.

The ODA1, designated as area of concern (AOC) RVAAP-03, is approximately 6 acres in size and is located in the southwestern quadrant of the former RVAAP/Camp Ravenna. The AOC was in operation from 1941 to 1949, and was primarily used for the thermal destruction of munitions, explosives, and related materials by open burning (OB) and open detonation (OD) operations. During the late 1940s through the early 1950s, ODA1 was also used as a plane storage area for the National Advisory Committee for Aeronautics (NACA) Test Area (NTA).

Under the United States (U.S.) Department of Defense (DOD) IRP, previous environmental investigations at ODA1 were conducted in order to characterize the site. Upon completion of a Relative Risk Site Evaluation (U.S. Army Center for Health Promotion and Preventative Medicine, 1996) and a Water Quality Surveillance Program (U.S. Army Toxic and Hazardous Materials Agency, 1980-1992), a 1999 Phase I RI was conducted in order to assess the occurrence, distribution, and potential risks from contamination in soil (up to 8 feet [ft.] below ground surface [bgs]), sediment, surface water, and groundwater at ODA1 (Science Applications International Corporation [SAIC] (2001a). The Phase I RI identified site-related contamination (explosives and metals) in soil and determined that no significant impact to sediment, surface water, or groundwater as a result of past operations at ODA1 had occurred. The Phase I RI concluded that based upon the future intended use of the site (Ohio Army National Guard [OHARNG] military use), a human health risk remained from impacted soil and that a human health risk assessment (HHRA) and ecological risk assessment be conducted in order to facilitate remedial activities at ODA1.

In conjunction with the Phase I RI, an MEC debris removal/Interim Removal Action (IRA) was performed in 2000–2001 (MKM Engineers, Inc. [MKM], 2004). The objective of the removal action at ODA1 was to remove the MEC/munitions debris (MD), and the hazards associated with it, to a depth of 4 ft. bgs, and to eliminate the human health exposure to environmental chemicals of concern (COCs) (explosives, such as trinitrotoluene [TNT], hexahydro-1,3,5-trinitro-1,3,5-triazine [RDX]), dinitrotoluene (DNT), and associated metals (i.e., cadmium, chromium, lead, and mercury) identified from the Phase I RI (SAIC, 2001a). After the completion of the IRA, confirmatory sampling indicated that surface and subsurface soils were still impacted with metal contamination.

Shaw was contracted to prepare a Data Quality Objectives (DQO) Report (*Final Data Quality Objectives for the RVAAP-03 Open Demolition Area # 1 Version 1.0* [*DQO Report*;

Shaw, 2009a]) to identify data gaps from past investigations and remedial activities where the extent of contamination was not adequately characterized or delineated for the purposes of environmental site closure. Prior to the issuance of the *DQO Report* (Shaw, 2009a), the Phase I RI data and IRA confirmatory sample data were screened against the U.S. Environmental Protection Agency (EPA) Preliminary Remediation Goals (among other general screening criteria). In order to identify potential data gaps, the *DQO Report* screened the remaining Phase I RI sample data (a large portion of the data was no longer applicable, since the soil had been subsequently removed and sampled during the IRA) and IRA confirmatory sample data against the former RVAAP Facility-Wide Background Values and the then Draft Facility-Wide Cleanup Goals (FWCUGs) (SAIC, 2008) for the future intended land use scenario for ODA1 (OHARNG military use [formerly included the trainee, dust control/fire worker, and range maintenance soldier]) and for the default Unrestricted Land Use (using the Residential Receptor[Adult and Child]; formerly called the Resident Farmer receptor). Comparing the data against the then newly developed Draft FWCUGs, the *DQO Report* identified chemicals of potential concern (COPCs) in surface and subsurface soils and COCs in subsurface soil that consisted of elevated concentrations of primarily inorganics. Table ES-1 presents the COPCs in surface and subsurface soils and COCs in subsurface soil identified from the 2009 *DQO Report* that required further investigation.

In conclusion, data gaps existed for inorganic COPCs in surface soil horizontally along the southwest, south, and southeast portions of ODA1. For subsurface soils, data gaps existed for six inorganic and five organic constituents identified as COCs vertically, primarily in the west, southwest, and south central portions of the site. The *DQO Report* recommended that additional surface and subsurface soil sampling be performed to address identified data gaps to define the extent of contamination. The *DQO Report* (Shaw, 2009a) also recommended the AOC site boundary be confirmed.

Based upon the need to address these data gaps mentioned above, additional sampling and a geophysical survey was performed for this Phase II RI. Additional sampling included completing a MEC-avoidance/clearance survey and collecting surface and subsurface soil samples, The AOC was divided into five separate Decision Units and seven ISM samples were taken for surface soil (0 to 1 ft. bgs). All ISM samples were analyzed for Target Analyte List (TAL) metals, explosives and propellants. Select ISM samples were analyzed for the remaining full-suite analyses including semi-volatile organic chemicals (SVOCs - or polycyclic aromatic hydrocarbons - PAHs), cyanide, polychlorinated biphenyls (PCBs), pesticides, and were speciated to determine the valence state of the chromium present. A discrete surface soil sample was also collected from each DU and was analyzed for volatile organic compounds (VOCs). Subsurface samples were also taken from the DUs using a modified ISM approach. One hundred and twelve subsurface samples were taken from the

DUs were assessed for the following aggregates: 1 to 4 ft. bgs, 4 to 8 ft. bgs, 8 to 12 ft. bgs, and 12 to 16 ft. bgs. The subsurface samples were treated as discrete samples in the evaluation of risks. Addressing these data gaps with the new data permitted the performance of a quantitative HHRA and a screening-level ecological risk assessment (SLERA) to scope remedial action alternatives for ODA1. The following is a description of the major findings, conclusions, and recommendations of this Phase II RI prepared by Shaw and updated/revised by USACE.

Nature and Extent of Contamination

Under the default unrestricted land use scenario, subsurface soil contamination with 2,4,6-TNT is limited to 1 to 4 ft. bgs at station DA1SB-070. With additional sampling under this Phase II RI, no other COCs were identified; therefore, the nature and extent of contamination has been adequately defined.

HHRA

The human health risk assessment originally included in the RI completed by Shaw, did not address modifications to the risk assessment process for the former RVAAP as described in the "Final Technical Memorandum: Land Uses and Revised Risk Assessment Process for the Ravenna Army Ammunition Plant (Risk Assessment Technical Memo) (RVAAP Installation Restoration Program, Portage/Trumbull Counties, Ohio (Army National Guard Directorate, 2014)." Therefore, the risk assessment was updated to reflect the changes iper the Risk Assessment Technical Memo. An HHRA was conducted to evaluate whether site conditions may pose a risk to current or future site receptors and to identify which, if any, site conditions need to be further addressed such as in an FS. The HHRA was prepared using the approach to risk decision-making, as described in the Final FWCUGs (SAIC, 2010), the *Position Paper for the Application and Use of Facility-Wide Human Health Cleanup Goals* (U.S. Army Corps of Engineers [USACE], 2012), and the "*Final Technical Memorandum: Land Uses and Revised Risk Assessment Process for the Ravenna Army Ammunition Plant* (Risk Assessment Technical Memo) (RVAAP Installation Restoration Program, Portage/Trumbull Counties, Ohio (Army National Guard Directorate, 2014)."

The first step in the process is to identify which of the detected chemicals are site related chemicals (SRCs) by consideration of background concentrations, essential nutrients, and frequency of detection. The US Environmental Protection Agency's Regional Screening Levels (RSLs), November 2015 version, developed for the Residential Receptors for each chemical, were used at the 1×10^{-6} cancer risk level (1 in 1 million excess cancer risk) and noncarcinogenic hazard quotient (HQ) of 0.1 to determine COPCs. In a few cases, RSLs were not available for a specified chemical, then the RSL from a surrogate chemical was used. Based on comparison of the maximum soil concentrations to the lower of these levels

for each chemical, COPCs were identified for the Resident Receptor. For the cobalt and thallium were identified as a COPC in surface soil (0-1 ft. below ground surface - gs). In addition, a number of metals were identified as COPCs in subsurface soil. For the Resident Receptor, aluminum, antimony, arsenic, cadmium, copper, lead, silver, and thallium were identified as COPCs in subsurface soil

Additional evaluation of the COPCs was conducted by considering exposure point concentrations (EPCs) as the 95 Percent Upper Confidence Limit (UCL) of the mean, when appropriate. This approach was used for discrete samples if there was an adequate number to calculate a UCL. The maximum concentration was used for incremental sampling method (ISM) samples and when there was not an adequate number of discrete samples. The EPCs were compared to the Residential RSLs at a cancer risk level of 10^{-5} (1 in 100,000) and an HQ of 1 for noncarcinogenic effects. A sum of these ratios was developed for carcinogenic effects and for non carcinogenic effects by target organ in order to consider possible cumulative effects. A COPC is identified as a COC if the cancer or noncancer ratio for a given COPC is greater than 1, or the sum of the ratios for cancer or noncancer effects for any target organ is greater than 1, and the COPC contributes more than 5 percent to the sum.

No COCs for the human health risk were identified for the resident Receptor, which is for the Unrestricted (Residential) Land Use.

SLERA

A SLERA was conducted to evaluate the potential for adverse ecological effects to ecological receptors from site-related contaminants (SRCs) at ODA1 and to determine if any ecological receptors need to be recommended for further evaluation. The SLERA included characterizing the ecological communities in the vicinity of the site, determining the particular contaminants present, identifying pathways for receptor exposure, and estimating the magnitude of the likelihood of potential adverse effects to identified receptors. Site-specific analyte concentration data for surface soil, sediment, and surface water from ODA1 were included in the SLERA. The ecological receptor species selected for evaluation in the SLERA were identified in the *RVAAP Facility-Wide Ecological Risk Assessment Work Plan* (USACE, 2003).

The SLERA was prepared in accordance with the *Ohio EPA Ecological Risk Assessment Guidance Documen*t (Ohio Environmental Protection Agency [Ohio EPA], 2008), Level I Scoping through Level III Baseline. The Level I ERA is designed to efficiently determine whether further ecological risk should be evaluated at a particular site. The Level II ERA is to be completed after the full nature and extent of the site contamination has been determined. The purpose of a Level II ERA is to screen the list of detected chemicals per media as appropriate; evaluate aquatic habitats potentially impacted by the site; and, if

necessary, revise the conceptual site model (CSM), complete a list of ecological receptors, identify chemicals of potential ecological concern (COPECs) and nonchemical stressors, and complete other tasks required for further ecological evaluation of the site and impacted habitats. The purpose of a Level III ERA is to identify the potential for ecological harm at a site. Specifically, the Level III ERA is a formal ecological risk assessment process that includes an exposure assessment, toxicity assessment, risk characterization, and an uncertainty analysis. Potential ecological hazards are evaluated by using the COPECs and nonchemical stressors identified in a Level II ERA, generic receptors, direct contact evaluations, and food-web models that are provided in the guidance document.

Slightly elevated concentrations were detected in both discrete and ISM samples and the potential for localized ecological impacts cannot be completely discounted. However, given the fact that the terrestrial area evaluated for ODA1 is approximately 6 acres in size, and that the Phase II Screen uses highly conservative assumptions, it is unlikely that exposure to the surface soil COPECs identified in this SLERA would adversely impact populations of ecological receptors at ODA1. Therefore, no further investigation (i.e., a Level III Baseline) or action is considered necessary at ODA1 for ecological purposes.

Investigation Conclusions and Recommendations

Based on results of this RI and in particular the HHRA and the SLERA, no additional remedial actions are required for this AOC. Further investigation is not warranted for the following reasons: (1) the nature and extent of chemicals detected in the media (soil, surface water, and sediment) at the AOC has been characterized; (2) no COCs for human health were identified at the AOC; and (3) no remedial actions to protect ecological resources were identified. Therefore, conditions for a NFA decision are met for soil, sediment and surface water at ODA1 and Unrestricted (Residential) Land Use is attained for this AOC.

Management and maintenance of MEC at the site will follow DOD safety procedures and policies as they relate to operational ranges. Use or entry on the AOC will be compliant with DOD safety procedures and policies and use/entry must be pre-approved by Camp Ravenna. Since this AOC is an operational range, MEC issues are not required to be investigated under the Military Munitions Response Program (MMRP) and will be addressed in the future if the operational range is no longer used and is closed as directed under DOD Directive 5134.01 and DoD Instruction 4715.7. Operational Ranges are actively managed by the DOD proponent under range management and other DOD policies. Management and closure are not relative to the IRP and have separate Regulations and policies that mandate their use, sustainability, and clearance such as DOD Instruction 3200.16. Additional Army Regulations and policies such as the management of natural resources for management of operational ranges exist. Operational ranges may pose challenges and considerations of potential hazards

similarly to those under the IRP, but the DOD has Regulations and policies that fully address these concerns.

Because NFA was recommended in this RI, the next step in the CERCLA process is to prepare a proposed plan (PP) to solicit public input with respect to NFA determination for this AOC (soil, surface water, and sediment).

Boundaries and certain information depicted on figures and contained in this RI may not reflect current conditions since this document was originally completed in 2013. Species lists and other natural resources were updated in the 2014 Integrated Natural Resource Management Plan (INRMP). Please refer to this document for current species list. However, additions and changes to the current species list do not affect the results and findings of this RI. Future documents such as the Proposed Plan, will be updated as necessary. None of these updates or changes such as changes to a boundary or updated species lists alter the findings and recommendations of this RI.

1.0 PROJECT DESCRIPTION

1.1 Introduction

This Phase II Remedial Investigation (RI) documents the environmental investigation and results conducted at the Open Demolition Area #1, RVAAP-03 (ODA1) at the former Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio (Figures 1-1 and 1-2). This Phase II RI was conducted under the U.S. Department of Defense (DOD) Installation Restoration Program (IRP). The IRP investigation was performed by Shaw Environmental & Infrastructure, Inc. (Shaw), a CB&I company, under contract number W912QR-08-D-0013, Delivery Order 0002, with the United States (U.S.) Army Corps of Engineers (USACE), Louisville District. Due to delays in the overall cleanup program at the former RVAAP that were unrelated to Shaw's performance, Shaw could complete this document before the Contract ended. Therefore, USACE has revised and completed this document for submission to the Army National Guard. In addition, the human health risk assessment that was originally completed in the RI by Shaw, did not include the modifications to the human health risk assessment as required in the "Final Technical Memorandum: Land Uses and Revised Risk Assessment Process for the Ravenna Army Ammunition Plant (Risk Assessment Technical Memo) (RVAAP Installation Restoration Program, Portage/Trumbull Counties, Ohio (Army National Guard Directorate, 2014)." Because the human health risk assessment was the only portion that needed updated in the RI, the primary work for this RI is unchanged. For example, no new samples were taken by the USACE. No new laboratory analysis were completed by USACE. Only the human health risk assessment section of the RI was fully updated and revised by USACE. Boundaries and certain information depicted on figures and contained in this RI may not reflect current conditions since this document was originally completed in 2013. Species lists and other natural resources were updated in the 2014 Integrated Natural Resource Management Plan (INRMP). Please refer to this document for current species list. However, additions and changes to the current species list do not affect the results and findings of this RI. Future documents such as the Proposed Plan, will be updated as necessary. None of these updates or changes such as changes to a boundary or updated species lists alter the findings and recommendations of this RI.

The Phase II RI further characterizes the area of concern (AOC) so that if an FS is necessary, then remedial action alternatives can be developed and evaluated quickly to address contamination identified that may pose unacceptable risks to human health and the environment. If an FS is needed, then it will ultimately recommend a remedial alternative to support a record of decision (ROD). This Phase II RI is for IRP use only. This study does not address any munitions and explosives of concern (MEC) issues that may remain at ODA1 as any MEC issues would be investigated under a separate program, such as the Military Munitions Response Program (MMRP).

This Phase II RI was conducted in compliance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 following the *Final Sampling and Analysis Plan Addendum No. 1 for Environmental Services at RVAAP-34 Sand Creek Disposal Road Landfill, RVAAP-03 Open Demolition Area #1, and RVAAP-28 Mustard Agent Burial Site Version 1.0, Ravenna Army Ammunition Plant, Ravenna, Ohio* (Shaw, 2010a); herein referred to as the *Addendum* reviewed and commented on by the Ohio Environmental Protection Agency (Ohio EPA). This combined Phase II RI was prepared in accordance with U.S. Environmental Protection Agency (EPA) guidance document, *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final* (EPA, 1988a).

1.2 Purpose

As identified in the Final Data Quality Objectives (DQO) Report, for the RVAAP-03 Open Demolition Area # 1 Version 1.0 (DQO Report; Shaw, 2009a), data gaps remained after the Phase I RI (Science Applications International Corporation [SAIC], 2001a) and the 2000–2001 Interim Removal Action (IRA) (MKM Engineers, Inc. [MKM], 2004). These data gaps included; horizontally determining the extent of inorganic chemicals of potential concern (COPCs) in surface soil along the southwest, south, and southeast portions of ODA1; vertically defining the extent of inorganic and organic chemicals of concern (COCs) in subsurface soil primarily in the west, southwest, and south central portions of the site; and redefining the AOC boundary, if necessary. In order to be able to fully characterize the site, this Phase II RI was initiated to address these data gaps mentioned above and in the DQO Report. Addressing these data gaps would allow for the performance of a quantitative human health risk assessment (HHRA) and screening-level ecological risk assessment (SLERA) as necessary to scope remedial alternatives for ODA1 in an FS if deemed necessary. If an FS is required, then the remedial action will be documented in a ROD.

This AOC is currently off limits and is surrounded by siebert stakes due to the potential to encounter MEC. Camp Ravenna is a controlled-access facility. Full-time Ohio Army National Guard (OHARNG), tenant Army/OHARNG units, and contractor staff work at the facility. Military training and operations are conducted at the facility.

The ODA1 is located in the south-central portion of the facility. The AOC is not currently used for military training activities, but may receive periodic foot traffic during restoration activities. The OHARNG projected future land use for the AOC is Military Training. The Representative Receptor is the National Guard Trainee (NGT); per the RVAAP Facility-Wide Human Health Risk Assessor Manual, Amendment 1 (FWHHRAM; USACE, 2005a) and the Risk Assessment Technical Memo. However, since this Phase II RI is being finalized and updated according to the Final Risk Assessment Technical Memo, the Unrestricted

(Residential) Land Use is evaluated first in the human health risk assessment in the RI. If no Chemicals of Concern (COCs) are identified, then the other two Land Uses (Commercial/Industrial and Military Training) do not need to be evaluated further. Since the original RI prepared by Shaw included an evaluation for Military Training using the National Guard Training (NGT) Receptor, USACE determined it would expedite future remedial decisions and limit revisions if the nature and extent and other information for the NGT are retained but is not included in the human health risk assessment. Only the Unrestricted (Residential) Land Use is evaluated fully and discussed in the human health risk assessment. If COCs are identified for the Residential Receptor, then the Military Training and Commercial/Industrial Land Uses and Representative Receptors would be evaluated in the human health risk assessment.. The RI prepared by Shaw considered the anticipated future land use as Military Training but also included the evaluation of Unrestricted (Residential) Land Use and associated receptors, was used to determine the COCs in this RI. As stated previously, Unrestricted (Residential) Land Use, is included to evaluate COCs for unrestricted land use at the AOC, as required by the CERCLA process and as outlined in the FWHHRAM (USACE, 2005a). Additionally, USACE updated the risk assessment for the Residential Receptor using current risk screening values and removed the evaluation of the NGT from the risk assessment The human health risk assessment in this RI originally prepared by Shaw, included an evaluation of the Military Training Land Use but this is not necessary per the Risk Assessment Technical Memo if COCs are not identified for the Residential Receptor.

Unrestricted (Residential) Land Use exposure scenario for ODA1, surface soil is defined as the 0–1 ft. bgs interval and subsurface soil is defined as the 1–13 ft. bgs interval. For the OHARNG receptors that were originally assessed in the RI, surface soil is defined as the 0–4 feet (ft.) below ground surface (bgs) interval and is referred to as deep surface soil. Subsurface soil defined by the OHARNG is the 4–7 ft. bgs interval. This data was retained in the RI for historical documentation but was not evaluated or included in the human health risk assessment.

1.3 Scope

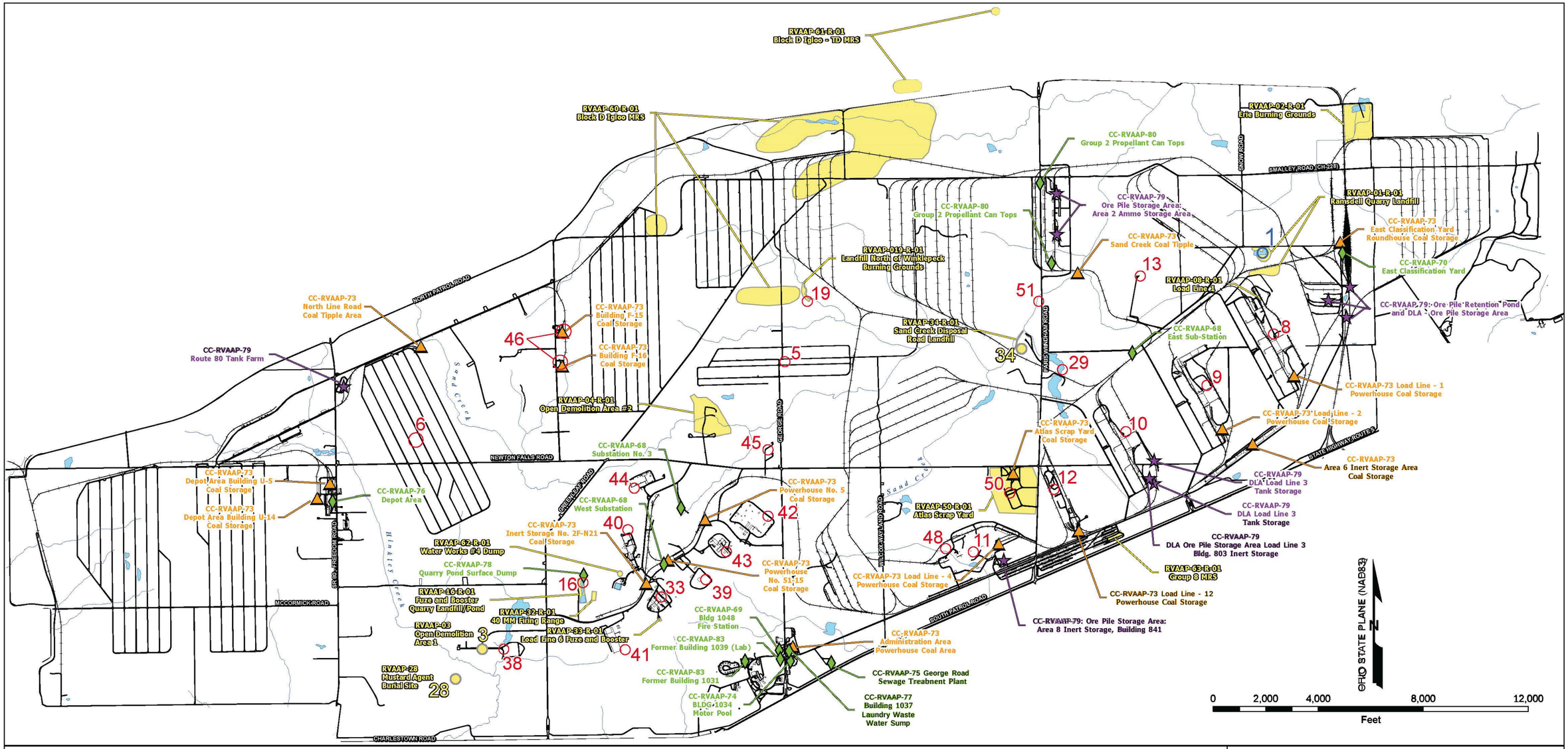
The scope of the RI encompassed the entire ODA1. The main goal of the RI process is to define the nature and extent of contamination and the potential risks to human health and the environment resulting from the presence of environmental contamination. Where little or no environmental hazards are determined to be present and/or not associated with site-related contamination, a no further action (NFA) decision will be recommended. However, if conditions for an NFA decision are not met (i.e., concentration of a chemical(s) is present and in excess of facility-wide background values (inorganics only), Facility-Wide Cleanup Goals (FWCUGs), or the US Environmental Protection Agency's Regional Screening Levels

(RSLs)), then site will proceed to a Feasibility Study (FS), and remedial action alternatives will be assessed.

1.4 Report Organization

The report is organized into ten sections as follows:

- **Section 1.0, Project Description**—This section presents the introduction, purpose, scope, and organization of this report.
- **Section 2.0, Background**—This section describes the installation's location, operational history, demography, land use, as well as the AOC site description, operational history, and previous investigations.
- **Section 3.0, Environmental Setting**—This section describes the environmental setting at the former RVAAP including geology, hydrogeology, climate, and potential human and ecological receptors.
- **Section 4.0, Study Area Investigation**—This section describes the scope of work completed and the procedures followed during the Phase II RI.
- **Section 5.0, Nature and Extent of Contamination**—This section describes the data generated during the Phase II RI and discusses the occurrence and distribution of contamination at ODA1.
- **Section 6.0, Contaminant Fate and Transport**—This section describes the media, and fate and transport mechanisms associated with the potential contaminants present.
- **Section 7.0, HHRA**—This section presents a qualitative assessment of the appropriate analytical data collected to evaluate potential risks to human health.
- **Section 8.0, SLERA**—This section presents a qualitative assessment of the appropriate analytical data collected to evaluate the potential risks to ecological receptors.
- **Section 9.0, RI Summary, Conclusions, and Recommendations**—This section presents the summaries, conclusions, and recommendations for ODA1 based upon the results of the RI.
- **Section 10.0, References—**This section contains a list of all applicable codes, regulations, and references for this document.



LEGEND OF SITES

IRP SITES (29 SITES)

- RVAAP-01 ..... RAMSDELL QUARRY LANDFILL
- RVAAP-03 ..... OPEN DEMOLITION AREA 1
- RVAAP-05 ..... WINKLEPECK BURNING GROUNDS
- RVAAP-06 ..... C BLOCK QUARRY
- RVAAP-08 ..... LOAD LINE 1
- RVAAP-09 ..... LOAD LINE 2
- RVAAP-10 ..... LOAD LINE 3
- RVAAP-11 ..... LOAD LINE 4
- RVAAP-12 ..... LOAD LINE 12
- RVAAP-13 ..... BLDG 1200 AND DILUTION SETTLING POND
- RVAAP-16 ..... FUZE AND BOOSTER QUARRY LANDFILL/PONDS
- RVAAP-19 ..... LANDFILL NORTH OF WINKLEPECK BURNING GROUND
- RVAAP-28 ..... MUSTARD AGENT BURIAL SITE
- RVAAP-29 ..... UPPER AND LOWER COBBS POND
- RVAAP-33 ..... LOAD LINE 6
- RVAAP-34 ..... SAND CREEK DISPOSAL ROAD LANDFILL
- RVAAP-38 ..... NACA TEST AREA
- RVAAP-39 ..... LOAD LINE 5
- RVAAP-40 ..... LOAD LINE 7
- RVAAP-41 ..... LOAD LINE 8
- RVAAP-42 ..... LOAD LINE 9
- RVAAP-43 ..... LOAD LINE 10
- RVAAP-44 ..... LOAD LINE 11
- RVAAP-45 ..... WET STORAGE AREA
- RVAAP-46 ..... BUILDINGS F-15 AND F-16
- RVAAP-48 ..... ANCHOR TEST AREA
- RVAAP-50 ..... ATLAS SCRAP YARD
- RVAAP-51 ..... DUMP ALONG PARIS-WINDHAM ROAD
- RVAAP-66 ..... FACILITY-WIDE GROUNDWATER
- RVAAP-67 ..... FACILITY-WIDE SEWERS

COMPLIANCE RESTORATION SITES (13 SITES)

- CC-RVAAP-68 ..... ELECTRIC SUBSTATIONS (E,W,No.3)
- CC-RVAAP-69 ..... BUILDING 1048 - FIRE STATION
- CC-RVAAP-70 ..... EAST CLASSIFICATION YARD
- CC-RVAAP-72 ..... FACILITY-WIDE USTS (45 SITES)
- CC-RVAAP-73 ..... FACILITY-WIDE COAL STORAGE
- CC-RVAAP-74 ..... BUILDING 1034 MOTOR POOL HYDRAULIC LIFT
- CC-RVAAP-75 ..... GEORGE ROAD SEWAGE TREATMENT PLANT
- CC-RVAAP-76 ..... DEPOT AREA
- CC-RVAAP-77 ..... BUILDING 1037 LAUNDRY WASTE WATER SUMP
- CC-RVAAP-78 ..... QUARRY POND SURFACE DUMP
- CC-RVAAP-79 ..... DLA ORE STORAGE SITES
- CC-RVAAP-80 ..... GROUP 2 PROPELLANT CAN TOPS
- CC-RVAAP-83 ..... FORMER BUILDINGS 1031 AND 1039

MMRP SITES (14 SITES)

- RVAAP-001-R-01 ..... RAMSDELL QUARRY LANDFILL MRS
- RVAAP-002-R-01 ..... ERIE BURNING GROUNDS MRS
- RVAAP-004-R-01 ..... OPEN DEMOLITION AREA #2 MRS
- RVAAP-008-R-01 ..... LOAD LINE 1 MRS
- RVAAP-016-R-01 ..... FUZE AND BOOSTER QUARRY MRS
- RVAAP-019-R-01 ..... LANDFILL NORTH OF WINKLEPECK MRS
- RVAAP-032-R-01 ..... 40MM FIRING RANGE MRS
- RVAAP-033-R-01 ..... FIRESTONE TEST FACILITY MRS
- RVAAP-034-R-01 ..... SAND CREEK DUMP MRS
- RVAAP-050-R-01 ..... ATLAS SCRAP YARD MRS
- RVAAP-060-R-01 ..... BLOCK D IGLOO MRS
- RVAAP-061-R-01 ..... BLOCK D IGLOO -TD MRS
- RVAAP-062-R-01 ..... WATER WORKS #4 DUMP MRS
- RVAAP-063-R-01 ..... GROUP 8 MRS

- ..... CERCLA
- ..... RCRA
- ..... MMRP SITES
- ..... COMPLIANCE RESTORATION SITES - APPROVED
- ..... DLA ORE STORAGE AREAS (7 SITES)
- ..... COAL STORAGE AREAS (17 SITES)
- ..... AOC UNDER A/E SERVICES CONTRACT

RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

Figure 1-2
RVAAP
Facility Map

US Army Corps
of Engineers
Louisville District

2.0 BACKGROUND

The description and history of the former RVAAP applicable to RI activities are presented in this section. Much of the setting information described below has been summarized from the *DQO Report* (Shaw, 2009a); the *Phase I RI Report for Demolition Area 1 at the RVAAP, Ravenna, Ohio* (SAIC, 2001a); and the *Integrated Natural Resources Management Plan* (INRMP) (AMEC Earth & Environmental, Inc. [AMEC], 2008).

2.1 General Facility Site Description

The former RVAAP, now known as the Camp Ravenna Joint Military Training Center (Camp Ravenna) is located in northeastern Ohio within Portage and Trumbull counties. Camp Ravenna is approximately three (3) miles east/northeast of the City of Ravenna and one (1) mile north/northwest of the City of Newton Falls (Figure 1-1). The facility is approximately 11 miles long and 3.5 miles wide. The facility is bounded by State Route 5, the Michael J. Kirwan Reservoir, and the CSX System Railroad to the south; Garret, McCormick, and Berry Roads to the west; the Norfolk Southern Railroad to the north; and State Route 534 to the east (Figure 1-1). In addition, the facility is surrounded by the communities of Windham, Garrettsville, Charlestown, and Wayland.

Administrative accountability for the entire 21,683-acre facility has been transferred to the United States Property and Fiscal Office (USP&FO) for Ohio and the property subsequently licensed to the OHARNG for use as a military training site, Camp Ravenna. The restoration program at the former RVAAP involves cleanup of former production/operational areas throughout the facility related to activities that were conducted there.

2.1.1 RVAAP Operational History and Mission

The former RVAAP was constructed in 1940 and 1941 with the primary missions of depot storage and ammunition loading during World War II. Industrial operations at the former RVAAP consisted of 12 munitions-assembly facilities referred to as “load lines.” Load Lines 1 through 4 were used to melt and load trinitrotoluene (TNT) and Composition B into large-caliber shells and bombs. The operations on the load lines produced explosive dust, spills, and vapors that collected on the floors and walls of each building. Periodically, the floors and walls would be cleaned with water and steam. The liquid, containing TNT and Composition B, was known as “pink water” for its characteristic color. Pink water was collected in concrete holding tanks, filtered, and pumped into unlined ditches for transport to earthen settling ponds. Load Lines 5 through 11 were used to manufacture fuzes, primers, and boosters. From 1946 to 1949, Load Line 12 was used to produce ammonium nitrate for explosives and fertilizers.

In 1950, the facility was placed on standby status and operations were limited to renovation, demilitarization, and normal maintenance of equipment, along with the storage of munitions. Production activities were resumed during the Korean Conflict (July 1954 to October 1957) and again during the Vietnam Conflict (May 1968 to August 1972). In addition to production missions, various demilitarization activities were conducted at facilities constructed at Load Lines 1, 2, and 12. Demilitarization activities included disassembly of munitions and explosives melt-out and recovery operations using hot water and steam processes. Periodic demilitarization of various munitions continued through 1992.

In addition to production and demilitarization activities at the load lines, other facilities at the former RVAAP include sites that were used for burning, demolition, and testing of munitions. These burning and demolition grounds consist of large parcels of open space or abandoned quarries.

In 1992, the status of the former RVAAP changed from inactive-maintained to modified caretaker. The only activities that were still being carried out from the wartime era was the storage of bulk explosives and propellants and the infrequent demolition of unexploded ordnance (UXO) found at the installation.

2.1.2 Demography and Land Use

The 2010 Census (U.S. Census Bureau, 2010) lists the total populations of Portage County and Trumbull County as 161,419 and 210,312, respectively. Population centers closest to the former RVAAP are Ravenna, Ohio, with a population of 11,724, and Newton Falls, Ohio, with a population of 4,795.

The former RVAAP facility is located in a rural area and is not close to any major industrial or developed areas. Approximately 55 percent of Portage County, in which the majority of the RVAAP is located, consists of either woodland or farm acreage. The Michael J. Kirwan Reservoir (also known as West Branch Reservoir) is the closest major recreational area and is located adjacent to the western half of the RVAAP, south of State Route 5.

The OHARNG is licensed to use the facility as a military training site, Camp Ravenna. The restoration program for the former RVAAP is managed by the ARNG and OHARNG. This program involves cleanup of former production/operational areas throughout the facility related to former activities conducted there. Training and related activities at Camp Ravenna include: field operations and bivouac training, convoy training, equipment maintenance, C-130 aircraft drop zone operations, helicopter operations, and storage of heavy equipment."

The U.S. Army intends to complete the required CERCLA remedy selection process and attain regulatory closure status for ODA1 for chemical contamination allowing this area to be

used by the OHARNG for OHARNG military use with the appropriate range safety control measures and other Army policies for the use and management for active ranges. This document focuses specifically on ODA1.

2.2 ODA1 Site Description

ODA1, designated as AOC RVAAP-03, covers approximately 6 acres and is located in the southwestern portion of the former RVAAP, north of Hinkley Creek, within the southern portion of the **National Advisory Committee for Aeronautics (**NACA) Test Area (NTA) AOC RVAAP-38 (Figure 2-1). ODA1 consisted of an oval open burn/open detonation (OB/OD) area, which was surrounded by a 25 ft. wide by 1.5 ft. tall earthen berm, and a plane storage area located on the south side of the site (Figure 2-2). These features where identified on historic aerial photographs from the 1940s and 1950s.

Currently, the AOC occupies an open, gently sloping parcel of land that is bounded to the south, east, and west by woodlands. The berms around the OB/OD area are essentially removed and a low area immediately south and east of the former berm collects runoff during rainfall events.

During the Phase I RI (SAIC, 2001a), areas outside of the berm contained shrapnel, fuzes, booster cups, and other debris on the soil surface. The occurrence of these materials on the ground surface outside the OB/OD area suggested that kickouts and shrapnel were generated during thermal destruction of ammunition. In addition, historical operations have indicated that, when congested with debris, burning areas were cleared using heavy equipment by pushing the debris to the periphery of the area. This activity may have contributed to the spread of contaminants (SAIC, 2001a).

In addition, slag is present at the site as fill around the berm and adjacent NTA runway. This aluminum-rich slag—the use of which was widespread throughout the former RVAAP/Camp Ravenna—may account for some elevated concentrations of metals (especially aluminum, barium, beryllium, and manganese). However, Ohio Administrative Code (OAC) 3745-27-01(B)40 specifically exempts slag as a solid waste (Ohio EPA, 2000).

Based upon historical information and visual observations conducted in 2008, it was believed that the ODA1 AOC boundary was not fully defined. The MEC/munitions debris (MD) had been observed in areas outside of the previously remediated areas of ODA1 and north of the former NACA crash strip, indicating that OB/OD activities associated with ODA1 may have also been conducted in small areas within the NTA plane storage area adjacent to ODA1. A discussion involving the boundary can be found in Section 2.4.6 of this report.

2.3 ODA1 Operational History

The ODA1 was formerly used from 1941 to 1949 primarily for the thermal destruction of munitions, explosives, and associated materials through the operation of OB/OD practices. The OB/OD area within ODA1 was surrounded by an oval shaped earthen berm (Figure 2-2).

In addition to ODA1 being used for OB/OD operations, ODA1 was used to stage aircraft that were employed during NTA operations (Plane Storage Area; see Figure 2-2). The NTA was constructed and used between 1947 and 1953. Aircraft have been observed to be parked atop the earthen berm, and areas east of the berm, in historic aerial photographs from 1952 (SAIC, 2001a).

The ODA1 has been inactive and access restricted since the cessation of OB/OD activities. The OHARNG is can only use the site for training purposes without proper UXO support and adherence to active range rule due to the concerns related to MEC. The OHARNG does utilize the adjacent NTA for training purposes.

2.4 Previous Investigations at ODA1

From 1996 until 2001, environmental assessments and investigations have occurred at ODA1. This section provides a summary of those previous investigations.

2.4.1 United States Army Center for Health Promotion and Preventive Medicine Relative Risk Site Evaluation

The U.S. Army Center for Health Promotion and Preventative Medicine (USACHPPM) conducted a Relative Risk Site Evaluation (RRSE) for previously uninvestigated sites at the former RVAAP in 1996 (USACHPPM, 1996). From the 19 sites that were evaluated, 4 were classified as "high" priority AOCs and the others were classified as "low" or "medium" Priority.

The 1996 USACHPPM Report (*Final Preliminary Assessment for Ravenna Army Ammunition Plant, Ravenna, Ohio)* identified surface soil to be the medium for concern at the AOC, and three surface soil samples were collected at ODA1 for the RRSE. One sample was collected from the treatment area inside the berm and one sample was collected at the top of the berm (Figure 2-1). All three surface soil samples were analyzed for arsenic, barium, cadmium, chromium, copper, mercury, zinc, and 2,4,6-TNT. All seven metals and 2,4,6-TNT were detected. The maximum concentration of 2,4,6-TNT was 23,000 milligrams per kilogram (mg/kg) from a location inside the berm. Of the detected metals, cadmium exceeded its RRSE standard criterion; in addition, 2,4,6-TNT exceeded its criterion. The contaminant hazard factor for ODA1 was determined to be "moderate" because of these two constituents. Because no engineering or access controls were in place, exposure to potential

human receptors was noted in the RRSE. On this basis, the overall relative risk attributed to surface soil was determined to be "medium" (SAIC, 2001a).

2.4.2 Water Quality Surveillance Program

Surface water samples were collected and analyzed at Hinkley Creek situated hydraulically downgradient of ODA1, as part of the installation Water Quality Surveillance Program by U.S. Army Toxic and Hazardous Materials Agency (USATHMA, 1980–1992). Low concentrations (i.e., detections are estimated values less than the reporting limit) of copper, zinc, and hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) were observed on one occasion at sample location HC-2 (see Figure 2-1). However, the limited amount of data, associated QA documents, and the distance and location of HC-2 from ODA1 did not allow for a comprehensive assessment of the extent of contaminant impact to surface water media from ODA1 (SAIC, 2001a).

2.4.3 Phase I RI

A Phase I RI was performed in 1999 (SAIC, 2001a) to assess the occurrence, distribution, and potential risks for contamination in soil to a depth of 8 ft. bgs, sediment, groundwater, and surface water. The Phase I RI activities were focused on the OB/OD area of ODA1 and surrounding areas to also identify whether releases of contamination beyond the AOC boundary had occurred. Screening of chemical data against the EPA Region 9 Preliminary Remediation Goals (see Section 5.4 of the Phase I RI [SAIC, 2001a]) showed the presence of human health and ecological COPCs in each environmental medium. A summary of the results of each media sampled (i.e., groundwater, surface water, sediment, and soil) and investigated as part of the Phase I RI are discussed below.

2.4.3.1 Phase I RI Results

The Phase I RI results for groundwater, surface water, sediment, surface soil, and subsurface soil are summarized in this section.

Groundwater

The one groundwater sample (DA1-027-GW) collected under the Phase I RI (Figure 2-3) was obtained using direct-push boring techniques. Groundwater obtained from well points at the former RVAAP/Camp Ravenna is solely used for screening purposes. Specifically, any detects are considered minimal values and nondetects do not definitively indicate lack of contamination. Groundwater data that is used at the former RVAAP for the purpose of evaluation, risk assessment, etc., must be obtained from properly installed, developed, and sampled monitoring wells. Based on the available limited screening data, leaching of contaminants from soil to shallow groundwater in the vicinity of station DA1-027 had not occurred. The limited data does not necessarily represent conditions in other portions of the

AOC. For the purposes of this Phase II RI, groundwater was not evaluated any further since groundwater is currently being evaluated under a separate facility-wide program.

Surface Water/Sediment

Three surface water samples and four sediment samples were collected from existing upgradient and downgradient surface water and sediment drainage channels to assess if any impacts had occurred because of ODA1 historic operations (Figure 2-3).

Aluminum and chromium were the only constituents identified as human health COPCs in sediment. The maximum detected value of 14,400 mg/kg in dry sediment at station DA1-44 was only slightly greater than the background criteria (13,900 mg/kg) for aluminum. The only chromium result greater than background (18.1 mg/kg) occurred at station DA1-46 at HC-2 (18.8 mg/kg). Sediment ecological COPCs included polychlorinated biphenyl (PCB)-1260, lead, nickel, aluminum, and magnesium.

Zinc concentrations greater than background concentrations were observed in surface water samples collected at station DA1-45 in Hinkley Creek. DA1-45 is the closest point to Hinkley Creek and is located to the south of the AOC. RDX was also detected once at the facility exit point (DA1-46, HC-2) at an estimated concentration (0.24 micrograms per liter) less than the detection limit. Two additional compounds, bis(2-ethylhexyl)phthalate and chloroform, were also detected in surface water samples collected from DA1-43 at concentrations greater than their risk-based screening criteria at the time of the RI. However, DA1-43 is located upgradient of ODA1, indicating the contaminants are not related to ODA1. Surface water ecological COPCs included bis(2-ethylhexyl)phthalate, RDX, zinc, and calcium.

The data collected during the Phase I RI indicated that sediment and surface water in Hinkley Creek had not been contaminated as a result of former operations at ODA1. Contaminant migration off of the AOC also appears to be negligible based on the Phase I RI data.

For the purposes of this Phase II RI, sediment and surface water were not evaluated further since ODA1 was not determined to be a source for impact to sediment/surface water.

Surface Soil

A total of 42 discrete surface soil samples (0–1 ft. bgs) were collected during the Phase I RI. The findings of the Phase I RI indicated the following for surface soil:

- The south ditch and “hot spots” in the western and southern portions of the plane storage area represent the principal locations having contamination greater than background levels. The greatest concentrations of explosives and propellants are clustered along the south drainage ditch, indicating potential contaminant migration via surface water runoff across the AOC and deposition along the ditch.

- Ten metals were identified as COPCs. Of these metals, concentrations of aluminum, arsenic, cadmium, chromium, lead, and manganese were greater than both background values and EPA Region 9 Preliminary Regional Goals used in the Phase I RI. The greatest concentrations were observed in the western and southern portions of the plane storage area in surface soils (see Figure 2-4).
- Surface soils contained explosives (2,4,6-TNT and 2,4-dinitrotoluene [DNT]) and nitrocellulose with 2,4,6-TNT concentrations greater than the residential risk-based screening criterion used at the time of the sampling at four locations (DA1-001, DA1-010, DA1-030, and DA1-040) and 2,4-DNT concentrations greater than the residential criterion at three locations (DA1-010, DA1-014, and DA1-022) (see Figure 2-5).
- 2-Methylnapthalene was the only semivolatile organic compound (SVOC) identified as a COPC due to lack of a risk-based screening criterion for comparison in surface soil at station DA1-007.
- Volatile organic compounds (VOCs) were not COPCs in surface soil.
- Screening of data against migration to groundwater criteria derived (by EPA Region 9) from standardized equations presented in EPA's *Soil Screening Guidance* (EPA, 1996a), showed that 2,4-DNT, antimony, arsenic, barium, cadmium, chromium, and zinc concentrations were greater than their respective criteria.

Subsurface Soil

A total of 77 discrete subsurface soil samples were collected during the Phase I RI in three intervals: 1–3 ft. bgs, 3–5 ft. bgs, and 6–8 ft. bgs. The findings of the Phase I RI indicated the following for subsurface soil:

- Aluminum, arsenic, cadmium, chromium, copper, lead, and zinc were identified as COPCs in subsurface soil. Each of the COPCs except copper and zinc concentrations were greater than both EPA Region 9 Preliminary Regional Goals and background concentrations available at the time of the RI investigation. The majority of concentrations greater than background and risk-based screening levels occurred in samples collected from the western half of the AOC (Figure 2-6). In general, the concentrations of metals are lower in subsurface soil samples than in surface soil samples.
- Explosives, SVOCs, and VOCs were not identified as COPCs in subsurface soil (Figure 2-7).

- Screening of data against migration to groundwater criteria derived (by EPA Region 9) from standardized equations presented in EPA's *Soil Screening Guidance* (EPA 1996a), shows that arsenic, cadmium, and chromium concentrations were greater than their respective criteria (Section 5.4 of the Phase I RI [SAIC, 2001a]).

2.4.3.2 Conclusions

The Phase I RI results indicated the primary media of concern were surface and subsurface soil. Contaminants detected in the surface soil greater than background included metals, low levels of explosives and propellants (i.e., 8 of 17 detections were estimated values less than the reporting limits), and isolated low level detections of VOCs and SVOCs (i.e., detections are estimated values less than the reporting limits). Subsurface soils were primarily found to contain metals greater than background criteria with isolated, low-level detections of VOCs and SVOCs (i.e., eight of nine VOCs detections and each of the SVOCs detections were estimated values less than the reporting limits). The detected contaminants are consistent with the historical activities performed at the site.

Therefore, the Phase I RI identified human health as the primary factor for facilitating further remedial activities at ODA1 based on the present and continued use of the site for OHARNG training.

2.4.4 MEC Debris Removal and IRA

The MEC debris removal and IRA at ODA1 (MKM, 2004) were initiated based on the presence of MEC/MD located on the surface at ODA1 and the human health risks identified during the Phase I RI (SAIC, 2001a). The objective of the removal action at ODA1 was to remove the MEC/MD, and the hazards associated with it, to a depth of 4 ft. bgs and to eliminate the human health exposure to environmental COCs that may have originated from activities at ODA1. Sixteen 50 by 50 ft. grids (Grids 1–16) were established for excavation based on Phase I RI samples indicating metals concentrations greater than the former RVAAP background values (as developed in the *Winklepeck Burning Grounds Phase II RI* [USACE, 2001]) and/or detections of explosive compounds in soil (Figure 2-8). Grids 17–20 were investigated for MEC only.

Eleven grids (Grids 1–6, 11, and 13–16) exhibited explosives contamination with MEC in soil; 1 grid (Grid 7) exhibited high lead contamination with MEC in soil; 4 grids (Grids 8, 9, 10, and 12) exhibited explosive and metals contamination with MEC in soil.

2.4.4.1 Results

The 16 grids (Grids 1–16) with environmental contamination were excavated to a total depth of 4 ft. bgs with a few exceptions. Grid 5 included a 10-ft by 5-ft area excavated to between

6 and 8 ft. bgs, and Grid 11A was excavated to 5 ft. bgs. The top lift (0–1 ft. for all grids except for Grid 7, which was 0–3 ft.) was excavated, sifted, and staged for waste characterization.

Four grids (Grids 17–20) exhibited the presence of high surficial MEC/MD with no environmental concerns (i.e., inorganics, explosives, and organics) and were excavated to a depth of 2 ft. bgs. Since the concentrations of chemical constituents in soil from these four grids was less than the established chemical criteria at the time based upon the Phase I RI sampling results, the soils were used immediately for backfill.

Segregated soils for grid excavations were sampled for waste characterization. After review and approval of the data, Ohio EPA determined that the soils did not pose a risk to human health and gave the approval to reuse the material as backfill (Grids 1, 2, and 20) and regrade material in ODA1. A total of approximately 1,455 cubic yards (cy) of soil was segregated from the IRA at ODA1 before being reused at the site. Also, at the time of MKM's report (2004), approximately 8 cy of VOC impacted soils remained at the site pending removal from the site. The 8 cy were transported off site for disposal by URS Corporation in 2008.

2.4.5 Final DQO Report

The purpose of the *DQO Report* (Shaw, 2009a), was to determine if there were any data gaps from past investigations (1999 Phase I RI) and remedial activities (2000–2001 IRA) at ODA1 where the extent of contamination in soil was not adequately characterized or delineated, or if there were any other efforts required to assess environmental closure of the AOC.

In order to identify COPCs, investigation data (i.e., Phase I RI surface and subsurface soil data) was screened to the 10^{-6} cancer risk level and hazard quotient (HQ) equal to 0.1 and evaluated to determine COPCs. The COCs were identified by screening the confirmation data collected during the remedial action (i.e., IRA subsurface soil data) to the 10^{-5} cancer risk level and HQ equal to 1. A summary of COPCs in surface soil and COCs in subsurface soil identified in the *DQO Report* that required further investigation is presented in Table 2-1. The Phase I RI data and IRA confirmatory sample data were compared against EPA Region 9 Preliminary Remediation Goals among other general risk-based criteria; however, the *DQO Report* compared the remaining Phase I RI data (a large portion of the data was no longer applicable since the soil had been subsequently removed and sampled during the IRA) and IRA confirmatory sample data to the then Draft FWCUGs (SAIC, 2008) and facility-wide background values, to determined if the site had been adequately characterized. Below is a summary of the results and conclusions from the *DQO Report*.

2.4.5.1 Surface Soil Samples

Select areas at ODA1 were subject to removal action under the IRA conducted in 2000–2001. Since the IRA activities were focused on removing surface soil from areas where concentrations in samples were greater than earlier versions of human health criteria, select data from the Phase I RI (19 out of 42 samples) were no longer applicable and a reduced post-IRA surface soil data set better represented current conditions at the site. No surface soil samples were collected during the 2000–2001 IRA. The post-IRA surface soil data was then reevaluated using updated screening criteria. The results of that evaluation are presented below in Section 2.4.5.2 and presented on Figure 2-9.

2.4.5.2 Summary of Results for Surface Samples

For the unrestricted Residential Farmer (Adult and Child) land use scenario, two inorganics (arsenic and beryllium) were detected in the surface soil samples of the post-IRA data set and were identified as COPCs requiring further evaluation at the site (Figure 2-9). Arsenic and beryllium were each detected as the sole COPCs in surface soil for the residential receptors and only once at concentrations only slightly greater than the background values (arsenic maximum detection of 15.6 mg/kg at DA1-034 with background of 15.4 mg/kg and beryllium maximum detection of 0.94 mg/kg at DA1-008 with background of 0.88 mg/kg).

For the future intended use of the site by the OHARNG, four inorganics (arsenic, beryllium, chromium [total], and cobalt) were detected in the surface soil samples and were identified as COPCs requiring further evaluation at the site for the National Guard receptors. However, as noted for the residential receptor scenario, arsenic and beryllium were each detected only once at concentrations only slightly greater than the background values. The remaining COPCs (chromium [total] and cobalt) occurred in surface soil samples collected from the southeast portion (DA1-034), southern perimeter (DA1-030), and central portion (DA1-018) of the site. Chromium (total) was identified as the sole COPC for the National Guard receptors in surface soil samples collected from the southwest perimeter (DA1-026) and central portion (DA1-019) of the site (see Figure 2-9).

It should be noted that surface soil samples collected during the Phase I RI activities were analyzed for total chromium only. In the *DQO Report*, the chromium (total) concentrations were evaluated as hexavalent chromium, which was identified to have the same values as total chromium in the then Draft FWCUG document (SAIC, 2008). The Final FWCUG document (SAIC, 2010) has identified total chromium and hexavalent chromium as having different values. Therefore, going forward, where chromium was identified as a COPC in surface soil requiring further evaluation, evaluation for hexavalent chromium as a COPC was also performed during the Phase II RI.

2.4.5.3 Post IRA Phase I RI Subsurface Soil Samples

Select areas at ODA1 were subject to removal action under the IRA conducted in 2000–2001. Since the IRA activities were focused on removing subsurface soil (to a depth of 4 ft. bgs) from areas where concentrations in samples were greater than earlier versions of human health criteria, select data from the Phase I RI were no longer applicable (28 out of 70 samples) and a reduced post-IRA subsurface soil data set better represented current conditions at the site prior to Phase II RI activities. The post-IRA surface soil data was then reevaluated using updated screening criteria. The results of that evaluation are presented below in Section 2.4.5.4 and presented on Figure 2-10.

2.4.5.4 Summary of Results for Post IRA Phase I RI Subsurface Samples

For the unrestricted and OHARNG land use scenarios, aluminum, arsenic, chromium, and lead were identified as the inorganic COPCs in subsurface soil in the post-IRA data set. The extent of arsenic is defined horizontally and vertically with depth at DA1-019 located in the central portion of the site. Aluminum, arsenic, chromium, and lead are not defined with depth below 5 ft. bgs at DA1-027 located in the southwest portion of the site, or to the west and south (see Figure 2-10).

It should be noted that surface soil samples collected during the Phase I RI activities were analyzed for total chromium only. In the *DQO Report*, the chromium (total) concentrations were evaluated as hexavalent chromium, which was identified to have the same values as total chromium in the then Draft FWCUG document (SAIC, 2008). The Final FWCUG document (SAIC, 2010) has identified total chromium and hexavalent chromium as having different values. Therefore, going forward, where chromium was identified as a COPC in surface soil requiring further evaluation, evaluation for hexavalent chromium as a COPC was also performed during the Phase II RI.

2.4.5.5 Post IRA Subsurface Soil Sample

Following completion of the excavation and removal of soil and MEC during the 2000–2001 IRA performed by MKM, composite confirmatory samples were collected from the base of each excavated area. Most of the data from the confirmatory samples supersedes a large portion of the subsurface and surface soil data from the Phase I RI because it represented current conditions after soil removal activities prior to Phase II RI activities. The results of that evaluation are presented below in Section 2.4.5.6 and presented on Figure 2-10.

2.4.5.6 Summary of Results for IRA Subsurface Samples

For the unrestricted land use scenario, five inorganics (aluminum, arsenic, beryllium, copper, and lead), one propellant (nitrocellulose), and four VOCs (benzene, ethylbenzene, toluene, and xylenes) were detected in the subsurface soil samples and were identified as COCs for the Residential Farmer (Adult and Child) receptors. The inorganic COCs occurred in

subsurface soil samples collected from excavation grids located in the southwest/central portion (Grids 3, 5, 9, and 19), southwest portion (Grid 17), northeast/central portion (Grids 14 and 15), and western perimeter (Grid 11A) of the site (see Figure 2-10). The majority of inorganic COCs were detected concurrently in surface soil samples collected from the south/central portion (Grid 3) and western perimeter (Grid 11A) of the site (Figure 2-10). Organic COCs occurred in Grid 5 located in the southern portion of the site, and Grid 10 located in the western portion of the site.

For the use of the site by the OHARNG, five inorganics (aluminum, arsenic, beryllium, chromium (total), and lead), one propellant (nitrocellulose), and four VOCs (benzene, ethylbenzene, toluene, and xylenes) were detected in the subsurface soil samples and were identified as COCs at the site for the NGT receptor. The inorganic COCs occurred in subsurface soil samples collected from excavation grids located in the western perimeter (Grid 11A), southwest portion (Grid 17), southwest/central portion (Grid 19), south/central portion (Grid 3), and northeast/central portion (Grids 14 and 15) of the site (Figure 2-10). In addition, arsenic was detected as the sole COC and only once (29.3 mg/kg at Grid 19) at a concentration slightly greater than the background value (19.8 mg/kg) and the cancer-risk Final FWCUG (27.8 mg/kg) for the NGT receptor. Organic COCs occurred in Grid 5 located in the southern portion of the site and Grid 10 located in the western portion of the site.

It should be noted that subsurface soil samples collected during the IRA activities were analyzed for total chromium only. In the *DQO Report*, the chromium (total) concentrations were evaluated as hexavalent chromium which was identified to have the same values as total chromium in the then Draft FWCUG document (SAIC, 2008). The Final FWCUG document (SAIC, 2010) has identified total chromium and hexavalent chromium as having different values. Therefore, going forward, where chromium is identified as a COPC or COC in subsurface soil requiring further evaluation, evaluation for hexavalent chromium as a COPC and COC was also performed during the Phase II RI.

2.4.5.7 Conclusions

A review of the sampling program (i.e., Phase I RI and IRA) through the performance of the *DQO Report*, indicated that previous activities have not adequately evaluated the primary media of concern (surface and subsurface soils) at ODA1 and additional information was needed to support selection of an environmental closure remedy for the site. The environmental impact at the site was not defined with depth or to the west, southwest, south, and southeast, particularly in the area of IRA excavation Grid 11A on the western perimeter of the site.

Data gaps existed for four inorganic COPCs based on the most conservative risk-based Final FWCUGs for surface soil including arsenic, beryllium, chromium (total), and cobalt. While

three of the four COPCs were detected concurrently in the surface soil sample collected from DA1-034 in the southeast portion of the site where the horizontal extent was not defined, the horizontal extent of inorganic COPCs in surface soil was also not defined by the Phase I RI to the southwest and south of ODA1. The vertical extent of surface soil COPCs was defined with depth by the Phase I RI subsurface soils data. The extent of COPCs in surface soil within the central portion of the site was defined by previous sampling results. Additional surface soil samples were identified as needing analysis for VOCs, SVOCs, and PCBs to further evaluate these parameters as COPCs.

Data gaps existed vertically with depth below 5 ft. bgs at DA1-027 located in the southwest portion of the site, and to the west and south of DA1-027 for four inorganic COPCs based on the most conservative risk-based Draft FWCUGs for subsurface soil including aluminum, arsenic, chromium (total), and lead. The COCs in subsurface soil included aluminum, arsenic, beryllium, chromium (total), copper, lead, nitrocellulose, benzene, ethylbenzene, toluene, and xylenes. The COCs occurred across the site with the greatest concentrations of multiple inorganics detected in the subsurface soil sample collected from Grid 11A located along the western perimeter of the site. The area of Grid 11A identified as the "Blue Ash" sample required further evaluation to determine the extent of contamination. Data gaps for the inorganic COCs outside of Grid 11A, namely arsenic, beryllium, and lead, existed vertically with depth in the southwest portion (Grids 17 and 19 [below 2 ft. bgs] and Grid 9 [below 4 ft. bgs]), southern portion (Grid 5 [below 8 ft. bgs]), southwest/central portion (Grid 3 [below 4 ft. bgs]), and northeast/central portion (Grids 14 and 15 [below 4 ft. bgs]) of the site. Data gaps for inorganic COCs existed horizontally to the north, west, and south of Grid 11A and north and west of Grid 14. Data gaps for the extent of organic COCs existed horizontally and vertically with depth below 8 ft. bgs in the southwest/central portion (Grid 5) and 4 ft. bgs in the western perimeter (Grid 10) of the site. Data gaps for VOCs exist in each direction around Grid 5. Data gaps for nitrocellulose existed to the north and south of Grid 10 and to the east and west of Grid 5.

2.4.6 Geophysical Survey Investigation

Based upon historical information and visual observations conducted in 2008, it was believed that the boundary of ODA1 may not have been properly defined and as a result, the AOC may not have been fully investigated. Historical information also indicated the potential for MEC/MD to be present north of the NACA crash strip indicating that OB/OD activities associated with ODA1 may have also been conducted in small areas within the NTA plane storage area adjacent to ODA1. Therefore, a geophysical survey was conducted from April through May, 2010 at ODA1 in order to better define the AOC boundary by determining the horizontal extent of potential MEC contamination and other suspected buried anomalies without performing intrusive activities.

A full discussion including the instruments used, and techniques employed, is documented in the *Final Digital Geophysical Mapping Report for the RVAAP-34 Sand Creek Disposal Road Landfill, RVAAP-03 Open Demolition Area #1, and RVAAP-28 Mustard Agent Burial Site Version 1.0* (*DGM Report*) (Shaw, 2011). For the purposes of this report, a brief summary of the results and conclusions of the *DGM Report* is discussed below.

2.4.6.1 Geophysical Results

The EM61-MK2 survey data displayed numerous distinct areas of extremely high anomaly density that surround the center of the ODA1 investigation area (Figures 2-11a and 2-11b). The circular-shaped anomaly just outside of the known OB/OD area, in the center of ODA1, appears to be the former berm that encircled the former OB/OD area and extends northeast toward the crash strip. The crash strip, associated with the former NTA, is the linear anomaly located in the northern third of the survey area.

East, south, and southwest of the former berm, which encircles the former OB/OD area, there are several localized areas characterized by relatively higher anomaly density that are most likely related to OB/OD operations. These anomalous areas most likely contain debris that was pushed or moved to clear the OB/OD area after each demolition shot. It is difficult to characterize individual anomalies because of the high anomaly density and cluttered nature of the site. However, over 4,000 target anomalies were over the 5-millivolt threshold that was defined by the geophysical prove out.

The “white areas” to the east and south portions of the investigation area represent locations with limited digital geophysical mapping (DGM) due to the remaining dense tree canopy, wet, and/or thick forest conditions that could not be accessed or removed during the vegetation clearance. It should be noted that the southern portion of the investigation area, as defined in the Scope of Work (USACE, 2008), actually extends into the flood plain associated with Hinkley Creek. For the most part, there are decreases in sensitivity as the geophysical investigations approached the investigation area boundaries where there was no coverage, in particular to the east and southeast. The fiducial surveys (linear transects and shown as the individual “spikes” along the southern survey boundaries on Figures 2-11a and 2-11b) were performed at the southern investigation area boundary where high anomaly density was identified and indicated decreased sensitivity (i.e., hot pink to green and blue in the color coded image) in that direction as well.

The one-dimensional transects on the south side of ODA1 that were collected in accessible areas indicate there are no large regions of high anomaly density present that are similar in character to those defined in the central portion of the site (the high anomaly density areas in the central portion of the site are referenced on the color coded image with black polygons for comparison). Overall, all of the transects exhibit a large decrease in the relative anomaly

density towards their southern endpoints, with the exception of one short transect in the middle of the site that terminates at the site boundary. Transects that extend past the site boundary that are located directly west and east of the shorter transect are characterized by a large decrease in anomaly density, suggesting that the higher anomaly density region has been successfully bounded.

2.4.6.2 Geophysical Conclusions

The geophysical survey investigation performed at ODA1 identified areas of dense anomalies. Further investigation at the AOC requires intrusive activities to characterize the buried anomalies and to substantiate whether potential MEC and/or MD are present. Further investigation is not part of the current IRP and would likely be addressed under a separate contract. The current AOC boundary and the limits of the investigation area are shown on Figure 2-11a.

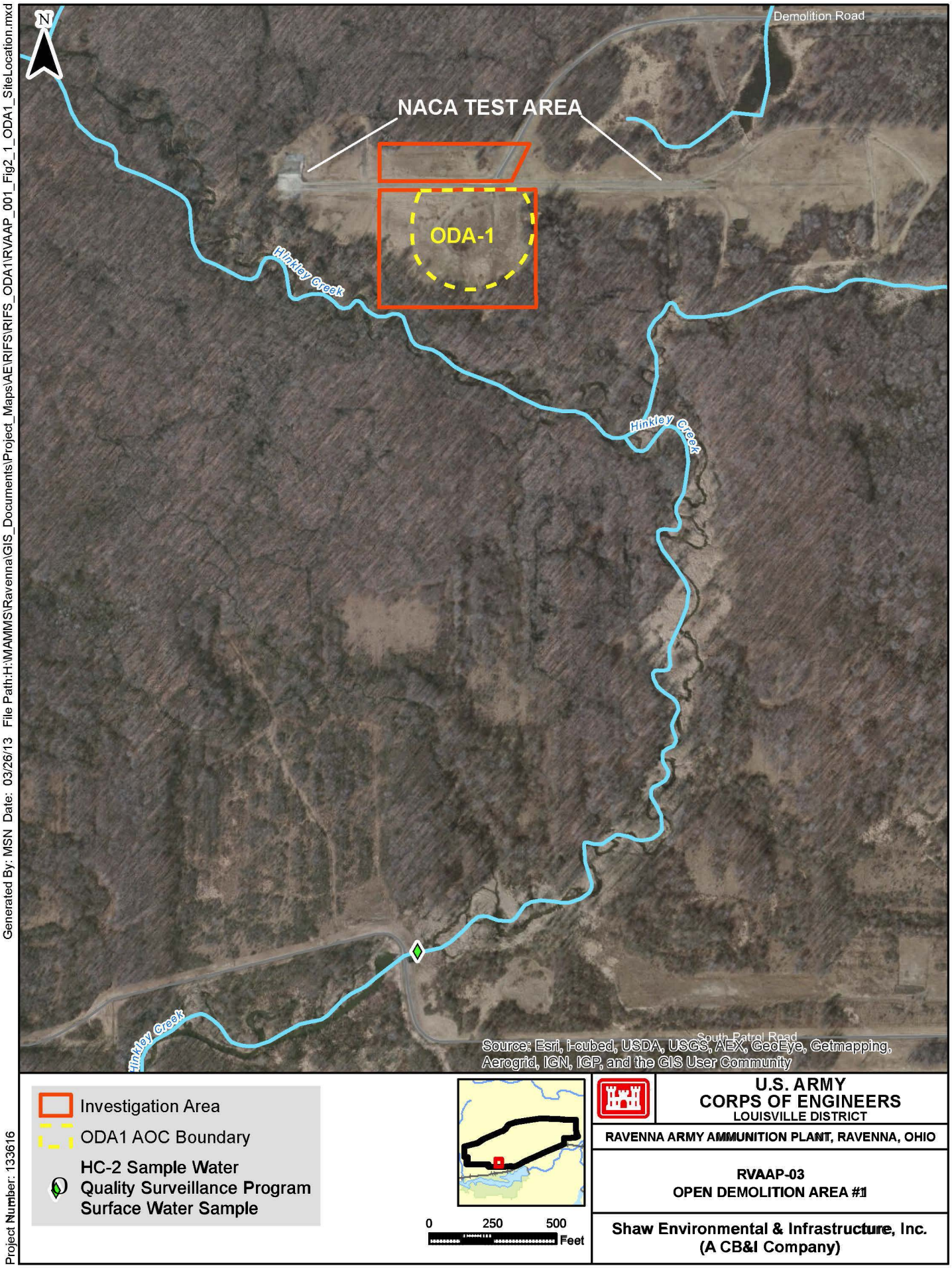


FIGURE 2-1 SITE BOUNDARIES ON AERIAL PHOTOGRAPH

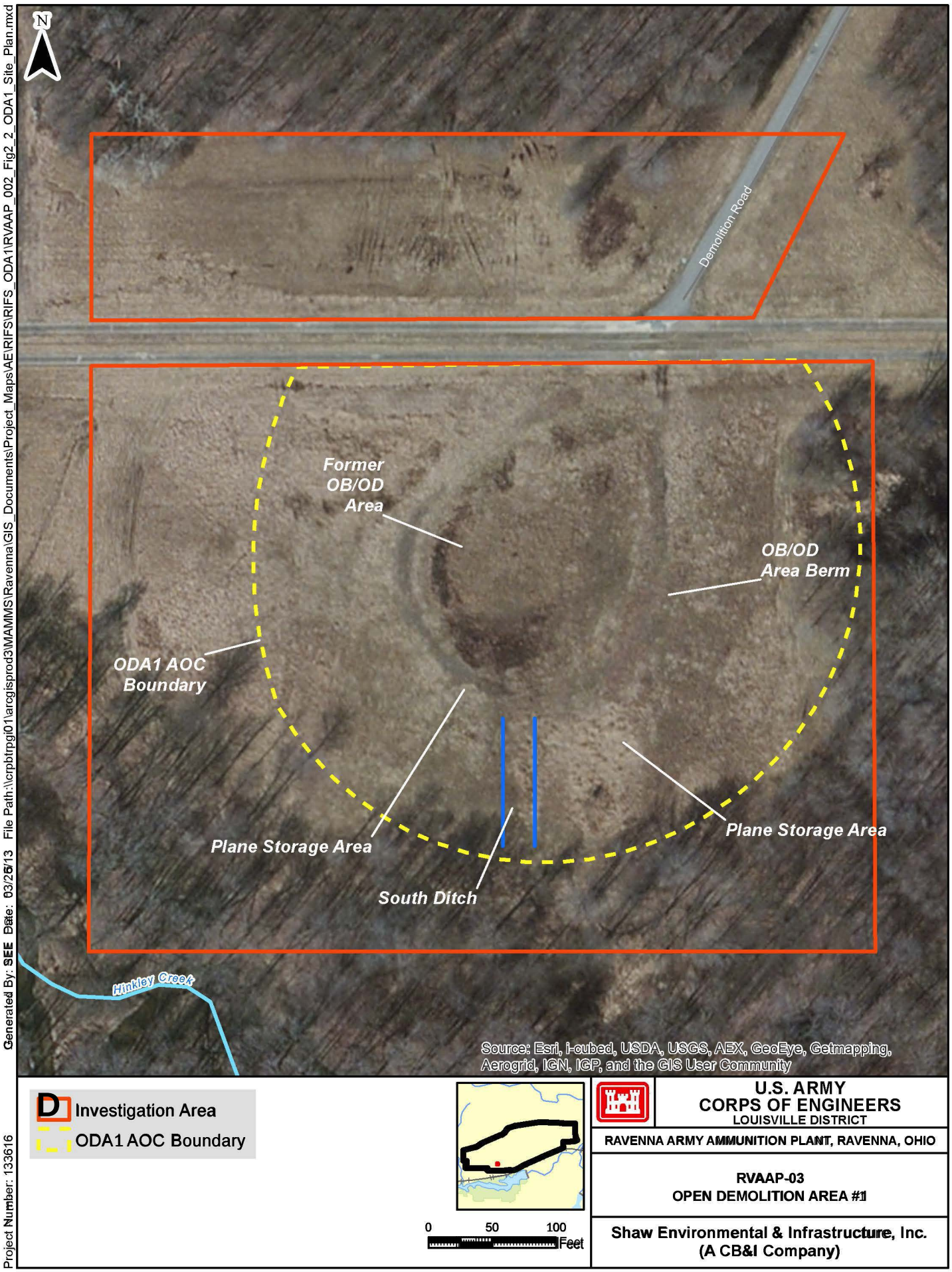


FIGURE 2-2 SITE FEATURES ON AERIAL PHOTOGRAPH

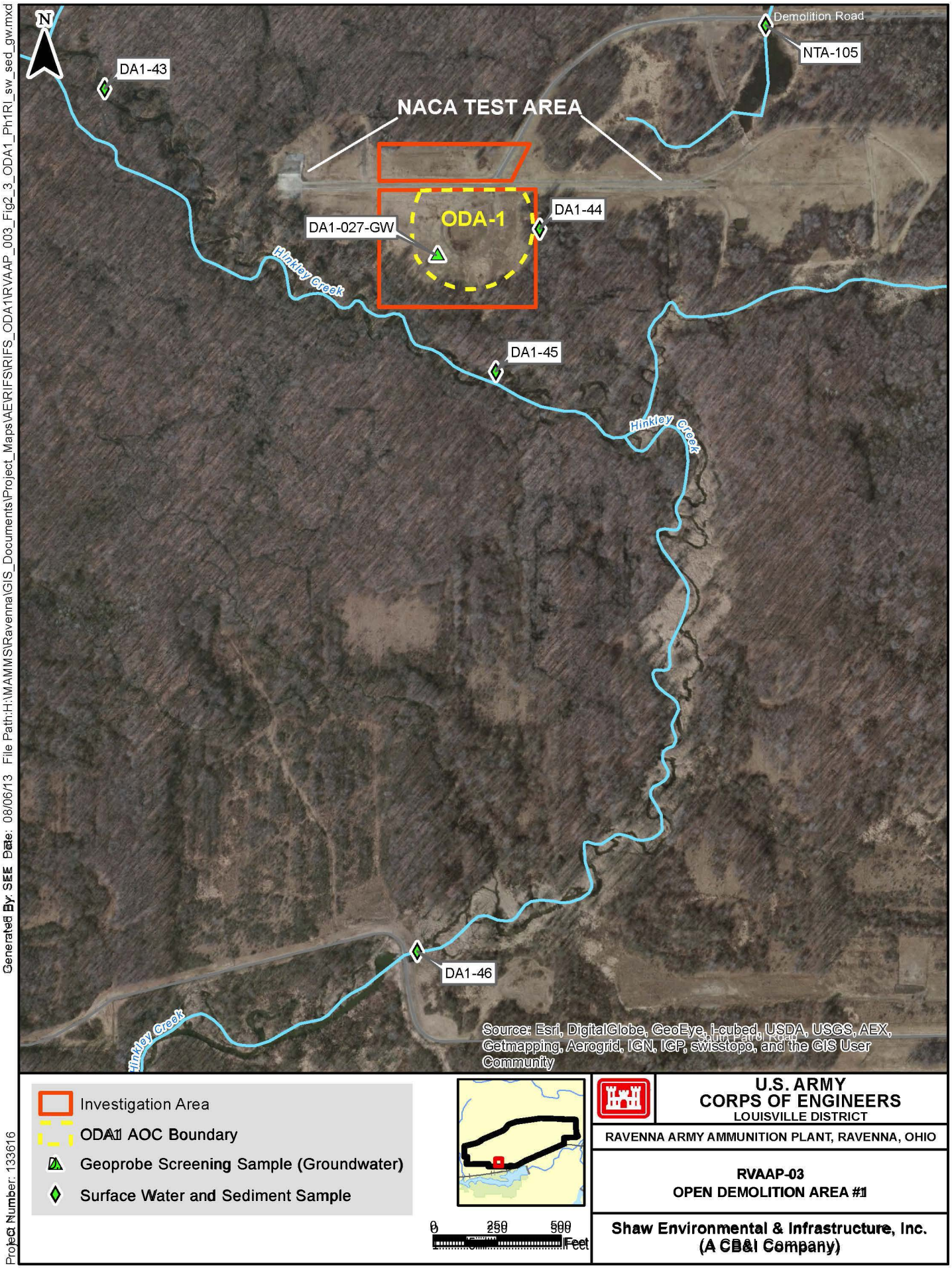


FIGURE 2-3 PHASE I RI SURFACE WATER, SEDIMENT, AND GROUNDWATER SAMPLE LOCATIONS

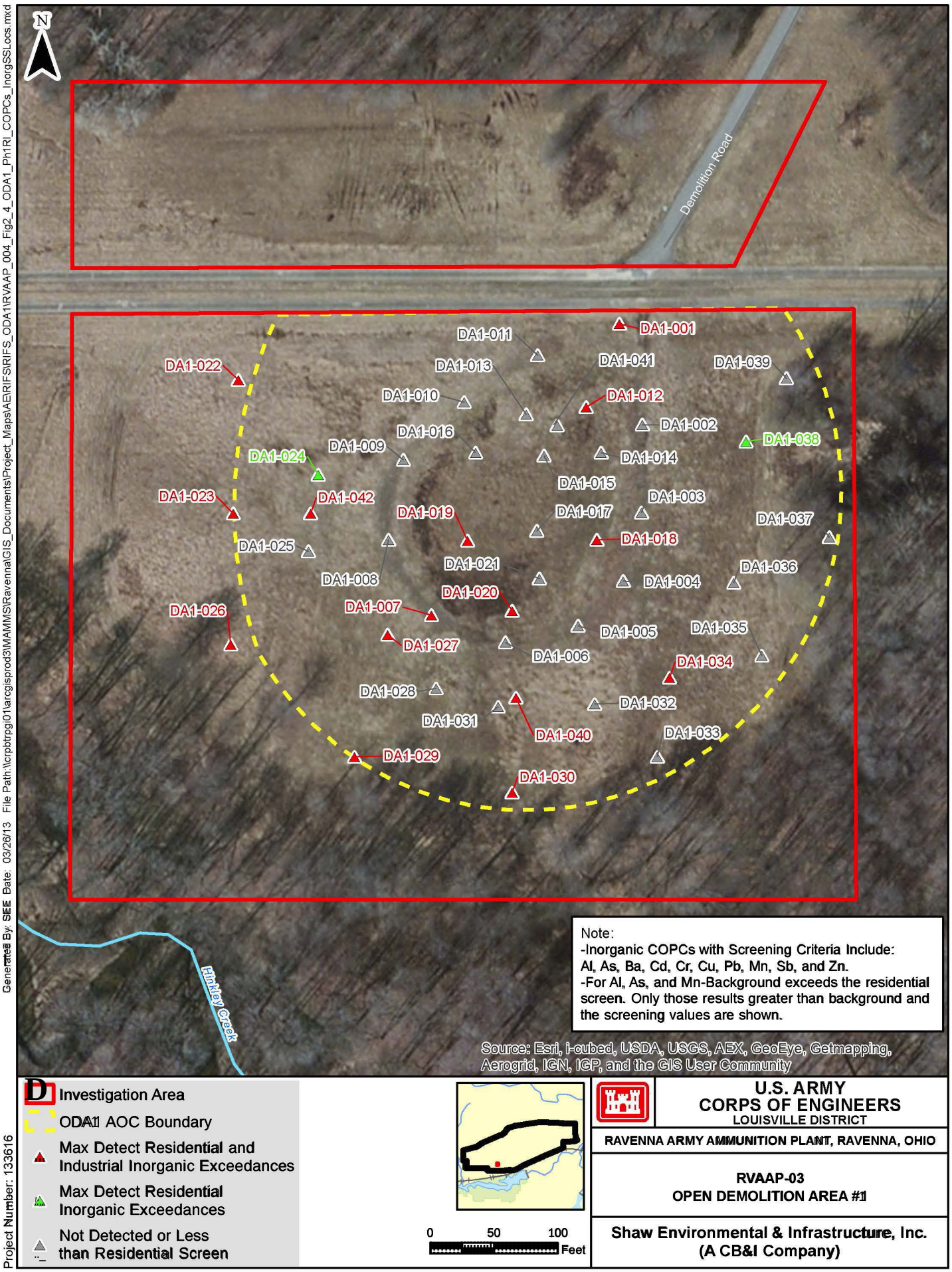


FIGURE 2-4 PHASE I RI DISTRIBUTION OF HUMAN HEALTH INORGANIC COPCs IN SURFACE SOIL

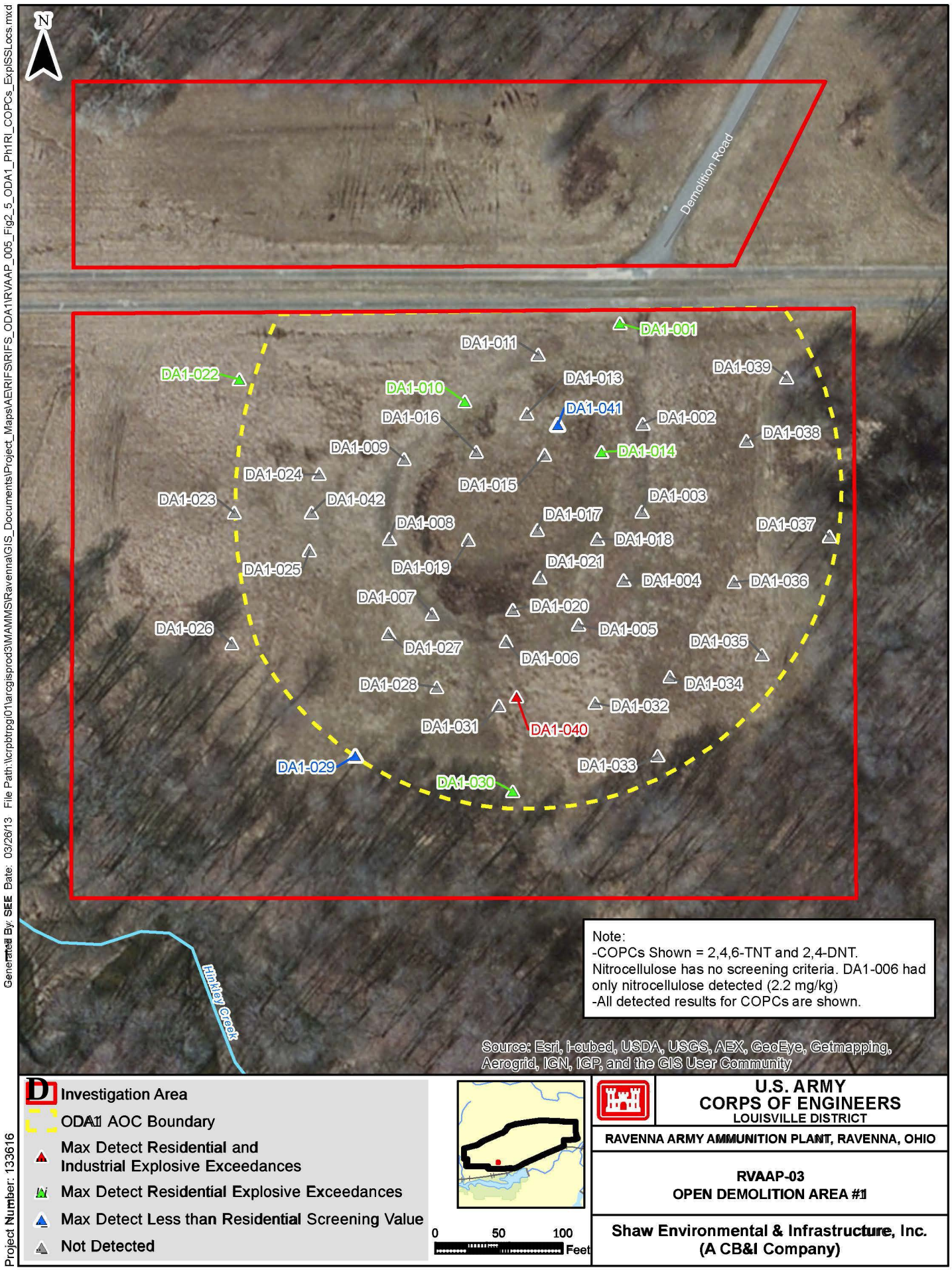


FIGURE 2-5 PHASE I RI DISTRIBUTION OF HUMAN HEALTH EXPLOSIVES COPCs IN SURFACE SOIL

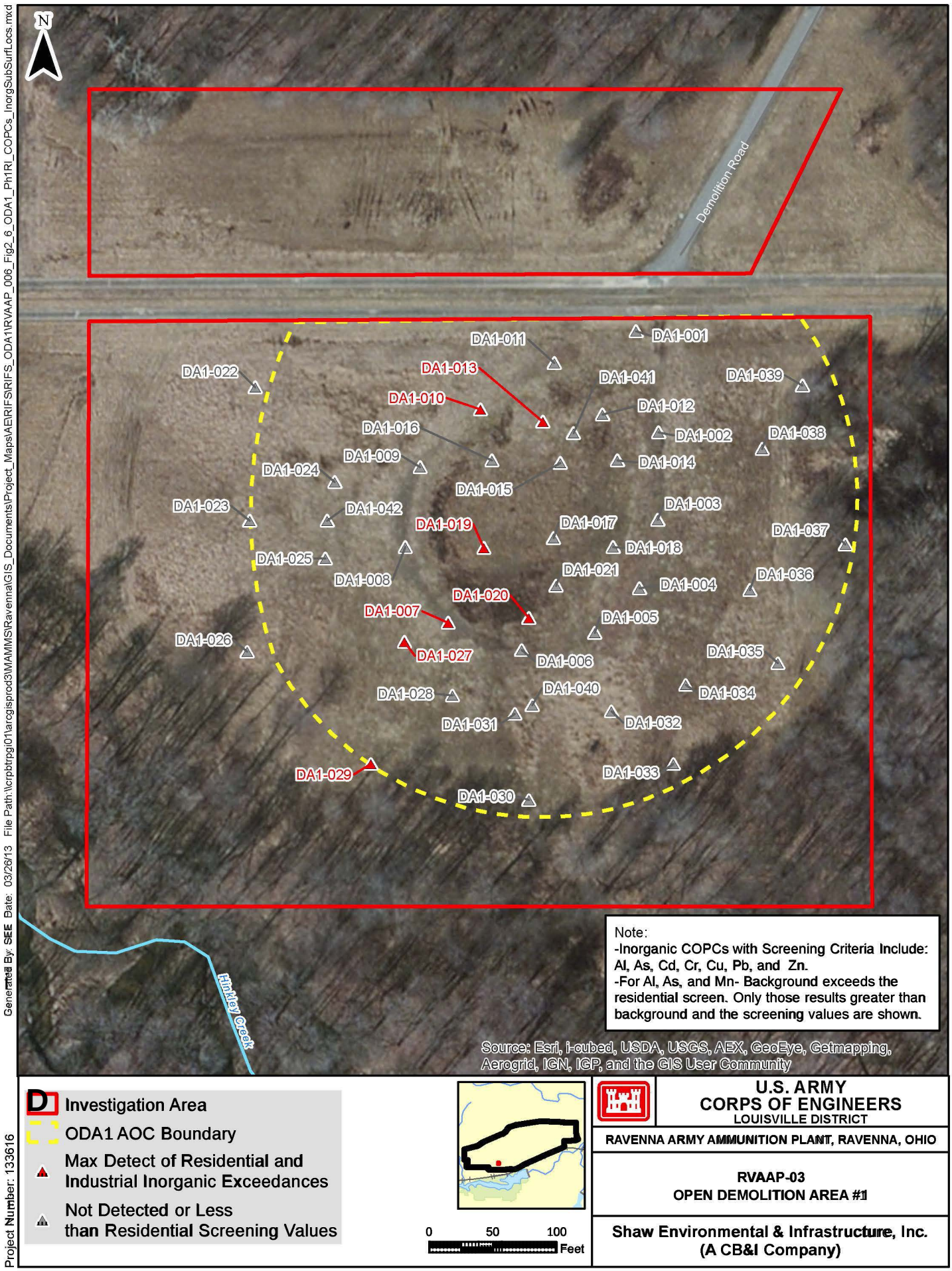


FIGURE 2-6 PHASE I RI DISTRIBUTION OF HUMAN HEALTH INORGANIC COPCs IN SUBSURFACE SOIL

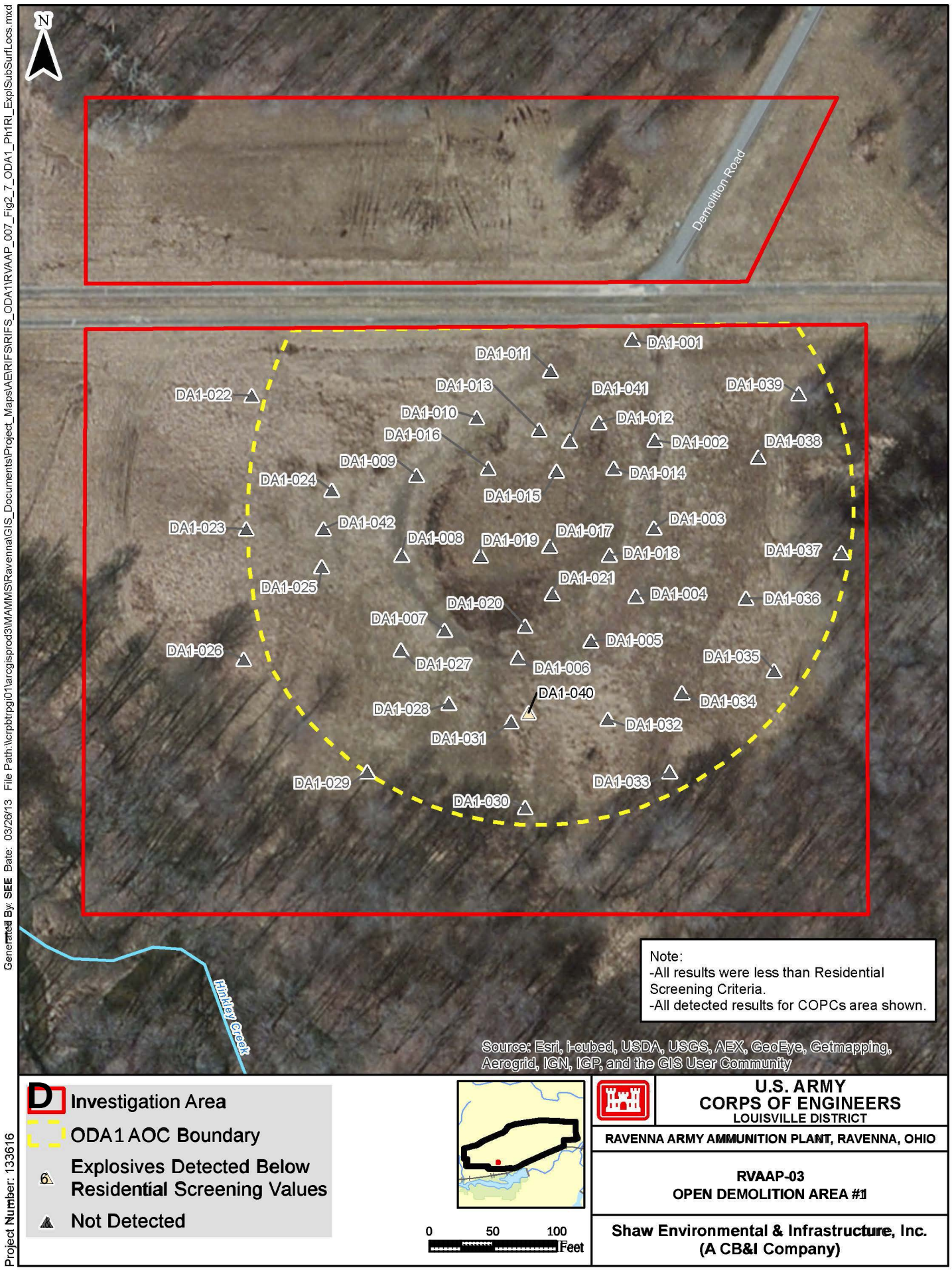


FIGURE 2-7 PHASE I RI DISTRIBUTION OF HUMAN HEALTH EXPLOSIVES COPCs IN SUBSURFACE SOIL

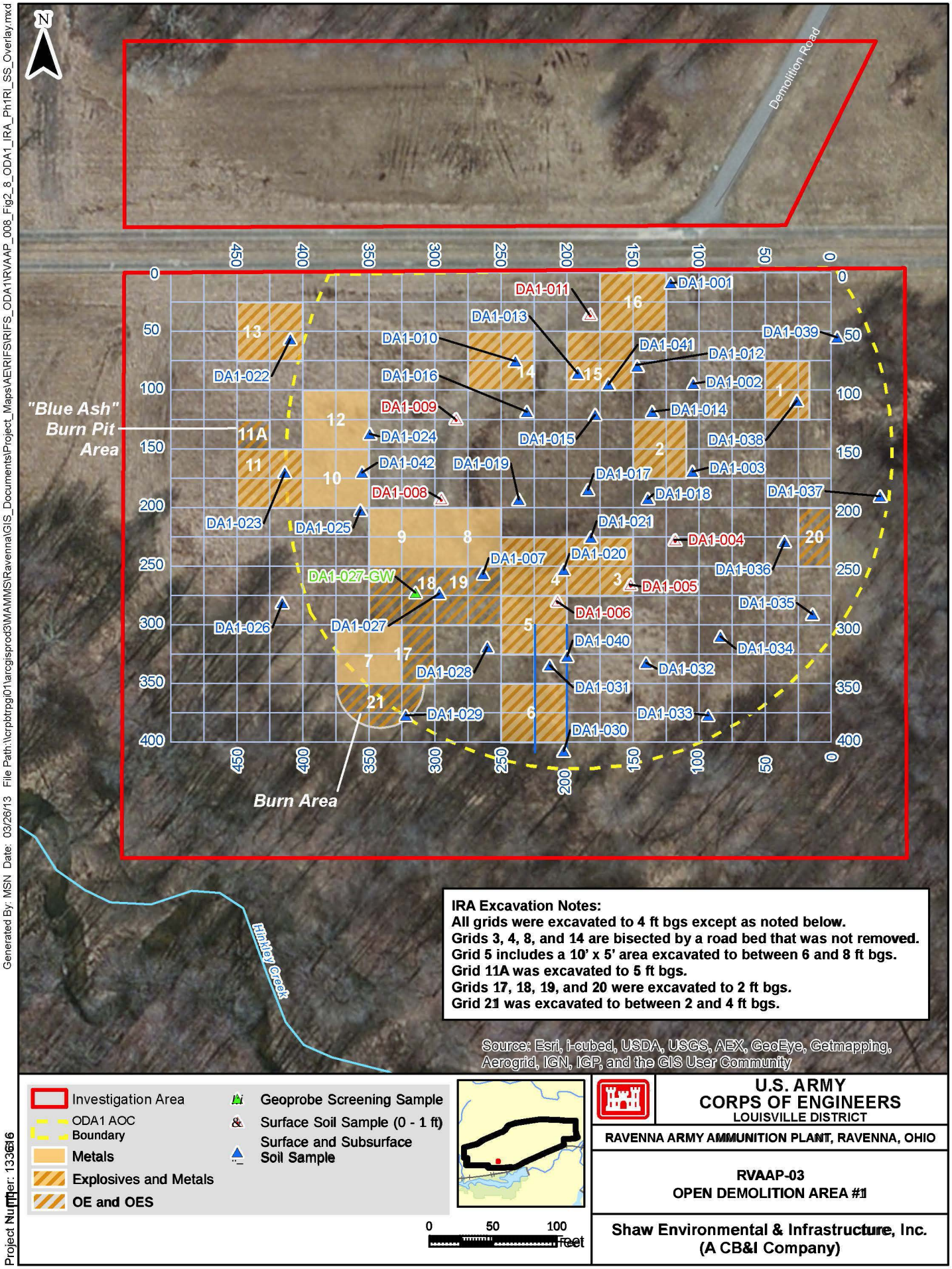


FIGURE 2-8 IRA GRID LAYOUT & PHASE I RI SOIL SAMPLE LOCATIONS OVERLAY

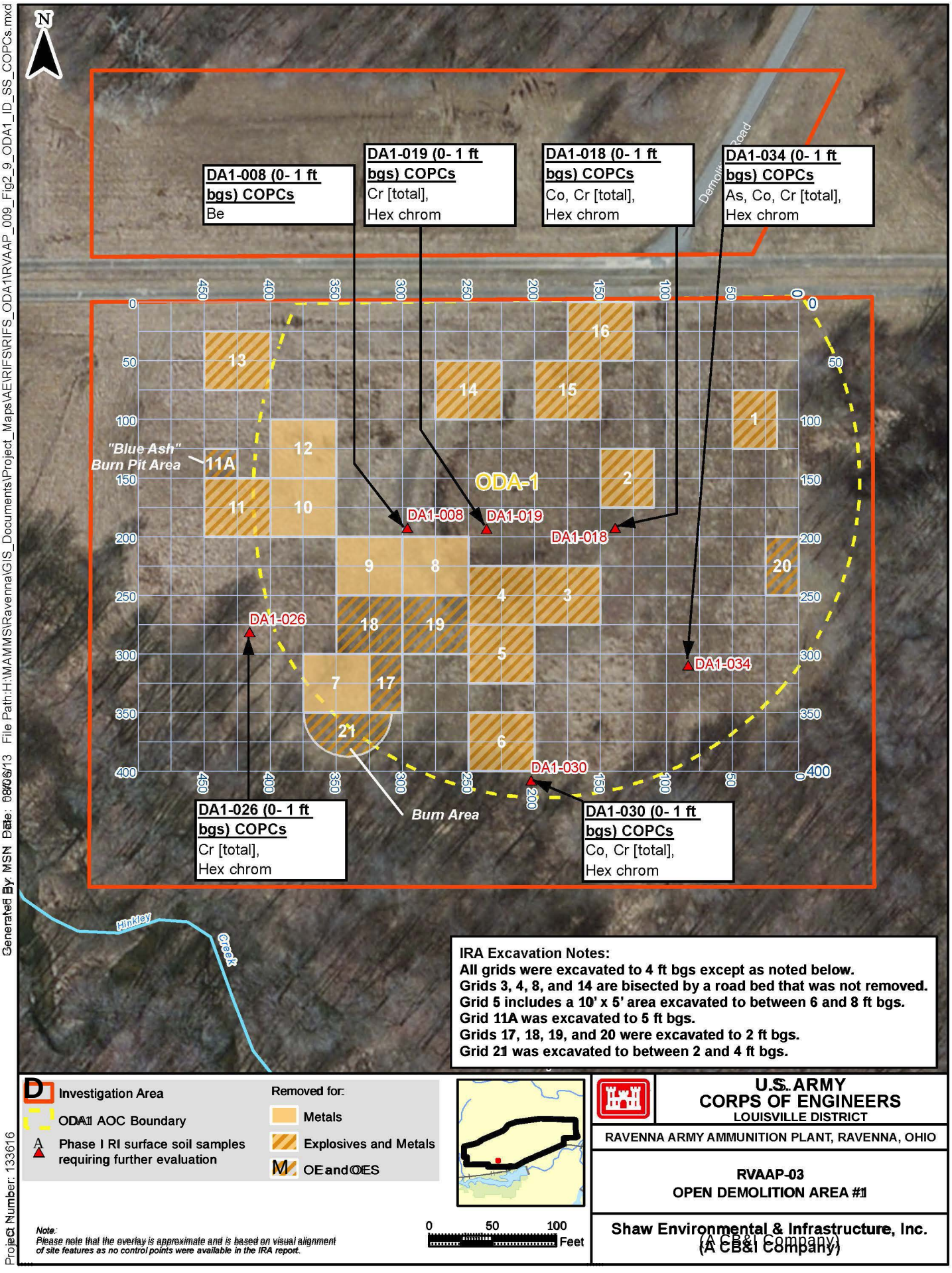


FIGURE 2-9 IDENTIFIED SURFACE SOIL COPCs POST PHASE I RI & IRA

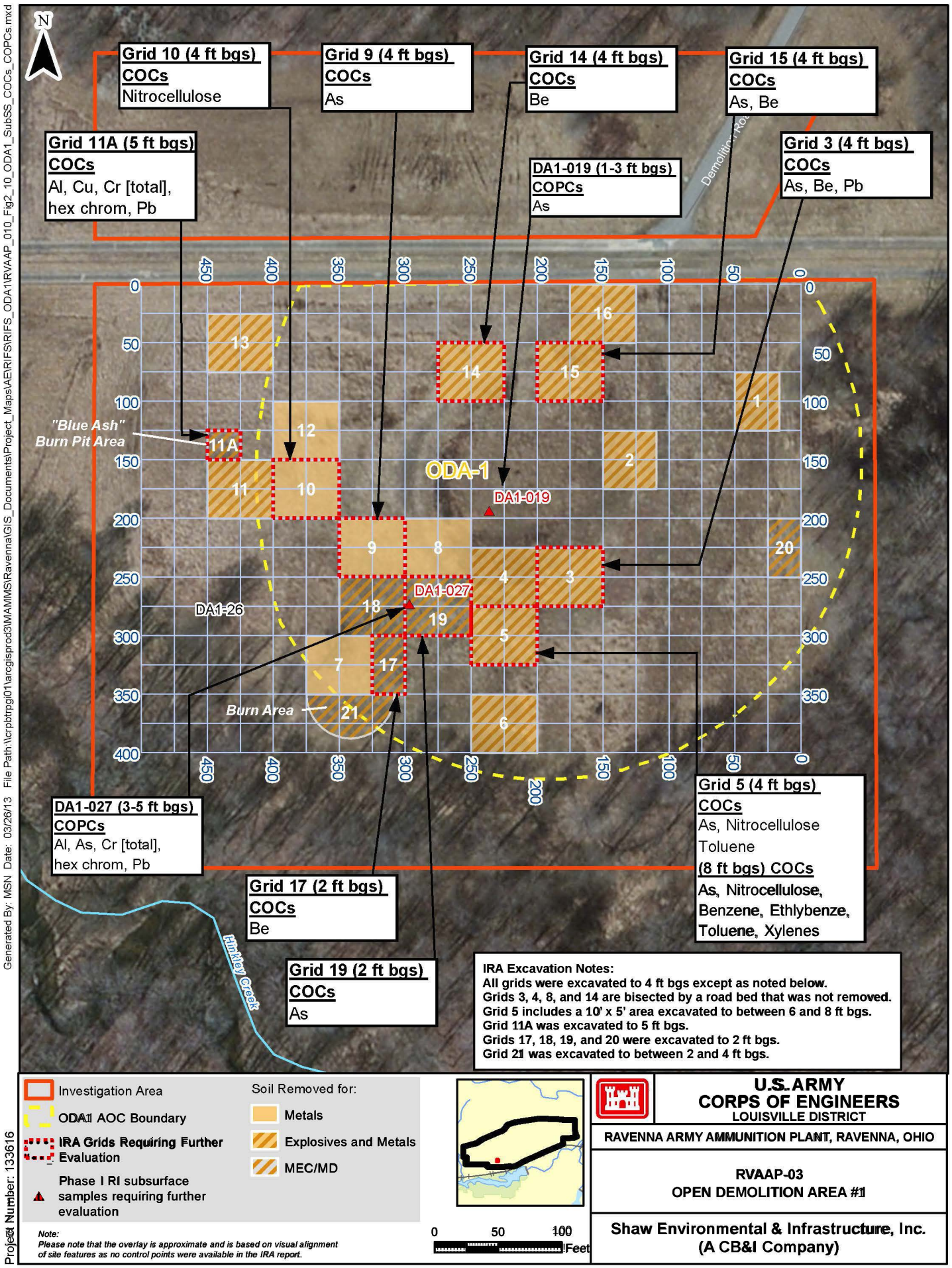


FIGURE 2-10 IDENTIFIED SUBSURFACE SOIL COCs AND COPCs POST PHASE I RI & IRA

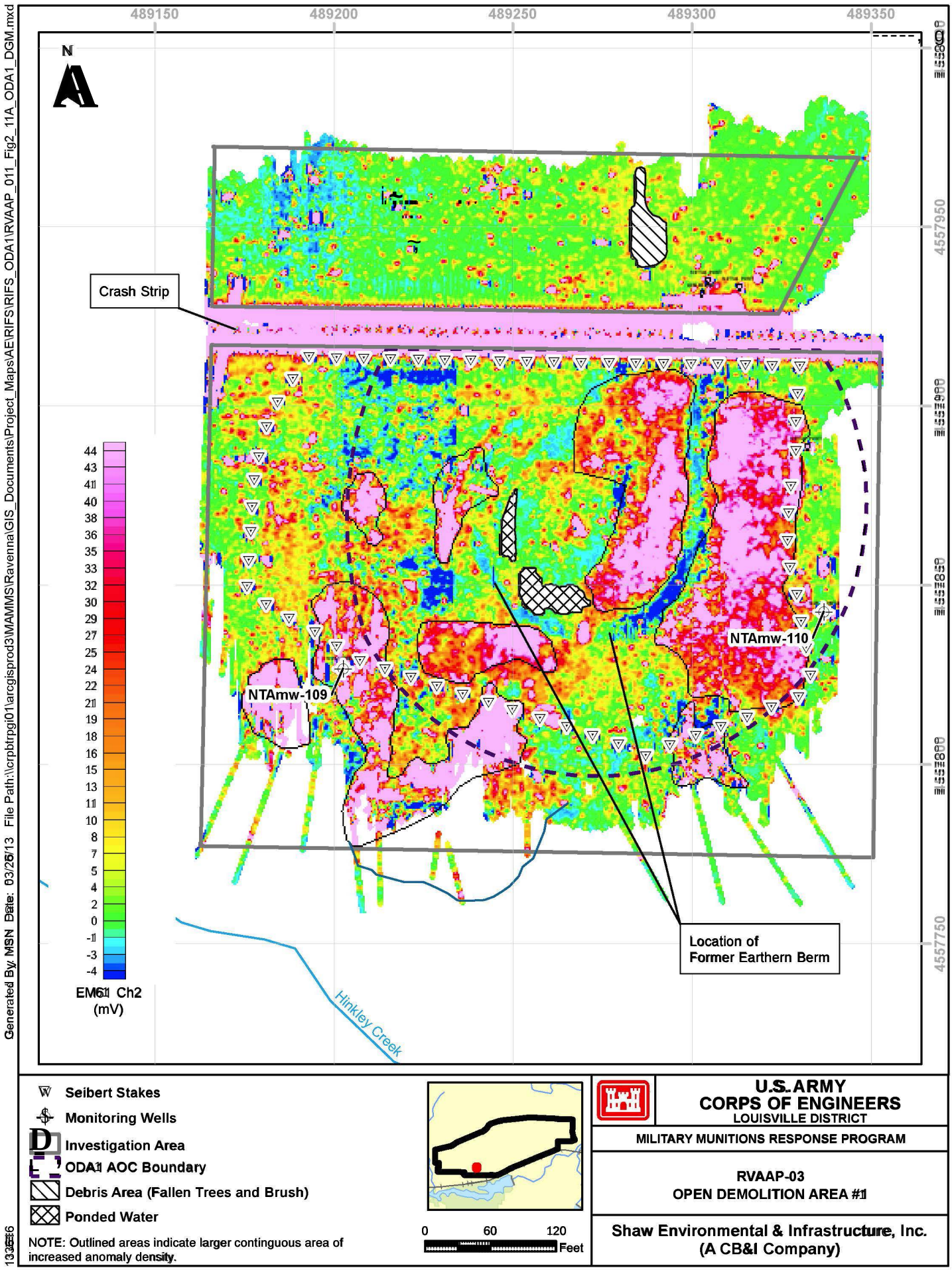


FIGURE 2-11a GEOPHYSICAL INVESTIGATION BOUNDARY SENSITIVE COLOR SCALE

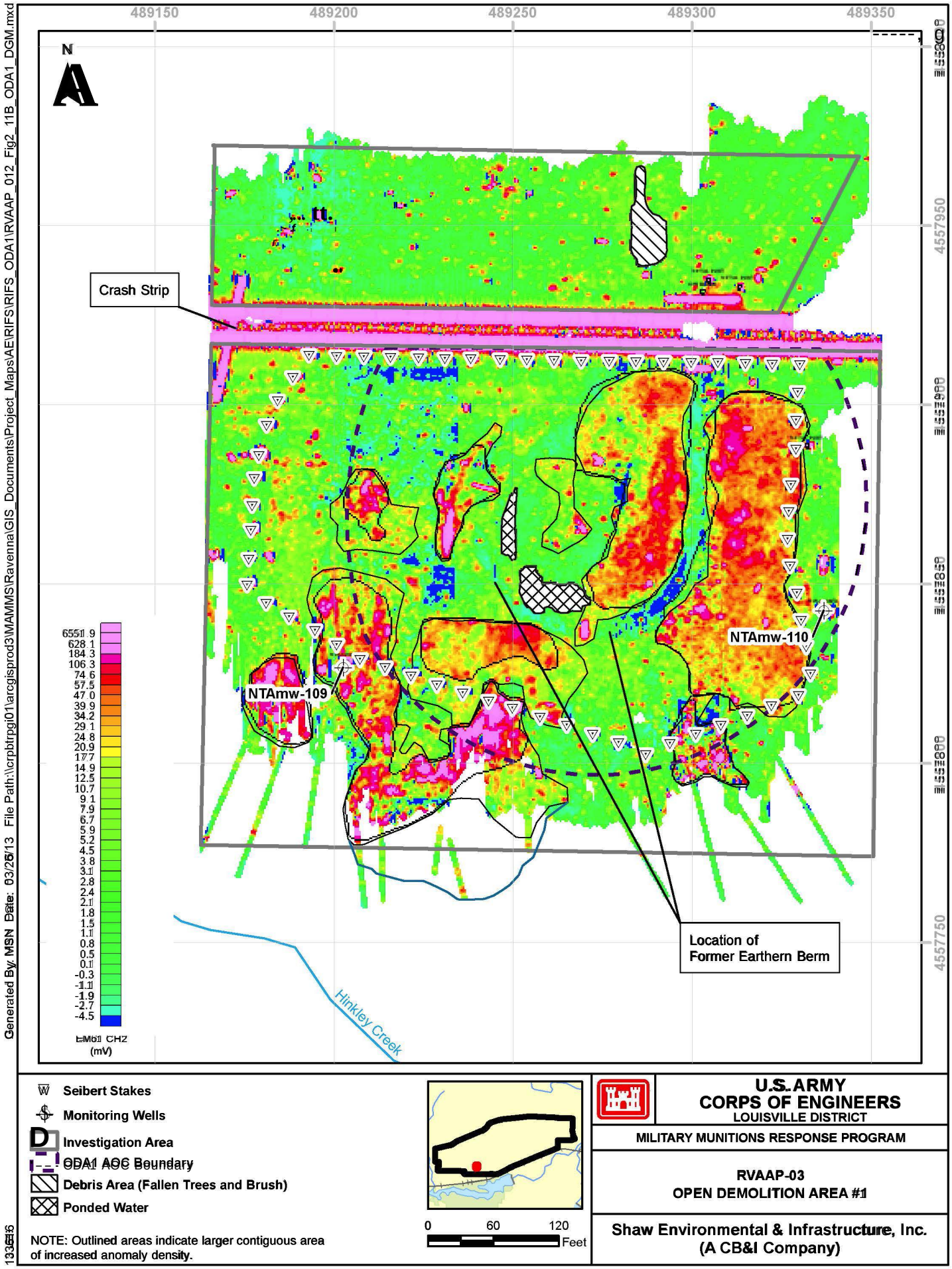


FIGURE 2-11b GEOPHYSICAL INVESTIGATION BOUNDARY COARSE COLOR SCALE

Table 2-1
Summary of COPCs for ODA1 Identified from the 2009 DQO Report
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Medium	Analyte	Frequency of Detection	# Detects > Background and Draft FWCUGs	Maximum Detect (mg/kg)
Surface Soil (COPCs)	Arsenic	23 / 23	1	15.6
	Beryllium	7 / 23	1	0.94
	Chromium (total)	23 / 23	5	22.7
	Cobalt	23 / 23	3	15.4
Subsurface Soil (COPCs)	Aluminum	42 / 42	1	28,600
	Arsenic	41 / 41	2	21.1
	Chromium (total)	42 / 42	1	34.7
	Lead	42 / 42	1	19.4
Subsurface Soil (COCs)	Aluminum	23 / 23	1	252,000
	Arsenic	22 / 23	6	29.3
	Beryllium	22 / 23	NA	1.0
	Chromium (total)	23 / 23	1	249
	Copper	23 / 23	1	74,200
	Lead	23 / 23	NA	2,370
	Nitrocellulose	3 / 3	NA	1.0
	Benzene	1 / 4	NA	0.066
	Ethylbenzene	1 / 4	NA	0.130
	Toluene	2 / 4	NA	0.180
	Xylene (total)	1 / 4	NA	0.610
	Naphthalene	1 / 4	NA	0.120

COC denotes chemical of concern, screened to Draft FWCUGs at 10^{-5} cancer risk and hazard quotient equal to 1.
COPC denotes chemical of potential concern, screened to Draft FWCUGs at 10^{-6} cancer risk and hazard quotient equal to 0.1.
DQO denotes data quality objective.
FWCUG denotes Facility-Wide Cleanup Goal.
mg/kg denotes milligrams per kilogram.
NA denotes not applicable.

3.0 ENVIRONMENTAL SETTING

This section presents the physical characteristics of the former RVAAP/Camp Ravenna and ODA1 and the surrounding environmental setting that are factors in understanding potential contaminant transport pathways, receptors, and exposure scenarios for human and ecological risks. The physiographic setting, hydrology, climate, and ecological characteristics of the RVAAP and ODA1 were compiled from information originally presented in the INRMP (AMEC, 2008); and the *Phase I Remedial Investigation Report for Demolition Area 1 at the Ravenna Army Ammunition Plant, Ravenna, Ohio* (SAIC, 2001a).

3.1 RVAAP and Camp Ravenna Physiographic Location

The former RVAAP/Camp Ravenna is located within the southern New York section of the Appalachian Plateaus physiographic province (SAIC, 2001a). This province is characterized by elevated uplands underlain primarily by Mississippian- and Pennsylvanian-age bedrock units that are horizontal or gently dipping. The province is also characterized by its rolling topography with incised streams having dendritic drainage patterns. The southern New York section has been modified by glaciation, with rounded ridges and filled valleys, and blanketed many areas with glacially derived unconsolidated deposits (i.e., sand, gravel, and finer-grained outwash deposits). As a result of glacial activity in this section, old stream drainage patterns were disrupted in many locales, and extensive wetland areas developed.

3.2 Climate

The general climate of the former RVAAP/Camp Ravenna area is continental and is characterized by moderately warm and humid summers, reasonably cold and cloudy winters, and wide variations in precipitation from year to year. The following climatological data were obtained from the Midwest Regional Climate Center at the Youngstown-Warren Regional Airport located in Trumbull County and are based on a 30-year average between 1971 and 2000 (Midwest Regional Climate Center, 2000).

Total annual rainfall in the former RVAAP/Camp Ravenna area is approximately 38.2 inches, with the greatest monthly average occurring in July (4.10 inches) and the lowest monthly average occurring in February (2.03 inches). Average annual snowfall totals approximately 55 inches with the greatest monthly average occurring in January (14.3 inches). It should be noted that due to the influence of lake-effect snowfall events associated with Lake Erie, located approximately 35 miles to the northwest of the RVAAP, snowfall totals vary widely throughout northeastern Ohio.

The average annual daily temperature in the former RVAAP/Camp Ravenna area is 48.3 degrees Fahrenheit (ºF), with an average daily high temperature of 58.2 ºF and an average

daily low temperature of 38.8 ºF. The prevailing wind direction at the former RVAAP/Camp Ravenna is from the southwest. Severe weather, in the form of thunder and hail in summer and snowstorms in winter is common. Tornadoes are infrequent in Portage County; however, minor structural damage to several buildings on facility property occurred as the result of a tornado in 1985.

3.3 Topography

Overall the installation is relatively flat with occasional broad ranging hills, although there are occasional steep slopes. Many of the steep slopes are due to modifications of the landscape from cut and fill operations during the construction of the ammunition plant in the 1940s. The elevation ranges across the facility from approximately 930 ft. above mean sea level (msl) to approximately 1,200 ft. above msl.

ODA1 is situated in the southwestern quadrant of the former RVAAP facility/Camp Ravenna, as shown on Figure 1-2. Topography across ODA1 is relatively flat with little change in elevation (see Figure 3-1). The elevation at ODA1 is approximately 1,085 ft. (330 meters [m]) above msl. The AOC is slightly elevated as compared to its immediate surroundings and surface drainage is to the east, west, and south.

3.4 Hydrology

The former RVAAP/Camp Ravenna is located in the Mahoning River Basin (AMEC, 2008). Three major streams (South Fork Eagle Creek, Sand Creek, and Hinkley Creek) drain approximately 65 percent of the facility. The northern and central portions of the property are drained by Sand Creek, with a total drainage area of 13.5 square miles (8,640 acres). Sand Creek subsequently drains to South Fork Eagle Creek, which has a drainage area of 30.7 square miles (19,648 acres) and runs into Eagle Creek, and finally the Mahoning River. The western portions of the former RVAAP/Camp Ravenna (including ODA1) drain to Hinkley Creek, a 7.2 square mile (4,608 acres) drainage basin, and subsequently to the West Branch of the Mahoning River. The easternmost portion of the installation drains to the West Branch of the Mahoning River near its confluence with the main trunk of the Mahoning River. The southern areas drain directly into Michael J. Kirwan Reservoir. A number of smaller, unnamed creeks drain other areas of the facility (AMEC, 2008). Drainage from within the bermed OB/OD area is south via a culvert towards a shallow ditch that ultimately discharges at ground surface within the Hinkley Creek drainage area. Surface drainage outside the berm is to the east, west, and south (Figure 3-2).

3.5 Soils and Geology

This section includes a discussion of soil types, regional geology, and geologic setting of ODA1.

3.5.1 Soils

Soil types at the former RVAAP/Camp Ravenna exist as a glacial veneer, and for the most part were formed in glacial till ground moraines on upland areas. Small pockets of end moraine material also exist throughout the installation. The soils covering the majority of the installation have a thin layer of topsoil, are heavily textured, seasonally wet, strongly acidic, and limited in productivity by poor drainage (AMEC, 2008). Installation soils have been heavily influenced in many areas by human-related activities, including agriculture, cut-and-fill operations, fire, and general construction related activities. Eight soil associations exist at the former RVAAP/Camp Ravenna: Chili, Fitchville-Haskins-Sebring, Loudonville-Mitiwanga-Dekalb, Mahoning-Ellsworth, Ravenna-Canfield, Remsen-Geeburg-Trumbull, Sebring-Holly-Canaedea, and Wadsworth-Rittman.

The eastern two-thirds of the property is Hiram Till, a 5- to 15-ft thick clay-rich, relatively impermeable till deposited as a ground moraine. The Hiram Till overlies thin beds of sandy outwash material in the far northeastern corner of the facility. Hiram Till generally falls in the Mahoning-Ellsworth soil association (AMEC, 2008). The Lavery Till was deposited along the western one-third of the installation (AMEC, 2008). The Lavery Till is composed of silty sand material, few cobbles, and sporadic boulders, and is approximately 20–40 ft. thick. The Lavery Till generally falls in the Wadsworth-Rittman soil association. In addition to the glacially formed soils, recent alluvium is present in the Lower Sand Creek area and in the Eagle Creek/Sand Creek confluence area, which is considered the Sebring-Holly-Canaedea association. Additional outwash sand and gravel is present in the elevated area of the northeastern corner of the installation (AMEC, 2008). This installation has very little difficulty with erosion control. Generally, slope on the installation is five percent or less. Most areas have a slope of two percent or less.

3.5.2 Regional Geology

The regional geology at the former RVAAP/Camp Ravennaconsists of horizontal to gently dipping bedrock strata of Mississippian and Pennsylvanian age overlain by varying thickness of unconsolidated glacial deposits. The former RVAAP/Camp Ravenna is situated within the glaciated Allegheny Plateau section of the Appalachian Plateaus Province. The general terrain is gently rolling, which is characteristic of postglacial moraine formations. Glacial till deposits from the Wisconsinan glacial period mark surficial geology at the former RVAAP/Camp Ravenna, with occasional outcrops of bedrock of the Pottsville formation.

The Pennsylvanian age Pottsville sandstone formation, composed of coarse, permeable sandstones to impermeable shales, is the uppermost bedrock unit underlying the former RVAAP/Camp Ravenna. The Pottsville formation is underlain by Mississippian-age shale of the Cuyahoga formation.

3.5.3 Geologic Setting of ODA1

Soils at ODA1 consist of the Fitchville silt loam series. This series exhibit 2–6 percent slopes, is somewhat poorly drained, and has low permeability (see Figure 3-3). The surficial geology at ODA1 consists of the Lavery Till. In general, the clayey silty Lavery Till consists of approximately 28 percent sand and 30 percent clay, but percentages can vary. As shown on Figure 3-4, ODA1 lies within the Sharon Conglomerate. However, depth to bedrock is unknown in the AOC.

Mississippian- and Pennsylvanian-age sandstones and conglomerates make up the stratigraphy underlying the Hiram and Lavery Tills at the former RVAAP/Camp Ravenna. The Mississippian Cuyahoga Formation, consisting of blue-gray silty shale with interbedded sandstone, crops out in the far northeastern corner of the facility. The Cuyahoga Formation has a gentle southward regional dip of 5 to 10 feet per mile. The remainder of the facility is underlain by the Pottsville Formation of Pennsylvanian age. The Pottsville Formation rests unconformably on the eroded Cuyahoga Formation and dips 5 to 10 feet per mile.

The Connoquenessing, Mercer, and Homewood Members of the Pottsville Formation are present beneath the western half of the former RVAAP/Camp Ravenna. The Connoquenessing Member is coarse gray sandstone with thin interbeds and partings of sandy shale. The Mercer Member, overlying the Connoquenessing Member, consists of silty to carbonaceous shale with thin, discontinuous sandstone lenses. The Homewood Member lies unconformably on the Mercer Member and consists of coarse-grained crossbedded sandstones.

The Sharon Sandstone Conglomerate Unit of the Cuyahoga Formation is the primary formation that underlies the eastern half of the former RVAAP/Camp Ravenna; however, the formation is also cross-bedded at the southwest portion of theormer RVAAP/Camp Ravenna RVAAP where the AOC is located. The Sharon Sandstone Conglomerate is frequently fractured, highly permeable, highly porous, coarse-grained, gray-white weathered orthoquartzite sandstone, commonly with white quartz pebbles and locally thin shale lenses. The Sharon shale overlies the conglomerate and consists of sandy, gray-black, fissile shale with plant fragments and thin flagstone beds.

3.6 Hydrogeology

This section describes the regional hydrogeology and hydrogeologic setting of ODA1.

3.6.1 Regional Hydrogeology

The major aquifers underlying the former RVAAP/Camp Ravenna are the sandstone units of the Pottsville formation. These aquifers exist under artesian conditions, and are typically confined by glacial drift or shale. Within this formation, the Sharon Conglomerate is the

most productive of these units, and is the major bedrock aquifer in northeastern Ohio. The study performed by Kammer (1982) indicated that of the 71 groundwater wells that penetrated the installation at that time, 57 were penetrating the Sharon Conglomerate. Data from the Kammer study indicated that the thickness of the Sharon Conglomerate ranges from 44–177 ft., while the average well depth at the former RVAAP/Camp Ravenna is approximately 155 ft., with a range between 83 and 261 ft. (Kammer, 1982).

Groundwater flow at the former RVAAP/Camp Ravenna is generally from west to east. Throughout the facility, average depth to groundwater is as deep as 50 ft. bgs (USACE, 2004). However, groundwater has been encountered at much shallower depths in the upper unconsolidated aquifer across the property. Groundwater flows from bedrock highs in the western portion of the property toward stream valleys in the eastern portion; these latter areas act as discharge areas, as indicated by static water levels in monitoring wells across the installation (Kammer, 1982).

Regionally, groundwater recharge occurs via surface streams and surface infiltration through sand and gravel within buried valleys. Two large buried valleys occur southwest and northwest of the facility, and can yield up to 1,600 gallons per minute of groundwater from wells penetrating those particular glacial tills.

The majority of the property itself is comprised of clay-rich glacial tills with low permeabilities and underlying bedrock formations with extremely variable, but relatively low permeabilities. Typical yields from wells penetrating the Sharon Conglomerate range from 5 to 200 gallons per minute; usually yields from the overlying unconsolidated sediments are considerably lower. In addition, the thickness and permeability of the bedrock formation/unit producing the water at the former RVAAP/Camp Ravenna vary considerably and have a strong effect on well yields, transmissivity, and hydraulic conductivity (Kammer, 1982).

3.6.2 Hydrogeologic Setting of ODA1

Characterization of the groundwater regime through monitoring well installation and sampling was not part of the scope of this Phase II RI. Subsurface hydrogeologic conditions at ODA1 are largely inferred from surface topography, surface water flow, soil conditions, and information from the surrounding NTA. The depth to the water table from direct-push soil borings at ODA1 has been observed from approximately 5 ft. bgs to 11 ft. bgs.

Shallow groundwater present in the unconsolidated glacial material is suspected to flow across the AOC from north to south, following topographic trends and surface water flow patterns. However, topographical relief is minute across the AOC that other factors may have a greater influence on groundwater movement (i.e., confining units, recharge areas, etc.). Because of the presence of a suspected regional buried bedrock valley beneath the AOC, it is

likely that multiple deeper saturated zones are present in the glacial materials. Any deeper groundwater is likely to flow along strike of the buried valley (i.e., to the southwest) and off of the former RVAAP/Camp Ravenna property (SAIC, 2001a).

3.7 Potential Receptors

Potential receptors include human and ecological receptors.

3.7.1 Human Receptors

This AOC is currently off-limits to unauthorized access due to MEC. The former RVAAP/Camp Ravenna is a controlled access facility that is fenced and patrolled by security personnel. Full-time OHARNG, BRAC, and contractor staff work at the facility. Military training and operations are conducted at the facility. ODA1 is located in the south central portion of the facility. The AOC is not currently used for military training activities, but may receive periodic foot traffic during restoration activities. The OHARNG projected future land use for the AOC is for military use. The AOC is classified as an active range and has activity and safety restrictions associated with Army policy and Range Management that are outside the purview of the CERCLA/IRP considerations of legacy contamination. The most representative receptor is the NGT; per the FWHHRAM (USACE, 2005a), this constitutes Military Training Land Use. However, since this RI is being updated and revised to incorporate requirements of the Risk Assessment Technical Memo, only the evaluation of Unrestricted (Residential) Land Use is fully evaluated to identify COCs in this RI. Residential land use, specifically the Residential Receptor (Adult and Child) scenario, is included to evaluate COCs for unrestricted land use at the AOC, as required by the CERCLA process and as outlined in the FWHHRAM (USACE, 2005a).

3.7.2 Ecological Receptors

The former RVAAP/Camp Ravenna has a diverse range of vegetation and habitat resources. The majority of lands within thefacility are postsuccessional agricultural lands, with the exception of a few areas of large mature forest and areas that were considered too wet to farm. Approximately 90 percent of the former RVAAP/Camp Ravenna, with the exception of wet woods, had historically been cleared and used for agriculture or otherwise disturbed (AMEC, 2008). Habitats currently present include large tracts of closed-canopy hardwood forest, scrub/shrub open areas, grasslands, wetlands, open-water ponds and lakes, and semi-improved administration areas.

Vegetated land can be divided into three broad vegetation categories: herb-dominated, shrub-dominated, and tree-dominated (AMEC, 2008). Tree-dominated areas are the most widespread form of vegetation across the former RVAAP/Camp Ravenna. The remaining

acres that are not dominated by vegetation include areas previously developed or disturbed through the emplacement of structures, roads, and other development.

Available estimates indicate that approximately one-third of the facility property meets the regulatory definition of a wetland, with the majority of the wetland areas located in the eastern portion of the facility. Wetland areas at the former RVAAP/Camp Ravenna include seasonal wetlands, wet fields, and forested wetlands. Many of the wetland areas are the result of natural drainage or beaver activity; however, some wetland areas are associated with anthropogenic settling ponds and drainage areas (AMEC, 2008). The potential for impacts on wetland areas at the former RVAAP/Camp Ravenna is real due to the amount of process effluent discharged to settling ponds and the natural drainage of the area in the past.

Federal status as a candidate, threatened, or endangered species is derived from the Endangered Species Act (ESA; *16 United States Code [USC] § 1538, et seq*) and is administered by the U.S. Fish and Wildlife Services. State-listed plant and animal species are determined by the Ohio Department of Natural Resources (ODNR). There are currently no federally listed species or critical habitats on Camp Ravenna property. There are species under federal review for listing, but none are listed. Information regarding endangered, threatened, and candidate species at the facility was obtained from the Camp Ravenna Rare Species List (Camp Ravenna, 2010). **Table 3-1** presents State-listed species that have been confirmed to be on the facility by biological inventories and confirmed sightings.

3.8 Conceptual Site Model

The Conceptual Site Model (CSM) for the former RVAAP/Camp Ravenna as presented in the *Final Facility-Wide Sampling and Analysis Plan* (*FSAP*) (SAIC, 2001b); herein referred to as the *FSAP*, operational information, and data collected during the Phase I RI in 1999 (SAIC, 2001a), were used to develop the preliminary CSM, as outlined below. The preliminary CSM was updated in the *DQO Report* (Shaw, 2009a). This preliminary CSM is refined to integrate the results of the evaluation of contaminant nature and extent, fate and transport modeling, and the HHRA and SLERA and presents a summary of available knowledge for the AOC.

3.8.1 Surface Soils

Surface soils at the site, characterized as 0–1 ft. bgs at the former RVAAP/Camp Ravenna, consist of silty loam. The surface soil is covered with thick vegetation consisting of primarily tall grass and overgrown brush. Surface soil sampling was conducted in 1999 as part of the Phase I RI. Additional surface soil sampling during the 2010 RI field activities was the target of surface soil sampling using incremental sampling method (ISM).

Previous surface soil samples collected at the site focused primarily on identified potential source areas within the AOC boundaries – the OB/OD area, plane storage areas, and low lying drainage areas. Sample results indicated that surface soils had been impacted primarily by metals and low level explosives (i.e., detections are primarily estimated values less than the EPA Region 9 Preliminary Remediation Goals) and the bulk of the contamination was concentrated around the south ditch and other isolated hotspots. Following the removal of soils from grids established during the 2000–2001 IRA, surface soils remain impacted by metals.

3.8.2 Subsurface Soils

Subsurface soils at the site, characterized as greater than 1 ft. bgs at the former RVAAP/Camp Ravenna, consist mostly of fine sands with interbedded lenses of silty sands and silty clays. Following the removal of soils from grids established during the 2000–2001 IRA, confirmatory composite samples from the base of these excavations indicated that subsurface soils had been impacted by metals (aluminum, arsenic, beryllium, chromium, copper, and lead).

A DGM investigation was performed in 2010 with the primary objective for ODA1 of characterizing the anomaly density in the subsurface. Subsurface soil sampling was performed during the 2010 RI field activities using a modified ISM approach (see Section 4.2.3.1). Locations were biased based on data gaps in subsurface soil results from the Phase I RI, confirmatory analytical results identified during the 2000–2001 removal action, and the DGM results for the site as presented in the *DGM Report* (Shaw, 2011).

3.8.3 Sediment/Surface Water

Sediment/surface water samples collected under the Phase I RI did not indicate impacts from ODA1 activities.

3.8.4 Groundwater

The one groundwater sample collected under the Phase I RI was obtained using direct-push boring techniques. Groundwater obtained from well points at the former RVAAP/Camp Ravenna is solely used for screening purposes. Specifically, any detects are considered minimal values and nondetects do not definitively indicate lack of contamination. Groundwater data that are used at the RVAAP for the purposes of evaluation, risk assessment, etc., must be obtained from properly installed, developed, and sampled monitoring wells. The groundwater sample did not indicate any impact from ODA1 activities. Future sampling of groundwater would be performed under a separate facility-wide program for groundwater.

3.8.5 Potential Chemicals of Interest

The nature and types of contaminants to be expected from the former ODA1 are primarily metals, explosives, and propellants. These types of chemicals would be expected as a result of the historical thermal destruction of munitions, explosives, and explosive-related material conducted at the site.

3.8.6 Potential Receptors

The OHARNG projected future land use for the AOC is for military use. The most representative receptor is the NGT; per the FWHHRAM (USACE, 2005a).

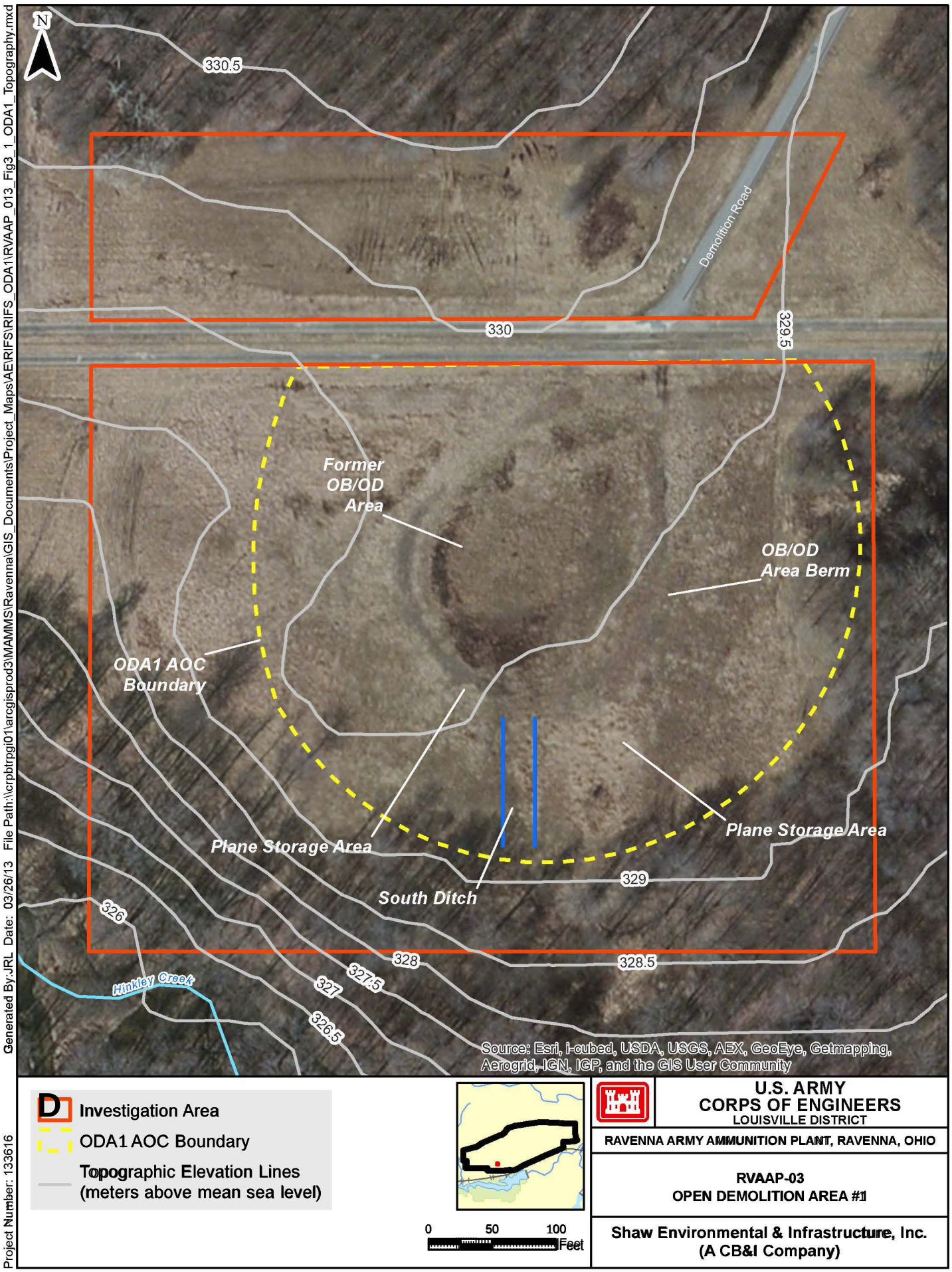


FIGURE 3-1 TOPOGRAPHY

FIGURE 3-2 SURFACE WATER DRAINAGE FEATURES

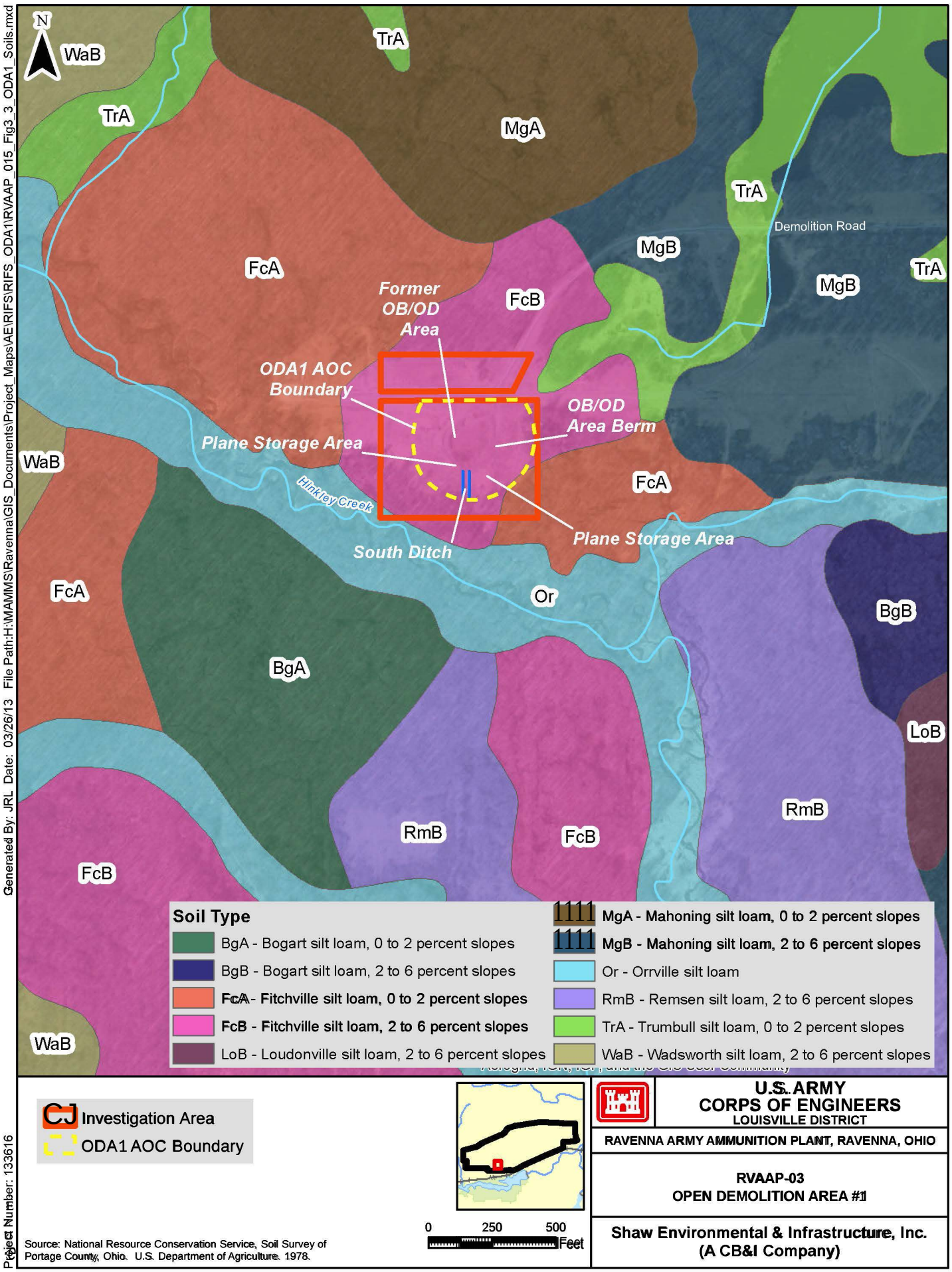


FIGURE 3-3 SOIL TYPES

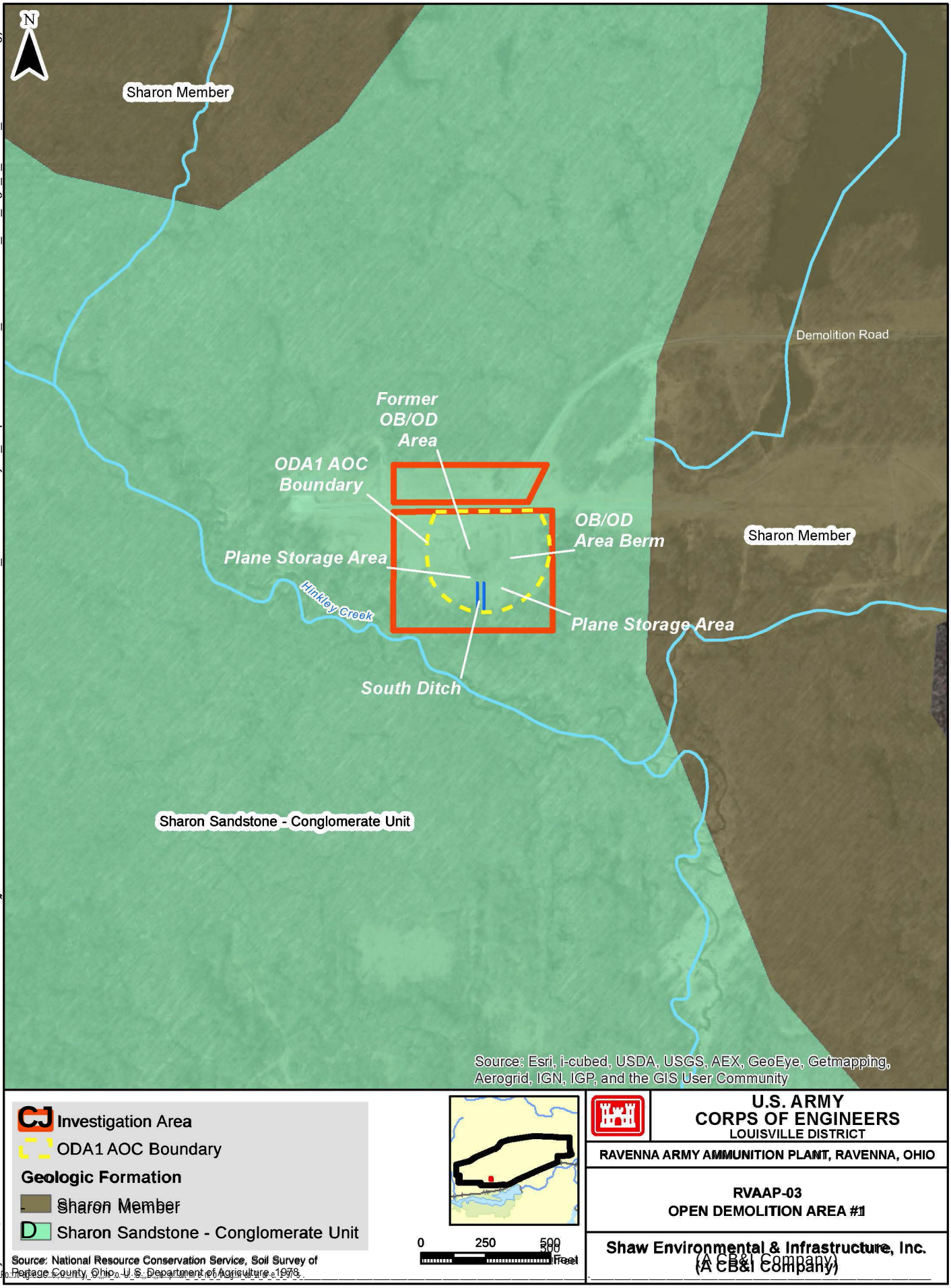


FIGURE 3-4 BEDROCK GEOLOGY

Table 3-1
Camp Ravenna Rare Species List
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Common Name	Scientific Name
State Endangered	
American bittern	*Botaurus lentiginosus*
Northern harrier	*Circus cyaneus*
Yellow-bellied sapsucker	*Sphyrapicus varius*
Golden-winged warbler	*Vermivora chrysoptera*
Osprey	*Pandion haliaetus*
Trumpeter swan	*Cygnus buccinator*
Mountain brook lamprey	*Ichthyomyzon greeleyi*
Graceful underwing moth	*Catocala gracilis*
Tufted moisture-loving moss	*Philonotis fontana var. Caespitosa*
Bobcat	*Felis rufus*
Narrow-necked Pohl's moss	*Pohlia elongate var. Elongata*
Sandhill crane (probable nester)	*Grus canadensis*
Bald eagle (nesting pair)	*Haliaetus leucocephalus*
State Threatened	
Barn owl	*Tyto alba*
Dark-eyed junco (migrant)	*Junco hyemalis*
Hermit thrush (migrant)	*Catharus guttatus*
Least bittern	*Ixobrychus exilis*
Least flycatcher	*Empidonax minimus*
Caddisfly	*Psilotreta indecisa*
Simple willow-herb	*Epilobium strictum*
Woodland horsetail	*Equisetum sylvaticum*
Lurking leskea	*Plagiiothecium latebricola*
Pale sedge	*Carex pallescens*
State Potentially Threatened Plants	
Gray birch	*Betula populifolia*
Butternut	*Juglans cinerea*
Northern rose azalea	*Rhododendron nudiflorum var. Roseum*

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Table 3-1 (continued)
Camp Ravenna Rare Species List
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Common Name	Scientific Name
Hobblebush	*Viburnum alnifolium*
Long beech fern	*Phegopteris connectilis*
Straw sedge	*Carex straminea*
Large St. Johnswort	*Hypercium majus*
Water avens	*Geum rivale*
Shinning lady's tresses	*Spiranthes lucida*
Swamp oats	*Sphenopholis pensylvanica*
Arborvitae	*Thuja occidentalis*
American chestnut	*Castanea dentata*
State Species of Concern	
Pygmy shrew	*Sorex hoyi*
Woodland jumping mouse	*Napaeozapus insignis*
Star-nosed mole	*Condylura cristata*
Sharp-shinned hawk	*Accipiter striatus*
Marsh wren	*Cistothorus palustris*
Henslow's sparrow	*Ammodramus henslowii*
Cerulean warbler	*Dendroica cerulea*
Prothonotary warbler	*Protonotaria citrea*
Bobolink	*Dolichonyx oryzivorus*
Northern bobwhite	*Colinus virginianus*
Common moorhen	*Gallinula chlorpus*
Great egret (migrant)	*Ardea alba*
Sora	*Porzana carolina*
Virginia rail	*Rallus limicola*
Creek heelsplitter	*Lasmigona compressa*
Eastern box turtle	*Terrapene carolina*
Four-toed salamander	*Hemidactylium scutatum*
Mayfly	*Stenonema ithica*
Coastal plain apamea	*Apamea mixta*

Table 3-1 (continued)
Camp Ravenna Rare Species List
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Common Name	Scientific Name
Willow peasant	*Brachylomia algens*
Sedge wren	*Cistothorus platensis*
State Special Interest	
Canada warbler	*Wilsonia canadensis*
Little blue heron	*Egretta caerula*
Magnolia warbler	*Dendroica magnolia*
Northern waterthrush	*Seiurus noveboracensis*
Winter wren	*Troglodytes troglodytes*
Back-throated blue warbler	*Dendroica caerulescens*
Brown creeper	*Certhia americana*
Mourning warbler	*Oporornis philadelphia*
Pine siskin	*Carduelis pinus*
Purple finch	*Carpodacus purpureus*
Red-breasted nuthatch	*Sitta canadensis*
Golden-crowned kinglet	*Regulus satrapa*
Blackburnian warbler	*Dendroica fusca*
Blue grosbeak	*Guiraca caerulea*
Common snipe	*Gallinago gallinago*
American wigeon	*Anas americana*
Gadwall	*Anas strepera*
Green-winged teal	*Anas crecca*
Northern shoveler	*Anas clypeata*
Redhead duck	*Aythya Americana*
Ruddy duck	*Oxyura jamaicensis*

Source: Camp Ravenna Joint Military Training Center Rare Species List, April 27, 2010.

4.0 STUDY AREA INVESTIGATION

This section presents a summary of the various tasks involved in the Phase II RI field investigation, from presampling activities, preparation for field work, sample locations, rationale, and description of sampling methods used, to develop this RI. In addition, specific details of how these tasks were carried out in the field are provided. **Appendices A** through **J** of this Phase II RI contain supporting data collected during the Phase II RI. These appendices consist of soil and sampling logs, QA documentation, laboratory analytical data, investigation-derived waste management characterization reports, and supporting data for the screening-level human health and ecological risk assessments.

4.1 Presampling Activities

Before sampling crews were mobilized to collect field samples, activities that ensured a quick, efficient mobilization and orderly execution of the project were completed. These activities included the following:

- Conducted MEC clearance for sampling locations using MEC avoidance procedures;
- Cleared vegetation from AOCs as needed for sample location access;
- Verified that no utilities were present;
- Staked sampling locations;
- Inspected and transported sampling equipment to the field; and
- Established work zones and decontamination facilities for sampling equipment.

4.1.1 MEC Avoidance

Prior to entry at ODA1 by Shaw field personnel, Shaw conducted MEC avoidance procedures as presented in Section 4.1.5 of the Safety, Health, and Emergency Response Plan (SHERP; Shaw, 2009b). Shaw provided a UXO technician for performing initial ground clearance of potential MEC with a Schonstedt Model GA-52Cx magnetometer. During subsurface sampling activities, the UXO technician screened the boreholes using the Schonstedt as a downhole sensor until the field geologist determined that the boring had reached undisturbed soil. No MEC was encountered during the Phase II RI investigation.

4.1.2 Vegetation Clearing

The vegetation in the north and south boundaries of ODA1 is thickly wooded with considerable canopy. The remainder of ODA1 is open with vegetation coverage consisting primarily of grass. Removing excess vegetation was required in order to allow for a quality

geophysical survey and sampling activities. Vegetation removal included small trees (less than 3 inches in diameter), scrub brush, and hanging vegetation (less than 6 ft. above ground surface) along the north, south, and east ODA1 boundaries. Clearing activities at these locations maximized the extent possible to allow for execution of work. Ground level vegetation was mowed so personnel and equipment could safely access the designated sampling locations, as necessary. Shaw cleared vegetation that impeded or interfered with the safe and effective implementation of the project.

4.1.3 Utility Clearance

Prior to intrusive subsurface activities, on-site personnel reviewed available subsurface geophysical details and facility plans to aid in identifying subsurface utilities for clearance. All infrastructure organizations or utility related agencies were contacted, including the Ohio Utilities Protection Services, which potentially had utilities in the vicinity of each area. No utilities were identified that impeded subsurface investigations at ODA1.

4.1.4 Staking Sample Locations

Wooden stakes were placed at the approximate subsurface soil sampling locations and at the four corners of each ISM decision unit area. Section 4.3.4 discusses the surveying techniques utilized for the staked areas.

4.1.5 Establish Work Zones and Decontamination Area

Shaw established work zones in accordance with the procedures presented in the SHERP (Shaw, 2009b). Due to the relatively short duration of this project, services such as water, telephone, sanitary, and gas were not installed at the AOC. Water for decontamination of personnel and equipment was stored in portable containers.

A temporary decontamination area was constructed to facilitate decontamination of drill rigs and other associated equipment and personnel. Section 4.3.3 further discusses decontamination procedures.

4.2 RI Field Investigation

ISM surface soil samples and modified ISM subsurface samples were collected as part of the environmental investigation at ODA1. The characterization field activities were performed in a well-defined and consistent manner, ensuring resulting data was comparable between sampling locations and could be validated against all applicable quality control (QC) requirements. This section defines the field methods and procedures that Shaw implemented in accordance with the *FSAP* (SAIC, 2001b), and the *Addendum* (Shaw, 2010a). Sampling activities conducted during the Phase II RI included the following:

- Discrete VOC soil sampling (varied, see AOC-specific Table 5-1);

- ISM surface soil characterization (0–1 ft. bgs); and
- Modified ISM subsurface soil characterization (varied, see AOC-specific Table 5-1).

Table 1-1 in the *Final Quality Assurance Project Plan (QAPP) Addendum No. 1 for Environmental Services at RVAAP-34 Sand Creek Disposal Road Landfill, RVAAP-03 Open Demolition Area #1, and RVAAP-28 Mustard Agent Burial Site Version 1.0* (Shaw, 2010b), herein referred to as the *QAPP Addendum*, summarizes sampling and analysis requirements. The following sections discuss the sampling rationale, field protocols, and procedures that were used for the sampling activities conducted at ODA1.

4.2.1 Surface Soil Sampling

Data gaps identified four inorganic COPCs (arsenic, beryllium, chromium (total), and cobalt) in the central portion surface soils (DA1-008, 018, and 019), southwest perimeter (DA1-026), southern perimeter (DA1-030), and southeast portion (DA1-034) of the site. As several of these previous sampling locations (DA1-008, DA1-018, and DA1-019) in the central portion of the site are bound horizontally by IRA excavation grids or other surface soil samples, data gaps for the inorganic COPCs in surface soil remained horizontally along the southwest, south, and southeast perimeter of the site. Five decision units (DA1dd-050–054) during this Phase II field investigation were established. Decision unit DA1ss-050 was established to horizontally define the extent of COPCs (arsenic, chromium (total), and cobalt) surrounding Phase I RI sample DA1-34. Decision unit DA1ss-051 was established to horizontally define the extent of COPCs (chromium (total) and cobalt) surrounding Phase I RI sample DA1-30. Decision unit DA1ss-052 was established to horizontally define the extent of COPCs (chromium (total) and cobalt) surrounding Phase I RI sample DA1-26. Since the purpose of the perimeter surface soil sampling was to confirm the significance of previous discrete surface soil sample results, the ISM effort included those previous sampling locations. Decision Units DA1ss-053 and DA1ss-054 were also established to fully characterize the site along the southern perimeter.

4.2.1.1 ISM Approach

Surface soil samples were collected using the ISM. Collecting, preparing, and analyzing an ISM sample provides a repeatable and accurate measure of the average concentrations of chemicals of interest (COIs) within a sample area. A sufficient amount of sample material was collected from the sample area to account for compositional heterogeneity.

Each ISM surface soil sample consisted of 30 random samples collected from the decision units (DA1SS-050 to DA1SS-054) across the entire 1-ft interval between 0 and 1 ft. bgs. Sub-sample locations within the designated ISM sampling area were selected on a

systematic-random basis at ODA1 due to its reproducibility. In using the systematic random sample approach (as depicted on Figure 4-1) three key steps were followed: (1) the ISM sampling area was subdivided into a uniform grid (i.e., paced out the area and divided into 30 grids for a 30-aliquot sample), (2) selected a single randomly selected sub-sample location in the first grid, and (3) collected sub-samples from the same relative locations within each of the other grids (USACE, 2009). The ISM decision units are shown on Figure 4-2.

A total of 6 (including one duplicate) ISM surface soil samples were collected from 0–1 ft. bgs from the 5 separate decision units (DA1ss-050- to DA1ss-054). The ISM samples were collected using a $^{7}/_{8}$-inch stainless steel step probe sample collection device. The samples were then placed into a plastic-lined bucket and combined to make a single sample. Approximately 1 kilogram of soil was collected from each ISM sample and submitted to the laboratory for processing and analysis. Any material larger than the # 10 sieve was discarded. The remaining air-dried, sieved material was then grounded to better homogenize the sample. Field duplicate QC samples were collected from within the same ISM decision unit consisting of 30 sub-sample aliquots each. ISM samples were analyzed for Target Analyte List (TAL) metals, explosives, and hexavalent chromium. One sample (DA1-052M-0201-SO) was also analyzed for remaining full-suite analyses except VOCs (SVOCs, PCBs, pesticides, and propellants) and cyanide. Note that ISM samples were not analyzed for VOCs (typically part of the RVAAP full suite) as discussed in the following section. Sample grid logs were prepared at the time of sampling in accordance with the *FSAP* and *Addendum,* and are provided in Appendix A.

4.2.2 Discrete VOC Surface Soil Samples

ISM was not utilized for surface samples to be analyzed for VOC analysis that comprised of one sample location collected as part of the RVAAP full suite. One discrete sample (DA1-052D-0201-SO) was collected for VOC analysis at the 0–1 ft. bgs interval from the soil borehole using a disposable terra core sampler. The specific location of the discrete sample was intended to be biased toward stained soils, or soils that exhibited volatile compounds; however, no such locations were identified during the field sampling activities and the location was randomly chosen within the designated sample interval. Soil portions designated for VOC analysis were placed directly in the sample container and were not composited or further processed in the field.

QC samples for surface soil samples VOC analysis included one field duplicate sample and matrix spike/matrix spike duplicate (MS/MSD) at the same frequency as the RVAAP full-suite ISM sample. The collection of the QC samples required similar portions of soil as the original sample. The field duplicates were labeled with different sample numbers and submitted to the laboratory for processing as a blind field duplicate. QA samples for VOC

analysis were collected for the USACE only at a frequency of 10 percent of the VOC samples collected using the same methods as for the collection of the QC samples. The QA samples were submitted to the specified USACE-contracted laboratory for processing and analysis.

4.2.3 Subsurface Soil Sampling

Data gaps were identified for six inorganic COCs (aluminum, arsenic, beryllium, chromium [total], copper, and lead), one propellant (nitrocellulose), and four VOCs (benzene, ethylbenzene, toluene, and xylenes) post Phase I and IRA. Subsurface modified ISM soil samples were collected in order to address these data gaps and to define the vertical extent of these COCs primarily in the west, southwest, and south central portions of the site.

4.2.3.1 Modified Incremental Sampling Approach

Subsurface soil samples were collected by means of hydraulic direct-push (i.e., Geoprobe®) to a maximum sampling depth of 16 ft. bgs at ODA1. The procedures for hydraulic direct-push and sampling are discussed in the *FSAP* and *Addendum*.

In order to be consistent with the excavation confirmation sampling and potential future use of the data in risk assessments, subsurface samples collected in previously excavated areas were collected at the beginning of the bottom of the excavation (either 2 ft., 4 ft., or 5 ft. bgs depending upon the location) and proceeded in 4-ft intervals thereafter. Subsurface soil samples collected in areas that were not previously excavated began at 1 ft. bgs such that the first interval was from 1–4 ft. bgs, and in 4-ft intervals thereafter (refer to Table 5-1 for sample depth intervals). A total of 91 (including eight duplicates) subsurface soil samples were collected using the modified ISM approach from 23 soil borings. In general, 30 increments of soil were collected from the soil column for each 4-ft interval to generate a modified ISM sample. Field duplicate QC samples were collected from within the same ISM boring consisting of 30 subsample aliquots each. Borehole logs were prepared at the time of sampling in accordance with the *FSAP* and *Addendum,* and are provided in Appendix A. Organic vapor screening using a photoionization detector was conducted on soil cores.

All modified ISM subsurface soil samples were analyzed for TAL metals and explosives. Select samples were collected for the remaining full-suite analyses except VOCs (SVOCs, PCBs, pesticides, and propellants), and cyanide. Select samples were also analyzed for hexavalent chromium (see Table 5-1). Note that ISM samples were not analyzed for VOCs (typically part of the full suite) as discussed in the following section.

4.2.4 Discrete VOC Subsurface Soil Samples

Modified ISM was not utilized for subsurface samples to be analyzed for VOC analysis which comprised approximately 10 percent of the sample locations collected as part of the

RVAAP full suite. For samples designated for VOC analysis, one discrete sample was collected at the designated depth interval from the Geoprobe® soil probe sample interval using a disposable terra core sampler. The specific location of the discrete sample was intended to be biased toward stained soils or soils that exhibited volatile compounds; however, no such locations were identified during the field sampling activities and the locations were randomly chosen within the designated sample interval (see Table 5-1 for locations and sample depths). Soil portions designated for VOC analysis were placed directly in the sample container and were not composited or further processed in the field. A total of 22 discrete subsurface soil samples were collected from 9 soil borings.

QC samples for VOC analysis of subsurface soil samples included field duplicate samples and MS/MSD at the same frequency as the RVAAP full suite modified ISM samples. The collection of QC samples required similar portions of soil as the original sample. The field duplicates were labeled with different sample numbers and submitted to the laboratory for processing as a blind field duplicate. QA samples for VOC analysis were collected for the USACE at a frequency of 10 percent of the VOC samples collected using the same methods as for the collection of the QC samples. The QA samples were submitted to the specified USACE-contracted laboratory for processing and analysis.

4.2.5 Chromium Speciation

Samples collected at ODA1 during the 1999 Phase I RI were analyzed for total chromium only. As part of the *DQO Report* (Shaw, 2009a), the Draft FWCUG for total chromium was used for screening both total and hexavalent chromium results. Although, a Final FWCUG is provided for hexavalent chromium for each of the receptors, it is the same as the Final FWCUG for total chromium. The use of the total chromium Final FWCUG for both chromium states is based on the assumption that chromium exists predominantly in the trivalent state, rather than the more toxic hexavalent state. In order to confirm this assumption and determine an appropriate risk, chromium speciation samples were collected at the site to develop AOC-specific ratios of hexavalent chromium to trivalent chromium in the surface soil and subsurface soil media.

Chromium speciation measures the concentration of chromium present in both the hexavalent and trivalent forms. Based on these measurements, a sample-specific ratio of hexavalent chromium to trivalent chromium can be calculated. When done for several samples at a site, a site-specific ratio can be determined. This ratio is then applied to the larger total chromium data set as part of the development of site-specific risks. For ODA1, this ratio was calculated by providing a comparison of the six surface soils, and five subsurface soils samples that were collected for both hexavalent chromium and total chromium analysis. Efforts were made to collect samples, both from areas previously

identified as having elevated total chromium concentrations and areas identified as having chromium concentrations near background levels.

Should analytical data indicate the ratio of hexavalent chromium to trivalent chromium is 1:6 (i.e., 14 percent) in environmental samples at the site; the Final FWCUG for total chromium will be used for risk calculations as part of the human health risk and ecological screening assessments required for the Phase II RI. This process has been approved and was documented in the RI Report Addendum No. 1 for the RVAAP-49 Central Burn Pits (SAIC, 2008). However, if the ratio varies from the standard 1:6 ratio, the Final FWCUG will be adjusted to a lower or greater value using the toxicity values for the two valence states of chromium and the AOC-specific hexavalent to trivalent chromium ratio for each media.

4.3 Deviations from the Work Plan

No Field Change Requests were submitted for the Phase II RI field work. Deviations in the field based on site conditions are documented in the field sampling logs (Appendix A). Deviations from the work plan consisted of the following:

- In soil boring DA1sb-070, discrete sample DA1sb-070D-0204 (12–16 ft. bgs) was not collected due to poor sample recovery.
- In soil boring DA1sb-076, sample interval 12–16 ft. bgs was not collected due to poor sample recovery.
- A U.S. Army duplicate sample DA1sb-087M-0201-SO (1–4 ft. bgs) from soil boring DA1sb-075 was not analyzed due to insufficient sample volume.

4.3.1 Sample Collection for Laboratory Chemical Analyses

The following chemical analyses were conducted for soil samples:

- All ISM samples were analyzed for TAL metals and explosives.
- Ten percent of ISM samples at ODA1 were analyzed for cyanide and the full suite of parameters (Table 1-1 of the *QAPP Addendum*) including VOCs (discrete samples only), SVOCs, pesticides, PCBs, and propellants (nitroglycerine, nitrocellulose, and nitroguanidine).
- ISM samples were not analyzed for VOCs; instead, a discrete sample was specially handled for VOC analysis at designated ISM sample areas.
- Up to five samples per media were analyzed for hexavalent chromium.

4.3.2 Field QC Sampling Procedures

Soil QA/QC samples were collected at ODA1. QC duplicate samples were collected at a frequency of 10 percent (1 per 10 environmental samples) for each medium (i.e., soil). MS/MSD samples were collected at a rate of 5 percent (1 per 20) of the total samples per medium. Field duplicate QC samples were collected from within the same ISM boring consisting of 30 sub-sample aliquots each or within the same decision unit for surface soil. The field duplicates were labeled with different sample numbers and submitted to the laboratory for processing as a blind field duplicate. For QA of ISM samples, designated samples were processed and split by the primary laboratory. The QA split sample was submitted to the USACE-contracted QA Laboratory for analysis. Rinsate blank samples were collected to ensure sampling equipment was decontaminated properly. A QA Summary Report is provided in Appendix B.

One source blank was also collected from the deionized/distilled (ASTM International Type I) water source used. The source blank was analyzed for a full suite of analyses. A sample was also collected from the potable water source.

Section 3.0 of the *QAPP Addendum* summarizes QA/QC sampling requirements. Quantities of QA/QC samples are presented in Table 1-1 of the *QAPP Addendum*.

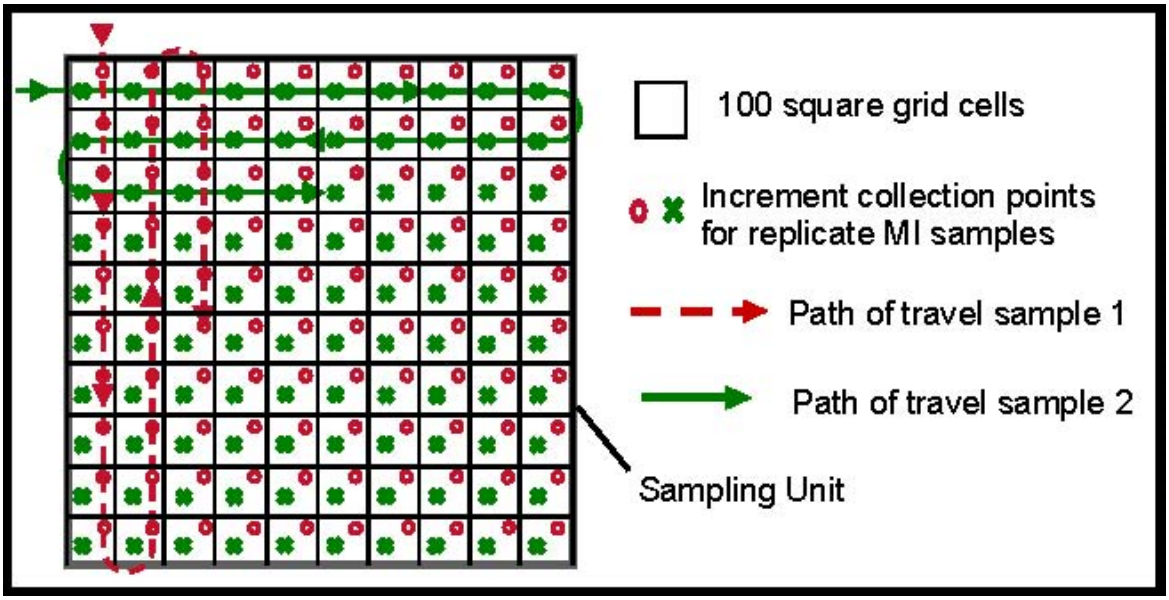
4.3.3 Decontamination Procedures

The decontamination procedure for surface and subsurface soil sampling activities is presented in Section 4.4.2.8 of the *FSAP*. This procedure was followed with the exception of using isopropanol in place of the methanol rinse. A final decontamination inspection of any equipment leaving the former RVAAP/Camp Ravenna at the end of field activities was conducted to ensure proper decontamination.

4.3.4 Site Survey

Following sampling activities, the horizontal coordinates of all sampling locations and the corners of ISM sample areas were determined. Surveys were performed utilizing a Trimble GeoXH Global Positioning System with subfoot accuracy. All locations were conveyed in Ohio State Plane Coordinates (NAD83) feet. The coordinates were downloaded and entered into an excel format for mapping.

Figure 4-1
Systematic Random Sampling



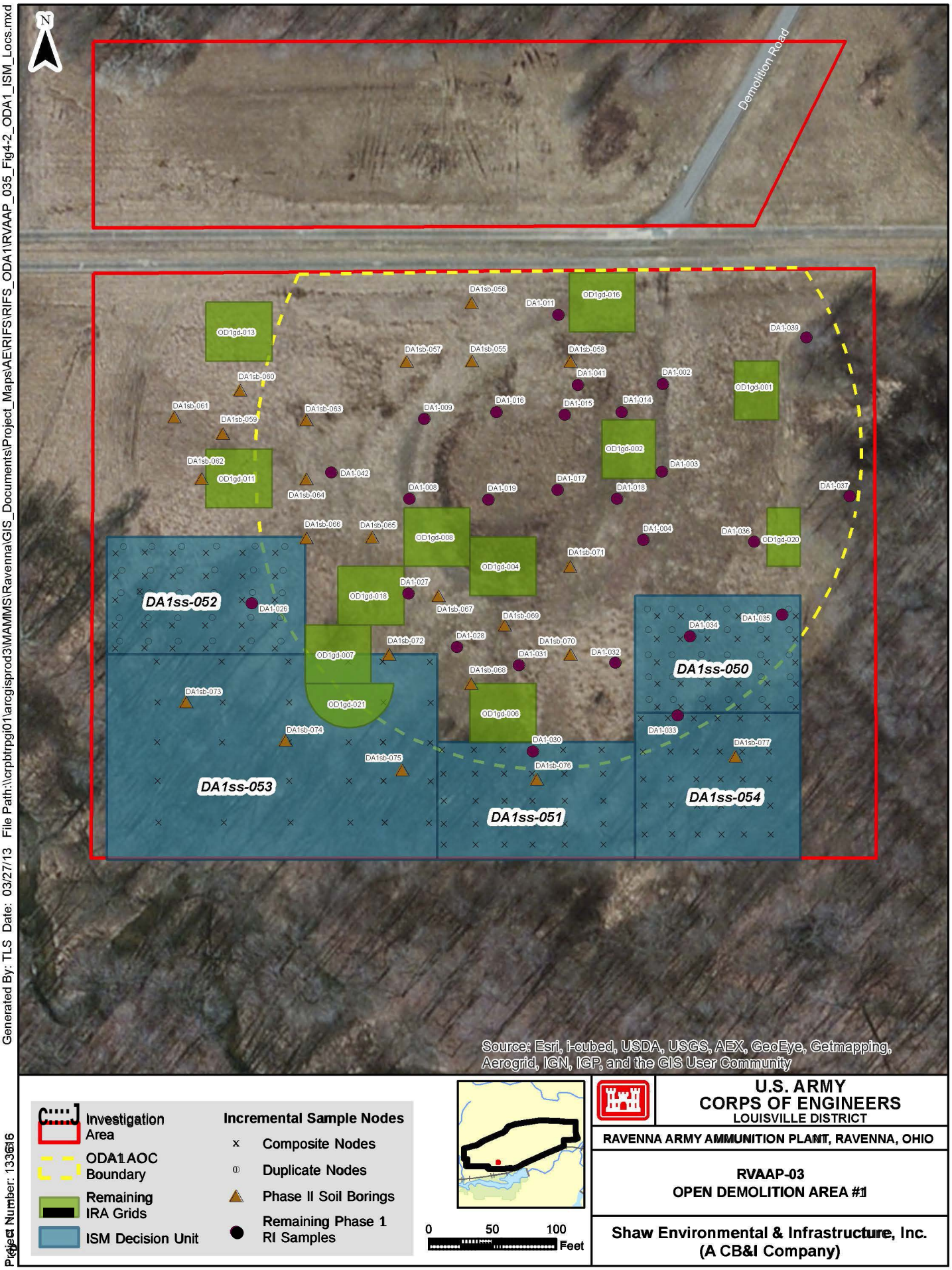


FIGURE 4-2 INCREMENTAL SAMPLING METHOD DECISION UNITS FOR PHASE II RI

5.0 NATURE AND EXTENT OF CONTAMINATION

This section presents results of the Phase II RI data screening process to identify site-related contaminants (SRCs) indicative of impacts from AOC operations, and to evaluate occurrence and distribution of SRCs in environmental media at ODA1. The data evaluated in this section is inclusive of the results from the 2010 Phase II RI sampling, as well as previously collected remaining samples collected during the 1999 Phase I RI and 2000–2001 removal action.

Section 5.1 presents the data reduction and screening process, which describes statistical methods and facility-wide background screening criteria used to distinguish constituents present at ambient concentrations from those present at concentrations that indicate potential impacts related to historical operations within the AOC. Sections 5.2 through 5.5 present the nature and extent of identified SRCs within each environmental media and spatial data aggregates (surface soil and subsurface soil) established for this Phase II RI Report. Summary analytical results are presented in tabular formats at the end of this section addressing each data aggregate. Complete analytical results are in Appendix C.

Table 5-1 presents a summary of the Phase II RI field sampling and analytical program for ODA1 and Table 5-2 (later in this section) presents a summary of the remaining Phase I RI and removal action samples that were used for the screening process. Appendix L is a photograph log of representative soil conditions from various soil borings and sampling equipment.

5.1 Data Evaluation Method

Data evaluation methods for ODA1 are consistent with those established in the Final FWCUG Report (SAIC, 2010). These methods consist of three general steps: (1) define data aggregates, (2) verify data, reduction and screening, and (3) present data.

5.1.1 Definition of Aggregates

ODA1 data was grouped (aggregated) in two ways for evaluation of contaminant nature and extent and the human health and ecological risk assessments. The initial basic aggregation of data was by environmental media: soil (surface and subsurface). For each media aggregate, an evaluation was conducted to determine if further aggregation was warranted with respect to site characteristics, historical operations, ecological habitat, and potential future remedial strategy and land use (i.e., spatial aggregates). Data for soil was further aggregated based on depth and sample type for consistency with the exposure units (EUs) for human health risk and guidance established in the *RVAAP Facility-Wide Human Health Risk Assessor Manual, Amendment 1* (USACE, 2005a) and Final FWCUG Report (SAIC, 2010). Data aggregates for evaluating the nature and extent of contamination at ODA1 are as follows:

- **Surface Soil (0–1 ft. bgs):** This medium is evaluated as an AOC-wide aggregate; however, both ISM and discrete data are available for this media. It is inappropriate to combine data from these two sample types; therefore, these two samples types are evaluated separately.
- **Subsurface Soil (greater than 1 ft. bgs):** This medium is evaluated as an AOC-wide aggregate on the same basis as surface soil. The subsurface soil samples were aggregated based on sample depth intervals of 1–4 ft. bgs, 4–8 ft. bgs, 8–12 ft. bgs, and 12–16 ft. bgs.

The soil data aggregates are further subdivided to define human health and ecological risk EUs in the risk assessments as discussed in Section 7.2 and Section 8.5 (i.e., shallow surface soil, deep surface soil, subsurface soil).

5.1.2 Data Verification

Data validation was performed on all 7 surface soil and 112 subsurface soil samples (including field and QC duplicates) collected during the Phase II RI field activities at ODA1 to ensure that the precision and accuracy of the analytical data were adequate for their intended use. The review constituted comprehensive validation of 100 percent of the primary dataset.

Analytical results were reported by the laboratory in electronic format and issued to Shaw on compact disc. Data validation was performed to ensure all requested data were received and complete. Data use qualifiers were assigned to each result based on the criteria provided in the *DOD Quality Systems Manual for Environmental Laboratories, Version* 4.1 (DOD, 2009). Results were qualified as follows:

- "U"—Analyte was not detected and reported less than the Level of Detection (LOD).
- "J"—The reported result is an estimated value or one or more QC criteria failed (i.e., Laboratory Control Sample, surrogate spike recovery, or Continued Calibration Verification); also used to identify a sample result between the detection limit and the level of quantitation.

In addition to assigning qualifiers, the validation process also selected the appropriate result to use when reanalysis or dilutions were performed. Where laboratory surrogate recovery data or laboratory QC samples were outside of analytical method specifications, the verification chemist determined whether laboratory reanalysis should be used in place of an original reported result. If the laboratory reported results for both diluted and undiluted samples, diluted sample results were used for those analytes whose concentrations were

greater than the calibration range of the undiluted sample. A complete presentation of the verification process results is contained in the QA Summary Report (Appendix B) and Data Validation Report (Appendix D).

USACE performed third-party data validation for the data results and deemed that the data is acceptable for use. USACE's Final Data Validation Report and chemical data usability assessment for the ODA1 data is presented in Appendix E.

5.1.3 Data Reduction and Screening

The data reduction process employed to identify SRCs involves identifying frequency of detection summary statistics, comparison to the former RVAAP/Camp Ravenna facility-wide background values (inorganics only), and evaluation of essential nutrients. Historical site data used were from the remaining Phase I RI sample data and the remaining 2000–2001 confirmatory sample data from the removal action; QC and field duplicates were excluded from the screening data sets. All analytes having at least one detected value were included in the data reduction process. Summary statistics calculated for each data aggregate included the minimum, maximum, and average (mean) detected values and the proportion of detected results to the total number of samples collected. For calculation of mean detected values, nondetected results were included by using one-half of the reported detection limit as a surrogate value during calculation of the mean result for each compound. Following data reduction, the data was screened to identify SRCs using the processes outlined in the following sections. Figure 5-1 shows the former RVAAP/Camp Ravenna data screening process to identify SRCs and COPCs in accordance with the Final FWCUG Report (SAIC, 2010).

5.1.3.1 Frequency of Detection

Chemicals that are detected infrequently, except explosives and propellants, may be artifacts in the data due to sampling, analytical, or other problems and; therefore, may not be related to the site activities or disposal practices. For sample aggregations, except for explosives and propellants, with at least 20 samples and frequency of detection of less than 5 percent, a weight of evidence approach was used to determine if the chemical is AOC-related. The magnitudes and clustering of the detections and the potential source of the chemical were evaluated keeping in mind that the site was used for the thermal destruction of munitions and munitions-related items and various chemicals may be present. For example, if detected results were not clustered, and the chemical was not found in other media at the study area, and the concentrations were not substantially elevated relative to the detection limit, then the chemical may be considered spurious and be eliminated from further consideration. Therefore, chemicals that were detected only at low concentrations in less than 5 percent of the samples from a given medium were dropped from further consideration, unless their

presence was expected based on historical information about the site, or it was likely to identify the existence of a 'hot spot'.

5.1.3.2 Facility Wide Background Screen

For each inorganic constituent, concentrations were compared against established former RVAAP facility-wide background values. For inorganic constituents, if the value was greater than its respective background criterion, it was considered to be an SRC. It should be noted that not all inorganic compounds, analyzed as part of the previous investigations or the Phase II RI sampling event, have established screening levels or background values; therefore, in the event an inorganic constituent was not detected in the background data set, the background value was set to zero, and any detected result for that constituent was considered above background. This conservative process ensures that detected constituents are not eliminated as SRCs simply because they are not detected in the background data set. All detected organic compounds were considered to be above background because these classes of compounds do not occur naturally.

5.1.3.3 Essential Nutrient Screen

Chemicals that are considered to be essential nutrients (calcium, chloride, iodine, iron, magnesium, potassium, phosphorus, and sodium) are an integral part of the food supply and are often added to foods as supplements. The EPA recommends that these chemicals not be evaluated as COPCs as long as they are (1) present at low concentrations (i.e., only slightly elevated above naturally occurring levels), and (2) toxic at very high doses (i.e., much higher than those that could be associated with contact at the site) (USACE, 2005a). For the remaining Phase I RI and removal action samples, as well as the Phase II RI samples, analyses were conducted for calcium, iron, magnesium, potassium, and sodium. These five constituents were eliminated as SRCs in soil based on comparison to background values.

5.1.4 Data Presentation

Data summary statistics and screening results for SRCs in surface and subsurface soil at ODA1 are presented for each media. Analytical results for the SRCs are presented by sample locations on Figures 5-2 through 5-13 and indicate the extent and magnitude of contamination by highlighting maximum detected concentrations of SRCs and those whose concentrations are greater than background values, if applicable. The SRCs are further evaluated in Section 7.0, Human Health Risk Assessment. The entire analytical data summary for samples collected for the Phase II RI as well as the remaining Phase I RI and 2000–2001 removal action samples are presented in Appendix C.

5.1.5 Data Use Evaluation

The types of environmental media sampled relevant to ODA1 during the 1999 Phase I RI consisted of surface and subsurface soil, and during the 2000–2001 removal action consisted of subsurface soil. Shaw collected additional samples as part of the 2010 Phase II RI that included surface and subsurface soil. All available sample data were evaluated to determine suitability for use in the various key RI data screens that include evaluation of nature and extent of contamination, fate and transport modeling, and human and ecological risk assessments. Evaluation of data suitability for use in this RI Report involved two primary considerations: (1) representativeness with respect to current AOC conditions, and (2) sample collection methods (i.e., discrete vs. ISM).

Previous data from past environmental investigations at ODA1 were considered to be included in the screening process; however, after evaluating data, it was concluded that (1) a large portion of data was no longer viable as the previous 2000–2001 removal action (MKM, 2004) removed most of the metal and explosive impacted soil to a depth of 4 ft. bgs (5–8 ft. in a few locations) that was previously identified during the Phase I RI. The remaining Phase I RI sample data that was not removed as part of the IRA represents current AOC conditions in their respective locations. In addition, most of the confirmatory grid sample data, collected during the removal action, has been superseded with more current samples collected in those grids during this Phase II RI investigation. The remaining confirmatory samples that were not superseded also represent current AOC conditions at the 4 ft. bgs interval in their respective locations. (2) The remaining subsurface Phase I RI data was collected using discrete sampling method; however, for the purposes of adequately defining the nature and extent of contamination and for the risk assessments, the data was screened along with modified ISM samples, since the modified ISM samples are representative of a specific interval and are not true multi-incremental samples in that they do not represent an entire area.

Therefore, applying the Phase I RI soil data that had not been removed from the removal action, and the soil data from the grids that were not superseded by current Phase II RI samples in conjunction with the Phase II RI sampling results, will adequately define the nature and extent of contamination in ODA1. Surface water and sediment were deemed not to have been impacted from historical ODA1 operations. Groundwater is currently being investigated under a separate facility-wide program. In addition to the samples listed in Table 5-1, the additional samples used in the screening process for ODA1 are presented in Table 5-2.

5.2 Chromium Speciation

During the Phase II RI field sampling event, six surface soil samples and five subsurface soil samples were collected for both chromium and hexavalent chromium analyses. These samples were collected for use in the risk calculations as part of the human health risk and ecological screening assessments required for the RI. Chromium speciation results are presented in Table 5-3. Hexavalent chromium was not detected in the 11 soil samples analyzed. Therefore, the tables and analysis of soil data in this report references total chromium only.

5.3 Contaminant Nature and Extent in Surface Soil

Data from all qualified and remaining historical Phase I RI surface samples and Phase II RI surface soil samples were combined and screened to identify SRCs representing current conditions at ODA1. The SRC screening data for surface soil included the following samples:

- 1999 Phase I RI: 18 discrete surface soil samples from 0–1 ft. bgs.
- 2010 RI:
  - Six ISM surface soil samples from 0–1 ft. bgs; and
  - One discrete surface soil sample from 0–1 ft. bgs for VOC analysis only.

The ISM samples were collected during the 2010 RI to further characterize the areas where COPCs, consisting of inorganics, data gaps were identified in the *DQO Report* (Shaw, 2009a) post Phase I RI and IRA excavation. All of the surface soil samples collected during the 2010 Phase II RI sampling event were submitted for TAL metals, explosives, and hexavalent chromium (previously discussed). Samples from one of the ISM decision units (DA1ss-052) were analyzed for SVOCs, VOCs, pesticides, PCBs, cyanide, and propellants. The sample analyzed for VOCs was collected as an individual discrete sample separate from the ISM decision units.

Tables 5-4 and 5-5 present the results of the SRCs screening for 2010 Phase II RI ISM and 1999 Phase I RI discrete surface soil samples, respectively. Table 5-8, included at the end of Section 5.0, summarizes the detected results for the 2010 Phase II surface soil samples. A summary of the 1999 Phase I RI discrete surface soil sample detects, along with the complete laboratory results are presented in Appendix C. Figures 5-2 through 5-4 present the SRC distribution in surface soils for ODA1.

5.3.1 Explosives and Propellants

The data presented in Table 5-4 and shown on Figure 5-2 identifies a total of two explosives (2,4,6-TNT and 2-amino-4,6-DNT), and one propellant compound (nitroguanidine) that are considered SRCs from the ISM samples collected during the 2010 Phase II RI field activities. The two explosives were detected at the southern portion of the site (DA1ss-051), downgradient of the "south ditch." The one propellant (nitroguanidine) detection was identified in the western portion of the site (DA1ss-052).

Two detections of explosives and no propellants were detected in the Phase I RI surface soil data set. A discrete surface soil sample (DA1ss-014) collected during the 1999 Phase I RI, detected the explosive 2,4-DNT at a concentration of 0.13 mg/kg located towards the northern central portion of the AOC within the OB/OD area. A discrete surface soil sample (DA1ss-003) collected during the 1999 Phase I RI, and located towards the northern central portion of the AOC within the OB/OD area, detected the explosive octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) at a concentration of 0.2 mg/kg; however, it was below the applicable method reporting limit. Surface soil samples were not collected during the 2010 Phase II RI in these 1999 Phase I RI sample locations.

5.3.2 Inorganics

A total of 11 inorganics were identified as SRCs based on the 2010 Phase II RI data summary presented in Table 5-4. All of these inorganics had a frequency of detection of at least 83 percent (5 detections in 6 samples). As shown on Figure 5-3, metals are distributed across the site.

Data gaps were identified for four inorganic COPCs (arsenic, beryllium, chromium [total], and cobalt) in surface soils in the central portion (DA1-008, 018, and 019), southwest perimeter (DA1-026), southern perimeter (DA1-030), and southeast portion (DA1-034) of the site in the *DQO Report* (Shaw, 2009a). The distribution of the four inorganic COPCs identified during the *DQO Report* for post Phase I RI and IRA samples, including the distribution in samples collected during the 2010 Phase II RI, are highlighted below:

- Arsenic consisted of 6 detections out of 6 samples collected during the 2010 Phase II RI; however, the maximum concentration (9.70 mg/kg) was less than the facility-wide background screen; therefore, was not retained as an SRC. Arsenic has been successfully delineated at the 1999 Phase I RI sample location DA1-034.
- Beryllium consisted of 6 detections out of 6 samples collected during the 2010 Phase II RI; however, the maximum concentration (0.40 mg/kg) was less than the EPA Region 9 preliminary remediation goals screening value (0.88 mg/kg) and was not retained as an SRC. Beryllium has been successfully delineated at the

1999 Phase I RI sample location DA1ss-008. This sample is located in the central portion of the site and bound horizontally by IRA excavation grids and other Phase I RI surface soil samples.

- Chromium consisted of six detections out of six samples collected during the 2010 Phase II RI. The maximum concentration (153 mg/kg) for chromium occurred in the southwestern portion of the site at decision unit DA1ss-053 (153 mg/kg). Chromium concentrations were greater than the facility-wide background screening value (BSV) in each of the six ISM samples collected from decision units DA1ss-050 to DA1ss-054. The area covered by these decision units includes the Phase I RI sample locations of DA1ss-034, DA1ss-030, and DA1ss-026 where chromium was identified in Phase I RI samples. The maximum detection of chromium during the 1999 Phase I RI occurred at DA1-018 (22.6 mg/kg), which is located in the central portion of the site. This sample location is bound horizontally by IRA excavation grids and other Phase I RI surface soil samples. A detection of chromium also occurred in the sample collected from DA1-019 during the 1999 Phase I RI, which is located in the central portion of the site. This sample location is bound horizontally by IRA excavation grids and other Phase I RI surface soil samples.
- Cobalt consisted of six detections out of six samples collected during the 2010 Phase II RI. The maximum concentration (20.6 mg/kg) for cobalt occurred in the southwestern portion of the site at sample location DA1ss-053, and this was the only ISM sample where the cobalt concentration was greater than the facility-wide BSV. The area covered by the ISM sample decision units DA1ss-050 to DA1ss-054 includes the Phase I RI sample locations of DA1ss-034 and DA1ss-030 where cobalt was identified in the Phase I RI samples. Cobalt was also detected in the sample collected from sample location DA1-018 during the 1999 Phase I RI, which is located in the central portion of the site. This sample is bound horizontally by IRA excavation grids and other Phase I RI surface soil samples.

5.3.3 Semivolatile Organic Compounds

One SVOC (di-n-butyl phthalate) was identified as an SRC and, in the 2010 Phase II RI data, di-n-butyl phthalate was detected at decision unit DA1ss-052. SVOCs results are presented in Table 5-4 and shown on Figure 5-4. DA1ss-052 is located along the western perimeter of the site. Two SVOCs were detected in the 1999 Phase I RI data; however, the associated sample locations were removed during the 2000 IRA. None of the remaining 1999 Phase I RI surface soil samples were analyzed for SVOCs.

5.3.4 Volatile Organic Compounds, Pesticides, and Polychlorinated Biphenyls

Four pesticides were identified as SRCs and, in the 2010 Phase II RI data, the detections occurred at decision unit DA1ss-052. Pesticide results are presented in Table 5-4 and shown on Figure 5-4. VOCs and PCBs were not detected in the sample collected from decision unit DA1ss-052, located along the western perimeter of the site. No other surface soil samples collected during the 2010 Phase II RI or the remaining 1999 Phase I RI were analyzed for VOCs, pesticides, or PCBs.

5.4 Contaminant Nature and Extent in Subsurface Soil

Data from all qualified and remaining historical Phase I RI and 2000–2001 IRA subsurface samples, along with the Phase II RI subsurface soil samples, were combined and screened to identify SRCs representing current conditions at ODA1. The SRC screening data for subsurface soil included the following samples:

- 1999 Phase I RI: 43 discrete subsurface soil samples from 1–8 ft. bgs using DPT sampling methods.
- 2000–2001 Removal Action: 13 ISM subsurface soil samples collected from the bottom of the excavation pits at 4 ft. bgs.
- 2010 Phase II RI:
  - 91 modified ISM subsurface samples (treated as discrete) from 1–16 ft. bgs taken from the following intervals: 1–4 ft. bgs, 4–8 ft. bgs, 8–12 ft. bgs, and 12–16 ft. bgs; and
  - 21 discrete subsurface samples for VOC analysis only.

The majority of the 2010 Phase II RI subsurface samples were collected to define the vertical extent of the six inorganic COCs (aluminum, arsenic, beryllium, chromium [total], copper, and lead), one propellant COC (nitrocellulose), and four VOC COCs (benzene, ethylbenzene, toluene, and xylenes) as identified in the *DQO Report* (Shaw, 2009a). The investigation was focused in the west, southwest, and south central portions of the site.

Subsurface soil samples collected during the 2010 Phase II RI sampling event were submitted for TAL metals and explosives analyses. Select samples were collected and analyzed for VOCs, pesticides, PCBs, cyanide, and propellants (see Table 5-1). The samples analyzed for VOCs were collected as discrete samples from the designated sample interval.

Tables 5-6 and 5-7 present the results of the SRC screening for discrete subsurface soil and ISM samples, respectively. Table 5-9 summarizes the detected results for the 2010 Phase II RI soil samples. A summary of the 1999 Phase I RI subsurface and 2000–2001 IRA

confirmatory subsurface samples, along with the complete laboratory results, are presented in Appendix C. Figures 5-5 through 5-13 present the SRC distribution in subsurface soils for ODA1.

5.4.1 Explosives and Propellants

The data presented in Table 5-6 identifies two explosives compounds (2,4,6-TNT and 2-amino-4,6-DNT) that are considered SRCs from the 2010 Phase II RI subsurface samples. These compounds were only detected in the samples collected from soil boring DA1sb-070. No other explosives or propellants were detected in subsurface soil samples collected during the 2010 Phase II RI. The distribution of explosives is shown on Figures 5-5 and 5-6. 2,4,6-TNT was detected at the 1–4 ft. bgs sample interval and again at the 4–8 ft. bgs sample interval from soil boring DA1sb-070. 2-Amino-4,6-DNT was detected at the 1–4 ft. bgs sample interval only in DA1sb-070. This boring location is situated downgradient of the former berms, east of the "south ditch." During the 1999 Phase I RI, 2,4,6-TNT was detected once at a concentration of 0.12 mg/kg at sample location DA1ss-040; however, this sample was removed during the 2000–2001 IRA. 2,4,6-TNT was detected at 4 ft. bgs in the 2000–2001 former IRA Grid 21.

5.4.2 Inorganics

A total of 16 inorganics were identified as SRCs in subsurface soils based on the Phase I RI data and the 2010 RI data summary presented in Table 5-6. A total of 14 inorganics were identified as SRCs in subsurface soils based on the 2000–2001 removal action data (shown in Table 5-7). The distribution of inorganic SRCs across the four sample intervals (1–4 ft. bgs, 4–8 ft. bgs, 8–12 ft. bgs, and 12–16 ft. bgs) is shown on Figures 5-7 through 5-10. For discrete samples, eight of the SRCs (aluminum, arsenic, barium, chromium, copper, lead, vanadium, and zinc) were detected in 100 percent of the subsurface samples (135 detections in 135 samples). The inorganic SRC with the lowest frequency of detection in the discrete samples was cyanide with 3 detections out of 48 samples. For the ISM samples, eight of the SRCs (aluminum, arsenic, beryllium, cobalt, lead, manganese, vanadium, and zinc) were detected in 100 percent of the subsurface samples (12 detections in 12 samples). The inorganic SRC with the lowest frequency of detection in the ISM samples was silver with 1 detection out of 12 samples.

In general, inorganics were detected above BSVs most notably along the western, southwestern, southern, south central, and southeastern portions of the site. Inorganics were also detected above BSVs along the northern perimeter of the site. Inorganic concentrations generally tend to decrease in concentration with depth. The most consistent inorganic is thallium being evenly distributed in sample intervals between the 1–4 ft. bgs sample interval and the 12–16 ft. bgs sample interval. The distribution of the six inorganics with data gaps as

identified from the *DQO Report* (Shaw, 2009a) (aluminum, arsenic, beryllium, chromium, copper, and lead), which are also among the SRCs for the subsurface soil samples (Table 5-6), is summarized below:

- The maximum concentration of aluminum was detected in the 1999 Phase I RI soil sample DA1so-027 (3–5 ft. bgs) at 28,600 mg/kg. The DA1so-027 sampling location is near the south central portion of the site. Samples were not collected below 5 ft. bgs at DA1so-027. Aluminum was also detected at concentrations greater than the facility-wide BSV in the 2010 Phase II RI soil samples DA1sb-056 (23,600 mg/kg) and DA1sb-061 (20,100 mg/kg), both at the 1–4 ft. bgs sample interval. Aluminum concentrations were less than the facility-wide BSV in samples collected below 4 ft. bgs at those sample borings.
- Arsenic (20.9 mg/kg) was detected at concentrations greater than the facility-wide BSV in the 1999 Phase I RI samples DA1so-027 (4–5 ft. bgs) and DA1so-019 (1–3 ft. bgs) at 21.1 mg/kg. The arsenic concentration was less than the background value in the samples collected below 3 ft. bgs at DA1so-019. The arsenic concentration was also greater than the facility-wide background screen in the 1999 Phase I RI sample DA1so-034 at a concentration of 20.9 mg/kg at the 3–5 ft. bgs interval. The arsenic concentration was less than the background screen in samples below 5 ft. bgs at DA1so-034. Arsenic (33 mg/kg), beryllium (0.95 mg/kg), copper (222 mg/kg), and lead (416 mg/kg) occurred as maximum detected SRCs at soil boring DA1sb-059 (5–8 ft. bgs). DA1sb-059 is located in the western portion of the site at former IRA Grid 11A "Blue Ash." Arsenic, beryllium, copper, and lead concentrations were less than the facility-wide background screen below 8 ft. bgs at DA1sb-059.
- Chromium occurred as the maximum detect in the 2010 Phase II RI sample collected at DA1sb-072 (12–16 ft. bgs) at a concentration of 589 mg/kg. Chromium also occurred as the maximum detect at DA1sb-058 (4–8 ft. bgs) at a concentration of 194 mg/kg. The chromium concentration is greater than the background screen at DA1sb-058 at the 8–12 ft. bgs interval. Chromium concentrations were greater than the facility-wide BSV in the majority of the samples evaluated and occurred at various depths.
- Lead (69.8 mg/kg) and copper (1,290 mg/kg) are maximum detected SRCs in DA1sb-072 (2–4 ft. bgs). Lead and copper concentrations are less than the facility-wide BSV in samples collected below 4 ft. bgs at DA1sb-072.
- Aluminum (23,600 mg/kg) and zinc (475 mg/kg) were the maximum detected SRCs in the 2000–2001 ISM removal action confirmatory samples in former IRA

Grid 21 (4 ft. bgs), located in the southwestern portion of the site. Arsenic (20.5 mg/kg) was the maximum detected SRC in former IRA Grid 8 (4 ft. bgs), located in the central portion of the site. Beryllium (869 mg/kg) was the maximum detected SRC in former IRA Grid 13 (4 ft. bgs), located in the northwestern portion of the site. Lead (416 mg/kg) was the maximum detected SRC in former IRA Grid 18 (2 ft. bgs), located near the central portion of the site.

5.4.3 Semivolatile Organic Compounds

A total of four SVOCs were identified as SRCs in subsurface soils as presented in Table 5-6. The distribution of SVOC SRCs across three sample intervals (1–4 ft. bgs, 4–8 ft. bgs, and 8–12 ft. bgs) is shown on Figures 5-11 through 5-13. The samples collected from the 4–8 ft. bgs interval typically had two SVOCs detected per sample, while samples collected from the 1–4 ft. bgs and 8–12 ft. bgs intervals had only one SVOC detected per sample. The sample with greatest total SVOCs concentration was DA1sb-074 (4–8 ft. bgs), located in the southwestern portion of the site. Di-n-butyl phthalate was detected in both surface and subsurface soil samples; however, no subsurface sample was collected within the area of the ISM surface soil sample where di-n-butyl phthalate was detected. Thus, no correlation on the distribution of di-n-butyl phthalate between surface and subsurface soils can be made.

5.4.4 Volatile Organic Compounds, Pesticides, and Polychlorinated Biphenyls

A total of one VOC and eight pesticides were identified as SRCs in the subsurface soil samples presented in Table 5-6. The distribution of these SRCs is shown on Figures 5-11 through 5-13.

The only VOC SRC is acetone. Acetone was detected at the 1–4 ft. bgs sample interval at boring location DA1sb-073, located in the southwestern perimeter of the site collocated with ISM surface soil decision unit DA1ss-053, at a trace concentration of 0.24 mg/kg. It was also detected at the 8–12 ft. bgs sample interval at soil boring DA1sb-074 at a trace concentration of 0.21 mg/kg, also collocated with ISM surface soil decision unit DA1ss-053. The sample collected at decision unit DA1ss-053 was not analyzed for VOCs and VOCs were not detected in Phase II RI surface soil samples.

Of the five Phase II RI subsurface soil samples where pesticides were detected, the samples with the most concurrent pesticide detections are DA1sb-068 (1–4 ft. bgs) with five pesticide compounds and DA1sb-064 (4–8 ft. bgs) with four pesticide compounds. The other three Phase II RI subsurface soil samples where pesticides were detected each had two concurrent pesticide compounds detected. Heptachlor was the most prevalent pesticide and was detected in four of the eight subsurface samples analyzed. Sample boring DA1sb-064 is located in the western portion of the site and boring DA1sb-068 is located within the south central portion of the site. All of the pesticides detected were at trace level concentrations.

PCBs were not detected in any of the samples analyzed.

5.5 Summary of Nature and Extent of Contamination

In general, the majority of the SRCs identified in the environmental media evaluated for nature and extent of contamination (surface soil and subsurface soil) occurred along the western, northern, and southern perimeters, and in the central portion of the AOC. A total of 23 SRCs were identified in surface soil (0–1 ft. bgs), and 33 in subsurface soil (greater than 1 ft. bgs). The spatial distribution of the SRCs, in particular inorganics, is consistent among the environmental media and the types of methods used to collect the samples (i.e., discrete vs. ISM).

5.5.1 Surface Soil

The greatest concentrations of inorganic, SVOCs, pesticides, explosives, and propellants SRCs occurred along the south central and western portions of the AOC where historical OB/OD activities occurred upgradient and following general downgradient topography. Explosives were detected at one location (DA1ss-051) towards the southern perimeter (downgradient) of the AOC. Explosives were also detected in the central portion of the site, located near the eastern portion of the former berm. One propellant was detected at one location (DA1ss-052) along the western portion of the AOC. The greatest concentrations of inorganics occurred along the central (OB/OD area) and southern portion of the AOC beyond the former berms, with less distributions along the eastern and northern portions of the AOC. The detected SVOCs and pesticides occurred at one location (DA1ss-052) along the western portion of the AOC. No PCBs were detected in the Phase II RI surface soil samples.

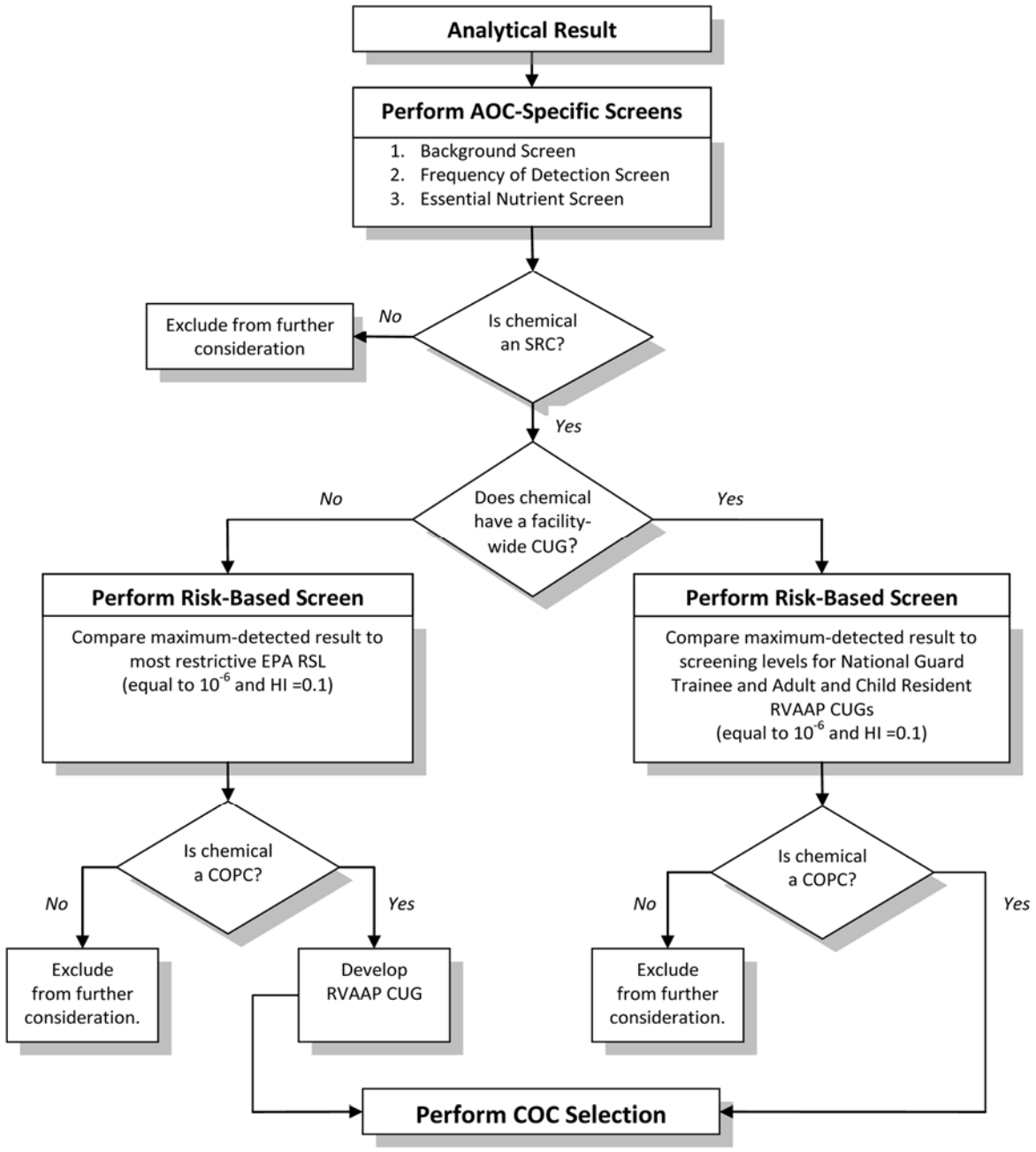
5.5.2 Subsurface Soils

A total of 23 soil borings were advanced during the 2010 Phase II RI field activities and subsurface samples were collected at a maximum depth of 16 ft. bgs over 4 depth intervals (1–4 ft. bgs, 4–8 ft. bgs, 8–12 ft. bgs, and 12–16 ft. bgs). Bedrock was not encountered in any of the borings. Explosive compound 2,4,6-TNT, was detected in the samples collected at soil boring location (DA1sb-070) in the 1–4 ft. bgs and 4–8 ft. bgs intervals. Soil boring location DA1sb-070 is located downgradient of the former berms and east of the "south ditch" berm towards the southern portion of the AOC. Another explosive compound (2-amino-4,6-DNT) was also detected at the same boring location (DA1sb-070) in the 1–4 ft. bgs sample interval. 2,4,6-TNT was detected at former IRA Grid 21 at 4 ft. bgs. IRA Grid 21 is located towards the southern portion of the AOC. The spatial distribution of inorganics in subsurface soil were along the central (OB/OD area), western, northern, and southern portions of the AOC. The greatest number of detects and the greatest concentrations of inorganics were typically found in the 1–4 ft. bgs and 4–8 ft. bgs sample intervals; however, the number of detections

and concentrations generally decreased with the sample depth. No inorganic concentrations greater than the facility-wide BSVs were detected in the OB/OD below 8 ft. bgs.

Only one VOC (acetone) was detected in subsurface soil samples. Acetone was detected in samples collected at borings DA1sb-073 (1–4 ft. bgs) and DA1sb-074 (12–16 ft. bgs). Detections of pesticides and SVOCs were generally concentrated along the south central to central, and western portions of the AOC. With the exception of pesticides detected at boring DA1sb-070 at 8–12 ft. bgs, generally SVOCs and pesticides were either detected at the 1–4 ft. bgs interval or 4–8 ft. bgs interval. No PCBs were detected in the Phase II RI subsurface soil samples.

Figure 5-1
Process to Identify Chemicals of Potential Concern at the former RVAAP



AOC denotes area of concern.
COC denotes chemical of concern.
COPC denotes chemical of potential concern.
CUG denotes cleanup goal.
EPA denotes U.S. Environmental Protection Agency.
HI denotes hazard index.
RSL denotes regional screening level.
RVAAP denotes Ravenna Army Ammunition Plant.
SRC denotes site-related chemical.

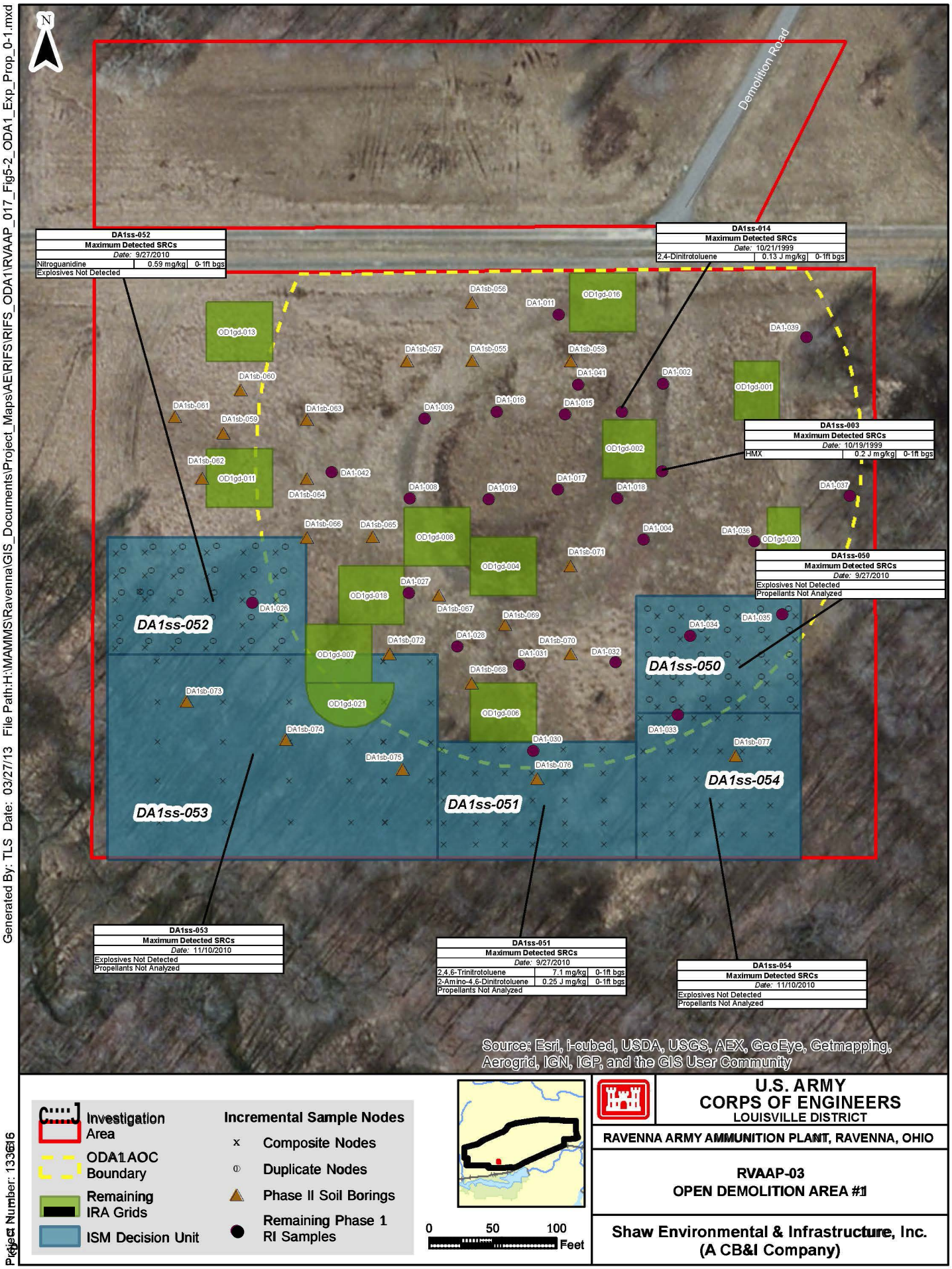


FIGURE 5-2 CONCENTRATIONS OF EXPLOSIVE & PROPELLANT MAX DETECTS & SRCs IN SURFACE SOIL (0-1 FT BGS)

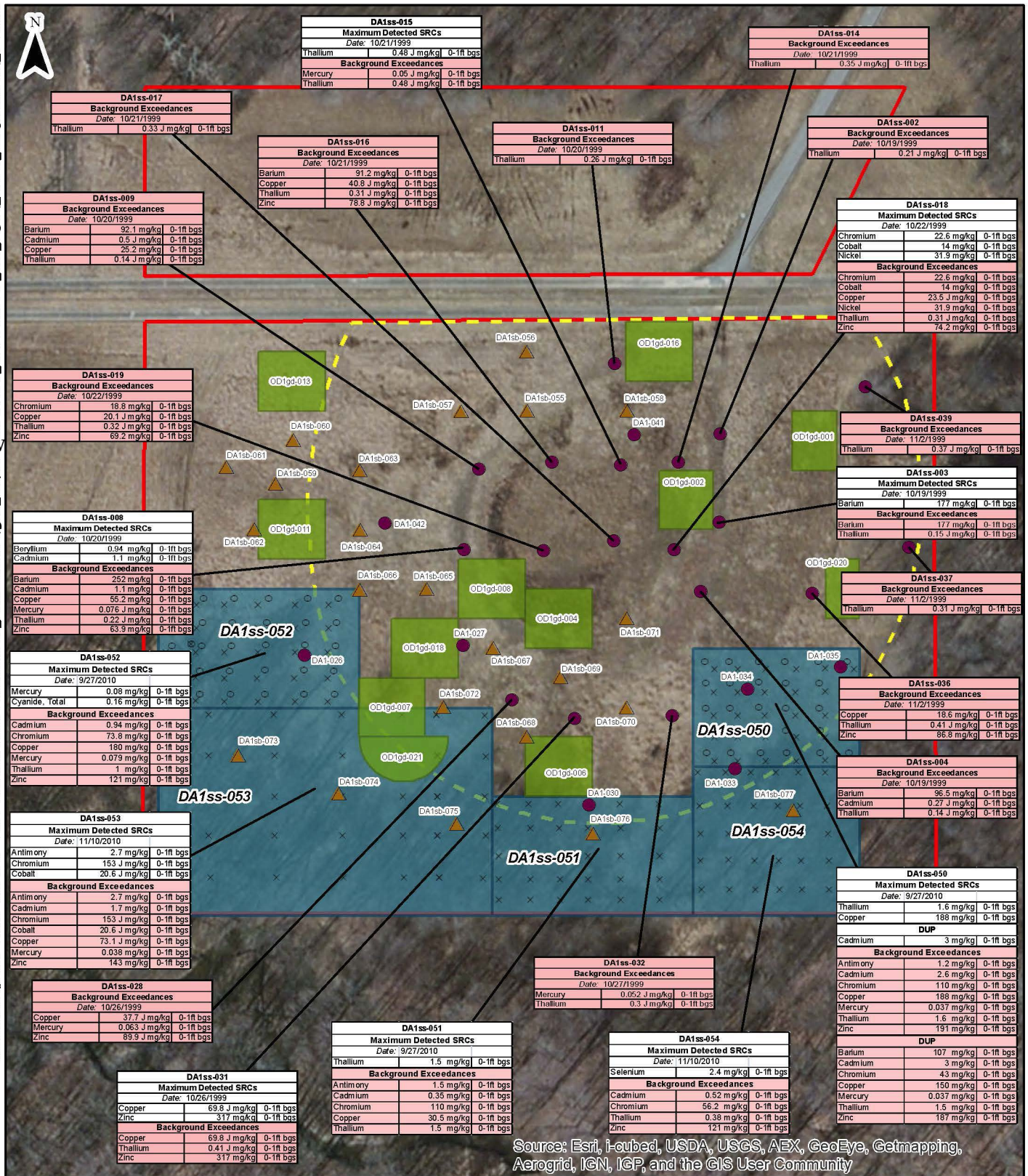


FIGURE 5-3 CONCENTRATIONS OF INORGANICS MAX DETECTS & SRCs IN SURFACE SOIL (0-1 FT BGS)

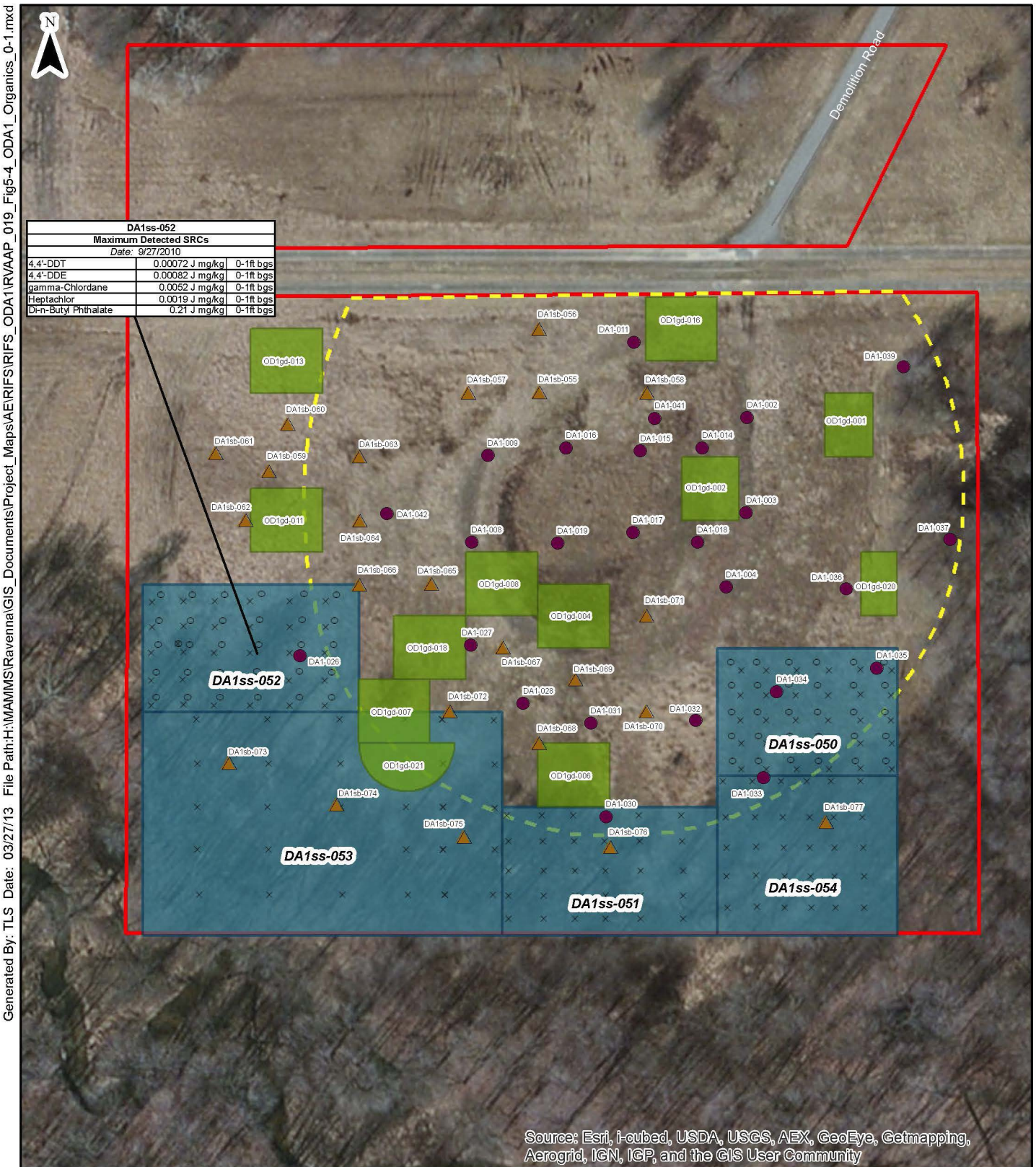
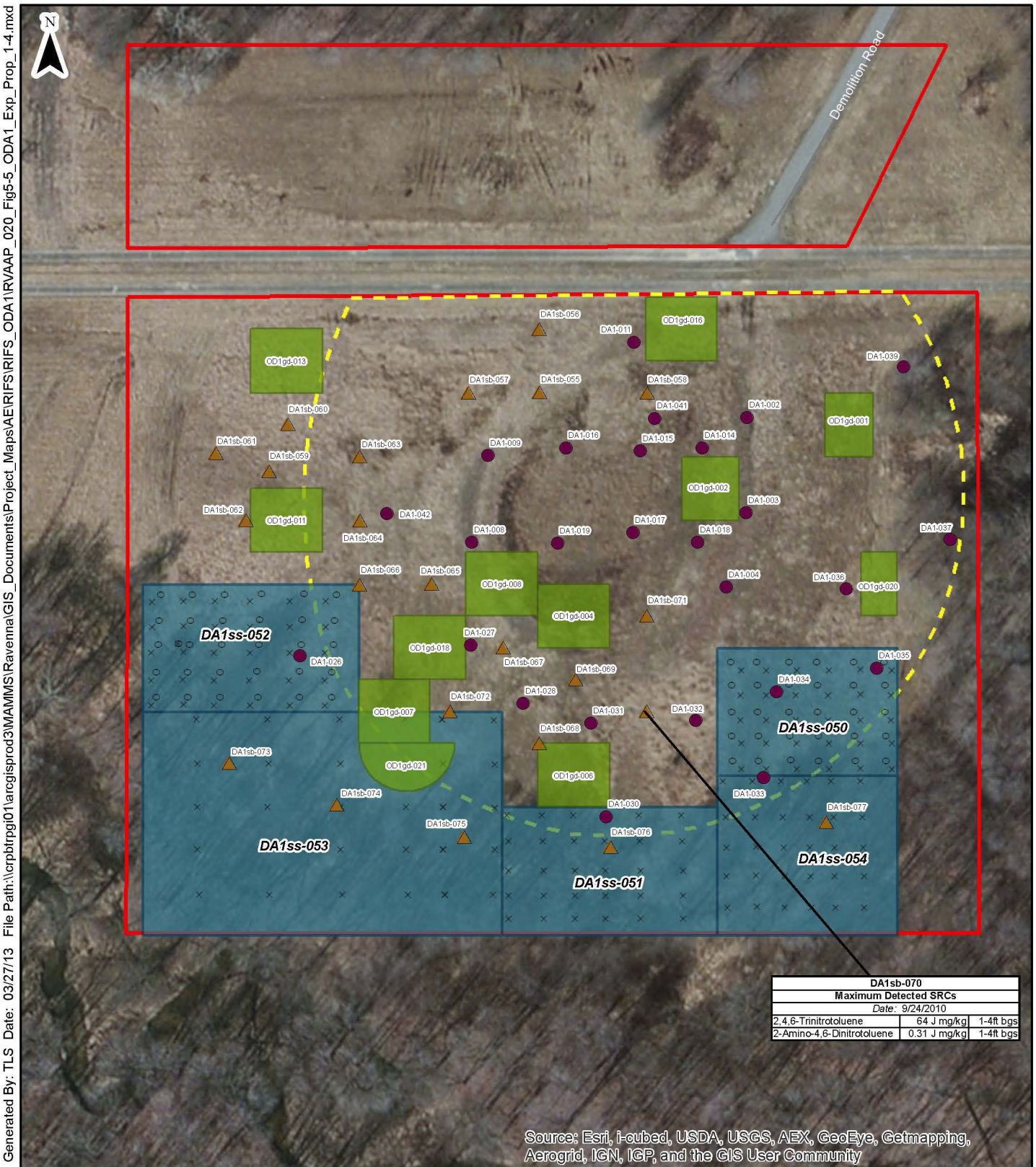


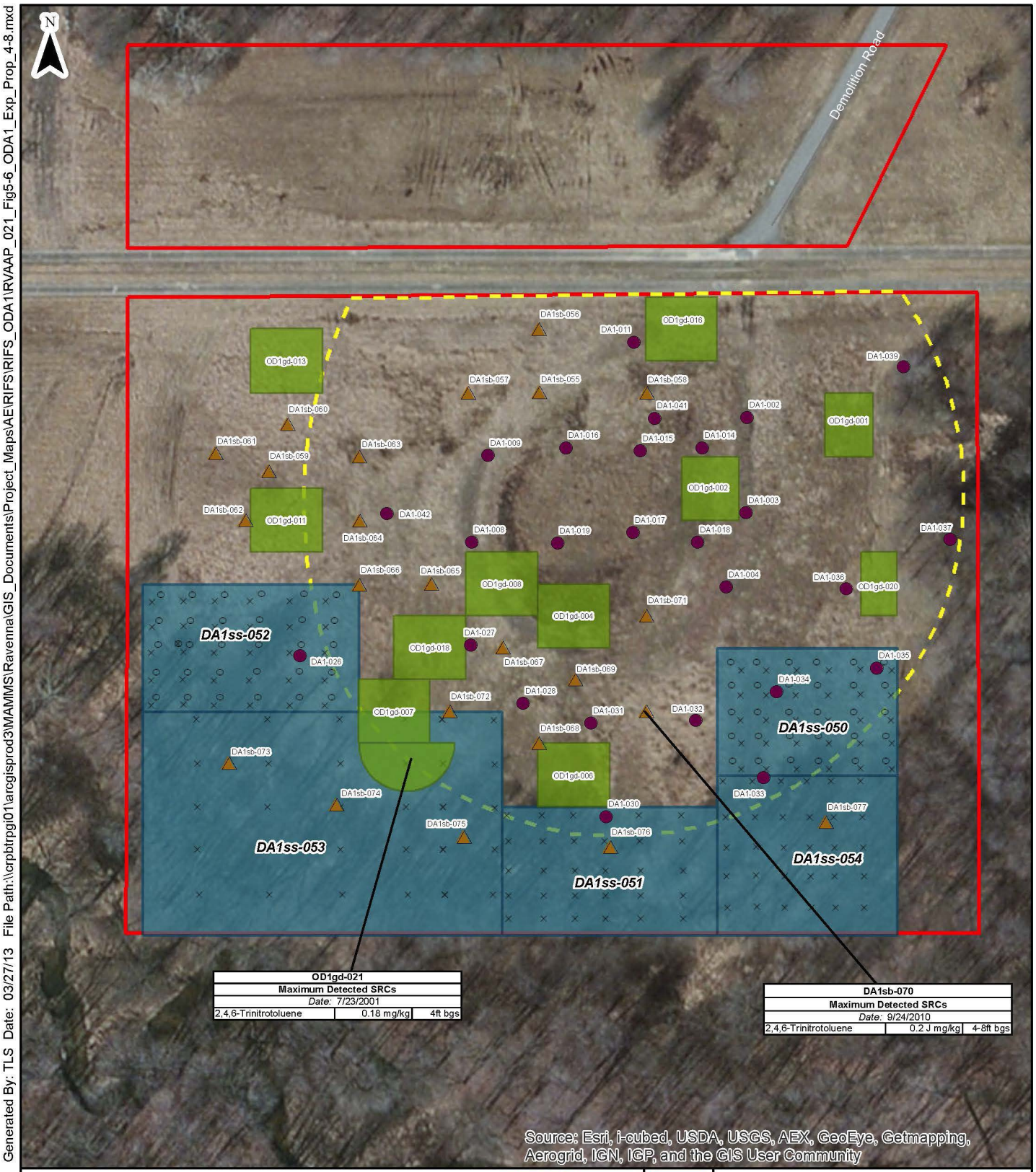
FIGURE 5-4 CONCENTRATIONS OF ORGANICS (PESTICIDES, SVOCs, & VOCs) MAX DETECTS & SRCs IN SURFACE SOIL (0-1FT BGS)



Generated By: TLS Date: 03/27/13 File Path:\\crpbtrpgi01\arcgisprod3\MAMMS\Ravenna\GIS_Documents\Project_Maps\AE\RIFS\RIFS_ODA1\RVAAP_020_Fig5-5_ODA1_Exp_Prop_1-4.mxd

Project Number: 133616

FIGURE 5-5 CONCENTRATIONS OF EXPLOSIVE & PROPELLANT MAX DETECTS & SRCs IN SUBSURFACE SOIL (1-4 FT BGS)



Generated By: TLS Date: 03/27/13 File Path:\\crpbtrpgi01\arcgisprod3\MAMMS\Ravenna\GIS_Documents\Project_Maps\AE\RIFS\RIFS_ODA1\RVAAP_021_Fig5-6_ODA1_Exp_Prop_4-8.mxd

Project Number: 133616

FIGURE 5-6 CONCENTRATIONS OF EXPLOSIVE & PROPELLANT MAX DETECTS & SRCs IN SUBSURFACE SOIL (4-8 FT BGS)

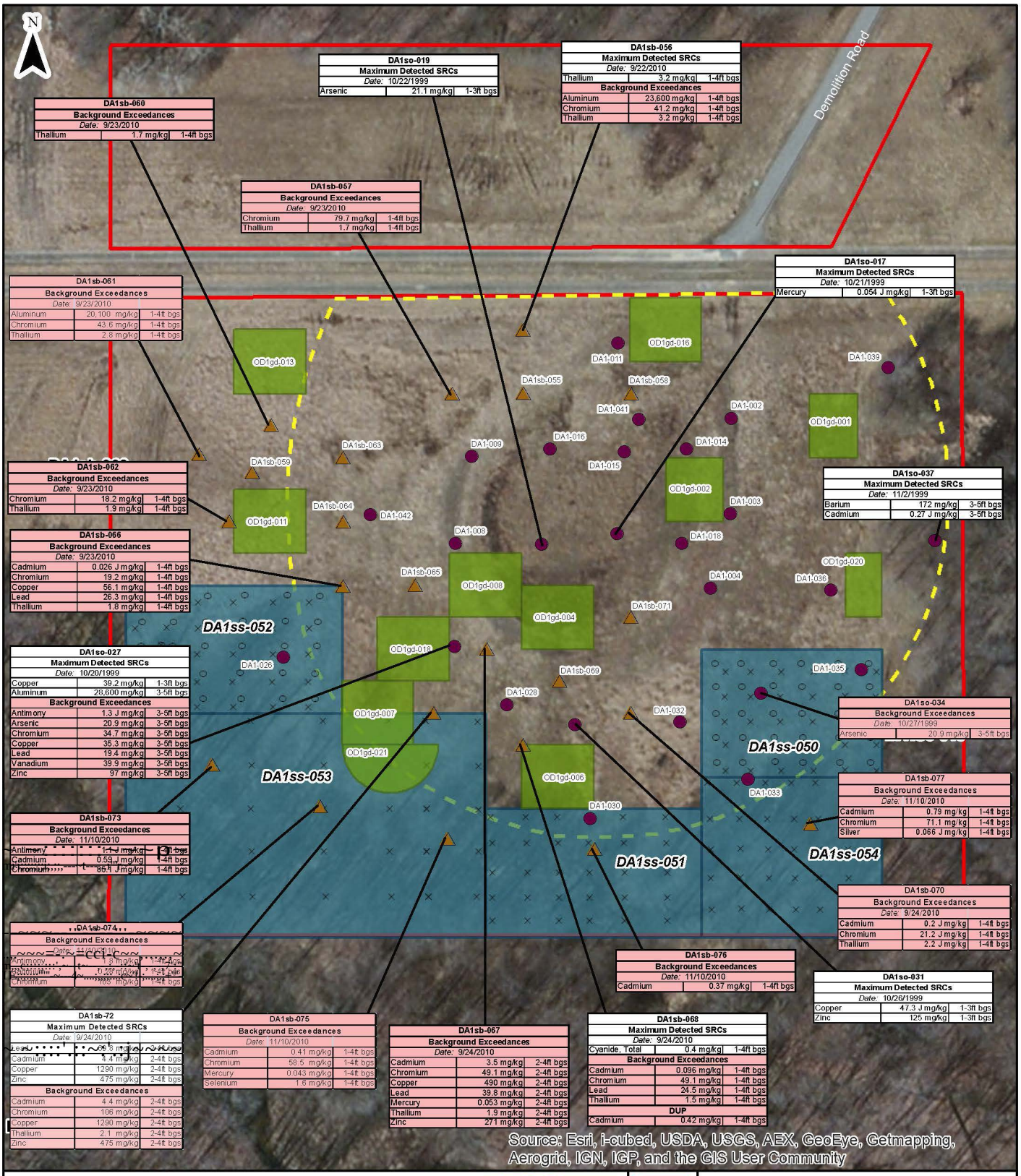


FIGURE 5-7 CONCENTRATIONS OF INORGANIC MAX DETECTS & SRCs IN SUBSURFACE SOIL (1-4 FT BGS)

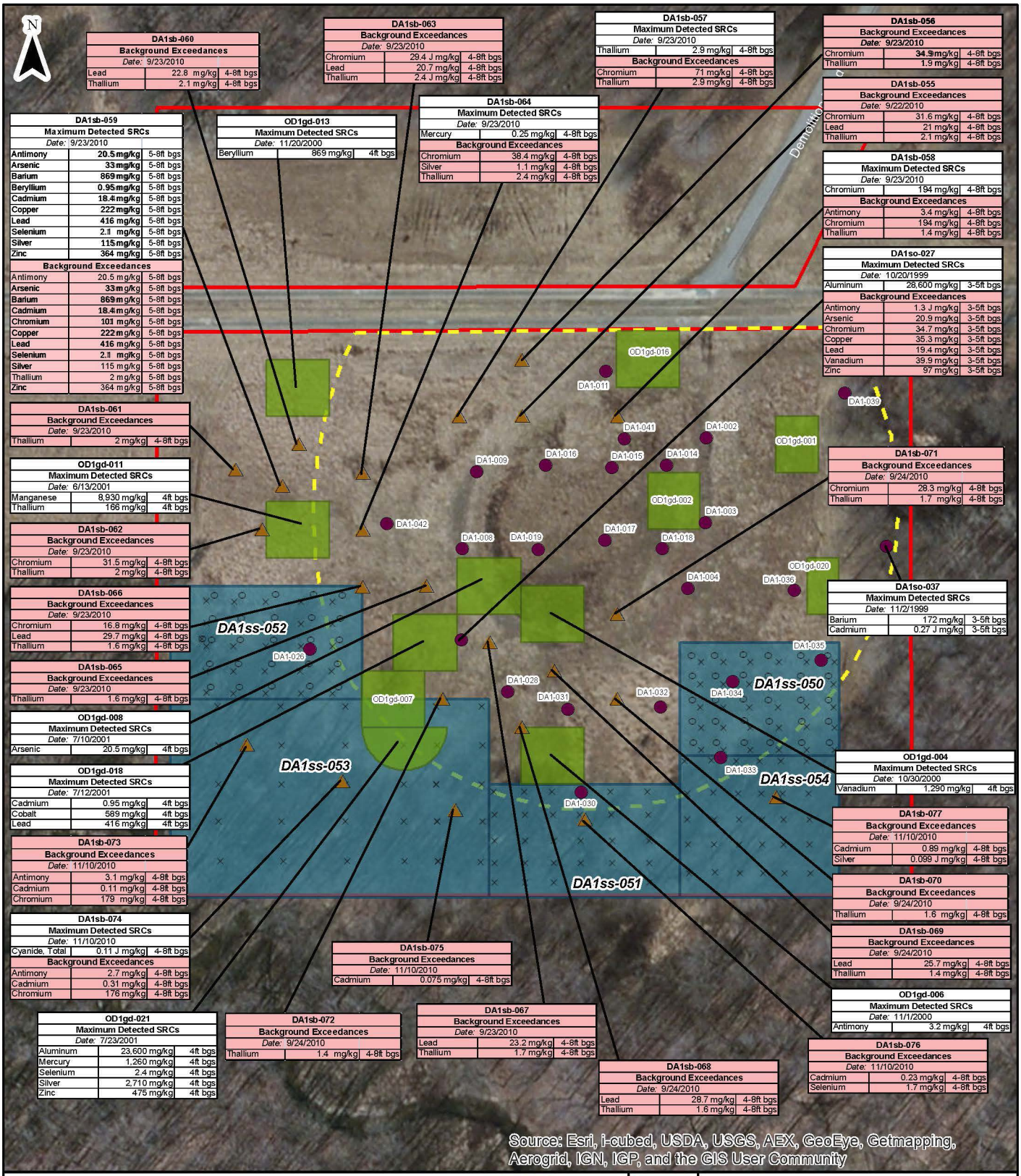


FIGURE 5-8 CONCENTRATIONS OF INORGANIC MAX DETECTS & SRCs IN SUBSURFACE SOIL (4-8 FT BGS)

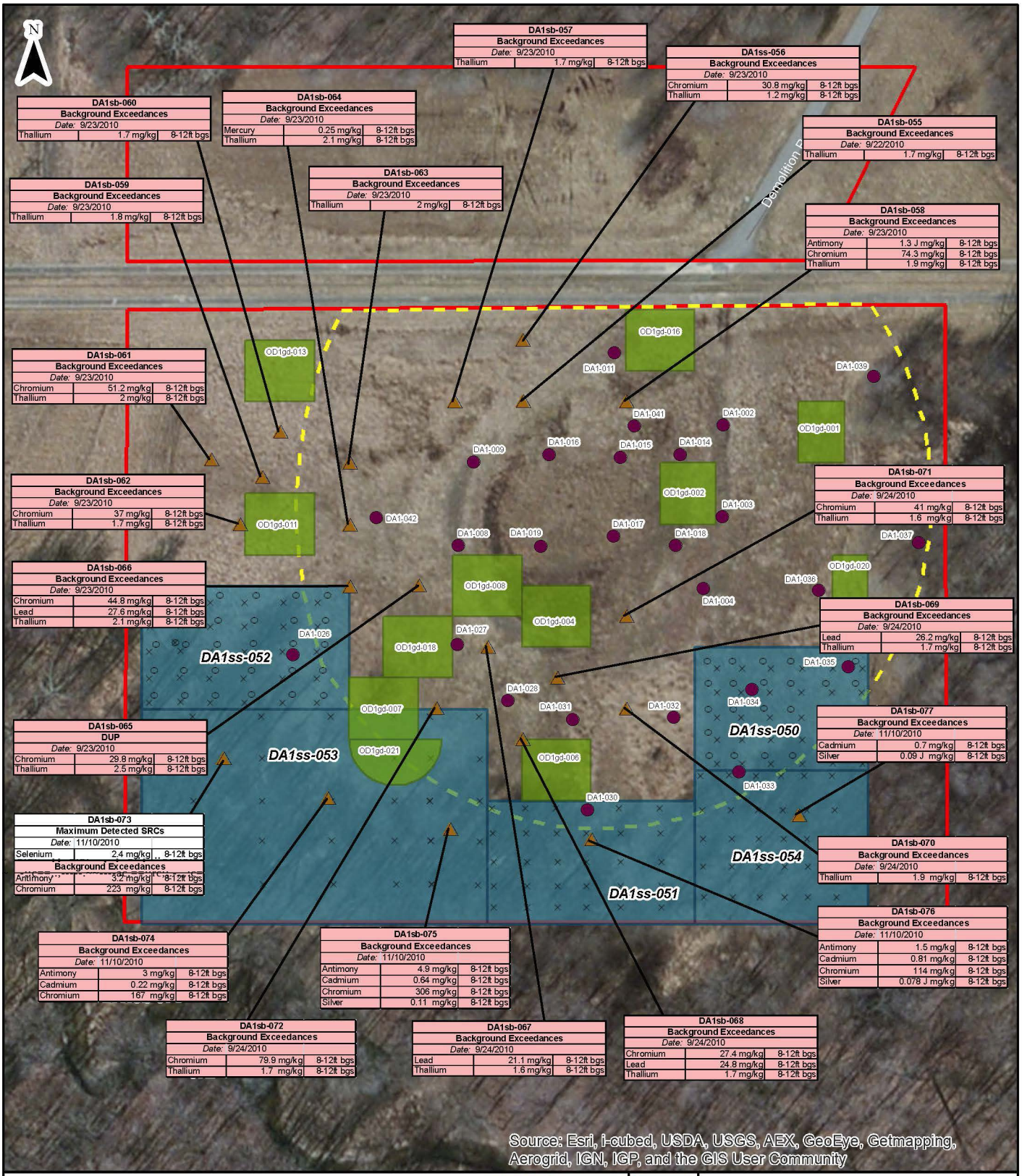


FIGURE 5-9 CONCENTRATIONS OF INORGANIC MAX DETECTS & SRCs IN SUBSURFACE SOIL (8-12 FT BGS)

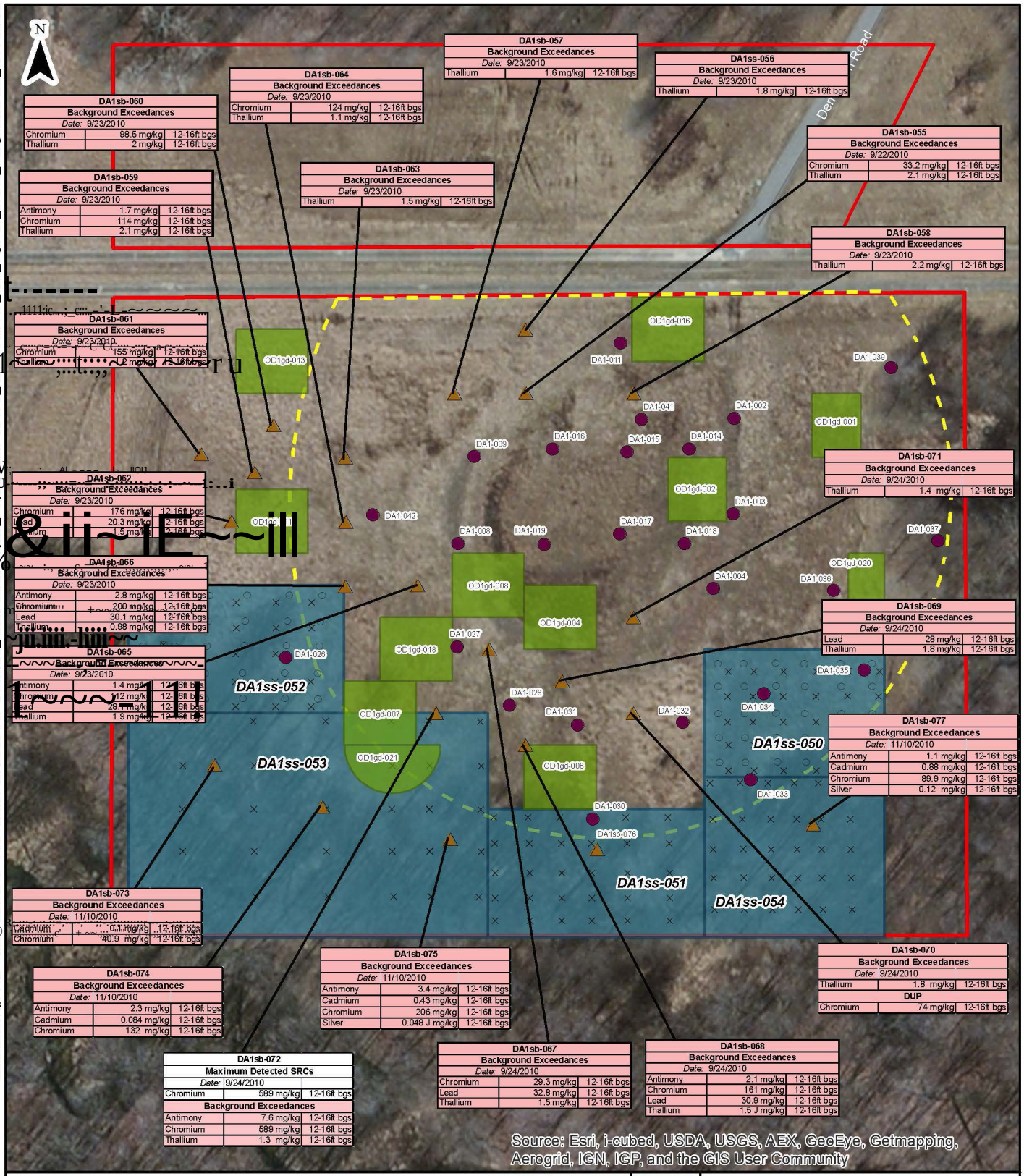


FIGURE 5-10 CONCENTRATIONS OF INORGANIC MAX DETECTS & SRCs IN SUBSURFACE SOIL (12-16 FT BGS)

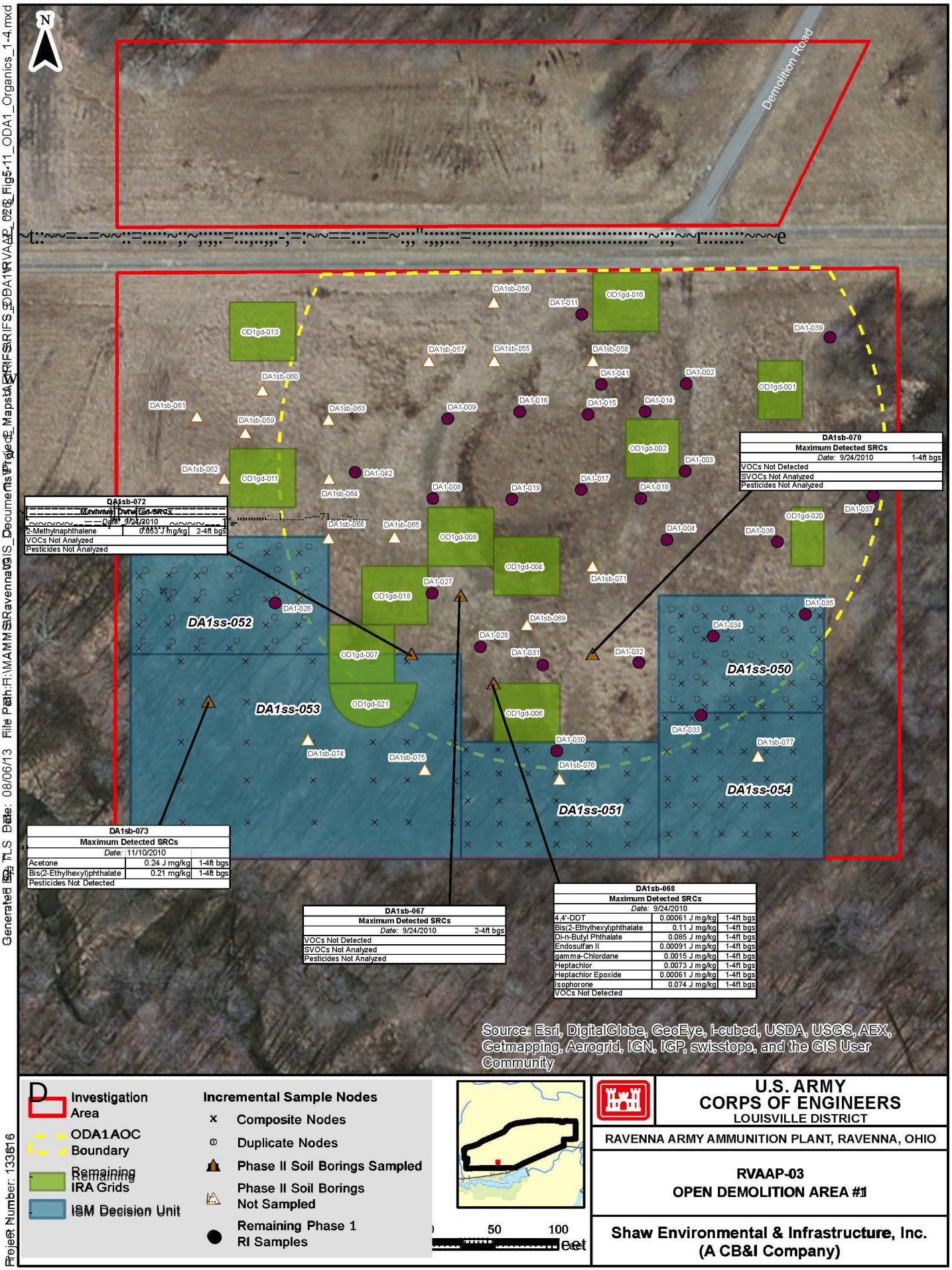


FIGURE 5-11 CONCENTRATIONS OF ORGANIC (PESTICIDES, SVOCs, & VOCs) MAX DETECTS & SRCs IN SUBSURFACE SOIL (1-4 FT BGS)

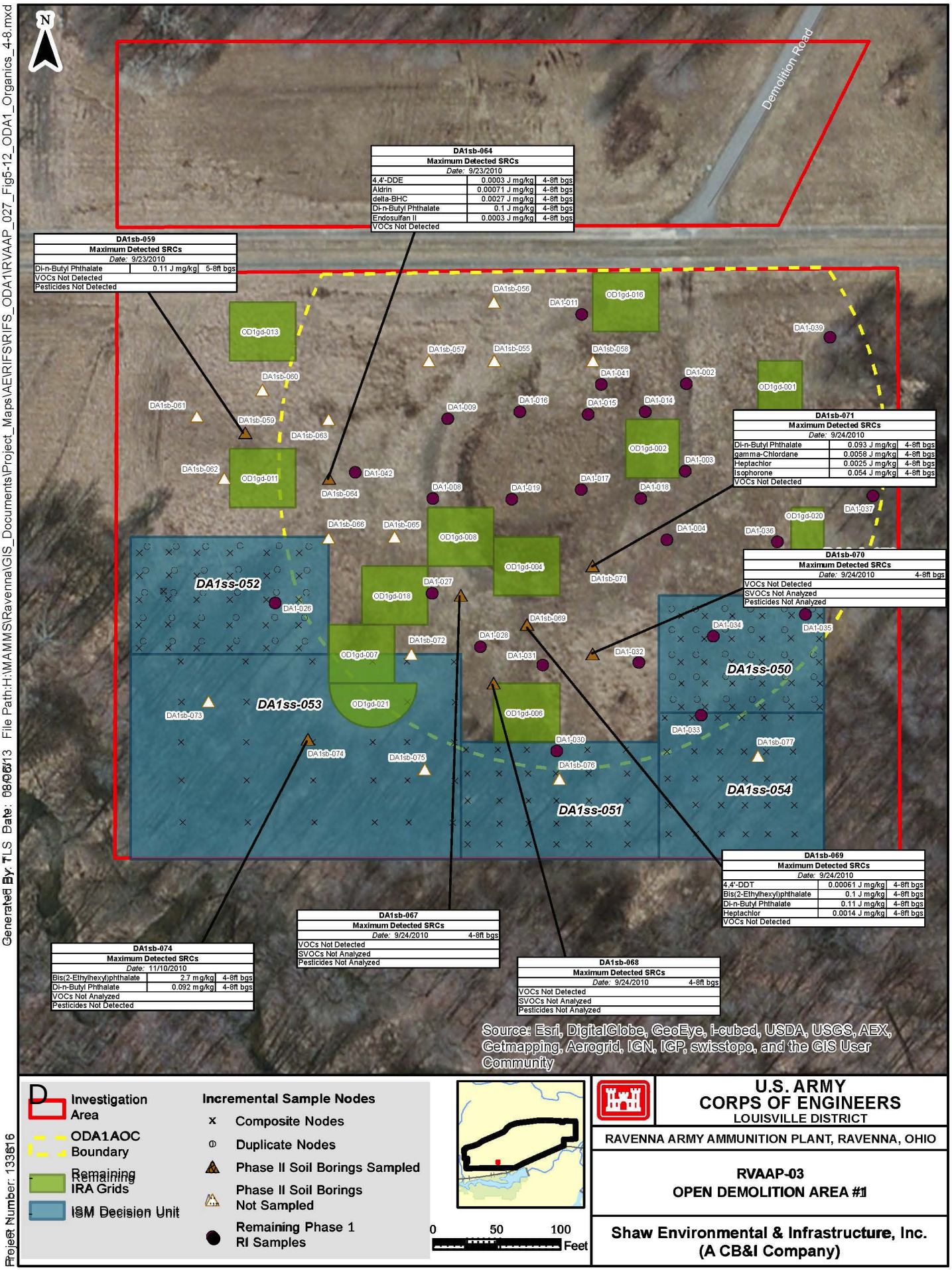


FIGURE 5-12 CONCENTRATIONS OF ORGANIC (PESTICIDES, SVOCs, & VOCs) MAX DETECTS & SRCs IN SUBSURFACE SOIL (4-8 FT BGS)

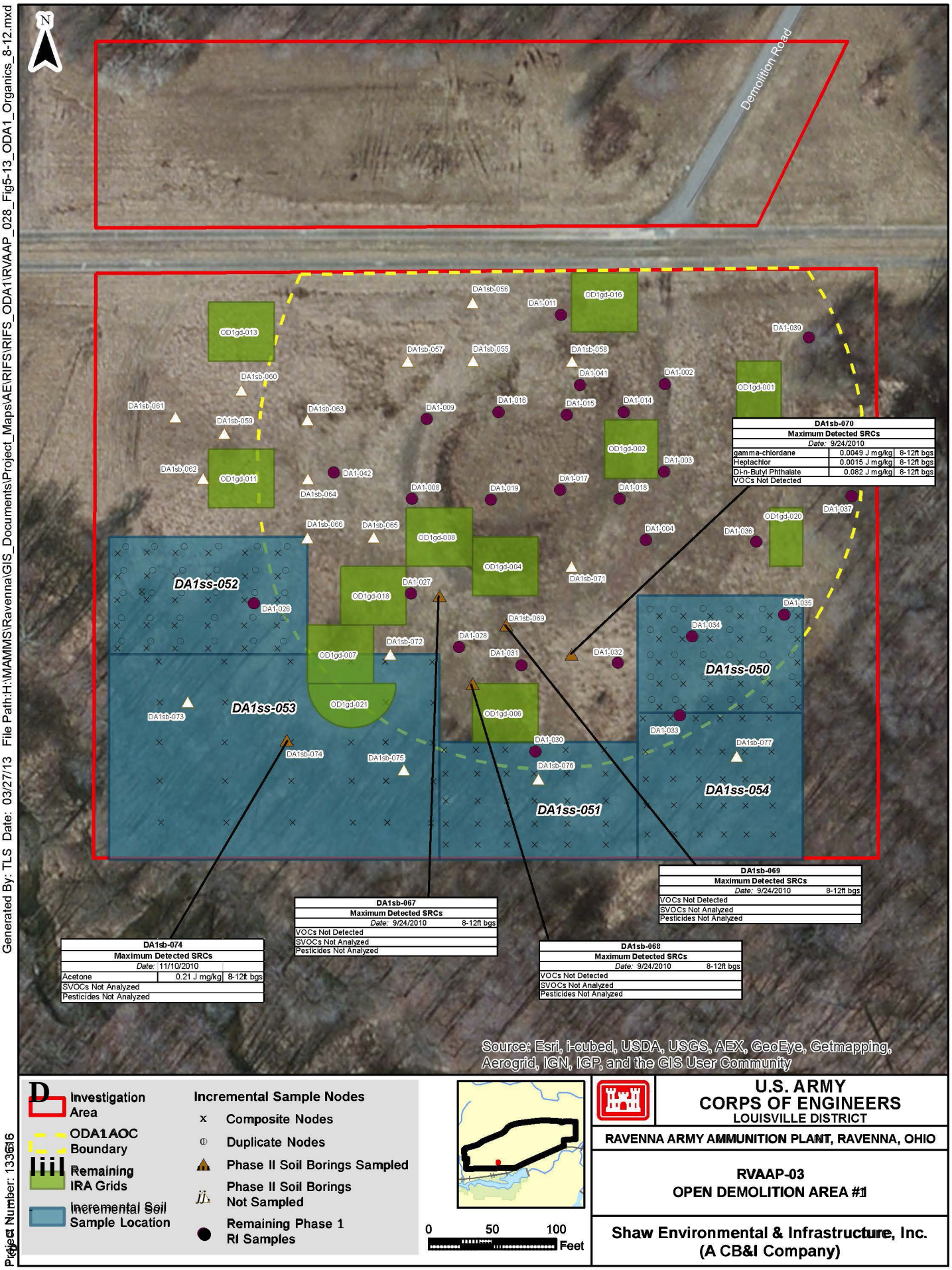


FIGURE 5-13 CONCENTRATIONS OF ORGANIC (PESTICIDES, SVOCs, & VOCs) MAX DETECTS & SRCs IN SUBSURFACE SOIL (8-12 FT BGS)

Table 5-1
ODA1 2010 Phase II RI Sample Collection Summary
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Sample Location/Soil Boring	Sample ID	Matrix	Top Depth (ft.)	Bottom Depth (ft.)	Date Collected	Sampling Method	TAL Metals	Explosives	Hexavalent Chromium	VOCs	SVOCs	Pesticides	PCBs	Cyanide	Propellants
Surface Soil Analytical Program for ODA1															
Trip Blank	DA1qc-003-0001-TB	QC	NA	NA	09/27/10	NA				1					
Trip Blank	DA1qc-004-0001-TB	QC	NA	NA	09/27/10	NA				1					
Trip Blank	DA1qc-005-0001-TB	QC	NA	NA	09/27/10	NA				1					
DA1ss-050	DA1ss-050m-0201-SO	SS	0.0	1.0	09/27/10	Increment	1	1	1						
DA1ss-050	DA1ss-050m-0201-MS	SS	0.0	1.0	09/27/10	Increment	1	1	1						
DA1ss-050	DA1ss-050m-0201-MD	SS	0.0	1.0	09/27/10	Increment	1	1	1						
DA1ss-050	DA1ss-080m-0201-SO	SS	0.0	1.0	09/27/10	Increment	1	1	1						
DA1ss-051	DA1ss-051m-0201-SO	SS	0.0	1.0	09/27/10	Increment	1	1	1						
DA1ss-052	DA1ss-052m-0201-SO	SS	0.0	1.0	09/27/10	Increment	1	1	1		1	1	1	1	1
DA1ss-052	DA1ss-052d-0201-SO	SS	0.0	1.0	09/27/10	Discrete				1					
DA1ss-053	DA1ss-053m-0201-SO	SS	0.0	1.0	11/10/10	Increment	1	1	1						
DA1ss-054	DA1ss-054m-0201-SO	SS	0.0	1.0	11/10/10	Increment	1	1	1						
Subsurface Soil Analytical Program for ODA1															
DA1sb-055	DA1sb-055m-0001-SO	SB	4.0	8.0	09/22/10	Modified ISM	1	1							
DA1sb-055	DA1sb-055m-0002-SO	SB	8.0	12.0	09/22/10	Modified ISM	1	1							
DA1sb-055	DA1sb-055m-0003-SO	SB	12.0	16.0	09/22/10	Modified ISM	1	1							
DA1sb-056	DA1sb-056m-0001-SO	SB	1.0	4.0	09/22/10	Modified ISM	1	1							
DA1sb-056	DA1sb-056m-0002-SO	SB	4.0	8.0	09/22/10	Modified ISM	1	1							
DA1sb-056	DA1sb-056m-0003-SO	SB	8.0	12.0	09/22/10	Modified ISM	1	1							

1

1

Table 5-1 (continued)
ODA1 2010 Phase II RI Sample Collection Summary
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Sample Location/Soil Boring	Sample ID	Matrix	Top Depth (ft.)	Bottom Depth (ft.)	Date Collected	Sampling Method	TAL Metals	Explosives	Hexavalent Chromium	VOCs	SVOCs	Pesticides	PCBs	Cyanide	Propellants
DA1sb-056	DA1sb-056m-0004-SO	SB	12.0	16.0	09/22/10	Modified ISM	1	1							
DA1sb-057	DA1sb-057m-0201-SO	SB	1.0	4.0	09/23/10	Modified ISM	1	1							
DA1sb-057	DA1sb-057m-0202-SO	SB	4.0	8.0	09/23/10	Modified ISM	1	1							
DA1sb-057	DA1sb-057m-0203-SO	SB	8.0	12.0	09/23/10	Modified ISM	1	1							
DA1sb-057	DA1sb-057m-0204-SO	SB	12.0	16.0	09/23/10	Modified ISM	1	1							
DA1sb-058	DA1sb-058m-0201-SO	SB	4.0	8.0	09/23/10	Modified ISM	1	1							
DA1sb-058	DA1sb-058m-0202-SO	SB	8.0	12.0	09/23/10	Modified ISM	1	1							
DA1sb-058	DA1sb-058m-0203-SO	SB	12.0	16.0	09/23/10	Modified ISM	1	1							
DA1sb-059	DA1sb-059d-0201-SO	SB	5.0	8.0	09/23/10	Discrete				1					
DA1sb-059	DA1sb-059m-0201-SO	SB	5.0	8.0	09/23/10	Modified ISM	1	1	1		1	1	1	1	1
DA1sb-059	DA1sb-059m-0202-SO	SB	8.0	12.0	09/23/10	Modified ISM	1	1							
DA1sb-059	DA1sb-059m-0203-SO	SB	12.0	16.0	09/23/10	Modified ISM	1	1							
DA1sb-059	DA1sb-081m-0203-SO	SB	12.0	16.0	09/23/10	Modified ISM	1	1							
DA1sb-060	DA1sb-060m-0201-SO	SB	1.0	4.0	09/23/10	Modified ISM	1	1							
DA1sb-060	DA1sb-060m-0202-SO	SB	4.0	8.0	09/23/10	Modified ISM	1	1							
DA1sb-060	DA1sb-060m-0203-SO	SB	8.0	12.0	09/23/10	Modified ISM	1	1							
DA1sb-060	DA1sb-060m-0204-SO	SB	12.0	16.0	09/23/10	Modified ISM	1	1							
DA1sb-061	DA1sb-061m-0201-SO	SB	1.0	4.0	09/23/10	Modified ISM	1	1							
DA1sb-061	DA1sb-061m-0202-SO	SB	4.0	8.0	09/23/10	Modified ISM	1	1							
DA1sb-061	DA1sb-061m-0203-SO	SB	8.0	12.0	09/23/10	Modified ISM	1	1							
DA1sb-061	DA1sb-061m-0204-SO	SB	12.0	16.0	09/23/10	Modified ISM	1	1							

Table 5-1 (continued)
ODA1 2010 Phase II RI Sample Collection Summary
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Sample Location/Soil Boring	Sample ID	Matrix	Top Depth (ft.)	Bottom Depth (ft.)	Date Collected	Sampling Method	TAL Metals	Explosives	Hexavalent Chromium	VOCs	SVOCs	Pesticides	PCBs	Cyanide	Propellants
DA1sb-062	DA1sb-062m-0201-SO	SB	1.0	4.0	09/23/10	Modified ISM	1	1							
DA1sb-062	DA1sb-062m-0202-SO	SB	4.0	8.0	09/23/10	Modified ISM	1	1							
DA1sb-062	DA1sb-062m-0203-SO	SB	8.0	12.0	09/23/10	Modified ISM	1	1							
DA1sb-062	DA1sb-062m-0204-SO	SB	12.0	16.0	09/23/10	Modified ISM	1	1							
DA1sb-063	DA1sb-063m-0201-MD	SB	4.0	8.0	09/23/10	Modified ISM	1	1							1
DA1sb-063	DA1sb-063m-0201-MS	SB	4.0	8.0	09/23/10	Modified ISM	1	1							1
DA1sb-063	DA1sb-063m-0201-SO	SB	4.0	8.0	09/23/10	Modified ISM	1	1							1
DA1sb-063	DA1sb-063m-0202-SO	SB	8.0	12.0	09/23/10	Modified ISM	1	1							1
DA1sb-063	DA1sb-082m-0202-SO	SB	8.0	12.0	09/23/10	Modified ISM	1	1							1
DA1sb-063	DA1sb-063m-0203-SO	SB	12.0	16.0	09/23/10	Modified ISM	1	1							1
DA1sb-064	DA1sb-064d-0201-SO	SB	4.0	8.0	09/23/10	Discrete				1					
DA1sb-064	DA1sb-064m-0201-SO	SB	4.0	8.0	09/23/10	Modified ISM	1	1	1		1	1	1	1	1
DA1sb-064	DA1sb-064m-0202-SO	SB	8.0	12.0	09/23/10	Modified ISM	1	1							1
DA1sb-064	DA1sb-064m-0203-SO	SB	12.0	16.0	09/23/10	Modified ISM	1	1							1
DA1sb-065	DA1sb-065m-0201-SO	SB	4.0	8.0	09/23/10	Modified ISM	1	1							
DA1sb-065	DA1sb-065m-0202-SO	SB	8.0	12.0	09/23/10	Modified ISM	1	1							
DA1sb-065	DA1sb-083m-0202-SO	SB	8.0	12.0	09/23/10	Modified ISM	1	1							
DA1sb-065	DA1sb-065m-0203-SO	SB	12.0	16.0	09/23/10	Modified ISM	1	1							
DA1sb-066	DA1sb-066m-0201-SO	SB	1.0	4.0	09/23/10	Modified ISM	1	1							1
DA1sb-066	DA1sb-066m-0202-SO	SB	4.0	8.0	09/23/10	Modified ISM	1	1							1
DA1sb-066	DA1sb-066m-0203-SO	SB	8.0	12.0	09/23/10	Modified ISM	1	1							1

Table 5-1 (continued)
ODA1 2010 Phase II RI Sample Collection Summary
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Sample Location/Soil Boring	Sample ID	Matrix	Top Depth (ft.)	Bottom Depth (ft.)	Date Collected	Sampling Method	TAL Metals	Explosives	Hexavalent Chromium	VOCs	SVOCs	Pesticides	PCBs	Cyanide	Propellants
DA1sb-066	DA1sb-066m-0204-SO	SB	12.0	16.0	09/23/10	Modified ISM	1	1							1
Trip Blank	DA1qc-001-0001-TB	QC	NA	NA	09/24/10	NA				1					
Trip Blank	DA1qc-002-0001-TB	QC	NA	NA	09/24/10	NA				1					
DA1sb-067	DA1sb-067d-0201-SO	SB	2.0	4.0	09/24/10	Discrete				1					
DA1sb-067	DA1sb-067d-0202-SO	SB	4.0	8.0	09/24/10	Discrete				1					
DA1sb-067	DA1sb-067d-0203-SO	SB	8.0	12.0	09/24/10	Discrete				1					
DA1sb-067	DA1sb-067d-0204-SO	SB	12.0	16.0	09/24/10	Discrete				1					
DA1sb-067	DA1sb-067m-0201-SO	SB	2.0	4.0	09/24/10	Modified ISM	1	1							
DA1sb-067	DA1sb-067m-0202-SO	SB	4.0	8.0	09/24/10	Modified ISM	1	1	1						
DA1sb-067	DA1sb-067m-0203-SO	SB	8.0	12.0	09/24/10	Modified ISM	1	1							
DA1sb-067	DA1sb-067m-0204-SO	SB	12.0	16.0	09/24/10	Modified ISM	1	1							
DA1sb-068	DA1sb-068d-0201-SO	SB	1.0	4.0	09/24/10	Discrete				1					
DA1sb-068	DA1sb-084d-0201-SO	SB	1.0	4.0	09/24/10	Discrete				1					
DA1sb-068	DA1sb-084m-0201-SO	SB	1.0	4.0	09/24/10	Modified ISM	1	1			1	1	1	1	1
DA1sb-068	DA1sb-084m-0201-SOa	SB	1.0	4.0	11/10/10	Modified ISM	1	1						1	
DA1sb-068	DA1sb-068d-0202-SO	SB	4.0	8.0	09/24/10	Discrete				1					
DA1sb-068	DA1sb-068d-0203-SO	SB	8.0	12.0	09/24/10	Discrete				1					
DA1sb-068	DA1sb-068d-0204-SO	SB	12.0	16.0	09/24/10	Discrete				1					
DA1sb-068	DA1sb-068m-0201-SO	SB	1.0	4.0	09/24/10	Modified ISM	1	1			1	1	1	1	1
DA1sb-068	DA1sb-068m-0202-SO	SB	4.0	8.0	09/24/10	Modified ISM	1	1							1

Table 5-1 (continued)
ODA1 2010 Phase II RI Sample Collection Summary
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Sample Location/Soil Boring	Sample ID	Matrix	Top Depth (ft.)	Bottom Depth (ft.)	Date Collected	Sampling Method	TAL Metals	Explosives	Hexavalent Chromium	VOCs	SVOCs	Pesticides	PCBs	Cyanide	Propellants
DA1sb-068	DA1sb-068m-0203-SO	SB	8.0	12.0	09/24/10	Modified ISM	1	1							1
DA1sb-068	DA1sb-068m-0204-SO	SB	12.0	16.0	09/24/10	Modified ISM	1	1							1
DA1sb-069	DA1sb-069d-0201-SO	SB	4.0	8.0	09/24/10	Discrete				1					
DA1sb-069	DA1sb-069d-0202-SO	SB	8.0	12.0	09/24/10	Discrete				1					
DA1sb-069	DA1sb-069d-0203-SO	SB	12.0	16.0	09/24/10	Discrete				1					
DA1sb-069	DA1sb-069m-0201-SO	SB	4.0	8.0	09/24/10	Modified ISM	1	1			1	1	1	1	1
DA1sb-069	DA1sb-069m-0202-SO	SB	8.0	12.0	09/24/10	Modified ISM	1	1							1
DA1sb-069	DA1sb-069m-0203-SO	SB	12.0	16.0	09/24/10	Modified ISM	1	1							1
DA1sb-070	DA1sb-070d-0201-MD	SB	1.0	4.0	09/24/10	Discrete				1					
DA1sb-070	DA1sb-070d-0201-MS	SB	1.0	4.0	09/24/10	Discrete				1					
DA1sb-070	DA1sb-070d-0201-SO	SB	1.0	4.0	09/24/10	Discrete				1					
DA1sb-070	DA1sb-070d-0202-SO	SB	4.0	8.0	09/24/10	Discrete				1					
DA1sb-070	DA1sb-070d-0203-SO	SB	8.0	12.0	09/24/10	Discrete				1					
DA1sb-070	DA1sb-070m-0201-MD	SB	1.0	4.0	09/24/10	Modified ISM	1	1							1
DA1sb-070	DA1sb-070m-0201-MS	SB	1.0	4.0	09/24/10	Modified ISM	1	1							1
DA1sb-070	DA1sb-070m-0201-SO	SB	1.0	4.0	09/24/10	Modified ISM	1	1							1
DA1sb-070	DA1sb-070m-0202-SO	SB	4.0	8.0	09/24/10	Modified ISM	1	1							1
DA1sb-070	DA1sb-070m-0203-SO	SB	8.0	12.0	09/24/10	Modified ISM	1	1			1	1	1	1	1
DA1sb-070	DA1sb-070m-0204-SO	SB	12.0	16.0	09/24/10	Modified ISM	1	1							1
DA1sb-070	DA1sb-085d-0204-SO	SB	12.0	16.0	09/24/10	Discrete				1					
DA1sb-070	DA1sb-085m-0204-SO	SB	12.0	16.0	09/24/10	Modified ISM	1	1							1

Table 5-1 (continued)
ODA1 2010 Phase II RI Sample Collection Summary
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Sample Location/Soil Boring	Sample ID	Matrix	Top Depth (ft.)	Bottom Depth (ft.)	Date Collected	Sampling Method	TAL Metals	Explosives	Hexavalent Chromium	VOCs	SVOCs	Pesticides	PCBs	Cyanide	Propellants
DA1sb-071	DA1sb-071d-0201-SO	SB	4.0	8.0	09/24/10	Discrete				1					
DA1sb-071	DA1sb-071m-0201-SO	SB	4.0	8.0	09/24/10	Modified ISM	1	1	1		1	1	1	1	1
DA1sb-071	DA1sb-071m-0202-SO	SB	8.0	12.0	09/24/10	Modified ISM	1	1							
DA1sb-071	DA1sb-071m-0203-SO	SB	12.0	16.0	09/24/10	Modified ISM	1	1							
DA1sb-072	DA1sb-072m-0201-SO	SB	2.0	4.0	09/24/10	Modified ISM	1	1	1		1				
DA1sb-072	DA1sb-072m-0202-SO	SB	4.0	8.0	09/24/10	Modified ISM	1	1							
DA1sb-072	DA1sb-072m-0203-SO	SB	8.0	12.0	09/24/10	Modified ISM	1	1							
DA1sb-072	DA1sb-072m-0204-SO	SB	12.0	16.0	09/24/10	Modified ISM	1	1							
DA1sb-072	DA1sb-086m-0204-SO	SB	12.0	16.0	09/24/10	Modified ISM	1	1							
Trip Blank	DA1qc-006-0001-TB	QC	NA	NA	11/10/10	NA				1					
DA1sb-073	DA1sb-073d-0201-SO	SB	1.0	4.0	11/10/10	Discrete				1					
DA1sb-073	DA1sb-073m-0201-SO	SB	1.0	4.0	11/10/10	Modified ISM	1	1		1	1	1	1	1	
DA1sb-073	DA1sb-073m-0202-SO	SB	4.0	8.0	11/10/10	Modified ISM	1	1							
DA1sb-073	DA1sb-073m-0203-SO	SB	8.0	12.0	11/10/10	Modified ISM	1	1							
DA1sb-073	DA1sb-073m-0204-SO	SB	12.0	16.0	11/10/10	Modified ISM	1	1							
DA1sb-074	DA1sb-074d-0203-SO	SB	8.0	12.0	11/10/10	Discrete				1					
DA1sb-074	DA1sb-074m-0201-SO	SB	1.0	4.0	11/10/10	Modified ISM	1	1							
DA1sb-074	DA1sb-074m-0202-SO	SB	4.0	8.0	11/10/10	Modified ISM	1	1		1	1	1	1	1	1
DA1sb-074	DA1sb-074m-0203-SO	SB	8.0	12.0	11/10/10	Modified ISM	1	1							
DA1sb-074	DA1sb-074m-0204-SO	SB	12.0	16.0	11/10/10	Modified ISM	1	1							
DA1sb-075	DA1sb-075m-0201-SO	SB	1.0	4.0	11/10/10	Modified ISM	1	1							

Table 5-1 (continued)
ODA1 2010 Phase II RI Sample Collection Summary
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Sample Location/Soil Boring	Sample ID	Matrix	Top Depth (ft.)	Bottom Depth (ft.)	Date Collected	Sampling Method	TAL Metals	Explosives	Hexavalent Chromium	VOCs	SVOCs	Pesticides	PCBs	Cyanide	Propellants
DA1sb-075	DA1sb-075m-0202-SO	SB	4.0	8.0	11/10/10	Modified ISM	1	1							
DA1sb-075	DA1sb-075m-0203-SO	SB	8.0	12.0	11/10/10	Modified ISM	1	1							
DA1sb-075	DA1sb-075m-0204-SO	SB	12.0	16.0	11/10/10	Modified ISM	1	1							
DA1sb-076	DA1sb-076m-0201-SO	SB	1.0	4.0	11/10/10	Modified ISM	1	1							
DA1sb-076	DA1sb-076m-0202-SO	SB	4.0	8.0	11/10/10	Modified ISM	1	1							
DA1sb-076	DA1sb-076m-0203-SO	SB	8.0	12.0	11/10/10	Modified ISM	1	1							
DA1sb-077	DA1sb-077m-0201-SO	SB	1.0	4.0	11/10/10	Modified ISM	1	1							
DA1sb-077	DA1sb-077m-0202-SO	SB	4.0	8.0	11/10/10	Modified ISM	1	1							
DA1sb-077	DA1sb-077m-0203-SO	SB	8.0	12.0	11/10/10	Modified ISM	1	1							
DA1sb-077	DA1sb-077m-0204-SO	SB	12.0	16.0	11/10/10	Modified ISM	1	1							
Trip Blank	DA1qc-007-0001-TB	QC	NA	NA	11/11/10	NA				1					
DA1sb-088	DA1sb-088m-0203-SO	SB	8.0	12.0	11/10/10	Modified ISM	1	1							
Analytical Program for ODA1 Equipment Rinsate Blanks															
Surface Soil	DA1QC-001-0001-ER	GW	NA	NA	09/27/10	NA	1	1	1	1	1	1	1	1	1
Surface Soil	DA1QC-002-0001-ER	GW	NA	NA	09/27/10	NA	1	1	1	1	1	1	1	1	1
Subsurface Soil	DA1QC-003-0001-ER	GW	NA	NA	11/10/10	NA	1	1	1	1	1	1	1	1	1
Analytical Program for Site-Wide Investigative-Derived Waste															
	RVAAP-001-DW	AQ	NA	NA	09/23/10	NA	1	1		1	1	1	1	1	1
	RVAAP-001-DL	AQ	NA	NA	09/27/10	NA	1	1		1	1	1	1	1	1
	RVAAP-001-IDW-DL	AQ	NA	NA	09/30/10	NA	1	1		1	1				1
	RVAAP-001-IDW-SO	SO	NA	NA	09/30/10	NA	1	1		1	1				1

Table 5-1 (continued)
ODA1 2010 Phase II RI Sample Collection Summary
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Sample Location/Soil Boring	Sample ID	Matrix	Top Depth (ft.)	Bottom Depth (ft.)	Date Collected	Sampling Method	TAL Metals	Explosives	Hexavalent Chromium	VOCs	SVOCs	Pesticides	PCBs	Cyanide	Propellants
	RVAAP-002-IDW-DL	AQ	NA	NA	11/11/10	NA	1	1		1	1				1
	RVAAP-002-IDW-SO	SO	NA	NA	11/11/10	NA	1	1		1	1				1

Color Coding:

Primary ISM Sample
Field (Blind) Duplicate Samples
Primary Discrete Sample
QA Samples
MS/MSD and MS/MSD Sample Pairs

Sample Location and ID:
a denotes repeat/ replacement sample.
DA1 denotes Open Demolition Area #1.
ER denotes equipment rinsate.
DW denotes investigation-derived waste.
D denotes duplicate.
DL denotes decontamination liquids.
IDW denotes investigation-derived waste.
M denotes multi-increment sample.
MD denotes matrix duplicate.
MS denotes matrix spike.
qc, QC denotes quality control.
RVAAP denotes Ravenna Army Ammunition Plant.
sb denotes soil boring sample.
ss denotes surface soil sample.
SO denotes soil sample.
TB denotes Trip Blank.

Matrix Types:
AQ denotes aqueous.
GW denotes groundwater.
QC denotes quality control.
SB denotes subsurface soil.
SO denotes soil.
SS denotes surface soil.

Other Abbreviations:
DA1 denotes Open Demolition Area # 1 area of concern.
ft. denotes feet.
ISM denotes incremental sampling method.
MS/MSD denotes matrix spike/matrix spike duplicate.
NA denotes not applicable.
ODA1 denotes Open Demolition Area #1 area of concern.
PCB denotes polychlorinated biphenyl.
QA denotes quality assurance.
RI denotes Remedial Investigation.
SVOC denotes semivolatile organic compound.
TAL denotes Target Analyte List.
VOC denotes volatile organic compound.

Table 5-2
Data Use Summary Table for Remaining Phase I RI and Remaining Removal Action Samples Collected at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Sample Location ID	Date	Depth (ft. bgs)	Sample Type	Data Use Type	Comments
Surface Soil (0–1 ft. bgs)					
DA1ss-008-0015-SO	10/20/1999	0-1	GR	N&E, R, F&T	Phase I RI surface soil sample
DA1ss-018-0042-SO	10/22/1999	0-1	GR	N&E, R, F&T	Phase I RI surface soil sample
DA1ss-019-0045-SO	10/22/1999	0-1	GR	N&E, R, F&T	Phase I RI surface soil sample
DA1ss-002-0003-SO	10/19/1999	0-1	GR	N&E, R, F&T	Phase I RI surface soil sample
DA1ss-003-0005-SO	10/19/1999	0-1	GR	N&E, R, F&T	Phase I RI surface soil sample
DA1ss-004-0007-SO	10/19/1999	0-1	GR	N&E, R, F&T	Phase I RI surface soil sample
DA1ss-009-0017-SO	10/20/1999	0-1	GR	N&E, R, F&T	Phase I RI surface soil sample
DA1ss-011-0021-SO	10/20/1999	0-1	GR	N&E, R, F&T	Phase I RI surface soil sample
DA1ss-014-0029-SO	10/20/1999	0-1	GR	N&E, R, F&T	Phase I RI surface soil sample
DA1ss-015-0032-SO	10/21/1999	0-1	GR	N&E, R, F&T	Phase I RI surface soil sample
DA1ss-016-0036-SO	10/21/1999	0-1	GR	N&E, R, F&T	Phase I RI surface soil sample
DA1ss-017-0039-SO	10/21/1999	0-1	GR	N&E, R, F&T	Phase I RI surface soil sample
DA1ss-028-0073-SO	10/26/1999	0-1	GR	N&E, R, F&T	Phase I RI surface soil sample
DA1ss-031-0082-SO	10/26/1999	0-1	GR	N&E, R, F&T	Phase I RI surface soil sample
DA1ss-032-0085-SO	10/27/1999	0-1	GR	N&E, R, F&T	Phase I RI surface soil sample
DA1ss-036-0097-SO	11/2/1999	0-1	GR	N&E, R, F&T	Phase I RI surface soil sample

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Table 5-2 (continued)
Data Use Summary Table for Remaining Phase I RI and Remaining Removal Action Samples Collected at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Sample Location ID	Date	Depth (ft. bgs)	Sample Type	Data Use Type	Comments
DA1ss-037-0100-SO	11/2/1999	0-1	GR	N&E, R, F&T	Phase I RI surface soil sample
DA1ss-039-0106-SO	11/2/1999	0-1	GR	N&E, R, F&T	Phase I RI surface soil sample
Subsurface Soil (1–8 ft. bgs)					
DA1so-030-0080-SO	10/26/1999	1-3	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1ss-018-0131-SO	10/22/1999	1-3	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1so-026-0067-SO	10/25/1999	1-3	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1so-034-0092-SO	10/27/1999	1-3	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1so-018-0043-SO	10/22/1999	1-3	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1so-019-0046-SO	10/22/1999	1-3	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1so-027-0070-SO	10/20/1999	1-3	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1ss-002-0004-SO	10/19/1999	1-3	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1ss-003-0006-SO	10/19/1999	1-3	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1ss-014-0030-SO	10/20/1999	1-3	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1ss-015-0033-SO	10/21/1999	1-3	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1ss-016-0037-SO	10/21/1999	1-3	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1ss-017-0040-SO	10/21/1999	1-3	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1ss-031-0083-SO	10/26/1999	1-3	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1ss-032-0086-SO	10/27/1999	1-3	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT

Table 5-2 (continued)
Data Use Summary Table for Remaining Phase I RI and Remaining Removal Action Samples Collected at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Sample Location ID	Date	Depth (ft. bgs)	Sample Type	Data Use Type	Comments
DA1ss-033-0089-SO	10/27/1999	1-3	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1ss-035-0095-SO	11/1/1999	1-3	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1ss-036-0098-SO	11/2/1999	1-3	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1ss-037-0101-SO	11/2/1999	1-3	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1ss-039-0107-SO	11/2/1999	1-3	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
OD1gd-021-0001-SO	7/23/2001	2-4	ISM	N&E, R, F&T	Removal Action subsurface soil sample
DA1so-018-0044-SO	10/22/1999	3-5	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1so-019-0047-SO	10/22/1999	3-5	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1so-026-0068-SO	10/25/1999	3-5	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1so-027-0071-SO	10/20/1999	3-5	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1so-034-0093-SO	10/27/1999	3-5	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1ss-014-0031-SO	10/20/1999	3-5	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1ss-015-0034-SO	10/21/1999	3-5	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1ss-016-0038-SO	10/21/1999	3-5	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1ss-017-0041-SO	10/21/1999	3-5	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1ss-031-0084-SO	10/26/1999	3-5	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1ss-032-0087-SO	10/27/1999	3-5	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1ss-033-0090-SO	10/27/1999	3-5	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT

Table 5-2 (continued)
Data Use Summary Table for Remaining Phase I RI and Remaining Removal Action Samples Collected at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Sample Location ID	Date	Depth (ft. bgs)	Sample Type	Data Use Type	Comments
DA1ss-035-0096-SO	11/1/1999	3-5	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1ss-036-0099-SO	11/2/1999	3-5	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1ss-037-0102-SO	11/2/1999	3-5	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1ss-039-0108-SO	11/3/1999	3-5	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1so-018-0160-SO	10/22/1999	6-8	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1so-019-0161-SO	10/22/1999	6-8	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1ss-041-0164-SO	11/3/1999	6-8	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA1ss-042-0165-SO	11/3/1999	6-8	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA10162-020-SO	10/22/1999	6-8	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA10074-028-SO	10/26/1999	1-3	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
DA10075-028-SO	10/26/1999	3-5	D	N&E, R, F&T	Phase I RI subsurface soil sample collected using DPT
OD1gd-001-0001-SO	10/25/2000	4	ISM	N&E, R, F&T	Removal Action subsurface soil sample
OD1gd-002-0001-SO	10/27/2000	4	ISM	N&E, R, F&T	Removal Action subsurface soil sample
OD1gd-004-0001-SO	10/30/2000	4	ISM	N&E, R, F&T	Removal Action subsurface soil sample
OD1gd-006-0001-SO	10/27/2000	4	ISM	N&E, R, F&T	Removal Action subsurface soil sample
OD1gd-007-0001-SO	7/18/2001	4	ISM	N&E, R, F&T	Removal Action subsurface soil sample
OD1gd-008-0001-SO	7/10/2001	4	ISM	N&E, R, F&T	Removal Action subsurface soil sample
OD1gd-011-0001-SO	6/13/2001	4	ISM	N&E, R, F&T	Removal Action subsurface soil sample

Table 5-2 (continued)
Data Use Summary Table for Remaining Phase I RI and Remaining Removal Action Samples Collected at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Sample Location ID	Date	Depth (ft. bgs)	Sample Type	Data Use Type	Comments
OD1gd-013-0001-SO	11/20/2000	4	ISM	N&E, R, F&T	Removal Action subsurface soil sample
OD1gd-016-0001-SO	7/6/2001	4	ISM	N&E, R, F&T	Removal Action subsurface soil sample
OD1gd-018-0001-SO	7/12/2001	4	ISM	N&E, R, F&T	Removal Action subsurface soil sample
OD1gd-020-0001-SO	11/5/2001	4	ISM	N&E, R, F&T	Removal Action subsurface soil sample
OD1gd-021-0001-SO	7/23/2001	4	ISM	N&E, R, F&T	Removal Action subsurface soil sample

AOC denotes area of concern.
D denotes discrete sample.
DA1 denotes Open Demolition Area # 1 AOC.
DPT denotes direct-push technology.
F&T denotes fate and transport evaluation.
ft. bgs denotes feet below ground surface.
gd denotes grid.
GR denotes grab sample collection method (discrete) from 0–1 foot below ground surface.
ISM denotes incremental sampling method.
N&E denotes nature and extent of contamination evaluation.
OD1 denotes Open Demolition Area # 1 AOC.
ODA1 denotes Open Demolition Area # 1 AOC.
R denotes risk assessment evaluation.
RI denotes remedial investigation.
SO, so denotes soil sample.
ss denotes surface soil.

Table 5-3
Chromium Speciation Results
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Sample Location ID	Hexavalent Chromium Concentration (mg/kg)	Total Chromium Concentration (mg/kg)	Percent Hexavalent Chromium (percent)
Surface Soil (0–1 ft. bgs)			
DA1ss-050M-0001-SO	ND	**110**	---
DA1ss-051M-0001-SO	ND	**110**	---
DA1ss-052M-0001-SO	ND	**73.8**	---
DA1ss-053M-0001-SO	ND	**153 J**	---
DA1ss-054M-0001-SO	ND	**56.2**	---
DA1ss-080M-0001-SO	ND	**43**	---
Subsurface Soil (1–16 ft. bgs)			
DA1sb-059M-0201-SO	ND	**101**	---
DA1sb-064M-0201-SO	ND	**38.4**	---
DA1sb-067M-0202-SO	ND	25	---
DA1sb-071M-0201-SO	ND	**28.3**	---
DA1sb-072M-0201-SO	ND	**106**	---

Bold *denotes concentrations greater than background.*
--- denotes not applicable, no hexavalent chromium was detected.
AOC denotes area of concern.
DA1 denotes Open Demolition Area # 1 AOC.
ft. bgs denotes feet below ground surface.
J denotes estimated concentration.
M denotes multi-incremental sample.
mg/kg denotes milligrams per kilogram.
ND denotes not detected.
sb denotes soil boring.
SO denotes soil sample.
ss denotes surface soil.

Table 5-4
Summary Statistics and Determination of SRCs in Surface Soil (0–1 ft. bgs), 2010 Phase II RI ISM Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result[a]	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
Explosives and Propellants								
2,4,6-Trinitrotoluene	mg/kg	1/6	1.37	7.1	7.1	NB	**Yes**	***Detected Organic***
2,4-Dinitrotoluene	mg/kg	0/6	0.22			NB	No	No Detects
RDX	mg/kg	0/6	0.22			NB	No	No Detects
4-Amino-2,6-Dinitrotoluene	mg/kg	0/6	0.22			NB	No	No Detects
HMX	mg/kg	0/6	0.22			NB	No	No Detects
2-Amino-4,6-Dinitrotoluene	mg/kg	1/6	0.22	0.25	0.25	NB	**Yes**	***Detected Organic***
Tetryl	mg/kg	0/6	0.22			NB	No	No Detects
Nitroglycerin	mg/kg	0/6	0.75			NB	No	No Detects
Nitroguanidine	mg/kg	1/1	0.59	0.59	0.59	NB	**Yes**	***Detected Organic***
2,6-Dinitrotoluene	mg/kg	0/6	0.25			NB	No	No Detects
3,5-Dinitroaniline	mg/kg	0/6	0.22			NB	No	No Detects
PETN	mg/kg	0/6	0.75			NB	No	No Detects
o-Nitrotoluene	mg/kg	0/6	0.22			NB	No	No Detects
Nitrocellulose	mg/kg	0/1	11.50			NB	No	No Detects
Nitrobenzene	mg/kg	0/6	0.22			NB	No	No Detects
m-Nitrotoluene	mg/kg	0/6	0.22			NB	No	No Detects
1,3,5-Trinitrobenzene	mg/kg	0/6	0.22			NB	No	No Detects
1,3-Dinitrobenzene	mg/kg	0/6	0.22			NB	No	No Detects
p-Nitrotoluene	mg/kg	0/6	0.25			NB	No	No Detects

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Table 5-4 (continued)
Summary Statistics and Determination of SRCs in Surface Soil (0–1 ft. bgs), 2010 Phase II RI ISM Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result[a]	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
Inorganics								
Aluminum	mg/kg	6/6	8,971.67	6,870	11,400	17,700	No	Below Background
Antimony	mg/kg	5/6	1.21	0.69	2.7	0.96	**Yes**	***Above Background***
Arsenic	mg/kg	6/6	7.88	3.9	9.7	15.4	No	Below Background
Barium	mg/kg	6/6	66.82	47.0	107.0	88.4	**Yes**	***Above Background***
Beryllium	mg/kg	6/6	0.35	0.23	0.4	0.88	No	Below Background
Cadmium	mg/kg	6/6	1.52	0.35	3	0	**Yes**	***Above Background***
Calcium[b]	mg/kg	6/6	1,493.50	552	2,500	15,800	No	Essential Nutrient
Chromium	mg/kg	6/6	91.00	43	153	17.4	**Yes**	***Above Background***
Cobalt	mg/kg	6/6	9.45	4.3	20.6	10.4	**Yes**	***Above Background***
Copper	mg/kg	6/6	106.33	16.4	188	17.7	**Yes**	***Above Background***
Cyanide, Total	mg/kg	1/1	0.16	0.16	0.16	NB	**Yes**	***Above Background***
Hexavalent Chromium	mg/kg	0/6	3.25			NB	No	Below Background
Iron[b]	mg/kg	6/6	19,250.00	11,300	24,300	23,100	No	Below Background
Lead	mg/kg	6/6	17.40	11.6	25.3	26.1	No	Below Background
Magnesium[b]	mg/kg	6/6	2,178.33	1,360	2,890	3,030	No	Below Background
Manganese	mg/kg	6/6	429.33	373	535	1,450	No	Below Background
Mercury	mg/kg	6/6	0.04	0.032	0.079	0.036	**Yes**	***Above Background***
Nickel	mg/kg	6/6	15.62	8	18.4	21.1	No	Below Background
Potassium[b]	mg/kg	6/6	810.67	542	1,050	927	No	Below Background
Selenium	mg/kg	6/6	1.04	0.52	2.4	1.4	**Yes**	***Above Background***
Silver	mg/kg	0/6	0.05			0	No	Below Background
Sodium[b]	mg/kg	6/6	47.37	21.7	106	123	No	Below Background
Thallium	mg/kg	5/6	1.02	0.38	1.6	0	**Yes**	***Above Background***

Table 5-4 (continued)
Summary Statistics and Determination of SRCs in Surface Soil (0–1 ft. bgs), 2010 Phase II RI ISM Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result[a]	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
Vanadium	mg/kg	6/6	14.17	8.5	16.1	31.1	No	Below Background
Zinc	mg/kg	6/6	136.25	54.5	191	61.8	**Yes**	***Above Background***
Polychlorinated Biphenyls (PCBs)								
PCB-1016	mg/kg	0/1	0.03			NB	No	No Detects
PCB-1221	mg/kg	0/1	0.03			NB	No	No Detects
PCB-1232	mg/kg	0/1	0.03			NB	No	No Detects
PCB-1242	mg/kg	0/1	0.03			NB	No	No Detects
PCB-1248	mg/kg	0/1	0.03			NB	No	No Detects
PCB-1254	mg/kg	0/1	0.03			NB	No	No Detects
PCB-1260	mg/kg	0/1	0.03			NB	No	No Detects
Aroclor 1262	mg/kg	0/1	0.03			NB	No	No Detects
Aroclor 1268	mg/kg	0/1	0.03			NB	No	No Detects
Pesticides								
4,4'-DDT	mg/kg	1/1	0.00	0.00072	0.00072	NB	**Yes**	***Detected Organic***
4,4'-DDD	mg/kg	0/1	0.00			NB	No	No Detects
4,4'-DDE	mg/kg	1/1	0.00	0.00082	0.00082	NB	**Yes**	***Detected Organic***
Aldrin	mg/kg	0/1	0.00			NB	No	No Detects
alpha-BHC	mg/kg	0/1	0.00			NB	No	No Detects
alpha-Chlordane	mg/kg	0/1	0.00			NB	No	No Detects
beta-BHC	mg/kg	0/1	0.00			NB	No	No Detects
Chlordane	mg/kg	0/1	0.04			NB	No	No Detects
Dieldrin	mg/kg	0/1	0.00			NB	No	No Detects
delta-BHC	mg/kg	0/1	0.00			NB	No	No Detects
Heptachlor Epoxide	mg/kg	0/1	0.00			NB	No	No Detects

Table 5-4 (continued)
Summary Statistics and Determination of SRCs in Surface Soil (0–1 ft. bgs), 2010 Phase II RI ISM Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result[a]	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
Endosulfan Sulfate	mg/kg	0/1	0.00			NB	No	No Detects
Endosulfan II	mg/kg	0/1	0.00			NB	No	No Detects
Endosulfan I	mg/kg	0/1	0.00			NB	No	No Detects
Endrin	mg/kg	0/1	0.00			NB	No	No Detects
Endrin Aldehyde	mg/kg	0/1	0.00			NB	No	No Detects
Endrin Ketone	mg/kg	0/1	0.00			NB	No	No Detects
gamma-Chlordane	mg/kg	1/1	0.01	0.0052	0.0052	NB	**Yes**	***Detected Organic***
Heptachlor	mg/kg	1/1	0.00	0.0019	0.0019	NB	**Yes**	***Detected Organic***
Lindane	mg/kg	0/1	0.00			NB	No	No Detects
Methoxychlor	mg/kg	0/1	0.00			NB	No	No Detects
Toxaphene	mg/kg	0/1	0.03			NB	No	No Detects
Semivolatile Organic Compounds (SVOCs)								
4-Nitroaniline	mg/kg	0/1	0.50			NB	No	No Detects
4-Nitrophenol	mg/kg	0/1	0.50			NB	No	No Detects
Benzyl Alcohol	mg/kg	0/1	0.50			NB	No	No Detects
4-Bromophenyl Phenyl Ether	mg/kg	0/1	0.21			NB	No	No Detects
2,4-Dimethylphenol	mg/kg	0/1	0.21			NB	No	No Detects
1,4-Dichlorobenzene	mg/kg	0/1	0.21			NB	No	No Detects
4-Chloroaniline	mg/kg	0/1	0.21			NB	No	No Detects
Bis(2-Chloroisopropyl)ether	mg/kg	0/1	0.21			NB	No	No Detects
Phenol	mg/kg	0/1	0.26			NB	No	No Detects
Bis(2-Chloroethyl)ether	mg/kg	0/1	0.21			NB	No	No Detects
Bis(2-Chloroethoxy)methane	mg/kg	0/1	0.21			NB	No	No Detects
Bis(2-Ethylhexyl)phthalate	mg/kg	0/1	0.50			NB	No	No Detects

Table 5-4 (continued)
Summary Statistics and Determination of SRCs in Surface Soil (0–1 ft. bgs), 2010 Phase II RI ISM Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result[a]	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
Di-n-Octyl Phthalate	mg/kg	0/1	0.21			NB	No	No Detects
Hexachlorobenzene	mg/kg	0/1	0.21			NB	No	No Detects
Anthracene	mg/kg	0/1	0.21			NB	No	No Detects
1,2,4-Trichlorobenzene	mg/kg	0/1	0.21			NB	No	No Detects
2,4-Dichlorophenol	mg/kg	0/1	0.26			NB	No	No Detects
2,4-Dinitrotoluene	mg/kg	0/1	0.21			NB	No	No Detects
Pyrene	mg/kg	0/1	0.21			NB	No	No Detects
Dimethyl Phthalate	mg/kg	0/1	0.21			NB	No	No Detects
Cresols (Total)	mg/kg	0/1	1.00			NB	No	No Detects
Dibenzofuran	mg/kg	0/1	0.21			NB	No	No Detects
Benzo(ghi)perylene	mg/kg	0/1	0.21			NB	No	No Detects
Indeno(1,2,3-cd)pyrene	mg/kg	0/1	0.21			NB	No	No Detects
Benzo(b)fluoranthene	mg/kg	0/1	0.21			NB	No	No Detects
Fluoranthene	mg/kg	0/1	0.21			NB	No	No Detects
Benzo(k)fluoranthene	mg/kg	0/1	0.21			NB	No	No Detects
Acenaphthylene	mg/kg	0/1	0.21			NB	No	No Detects
Chrysene	mg/kg	0/1	0.21			NB	No	No Detects
Benzo(a)pyrene	mg/kg	0/1	0.21			NB	No	No Detects
2,4-Dinitrophenol	mg/kg	0/1	1.00			NB	No	No Detects
Dibenzo(a,h)anthracene	mg/kg	0/1	0.21			NB	No	No Detects
4,6-Dinitro-2-Methylphenol	mg/kg	0/1	0.50			NB	No	No Detects
1,3-Dichlorobenzene	mg/kg	0/1	0.21			NB	No	No Detects
Benzo(a)anthracene	mg/kg	0/1	0.21			NB	No	No Detects
4-Chloro-3-Methylphenol	mg/kg	0/1	0.26			NB	No	No Detects

Table 5-4 (continued)
Summary Statistics and Determination of SRCs in Surface Soil (0–1 ft. bgs), 2010 Phase II RI ISM Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result[a]	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
2,6-Dinitrotoluene	mg/kg	0/1	0.21			NB	No	No Detects
N-Nitroso-di-n-Propylamine	mg/kg	0/1	0.21			NB	No	No Detects
Benzoic Acid	mg/kg	0/1	1.00			NB	No	No Detects
Hexachloroethane	mg/kg	0/1	0.21			NB	No	No Detects
4-Chlorophenyl Phenyl Ether	mg/kg	0/1	0.21			NB	No	No Detects
Hexachlorocyclopentadiene	mg/kg	0/1	0.21			NB	No	No Detects
Isophorone	mg/kg	0/1	0.21			NB	No	No Detects
Acenaphthene	mg/kg	0/1	0.21			NB	No	No Detects
Diethyl Phthalate	mg/kg	0/1	0.21			NB	No	No Detects
Di-n-Butyl Phthalate	mg/kg	1/1	0.21	0.21	0.21	NB	**Yes**	***Detected Organic***
Phenanthrene	mg/kg	0/1	0.21			NB	No	No Detects
Butyl Benzyl Phthalate	mg/kg	0/1	0.21			NB	No	No Detects
N-Nitrosodiphenylamine	mg/kg	0/1	0.41			NB	No	No Detects
Fluorene	mg/kg	0/1	0.21			NB	No	No Detects
Carbazole	mg/kg	0/1	0.21			NB	No	No Detects
Hexachlorobutadiene	mg/kg	0/1	0.21			NB	No	No Detects
Pentachlorophenol	mg/kg	0/1	0.50			NB	No	No Detects
2,4,6-Trichlorophenol	mg/kg	0/1	0.26			NB	No	No Detects
2-Nitroaniline	mg/kg	0/1	0.21			NB	No	No Detects
2-Nitrophenol	mg/kg	0/1	0.26			NB	No	No Detects
Naphthalene	mg/kg	0/1	0.21			NB	No	No Detects
2-Methylnaphthalene	mg/kg	0/1	0.21			NB	No	No Detects
2-Chloronaphthalene	mg/kg	0/1	0.21			NB	No	No Detects
3,3’-Dichlorobenzidine	mg/kg	0/1	0.26			NB	No	No Detects

Table 5-4 (continued)
Summary Statistics and Determination of SRCs in Surface Soil (0–1 ft. bgs), 2010 Phase II RI ISM Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result[a]	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
o-Cresol	mg/kg	0/1	0.50			NB	No	No Detects
1,2-Dichlorobenzene	mg/kg	0/1	0.21			NB	No	No Detects
2-Chlorophenol	mg/kg	0/1	0.26			NB	No	No Detects
2,4,5-Trichlorophenol	mg/kg	0/1	0.26			NB	No	No Detects
Nitrobenzene	mg/kg	0/1	0.21			NB	No	No Detects
3-Nitroaniline	mg/kg	0/1	0.50			NB	No	No Detects
Volatile Organic Compounds (VOCs)								
Ethylbenzene	mg/kg	0/1	0.03			NB	No	No Detects
Styrene	mg/kg	0/1	0.03			NB	No	No Detects
cis-1,3-Dichloropropene	mg/kg	0/1	0.03			NB	No	No Detects
trans-1,3-Dichloropropene	mg/kg	0/1	0.06			NB	No	No Detects
1,2-Dibromoethane	mg/kg	0/1	0.03			NB	No	No Detects
1,2-Dichloroethane	mg/kg	0/1	0.03			NB	No	No Detects
Methyl Isobutyl Ketone	mg/kg	0/1	0.31			NB	No	No Detects
Toluene	mg/kg	0/1	0.03			NB	No	No Detects
Chlorobenzene	mg/kg	0/1	0.03			NB	No	No Detects
Dibromochloromethane	mg/kg	0/1	0.03			NB	No	No Detects
Tetrachloroethylene	mg/kg	0/1	0.03			NB	No	No Detects
Xylene, (Total)	mg/kg	0/1	0.06			NB	No	No Detects
cis-1,2-Dichloroethene	mg/kg	0/1	0.03			NB	No	No Detects
trans-1,2-Dichloroethene	mg/kg	0/1	0.03			NB	No	No Detects
Carbon Tetrachloride	mg/kg	0/1	0.03			NB	No	No Detects
2-Hexanone	mg/kg	0/1	0.31			NB	No	No Detects
Acetone	mg/kg	0/1	0.60			NB	No	No Detects

Table 5-4 (continued)
Summary Statistics and Determination of SRCs in Surface Soil (0–1 ft. bgs), 2010 Phase II RI ISM Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result[a]	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
Chloroform	mg/kg	0/1	0.03			NB	No	No Detects
Benzene	mg/kg	0/1	0.03			NB	No	No Detects
1,1,1-Trichloroethane	mg/kg	0/1	0.03			NB	No	No Detects
Bromomethane	mg/kg	0/1	0.06			NB	No	No Detects
Chloromethane	mg/kg	0/1	0.06			NB	No	No Detects
Bromochloromethane	mg/kg	0/1	0.03			NB	No	No Detects
Chloroethane	mg/kg	0/1	0.06			NB	No	No Detects
Vinyl Chloride	mg/kg	0/1	0.03			NB	No	No Detects
Methylene Chloride	mg/kg	0/1	0.06			NB	No	No Detects
Carbon Disulfide	mg/kg	0/1	0.06			NB	No	No Detects
Bromoform	mg/kg	0/1	0.03			NB	No	No Detects
Bromodichloromethane	mg/kg	0/1	0.03			NB	No	No Detects
1,1-Dichloroethane	mg/kg	0/1	0.03			NB	No	No Detects
1,1-Dichloroethylene	mg/kg	0/1	0.03			NB	No	No Detects
1,2-Dichloropropane	mg/kg	0/1	0.03			NB	No	No Detects
Methyl Ethyl Ketone	mg/kg	0/1	0.31			NB	No	No Detects
1,1,2-Trichloroethane	mg/kg	0/1	0.03			NB	No	No Detects
Trichloroethylene	mg/kg	0/1	0.03			NB	No	No Detects
1,1,2,2-Tetrachloroethane	mg/kg	0/1	0.03			NB	No	No Detects
1,2-Dimethylbenzene	mg/kg	0/1	0.03			NB	No	No Detects

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Table 5-4 (continued)
Summary Statistics and Determination of SRCs in Surface Soil (0–1 ft. bgs), 2010 Phase II RI ISM Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

[a] *denotes values less than the detection limit were set to one-half of the reporting limit in calculation of the average.*
[b] *denotes eliminated based on the essential element screen.*
BHC denotes benzene hexachloride.
DDD denotes dichlorodiphenyldichloroethane.
DDE denotes dichlorodiphenyldichloroethylene.
DDT denotes dichlorodiphenyltrichloroethane.
ft. bgs denotes feet below ground surface.
HMX denotes octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ISM denotes incremental sampling method.
mg/kg denotes milligram(s) per kilogram.
NB denotes No Facility-Wide Background Criterion established.
PCB denotes polychlorinated biphenyl.
RDX denotes hexahydro-1,3,5-trinitro-1,3,5-triazine.
RI denotes Remedial Investigation.
SRC denotes site-related contaminant.
SVOC denotes semivolatile organic compound.
VOC denotes volatile organic compound.

Table 5-5
Summary Statistics and Determination of SRCs in Surface Soil (0–1 ft. bgs), 1999 Phase I RI Remaining Discrete Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result[a]	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
Explosives and Propellants								
2,4,6-Trinitrotoluene	mg/kg	0/18	0.13			NB	No	No Detects
2,4-Dinitrotoluene	mg/kg	1/18	0.13	0.13	0.13	NB	**Yes**	***Detected Organic***
RDX	mg/kg	0/18	0.13			NB	No	No Detects
HMX	mg/kg	1/18	0.25	0.2	0.2	NB	**Yes**	***Detected Organic***
Tetryl	mg/kg	0/18	0.13			NB	No	No Detects
Nitroglycerin	mg/kg	0/18	0.13			NB	No	No Detects
Nitroguanidine	mg/kg	0/18	0.13			NB	No	No Detects
2,6-Dinitrotoluene	mg/kg	0/18	0.13			NB	No	No Detects
o-Nitrotoluene	mg/kg	0/18	0.13			NB	No	No Detects
Nitrocellulose	mg/kg	0/18	0.13			NB	No	No Detects
Nitrobenzene	mg/kg	0/18	0.13			NB	No	No Detects
m-Nitrotoluene	mg/kg	0/18	0.13			NB	No	No Detects
1,3,5-Trinitrobenzene	mg/kg	0/18	0.13			NB	No	No Detects
1,3-Dinitrobenzene	mg/kg	0/18	0.13			NB	No	No Detects
p-Nitrotoluene	mg/kg	0/18	0.13			NB	No	No Detects
Inorganics								
Aluminum	mg/kg	18/18	8,871.11	1,730	16,200	17,700	No	Below Background
Antimony	mg/kg	2/18	0.58	0.54	0.63	0.96	No	Below Background
Arsenic	mg/kg	18/18	9.64	5	15.1	15.4	No	Below Background
Barium	mg/kg	18/18	80.59	35.8	252	88.4	**Yes**	**Above Background**
Beryllium	mg/kg	7/18	0.23	0.15	0.94	0.88	**Yes**	**Above Background**

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Table 5-5 (continued)
Summary Statistics and Determination of SRCs in Surface Soil (0–1 ft. bgs),
1999 Phase I RI Remaining Discrete Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result[a]	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
Cadmium	mg/kg	3/18	0.35	0.27	1.1	0	**Yes**	***Above Background***
Calcium[b]	mg/kg	18/18	49,758.72	250	248,000	15,800	No	Essential Nutrient
Chromium	mg/kg	18/18	11.54	3.4	22.6	17.4	**Yes**	***Above Background***
Cobalt	mg/kg	18/18	6.54	2.7	14	10.4	**Yes**	***Above Background***
Copper	mg/kg	18/18	21.76	5.8	69.8	17.7	**Yes**	***Above Background***
Cyanide, Total	mg/kg	0/18	0.29			NB	No	No Detects
Iron[b]	mg/kg	18/18	17,575.56	5,820	33,400	23,100	No	Essential Nutrient
Lead	mg/kg	18/18	15.01	8.2	20.2	26.1	No	Below Background
Magnesium[b]	mg/kg	18/18	2,177.22	797	5,280	3,030	No	Essential Nutrient
Manganese	mg/kg	18/18	477.00	138	947	1,450	No	Below Background
Mercury	mg/kg	12/18	0.03	0.0078	0.076	0.036	**Yes**	***Above Background***
Nickel	mg/kg	18/18	13.64	7.9	31.9	21.1	**Yes**	***Above Background***
Potassium[b]	mg/kg	18/18	823.67	332	2,050	927	No	Essential Nutrient
Selenium	mg/kg	2/18	0.43	0.88	1.2	1.4	No	Below Background
Silver	mg/kg	0/18	0.58			0	No	Below Background
Sodium[b]	mg/kg	0/18	126.73			123	No	Essential Nutrient
Thallium	mg/kg	17/18	0.32	0.14	0.48	0	**Yes**	***Above Background***
Vanadium	mg/kg	18/18	15.88	3.8	26.6	31.1	No	Below Background
Zinc	mg/kg	18/18	68.60	31.9	317	61.8	**Yes**	***Above Background***

Table 5-5 (continued)
Summary Statistics and Determination of SRCs in Surface Soil (0–1 ft. bgs),
1999 Phase I RI Remaining Discrete Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

[a] denotes values less than the detection limit were set to one-half of the reporting limit in calculation of the average.
[b] denotes eliminated based on the essential element screen.
ft. bgs denotes feet below ground surface.
HMX denotes octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
mg/kg denotes milligram(s) per kilogram.
NB denotes No Facility-Wide Background Criterion established.
RDX denotes.hexahydro-1,3,5-trinitro-1,3,5-triazine.
RI denotes Remedial Investigation.
SRC denotes site-related contaminant.

Table 5-6
Statistics and Determination of SRCs in Subsurface Soil (>1 ft. bgs), 1999 Phase I RI Remaining Discrete and 2010 Phase II Samples forOpen Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result[a]	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
Explosives and Propellants								
2,4,6-Trinitrotoluene	mg/kg	3/135	0.65	0.18	64	NB	**Yes**	***Detected Organic***
2,4-Dinitrotoluene	mg/kg	0/135	0.18			NB	No	No Detects
RDX	mg/kg	0/135	0.21			NB	No	No Detects
4-Amino-2,6-Dinitrotoluene	mg/kg	0/84	0.22			NB	No	No Detects
HMX	mg/kg	0/135	0.22			NB	No	No Detects
2-Amino-4,6-Dinitrotoluene	mg/kg	1/84	0.22	0.31	0.31	NB	**Yes**	***Detected Organic***
Tetryl	mg/kg	0/135	0.24			NB	No	No Detects
Nitroglycerin	mg/kg	0/123	0.91			NB	No	No Detects
Nitroguanidine	mg/kg	0/26	0.08			NB	No	No Detects
2,6-Dinitrotoluene	mg/kg	0/135	0.20			NB	No	No Detects
3,5-Dinitroaniline	mg/kg	0/84	0.22			NB	No	No Detects
PETN	mg/kg	0/84	0.75			NB	No	No Detects
o-Nitrotoluene	mg/kg	0/135	0.19			NB	No	No Detects
Nitrocellulose	mg/kg	0/26	34.79			NB	No	No Detects
Nitrobenzene	mg/kg	0/135	0.18			NB	No	No Detects
m-Nitrotoluene	mg/kg	0/135	0.19			NB	No	No Detects
1,3,5-Trinitrobenzene	mg/kg	0/135	0.18			NB	No	No Detects
1,3-Dinitrobenzene	mg/kg	0/135	0.18			NB	No	No Detects
p-Nitrotoluene	mg/kg	0/135	0.22			NB	No	No Detects

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Table 5-6 (continued)
Summary Statistics and Determination of SRCs in Subsurface Soil (>1 ft. bgs),
1999 Phase I RI Remaining Discrete and 2010 Phase II Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result[a]	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
Inorganics								
Aluminum	mg/kg	135/135	11,772.59	1,990	28,600	19,500	**Yes**	***Above Background***
Antimony	mg/kg	47/135	0.91	0.22	20.5	0.96	**Yes**	***Above Background***
Arsenic	mg/kg	135/135	10.49	0.4	33	19.8	**Yes**	***Above Background***
Barium	mg/kg	135/135	70.28	9.5	869	124	**Yes**	***Above Background***
Beryllium	mg/kg	115/135	0.44	0.069	0.95	0.88	**Yes**	***Above Background***
Cadmium	mg/kg	29/135	0.37	0.026	18.4	0	**Yes**	***Above Background***
Calcium[b]	mg/kg	135/135	10,446.54	367	36,000	35,500	No	Essential Nutrient
Chromium	mg/kg	135/135	49.53	10.1	589	27.2	**Yes**	***Above Background***
Cobalt	mg/kg	135/135	10.14	4.5	20.5	23.2	No	Below Background
Copper	mg/kg	135/135	34.44	9	1,290	32.3	**Yes**	***Above Background***
Cyanide, Total	mg/kg	3/48	0.28	0.11	0.4	NB	**Yes**	***Above Background***
Hexavalent Chromium	mg/kg	0/4	3.25			NB	No	No Detects
Iron[b]	mg/kg	135/135	27,537.26	4,660	44,300	35,200	No	Essential Nutrient
Lead	mg/kg	135/135	16.39	3.6	416	19.1	**Yes**	***Above Background***
Magnesium[b]	mg/kg	135/135	4,467.76	777	9,120	8,790	No	Essential Nutrient
Manganese	mg/kg	135/135	366.54	26.6	2,180	3,030	No	Below Background
Mercury	mg/kg	112/135	0.02	0.0063	0.25	0.044	**Yes**	***Above Background***
Nickel	mg/kg	135/135	23.68	10	55.9	60.7	No	Below Background
Potassium[b]	mg/kg	135/135	1,526.86	479	4,430	3,350	No	Essential Nutrient
Selenium	mg/kg	80/135	0.56	0.14	2.4	1.5	**Yes**	***Above Background***
Silver	mg/kg	10/135	1.09	0.048	115	0	**Yes**	***Above Background***

Table 5-6 (continued)
Summary Statistics and Determination of SRCs in Subsurface Soil (>1 ft. bgs),
1999 Phase I RI Remaining Discrete and 2010 Phase II Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result[a]	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
Sodium[b]	mg/kg	95/135	106.16	23.6	965	145	No	Essential Nutrient
Thallium	mg/kg	110/135	1.00	0.14	3.2	0.91	**Yes**	***Above Background***
Vanadium	mg/kg	135/135	17.93	3.7	39.9	37.6	**Yes**	***Above Background***
Zinc	mg/kg	135/135	64.40	31.4	475	93.3	**Yes**	***Above Background***
Polychlorinated Biphenyls (PCBs)								
PCB-1016	mg/kg	0/9	0.02			NB	No	No Detects
PCB-1221	mg/kg	0/9	0.02			NB	No	No Detects
PCB-1232	mg/kg	0/9	0.02			NB	No	No Detects
PCB-1242	mg/kg	0/9	0.02			NB	No	No Detects
PCB-1248	mg/kg	0/9	0.02			NB	No	No Detects
PCB-1254	mg/kg	0/9	0.02			NB	No	No Detects
PCB-1260	mg/kg	0/9	0.02			NB	No	No Detects
Aroclor 1262	mg/kg	0/8	0.03			NB	No	No Detects
Aroclor 1268	mg/kg	0/8	0.03			NB	No	No Detects
Pesticides								
4,4'-DDT	mg/kg	3/9	0.00034	0.0005	0.00061	NB	**Yes**	***Detected Organic***
4,4'-DDD	mg/kg	0/9	0.00125			NB	No	No Detects
4,4'-DDE	mg/kg	1/9	0.00017	0.0003	0.0003	NB	**Yes**	***Detected Organic***
Aldrin	mg/kg	1/9	0.00028	0.00071	0.00071	NB	**Yes**	***Detected Organic***
alpha-BHC	mg/kg	0/5	0.00205			NB	No	No Detects
alpha-Chlordane	mg/kg	0/9	0.00205			NB	No	No Detects

Table 5-6 (continued)
Summary Statistics and Determination of SRCs in Subsurface Soil (>1 ft. bgs),
1999 Phase I RI Remaining Discrete and 2010 Phase II Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result[a]	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
beta-BHC	mg/kg	0/9	0.00205			NB	No	No Detects
Chlordane	mg/kg	0/6	0.04			NB	No	No Detects
Dieldrin	mg/kg	0/9	0.00125			NB	No	No Detects
delta-BHC	mg/kg	1/9	0.00042	0.0027	0.0027	NB	**Yes**	***Detected Organic***
Heptachlor Epoxide	mg/kg	1/9	0.00027	0.00061	0.00061	NB	**Yes**	***Detected Organic***
Endosulfan Sulfate	mg/kg	0/9	0.00205			NB	No	No Detects
Endosulfan II	mg/kg	2/9	0.00026	0.0003	0.00091	NB	**Yes**	***Detected Organic***
Endosulfan I	mg/kg	0/9	0.00125			NB	No	No Detects
Endrin	mg/kg	0/9	0.00125			NB	No	No Detects
Endrin Aldehyde	mg/kg	0/9	0.00205			NB	No	No Detects
Endrin Ketone	mg/kg	0/9	0.00125			NB	No	No Detects
gamma-Chlordane	mg/kg	3/9	0.00146	0.0015	0.0058	NB	**Yes**	***Detected Organic***
Heptachlor	mg/kg	5/9	0.00214	0.0014	0.0073	NB	**Yes**	***Detected Organic***
Lindane	mg/kg	0/9	0.00125			NB	No	No Detects
Methoxychlor	mg/kg	0/9	0.00125			NB	No	No Detects
Toxaphene	mg/kg	0/9	0.02			NB	No	No Detects
Semivolatile Organic Compounds (SVOCs)								
4-Nitrobenzenamine	mg/kg	0/10	0.50			NB	No	No Detects
4-Nitrophenol	mg/kg	0/10	0.50			NB	No	No Detects
Benzyl Alcohol	mg/kg	0/9	0.50			NB	No	No Detects
4-Bromophenyl Phenyl Ether	mg/kg	0/10	0.20			NB	No	No Detects
2,4-Dimethylphenol	mg/kg	0/10	0.20			NB	No	No Detects

Table 5-6 (continued)
Summary Statistics and Determination of SRCs in Subsurface Soil (>1 ft. bgs),
1999 Phase I RI Remaining Discrete and 2010 Phase II Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result[a]	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
4-Methylphenol	mg/kg	0/1	0.21			NB	No	No Detects
1,4-Dichlorobenzene	mg/kg	0/10	0.20			NB	No	No Detects
4-Chloroaniline	mg/kg	0/10	0.20			NB	No	No Detects
Bis(2-Chloroisopropyl)ether	mg/kg	0/10	0.20			NB	No	No Detects
Phenol	mg/kg	0/10	0.25			NB	No	No Detects
Bis(2-Chloroethyl)ether	mg/kg	0/10	0.20			NB	No	No Detects
Bis(2-Chloroethoxy)methane	mg/kg	0/10	0.20			NB	No	No Detects
Bis(2-Ethylhexyl)phthalate	mg/kg	4/10	0.58	0.1	2.7	NB	**Yes**	***Detected Organic***
Di-n-Octyl Phthalate	mg/kg	0/10	0.20			NB	No	No Detects
Hexachlorobenzene	mg/kg	0/10	0.20			NB	No	No Detects
Anthracene	mg/kg	0/10	0.20			NB	No	No Detects
1,2,4-Trichlorobenzene	mg/kg	0/10	0.20			NB	No	No Detects
2,4-Dichlorophenol	mg/kg	0/10	0.25			NB	No	No Detects
2,4-Dinitrotoluene	mg/kg	0/9	0.20			NB	No	No Detects
Pyrene	mg/kg	0/10	0.20			NB	No	No Detects
Dimethyl Phthalate	mg/kg	0/10	0.20			NB	No	No Detects
Cresols (Total)	mg/kg	0/9	1.00			NB	No	No Detects
Dibenzofuran	mg/kg	0/10	0.20			NB	No	No Detects
Benzo(ghi)perylene	mg/kg	0/10	0.20			NB	No	No Detects
Indeno(1,2,3-cd)pyrene	mg/kg	0/10	0.20			NB	No	No Detects
Benzo(b)fluoranthene	mg/kg	0/10	0.20			NB	No	No Detects
Fluoranthene	mg/kg	0/10	0.20			NB	No	No Detects

Table 5-6 (continued)
Summary Statistics and Determination of SRCs in Subsurface Soil (>1 ft. bgs),
1999 Phase I RI Remaining Discrete and 2010 Phase II Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result[a]	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
Benzo(k)fluoranthene	mg/kg	0/10	0.20			NB	No	No Detects
Acenaphthylene	mg/kg	0/10	0.20			NB	No	No Detects
Chrysene	mg/kg	0/10	0.20			NB	No	No Detects
Benzo(a)pyrene	mg/kg	0/10	0.20			NB	No	No Detects
2,4-Dinitrophenol	mg/kg	0/10	0.95			NB	No	No Detects
Dibenzo(a,h)anthracene	mg/kg	0/10	0.20			NB	No	No Detects
4,6-Dinitro-2-Methylphenol	mg/kg	0/10	0.50			NB	No	No Detects
1,3-Dichlorobenzene	mg/kg	0/10	0.20			NB	No	No Detects
Benzo(a)anthracene	mg/kg	0/10	0.20			NB	No	No Detects
4-Chloro-3-Methylphenol	mg/kg	0/10	0.25			NB	No	No Detects
2,6-Dinitrotoluene	mg/kg	0/9	0.20			NB	No	No Detects
N-Nitroso-di-n-Propylamine	mg/kg	0/10	0.20			NB	No	No Detects
Benzoic Acid	mg/kg	0/9	0.61			NB	No	No Detects
Hexachloroethane	mg/kg	0/10	0.20			NB	No	No Detects
4-Chlorophenyl Phenyl Ether	mg/kg	0/10	0.20			NB	No	No Detects
Hexachlorocyclopentadiene	mg/kg	0/10	0.20			NB	No	No Detects
Isophorone	mg/kg	2/10	0.17	0.05	0.07	NB	**Yes**	***Detected Organic***
Acenaphthene	mg/kg	0/10	0.20			NB	No	No Detects
Diethyl Phthalate	mg/kg	0/10	0.20			NB	No	No Detects
Di-n-Butyl Phthalate	mg/kg	7/10	0.13	0.08	0.11	NB	**Yes**	***Detected Organic***
Phenanthrene	mg/kg	0/10	0.20			NB	No	No Detects
Butyl Benzyl Phthalate	mg/kg	0/10	0.20			NB	No	No Detects

Table 5-6 (continued)
Summary Statistics and Determination of SRCs in Subsurface Soil (>1 ft. bgs),
1999 Phase I RI Remaining Discrete and 2010 Phase II Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result[a]	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
Fluorene	mg/kg	0/10	0.20			NB	No	No Detects
Carbazole	mg/kg	0/10	0.20			NB	No	No Detects
Hexachlorobutadiene	mg/kg	0/10	0.20			NB	No	No Detects
Pentachlorophenol	mg/kg	0/10	0.50			NB	No	No Detects
2,4,6-Trichlorophenol	mg/kg	0/10	0.25			NB	No	No Detects
2-Nitroaniline	mg/kg	0/10	0.23			NB	No	No Detects
2-Nitrophenol	mg/kg	0/10	0.25			NB	No	No Detects
Naphthalene	mg/kg	0/10	0.20			NB	No	No Detects
2-Methylnaphthalene	mg/kg	1/10	0.19	0.05	0.05	NB	**Yes**	***Detected Organic***
2-Chloronaphthalene	mg/kg	0/10	0.20			NB	No	No Detects
3,3'-Dichlorobenzidine	mg/kg	0/10	0.25			NB	No	No Detects
o-Cresol	mg/kg	0/10	0.47			NB	No	No Detects
1,2-Dichlorobenzene	mg/kg	0/10	0.20			NB	No	No Detects
2-Chlorophenol	mg/kg	0/10	0.25			NB	No	No Detects
2,4,5-Trichlorophenol	mg/kg	0/10	0.28			NB	No	No Detects
Nitrobenzene	mg/kg	0/9	0.20			NB	No	No Detects
3-Nitroaniline	mg/kg	0/10	0.50			NB	No	No Detects
N-Nitrosodiphenylamine	mg/kg	0/10	0.39			NB	No	No Detects
Volatile Organic Compounds (VOCs)								
Ethylbenzene	mg/kg	0/21	0.03			NB	No	No Detects
Styrene	mg/kg	0/21	0.03			NB	No	No Detects
cis-1,3-Dichloropropene	mg/kg	0/21	0.03			NB	No	No Detects

Table 5-6 (continued)
Summary Statistics and Determination of SRCs in Subsurface Soil (>1 ft. bgs),
1999 Phase I RI Remaining Discrete and 2010 Phase II Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result[a]	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
trans-1,3-Dichloropropene	mg/kg	0/21	0.05			NB	No	No Detects
1,2-Dibromoethane	mg/kg	0/20	0.03			NB	No	No Detects
1,2-Dichloroethane	mg/kg	0/21	0.03			NB	No	No Detects
Methyl Isobutyl Ketone	mg/kg	0/21	0.26			NB	No	No Detects
Toluene	mg/kg	0/21	0.03			NB	No	No Detects
Chlorobenzene	mg/kg	0/21	0.03			NB	No	No Detects
Dibromochloromethane	mg/kg	0/21	0.03			NB	No	No Detects
Tetrachloroethylene	mg/kg	0/21	0.03			NB	No	No Detects
Xylene, (Total)	mg/kg	0/21	0.05			NB	No	No Detects
cis-1,2-Dichloroethene	mg/kg	0/20	0.03			NB	No	No Detects
trans-1,2-Dichloroethene	mg/kg	0/20	0.03			NB	No	No Detects
1,2-Dichloroethylene	mg/kg	0/1	0.00			NB	No	No Detects
Carbon Tetrachloride	mg/kg	0/21	0.03			NB	No	No Detects
2-Hexanone	mg/kg	0/21	0.26			NB	No	No Detects
Acetone	mg/kg	2/21	0.48	0.21	0.24	NB	**Yes**	***Detected Organic***
Chloroform	mg/kg	0/21	0.03			NB	No	No Detects
Benzene	mg/kg	0/21	0.03			NB	No	No Detects
1,1,1-Trichloroethane	mg/kg	0/21	0.03			NB	No	No Detects
Bromomethane	mg/kg	0/21	0.05			NB	No	No Detects
Chloromethane	mg/kg	0/21	0.05			NB	No	No Detects
Bromochloromethane	mg/kg	0/20	0.03			NB	No	No Detects
Chloroethane	mg/kg	0/21	0.05			NB	No	No Detects

Table 5-6 (continued)
Summary Statistics and Determination of SRCs in Subsurface Soil (>1 ft. bgs),
1999 Phase I RI Remaining Discrete and 2010 Phase II Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result[a]	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
Vinyl Chloride	mg/kg	0/21	0.03			NB	No	No Detects
Methylene Chloride	mg/kg	0/21	0.05			NB	No	No Detects
Carbon Disulfide	mg/kg	0/21	0.05			NB	No	No Detects
Bromoform	mg/kg	0/21	0.03			NB	No	No Detects
Bromodichloromethane	mg/kg	0/21	0.03			NB	No	No Detects
1,1-Dichloroethane	mg/kg	0/21	0.03			NB	No	No Detects
1,1-Dichloroethylene	mg/kg	0/21	0.03			NB	No	No Detects
1,2-Dichloropropane	mg/kg	0/21	0.03			NB	No	No Detects
Methyl Ethyl Ketone	mg/kg	0/21	0.26			NB	No	No Detects
1,1,2-Trichloroethane	mg/kg	0/21	0.03			NB	No	No Detects
Trichloroethylene	mg/kg	0/21	0.03			NB	No	No Detects
1,1,2,2-Tetrachloroethane	mg/kg	0/21	0.03			NB	No	No Detects
1,2-Dimethylbenzene	mg/kg	0/20	0.03			NB	No	No Detects

[a] denotes values less than the detection limit were set to one-half of the reporting limit in calculation of the average.
[b] denotes eliminated based on the essential element screen.
BHC denotes benzene hexachloride.
DDD denotes dichlorodiphenyldichloroethane.
DDE denotes dichlorodiphenyldichloroethylene.
DDT denotes dichlorodiphenyltrichloroethane.
ft. bgs denotes feet below ground surface.
HMX denotes octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
mg/kg denotes milligram(s) per kilogram.
NB denotes No Facility-Wide Background Criterion established.
PCB denotes polychlorinated biphenyl.
RDX denotes hexahydro-1,3,5-trinitro-1,3,5-triazine.
RI denotes Remedial Investigation.
SRC denotes site-related contaminant.
SVOCs denotes semivolatile organic compound.
VOCs denotes volatile organic compound.

Table 5-7
Summary Statistics and Determination of SRCs in Subsurface Soil (>1 ft. bgs), 2000–2001 IRA Remaining Confirmatory ISM Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
Explosives and Propellants								
2,4,6-Trinitrotoluene	mg/kg	1/12	0.05	0.18	0.18	NB	**Yes**	***Detected Organic***
2,4-Dinitrotoluene	mg/kg	0/12	0.04			NB	No	No Detects
RDX	mg/kg	0/12	0.04			NB	No	No Detects
HMX	mg/kg	0/12	0.10			NB	No	No Detects
Tetryl	mg/kg	0/12	0.07			NB	No	No Detects
2,6-Dinitrotoluene	mg/kg	0/12	0.07			NB	No	No Detects
o-Nitrotoluene	mg/kg	0/12	0.07			NB	No	No Detects
Nitrobenzene	mg/kg	0/12	0.04			NB	No	No Detects
m-Nitrotoluene	mg/kg	0/12	0.08			NB	No	No Detects
1,3,5-Trinitrobenzene	mg/kg	0/12	0.04			NB	No	No Detects
1,3-Dinitrobenzene	mg/kg	0/12	0.04			NB	No	No Detects
p-Nitrotoluene	mg/kg	0/12	0.17			NB	No	No Detects
Inorganics								
Aluminum	mg/kg	12/12	11,251.98	1,990	23,600	19,500	**Yes**	***Above Background***
Antimony	mg/kg	3/12	1.42	0.12	3.2	0.96	**Yes**	***Above Background***
Arsenic	mg/kg	12/12	1.14	0.22	20.5	19.8	**Yes**	***Above Background***
Barium	mg/kg	12/12	8.22	0.4	33	124	No	Below Background
Beryllium	mg/kg	12/12	68.76	9.5	869	0.88	**Yes**	***Above Background***
Cadmium	mg/kg	3/12	0.44	0.069	0.95	0	**Yes**	***Above Background***
Calcium[b]	mg/kg	12/12	13,983.90	367	36,000	35,500	No	Essential Nutrient
Chromium	mg/kg	12/12	0.41	0.016	18.4	27.2	No	Below Background

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Table 5-7 (continued)
Summary Statistics and Determination of SRCs in Subsurface Soil (>1 ft. bgs),
2000–2001 IRA Remaining Confirmatory ISM Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
Cobalt	mg/kg	12/12	70.25	12.4	589	23.2	**Yes**	***Above Background***
Copper	mg/kg	12/12	9.56	4.9	14.2	32.3	No	Below Background
Cyanide, Total	mg/kg	0/1	0.27	0.11	0.4	NB	No	No Detects
Iron[b]	mg/kg	12/12	27,377.25	4,660	43,700	35,200	No	Essential Nutrient
Lead	mg/kg	12/12	17.50	3.6	416	19.1	**Yes**	***Above Background***
Magnesium[b]	mg/kg	12/12	4,882.62	777	8,930	8,790	No	Essential Nutrient
Manganese	mg/kg	12/12	4,882.62	777	8,930	3,030	**Yes**	***Above Background***
Mercury	mg/kg	7/12	362.08	26.6	1,260	0.044	**Yes**	***Above Background***
Nickel	mg/kg	12/12	0.02	0.0063	0.25	60.7	No	Below Background
Potassium[b]	mg/kg	12/12	21.80	10	40.7	3,350	No	Essential Nutrient
Selenium	mg/kg	5/12	0.66	0.14	2.4	1.5	**Yes**	***Above Background***
Silver	mg/kg	1/12	1,442.11	479	2,710	0	**Yes**	***Above Background***
Sodium[b]	mg/kg	11/12	1.34	0.047	115	145	No	Essential Nutrient
Thallium	mg/kg	3/12	67.75	20	166	0.91	**Yes**	***Above Background***
Vanadium	mg/kg	12/12	39.55	9	1,290	37.6	**Yes**	***Above Background***
Vanadium	mg/kg	12/12	16.35	3.7	31.3	37.6	No	Below Background
Zinc	mg/kg	12/12	63.55	31.4	475	93.3	**Yes**	***Above Background***
Polychlorinated Biphenyls (PCBs)								
PCB-1260	mg/kg	0/1	0.01			NB	No	No Detects
PCB-1254	mg/kg	0/1	0.01			NB	No	No Detects
Aroclor 1268	mg/kg	0/1	0.01			NB	No	No Detects
PCB-1221	mg/kg	0/1	0.01			NB	No	No Detects
PCB-1232	mg/kg	0/1	0.01			NB	No	No Detects

Table 5-7 (continued)
Summary Statistics and Determination of SRCs in Subsurface Soil (>1 ft. bgs), 2000–2001 IRA Remaining Confirmatory ISM Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
PCB-1248	mg/kg	0/1	0.01			NB	No	No Detects
PCB-1016	mg/kg	0/1	0.01			NB	No	No Detects
Aroclor 1262	mg/kg	0/1	0.01			NB	No	No Detects
PCB-1242	mg/kg	0/1	0.01			NB	No	No Detects
Pesticides								
Heptachlor Epoxide	mg/kg	0/1	0.00			NB	No	No Detects
Endosulfan Sulfate	mg/kg	0/1	0.00			NB	No	No Detects
Aldrin	mg/kg	0/1	0.00			NB	No	No Detects
alpha-BHC	mg/kg	0/1	0.00			NB	No	No Detects
beta-BHC	mg/kg	0/1	0.00			NB	No	No Detects
delta-BHC	mg/kg	0/1	0.00			NB	No	No Detects
Endosulfan II	mg/kg	0/1	0.00			NB	No	No Detects
4,4’-DDT	mg/kg	0/1	0.00			NB	No	No Detects
alpha-Chlordane	mg/kg	0/1	0.00			NB	No	No Detects
gamma-Chlordane	mg/kg	0/1	0.00			NB	No	No Detects
Endrin Ketone	mg/kg	0/1	0.00			NB	No	No Detects
Lindane	mg/kg	0/1	0.00			NB	No	No Detects
Dieldrin	mg/kg	0/1	0.00			NB	No	No Detects
Endrin	mg/kg	0/1	0.00			NB	No	No Detects
Methoxychlor	mg/kg	0/1	0.01			NB	No	No Detects
4,4’-DDD	mg/kg	0/1	0.00			NB	No	No Detects
4,4’-DDE	mg/kg	0/1	0.00			NB	No	No Detects
Endrin Aldehyde	mg/kg	0/1	0.00			NB	No	No Detects

Table 5-7 (continued)
Summary Statistics and Determination of SRCs in Subsurface Soil (>1 ft. bgs),
2000–2001 IRA Remaining Confirmatory ISM Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
Heptachlor	mg/kg	0/1	0.00			NB	No	No Detects
Toxaphene	mg/kg	0/1	0.01			NB	No	No Detects
Endosulfan I	mg/kg	0/1	0.00			NB	No	No Detects
Semivolatile Organic Compounds (SVOCs)								
4-Nitroaniline	mg/kg	0/1	0.50			NB	No	No Detects
4-Nitrophenol	mg/kg	0/1	0.50			NB	No	No Detects
4-Bromophenyl Phenyl Ether	mg/kg	0/1	0.21			NB	No	No Detects
2,4-Dimethylphenol	mg/kg	0/1	0.21			NB	No	No Detects
p-Cresol	mg/kg	0/1	0.21			NB	No	No Detects
1,4-Dichlorobenzene	mg/kg	0/1	0.21			NB	No	No Detects
4-Chloroaniline	mg/kg	0/1	0.21			NB	No	No Detects
Bis(2-Chloroisopropyl)ether	mg/kg	0/1	0.21			NB	No	No Detects
Phenol	mg/kg	0/1	0.21			NB	No	No Detects
Bis(2-Chloroethyl)ether	mg/kg	0/1	0.21			NB	No	No Detects
Bis(2-Chloroethoxy)methane	mg/kg	0/1	0.21			NB	No	No Detects
Bis(2-Ethylhexyl)phthalate	mg/kg	0/1	0.21			NB	No	No Detects
Di-n-Octyl Phthalate	mg/kg	0/1	0.21			NB	No	No Detects
Hexachlorobenzene	mg/kg	0/1	0.21			NB	No	No Detects
Anthracene	mg/kg	0/1	0.21			NB	No	No Detects
1,2,4-Trichlorobenzene	mg/kg	0/1	0.21			NB	No	No Detects
2,4-Dichlorophenol	mg/kg	0/1	0.21			NB	No	No Detects
Pyrene	mg/kg	0/1	0.21			NB	No	No Detects
Dimethyl Phthalate	mg/kg	0/1	0.21			NB	No	No Detects

Table 5-7 (continued)
Summary Statistics and Determination of SRCs in Subsurface Soil (>1 ft. bgs),
2000–2001 IRA Remaining Confirmatory ISM Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
Dibenzofuran	mg/kg	0/1	0.21			NB	No	No Detects
Benzo(ghi)perylene	mg/kg	0/1	0.21			NB	No	No Detects
Indeno(1,2,3-cd)pyrene	mg/kg	0/1	0.21			NB	No	No Detects
Benzo(b)fluoranthene	mg/kg	0/1	0.21			NB	No	No Detects
Fluoranthene	mg/kg	0/1	0.21			NB	No	No Detects
Benzo(k)fluoranthene	mg/kg	0/1	0.21			NB	No	No Detects
Acenaphthylene	mg/kg	0/1	0.21			NB	No	No Detects
Chrysene	mg/kg	0/1	0.21			NB	No	No Detects
Benzo(a)pyrene	mg/kg	0/1	0.21			NB	No	No Detects
2,4-Dinitrophenol	mg/kg	0/1	0.50			NB	No	No Detects
Dibenzo(a,h)anthracene	mg/kg	0/1	0.21			NB	No	No Detects
4,6-Dinitro-2-Methylphenol	mg/kg	0/1	0.50			NB	No	No Detects
1,3-Dichlorobenzene	mg/kg	0/1	0.21			NB	No	No Detects
Benzo(a)anthracene	mg/kg	0/1	0.21			NB	No	No Detects
4-Chloro-3-Methylphenol	mg/kg	0/1	0.21			NB	No	No Detects
N-Nitroso-di-n-Propylamine	mg/kg	0/1	0.21			NB	No	No Detects
Hexachloroethane	mg/kg	0/1	0.21			NB	No	No Detects
4-Chlorophenyl Phenyl Ether	mg/kg	0/1	0.21			NB	No	No Detects
Hexachlorocyclopentadiene	mg/kg	0/1	0.21			NB	No	No Detects
Isophorone	mg/kg	0/1	0.21			NB	No	No Detects
Acenaphthene	mg/kg	0/1	0.21			NB	No	No Detects
Diethyl Phthalate	mg/kg	0/1	0.21			NB	No	No Detects
Di-n-Butyl Phthalate	mg/kg	0/1	0.21			NB	No	No Detects

Table 5-7 (continued)
Summary Statistics and Determination of SRCs in Subsurface Soil (>1 ft. bgs),
2000–2001 IRA Remaining Confirmatory ISM Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
Phenanthrene	mg/kg	0/1	0.21			NB	No	No Detects
Butyl Benzyl Phthalate	mg/kg	0/1	0.21			NB	No	No Detects
N-Nitrosodiphenylamine	mg/kg	0/1	0.21			NB	No	No Detects
Fluorene	mg/kg	0/1	0.21			NB	No	No Detects
Carbazole	mg/kg	0/1	0.21			NB	No	No Detects
Hexachlorobutadiene	mg/kg	0/1	0.21			NB	No	No Detects
Pentachlorophenol	mg/kg	0/1	0.50			NB	No	No Detects
2,4,6-Trichlorophenol	mg/kg	0/1	0.21			NB	No	No Detects
2-Nitroaniline	mg/kg	0/1	0.50			NB	No	No Detects
2-Nitrophenol	mg/kg	0/1	0.21			NB	No	No Detects
Naphthalene	mg/kg	0/1	0.21			NB	No	No Detects
2-Methylnaphthalene	mg/kg	0/1	0.21			NB	No	No Detects
2-Chloronaphthalene	mg/kg	0/1	0.21			NB	No	No Detects
3,3'-Dichlorobenzidine	mg/kg	0/1	0.21			NB	No	No Detects
o-Cresol	mg/kg	0/1	0.21			NB	No	No Detects
1,2-Dichlorobenzene	mg/kg	0/1	0.21			NB	No	No Detects
2-Chlorophenol	mg/kg	0/1	0.21			NB	No	No Detects
2,4,5-Trichlorophenol	mg/kg	0/1	0.50			NB	No	No Detects
3-Nitroaniline	mg/kg	0/1	0.50			NB	No	No Detects
Volatile Organic Compounds (VOCs)								
Ethylbenzene	mg/kg	0/1	0.00			NB	No	No Detects
Styrene	mg/kg	0/1	0.00			NB	No	No Detects
cis-1,3-Dichloropropene	mg/kg	0/1	0.00			NB	No	No Detects

Table 5-7 (continued)
Summary Statistics and Determination of SRCs in Subsurface Soil (>1 ft. bgs), 2000–2001 IRA Remaining Confirmatory ISM Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
trans-1,3-Dichloropropene	mg/kg	0/1	0.00			NB	No	No Detects
1,2-Dichloroethane	mg/kg	0/1	0.00			NB	No	No Detects
Methyl Isobutyl Ketone	mg/kg	0/1	0.00			NB	No	No Detects
Toluene	mg/kg	0/1	0.00			NB	No	No Detects
Chlorobenzene	mg/kg	0/1	0.00			NB	No	No Detects
Dibromochloromethane	mg/kg	0/1	0.00			NB	No	No Detects
Tetrachloroethylene	mg/kg	0/1	0.00			NB	No	No Detects
Xylene, (Total)	mg/kg	0/1	0.00			NB	No	No Detects
1,2-Dichloroethylene	mg/kg	0/1	0.00			NB	No	No Detects
Carbon Tetrachloride	mg/kg	0/1	0.00			NB	No	No Detects
2-Hexanone	mg/kg	0/1	0.00			NB	No	No Detects
Acetone	mg/kg	0/1	0.00			NB	No	No Detects
Chloroform	mg/kg	0/1	0.00			NB	No	No Detects
Benzene	mg/kg	0/1	0.00			NB	No	No Detects
1,1,1-Trichloroethane	mg/kg	0/1	0.00			NB	No	No Detects
Bromomethane	mg/kg	0/1	0.00			NB	No	No Detects
Chloromethane	mg/kg	0/1	0.00			NB	No	No Detects
Chloroethane	mg/kg	0/1	0.00			NB	No	No Detects
Vinyl Chloride	mg/kg	0/1	0.00			NB	No	No Detects
Methylene Chloride	mg/kg	0/1	0.00			NB	No	No Detects
Carbon Disulfide	mg/kg	0/1	0.00			NB	No	No Detects
Bromoform	mg/kg	0/1	0.00			NB	No	No Detects
Bromodichloromethane	mg/kg	0/1	0.00			NB	No	No Detects

Table 5-7 (continued)
Summary Statistics and Determination of SRCs in Subsurface Soil (>1 ft. bgs), 2000–2001 IRA Remaining Confirmatory ISM Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Analyte	Units	Results> Detection Limit	Average Result	Minimum Detect	Maximum Detect	Site Background Criteria	Site Related?	SRC Justification
1,1-Dichloroethane	mg/kg	0/1	0.00			NB	No	No Detects
1,1-Dichloroethylene	mg/kg	0/1	0.00			NB	No	No Detects
1,2-Dichloropropane	mg/kg	0/1	0.00			NB	No	No Detects
Methyl Ethyl Ketone	mg/kg	0/1	0.00			NB	No	No Detects
1,1,2-Trichloroethane	mg/kg	0/1	0.00			NB	No	No Detects
Trichloroethylene	mg/kg	0/1	0.00			NB	No	No Detects
1,1,2,2-Tetrachloroethane	mg/kg	0/1	0.00			NB	No	No Detects

[a] denotes values less than the detection limit were set to one-half of the reporting limit in calculation of the average.
[b] denotes eliminated based on the essential element screen.
BHC denotes benzene hexachloride.
DDD denotes dichlorodiphenyldichloroethane.
DDE denotes dichlorodiphenyldichloroethylene.
DDT denotes dichlorodiphenyltrichloroethane.
ft. bgs denotes feet below ground surface.
HMX denotes octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
IRA denotes Immediate Response Action (IRA).
ISM denotes incremental sampling method.
mg/kg denotes milligram(s) per kilogram.
NB denotes No Facility-Wide Background Criterion established.
PCB denotes polychlorinated biphenyl.
RDX denotes hexahydro-1,3,5-trinitro-1,3,5-triazine.
SRC denotes site-related contaminant.
SVOC denotes semivolatile organic compound.
VOC denotes volatile organic compound.

Table 5-8
Detected Analytes in 2010 Phase II RI ISM Surface Soil Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

	Location Code		DA1SS-050			DA1SS-050			DA1SS-051			DA1SS-052			DA1SS-052			DA1SS-053			DA1SS-054		
	Sample Number		DA1SS-050M-0201-SO			DA1SS-080M-0201-SO			DA1SS-051M-0201-SO			DA1SS-052D-0201-SO			DA1SS-052M-0201-SO			DA1SS-053M-0201-SO			DA1SS-054M-0201-SO		
	Sample Date		9/27/2010			9/27/2010			9/27/2010			9/27/2010			9/27/2010			11/10/2010			11/10/2010		
	Sample Depth		0 - 1 ft.			0 - 1 ft.			0 - 1 ft.			0 - 1 ft.			0 - 1 ft.			0 - 1 ft.			0 - 1 ft.		
Parameter	**BKG**	**Units**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**
Explosives																							
2,4,6-Trinitrotoluene	NA	mg/kg	0.09	U	U	0.09	U	U	7.1			NT			0.089	U	U	0.089	U	U	0.091	U	U
2,4-Dinitrotoluene	NA	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	NT			0.2	U	U	0.2	U	U	0.2	U	U
2-Amino-4,6-Dinitrotoluene	NA	mg/kg	0.05	U	U	0.05	U	U	0.25	J	J	NT			0.05	U	U	0.049	U	U	0.051	U	U
HMX	NA	mg/kg	0.12	U	U	0.12	U	U	0.12	U	U	NT			0.12	U	U	0.12	U	U	0.12	U	U
Nitroguanidine	NA	mg/kg	NT			NT			NT			NT			0.59			NT			NT		
GENERAL CHEMISTRY																							
Cyanide, Total	NA	mg/kg	NT			NT			NT			NT			0.16	J	J	NT			NT		
Total Solids	NA	Percent	98.3			97.8			98.2			82.2			97.9			98.5		U	97.8		U
Metals																							
Aluminum	17700	mg/kg	10,900			11,400			8,250			NT			6,870			7,920			8,490		
Antimony	0.96	mg/kg	**1.2**			0.16	UV	U	**1.5**			NT			0.69			**2.7**			0.92		
Arsenic	15.4	mg/kg	9.1			8.9			7.3			NT			3.9			9.7			8.4		
Barium	88.4	mg/kg	78.8	B		**107**	**B**		54.5	B		NT			47	B		60.9			52.7	B	
Beryllium	0.88	mg/kg	0.38			0.4			0.33			NT			0.23			0.37			0.4		
Cadmium	0	mg/kg	**2.6**			**3**			**0.35**			NT			**0.94**			**1.7**			**0.52**		
Calcium[a]	15,800	mg/kg	2,500			2,260			2,120			NT			600			929			552		
Chromium	17.4	mg/kg	**110**			**43**			**110**			NT			**73.8**			**153**	**B,M**	**J**	**56.2**	**B**	
Cobalt	10.4	mg/kg	7.6			8.4			6.9			NT			4.3			**20.6**	**M**	**J**	8.9		
Copper	17.7	mg/kg	**188**			**150**			**30.5**			NT			**180**			**73.1**	**M**	**J**	16.4		
Iron[a]	23,100	mg/kg	**23,700**			**24,300**			18400			NT			11,300			18,400	M,B	J	19,400		
Lead	26.1	mg/kg	23.4			25.3			16.1			NT			13.2			14.8			11.6		
Magnesium[a]	3,030	mg/kg	2,860			2,890			1,960			NT			1,360			2,060			1,940		
Manganese	1,450	mg/kg	407			456			535			NT			373			407			398	B	
Mercury	0.036	mg/kg	**0.037**			**0.037**			0.036			NT			**0.079**			**0.038**			0.032		
Nickel	21.1	mg/kg	18.4			18			14.4			NT			8			18.2			16.7		
Potassium[a]	927	mg/kg	814			729			542			NT			850			1050			879		
Selenium	1.4	mg/kg	0.75	JV	J	0.62	JV	J	0.73	JV	J	NT			0.52			1.2			2.4		
Sodium[a]	123	mg/kg	31.8			26.8			21.7			NT			35.8			106	Y	J	62.1		
Thallium	0	mg/kg	**1.6**	**B**		**1.5**	**B**		**1.5**	**B**		NT			**1**	**B**		0.081	UV,M	UJ	**0.38**		

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Table 5-8 (continued)
Detected Analytes in 2010 Phase II RI ISM Surface Soil Samples
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

	Location Code		DA1SS-050			DA1SS-050			DA1SS-051			DA1SS-052			DA1SS-052			DA1SS-053			DA1SS-054		
	Sample Number		DA1SS-050M-0201-SO			DA1SS-080M-0201-SO			DA1SS-051M-0201-SO			DA1SS-052D-0201-SO			DA1SS-052M-0201-SO			DA1SS-053M-0201-SO			DA1SS-054M-0201-SO		
	Sample Date		9/27/2010			9/27/2010			9/27/2010			9/27/2010			9/27/2010			11/10/2010			11/10/2010		
	Sample Depth		0 - 1 ft.			0 - 1 ft.			0 - 1 ft.			0 - 1 ft.			0 - 1 ft.			0 - 1 ft.			0 - 1 ft.		
Parameter	**BKG**	**Units**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**
Vanadium	31.1	mg/kg	16.1			16			14.3			NT			8.5			14.5			15.6		
Zinc	61.8	mg/kg	**191**			**187**			54.5			NT			**121**			**143**			**121**		
Pesticides																							
4,4'-DDE	NA	mg/kg	NT			NT			NT			NT			0.00082	JP	J	NT			NT		
4,4'-DDT	NA	mg/kg	NT			NT			NT			NT			0.00072	J	J	NT			NT		
gamma-Chlordane	NA	mg/kg	NT			NT			NT			NT			0.0052	P	J	NT			NT		
Heptachlor	NA	mg/kg	NT			NT			NT			NT			0.0019	J	J	NT			NT		
Semivolatiles																							
Di-n-Butyl Phthalate	NA	mg/kg	NT			NT			NT			NT			0.21	J	J	NT			NT		

Bold *denotes concentration is greater than the facility-wide background screening value.*
[a] *denotes essential nutrient/not a site-related contaminants (SRC).*
AOC denotes area of concern.
B denotes analyte detected in associated blank.
BKG denotes facility-wide background screening value.
D denotes field duplicate.
DA1 denotes Open Demolition Area # 1 AOC.
DDE denotes dichlorodiphenyldichloroethylene.
DDT denotes dichlorodiphenyltrichloroethane.
ft. denotes feet.
HMX denotes octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ISM denotes incremental sampling method.
J denotes estimated value.
M (as a qualifier) denotes matrix spike and/or matrix spike duplicate recovery outside acceptance limits.
M (in a sample ID) denotes multi-incremental sample.
mg/kg denotes milligrams per kilogram.
NA denotes not applicable.
NT denotes not tested.
P denotes concentration of analyte differs more than 40 percent between primary and confirmation analysis.
Qual denotes data qualifier assigned by the analytical laboratory.
RI denotes Remedial Investigation.
SO denotes soil sample.
SS denotes surface soil.
Y denotes replicate/duplicate precision outside acceptance limits.
U denotes analyte concentration was not detected above the detection level.
V denotes raised quantitation or reporting limit due to limited sample amount or dilution for matrix background interference.
ValQual denotes data qualifier assigned after data validation.

Table 5-9
Detected Analytes in 2010 Phase II RI Subsurface Soil Samples (>1 ft. bgs)
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

	Location Code		DA1SB-055			DA1SB-055			DA1SB-055			DA1SB-056			DA1SB-056			DA1SB-056			DA1SB-056			DA1SB-057		
	Sample Number		DA1SB-055M-0001-SO			DA1SB-055M-0002-SO			DA1SB-055M-0003-SO			DA1SB-056M-0001-SO			DA1SB-056M-0002-SO			DA1SB-056M-0003-SO			DA1SB-056M-0004-SO			DA1SB-057M-0201-SO		
	Sample Date		9/22/2010			9/22/2010			9/22/2010			9/22/2010			9/22/2010			9/22/2010			9/22/2010			9/23/2010		
	Sample Depth		4 - 8 ft.			8 - 12 ft.			12 - 16 ft.			1 - 4 ft.			4 - 8 ft.			8 - 12 ft.			12 - 16 ft.			1 - 4 ft.		
Parameter	**BKG**	**Units**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**
Explosives																										
2,4,6-Trinitrotoluene	NA	mg/kg	0.089	U	U	0.09	U	U	0.09	U	U	0.09	U	U	0.091	U	U	0.09	U	U	0.09	U	U	0.089	U	U
2-Amino-4,6-Dinitrotoluene	NA	mg/kg	0.05	U	U	0.05	U	U	0.05	U	U	0.05	U	U	0.051	U	U	0.05	U	U	0.05	U	U	0.05	U	U
GENERAL CHEMISTRY																										
Cyanide, Total	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Total Solids	NA	Percent	98.8			98.3			98.5			98.1			98.9			98.5			98.8			97.7		
Metals																										
Aluminum	19,500	mg/kg	14,400			12,100	B		13,300	B		**23,600**			14,200			8,480			14,700			13,700	B	
Antimony	0.96	mg/kg	0.16	UV	U	0.16	UV	U	0.41	UV	U	0.33	UV	U	0.16	UV	U	0.16	UV	U	0.16	UV	U	0.91	JV	J
Arsenic	19.8	mg/kg	4.6			1.2			11			8.9			3.3			4.1			1.1			17.5		
Barium	124	mg/kg	73.4			58			73.5			103			56.1			49.7			68.3			51		
Beryllium	0.88	mg/kg	0.53			0.44			0.46			0.84			0.5			0.33			0.54			0.54		
Cadmium	0	mg/kg	0.012	UV	U	0.012	UV	U	0.03	UV	U	0.024	UV	U	0.012	UV	U	0.012	UV	U	0.012	UV	U	0.031	UV	U
Calcium[a]	35,500	mg/kg	18,700	M	J	28,700			36,000			2,430			24,500			1,290			34,600			6,900		
Chromium	27.2	mg/kg	**31.6**			15.2			**33.2**			**41.2**			**34.9**			**30.8**			17.4			**79.7**		
Cobalt	23.2	mg/kg	10.8			8.8			12.9			10.8			9.4			5.5			9			13.4		
Copper	32.3	mg/kg	19.1			12.8			18.8			23.8			16.8			11.3			13.5			18.9		
Iron[a]	35,200	mg/kg	**36,300**			26,700			31,000	B		**43,700**			31,500			18,700			30,500			**36,500**	**B**	
Lead	19.1	mg/kg	**21**			4.4			11.3			9.6			5.7			4.2			4.5			9.7		
Magnesium[a]	2,790	mg/kg	6,120			6,410			8,930	B		4,710			7,030			2,230			8,600			7,380	B	
Manganese	3,030	mg/kg	387			320			492			238			305			217			345			335		
Mercury	0.044	mg/kg	0.012			0.011			0.0091			0.019			0.0083			0.012			0.0063	J	J	0.019		
Nickel	60.7	mg/kg	26.3			19.4			27.9			26.3			22.8			14.3			21			31.3		
Potassium[a]	3,350	mg/kg	1470			2160			1610			1900			2240			1580			2710			1450		
Selenium	1.5	mg/kg	0.32	JVB	J	0.2	JBV	J	0.36	UBV	U	0.42	JV	J	0.67	JV	J	0.14	UV	U	0.58	JV	J	0.88	JVB	J
Silver	0	mg/kg	0.034	UV	U	0.035	UV	U	0.086	UV	U	0.069	UV	U	0.034	UV	U	0.035	UV	U	0.034	UV	U	0.087	UV	U
Sodium[a]	145	mg/kg	61.2			82.4			68.3			69.8			95			71.8			111			55.3		
Thallium	0.91	mg/kg	**2.1**			**1.7**			**2.1**			**3.2**			**1.9**			**1.2**			**1.8**			**1.7**		
Vanadium	37.6	mg/kg	19.4			14.4	B		18.9	B		31.3			17.9			11.5			16.2			18.6	B	
Zinc	93.3	mg/kg	55.2			40.5			63.3			63.3			49.7			31.4			43.4			64.5		
Pesticides																										
4,4'-DDE	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
4,4'-DDT	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Aldrin	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
delta-BHC	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Endosulfan II	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
gamma-Chlordane	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Heptachlor	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Heptachlor Epoxide	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Semivolatiles																										
2-Methylnaphthalene	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Bis(2-Ethylhexyl)phthalate	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Di-n-Butyl Phthalate	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Isophorone	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Volatiles																										
Acetone	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		

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Table 5-9 (continued)
Detected Analytes in 2010 Phase II RI Subsurface Soil Samples (>1 ft. bgs)
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

		Location Code	DA1SB-057			DA1SB-057			DA1SB-057			DA1SB-058			DA1SB-058			DA1SB-058			DA1SB-059			DA1SB-059		
		Sample Number	DA1SB-057M-0202-SO			DA1SB-057M-0203-SO			DA1SB-057M-0204-SO			DA1SB-058M-0201-SO			DA1SB-058M-0202-SO			DA1SB-058M-0203-SO			DA1SB-059D-0201-SO			DA1SB-059M-0201-SO		
		Sample Date	9/23/2010			9/23/2010			9/23/2010			9/23/2010			9/23/2010			9/23/2010			9/23/2010			9/23/2010		
		Sample Depth	4 - 8 ft.			8 - 12 ft.			12 - 16 ft.			4 - 8 ft.			8 - 12 ft.			12 - 16 ft.			5 - 8 ft.			5 - 8 ft.		
Parameter	**BKG**	**Units**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**
Explosives																										
2,4,6-Trinitrotoluene	NA	mg/kg	0.089	U	U	0.089	U	U	0.09	U	U	0.089	U	U	0.09	U	U	0.09	U	U				0.09	U	U
2-Amino-4,6-Dinitrotoluene	NA	mg/kg	0.049	U	U	0.049	U	U	0.05	U	U	0.049	U	U	0.05	U	U	0.05	U	U				0.05	U	U
GENERAL CHEMISTRY																										
Cyanide, Total	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			0.11	U	U
Total Solids	NA	Percent	98.4			98.7			99			99			98.4			98.5			81.5			98		
Metals																										
Aluminum	19,500	mg/kg	16,800			13,800			13,800			8,810			12,600			15,900						12,200	B	
Antimony	0.96	mg/kg	0.72	JV	J	0.41	UV	U	0.4	UV	U	**3.4**			**1.3**	**JV**	**J**	0.41	UV	U				**20.5**		
Arsenic	19.8	mg/kg	15.5			15.3			13			7.3			13.8			11						**33**		
Barium	124	mg/kg	111	B		68.8	B		68.1	B		52.9	B		68.3	B		91	B					**869**		
Beryllium	0.88	mg/kg	0.63			0.51			0.49			0.33			0.47			0.59						**0.95**		
Cadmium	0	mg/kg	0.03	UV	U	0.03	UV	U	0.03	UV	U	0.03	UV	U	0.03	UV	U	0.03	UV	U				**18.4**		
Calcium[a]	35,500	mg/kg	1,090			18,200			28,000			25,500			8,960			33,000						18,800		
Chromium	27.2	mg/kg	**71**			20			24.2			**194**			**74.3**			25.5						**101**		
Cobalt	23.2	mg/kg	13			12.4			11.6			9			11.8			14.2						10.1		
Copper	32.3	mg/kg	20.3			20.1			18.8			16.3			21			18.8						**222**		
Iron[a]	35,200	mg/kg	**37,000**			34,100			31,900			23,400			31,600			33,100						33,000	B	
Lead	19.1	mg/kg	14.1			11.4			10.8			8.3			11			11.3						**416**		
Magnesium[a]	2,790	mg/kg	3,940			5,850			7,820			6,630			4,610			8,930						3,470	B	
Manganese	3,030	mg/kg	1,260			375			379			338			441			509						1,100		
Mercury	0.044	mg/kg	0.012			0.0094			0.0086			0.0091			0.0095			0.0095						0.012		
Nickel	60.7	mg/kg	22.7			28.9			27			21.1			26.4			30.3						40.7		
Potassium[a]	3,350	mg/kg	1110			1860			1620			1550			2430			2020						2060		
Selenium	1.5	mg/kg	0.62	JVB	J	0.35	UV	U	0.55	JVB	J	0.35	UV	U	0.42	JVB	J	0.54	JVB	J				2.1	B	
Silver	0	mg/kg	0.086	UV	U	0.086	UV	U	0.086	UV	U	0.086	UV	U	0.086	UV	U	0.086	UV	U				**115**		
Sodium[a]	145	mg/kg	48			74.2			77.5			73.7			89.9			78.4						84.2		
Thallium	0.91	mg/kg	**2.9**			**1.7**			**1.6**			**1.4**			**1.9**			**2.2**						**2**		
Vanadium	37.6	mg/kg	26.3			19.5			20.2			15.3			19.3			22						16.5	B	
Zinc	93.3	mg/kg	62			63.8			60.4			47.3			62.1			62.3						**364**		
Pesticides																										
4,4'-DDE	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			0.00031	U	U
4,4'-DDT	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			0.00051	U	U
Aldrin	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			0.00051	U	U
delta-BHC	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			0.00031	U	U
Endosulfan II	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			0.00031	U	U
gamma-Chlordane	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			0.00031	U	U
Heptachlor	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			0.00041	U	U
Heptachlor Epoxide	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			0.00051	U	U
Semivolatiles																										
2-Methylnaphthalene	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			0.026	U	U
Bis(2-Ethylhexyl)phthalate	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			0.089	U	U
Di-n-Butyl Phthalate	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			0.11	J	J
Isophorone	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			0.051	U	U
Volatiles																										
Acetone	NA	mg/kg	NT			NT			NT			NT			NT			NT			0.067	U	U	NT		

Table 5-9 (continued)
Detected Analytes in 2010 Phase II RI Subsurface Soil Samples (>1 ft. bgs)
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

		Location Code	DA1SB-059			DA1SB-059			DA1SB-059			DA1SB-060			DA1SB-060			DA1SB-060			DA1SB-060			DA1SB-061		
		Sample Number	DA1SB-059M-0202-SO			DA1SB-059M-0203-SO			DA1SB-081M-0203-SO			DA1SB-060M-0201-SO			DA1SB-060M-0202-SO			DA1SB-060M-0203-SO			DA1SB-060M-0204-SO			DA1SB-061M-0201-SO		
		Sample Date	9/23/2010			9/23/2010			9/23/2010			9/23/2010			9/23/2010			9/23/2010			9/23/2010			9/23/2010		
		Sample Depth	8 - 12 ft.			12 - 16 ft.			12 - 16 ft.			1 - 4 ft.			4 - 8 ft.			8 - 12 ft.			12 - 16 ft.			1 - 4 ft.		
Parameter	**BKG**	**Units**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**
Explosives																										
2,4,6-Trinitrotoluene	NA	mg/kg	0.089	U	U	0.09	U	U				0.09	U	U	0.09	U	U	0.09	U	U	0.09	U	U	0.09	U	U
2-Amino-4,6-Dinitrotoluene	NA	mg/kg	0.049	U	U	0.05	U	U				0.05	U	U	0.05	U	U	0.05	U	U	0.05	U	U	0.05	U	U
GENERAL CHEMISTRY																										
Cyanide, Total	NA	mg/kg	NT			NT			NT			NT	NT	NT	NT			NT			NT			NT		
Total Solids	NA	Percent	98.9			99.6						98.9			98.5			98.6			99			98.3		
Metals																										
Aluminum	19,500	mg/kg	15,200			13,300						13,900	B		14,200	B		13,700	B		12,900	B		**20,100**	**B**	
Antimony	0.96	mg/kg	0.4	UV	U	**1.7**						0.16	UV	U	0.16	UV	U	0.16	UV	U	0.3	JV	J	0.33	UV	U
Arsenic	19.8	mg/kg	13.8						14.9			5.9			5.5			3.4			3.1			8.3		
Barium	124	mg/kg	76	B		71.4	B					51.1			64			60.9			62.6			99.7		
Beryllium	0.88	mg/kg	0.55			0.48						0.47			0.48			0.47			0.42			0.8		
Cadmium	0	mg/kg	0.03	UV	U	0.03	UV	U				0.012	UV	U	0.012	UV	U	0.012	UV	U	0.012	UV	U	0.024	UV	U
Calcium[a]	35,500	mg/kg	27,400			31,100						531			2,100			26,300			21,900			1,580		
Chromium	27.2	mg/kg	24.9			**114**						15.4			19.2			19.9			**98.5**			**43.6**		
Cobalt	23.2	mg/kg	11.5			11.1						8.1			12.9			9.2			8.8			12.9		
Copper	32.3	mg/kg	18.2						19			16.7			20.8			15.7			19			23.4		
Iron[a]	35,200	mg/kg	33,700			31,300						31,500			**38,200**			29,400			29,200			**41,300**		
Lead	19.1	mg/kg	10.6						11.9			6.9	B		**22.8**	B		5.5	B		6	B		9.4	B	
Magnesium[a]	2,790	mg/kg	7,870			7,170						3,060			4,570			6,030			5,250			4,990		
Manganese	3,030	mg/kg	346			449						287	B		485	B		306	B		334	B		331	B	
Mercury	0.044	mg/kg	0.01			0.015						0.025			0.011			0.0098			0.01			0.018		
Nickel	60.7	mg/kg	26.4			25.6						16.1			27.8			22.1			21.6			31.1		
Potassium[a]	3,350	mg/kg	1770						507			1300			1030			2150			2010			2040		
Selenium	1.5	mg/kg	0.35	UV	U	0.35	UV	U				0.77	JV	J	0.51	JV	J	0.38	JV	J	0.42	JV	J	0.51	JV	J
Silver	0	mg/kg	0.086	UV	U	0.085	UV	U				0.034	UV	U	0.035	UV	U	0.034	UV	U	0.034	UV	U	0.069	UV	U
Sodium[a]	145	mg/kg	78.1						30.6			59.4			39.3			83.4			80.6			73.8		
Thallium	0.91	mg/kg	**1.8**			**2.1**						**1.7**			**2.1**			**1.7**			**2**			**2.8**		
Vanadium	37.6	mg/kg	20.7			19.5						17.3			19.1			17.7			18.1			27.1		
Zinc	93.3	mg/kg	63.1						69.8			46.5			62.9			47.9			51			68		
Pesticides																										
4,4'-DDE	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
4,4'-DDT	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Aldrin	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
delta-BHC	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Endosulfan II	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
gamma-Chlordane	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Heptachlor	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Heptachlor Epoxide	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Semivolatiles																										
2-Methylnaphthalene	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Bis(2-Ethylhexyl)phthalate	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Di-n-Butyl Phthalate	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Isophorone	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Volatiles																										
Acetone	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		

Table 5-9 (continued)
Detected Analytes in 2010 Phase II RI Subsurface Soil Samples (>1 ft. bgs)
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

	Location Code		DA1SB-061			DA1SB-061			DA1SB-061			DA1SB-062			DA1SB-062			DA1SB-062			DA1SB-062			DA1SB-062			DA1SB-063		
	Sample Number		DA1SB-061M-0202-SO			DA1SB-061M-0203-SO			DA1SB-061M-0204-SO			DA1SB-062M-0201-SO			DA1SB-062M-0202-SO			DA1SB-062M-0203-SO			DA1SB-062M-0204-SO			DA1SB-063M-0201-SO					
	Sample Date		9/23/2010			9/23/2010			9/23/2010			9/23/2010			9/23/2010			9/23/2010			9/23/2010			9/23/2010					
	Sample Depth		4 - 8 ft.			8 - 12 ft.			12 - 16 ft.			1 - 4 ft.			4 - 8 ft.			8 - 12 ft.			12 - 16 ft.			4 - 8 ft.					
Parameter	**BKG**	**Units**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**			
Explosives																												
2,4,6-Trinitrotoluene	NA	mg/kg	0.09	U	U	0.09	U	U	0.09	U	U	0.089	U	U	0.089	U	U	0.09	U	U	0.09	U	U	0.09	U	U			
2-Amino-4,6-Dinitrotoluene	NA	mg/kg	0.05	U	U	0.05	U	U	0.05	U	U	0.049	U	U	0.05	U	U	0.05	U	U	0.05	U	U	0.05	U	U			
GENERAL CHEMISTRY																												
Cyanide, Total	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT					
Total Solids	NA	Percent	98.7			98.7			99.5			97.9			98.8			99.1			99.7			98.9					
Metals																												
Aluminum	19,500	mg/kg	13,800	B		11,500	B		6,130	B		14,200	B		14,400			11,400	B		6,970	B		16,500	B				
Antimony	0.96	mg/kg	0.16	UV	U	0.16	UV	U	0.72			0.16	UV	U	0.4	UV	U	0.16	UV	U	0.73			0.16	UV	U			
Arsenic	19.8	mg/kg	3.9			4.1			4.4			4.6			13			3.3			6.2			5.7					
Barium	124	mg/kg	59.8			63.8			24.3			79.7			69.5	B		59			26.6			78.9					
Beryllium	0.88	mg/kg	0.43			0.43			0.23			0.58			0.51			0.42			0.29			0.62					
Cadmium	0	mg/kg	0.012	UV	U	0.012	UV	U	0.012	UV	U	0.012	UV	U	0.03	UV	U	0.012	UV	U	0.012	UV	U	0.012	UVM	UJ			
Calcium[a]	35,500	mg/kg	32,300			28,000			965			1,590			28,800			28,000			632			16,200					
Chromium	27.2	mg/kg	17.9			**51.2**			**155**			18.2			**31.5**			**37**			**176**			**29.4**	**M**	**J**			
Cobalt	23.2	mg/kg	10.7			8.3			5.1			11.4			11.5			8.3			6.3			11.6	M	J			
Copper	32.3	mg/kg	17.7			16.7			18.4			17.7			17.6			16.1			19.3			19	M	J			
Iron[a]	35,200	mg/kg	33,600			**35,500**			23,300			34,400			32,800			30,200			25,400			**37,000**	**M**	**J**			
Lead	19.1	mg/kg	5.9			4.9			7.7			6.2			10.4			6.5			**20.3**			**20.7**					
Magnesium[a]	2,790	mg/kg	7,550	B		6,380	B		1,840	B		4,280	B		7,540			5,400	B		1,950	B		5,920	B				
Manganese	3,030	mg/kg	342	B		444	B		211	B		362	B		395			380	B		370	B		429	B				
Mercury	0.044	mg/kg	0.0092			0.014			0.0082			0.015			0.0096			0.014			0.0078	J	J	0.0099					
Nickel	60.7	mg/kg	24.9			19.2			13.2			25.6			25.9			19.1			15			27.3	M	J			
Potassium[a]	3,350	mg/kg	1300			1890			854			1220			2000			1380			785			2260					
Selenium	1.5	mg/kg	0.29	JV	J	0.44	JV	J	0.25	JV	J	0.37	JV	J	0.35	UV	U	0.47	JV	JV	0.14	UV	U	0.18	JVM	J			
Silver	0	mg/kg	0.034	UV	U	0.034	UV	U	0.034	UV	U	0.035	UV	U	0.086	UV	U	0.034	UV	U	0.034	UV	U	0.034	UV	U			
Sodium[a]	145	mg/kg	58.3			83.3			61.6			36.8			83.5			58			49.6			86.2					
Thallium	0.91	mg/kg	**2**			**2**			**1.2**			**1.9**			**2**			**1.7**			**1.5**			**2.4**	**M**	**J**			
Vanadium	37.6	mg/kg	18			17			10.4			18.1			19.9			15.1			12.6			22.9	M	J			
Zinc	93.3	mg/kg	53.7			53.2			57.3			54.6			60.2			51.5			56.2			58.1	M	J			
Pesticides																												
4,4'-DDE	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT					
4,4'-DDT	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT					
Aldrin	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT					
delta-BHC	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT					
Endosulfan II	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT					
gamma-Chlordane	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT					
Heptachlor	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT					
Heptachlor Epoxide	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT					
Semivolatiles																												
2-Methylnaphthalene	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT					
Bis(2-Ethylhexyl)phthalate	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT					
Di-n-Butyl Phthalate	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT					
Isophorone	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT					
Volatiles																												
Acetone	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT					

Table 5-9 (continued)
Detected Analytes in 2010 Phase II RI Subsurface Soil Samples (>1 ft. bgs)
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

		Location Code	DA1SB-063			DA1SB-063			DA1SB-063			DA1SB-064			DA1SB-064			DA1SB-064			DA1SB-064			DA1SB-065		
		Sample Number	DA1SB-063M-0202-SO			DA1SB-063M-0203-SO			DA1SB-082M-0202-SO			DA1SB-064D-0201-SO			DA1SB-064M-0201-SO			DA1SB-064M-0202-SO			DA1SB-064M-0203-SO			DA1SB-065M-0201-SO		
		Sample Date	9/23/2010			9/23/2010			9/23/2010			9/23/2010			9/23/2010			9/23/2010			9/23/2010			9/23/2010		
		Sample Depth	8 - 12 ft.			12 - 16 ft.			8 - 12 ft.			4 - 8 ft.			4 - 8 ft.			8 - 12 ft.			12 - 16 ft.			4 - 8 ft.		
Parameter	**BKG**	**Units**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**
Explosives																										
2,4,6-Trinitrotoluene	NA	mg/kg	0.089	U	U	0.09	U	U				NT			0.089	U	U	0.089	U	U	0.09	U	U	0.089	U	U
2-Amino-4,6-Dinitrotoluene	NA	mg/kg	0.05	U	U	0.05	U	U				NT			0.05	U	U	0.05	U	U	0.05	U	U	0.05	U	U
GENERAL CHEMISTRY																										
Cyanide, Total	NA	mg/kg	NT			NT			NT			NT			0.11	U		NT			NT			NT		
Total Solids	NA	Percent	98.9			99						82.2			98.1			98.7			99.7			98.4		
Metals																										
Aluminum	19,500	mg/kg	13,300	B		11,300	B					NT			17,500	B		14,200	B		5,720	B		12,900	B	
Antimony	0.96	mg/kg	0.16	UV	U	0.16	UV	U				NT			0.41	UV	U	0.16	UV	U	0.46	JV	J	0.16	UV	U
Arsenic	19.8	mg/kg				0.4	JV	J	5.1			NT			14.4			5.2			5.1			0.67	JV	J
Barium	124	mg/kg				53.5			62.7			NT			91.4			68.9			30			66.6		
Beryllium	0.88	mg/kg	0.43			0.37						NT			0.69			0.53			0.14			0.5		
Cadmium	0	mg/kg	0.012	UV	U	0.012	UV	U				NT			0.031	UV	U	0.012	UV	U	0.012	UV	U	0.012	UV	U
Calcium[a]	35,500	mg/kg	27,500			28,700						NT			18,600			24,500			1,340			3,750		
Chromium	27.2	mg/kg	22.6			18						NT			**38.4**			15.4			**124**			16.2		
Cobalt	23.2	mg/kg				7.6			9.5			NT			13.9			10.9			4.9			7.9		
Copper	32.3	mg/kg	16.8			12.5						NT			22.3			16.1			17.9			12.1		
Iron[a]	35,200	mg/kg	31,300			24,600						NT			**37,500**	**B**		31,300			22,000			28,600		
Lead	19.1	mg/kg	5.8			3.8						NT			12.4			5.7			5.4			3.6		
Magnesium[a]	2,790	mg/kg	7,180	B		6,410	B	B				NT			6,750	B		5,980	B		2,500	B		4,170	B	
Manganese	3,030	mg/kg				315			486			NT			423			406			253			331		
Mercury	0.044	mg/kg	0.01			0.0098						NT			0.011			**0.25**			0.011			0.012		
Nickel	60.7	mg/kg	22.1			17.7						NT			32.4			24.1			11			18.6		
Potassium[a]	3,350	mg/kg	1850			1810						NT			1170			2190			983			1,990		
Selenium	1.5	mg/kg	0.53	JV	J	0.74	JV	J				NT			0.36	JVB	J	0.57	JV	J	0.37	JV	J	0.77	JV	J
Silver	0	mg/kg	0.034	UBV	U	0.034	UBV	U				NT			**1.1**			0.034	UBV	U	0.034	UBV	U	0.035	UBV	U
Sodium[a]	145	mg/kg	82.7			80.8						NT			55			87.6			75.2			68.9		
Thallium	0.91	mg/kg	**2**			**1.5**						NT			**2.4**			**2.1**			**1.1**			**1.6**		
Vanadium	37.6	mg/kg	16.9	B		13.2	B					NT			24.3	B		17.6	B		9.4	B		14.4	B	
Zinc	93.3	mg/kg	51.1			38						NT			69.3			50.2			47.5			38.7		
Pesticides																										
4,4'-DDE	NA	mg/kg	NT			NT			NT			NT			0.0003	JP	J	NT			NT			NT		
4,4'-DDT	NA	mg/kg	NT			NT			NT			NT			0.00051	U	U	NT			NT			NT		
Aldrin	NA	mg/kg	NT			NT			NT			NT			0.00071	J	J	NT			NT			NT		
delta-BHC	NA	mg/kg	NT			NT			NT			NT			0.0027	P	J	NT			NT			NT		
Endosulfan II	NA	mg/kg	NT			NT			NT			NT			0.0003	JP	J	NT			NT			NT		
gamma-Chlordane	NA	mg/kg	NT			NT			NT			NT			0.0003	U		NT			NT			NT		
Heptachlor	NA	mg/kg	NT			NT			NT			NT			0.0004	U	U	NT			NT			NT		
Heptachlor Epoxide	NA	mg/kg	NT			NT			NT			NT			0.00051	U	U	NT			NT			NT		
Semivolatiles																										
2-Methylnaphthalene	NA	mg/kg	NT			NT			NT			NT			0.026	U	U	NT			NT			NT		
Bis(2-Ethylhexyl)phthalate	NA	mg/kg	NT			NT			NT			NT			0.089	U	U	NT			NT			NT		
Di-n-Butyl Phthalate	NA	mg/kg	NT			NT			NT			NT			0.1	J	J	NT			NT			NT		
Isophorone	NA	mg/kg	NT			NT			NT			NT			0.051	U	U	NT			NT			NT		
Volatiles																										
Acetone	NA	mg/kg	NT			NT			NT			0.061	U	U	NT			NT			NT			NT		

Table 5-9 (continued)
Detected Analytes in 2010 Phase II RI Subsurface Soil Samples (>1 ft. bgs)
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

		Location Code	DA1SB-065			DA1SB-065			DA1SB-065			DA1SB-066			DA1SB-066			DA1SB-066			DA1SB-066			DA1SB-067		
		Sample Number	DA1SB-065M-0202-SO			DA1SB-065M-0203-SO			DA1SB-083M-0202-SO			DA1SB-066M-0201-SO			DA1SB-066M-0202-SO			DA1SB-066M-0203-SO			DA1SB-066M-0204-SO			DA1SB-067D-0201-SO		
		Sample Date	9/23/2010			9/23/2010			9/23/2010			9/23/2010			9/23/2010			9/23/2010			9/23/2010			9/24/2010		
		Sample Depth	8 - 12 ft.			12 - 16 ft.			8 - 12 ft.			1 - 4 ft.			4 - 8 ft.			8 - 12 ft.			12 - 16 ft.			2 - 4 ft.		
Parameter	**BKG**	**Units**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**
Explosives																										
2,4,6-Trinitrotoluene	NA	mg/kg	0.089	U	U	0.088	U	U				0.09	U	U	0.09	U	U	0.088	U	U	0.09	U	U	NT		
2-Amino-4,6-Dinitrotoluene	NA	mg/kg	0.05	U	U	0.049	U	U				0.05	U	U	0.05	U	U	0.049	U	U	0.05	U	U	NT		
GENERAL CHEMISTRY																										
Cyanide, Total	NA	mg/kg	NT			NT																				
Total Solids	NA	Percent	98.7			98.7						98			98.5			97.7			99.6			84		
Metals																										
Aluminum	19,500	mg/kg				11500	B		15,900	B		12,700	B		11,600	B		15,700			6,170			NT		
Antimony	0.96	mg/kg	0.16	UV	U	**1.4**						0.16	UV	U	0.16	UV	U	0.35	JV	J	**2.8**			NT		
Arsenic	19.8	mg/kg				5.8			4.8			5.2			5.8			5			7			NT		
Barium	124	mg/kg				68.4	B		72.1			78.1	B		53.3	B		78.8	B		34.3	B		NT		
Beryllium	0.88	mg/kg				0.43			0.56			0.52			0.38			0.58			0.24			NT		
Cadmium	0	mg/kg	0.012	UV	U	0.012	UV	U				**0.026**	**JV**	**J**	0.012	UV	U	0.012	UV	U	0.012	UV	U	NT		
Calcium[a]	35,500	mg/kg				18200			16,100			1,150			11,400			32,000			1,510			NT		
Chromium	27.2	mg/kg				**112**			**29.8**			19.2			16.8			**44.8**			**200**			NT		
Cobalt	23.2	mg/kg				8.9			11.3			10.9			10			11.5			6.1			NT		
Copper	32.3	mg/kg				19.9			18.1			**56.1**			18.3			18.8			23.5			NT		
Iron[a]	35,200	mg/kg				29100			34,400			28,200			29,500			32,100			22,100			NT		
Lead	19.1	mg/kg				28.1			6.4			**26.3**			**29.7**			**27.6**			**30.1**			NT		
Magnesium[a]	2,790	mg/kg				5020	B		6,040	B		3,730	B		4,970	B		7,630			1,930			NT		
Manganese	3,030	mg/kg				418			372			430			352			403			317			NT		
Mercury	0.044	mg/kg				0.013			0.012			0.021			0.0093			0.01			0.013			NT		
Nickel	60.7	mg/kg				20.7			27			21.5			23.2			26.4			14.7			NT		
Potassium[a]	3,350	mg/kg				1910			2,390			791			1,070			2,300			976			NT		
Selenium	1.5	mg/kg	0.56	JV	J	0.45	JV	J				0.39	JV	J	0.31	JV	J	0.24	JV	J	0.47	JV	J	NT		
Silver	0	mg/kg	0.034	UBV	U	0.034	UV	U				0.035	UV	U	0.035	UV	U	0.035	UV	U	0.034	UV	U	NT		
Sodium[a]	145	mg/kg				71.4			87.6			24.8			41.1			83.2			92.1			NT		
Thallium	0.91	mg/kg				**1.9**			**2.5**						**1.6**			**2.1**			**0.98**			NT		
Vanadium	37.6	mg/kg				17.5			21.6	B		18.8			16.8			22.3			11.1			NT		
Zinc	93.3	mg/kg				62.3			55.8			77			56.3			58.3			66.3			NT		
Pesticides																										
4,4'-DDE	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
4,4'-DDT	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Aldrin	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
delta-BHC	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Endosulfan II	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
gamma-Chlordane	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Heptachlor	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Heptachlor Epoxide	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Semivolatiles																										
2-Methylnaphthalene	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Bis(2-Ethylhexyl)phthalate	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Di-n-Butyl Phthalate	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Isophorone	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Volatiles																										
Acetone	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			0.078	U	U

Table 5-9 (continued)
Detected Analytes in 2010 Phase II RI Subsurface Soil Samples (>1 ft. bgs)
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

		Location Code	DA1SB-067			DA1SB-067			DA1SB-067			DA1SB-067			DA1SB-067			DA1SB-067			DA1SB-067			DA1SB-068		
		Sample Number	DA1SB-067D-0202-SO			DA1SB-067D-0203-SO			DA1SB-067D-0204-SO			DA1SB-067M-0201-SO			DA1SB-067M-0202-SO			DA1SB-067M-0203-SO			DA1SB-067M-0204-SO			DA1SB-068D-0201-SO		
		Sample Date	9/24/2010			9/24/2010			9/24/2010			9/24/2010			9/24/2010			9/24/2010			9/24/2010			9/24/2010		
		Sample Depth	4 - 8 ft.			8 - 12 ft.			12 - 16 ft.			2 - 4 ft.			4 - 8 ft.			8 - 12 ft.			12 - 16 ft.			1 - 4 ft.		
Parameter	**BKG**	**Units**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**
Explosives																										
2,4,6-Trinitrotoluene	NA	mg/kg	NT			NT			NT			0.09	U	U	0.09	U	U	0.09	U	U	0.089	U	U	NT		
2-Amino-4,6-Dinitrotoluene	NA	mg/kg	NT			NT			NT			0.05	U	U	0.05	U	U	0.05	U	U	0.049	U	U	NT		
GENERAL CHEMISTRY																										
Cyanide, Total	NA	mg/kg																						NT		
Total Solids	NA	Percent	82.1			82.6			75.9			98.6			98.8			98.7			99.3					
Metals																										
Aluminum	19,500	mg/kg	NT			NT			NT			17,600			11,700			12,000			6,240			NT		
Antimony	0.96	mg/kg	NT			NT			NT			0.16	UV	U	0.23	JV	J	0.16	UV	U	0.16	UV	U	NT		
Arsenic	19.8	mg/kg	NT			NT			NT			6.1			4.3			2.4			9.5			NT		
Barium	124	mg/kg	NT			NT			NT			74.5	B		57.7	B		61.3	B		35.9	B		NT		
Beryllium	0.88	mg/kg	NT			NT			NT			0.47			0.41			0.44			0.23			NT		
Cadmium	0	mg/kg	NT			NT			NT			**3.5**			0.012	UV	U	0.012	UV	U	0.012	UV	U	NT		
Calcium[a]	35,500	mg/kg	NT			NT			NT			2,200			18,200			24,400			4,470			NT		
Chromium	27.2	mg/kg	NT			NT			NT			**49.1**			25			17.3			**29.3**			NT		
Cobalt	23.2	mg/kg	NT			NT			NT			8.3			8.9			9			6.2			NT		
Copper	32.3	mg/kg	NT			NT			NT			**490**			16.5			14.5			24.6			NT		
Iron[a]	35,200	mg/kg	NT			NT			NT			26,600			25,900			24,200			23,500			NT		
Lead	19.1	mg/kg	NT			NT			NT			**39.8**			**23.2**			**21.1**			32.8			NT		
Magnesium[a]	2,790	mg/kg	NT			NT			NT			3,170			5,670			6,690			2,390			NT		
Manganese	3,030	mg/kg	NT			NT			NT			348			315			318			317			NT		
Mercury	0.044	mg/kg	NT			NT			NT			**0.053**			0.0087			0.0089			0.019			NT		
Nickel	60.7	mg/kg	NT			NT			NT			26.8			21			21.4			16.3			NT		
Potassium[a]	3,350	mg/kg	NT			NT			NT			1,530			1,780			1,820			695			NT		
Selenium	1.5	mg/kg	NT			NT			NT			0.5	JV	J	0.14	UV	U	0.14	UV	U	0.14	UV	U	NT		
Silver	0	mg/kg	NT			NT			NT			0.034	UV	U	0.034	UV	U	0.034	UV	U	0.034	UV	U	NT		
Sodium[a]	145	mg/kg	NT			NT			NT			51.5			65.8			67.4			31.7			NT		
Thallium	0.91	mg/kg	NT			NT			NT			**1.9**			**1.7**			**1.6**			**1.5**			NT		
Vanadium	37.6	mg/kg	NT			NT			NT			19.3			15.8			16.4			12.3			NT		
Zinc	93.3	mg/kg	NT			NT			NT			**271**			48			46			75			NT		
Pesticides																										
4,4'-DDE	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
4,4'-DDT	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Aldrin	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
delta-BHC	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Endosulfan II	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
gamma-Chlordane	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Heptachlor	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Heptachlor Epoxide	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Semivolatiles																										
2-Methylnaphthalene	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Bis(2-Ethylhexyl)phthalate	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Di-n-Butyl Phthalate	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Isophorone	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		
Volatiles																										
Acetone	NA	mg/kg	0.066	U	U	0.064	U	U	0.069	U	U	NT			NT			NT			NT			0.065	U	U

Table 5-9 (continued)
Detected Analytes in 2010 Phase II RI Subsurface Soil Samples (>1 ft. bgs)
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

			Location Code	DA1SB-068			DA1SB-068			DA1SB-068			DA1SB-068			DA1SB-068			DA1SB-068			DA1SB-068			DA1SB-068		
			Sample Number	DA1SB-068D-0202-SO			DA1SB-068D-0203-SO			DA1SB-068D-0204-SO			DA1SB-068M-0201-SO			DA1SB-068M-0202-SO			DA1SB-068M-0203-SO			DA1SB-068M-0204-SO			DA1SB-084M-0201-SO		
			Sample Date	9/24/2010			9/24/2010			9/24/2010			9/24/2010			9/24/2010			9/24/2010			9/24/2010			9/24/2010		
			Sample Depth	4 - 8 ft.			8 - 12 ft.			12 - 16 ft.			1 - 4 ft.			4 - 8 ft.			8 - 12 ft.			12 - 16 ft.			1 - 4 ft.		
Parameter	**BKG**	**Units**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**
Explosives																										
2,4,6-Trinitrotoluene	NA	mg/kg	NT			NT			NT			0.091	U	U	0.09	U	U	0.089	U	U	0.089	U	U			
2-Amino-4,6-Dinitrotoluene	NA	mg/kg	NT			NT			NT			0.05	U	U	0.05	U	U	0.049	U	U	0.05	U	U			
GENERAL CHEMISTRY																										
Cyanide, Total	NA	mg/kg	NT			NT			NT			0.4			NT			NT			NT					
Total Solids	NA	Percent	80.2			77.1			76.3			98.8			98.9			98.9			99.1					
Metals																										
Aluminum	19,500	mg/kg	NT			NT			NT			10,900			10,900			13,200			8,530					
Antimony	0.96	mg/kg	NT			NT			NT			0.49	JV	J	0.16	UV	U	0.16	UV	U	**2.1**					
Arsenic	19.8	mg/kg	NT			NT			NT						4.2			3.3			5.8			11.6		
Barium	124	mg/kg	NT			NT			NT			47.6	B		55.1	B		63.2	B		50.4	B				
Beryllium	0.88	mg/kg	NT			NT			NT			0.42			0.37			0.48			0.31					
Cadmium	0	mg/kg	NT			NT			NT			**0.096**			0.012	UV	U	0.012	UV	U	0.012	UV				
Calcium[a]	35,500	mg/kg	NT			NT			NT						2,890			25,800			7,870		U	438		
Chromium	27.2	mg/kg	NT			NT			NT			**49.1**			16.9			**27.4**			**161**					
Cobalt	23.2	mg/kg	NT			NT			NT			8			9.8			9.5			8.2					
Copper	32.3	mg/kg	NT			NT			NT			21.2			19.1			16.4			22.6					
Iron[a]	35,200	mg/kg	NT			NT			NT						28,600			27,300			25,200			26,500		
Lead	19.1	mg/kg	NT			NT			NT			**24.5**			**28.7**			**24.8**			**30.9**					
Magnesium[a]	2,790	mg/kg	NT			NT			NT						4,120			6,830			3,160			2,720		
Manganese	3,030	mg/kg	NT			NT			NT						388			322			365			343		
Mercury	0.044	mg/kg	NT			NT			NT						0.008			0.0087			0.015			0.022		
Nickel	60.7	mg/kg	NT			NT			NT			15.9			23.7			22			19.4					
Potassium[a]	3,350	mg/kg	NT			NT			NT			1,000			1,000			2,180			1,310					
Selenium	1.5	mg/kg	NT			NT			NT						0.4	JV	J	0.14	UV	U	0.43	JV		0.63	JV	J
Silver	0	mg/kg	NT			NT			NT			0.034	UV	U	0.034	UV	U	0.034	UV	U	0.034	UV				
Sodium[a]	145	mg/kg	NT			NT			NT			45.3			32.6			77.4			53.2					
Thallium	0.91	mg/kg	NT			NT			NT			**1.5**			**1.6**			**1.7**			**1.5**		**J**			
Vanadium	37.6	mg/kg	NT			NT			NT			15.2			15.9			18.3			14.2		U			
Zinc	93.3	mg/kg	NT			NT			NT			51.6			57.6			50.6			63.1					
Pesticides																										
4,4'-DDE	NA	mg/kg	NT			NT			NT			0.0003	U	U	NT			NT			NT					
4,4'-DDT	NA	mg/kg	NT			NT			NT						NT			NT			NT			0.00061	J	J
Aldrin	NA	mg/kg	NT			NT			NT			0.0005	U	U	NT			NT			NT					
delta-BHC	NA	mg/kg	NT			NT			NT			0.0003	U	U	NT			NT			NT					
Endosulfan II	NA	mg/kg	NT			NT			NT			0.00091	JP	J	NT			NT			NT					
gamma-Chlordane	NA	mg/kg	NT			NT			NT						NT			NT			NT			0.0015	JP	J
Heptachlor	NA	mg/kg	NT			NT			NT			0.0073	P	J	NT			NT			NT					
Heptachlor Epoxide	NA	mg/kg	NT			NT			NT			0.00061	J	J	NT			NT			NT					
Semivolatiles																										
2-Methylnaphthalene	NA	mg/kg	NT			NT			NT			0.025	U	U	NT			NT			NT					
Bis(2-Ethylhexyl)phthalate	NA	mg/kg	NT			NT			NT						NT			NT			NT			0.11	J	J
Di-n-Butyl Phthalate	NA	mg/kg	NT			NT			NT			0.085	J	J	NT			NT			NT					
Isophorone	NA	mg/kg	NT			NT			NT						NT			NT			NT			0.074	J	J
Volatiles																										
Acetone	NA	mg/kg	0.064	U	U	0.069	U	U	0.083	U	U	NT			NT			NT			NT					

Table 5-9 (continued)
Detected Analytes in 2010 Phase II RI Subsurface Soil Samples (>1 ft. bgs)
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

		Location Code	DA1SB-068			DA1SB-069			DA1SB-069			DA1SB-069			DA1SB-069			DA1SB-069			DA1SB-069			DA1SB-070		
		Sample Number	DA1SB-084M-0201-SOa			DA1SB-069D-0201-SO			DA1SB-069D-0202-SO			DA1SB-069D-0203-SO			DA1SB-069M-0201-SO			DA1SB-069M-0202-SO			DA1SB-069M-0203-SO			DA1SB-070D-0201-SO		
		Sample Date	11/10/2010			9/24/2010			9/24/2010			9/24/2010			9/24/2010			9/24/2010			9/24/2010			9/24/2010		
		Sample Depth	1 - 4 ft.			4 - 8 ft.			8 - 12 ft.			12 - 16 ft.			4 - 8 ft.			8 - 12 ft.			12 - 16 ft.			1 - 4 ft.		
Parameter	**BKG**	**Units**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**
Explosives																										
2,4,6-Trinitrotoluene	NA	mg/kg	0.089	U	U	NT			NT			NT			0.09	U	U	0.09	U	U	0.089	U	U	NT		
2-Amino-4,6-Dinitrotoluene	NA	mg/kg	0.049	U	U	NT			NT			NT			0.05	U	U	0.05	U	U	0.05	U	U	NT		
GENERAL CHEMISTRY																										
Cyanide, Total	NA	mg/kg				NT			NT			NT			0.11	U								NT		
Total Solids	NA	Percent	97.8			82.7			82.5			81.7			99.2			99			99			83.6		
Metals																										
Aluminum	19,500	mg/kg	10,400			NT			NT			NT			9,480			12,000	B		12,400	B		NT		
Antimony	0.96	mg/kg	0.34			NT			NT			NT			0.16	UV	U	0.16	UV	U	0.16	UV	U	NT		
Arsenic	19.8	mg/kg	11.4			NT			NT			NT			5.4			3.7			5.7			NT		
Barium	124	mg/kg	55	B		NT			NT			NT			57.5	B		51	B		67.2	B		NT		
Beryllium	0.88	mg/kg	0.45			NT			NT			NT			0.35			0.41			0.43			NT		
Cadmium	0	mg/kg	**0.42**			NT			NT			NT			0.012	UV	U	0.012	UV	U	0.012	UV	U	NT		
Calcium[a]	35,500	mg/kg	787			NT			NT			NT			6,400			26,300			31,500			NT		
Chromium	27.2	mg/kg	16.8	B		NT			NT			NT			16.5			16.5			25.9			NT		
Cobalt	23.2	mg/kg	9.7	B		NT			NT			NT			9.2			9.8			10.4			NT		
Copper	32.3	mg/kg	17.8			NT			NT			NT			17.2			16.6			17.5			NT		
Iron[a]	35,200	mg/kg	25,400			NT			NT			NT			25,200			27,800			28,500			NT		
Lead	19.1	mg/kg	9.2			NT			NT			NT			**25.7**			**26.2**			**28**			NT		
Magnesium[a]	2,790	mg/kg	2,490			NT			NT			NT			3,930			7,980			8,380			NT		
Manganese	3,030	mg/kg	396	B		NT			NT			NT			514			353			414			NT		
Mercury	0.044	mg/kg	0.035			NT			NT			NT			0.0077	J	J	0.012			0.012			NT		
Nickel	60.7	mg/kg	14.2			NT			NT			NT			21.4			22.9			24.1			NT		
Potassium[a]	3,350	mg/kg	948			NT			NT			NT			882			1,470			1,660			NT		
Selenium	1.5	mg/kg	1.5			NT			NT			NT			0.14	UV	U	0.14	JV	J	0.14	UV	U	NT		
Silver	0	mg/kg	0.017	U	U	NT			NT			NT			0.034	UV	U	0.034	UV	U	0.034	UV	U	NT		
Sodium[a]	145	mg/kg	38.1			NT			NT			NT			36.3			63.4			77.5			NT		
Thallium	0.91	mg/kg	0.041	U	U	NT			NT			NT			**1.4**			**1.7**			**1.8**			NT		
Vanadium	37.6	mg/kg	18.3			NT			NT			NT			14			16.3			16.9			NT		
Zinc	93.3	mg/kg	57.8			NT			NT			NT			49.6			51.5			58.6			NT		
Pesticides																										
4,4'-DDE	NA	mg/kg	NT			NT			NT			NT			0.0003	U	U	NT			NT			NT		
4,4'-DDT	NA	mg/kg	NT			NT			NT			NT			0.00061	J	J	NT			NT			NT		
Aldrin	NA	mg/kg	NT			NT			NT			NT			0.00051	U	U	NT			NT			NT		
delta-BHC	NA	mg/kg	NT			NT			NT			NT			0.0003	U	U	NT			NT			NT		
Endosulfan II	NA	mg/kg	NT			NT			NT			NT			0.0003	U	U	NT			NT			NT		
gamma-Chlordane	NA	mg/kg	NT			NT			NT			NT			0.0003	U	U	NT			NT			NT		
Heptachlor	NA	mg/kg	NT			NT			NT			NT			0.0014	JP	J	NT			NT			NT		
Heptachlor Epoxide	NA	mg/kg	NT			NT			NT			NT			0.00051	U	U	NT			NT			NT		
Semivolatiles																										
2-Methylnaphthalene	NA	mg/kg	NT			NT			NT			NT			0.025	U	U	NT			NT			NT		
Bis(2-Ethylhexyl)phthalate	NA	mg/kg	NT			NT			NT			NT			0.1	J	J	NT			NT			NT		
Di-n-Butyl Phthalate	NA	mg/kg	NT			NT			NT			NT			0.11	J	J	NT			NT			NT		
Isophorone	NA	mg/kg	NT			NT			NT			NT			0.05	U	U	NT			NT			NT		
Volatiles																										
Acetone	NA	mg/kg	NT			0.073	U	U	0.062	U	U	0.063	U	U	NT			NT			NT			0.073	U	U

Table 5-9 (continued)
Detected Analytes in 2010 Phase II RI Subsurface Soil Samples (>1 ft. bgs)
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

		Location Code	DA1SB-070			DA1SB-070			DA1SB-070			DA1SB-070			DA1SB-070			DA1SB-070			DA1SB-070			DA1SB-070		
		Sample Number	DA1SB-070D-0202-SO			DA1SB-070D-0203-SO			DA1SB-070M-0201-SO			DA1SB-070M-0202-SO			DA1SB-070M-0203-SO			DA1SB-070M-0204-SO			DA1SB-085D-0204-SO			DA1SB-085M-0204-SO		
		Sample Date	9/24/2010			9/24/2010			9/24/2010			9/24/2010			9/24/2010			9/24/2010			9/24/2010			9/24/2010		
		Sample Depth	4 - 8 ft.			8 - 12 ft.			1 - 4 ft.			4 - 8 ft.			8 - 12 ft.			12 - 16 ft.			12 - 16 ft.			12 - 16 ft.		
Parameter	**BKG**	**Units**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**
Explosives																										
2,4,6-Trinitrotoluene	NA	mg/kg	NT			NT			64	M	J	0.2	J	J	0.09	U	U	0.09	U	U	NT					
2-Amino-4,6-Dinitrotoluene	NA	mg/kg	NT			NT			0.31	J	J	0.05	U	U	0.05	U	U	0.05	U	U	NT					
GENERAL CHEMISTRY																										
Cyanide, Total	NA	mg/kg	NT			NT			NT			NT			0.11	U	U	NT			NT			NT		
Total Solids	NA	Percent	81			81.1			97.9			98.3			98.1			98.6								
Metals																										
Aluminum	19,500	mg/kg	NT			NT			11,200	B		10,400			13,300			12,900			NT					
Antimony	0.96	mg/kg	NT			NT			0.16	UV	U	0.16	UBV	U	0.16	UV	U				NT			0.66		
Arsenic	19.8	mg/kg	NT			NT			13.1			15.3			12.8			10.2			NT					
Barium	124	mg/kg	NT			NT			81.2	B		71.2	B		85.1	B					NT			64.4	B	
Beryllium	0.88	mg/kg	NT			NT			0.51			0.47			0.5			0.46			NT					
Cadmium	0	mg/kg	NT			NT			**0.2**	**MY**	**J**	0.012	UBV	U	0.012	UV	U	0.012	UV	U	NT					
Calcium[a]	35,500	mg/kg	NT			NT			1,460			1,980			19,700						NT			30,700		
Chromium	27.2	mg/kg	NT			NT			21.2	M	J	16.8			21.1						NT			**74**		
Cobalt	23.2	mg/kg	NT			NT			10.9	M	J	9.7			12.5			9.8			NT					
Copper	32.3	mg/kg	NT			NT			28.3	M	J	20.6			17.9			17.3			NT					
Iron[a]	35,200	mg/kg	NT			NT			30,300			30,700			31,700						NT			29,100		
Lead	19.1	mg/kg	NT			NT			18.5			11.9			12.3						NT			11.2		
Magnesium[a]	2,790	mg/kg	NT			NT			2,720	B		3,650			6,880			8,010			NT					
Manganese	3,030	mg/kg	NT			NT			659			476			642						NT			313		
Mercury	0.044	mg/kg	NT			NT			0.027			0.013			0.011			0.01			NT					
Nickel	60.7	mg/kg	NT			NT			17	M	J	25			28.5			24.1			NT					
Potassium[a]	3,350	mg/kg	NT			NT			679			682			1,500						NT			1,950		
Selenium	1.5	mg/kg	NT			NT			1.1	M	J	0.32	JBV	J	0.36	JV	J				NT			0.71	JV	J
Silver	0	mg/kg	NT			NT			0.035	U	U	0.035	UV	U	0.035	UV	U	0.034	UV	U	NT					
Sodium[a]	145	mg/kg	NT			NT			23.6			28.7			58.1			78.9			NT					
Thallium	0.91	mg/kg	NT			NT			**2.2**	**MB**	**J**	**1.6**	**B**		**1.9**	**B**		**1.8**	**B**		NT					
Vanadium	37.6	mg/kg	NT			NT			19.9	M	J	16.1			18.8			18.9			NT					
Zinc	93.3	mg/kg	NT			NT			60.3	M	J	56			57.6			51.2			NT					
Pesticides																										
4,4'-DDE	NA	mg/kg	NT			NT			NT			NT			0.00031	U	U	NT			NT			NT		
4,4'-DDT	NA	mg/kg	NT			NT			NT			NT			0.00051	U	U	NT			NT			NT		
Aldrin	NA	mg/kg	NT			NT			NT			NT			0.00051	U	U	NT			NT			NT		
delta-BHC	NA	mg/kg	NT			NT			NT			NT			0.00031	U	U	NT			NT			NT		
Endosulfan II	NA	mg/kg	NT			NT			NT			NT			0.00031	U	U	NT			NT			NT		
gamma-Chlordane	NA	mg/kg	NT			NT			NT			NT			0.0049	P	J	NT			NT			NT		
Heptachlor	NA	mg/kg	NT			NT			NT			NT			0.0015	JP	J	NT			NT			NT		
Heptachlor Epoxide	NA	mg/kg	NT			NT			NT			NT			0.00051	U	U	NT			NT			NT		
Semivolatiles																										
2-Methylnaphthalene	NA	mg/kg	NT			NT			NT			NT			0.025	U	U	NT			NT			NT		
Bis(2-Ethylhexyl)phthalate	NA	mg/kg	NT			NT			NT			NT			0.089	U	U	NT			NT			NT		
Di-n-Butyl Phthalate	NA	mg/kg	NT			NT			NT			NT			0.082	J	J	NT			NT			NT		
Isophorone	NA	mg/kg	NT			NT			NT			NT			0.051	U	U	NT			NT			NT		
Volatiles																										
Acetone	NA	mg/kg	0.064	U	U	0.063	U	U	NT			NT			NT			NT			0.066	U	U	NT		

Table 5-9 (continued)
Detected Analytes in 2010 Phase II RI Subsurface Soil Samples (>1 ft. bgs)
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

		Location Code	DA1SB-071			DA1SB-071			DA1SB-071			DA1SB-071			DA1SB-072			DA1SB-072			DA1SB-072			DA1SB-072		
		Sample Number	DA1SB-071D-0201-SO			DA1SB-071M-0201-SO			DA1SB-071M-0202-SO			DA1SB-071M-0203-SO			DA1SB-072M-0201-SO			DA1SB-072M-0202-SO			DA1SB-072M-0203-SO			DA1SB-072M-0204-SO		
		Sample Date	9/24/2010			9/24/2010			9/24/2010			9/24/2010			9/24/2010			9/24/2010			9/24/2010			9/24/2010		
		Sample Depth	4 - 8 ft.			4 - 8 ft.			8 - 12 ft.			12 - 16 ft.			2 - 4 ft.			4 - 8 ft.			8 - 12 ft.			12 - 16 ft.		
Parameter	**BKG**	**Units**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**
Explosives																										
2,4,6-Trinitrotoluene	NA	mg/kg	NT			0.089	U	U	0.09	U	U	0.09	U	U	0.091	U	U	0.09	U	U	0.091	U	U	0.09	U	U
2-Amino-4,6-Dinitrotoluene	NA	mg/kg	NT			0.05	U	U	0.05	U	U	0.05	U	U	0.05	U	U	0.05	U	U	0.05	U	U	0.05	U	U
GENERAL CHEMISTRY																										
Cyanide, Total	NA	mg/kg	NT			0.11	U	U	NT			NT			NT			NT			NT			NT		
Total Solids	NA	Percent	81.4			98.7			98.9			98.8			98.2			98.2			98.3			99.4		
Metals																										
Aluminum	19,500	mg/kg	NT			11,700			11,800			10,900			16,100			11,200			13,900			6,790		
Antimony	0.96	mg/kg	NT			0.16	UV	U	0.43	JV	J	0.16	UV	U	0.3	JV	J	0.16	UV	U	0.82			**7.6**		
Arsenic	19.8	mg/kg	NT			13.3			10.2			8.2			13.5			10.5			10.4			10.7		
Barium	124	mg/kg	NT			69.4	B		57.6	B		60.7	B		89.6	B		57	B		77.8	B		40.2	B	
Beryllium	0.88	mg/kg	NT			0.44			0.41			0.37			0.6			0.39			0.52					
Cadmium	0	mg/kg	NT			0.012	UV	U	0.012	UV	U	0.012	UV	U	**4.4**			0.012	UV	U	0.012	UV	U	0.012	UV	U
Calcium[a]	35,500	mg/kg	NT			18,200			26,300			30,500			14,300			16,400			30,800			1,060		
Chromium	27.2	mg/kg	NT			**28.3**			**41**			14.9			**106**			14.8			**79.9**			**589**		
Cobalt	23.2	mg/kg	NT			9.5			9.4			9.2			11.2			8.5			10.1					
Copper	32.3	mg/kg	NT			17.8			17.3			14.8			**1290**			14.5			16.8			26.5		
Iron[a]	35,200	mg/kg	NT			28,800			27,900			25,300			34,500			28,700			30,800			25,500		
Lead	19.1	mg/kg	NT			12.1			11.6			10.3			69.8			9.2			12.5			13.9		
Magnesium[a]	2,790	mg/kg	NT			5,620			8,390			8,650			5,800			5,400			7,380			1,750		
Manganese	3,030	mg/kg	NT			427			344			324			405			334			380					
Mercury	0.044	mg/kg	NT			0.011			0.012			0.012			0.022			0.01			0.011			0.037		
Nickel	60.7	mg/kg	NT			23			23.6			22.5			27.7			20.6			24.2					
Potassium[a]	3,350	mg/kg	NT			1,470			1,740			1,440			1,550			1,060			1,960			1,330		
Selenium	1.5	mg/kg	NT			0.53	JV	J	0.52	JV	J	0.45	JV	J	0.6	JV	J	0.39	JV	J	0.92			0.68	JV	J
Silver	0	mg/kg	NT			0.034	UV	U	0.034	UV	U	0.034	UV	U	0.035	UV	U	0.035	UV	U	0.035	UV	U	0.034	UV	U
Sodium[a]	145	mg/kg	NT			60.8			83.7			80			62.4			47.6			78.8			115		
Thallium	0.91	mg/kg	NT			**1.7**	**B**		**1.6**	**B**		**1.4**	**B**		**2.1**	**B**		**1.4**	**B**		**1.7**	**B**		**1.3**	**B**	
Vanadium	37.6	mg/kg	NT			17.2			16.9			15			21.2			15.4			19.6			13.3		
Zinc	93.3	mg/kg	NT			52.7			51.1			46.6			**475**			46			51.4			63.9		
Pesticides																										
4,4'-DDE	NA	mg/kg	NT			0.0003	U	U	NT			NT			NT			NT			NT			NT		
4,4'-DDT	NA	mg/kg	NT			0.00051	U	U	NT			NT			NT			NT			NT			NT		
Aldrin	NA	mg/kg	NT			0.00051	U	U	NT			NT			NT			NT			NT			NT		
delta-BHC	NA	mg/kg	NT			0.0003	U	U	NT			NT			NT			NT			NT			NT		
Endosulfan II	NA	mg/kg	NT			0.0003	U	U	NT			NT			NT			NT			NT			NT		
gamma-Chlordane	NA	mg/kg	NT			0.0058	P	J	NT			NT			NT			NT			NT			NT		
Heptachlor	NA	mg/kg	NT			0.0025	P	J	NT			NT			NT			NT			NT			NT		
Heptachlor Epoxide	NA	mg/kg	NT			0.00051	U	U	NT			NT			NT			NT			NT			NT		
Semivolatiles																										
2-Methylnaphthalene	NA	mg/kg	NT			0.025	U	U	NT			NT			0.053	J	J	NT			NT			NT		
Bis(2-Ethylhexyl)phthalate	NA	mg/kg	NT			0.088	U	U	NT			NT			0.088	U	U	NT			NT			NT		
Di-n-Butyl Phthalate	NA	mg/kg	NT			0.093	J	J	NT			NT			0.08	U	U	NT			NT			NT		
Isophorone	NA	mg/kg	NT			0.054	J	J	NT			NT			0.051	U	U	NT			NT			NT		
Volatiles																										
Acetone	NA	mg/kg	0.061	U	U	NT			NT			NT			NT			NT			NT			NT		

Table 5-9 (continued)
Detected Analytes in 2010 Phase II RI Subsurface Soil Samples (>1 ft. bgs)
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

		Location Code	DA1SB-072			DA1SB-073			DA1SB-073			DA1SB-073			DA1SB-073			DA1SB-073			DA1SB-074			DA1SB-074		
		Sample Number	DA1SB-086M-0204-SO			DA1SB-073D-0201-SO			DA1SB-073M-0201-SO			DA1SB-073M-0202-SO			DA1SB-073M-0203-SO			DA1SB-073M-0204-SO			DA1SB-074D-0203-SO			DA1SB-074M-0201-SO		
		Sample Date	9/24/2010			11/10/2010			11/10/2010			11/10/2010			11/10/2010			11/10/2010			11/10/2010			11/10/2010		
		Sample Depth	12 - 16 ft.			1 - 4 ft.			1 - 4 ft.			4 - 8 ft.			8 - 12 ft.			12 - 16 ft.			8 - 12 ft.			1 - 4 ft.		
Parameter	**BKG**	**Units**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**
Explosives																										
2,4,6-Trinitrotoluene	NA	mg/kg				NT			0.09	U	U	0.089	U	U	0.089	U	U	0.089	U	U	NT			0.089	U	U
2-Amino-4,6-Dinitrotoluene	NA	mg/kg				NT			0.05	U	U	0.05	U	U	0.049	U	U	0.05	U	U	NT			0.05	U	U
GENERAL CHEMISTRY																										
Cyanide, Total	NA	mg/kg	NT			NT			0.17	J	J	NT			NT			NT			NT			NT		
Total Solids	NA	Percent				89.7			98.7			99.4		U	99.6		U	99.7		U	86.8			98.8		U
Metals																										
Aluminum	19,500	mg/kg				NT			7,900	M	J	6,140		.	6,020			1,990			NT			7,240		
Antimony	0.96	mg/kg				NT			**1.1**	**M**	**J**	**3.1**			**3.2**			0.77			NT			**1.8**		
Arsenic	19.8	mg/kg				NT			7.8			5.8			3.9			5.2			NT			6		
Barium	124	mg/kg				NT			48.4	B		35	B		37.7	B		9.5	B		NT			52.4	B	
Beryllium	0.88	mg/kg	0.25			NT			0.42			0.25			0.27			0.069			NT			0.33		
Cadmium	0	mg/kg				NT			**0.59**	**Y**	**J**	**0.11**			0.012	UV	U	**0.1**			NT			**0.28**		
Calcium[a]	35,500	mg/kg				NT			391			463			818			369			NT			541		
Chromium	27.2	mg/kg				NT			**85.1**	**Y,M**	**J**	**179**	**B**		**223**	**B**		**40.9**	**B**		NT			**103**	**B**	
Cobalt	23.2	mg/kg	6.1			NT			7.6	M	J	6.3			6.4			6.4			NT			6.5		
Copper	32.3	mg/kg				NT			9	Y,M	J	9.4			14.7			13.7			NT			10.1		
Iron[a]	35,200	mg/kg				NT			19,700			15,500			15,300			4,660			NT			15,100		
Lead	19.1	mg/kg				NT			7.7	M	J	6.6			8.4			4.5			NT			6.7		
Magnesium[a]	2,790	mg/kg				NT			1,960	B		1,930			2,170			777			NT			1,680		
Manganese	3,030	mg/kg	390			NT			243	B		221	B		128	B		26.6	B		NT			273	B	
Mercury	0.044	mg/kg				NT			0.024			0.0082			0.014			0.0088			NT			0.032		
Nickel	60.7	mg/kg	16.4			NT			14	M	J	13.7			13.2			15			NT			11.6		
Potassium[a]	3,350	mg/kg				NT			689			1,310			969			479			NT			865		
Selenium	1.5	mg/kg				NT			0.98	M	J	1.1			2.4			0.25	J	J	NT			0.95		
Silver	0	mg/kg				NT			0.034	UV,M	UJ	0.034	UV	U	0.034	UV	U	0.017	U	U	NT			0.017	U	U
Sodium[a]	145	mg/kg				NT			40.8			166			94.9			50.4			NT			73.4		
Thallium	0.91	mg/kg				NT			0.081	UV,M	UJ	0.08	UV	U	0.08	UV	U	0.04	U	U	NT			0.04	U	U
Vanadium	37.6	mg/kg				NT			13.4			10.6			10.6			3.7			NT			11.4		
Zinc	93.3	mg/kg				NT			53.2	M	J	40.7			35.6			43.9			NT			48.1		
Pesticides																										
4,4'-DDE	NA	mg/kg	NT			NT			0.000331	UQ	UJ	NT			NT			NT			NT			NT		
4,4'-DDT	NA	mg/kg	NT			NT			0.000331	UQ	UJ	NT			NT			NT			NT			NT		
Aldrin	NA	mg/kg	NT			NT			0.000331	UQ	UJ	NT			NT			NT			NT			NT		
delta-BHC	NA	mg/kg	NT			NT			0.000331	UQ	UJ	NT			NT			NT			NT			NT		
Endosulfan II	NA	mg/kg	NT			NT			0.000331	UQ	UJ	NT			NT			NT			NT			NT		
gamma-Chlordane	NA	mg/kg	NT			NT			0.000331	UQ	UJ	NT			NT			NT			NT			NT		
Heptachlor	NA	mg/kg	NT			NT			0.000331	UQ	UJ	NT			NT			NT			NT			NT		
Heptachlor Epoxide	NA	mg/kg	NT			NT			0.000331	UQ	UJ	NT			NT			NT			NT			NT		
Semivolatiles																										
2-Methylnaphthalene	NA	mg/kg	NT			NT			0.025	U	U	NT			NT			NT			NT			NT		
Bis(2-Ethylhexyl)phthalate	NA	mg/kg	NT			NT			0.21	J	J	NT			NT			NT			NT			NT		
Di-n-Butyl Phthalate	NA	mg/kg	NT			NT			0.079	U	U	NT			NT			NT			NT			NT		
Isophorone	NA	mg/kg	NT			NT			0.05	U	U	NT			NT			NT			NT			NT		
Volatiles																										
Acetone	NA	mg/kg	NT			0.24	JB	J	NT			NT			NT			NT			0.21	JB	J	NT		

Table 5-9 (continued)
Detected Analytes in 2010 Phase II RI Subsurface Soil Samples (>1 ft. bgs)
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

		Location Code	DA1SB-074			DA1SB-074			DA1SB-074			DA1SB-075			DA1SB-075			DA1SB-075			DA1SB-075			DA1SB-076		
		Sample Number	DA1SB-074M-0202-SO			DA1SB-074M-0203-SO			DA1SB-074M-0204-SO			DA1SB-075M-0201-SO			DA1SB-075M-0202-SO			DA1SB-075M-0203-SO			DA1SB-075M-0204-SO			DA1SB-076M-0201-SO		
		Sample Date	11/10/2010			11/10/2010			11/10/2010			11/10/2010			11/10/2010			11/10/2010			11/10/2010			11/10/2010		
		Sample Depth	4 - 8 ft.			8 - 12 ft.			12 - 16 ft.			1 - 4 ft.			4 - 8 ft.			8 - 12 ft.			12 - 16 ft.			1 - 4 ft.		
Parameter	**BKG**	**Units**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**
Explosives																										
2,4,6-Trinitrotoluene	NA	mg/kg	0.091	U	U	0.09	U	U	0.091	U	U	0.089	U	U	0.091	U	U	0.09	U	U	0.091	U	U	0.089	U	U
2-Amino-4,6-Dinitrotoluene	NA	mg/kg	0.05	U	U	0.05	U	U	0.051	U	U	0.049	U	U	0.051	U	U	0.05	U	U	0.05	U	U	0.049	U	U
GENERAL CHEMISTRY																										
Cyanide, Total	NA	mg/kg	0.11	J	J	NT			NT			NT			NT			NT			NT			NT		
Total Solids	NA	Percent	99.3			99.4		U	99.6			97.8			98.7			99.3			99.7			98.1		
Metals																										
Aluminum	19,500	mg/kg	5,440			4,600			2,230			9,970			6,230			6,390			4,140			10,600		
Antimony	0.96	mg/kg	**2.7**			**3**			**2.3**			0.95			0.27			**4.9**			**3.4**			0.38		
Arsenic	19.8	mg/kg	6			6.6			5.4			11.1			5			9.5			7.1			13.4		
Barium	124	mg/kg	31.5			31.2	B		10.8	B		57	B		29.1	B		45.7	B		30.5	B		72.9	B	
Beryllium	0.88	mg/kg	0.24			0.31			0.1			0.45			0.21			0.35			0.18			0.62		
Cadmium	0	mg/kg	**0.31**			**0.22**			**0.084**			**0.41**			**0.075**			**0.64**			**0.43**			**0.37**		
Calcium[a]	35,500	mg/kg	387			614			452			800			367			609			682			5,280		
Chromium	27.2	mg/kg	**176**			**167**	**B**		**132**	**B**		**58.5**	**B**		16.5	B		**306**			**206**			12.9	B	
Cobalt	23.2	mg/kg	6.8			8			4.9			9.4	B		5.4	B		11.6			7.7			11.7	B	
Copper	32.3	mg/kg	12.2			20.6			10.3			16.6			9.8			25			21.5			17.3		
Iron[a]	35,200	mg/kg	13,300			13,300			5,670			23,700			12,200			19,200			11,900			27,800		
Lead	19.1	mg/kg	7.2			7.8			5.3			11.2			6			8.7			7.3			7.5		
Magnesium[a]	2,790	mg/kg	1,790			1,510			801			2,360			1,690			1,970			1,430			4,230		
Manganese	3,030	mg/kg	148			90	B		33.1	B		419	B		88.7	B		331	B		80.7	B		339	B	
Mercury	0.044	mg/kg	0.01			0.012			0.0067	J	J	0.043			0.016			0.013			0.0095			0.017		
Nickel	60.7	mg/kg	16.8			12.8			10			14.6			12.1			24.6			12.4			26		
Potassium[a]	3,350	mg/kg	770			1,150			610			1,170			633			1,230			722			1,350		
Selenium	1.5	mg/kg	0.14	UV	U	0.83			0.4	J	J	1.6			0.63			0.94			0.89			1.5		
Silver	0	mg/kg	0.086	UV	U	0.017	U	U	0.017	U	U	0.017	U	U	0.017	U	U	**0.11**	**B**		**0.048**	**JV,B**	**J**	0.017	U	U
Sodium[a]	145	mg/kg	59.2			125			82.3			55.7			25.6			107			57.9			55.3		
Thallium	0.91	mg/kg	0.65	J	J	0.04	U	U	0.04	U	U	0.041	U	U	0.041	U	U	0.081	UV	U	0.08	UV	U	0.041	U	U
Vanadium	37.6	mg/kg	10.4	B		10.4			4.9			17.3			10.2			12.6	B		7.9	B		17.4		
Zinc	93.3	mg/kg	33			40.5			31.9			57.5			41.5			59.4			35.7			55		
Pesticides																										
4,4'-DDE	NA	mg/kg	0.000323	U	U	NT			NT			NT			NT			NT			NT			NT		
4,4'-DDT	NA	mg/kg	0.000323	U	U	NT			NT			NT			NT			NT			NT			NT		
Aldrin	NA	mg/kg	0.000323	U	U	NT			NT			NT			NT			NT			NT			NT		
delta-BHC	NA	mg/kg	0.000323	U	U	NT			NT			NT			NT			NT			NT			NT		
Endosulfan II	NA	mg/kg	0.000323	U	U	NT			NT			NT			NT			NT			NT			NT		
gamma-Chlordane	NA	mg/kg	0.000323	U	U	NT			NT			NT			NT			NT			NT			NT		
Heptachlor	NA	mg/kg	0.000323	U	U	NT			NT			NT			NT			NT			NT			NT		
Heptachlor Epoxide	NA	mg/kg	0.000323	U	U	NT			NT			NT			NT			NT			NT			NT		
Semivolatiles																										
2-Methylnaphthalene	NA	mg/kg	0.025	U	U	NT			NT			NT			NT			NT			NT			NT		
Bis(2-Ethylhexyl)phthalate	NA	mg/kg	2.7			NT			NT			NT			NT			NT			NT			NT		
Di-n-Butyl Phthalate	NA	mg/kg	0.092	J	J	NT			NT			NT			NT			NT			NT			NT		
Isophorone	NA	mg/kg	0.05	U	U	NT			NT			NT			NT			NT			NT			NT		
Volatiles																										
Acetone	NA	mg/kg	NT			NT			NT			NT			NT			NT			NT			NT		

Table 5-9 (continued)
Detected Analytes in 2010 Phase II RI Subsurface Soil Samples (>1 ft. bgs)
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

	Location Code		DA1SB-076			DA1SB-076			DA1SB-076			DA1SB-077			DA1SB-077			DA1SB-077			DA1SB-077		
	Sample Number		DA1SB-076M-0202-SO			DA1SB-076M-0203-SO			DA1SB-088M-0203-SO			DA1SB-077M-0201-SO			DA1SB-077M-0202-SO			DA1SB-077M-0203-SO			DA1SB-077M-0204-SO		
	Sample Date		11/10/2010			11/10/2010			11/10/2010			11/10/2010			11/10/2010			11/10/2010			11/10/2010		
	Sample Depth		4 - 8 ft.			8 - 12 ft.			8 - 12 ft.			1 - 4 ft.			4 - 8 ft.			8 - 12 ft.			12 - 16 ft.		
Parameter	**BKG**	**Units**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**	**Result**	**Qual**	**ValQual**
Explosives																							
2,4,6-Trinitrotoluene	NA	mg/kg	0.091	U	U	0.091	U	U				0.089	U	U	0.09	U	U	0.091	U	U	0.089	U	U
2-Amino-4,6-Dinitrotoluene	NA	mg/kg	0.05	U	U	0.051	U	U				0.05	U	U	0.05	U	U	0.05	U	U	0.049	U	U
GENERAL CHEMISTRY																							
Cyanide, Total	NA	mg/kg	NT			NT						NT			NT			NT			NT		
Total Solids	NA	Percent	98.3			98.6						98.5			98.7			98.6			99		
Metals																							
Aluminum	19,500	mg/kg	9,540			11,100						11,200			8,660			8,320			8,640		
Antimony	0.96	mg/kg	0.22	J	J	**1.5**						0.73			0.16	UV	U	0.16	UV	U	**1.1**		
Arsenic	19.8	mg/kg	11.5			10.6						12			14			11.5			14.8		
Barium	124	mg/kg	63.3	B		81.1	B					74.6	B		68.4	B		59.3	B		65.7	B	
Beryllium	0.88	mg/kg	0.5			0.63						0.66			0.48			0.43			0.5		
Cadmium	0	mg/kg	**0.23**			**0.81**						**0.79**			**0.89**			**0.7**			**0.88**		
Calcium[a]	35,500	mg/kg	32,600			24,900						949			13,200			24,400			13,500		
Chromium	27.2	mg/kg	15.4	B		**114**						**71.1**			13			12.4			**89.9**		
Cobalt	23.2	mg/kg	11	B		13.8						12.8			12.4			11.4			12.4		
Copper	32.3	mg/kg	15.4			21.5						16.6			18			15.3			19.4		
Iron[a]	35,200	mg/kg	25,900			28,300						27,200			27,400			23,800			27,500		
Lead	19.1	mg/kg	5.5			7.3						8			5.5			4.5			5.8		
Magnesium[a]	2,790	mg/kg	6,610			6,800						3,330			4,700			6,090			5,020		
Manganese	3,030	mg/kg	412	B		388	B					315	B		399	B		298	B		485	B	
Mercury	0.044	mg/kg	0.011			0.01						0.019			0.0072	J	J	0.0065	J	J	0.0073	J	J
Nickel	60.7	mg/kg	24.4			33.9						24.7			25.9			25.1			27		
Potassium[a]	3,350	mg/kg	1,740			1,860						1,450			788			1,050			1,740		
Selenium	1.5	mg/kg	1.7						1.1			1.2			0.68	JV	J	0.14	UV	U	1.2		
Silver	0	mg/kg	0.017	U	U	**0.078**	**JV,B**	**J**				**0.066**	**JV,B**	**J**	**0.099**	**JV,B**	**J**	**0.09**	**JV,B**	**J**	**0.12**	**B**	
Sodium[a]	145	mg/kg	95.6			92.8						55.6			44.3			53.8			77.8		
Thallium	0.91	mg/kg	0.14			0.18	JV	J				0.081	UV	U	0.44			0.56			0.23	J	J
Vanadium	37.6	mg/kg	15.1			18.6	B					19.2	B		14.3	B		13.7	B		15	B	
Zinc	93.3	mg/kg	46.3			59.8						49.1			48.6			44.2			51.5		
Pesticides																							
4,4'-DDE	NA	mg/kg	NT			NT						NT			NT			NT			NT		
4,4'-DDT	NA	mg/kg	NT			NT						NT			NT			NT			NT		
Aldrin	NA	mg/kg	NT			NT						NT			NT			NT			NT		
delta-BHC	NA	mg/kg	NT			NT						NT			NT			NT			NT		
Endosulfan II	NA	mg/kg	NT			NT						NT			NT			NT			NT		
gamma-Chlordane	NA	mg/kg	NT			NT						NT			NT			NT			NT		
Heptachlor	NA	mg/kg	NT			NT						NT			NT			NT			NT		
Heptachlor Epoxide	NA	mg/kg	NT			NT						NT			NT			NT			NT		
Semivolatiles																							
2-Methylnaphthalene	NA	mg/kg	NT			NT						NT			NT			NT			NT		
Bis(2-Ethylhexyl)phthalate	NA	mg/kg	NT			NT						NT			NT			NT			NT		
Di-n-Butyl Phthalate	NA	mg/kg	NT			NT						NT			NT			NT			NT		
Isophorone	NA	mg/kg	NT			NT						NT			NT			NT			NT		
Volatiles																							
Acetone	NA	mg/kg	NT			NT						NT			NT			NT			NT		

Table 5-9 (continued)
Detected Analytes in 2010 Phase II RI Subsurface Soil Samples (>1 ft. bgs)
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Bold *denotes concentration is greater than the facility-wide background screening value.*
[a] *denotes essential nutrient/not a site-related contaminant.*
AOC denotes area of concern.
B denotes analyte detected in associated blank.
BHC denotes benzene hexachloride.
BKG denotes background value.
D denotes field duplicate.
DA1 denotes Open Demolition Area # 1 AOC.
DDE denotes dichlorodiphenyldichloroethylene.
DDT denotes dichlorodiphenyltrichloroethane.
ft. denotes feet.
ft. bgs denotes feet below ground surface.
J denotes estimated concentration.
M (as a qualifier) denotes matrix spike and/or matrix spike duplicate recovery outside acceptance limits.
M (in a sample ID) denotes multi-incremental sample.
mg/kg denotes milligrams per kilogram.
NA denotes not applicable.
NT denotes no sample collected or analyzed.
P denotes concentration of analyte differs more than 40 percent between primary and confirmation analysis.
Qual denotes data qualifier assigned by the analytical laboratory.
RI denotes Remedial Investigation.
SB denotes soil boring sample.
SO denotes soil sample.
U denotes not detected.
V denotes raised quantitation or reporting limit due to limited sample amount or dilution for matrix background interference.
ValQual denotes data qualifier assigned after data validation.
Y denotes replicate/duplicate precision outside acceptance limits.

6.0 CONTAMINANT FATE AND TRANSPORT

Contaminant fate and transport analyses were conducted for SRCs identified in Section 5.5 in the environmental media evaluated for nature and extent of contamination (surface soil and subsurface soil). Several SRCs, including inorganic compounds, SVOCs, pesticides, explosives, and propellants were identified in the impacted soil media. One VOC—acetone, which is a common lab contaminant—was detected in the subsurface soil, but not evaluated further for its fate and transport. No PCB SRCs were identified. The potential migration pathways and transport mechanisms for these SRCs from the impacted media to potential receptors were evaluated and are presented in this section.

Characterization of the groundwater regime through monitoring well installation and sampling was not part of the scope of this Phase II RI and, therefore, SRCs could not be identified in the groundwater. However, the potential for leaching of contaminants through soil to groundwater and the potential for groundwater impacted from contaminated soil to impact surface water is included in this section. A single groundwater sample was collected during the Phase I RI using direct-push boring techniques. While results of a single sample collected without installing a monitoring well are not conclusive, the sample did not indicate any impact from ODA1 activities. Future sampling of groundwater would be performed under a separate facility-wide program for groundwater.

As discussed in Section 5.1.5, surface water and sediment, were deemed not to have been impacted from historical ODA1 operations.

Fate and transport modeling was performed to determine the potential for the SRCs present in surface and subsurface soils to migrate vertically downwards and impact the groundwater quality underneath ODA1. Computer models were used to predict which SRCs will leach to the groundwater at concentrations greater than the groundwater standards and also predict at what time in future the impacts to groundwater are likely to occur. The model predictions provide a mechanism to establish the potential for future impacts to human health and environment arising from the documented SRCs. Model predictions can also serve as a basis for determining if follow-up remedial action is warranted, in what media the remediation needs to be performed, and to what extent will the remediation be effective in mitigation impacts to human and ecological receptors downgradient of the site. The model includes site-specific conditions where possible. If site-specific conditions were not available, then the former RVAAP-specific parameters were taken from referenced documents. Assumptions are provided for inputs where site-specific and the former RVAAP-specific parameters were not available.

For the purpose of fate and transport modeling, a conservative approach was utilized wherein the vertical transport of SRCs present in soils above the water table was simulated by using the greatest detected SRC concentrations in surface and subsurface soils. The model prediction identified the maximum concentrations of the SRCs expected in groundwater under ODA1. The final step of predicting the horizontal transport of the SRCs in groundwater to the receptor locations could not be completed at this time, because groundwater at ODA1 has not been investigated and information on the chemical present in the site groundwater and the flow characteristics of the groundwater underneath ODA1 are not available.

A summary of the fundamental mechanisms affecting contaminant fate and transport is provided in this section, along with the results of the computer modeling performed. The procedure used to identify the SRCs was discussed in Section 5.0 and the identified SRCs are listed in Section 6.1. Section 6.2 briefly discusses the physical and chemical properties of the SRCs that affect their fate and transport in the environment. The biodegradation of organic compounds is discussed in Section 6.3, followed by a discussion of the transformation of explosives and propellants in Section 6.4. A conceptual model of the contamination sources, migration pathways, and transport mechanisms is provided in Section 6.5. Soil leaching analysis was performed to identify the contaminant migration COPCs (CMCOPCs) and is presented in Section 6.6. Section 6.7 describes the fate and transport modeling, followed by a presentation of summary and conclusions of the contaminant fate and transport analyses in Section 6.8.

6.1 Identification of SRCs

SRCs were identified for surface soil and subsurface soil based on procedures described in Section 5.0. Surface soil and sediment samples were collected from depths of 0–1 ft. bgs, while subsurface samples were collected from depths greater than 1 ft. bgs. Data from all qualified and remaining historical Phase I RI surface samples and Phase II RI surface soil samples were combined and screened to identify SRCs representing current conditions at ODA1. Following the screening process, the following SRCs were identified.

6.1.1 Surface Soil

A total of 23 SRCs were identified. These SRCs included the following:

- Five explosives and propellants (2,4,6-TNT, 2,4-DNT, 2-amino-4,6-DNT, HMX, and nitroguanidine);
- Thirteen inorganics (antimony, barium, beryllium, cadmium, chromium, cobalt, copper, cyanide, mercury, nickel, selenium, thallium, and zinc);
- One SVOC (di-n-butyl phthalate); and

- Four pesticides (4,4'-dichlorodiphenyltrichloroethane [DDT], gamma-chlordane, 4,4'-dichlorodiphenyldichloroethylene [DDE], and heptachlor).

6.1.2 Subsurface Soil

A total of 32 SRCs were identified. These SRCs included the following:

- Two explosives and propellants (2,4,6-TNT, and 2-amino-4,6-DNT);
- Eighteen inorganics (aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, cyanide, lead, manganese, mercury, selenium, silver, thallium, vanadium, and zinc);
- Four SVOCs (bis[2-ethylhexyl]phthalate, isophorone, di-n-butyl phthalate, and 2-methylnaphthalene); and
- Eight pesticides (endosulfan II, 4,4'-DDT, 4,4'-DDE, aldrin, delta-benzene hexachloride [BHC], heptachlor epoxide, gamma-chlordane, and heptachlor).

6.2 Physical and Chemical Properties of SRCs

The SRCs identified at the site consist of chemicals that may be classified as inorganic compounds and organic compounds (including explosives, SVOCs, and pesticides). Each of these chemicals have unique physical and chemical properties that govern their fate and transport characteristics, such as persistence in the environment (how long will the chemical last in the environment under natural conditions) and their mobility (ability to migrate through the soil and groundwater without being adsorbed to the surfaces of solids in these media). The persistence and mobility of chemicals determines the potential for human and ecological receptors to be exposed to these contaminants at locations at a certain distance away from the source areas, and also determine the chemical concentration the receptors may be exposed to over certain time duration.

A number of chemical and biological reactions occur along the migration pathways once the chemicals are released to the environment. Examples of these reactions include hydrolysis, oxidation, reduction, isomerization, photolysis, photo-oxidation, biotransformation, and biodegradation. These reactions tend to reduce the concentrations of chemicals over time and distance from the source. The reactions depend upon the properties of the chemicals as well as the properties of the media (i.e., soil and groundwater) that the chemicals are exposed to before reaching the potential receptors.

Key chemical-specific parameters that affect the fate and transport of chemicals in the environment include the organic carbon normalized soil-water partition coefficient (K_{oc}) for organic compounds, the soil-water partition coefficient (K_d) for inorganic chemicals, water

solubility (S), Henry's Law constant (HLC), and biodegradation rates for organic compounds along with air and water diffusivity. A compilation of these parameters is provided in the following reference sources:

- Soil Screening Guidance: Technical Background Document (EPA, 1996a); and
- Regional Screening Level (RSL) Chemical-Specific Parameters Supporting Table (EPA, 2010).

The chemical-specific properties are discussed in further detail in Section 6.2.1.

Media-specific parameters that affect the fate and transport of contaminants in groundwater include depth to groundwater, groundwater flow direction, aquifer characteristics, infiltration rate in soil, organic carbon content, bulk density, and soil moisture content. These media-specific properties are discussed in further detail in Section 6.2.2. As stated previously in Section 6.0, the groundwater investigation at ODA1 was not included in the Phase II RI. However, the potential for leaching of contaminants through soil to groundwater, and the potential for groundwater impacted from contaminated soil to impact surface water, is included in this document.

6.2.1 Chemical Properties Affecting Fate and Transport

The following chemical-specific properties affect the fate and transport of contaminants in soil and groundwater.

6.2.1.1 Soil-Water Partition Coefficient for Organic Chemicals

When an organic chemical is released to soil or groundwater, a fraction of the chemical may be adsorbed to the solid media (unsaturated soil or aquifer) due to hydrophobic effects while the remainder is dissolved in the soil moisture or groundwater. The primary adsorptive surface for organic chemicals is the fraction of organic solids in the unsaturated soil or aquifer (Fetter, 1992). Therefore, the partitioning of the chemical between the surface of the solids and soil moisture or groundwater depends upon organic carbon fraction of the soil (f_{oc}), which may be expressed as a fraction or as a percent of soil weight.

The preference of an organic chemical to partition between the solids and water is defined by the K_{oc}, which is related to f_{oc} and soil sorption coefficient (K_d) as follows:

$$K_{oc} = \frac{K_d}{f_{oc}}$$

Where: f_{oc} is dimensionless; K_{oc} and K_d are expressed in units of L/Kg.

6.2.1.2 Retardation Factor

The soil sorption coefficient K_d can be used to calculate the degree to which a chemical will tend to adsorb to the soil and therefore not be available to migrate with water. The lack of mobility of the chemical caused by the adsorption to solid surfaces can be defined by a term called the retardation factor. The retardation factor (R_f) is defined as follows:

$$R_f = 1 + \frac{K_d \rho_b}{\theta_w}$$

Where:

ρ_b is the soil bulk density (g/cm^3)
θ_w is the water filled soil porosity (or soil water content, dimensionless)

For chemicals that move at the same velocity as groundwater, the retardation factor is one. Chemicals whose mobility is slower than groundwater, i.e., are retarded as compared to the flow of groundwater; have a retardation factor greater than one. The greater the retardation factor, the slower the chemical will move relative to groundwater.

6.2.1.3 Soil-Water Partition Coefficient for Inorganic Chemicals

Unlike organic compounds, the partitioning of inorganic chemicals and metals between solids and water is not dependent on the organic carbon content. The mobility of metals is defined by the distribution coefficient (K_d), which is the soil-water partitioning coefficient defined as the ratio of a chemical's sorbed concentration (mg/kg) to the dissolved concentration (milligrams per liter) in water (EPA, 1996a).

6.2.1.4 Water Solubility (S)

The water solubility of a compound is the concentration of the compound in water, and varies with the temperature of the water, pH, and pressure. Compounds with greater water solubility tend to remain dissolved in water and are more likely to migrate with water as compared to compounds with low water solubility, which tend to either adsorb to soil or volatilize into air.

6.2.1.5 Henry's Law Constant

HLC is the ratio of a chemical's concentration in the air (vapor pressure) to its concentration in water (aqueous solubility) at equilibrium. This parameter can vary significantly with temperature for some chemicals. HLC can be expressed in dimensionless form or in units of atmospheres cubic meters per mole (atm-m^3/mol). This parameter is used to calculate a soil concentration that is protective of groundwater (EPA, 1996a). General predictions regarding a compound's tendency to volatilize from water can be made using this parameter. If the HLC value of a compound is less than 10^{-7} atm-m^3/mol, it will tend to remain in solution and

volatilize slowly, while compounds with HLC greater than 10^{-3} atm-m^3/mol will tend to volatilize rapidly (Lyman, Reehl, and Rosenblatt, 1990).

6.2.2 Media Properties Affecting Fate and Transport

The following properties of the porous media (unsaturated soil and aquifer media) affect the fate and transport of contaminants in soil and groundwater.

6.2.2.1 Groundwater Flow Direction

The direction of groundwater flow in the aquifer underlying the source of contamination determines source length parallel to that flow, which is a factor in calculating the amount of dilution and attenuation a chemical undergoes during transport between the source and the receptor.

6.2.2.2 Aquifer Parameters

Aquifer parameters needed to estimate a site-specific dilution factor include the following:

- Hydraulic conductivity (K);
- Hydraulic gradient (i), and
- Aquifer thickness (d_a).

Site-measured values for these parameters are the preferred alternative (EPA, 1996a).

6.2.2.3 Infiltration Rate

Infiltration rate is used to calculate leachate concentration arising from contaminants present in soil. Infiltration rates are a subset of the precipitation rates in an area and can be estimated as a percentage of the recharge rates. Another method of estimating infiltration rates is to use infiltration rates determined for a better-characterized site in the same hydrogeologic setting and with similar meteorological conditions as the site in question. A third alternative is to use the Hydrologic Evaluation of Landfill Performance (HELP) model developed by Schroeder et al., 1984 (EPA, 1996a).

6.2.2.4 Soil Moisture Content

The soil moisture content represents a fraction of total soil porosity that is filled by water. It is an important parameter in the application of the soil/water partition equation and the calculation of retardation factor.

6.3 Biodegradation

An additional consideration that applies to the fate and transport of organic compounds (VOCs, SVOCs, PCBs, and pesticides) is the reduction in contaminant concentration by biodegradation. Biodegradation is the transformation or breakdown of organic compounds

that occurs when microorganisms use the organic compounds as a source of carbon and energy. Biodegradation can reduce the chemical hazards related to organic compounds through the following mechanisms:

- *Primary Reduction*. Alteration of the chemical structure of a substance resulting in loss of a specific property of that substance.
- *Environmentally Acceptable Reduction*. Biodegradation to such an extent as to remove undesirable properties of the compound. This often corresponds to primary biodegradation but it depends on the circumstances under which the products are discharged into the environment.
- *Ultimate Reduction*. Complete breakdown of a compound to either fully oxidized or reduced simple molecules (i.e., carbon dioxide/methane, nitrate/ammonium, and water).

In some cases the products of biodegradation can be more harmful than the substance degraded (U.S. Geological Survey, 2007).

The biodegradation half-life is calculated as follows:

$$t_{1/2} = \frac{\ln 2}{\lambda} = \frac{0.693}{\lambda}$$

Where:
t ½ is the half life of the organic compound (days)
λ is the biodegradation rate constant

The biodegradation half life represents the time taken by biodegradation activities to reduce the concentration of an organic chemical to 50 percent of the original concentration. It depends upon a number of factors, including the presence of microorganisms capable of degrading the chemical, the size of the microbial populations, and environmental conditions like temperature.

6.4 Transformation of Explosives

Explosive and propellant SRCs were detected at ODA1. Their concentrations in soil and groundwater are attenuated by the processes of microbiological and photochemical transformation, which govern their fate and transport in the environment. Explosives such as TNT have been documented to undergo biotransformation to other compounds instead of biodegradation (Burrows et al., 1989). The principal mechanism for the microbial transformation of the nitroaromatic explosive compounds is the reduction of nitro groups to form amino groups. Results of field experiments conducted by Heaston et al. (2001)

provided strong evidence that anaerobic treatment using an electron donor facilitates the reductive transformation of several explosive compounds in groundwater.

6.5 Conceptual Model for Fate and Transport

This section provides a conceptual model of the contamination sources at ODA1, the contaminant migration pathways, and the transport mechanisms. The conceptual model represents site-specific conditions and is derived from numerical modeling for soil leaching and groundwater transport. The numerical modeling consists of site-specific parameters that are entered into the model application. The conceptual model is based on the description of site physiographic setting, climate, topography, geology, hydrogeology, and potential receptors presented in Section 3.0. The conceptual model is used to identify chemical migration pathways at ODA1 for fate and transport analysis.

The conceptual model serves as a basis for the model predictions during the fate and transport analysis and is dependent upon the available information and assumptions about site conditions. The accuracy of the predictions made by the numerical models is comparative to the accuracy of these assumptions and the ability of site-specific data to accurately represent physical and chemical conditions at ODA1.

A summary of the essential elements of the conceptual model that apply to fate and transport modeling is presented in the following subsections.

6.5.1 Contamination Sources

The exact release histories of contaminants at ODA1 are largely unknown due to incomplete operational records and minimal environmental media samples collected prior to the Phase I RI. Elevated concentrations of metals, VOCs, SVOCs, pesticides, explosives, and propellants are consistent with past activities performed at the former RVAAP/Camp Ravenna and would be expected as a result of historical activities conducted at ODA1.

Historically, the oval OB/OD area at ODA1 was surrounded by a 25 ft wide by 1.5 ft tall earthen berm, and a plane storage area located on the south side of the site. Currently, the AOC occupies an open, gently sloping parcel of land that is bounded to the south, east, and west by woodlands. The berms around the OB/OD area have been removed and a low area immediately south and east of the former berm collects runoff during rainfall events.

During the Phase I RI (SAIC, 2001a), areas outside of the berm contained shrapnel, fuzes, booster cups, and other debris on the soil surface. The occurrence of these materials on the ground surface outside the OB/OD area suggested that kickouts and shrapnel were generated during thermal destruction of ammunition. In addition, historical operations have indicated that, when congested with debris, burning areas were cleared using heavy equipment by

pushing the debris to the periphery of the area. This activity may have contributed to the spread of contaminants (SAIC, 2001a).

During the 2000–2001 removal action, most of the metal and explosive impacted soil to a depth of 4 ft bgs (5–8 ft bgs in a few locations) was removed from areas previously identified during the Phase I RI. The remaining area where removal action was not implemented represents current AOC contamination.

Slag is present at the site as fill around the berm and adjacent NTA runway. The presence of slag may account for some elevated concentrations of metals (especially aluminum, barium, beryllium, and manganese).

With the exception of a single groundwater sample that was collected during the Phase I RI using direct-push boring techniques, no other groundwater sampling was conducted. The single sample did not indicate any impact from ODA1 activities. SRCs were not identified in groundwater as future sampling of groundwater will be performed under a separate facility-wide program for groundwater. As stated previously in Section 6.0, groundwater investigation at ODA1 was not included in the Phase II RI, but the potential for leaching of contaminants through soil to groundwater, and the potential for groundwater impacted from contaminated soil to impact surface water, is included in this document.

Similarly, surface water and sediment, were deemed not to have been impacted from historical ODA1 operations and SRCs were not identified in these media at the AOC.

6.5.2 Hydrogeologic Setting

A complete description of the regional and site hydrogeologic setting was presented previously in Section 3.0 of this report. Salient features applicable to fate and transport analysis are presented here:

- Topography across ODA1 is relatively flat with little change in elevation. The elevation at ODA1 is approximately 1,085 ft (330 m) above msl. The AOC is slightly elevated as compared to its immediate surroundings, and surface drainage is to the east, west, and south.
- Drainage from within the bermed OB/OD area is to the south via a culvert towards a shallow ditch that ultimately discharges at ground surface within the Hinkley Creek drainage area. Surface drainage outside the berm is to the east, west, and south.
- Soils at ODA1 consist of the Fitchville silt loam series. This series exhibits 2–6 percent slopes, is somewhat poorly drained, and has low permeability.

- The surficial geology at ODA1 consists of the Lavery Till, which is a mix of approximately 28 percent sand and 30 percent clay, although percentages can vary.
- The till is underlain by Sharon Sandstone, which was not encountered in the soil borings that were generally 16 ft deep. Depth to bedrock is unknown.
- No monitoring wells have been installed and groundwater data is not available.
- As shown in **Table 6-1**, the generalized lithologic sequence consists of sands and silts with a silty clay lens in between.
- Groundwater was encountered in a majority of the borings at ODA1. The depth to groundwater at these borings ranged from 4–11 ft bgs, with an average groundwater depth of approximately 6 ft bgs. Throughout the former RVAAP/Camp Ravenna, average depth to groundwater is as deep as 50 ft bgs (Kammer, 1982).

6.5.3 Contaminant Release Mechanism and Migration Pathways

The following contaminant release mechanisms and migration pathways were identified based on an analysis of the contaminant sources and hydrogeologic setting information presented above:

- One of the principal migration pathways at ODA1 is infiltration through the unsaturated soil (approximately six ft thick) to the underlying groundwater causing SRCs to leach from surface and subsurface soils into groundwater present in the unconsolidated water bearing zone.
- Due to the very heterogeneous nature of the unconsolidated glacial materials, groundwater flow patterns within the unconsolidated water bearing zone are difficult to predict. Site-specific groundwater data is not available at ODA1.
- Some of the precipitation falling as rainfall and snow leaves ODA1 as surface runoff to Hinkley Creek, carrying dissolved SRCs that are present in the surface soil to Hinkley Creek. The fraction of the precipitation that does not leave ODA1 as surface runoff infiltrates into the subsurface. Some of the infiltrating water is lost to the atmosphere as evapotranspiration. The remainder of the infiltrating water recharges the groundwater.
- The rate of infiltration and eventual recharge of the groundwater is controlled by soil cover, ground slope, saturated hydraulic conductivity of the soil, and meteorological conditions.
- The infiltrating water leaches the contaminated soil impacted with SRCs and carries the dissolved SRCs to deeper soil and groundwater. The factors that affect

the leaching rate include the amount of infiltration, the SRCs' solubility in water, and partitioning between solids and water. Insoluble compounds will precipitate out of solution in the subsurface or remain in insoluble forms with little leaching. For organic compounds, the rate of decay, either by biodegradation or biotransformation, determines whether a contaminant will leach to the groundwater and if it does then at what concentration. Inorganic compounds are not attenuated by the decay processes. Most organic compounds decay at rates that are proportional to their half life. SRCs with longer half lives have a greater potential for contaminating groundwater than the SRCs with shorter half lives.

- The impacted groundwater eventually discharges to the surface water in Hinkley Creek, carrying dissolved SRCs with it.

Figure 6-1 shows the contaminant migration conceptual model. After the SRCs leach through the unsaturated soil and reach the groundwater, they migrate with the local groundwater and potentially discharge to Hinkley Creek.

6.5.4 Water Budget

Precipitation falling as rainfall and snow leaves ODA1 via the following mechanisms:

- Evapotranspiration (ET);
- Overland Flow or Surface Runoff (R); and
- Infiltration to Groundwater (I).

The partitioning of precipitation (P) into the three components (ET, R, I) of the hydrologic cycle constitutes the water budget. ET is the mechanism by which a fraction of the precipitation is lost to the atmosphere. The remainder of precipitation either reaches Hinkley Creek as surface runoff or infiltrates to the water table. Infiltration is the mechanism that transports contaminants from soil to the groundwater by the process of leaching.

The actual amount of rainwater available for flow and infiltration to groundwater is highly variable and dependent upon soil type and climatic conditions.

A water budget was prepared to quantify the components of the hydrologic cycle at ODA1. The quantified components of the water balance are used for inputs to the numerical modeling of soil leaching and groundwater transport. The components of a simple steady-state water balance model are related by the following equation:

$$P = ET + R + I$$

The water balance estimations were developed using the HELP model (Schroeder et al., 1984). Calculations for site conditions using precipitation and temperature data for a 100-year period were generated synthetically using coefficients for Cleveland, Ohio (see USACE, 2005a for details). The annual average water balance estimates for ODA1 indicate evapotranspiration of 28 percent (0.26 m [10.3 inches]) of total precipitation (0.94 m [37 inches]). The remaining 72 percent (0.68 m [27 inches]) of rainwater is available for surface water runoff and infiltration to groundwater. Of that 0.68 m (27 inches), groundwater recharge (infiltration) accounts for 10 percent (0.095 m [3.6 inches]), and surface runoff accounts for the remaining 62 percent (0.60 m [23 inches]).

6.5.5 Natural Attenuation of SRCs

As chemicals migrate vertically through the soil zone and then horizontally in groundwater, the concentrations are reduced by several natural processes that are collectively referred to as natural attenuation. These processes include advection, dispersion, sorption, volatilization, and decay effects. The net result of natural attenuation is the reduction of toxicity, mobility, and volume (mass) associated with a chemical. It is possible that for some chemicals with elevated levels, the concentrations are reduced to levels that are protective of human health and the ecosystem within an acceptable, site-specific time period. Therefore, natural attenuation is a viable alternative to active remediation.

Geotechnical samples were not collected from the unsaturated soil or the groundwater zone; therefore, site-specific data regarding the soil moisture content, bulk density and porosity, and organic carbon content is not available. Data from other areas at the former RVAAP/Camp Ravenna, such as Ramsdell Quarry Landfill and Building 1200, were used for estimating these parameters at ODA1. It is expected that attenuation through adsorption will occur in the unsaturated soil because of the organic carbon and clay content in the soils.

6.6 Soil Leachability Analysis

A soil leachability analysis was conducted to determine which of the SRCs found in surface and subsurface soils have the potential to leach to groundwater, and eventually migrate to Hinkley Creek, when the groundwater discharges to Hinkley Creek.

The soil leachability analysis is a three-step screening process that includes the following:

1. Identifying SRCs for sample aggregates of interest;
2. Comparing the maximum concentration of SRCs with Generic Soil Screening Levels (GSSLs) to develop initial CMCOPCs; and

3. Comparing the maximum concentration of initial CMCOPCs with Site-Specific Soil Screening Levels (SSSLs) (GSSL multiplied by the site-specific dilution attenuation factor [DAF]) to refine the initial CMCOPCs.

6.6.1 Soil Screening Analysis

The soil screening analysis consists of identification of SRCs, development of initial CMCOPCs, refinement of initial CMCOPCs, and limitations and assumptions of soil screening analysis.

6.6.1.1 Identification of SRCs

The SRCs identified for ODA1 are presented in Section 6.1.

6.6.1.2 Development of Initial CMCOPCs

A screening evaluation was performed to identify SRCs with the potential to leach to the perched groundwater and potentially migrate to the surface water. These SRCs are referred to as initial CMCOPCs. The CMCOPCs are defined as the constituents that may leach to groundwater and migrate to a downgradient receptor location at a concentration greater than the drinking water maximum contaminant level (MCL) or Risk-Based Soil Screening Level (RSSL).

Table F-1 in **Appendix F** shows the development of initial CMPOCS for the surface soil. The maximum SRC concentrations were compared with the GSSLs for contaminant migration to groundwater pathway developed by EPA for application at Superfund sites. These GSSLs are available at the website http://www.epa.gov/superfund/health/conmedia/soil/pdfs/appd_a.pdf (EPA, 1996a). The GSSL is defined as the concentration of a contaminant in soil that represents a level of contamination below which there is no concern for impacts to groundwater under CERCLA, provided conditions associated with Soil Screening Levels (SSLs) are met. Generally, if contaminant concentrations in soil fall below the GSSL, and there are no significant ecological receptors of concern, then no further study or action is warranted for that area. A default DAF of one was used, which assumes that there is no reduction in contaminant concentrations by dilution of natural attenuation processes active between the source and the receptor location. If the maximum SRC concentration was less than the GSSL, the SRC was excluded from further consideration as a CMCOPC.

For SRCs for which the EPA GSSLs are not available, the EPA protection of groundwater SSLs - RSSLs and the MCL based SSLs were used to determine if the SRCs qualify as CMCOPCs (EPA, 2010). The protection of groundwater SSLs are available at the website http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/xls/master_sl_table_run_NOVEMBER2010.xls. If neither the GSSL nor the

EPA protection of groundwater SSL was available for a chemical, then no further evaluation of the chemical was performed.

The results of the initial CMCOPC screen (presented in Table F-1 in Appendix F) for surface soils eliminated 9 out of 19 SRCs, i.e., one explosive (nitroguanidine), three inorganics (cyanide, mercury, and zinc), one SVOC (di-n-butyl phthalate) and four pesticides (4,4'-DDT, 4,4'-DDE, gamma-chlordane, and heptachlor) from further consideration.

The results of the initial CMCOPC screen (presented in Table F-2 in Appendix F) for subsurface soils eliminated 16 out of 30 SRCs, i.e., five inorganic (aluminum, beryllium, cyanide, vanadium, and zinc), three SVOCs (bis[2-Ethylhexyl]phthalate, di-n-butyl phthalate, and 2-methylnaphthalene), and eight pesticides (4,4'-DDT, 4,4'-DDE, aldrin, delta-BHC, heptachlor epoxide, endosulfan II, gamma-chlordane, and heptachlor) from further consideration.

6.6.1.3 Refinement of Initial CMCOPCs

The third step of the screening process involves comparing the maximum SRC concentrations with the SSSLs. The SSSL is defined as the GSSL multiplied by the site-specific DAF. The DAF, which is defined as the ratio of soil leachate concentration to receptor point concentration, is minimally equal to one. In the derivation of the GSSLs (DAF equal to 1), direct partitioning is used, assuming groundwater is in contact with the analytes in soil and the groundwater concentration is assumed to be equal to the leachate concentration. However, as soil leachate moves through soil, contaminant concentrations are attenuated by adsorption and degradation. When the leachate reaches the water table, dilution by groundwater further reduces leachate concentrations. This reduction in concentration can be expressed by a DAF that is greater than one.

The DAF for ODA1 was calculated using the site data to the extent possible and assumed or literature values where site-specific data related to the hydrogeologic properties was not available. The EPA Soil Screening Guidance (EPA, 1996a) protocol was used to calculate the DAF. The following equations were used:

$$DAF = 1 + \frac{(Kid)}{IL}$$

Where:

DAF is the dilution attenuation factor
K is the aquifer hydraulic conductivity (m/yr)
i is the horizontal hydraulic gradient (m/m)

I is the infiltration rate (m/yr)
L is the source length parallel to groundwater flow (m)
d is the mixing zone depth (m) (see equation below)

$$d = \sqrt{0.012\,L^2} + d_a\left\{1 - \exp\left(\frac{-Li}{Kid_a}\right)\right\}$$

Where:

d_a is aquifer thickness (m)
$d \leq d_a$

If the aquifer thickness is less than the calculated mixing zone depth, then the aquifer thickness is used for "d" in the DAF calculation.

The DAF calculation is presented in Table F-3 in Appendix F. A site-specific DAF of 1.03 was calculated.

The results of the DAF evaluation are presented in Appendix F, Table F-4 for surface soils and in Table F-5 for subsurface soils. Based on this screening, only those constituents whose concentrations were greater than their published or calculated GSSL multiplied by the DAF were identified as the initial CMCOPCs, based on leaching to groundwater. No additional SRCs were eliminated during the SSSL screening at ODA1. The refined CMCOPCs are presented in Tables F-4 and F-5.

6.6.1.4 Limitations and Assumptions of Soil Screening Analysis

It is important to note a limitation of the soil leachability analysis approach utilized above. The GSSLs and RSSLs used in this screening are based on a number of default assumptions chosen by EPA to be protective of human health for most site conditions. These GSSLs and RSSLs are expected to be more conservative than SSSLs developed, based on site conditions which could be conducted if site-specific data were available.

The conservative assumptions included in this analysis are as follows:

- Uniform distribution of contamination throughout the source area at concentration equal to the maximum detected concentration;
- No adsorption in the unsaturated soil or in the groundwater to retard the contaminated migration; and
- No biological degradation or transformation in the soil or in the groundwater.

6.7 Fate and Transport Modeling

The conceptual model for ODA1 presented in Section 6.5 served as the basis for the numerical fate and transport modeling performed at ODA1.

A two-step modeling approach was utilized as follows:

1. Screening the refined CMCOPCs (Section 6.6.1.3 and Tables F-4 and F-5 of Appendix F) with a travel time leaching analysis over a duration of 1,000 years; and
2. Evaluating CMCOPCs that remain after the travel time screening using numerical fate and transport models to develop final CMCOPCs.

Details of the two-step approach are presented in the following subsections.

6.7.1 Travel Time Analysis

This step of the screening process involves comparing the maximum contaminant concentrations of the refined CMCOPCs identified in the SSSL screen with a travel time evaluation. A travel time simulation for a contaminant was performed over a 1,000-year period. Typical travel times used in fate and transport modeling range from 500 to 1,000 years. The 1,000-year travel time was used to be consistent with previous RIs completed for the former RVAAP/Camp Ravenna and is considered applicable to the ODA1 site based on the clay conditions found there. The time period of 1,000 years was selected assuming the time to be sufficient for the potential migration of the contaminant to the receptor locations and considering the high uncertainty associated with predicting conditions beyond that time frame. Therefore, the refined CMCOPCs at the selected sources were screened against a travel time of greater than 1,000 years. The travel time is the time required by a contaminant to travel from the base of its contamination source to the water table. The estimated travel time for each initial CMCOPC to reach the water table is determined using the following equations:

$$T_r = \frac{T_h R_f}{V_p}$$

Where:

T_r is the leachate travel time (years)
T_h is the thickness of the leaching zone – the vertical separation between soil source and water table (ft)
R_f is the retardation factor (unit less)
V_p is the pore water velocity (ft/year)

and

$$V_p = \frac{I}{\theta_w}$$

Where:

I is the infiltration rate (ft/year)
θ_w is the water filled soil porosity (unit less)

Table 6-2 presents the input parameters used in the travel time analysis.

Travel times for each of the refined CMCOPCs are presented in Tables F-6 (surface soils) and F-7 (subsurface soils) of Appendix F. If the travel time for refined CMCOPCs from a source area exceeded 1,000 years, then the constituent was eliminated from the list of CMCOPCs. Initial CMCOPCs with travel times less than 1,000 years are considered to be CMCOPCs and are retained for further analysis. This screening evaluation eliminated seven inorganics from further consideration in the surface soil. It also eliminated 10 inorganics and 1 SVOC from further consideration in the subsurface soil.

Cadmium was identified as a shallow soil CMCOPC based on its travel time to groundwater. However, as shown in Table F-7, cadmium was measured in the subsurface soil sample at soil boring DA1SB-059, collected from interval with bottom depth of 8 ft bgs. Groundwater was encountered at DA1SB-059 at a depth of 5 ft bgs. Therefore, it appears that cadmium may already be present in the groundwater and further leaching analysis is not necessary.

The constituents selected for further consideration and numerical modeling are listed below:

- Explosives and Propellants
  - 2,4,6-TNT
  - 2-Amino-4,6-DNT
- Inorganics: Copper

Table F-8 of Appendix F lists the physical and chemical properties of these selected constituents.

6.7.2 Seasonal Soil Compartment Modeling

Seasonal Soil Compartment (SESOIL) modeling (Waterloo Hydrogeologic Inc., WHI Unsat Suite, Version 2.2.03; November 2004) was performed for constituents identified as CMCOPCs after screening against the 1,000-year travel time criteria presented in

Section 6.7.1. Modeling was performed to predict concentrations of constituents in the leachate immediately beneath the selected source areas, just above the water table. If the predicted groundwater concentration derived from the leachate concentration of a CMCOPC was greater than its MCL or RSL, then the CMCOPC was retained as a final CMCOPC. The CMCOPC was not evaluated further using groundwater flow and transport models (i.e., the Analytical Transient 1-,2-,3-Dimensional [AT123D] model or the BIOSCREEN model) to predict the groundwater concentrations at designated receptor locations, because groundwater at ODA1 has not been investigated and input data for groundwater modeling are not available. The receptor location identified for the source areas is Hinkley Creek at its closest point downgradient of the source areas. SESOIL modeling and AT123D model have been used for the evaluation of fate and transport for RIs at other AOCs at the former RVAAP/Camp Ravenna and are industry standard models.

The SESOIL model defines the soil compartment as a soil column extending from the ground surface through the unsaturated zone and to the upper level of the saturated zone. Processes simulated in SESOIL are categorized in three cycles—the hydrologic cycle, the sedimentation cycle, and the pollutant cycle. Each cycle is a separate sub module in the SESOIL code. The hydrologic cycle includes rainfall, surface runoff, infiltration, soil-water content, evapotranspiration, and groundwater recharge. The sedimentation cycle includes the sediment load that originated from rainstorms (i.e., soil erosion from surface runoff). The pollutant cycle includes convective transport, volatilization, adsorption/desorption, and degradation/decay. A contaminant in SESOIL can partition in up to four phases (liquid, adsorbed, air, and pure).

Data requirements for SESOIL are not extensive, and utilize a minimum of site-specific soil and chemical parameters, and monthly or seasonal meteorological values as input. Output of the SESOIL model includes pollutant concentrations at various soil depths and pollutant loss from the unsaturated soil zone in terms of surface runoff, percolation to groundwater, volatilization, and degradation. The mathematical representations in SESOIL generally consider the rate at which the modeled processes occur, the interaction of different processes with each other, and the initial conditions of both the waste area and the surrounding subsurface matrix material.

The input data for SESOIL can be grouped into four types: climatic data, chemical data, soil data, and application data. There are a total of 61 separate parameters contained in these 4 data groups. Wherever possible, site-specific parameter values were used for modeling. Certain parameters, however, were not available for all of the source areas, and were estimated based on pertinent scientific literature, geochemical investigations, and checks for consistency between model results and historical data. Conservative estimates were used when a range of values was indicated, or parameter values were not available.

6.7.2.1 Climate Data

The climatic data file of SESOIL consists of an array of mean monthly temperature, mean monthly cloud cover fraction, average monthly relative humidity, average monthly shortwave albedo, average daily evapotranspiration, monthly precipitation, mean number of storm events per month, mean duration of rainfall, and mean length of rainy season. The climatic data for ODA1 is presented in Table F-9 in Appendix F. This data was taken from the Youngstown Weather Service Office – Airport Station, Ohio, as it was determined to be nearest weather station to ODA1.

6.7.2.2 Chemical Data

The pollutant fate cycle of SESOIL focuses on the various chemical transport and transformation processes that may occur in the soil zone. These processes include volatilization/diffusion, adsorption/desorption, cation exchange, biodegradation and hydrolysis, and metal complexation. The chemical-specific parameters are presented in Table F-8 in Appendix F.

Parameters such as water solubility, air diffusivity, HLC, the distribution coefficients (K_d for inorganic chemicals and K_{oc} for organic compounds) were obtained from the following sources:

- Soil Screening Guidance: Technical Background Document (EPA, 1996a);
- A Proposal for Estimation of Soil Leaching Constants for Use in Assessment Models (Baes and Sharp, 1983); and
- RSL Chemical-Specific Parameters Supporting Table (EPA, 2010).

For compounds that are subject to biodegradation and transformation, the most conservative degradation rates found in the literature (Howard et al., 1991) were used.

6.7.2.3 Soil Data

The soil data input parameters describing the physical characteristics of the soil are presented in Table 6-3. Site-specific data were used if available; otherwise, SESOIL default values or data from Building 1200 geotechnical analysis were used.

6.7.2.4 Source Terms

Analytical data from surface and subsurface soil collected from ODA1 were used as the source term for SESOIL modeling. Samples at different depth intervals were compiled to provide a detailed loading option for the SESOIL model. Maximum soil concentrations from the surface soil and subsurface soil overlying the water table were used as source term concentrations.

6.7.2.5 Application Data

The model was arranged in three layers. The first layer is equivalent to the surface soil (0–1 ft bgs), the second layer corresponds to the subsurface soil sampling increment (1–4 ft bgs), while the third layer represents the separation between the 1–4 ft bgs sample and the water table. Contamination loading was in the first and second layers. Details of the model layers utilized in this modeling are presented in Table F-10 in Appendix F.

6.7.2.6 Seasonal Soil Compartment Modeling Results

SESOIL modeling was performed for CMCOPCs 2,4,6-TNT, 2-amino-4,6-DNT, and copper. These CMCOPCs have the potential to reach the water table within 1,000 years based on the screening analysis results (Tables F-6 and F-7 in Appendix F). Table 6-4 presents the SESOIL predicted peak leachate concentrations beneath source areas and the corresponding time for peak leachate concentrations. The variation of leachate concentrations over time is presented graphically in Appendix F (Figures F-1, F-2, and F-3). Maximum groundwater concentration calculated using a DAF of 1.03. The MCL/RBC values for the CMCOPCs are also shown in Table 6-4 for comparison purposes. For determining if a CMCOPC would qualify as a final CMCOPC, the predicted maximum groundwater concentration was compared to the MCL. If MCL was not available, then the Risk Based Concentration (RBC) was used. RBC values are available at http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/xls/restap_sl_table_run_NOVEMBER2010.xls (EPA, 2010).

Table 6-4 shows that concentrations of 2,4,6-TNT, and 2-amino-4,6-DNT are predicted to be greater than MCLs or RBCs; therefore, these two constituents were selected as the final CMCOPCs. In addition, one SVOC (isophorone) and ten metals (antimony, arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, and thallium) that were detected in both groundwater samples and soil samples collected from below the water table are also final CMCOPCs. Modeling to determine if these SVOC and metals constituents would reach groundwater, and thus be retained as CMCOPCs, was not performed because they are already detected in groundwater samples.

6.7.3 Limitations and Assumptions

Throughout the screening and modeling processes, conservative approaches were used to evaluate for worst-case scenarios, which may overestimate the contaminant concentration in the leachate for migration from observed soil concentrations. The important assumptions used in the fate and transport analysis and the related limitations of the analysis are as follows:

- The equations used to determine soil adsorption and contaminant retardation are based on the assumption that an equilibrium relationship exists between the solid-

and solution-phase concentrations, and that the relationship is linear and reversible.

- A number of literature values were used in the analysis. These values depend upon the properties of the impacted media and vary from site to site (i.e., organic carbon content, hydraulic conductivity, and soil-moisture content). The use of literature values is an approximation that may not represent site conditions.
- This modeling used current soil concentration data between 1999 and 2010, collected several years after historical operations were terminated. The modeling does not account for constituents that have already leached to groundwater.
- Groundwater flow and solute transport are not affected by density variations.
- The maximum concentration values were used as the source term concentrations for SESOIL model instead of more realistic average values.
- The water budget represents an overall average rainwater recharge and assumes an even distribution of infiltration in the modeled area. An average water budget assumes some areas will have greater or lower recharge based on the heterogeneity of the soil and varying topography.
- The effects of porous media heterogeneity and anisotropy are not addressed in these simulations.
- The effects of seasonal fluctuations in the depth to water and changes in flow directions and gradients were not considered.
- Groundwater at the site has not been investigated. The hydrogeologic parameters are either assumed values or literature values for comparable lithology.
- The biodegradation rate constants for organic constituents are literature based values that may deviate from actual biodegradation rates at the site. Generally, greater biodegradation rates will produce lower concentrations.

6.8 Summary and Conclusions

Based on soil, sediment, and surface water sampling data collected at ODA1, explosive and propellant related compounds, inorganics, SVOCs, and pesticides were identified as SRCs. The SRCs found in the surface and subsurface soil samples were used as the primary contamination sources in the fate and transport assessment for ODA1.

Fate and transport analysis indicates that some of these SRCs may leach from soil into the groundwater beneath the source. A soil leachability analysis was conducted to determine which of the SRCs found in surface and subsurface soils have the potential to leach to groundwater, impact the groundwater, and eventually impact Hinkley Creek when the

groundwater discharges to Hinkley Creek. A multistep approach was utilized. First, a three-step screening process was performed that included the following:

- Identifying SRCs;
- Comparing the maximum concentration of SRCs with GSSLs to develop initial CMCOPCs; and
- Comparing the maximum concentration of initial CMCOPCs with DAF based SSSLs to refine the initial CMCOPCs.

The refined list of CMCOPCs was then used for the numerical fate and transport modeling performed at ODA1. A two-step modeling approach was utilized as follows:

- Screening the refined CMCOPCs with a travel time leaching analysis; and
- Evaluating CMCOPCs that remain after the travel time screening using SESOIL to develop final CMCOPCs.

The final list of CMCOPCs that have the potential for impacting groundwater based on a) leaching analysis and modeling, and b) detection in soil samples collected from below the water table, are listed below:

- Two explosives and propellants (2,4,6-TNT and 2-amino-4,6-DNT);
- One SVOC (isophorone); and
- Ten metals (antimony, arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, and thallium).

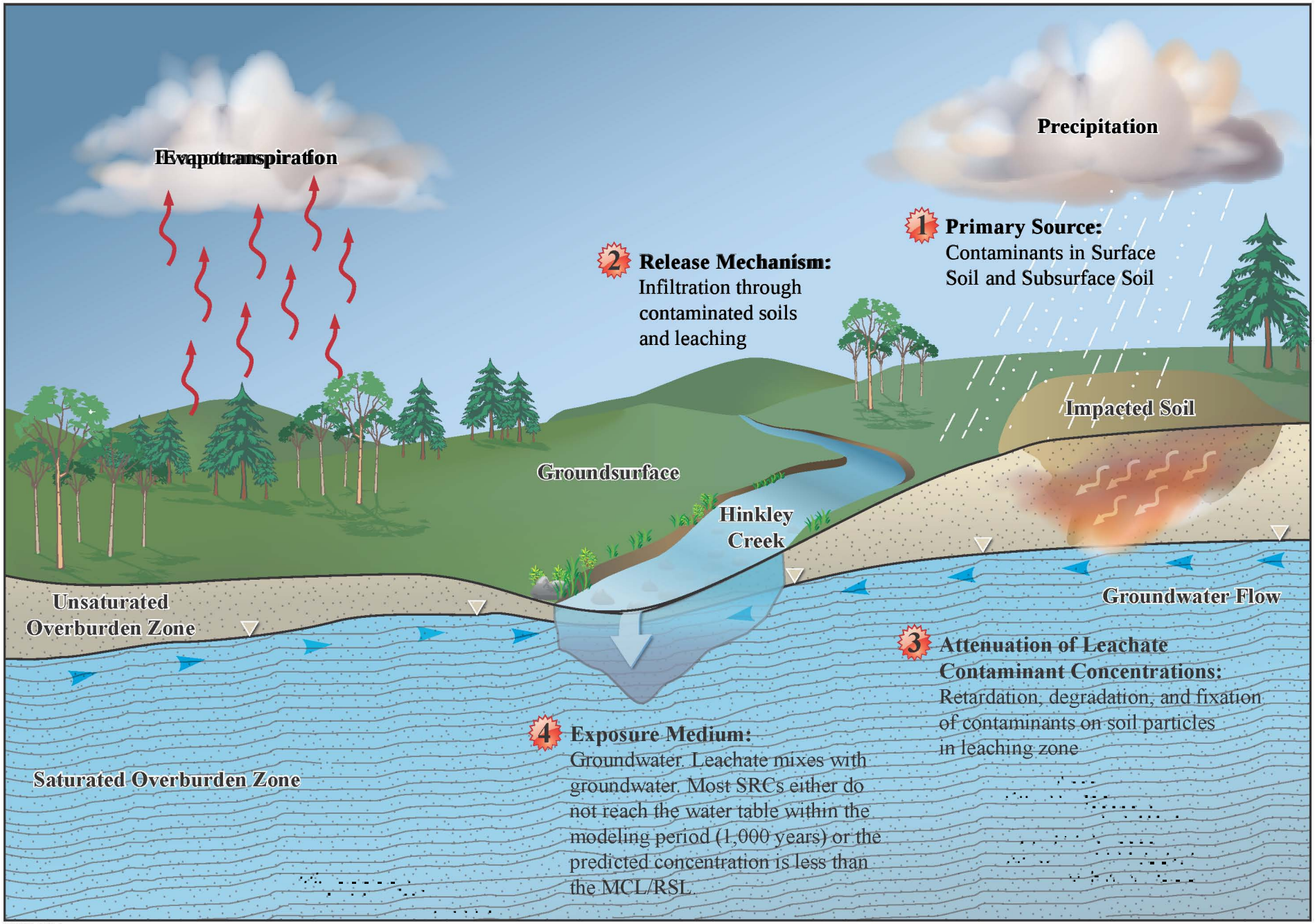


Figure 6-1. Contaminant Migration Conceptual Model

Table 6-1
Lithology and Depth to Water Measured in Boreholes
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Boring ID	Lithology Description	Depth ft bgs	Depth to Water ft bgs
DA1sb-056	Sand, trace silt	0–6	
	Sand, silty	6–8	~ 6
	Clay, silty	8–16	
DA1sb-055	Sand, silty	0–6	
	Silt	6–12	~ 6
	Sand	12–13	
	Clay, silty	13–16	
DA1sb-057	Sand, trace gravel	0–1.5	
	Sand, silty	1.5–8	~ 6
	Clay, silty	8–14.5	
	Sand	14.5–16	
DA1sb-058	Sand, trace silt and gravel	0–4	
	Sand	4–8	~ 6
	Clay, silty	8–16	
DA1sb-059	Sand and silty sand	0–8	~5
	Clay and silty clay	8–11	
	Sand	11–16	
DA1sb-060	Sand	0–4	
	Clay, silty	4–10	~5
	Silt and sandy silt	10–14	
	Sand	14–16	
DA1sb-061	Sand and silt	0–4	~5
	Clay and silty Clay	4–10	
	Sand	10–16	
DA1sb-062	Sand, silty	0–4	
	Clay, silty	4–8	~5
	Silt	8–10.5	
DA1sb-063	Sand, silty	0–4	
	Clay, silty	4–8	~6

1

Table 6-1 (continued)
Lithology and Depth to Water Measured in Boreholes
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Boring ID	Lithology Description	Depth ft bgs	Depth to Water ft bgs
	Silt, sandy	8–12	
	Clay, silty	12–14.5	
	Sand	14.5–16	
DA1sb-064	Sand, silty	0–4	
	Clay, silty	4–11.5	~6
	Sand	11.5–16	
DA1sb-065	Sand, silty	0–4	
	Clay, silty	4–8	~6.5
	Sand, silty	8–12	
	Clay, silty	12–15	
	Sand	15–16	
DA1sb-066	Sand and sandy silt	0–4	
	Clay, silty	4–11.5	~5
	Sand, silty	11.5–12	
	Sand	12–16	
DA1sb-067	Sand	0–4	
	Clay, silty	4–14.5	~4
	Sand	14.5–16	
DA1sb-068	Sand and sandy silt	0–8	~4
	Clay, silty	8–13.5	
	Sand	13.5–16	
DA1sb-069	Silt, sandy	0–8	~6
	Clay, silty	8–13.5	
	Clay	13.5–16	
DA1sb-070	Sand and silty sand	0–8	~5
	Clay, silty	8–15.5	
	Sand	15.5–16	
DA1sb-071	Sand	0–4	
	Clay, silty	4–9	~5
	Clay	9–16	

Table 6-1 (continued)
Lithology and Depth to Water Measured in Boreholes
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Boring ID	Lithology Description	Depth ft bgs	Depth to Water ft bgs
DA1sb-072	Sand	0–6	
	Clay, silty	6–11	~6
	Sand	11–16	
DA1sb-073	Silt, clayey	0–1	
	Clay, silty	1–7	~7
	Sand and silt	7–16	
DA1sb-074	Silt, clayey	0–1	
	Clay, silty	1–7	~7
	Sand, silt	7–16	
DA1sb-075	Silt, clayey	0–1	
	Clay, silty	1–10	~10
	Sand and silt	10–16	
DA1sb-076	Silt, clayey	0–1	
	Clay, silty	1–11	~11
	Gavel, silty	11–12	
DA1sb-077	Silt, clayey	0–1	
	Clay, silty	1–7	~7
	Silt	7–14	
	Sand, silt	14–16	

AOC denotes area of concern.
DA1 denotes Open Demolition Area # 1 AOC.
ft bgs denotes feet below ground surface.
ID denotes identification.
sb denotes soil boring sample.

Table 6-2
Input Parameters Used in Travel Time Analysis
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Parameter	Symbol	Value	Units	Notes
Infiltration rate	I	0.31	ft/yr	10 percent of annual precipitation from Youngstown WSO AP, Ohio weather station
Soil-water distribution coefficient	K_d	SRC-specific	L/kg	See Appendix F, Tables F-6 and F-7
Organic carbon distribution coefficient	K_{oc}	SRC-specific	L/kg	See Appendix F, Tables F-6 and F-7
Fraction organic carbon – surface soil	foc	0.0026	unit less	Assumed value, based on data from Ramsdell Quarry Landfill data
Fraction organic carbon – subsurface soil	foc	0.0012	unit-less	Assumed value, based on data from Building 1200
Water filled soil porosity – surface soil	θ_w	0.30	unit-less	Assumed value, based on lithology type
Bulk density (dry) – surface soil	ρ_b	1.8		Assumed value, based on data from Ramsdell Quarry Landfill
Water filled soil porosity – subsurface soil	θ_w	0.367	unit-less	Assumed value, based on lithology type
Bulk density (dry) – subsurface soil	ρ_b	1.63		Assumed value, based on data from Building 1200
Thickness of leaching zone – surface soil	T_h	5	ft	Distance between sample collected from 0–1 ft bgs and the average water table depth of 6 ft bgs
Thickness of leaching zone – subsurface soil	T_h	Variable	ft	See Appendix F, Tables F-6 and F-7
Retardation factor	R_f	SRC-specific	unit-less	Calculated in Appendix F, Tables F-6 and F-7 using equation in Section 6.2.1.2
Contaminant arrival time	T_r	SRC-specific	yr	Calculated in Appendix F, Tables F-6 and F-7 using equations above

ft/yr denotes feet per year.
ft bgs denotes feet below ground surface.
L/kg denotes liters per kilogram.
SRC denotes site-related contaminant.

Table 6-3
Soil Property Input Data Used In Seasonal Soil Compartment Model
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Parameter	Symbol	Value	Units	Notes
Infiltration rate (Recharge Rate)	q	0.09	m/yr	10 percent of annual precipitation from Youngstown WSO AP, Ohio weather station
Intrinsic Permeability	K	1×10^{-9}	cm^2	Estimated value based on lithology
Application Area	Ap	4.05E+0	cm^2	Model Calculated value
Disconnectedness Index	c	3.7	unit-less	Model Calculated value
Fraction organic carbon	foc	0.0012	unit-less	Assumed value, based on comparable data from Building 1200 geotech sample
Water filled soil porosity	θ_w	0.367	unit-less	Assumed value, based on lithology type
Freunlich Equation Exponent	n	0.5	unit-less	Model Calculated value
Effective porosity	θ_e	0.30	unit-less	Assumed value, based on lithology type
Bulk density (dry) – subsurface soil	ρ_b	1.63	kg/L	Assumed value, based on data from Building 1200
Thickness of leaching zone	T_h	Variable	ft	See Appendix Table F-10
Vadose Zone Thickness	Vz	5–6 ft	ft	From boring logs

cm^2 denotes square centimeters.
ft denotes feet.
kg/L denotes kilograms per liter.
m/yr denotes meters per year.
Youngstown WSO AP denotes Youngstown Weather Service Office – Airport Station.

Table 6-4
Summary of Seasonal Soil Compartment Modeling Results
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

CMCOPC based on travel time less than 1,000 years	Maximum Leachate Concentration (mg/L)	Time (days)	Maximum Groundwater Concentration (mg/L)	Time (years)	MCL/RBC (mg/L)	Final CMCOPC
Explosives and Propellants						
2,4,6-Trinitrotoluene	1.54	7,305	1.50	20	0.018	Yes
2-Amino-4,6-Dinitrotoluene	0.59	1,461	0.57	4	0.073	Yes
Inorganics						
Copper	0.00	NA	0.00	NA	1,300	No

The Final CMCOPC was identified comparing predicted maximum leachate concentration to MCL/RBC. A constituent is a CMCOPC if its predicted leachate concentration is greater than its MCL/RBC within 1,000 years.

CMCOPC denotes contaminant migration chemical of potential concern.

MCL denotes maximum concentration level.

mg/L denotes milligrams per liter.

NA denotes not applicable.

RBC denotes risk-based concentration.

7.0 HUMAN HEALTH RISK ASSESSMENT

The purpose of this HHRA is to document whether concentrations of chemicals remaining on the AOC may pose a risk to current or future site receptors, and to identify if any site conditions need to be addressed in an FS. This human health risk assessment has been revised and updated per requirements in the Risk Assessment Technical Memo (February 2014). This risk assessment follows the streamlined approach to risk decision-making, as described in the FWCUG Report (SAIC, 2010) but also includes the USEPA's November 2015 Regional Screening Levels (RSLs). The values are used in lieu of updating the Residential FWCUGs. The Risk Assessment Technical Memo states that the FWCUGs should be updated for all new documents. Since the Risk Assessment Technical Memo allows the use of the most current Residential RSL if a FWCUG is not available, the RSLs were used in this risk assessment as the risk criteria for all chemicals. Updated FWCUGs were not available at the time of this revision. The Risk Assessment Technical Memo identifies two other Land Uses that should be evaluated in the RI if the Unrestricted (Residential) Land Use is not obtained. These two Land Uses: Commercial/Industrial Land and the Military Training Land Use, are not included in this RI since the Unrestricted (Residential) Land Use was achieved. The Residential RSLs have been a part of the risk assessment process since the development of the FWCUGs. The use of the RSLs follow the same process as that developed for the FWCUGs.

The *Position Paper for the Application and Use of FWCUGs* (USACE, 2012), describes the use of FWCUGs/RSLs in the following steps:

- Identify COPCs for the site by comparing site concentrations to soil background concentrations, eliminating essential nutrients, and comparing site concentrations to FWCUGs and RSLs.
- Identify COCs by comparing site concentrations to specific FWCUGs and RSLs, and using a “sum of ratios” approach to account for cumulative effects from exposure to multiple chemicals. This method sums the ratios of site concentration to the FWCUG and RSL for all COPCs. A sum of ratios greater than one represents an unacceptable risk, and cancer and noncancer effects are considered separately.

More details on this approach and its application at this site are provided in the following sections.

7.1 Data Considered in the HHRA

As described in Section 2.2, ODA1 covers approximately six acres and is located in the southwestern portion of the former RVAAP/Camp Ravenna, north of Hinkley Creek, located within the southern portion of the NTA. It consisted of an oval OB/OD area, which was surrounded by a 25 ft. wide by 1.5 ft. tall earthen berm, and a plane storage area located on the south side of the site (Figure 2-2). Currently, the AOC occupies an open, gently sloping parcel of land that is bounded to the south, east, and west by woodlands. The berms around the OB/OD area are essentially removed and a low area immediately south and east of the former berm collects runoff during rainfall events.

Section 2.4 describes the previous investigations conducted at ODA1. The inclusion or exclusion of these data in the risk assessment is described below:

- **USACHPPM Relative Risk Site Evaluation (USACHPPM, 1996)**—Due to the limited nature and age of this data (three surface soil samples), they are not included in the risk assessment. In addition, a more comprehensive soil sampling program was conducted in the Phase I and later sampling events.
- **Water Quality Surveillance Program (USATHMA, 1980–1992)**—Due to the limited nature and age of this data as discussed in Section 2.4.2, it was not included in the risk assessment. In addition, surface water has been sampled more recently. The *Final Facility-Wide Biological and Water Quality Study 2003* (USACE, 2005b) presented the findings of additional surface water sampling.
- **Phase I RI (SAIC, 2001a)**—The Phase I RI was a comprehensive assessment of ODA1. As a result, most data collected during this assessment was included in the risk assessment. All soil samples collected during this investigation were discrete samples. Data excluded are soil samples for which the sample location was subsequently removed in the IRA and data results that were rejected based on data validation (see Section 5.1.2). All other soil data were included in this risk assessment. Groundwater data were not considered, as groundwater is being addressed in a facility-wide evaluation. Surface water and sediment were not considered as these media have already been eliminated as being of concern, as discussed in Section 2.4.3.1.
- **MEC Debris Removal and IRA**—As described in Section 2.4.4, this removal action consisted of the excavation and disposal of MEC/MD to a depth of 4 ft. bgs. Sixteen grids were identified and sampled at the completion of the excavation. Samples were composite samples from 4 areas of the base of 50 ft. by 50 ft. grids. While these samples were not true multi-incremental samples, they were intended to represent the area of the base of each grid. Therefore, these data were

considered as multi-incremental samples for the purposes of this evaluation. These data were included in the risk assessment unless data results were rejected based on data validation (see Section 5.1.2).

- **RI Sampling (Section 4.0)**—As described in Section 4.0, soil sampling was conducted in the Phase II RI to fill data gaps identified in the *DQO Report* (Shaw, 2009a). Surface soil samples were ISM samples taken from the 0–1 ft. bgs interval. The subsurface samples were collected at 4-ft intervals using the modified ISM sampling approach were not included in this risk assessment. In general, 30 increments of soil were collected from the soil column for each 4-ft interval to generate a modified ISM sample. Even though these samples consisted of 30 increments, they are still representative of a 4-ft interval. Therefore, they are more similar to subsurface borings collected during the Phase I RI (SAIC, 2001a) and would be considered as discrete samples if the Commercial/Industrial and Military Training land uses are evaluated.

Samples included in the RI data sets are provided in Tables 7-1 and 7-2. Sample lists are included for four depth intervals to account for the different intervals used to evaluate the different receptors, is discussed below. Also, discrete and ISM samples are distinguished on these tables, as these two types of samples are considered separately in the risk assessment and not combined. This risk assessment only evaluates and discusses potential risk for the Residential Receptors.

7.2 COPC Identification

The data for this RI was evaluated in accordance with the initial evaluation step presented in the Position Paper (USACE, 2012) to further establish COPCs and characterize source areas of contamination. The process to identify COPCs at the former RVAAP/Camp Ravenna is presented on Figure 5-1 but this process is what was used to determine which chemicals would have a FWCUG developed for them rather than the exact process to identify site-specific COPCs. The process to identify COPCs begins with the list of chemicals identified as SRCs. The SRCs were evaluated as described in Steps 1 through 3 below. Since identified in Section 5, the initial evaluation of data to identify SRCs is not repeated in this revised human health risk assessment since the SRC determination process has not changed since the original risk assessment was completed by Shaw. This evaluation process for SRCs and then COPCs consists of the following progression:

1. The concentrations of detected inorganics were compared to the soil background values in the FWCUG Report (SAIC, 2010) and the results of the geophysical evaluation. An inorganic was retained as a SRC if its maximum concentration detected was greater than its respective background value.

2. Chemicals identified as essential nutrients (i.e., calcium, chloride, iodine, iron, magnesium, potassium, phosphorus, and sodium) were screened out as long as they are: (1) present at low concentrations (i.e., only slightly elevated above naturally occurring levels), and (2) toxic at very high doses (i.e., much higher than those that could be associated with contact at an AOC.

3. Chemicals meeting the less than 5 percent detected rule (i.e., frequency of detection) can be screened out; however, in order for this to occur, the chemical must have a statistically valid data set with a sample size of at least 20. No chemicals were screened out based on frequency of detection in this evaluation.

4. To establish COPCs, all chemicals (SRCs) that were not eliminated to this point were evaluated using the following process with revisions as required in the Risk Assessment Technical Memo:

    - The Risk Assessment Technical Memo requires that new risk assessments use updated FWCUGs and also use the most current RSLs for those chemicals lacking a FWCUG. Rather than update the FWCUGs at this time, the November 2015 values for the Residential Receptor for the Unrestricted (Residential) Land Use and the Industrial RSLs were used. The November 2015 Residential RSLs are provided and used as the determining factor to identify COPCS and COCs. This is a reasonable approach since the current guidance allows for the use of Residential RSLs if there is no FWCUGs developed for a particular chemical. If neither the FWCUG nor the RSL was available, then a site-specific cleanup goal was developed or another approach, such as the use of an FWCUG or RSL from a surrogate chemical, was used. The use of such alternative values is documented in this evaluation.

    - The RSL and FWCUGs at the 1×10^{-6} cancer risk level and noncarcinogenic risk HQ using the 0.1 risk value for each of the receptors were selected.

    - A comparison of the selected RSL and FWCUG to the exposure point concentration (EPC) was completed. The EPC was the maximum value detected for each chemical.

    - The chemical was retained as a COPC if the EPC exceeds the Residential RSL for either one of the 1×10^{-6} carcinogenic value and the noncarcinogenic HQ using the 0.1 risk value.

Using the data described in the previous section, COPCs were identified for the Residential Receptor. The COPCs were determined for the Residential Receptor for expected depth of

exposure and because discrete and ISM samples were considered separately, the COPC identification was completed for the following data sets:

- Residential Receptor – Surface Soil (0–1 ft. bgs): ISM Samples (Table 7-3);
- Residential Receptor – Surface Soil (0–1 ft. bgs): Discrete Samples (Table 7-4);
- Residential Receptor – Subsurface Soil (1–13 ft. bgs): ISM Samples (Table 7-5);
- Residential Receptor – Subsurface Soil (1–13 ft. bgs): Discrete Samples (Table 7-6);

Tables 7-3 through 7-6, referenced in the above bullets, provide the frequency and percent detection of each chemical. The minimum and maximum detected concentrations are provided as well as the location of the maximum detection and the range of reporting limits. The mean concentration is also provided, based on an assumed value of one-half the reporting limit for nondetect results. The applicable BSV is provided, taken from SAIC (2010) and USACE (2001), and as discussed in Section 5.1.3.2. The above tables also include a column identifying whether the chemical was identified as an SRC, based on consideration of the background screening and consideration as an essential nutrient (Section 5.1.3.3).

Tables 7-3 through 7-6 also include the applicable RSLs for the Residential Receptor for the relevant depth interval. The RSL values are those from the USEPA's website (http://www.epa.gov/risk/risk-based-screening-table-generic-tables) for the November 2015 tables. As recommended by USACE (2012), the carcinogenic RSL is based on a cancer risk of 10^{-6} (1 in 1 million), and the noncarcinogenic RSL is based on an HQ of 0.1. The RSLs are based on the lower of values derived considering a cancer risk of 10^{-6} and noncancer hazard considering an HQ of 1. The RSLs derived based on noncancer risk were adjusted to an HQ of 0.1 in order to be consistent with the noncancer RSLs. However, the RSL for lead was not adjusted in this manner, since it was not derived using the HQ approach. The RSL for lead in soil is based on the value recommended by EPA as generally safe for residential settings (EPA, 2010).

In some cases, RSLs were not available for the detected chemical, and values for a closely related compound are used. All such substitutions are noted in the tables.

The COPCs are identified by comparing the maximum detected concentration to the applicable screening criteria. Substances that are considered SRCs, and for which the maximum concentration is greater than the RSL are considered COPCs.

COPCs for each receptor and depth interval are identified in Tables 7-3 through 7-6 and summarized in Table 7-7.

7.2.1 COPCs in Surface Soil

The results from the evaluation of COPCs in surface soil for the Residential Receptor is provided in Tables 7-3 and 7-4, Surface soil for the Residential Receptor is defined as the 0–1 ft bgs interval. Two COPCs, cobalt and thallium, were identified in the surface soil for the Residential Receptor based on the ISM data. The cobalt was detected in all five of the ISM surface soil samples but was less than the BSV in all but one sample. In the sample identified as DA1SS-053, the maximum detected concentration was detected at a concentration greater than the BSV and above the screening value (Table 7-3). Thallium was detected in 4 of the 5 ISM samples. All concentrations were less than the BSV except in DA1SS-050 where the maximum concentration was detected and was greater than risk screening criteria.

Cobalt was the only COPC identified in the surface soil for the Residential Receptor based on the discrete data. Cobalt was detected in all 18 discrete surface soil samples but most results were less than the BSV. The maximum concentration of cobalt detected in the discrete surface soil sample identified as DA1-018 (Table 7-4).

7.2.2 COPCs in Subsurface Soil

The evaluation of COPCs in subsurface soil for the Residential Receptor is provided in Tables 7-5 and 7-6, subsurface soil for the Residential Receptor is defined as the 1–13 ft. bgs interval. No COPCs were identified for the Residential Receptor in the modified ISM samples for subsurface soil (Table7-5. As shown in Table 7-2, the samples included for this depth interval were composite samples taken from the base of the grids excavated during the IRA.

Several COPCs were identified in subsurface soil for the Residential Receptor based on the discrete samples (Table 7-6). They are aluminum, antimony, arsenic, cadmium, copper, lead, silver, and thallium.

7.3 COC Evaluation

The COCs were identified through additional screening of the COPCs identified in Section 7.2 and summarized per media in Table 7-7. The COCs are chemicals that may be addressed in an FS following the RI stage of the CERCLA process, if the Weight-of-Evidence evaluation indicates these chemicals are true COCs The determination of COCs was conducted in accordance with USACE (2012) and modified to reflect changes in the Risk Assessment Technical Memo as follows:

1. The Residential RSLs for the Residential Receptor were selected using the 1×10^{-5} carcinogenic value and noncarcinogenic risk value at an HQ of 1 for each COPC previously identified.

2. All carcinogenic and noncarcinogenic risk values for all receptors and all critical effect and target organ for each of the noncarcinogenic risk values are reported.

3. A comparison of the RSLs to the appropriate EPC was conducted. The EPC was the ISM (maximum concentrations detected) result for ISM sampling. The EPC for discrete samples were based on the 95 percent upper confidence limit (UCL) on the mean or the maximum detected result for discrete samples, whichever was lowest. If the 95 percent UCL could not be calculated, the maximum concentration was used as the EPC.

4. For carcinogens and noncarcinogens, the EPCs were compared to the target risk RSLs using the Sum or Ratios (SOR) method presented in the Position Paper (USACE, 2012).

5. The chemical was retained as a COC if: (1) the EPC exceeds the Residential RSL for the Unrestricted (Residential) Land Use for either one of the 1×10^{-5} carcinogenic value and the noncarcinogenic risk value termed HQ using the 1.0 risk value, and/or (2) the Sum of Ratios for all carcinogens or all noncarcinogens that may affect the same organ are greater than 1 and the chemical contributes at least 5 percent to the sum.

The use of the SORs approach is intended to account for additive effects from exposure to multiple chemicals that can cause the same effect (i.e., cancer) or affect the same target organ. Each of these steps is discussed in more detail below.

7.3.1 RSL Identification

As stated previously, the November 2015 version of the Residential RSLs are used to assess the Unrestricted (Residential) Land Use. As described in Section 3.7.1, the OHARNG projected future land use for the AOC is as an Operational Range.

The determination of COCs in this risk assessment follows requirements of the Risk Assessment Technical Memo. Since the FWCUGs are not currently updated and this is a new screening, the Residential RSLs were used for the Resident Receptor. The Unrestricted (Residential) Land Use is also required by the CERCLA process and is outlined in the FWHHRAM (USACE, 2005a).

The RSLs selected are those based on a 10^{-5} (1 in 100,000) excess cancer risk for carcinogenic effects, and an HQ of 1 for noncarcinogenic effects. The RSLs for the identified COCs are provided in Tables 7-7 and 7-8.

7.3.2 EPC Development

As discussed above, COPCs in ISM and discrete samples are evaluated separately. The surface soil samples (0–1 ft. bgs) were true ISM samples. However, even though the subsurface soil samples were collected as modified ISM (as directed by Louisville USACE), they can only be evaluated as discrete since they only represent a single location. Therefore, the surface soil samples were evaluated as ISM and the subsurface soil samples were evaluated as discrete. The ISM and discrete (modified ISM) samples were not averaged or combined together.

For the ISM samples, the maximum concentration for each relevant depth interval is used as the EPC because these samples represent an average concentration over the area sampled. Therefore, additional statistical evaluation of these samples is not appropriate. For the discrete samples, the lower of the maximum and the 95 percent UCL on the mean is used as the EPC. The 95 percent UCLs were derived for COPCs using results for all discrete samples identified in Tables 7-1 through 7-2. They were calculated using ProUCL Version 4.00.04, which is a software package developed by EPA designed to calculate various statistical measures, including UCL. It contains several parametric, nonparametric, and bootstrap methods for calculating UCL, and some methods are capable of handling nondetect results, including multiple detection limits. The data sets for UCL derivation include detected and nondetect results. The nondetect results are included as such, with the reporting limit. The ProUCL outputs are provided in Appendix G. The recommended 95 percent UCL values are used as the EPC; if more than one value is recommended, the greatest value was selected. The EPCs used are provided in Tables 7-7 and 7-8.

7.3.3 Comparison of EPCs to RSLs

As described in USACE (2012), EPCs are compared to the applicable FWCUGs (RSLs) for cancer and noncancer effects through the development of a ratio. These ratios are summed to account for potential cumulative effects. These ratios and sums are shown in Tables 7-7 and 7-8. For noncancer effects, the ratios are summed for target organs, which are shown for each COPC as reported in SAIC (2010). A COPC is identified as a COC if the following conditions are met:

- The cancer or noncancer ratio for a given COPC is greater than 1; or
- The sum of the ratios for cancer or noncancer effects for any target organ is greater than 1, and the COPC contributes more than 5 percent to the sum.

Tables 7-7 and 7-8 identify COPCs that have been identified as potential COCs and the justification for the decision.

7.3.4 COCs in Surface Soil

The evaluation of COCs in surface soil in both the ISM and the discrete results for the Residential Farmer is provided in Table 7-7. Surface soil for the Residential Farmer is defined as the 0–1 ft. bgs interval. Only cobalt and thallium were identified as COPCs for the Residential Receptor in surface soil based on the ISM data. As shown in Table 7-7, these chemicals were not identified as COCs based on their individual HQs and the ratios of the maximum EPC (maximum concentration detected) for the ISM samples to the applicable RSLs. Neither are considered carcinogens from oral ingestion of soil and the noncancer effects per target organ were less than one, since there was only one chemical per effect. Only cobalt was identified as a COPC in the surface soil for the Resident Receptor based on the maximum discrete concentrations detected (Table 7-4). Since this HQ was less than one and there is only one chemical, the calculation of the SORs is not needed. Therefore, no COCs were identified for the Resident Receptor in the surface soil either from ISM or discrete data for the 0-1 foot depth

7.3.5 COCs in Subsurface Soil

The evaluation of COCs in subsurface soil for the Residential Receptor for is provided in Table 7--8. Subsurface soil for the Residential Farmer is defined as the 1–13 ft. bgs interval. Eight COPCs were identified in subsurface soil for the Residential Farmer based on the discrete samples. These are aluminum, antimony, arsenic, cadmium, copper, lead, silver, and thallium. None of these were identified as COCs. Since the ratios of the EPC to the noncancer Residential RSLs was less than 1 and the SOR for the effect to specific target organs were less than 1

7.4 Uncertainty Assessment

There are various sources of uncertainty in the assessment of exposure and risk that are common to all risk assessments. These general sources of uncertainty are not described here, however, those specific to this assessment are discussed in the following sections. These uncertainties generally relate to sampling considerations, the determination of EPCs, and the selection of appropriate exposure parameters for a given receptor. There are numerous uncertainties related to the RSLs, including exposure assumptions and toxicity values. These uncertainties are inherent to the use of these values, and will be similar for all assessments using them. Therefore, these uncertainties are not discussed here unless there is a particular issue relevant to this evaluation.

Uncertainty can arise from sampling techniques or approaches. In this assessment surface soil was sampled using ISM techniques. These techniques provide a good representation of average concentrations over the area sampled. While it may not identify small areas of greater concentrations, this approach is useful for estimating exposure, which is expected to

occur over an area and not discrete locations. Sampling of subsurface soil was conducted using discrete sampling techniques. As a result, there is more variability in these results. However, if sample numbers are sufficient, 95 percent UCLs on the mean can be calculated to provide an upper limit on the mean concentration for use in exposure assessment, thus limiting the uncertainty associated with this sampling technique. Some of the historic data were composite samples taken from the base of excavated areas. Because the composite samples were intended to represent an area, they were considered as ISM samples in this evaluation. This consideration represents an uncertainty to the risk assessment, however, since maximum concentrations are used as EPCs for ISM samples, this assumption should not result in the underestimation of risk.

The identification of COPCs and COCs is based on the identification of SRCs. The identification of SRCs is largely based on site-specific background concentrations. As shown in Table 7-6, a number of metals were identified as COPCs. The identification of these metals as SRCs in some cases is based on small differences in maximum concentrations compared to background. This comparison is subject to uncertainties in both the site data and background data sets. No metals were identified as COCs because EPCs were less than either RSLs (risk criteria) or BSVs.

The evaluation of chromium in this assessment is based on the background information (from development of the FWCUGs for trivalent chromium). This assumption was made since samples of soil were analyzed for hexavalent chromium, and it was not detected in any sample. Therefore, this assumption represents a minor uncertainty to the risk assessment.

The generic Residential RSLs were used as the screening values for the Resident Receptor rather than the site-specific and chemical-specific FWCUGs. This provides a conservative evaluation, since RSLs are based on residential exposure and generic values. In some cases, if no RSLs were available, screening values for closely related chemicals were used. This assumption represents an uncertainty to the risk assessment, although concentrations of most substances without Final FWCUGs or RSLs were quite low. In addition, the chemicals for which there was an FWCUG developed were the ones that had been detected in previously completed investigations on the former RVAAP/Camp Ravenna. Since RSLs were used for this human health risk assessment rather than FWCUGs, it is likely that many chemicals were identified as RSLs that are not an SRC from a facility-wide perspective.

The selection of the maximum detected concentration as the EPC for the ISM samples provides a conservative evaluation of potential exposures in the area. For discrete samples, the 95 percent UCL of the mean is used as the EPC for COC identification unless it is greater than the maximum concentration. There is uncertainty associated with the calculation and selection of the 95 percent UCL. In some cases, the 95 percent UCL on data sets skewed by a

few high values are more uncertain. However, the UCLs recommended in this circumstance are conservative to reflect the uncertainty.

The selection of receptors also represents an uncertainty to the risk assessment. However, the Residential Receptor is assumed to be a future receptor in both the COPC and COC evaluations, representing a conservative evaluation of possible future exposures. Therefore, risks are not expected to be underestimated for other future uses.

Table 7-1
Surface Soil (0–1 ft. bgs) Human Health Risk Assessment Data Set for Residential Land Use

Sample Location	Sample Number	Sample Date	Depth of Sample (ft. bgs)			Analyses
Discrete Surface Soil						
DA1-002	DA10003	19-Oct-99	0	-	1	Exp, Gen Chem, Metals
DA1-003	DA10005	19-Oct-99	0	-	1	Exp, Gen Chem, Metals
DA1-004	DA10007	19-Oct-99	0	-	1	Exp, Gen Chem, Metals
DA1-008	DA10015	20-Oct-99	0	-	1	Exp, Gen Chem, Metals
DA1-009	DA10017	20-Oct-99	0	-	1	Exp, Gen Chem, Metals
DA1-011	DA10021	20-Oct-99	0	-	1	Exp, Gen Chem, Metals
DA1-014	DA10029	21-Oct-99	0	-	1	Exp, Gen Chem, Metals
DA1-015	DA10032	21-Oct-99	0	-	1	Exp, Gen Chem, Metals
DA1-016	DA10036	21-Oct-99	0	-	1	Exp, Gen Chem, Metals
DA1-017	DA10039	21-Oct-99	0	-	1	Exp, Gen Chem, Metals
DA1-018	DA10042	22-Oct-99	0	-	1	Exp, Gen Chem, Metals
DA1-019	DA10045	22-Oct-99	0	-	1	Exp, Gen Chem, Metals
DA1-028	DA10073	26-Oct-99	0	-	1	Exp, Gen Chem, Metals
DA1-031	DA10082	26-Oct-99	0	-	1	Exp, Gen Chem, Metals
DA1-032	DA10085	27-Oct-99	0	-	1	Exp, Gen Chem, Metals
DA1-036	DA10097	2-Nov-99	0	-	1	Exp, Gen Chem, Metals
DA1-037	DA10100	2-Nov-99	0	-	1	Exp, Gen Chem, Metals
DA1-039	DA10106	2-Nov-99	0	-	1	Exp, Gen Chem, Metals
DA1SS-052D	DA1SS-052D-0201-SO	27-Sep-10	0	-	1	Gen Chem, VOCs
ISM Surface Soil						
DA1SS-050M	DA1SS-050M-0201-SO	27-Sep-10	0	-	1	Exp, Gen Chem, Metals
DA1SS-051M	DA1SS-051M-0201-SO	27-Sep-10	0	-	1	Exp, Gen Chem, Metals
DA1SS-052M	DA1SS-052M-0201-SO	27-Sep-10	0	-	1	Exp, Gen Chem, Metals, PCBs, Pest, SVOCs
DA1SS-053M	DA1SS-053M-0201-SO	10-Nov-10	0	-	1	Exp, Gen Chem, Metals
DA1SS-054M	DA1SS-054M-0201-SO	10-Nov-10	0	-	1	Exp, Gen Chem, Metals

1

Table 7-1 (continued)
Surface Soil (0–1 ft. bgs) Human Health Risk Assessment Data Set for Residential Land Use

ft. bgs denotes feet below ground surface.
D denotes discrete sample.
DA1 denotes Open Demolition Area # 1 area of concern.
Exp denotes explosives.
Gen Chem denotes General Chemistry.
ISM denotes incremental sampling method.
M denotes multi-incremental sample.
PCB denotes polychlorinated biphenyl.
Pest denotes pesticides.
SO denotes soil sample.
SS denotes surface soil.
SVOC denotes semivolatile organic compound.
VOC denotes volatile organic compound.

Table 7-2
Subsurface Soil (1-13 ft bgs) Human Health Risk Evaluation Data Set for Residential Land Use
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Sample Location	Sample Number	Sample Date	Depth of Sample (ft bgs)			Analyses
Discrete Subsurface Soil						
DA1SB-055	DA1SB-055M-0001-SO	22-Sep-10	4	-	8	Exp, Gen Chem, Metals
DA1SB-055	DA1SB-055M-0002-SO	22-Sep-10	8	-	12	Exp, Gen Chem, Metals
DA1SB-055	DA1SB-055M-0003-SO	22-Sep-10	12	-	16	Exp, Gen Chem, Metals
DA1SB-056	DA1SB-056M-0001-SO	22-Sep-10	1	-	4	Exp, Gen Chem, Metals
DA1SB-056	DA1SB-056M-0002-SO	22-Sep-10	4	-	8	Exp, Gen Chem, Metals
DA1SB-056	DA1SB-056M-0003-SO	22-Sep-10	8	-	12	Exp, Gen Chem, Metals
DA1SB-056	DA1SB-056M-0004-SO	22-Sep-10	12	-	16	Exp, Gen Chem, Metals
DA1SB-057	DA1SB-057M-0201-SO	23-Sep-10	1	-	4	Exp, Gen Chem, Metals
DA1SB-057	DA1SB-057M-0202-SO	23-Sep-10	4	-	8	Exp, Gen Chem, Metals
DA1SB-057	DA1SB-057M-0203-SO	23-Sep-10	8	-	12	Exp, Gen Chem, Metals
DA1SB-057	DA1SB-057M-0204-SO	23-Sep-10	12	-	16	Exp, Gen Chem, Metals
DA1SB-058	DA1SB-058M-0201-SO	23-Sep-10	4	-	8	Exp, Gen Chem, Metals
DA1SB-058	DA1SB-058M-0202-SO	23-Sep-10	8	-	12	Exp, Gen Chem, Metals
DA1SB-058	DA1SB-058M-0203-SO	23-Sep-10	12	-	16	Exp, Gen Chem, Metals
DA1SB-059	DA1SB-059D-0201-SO	23-Sep-10	5	-	8	Gen Chem, VOCs
DA1SB-059	DA1SB-059M-0201-SO	23-Sep-10	5	-	8	Exp, Gen Chem, Metals, PCBs, Pest, SVOCs
DA1SB-059	DA1SB-059M-0202-SO	23-Sep-10	8	-	12	Exp, Gen Chem, Metals
DA1SB-059	DA1SB-059M-0203-SO	23-Sep-10	12	-	16	Exp, Gen Chem, Metals
DA1SB-060	DA1SB-060M-0201-SO	23-Sep-10	1	-	4	Exp, Gen Chem, Metals
DA1SB-060	DA1SB-060M-0202-SO	23-Sep-10	4	-	8	Exp, Gen Chem, Metals
DA1SB-060	DA1SB-060M-0203-SO	23-Sep-10	8	-	12	Exp, Gen Chem, Metals
DA1SB-060	DA1SB-060M-0204-SO	23-Sep-10	12	-	16	Exp, Gen Chem, Metals
DA1SB-061	DA1SB-061M-0201-SO	23-Sep-10	1	-	4	Exp, Gen Chem, Metals
DA1SB-061	DA1SB-061M-0202-SO	23-Sep-10	4	-	8	Exp, Gen Chem, Metals
DA1SB-061	DA1SB-061M-0203-SO	23-Sep-10	8	-	12	Exp, Gen Chem, Metals
DA1SB-061	DA1SB-061M-0204-SO	23-Sep-10	12	-	16	Exp, Gen Chem, Metals

Table 7-2
Subsurface Soil (1-13 ft bgs) Human Health Risk Evaluation Data Set for Residential Land Use
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Sample Location	Sample Number	Sample Date	Depth of Sample (ft bgs)			Analyses
DA1SB-062	DA1SB-062M-0201-SO	23-Sep-10	1	-	4	Exp, Gen Chem, Metals
DA1SB-062	DA1SB-062M-0202-SO	23-Sep-10	4	-	8	Exp, Gen Chem, Metals
DA1SB-062	DA1SB-062M-0203-SO	23-Sep-10	8	-	12	Exp, Gen Chem, Metals
DA1SB-062	DA1SB-062M-0204-SO	23-Sep-10	12	-	16	Exp, Gen Chem, Metals
DA1SB-063	DA1SB-063M-0201-SO	23-Sep-10	4	-	8	Exp, Gen Chem, Metals
DA1SB-063	DA1SB-063M-0202-SO	23-Sep-10	8	-	12	Exp, Gen Chem, Metals
DA1SB-063	DA1SB-063M-0203-SO	23-Sep-10	12	-	16	Exp, Gen Chem, Metals
DA1SB-064	DA1SB-064D-0201-SO	23-Sep-10	4	-	8	Gen Chem, VOCs
DA1SB-064	DA1SB-064M-0201-SO	23-Sep-10	4	-	8	Exp, Gen Chem, Metals, PCBs, Pest, SVOCs
DA1SB-064	DA1SB-064M-0202-SO	23-Sep-10	8	-	12	Exp, Gen Chem, Metals
DA1SB-064	DA1SB-064M-0203-SO	23-Sep-10	12	-	16	Exp, Gen Chem, Metals
DA1SB-065	DA1SB-065M-0201-SO	23-Sep-10	4	-	8	Exp, Gen Chem, Metals
DA1SB-065	DA1SB-065M-0202-SO	23-Sep-10	8	-	12	Exp, Gen Chem, Metals
DA1SB-065	DA1SB-065M-0203-SO	23-Sep-10	12	-	16	Exp, Gen Chem, Metals
DA1SB-066	DA1SB-066M-0201-SO	23-Sep-10	1	-	4	Exp, Gen Chem, Metals
DA1SB-066	DA1SB-066M-0202-SO	23-Sep-10	4	-	8	Exp, Gen Chem, Metals
DA1SB-066	DA1SB-066M-0203-SO	23-Sep-10	8	-	12	Exp, Gen Chem, Metals
DA1SB-066	DA1SB-066M-0204-SO	23-Sep-10	12	-	16	Exp, Gen Chem, Metals
DA1SB-067	DA1SB-067D-0201-SO	24-Sep-10	2	-	4	Gen Chem, VOCs
DA1SB-067	DA1SB-067D-0202-SO	24-Sep-10	4	-	8	Gen Chem, VOCs
DA1SB-067	DA1SB-067D-0203-SO	24-Sep-10	8	-	12	Gen Chem, VOCs
DA1SB-067	DA1SB-067D-0204-SO	24-Sep-10	12	-	16	Gen Chem, VOCs
DA1SB-067	DA1SB-067M-0201-SO	24-Sep-10	2	-	4	Exp, Gen Chem, Metals
DA1SB-067	DA1SB-067M-0202-SO	24-Sep-10	4	-	8	Exp, Gen Chem, Metals
DA1SB-067	DA1SB-067M-0203-SO	24-Sep-10	8	-	12	Exp, Gen Chem, Metals
DA1SB-067	DA1SB-067M-0204-SO	24-Sep-10	12	-	16	Exp, Gen Chem, Metals
DA1SB-068	DA1SB-068D-0201-SO	24-Sep-10	1	-	4	Gen Chem, VOCs

Table 7-2
Subsurface Soil (1-13 ft bgs) Human Health Risk Evaluation Data Set for Residential Land Use
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Sample Location	Sample Number	Sample Date	Depth of Sample (ft bgs)			Analyses
DA1SB-068	DA1SB-068D-0202-SO	24-Sep-10	4	-	8	Gen Chem, VOCs
DA1SB-068	DA1SB-068D-0203-SO	24-Sep-10	8	-	12	Gen Chem, VOCs
DA1SB-068	DA1SB-068D-0204-SO	24-Sep-10	12	-	16	Gen Chem, VOCs
DA1SB-068	DA1SB-068M-0201-SO	24-Sep-10	1	-	4	Exp, Gen Chem, Metals, PCBs, Pest, SVOCs
DA1SB-068	DA1SB-068M-0202-SO	24-Sep-10	4	-	8	Exp, Gen Chem, Metals
DA1SB-068	DA1SB-068M-0203-SO	24-Sep-10	8	-	12	Exp, Gen Chem, Metals
DA1SB-068	DA1SB-068M-0204-SO	24-Sep-10	12	-	16	Exp, Gen Chem, Metals
DA1SB-069	DA1SB-069D-0201-SO	24-Sep-10	4	-	8	Gen Chem, VOCs
DA1SB-069	DA1SB-069D-0202-SO	24-Sep-10	8	-	12	Gen Chem, VOCs
DA1SB-069	DA1SB-069D-0203-SO	24-Sep-10	12	-	16	Gen Chem, VOCs
DA1SB-069	DA1SB-069M-0201-SO	24-Sep-10	4	-	8	Exp, Gen Chem, Metals, PCBs, Pest, SVOCs
DA1SB-069	DA1SB-069M-0202-SO	24-Sep-10	8	-	12	Exp, Gen Chem, Metals
DA1SB-069	DA1SB-069M-0203-SO	24-Sep-10	12	-	16	Exp, Gen Chem, Metals
DA1SB-070	DA1SB-070D-0201-SO	24-Sep-10	1	-	4	Gen Chem, VOCs
DA1SB-070	DA1SB-070D-0202-SO	24-Sep-10	4	-	8	Gen Chem, VOCs
DA1SB-070	DA1SB-070D-0203-SO	24-Sep-10	8	-	12	Gen Chem, VOCs
DA1SB-070	DA1SB-070M-0201-SO	24-Sep-10	1	-	4	Exp, Gen Chem, Metals
DA1SB-070	DA1SB-070M-0202-SO	24-Sep-10	4	-	8	Exp, Gen Chem, Metals
DA1SB-070	DA1SB-070M-0203-SO	24-Sep-10	8	-	12	Exp, Gen Chem, Metals, PCBs, Pest, SVOCs
DA1SB-070	DA1SB-070M-0204-SO	24-Sep-10	12	-	16	Exp, Gen Chem, Metals
DA1SB-071	DA1SB-071D-0201-SO	24-Sep-10	4	-	8	Gen Chem, VOCs
DA1SB-071	DA1SB-071M-0201-SO	24-Sep-10	4	-	8	Exp, Gen Chem, Metals, PCBs, Pest, SVOCs
DA1SB-071	DA1SB-071M-0202-SO	24-Sep-10	8	-	12	Exp, Gen Chem, Metals
DA1SB-071	DA1SB-071M-0203-SO	24-Sep-10	12	-	16	Exp, Gen Chem, Metals
DA1SB-072	DA1SB-072M-0201-SO	24-Sep-10	2	-	4	Exp, Gen Chem, Metals, SVOCs
DA1SB-072	DA1SB-072M-0202-SO	24-Sep-10	4	-	8	Exp, Gen Chem, Metals
DA1SB-072	DA1SB-072M-0203-SO	24-Sep-10	8	-	12	Exp, Gen Chem, Metals

Table 7-2
Subsurface Soil (1-13 ft bgs) Human Health Risk Evaluation Data Set for Residential Land Use
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Sample Location	Sample Number	Sample Date	Depth of Sample (ft bgs)			Analyses
DA1SB-072	DA1SB-072M-0204-SO	24-Sep-10	12	-	16	Exp, Gen Chem, Metals
DA1SB-073	DA1SB-073D-0201-SO	10-Nov-10	1	-	4	Gen Chem, VOCs
DA1SB-073	DA1SB-073M-0201-SO	10-Nov-10	1	-	4	Exp, Gen Chem, Metals, PCBs, Pest, SVOCs
DA1SB-073	DA1SB-073M-0202-SO	10-Nov-10	4	-	8	Exp, Gen Chem, Metals
DA1SB-073	DA1SB-073M-0203-SO	10-Nov-10	8	-	12	Exp, Gen Chem, Metals
DA1SB-073	DA1SB-073M-0204-SO	10-Nov-10	12	-	16	Exp, Gen Chem, Metals
DA1SB-074	DA1SB-074D-0203-SO	10-Nov-10	8	-	12	Gen Chem, VOCs
DA1SB-074	DA1SB-074M-0201-SO	10-Nov-10	1	-	4	Exp, Gen Chem, Metals
DA1SB-074	DA1SB-074M-0202-SO	10-Nov-10	4	-	8	Exp, Gen Chem, Metals, PCBs, Pest, SVOCs
DA1SB-074	DA1SB-074M-0203-SO	10-Nov-10	8	-	12	Exp, Gen Chem, Metals
DA1SB-074	DA1SB-074M-0204-SO	10-Nov-10	12	-	16	Exp, Gen Chem, Metals
DA1SB-075	DA1SB-075M-0201-SO	10-Nov-10	1	-	4	Exp, Gen Chem, Metals
DA1SB-075	DA1SB-075M-0202-SO	10-Nov-10	4	-	8	Exp, Gen Chem, Metals
DA1SB-075	DA1SB-075M-0203-SO	10-Nov-10	8	-	12	Exp, Gen Chem, Metals
DA1SB-075	DA1SB-075M-0204-SO	10-Nov-10	12	-	16	Exp, Gen Chem, Metals
DA1SB-076	DA1SB-076M-0201-SO	10-Nov-10	1	-	4	Exp, Gen Chem, Metals
DA1SB-076	DA1SB-076M-0202-SO	10-Nov-10	4	-	8	Exp, Gen Chem, Metals
DA1SB-076	DA1SB-076M-0203-SO	10-Nov-10	8	-	12	Exp, Gen Chem, Metals
DA1SB-077	DA1SB-077M-0201-SO	10-Nov-10	1	-	4	Exp, Gen Chem, Metals
DA1SB-077	DA1SB-077M-0202-SO	10-Nov-10	4	-	8	Exp, Gen Chem, Metals
DA1SB-077	DA1SB-077M-0203-SO	10-Nov-10	8	-	12	Exp, Gen Chem, Metals
DA1SB-077	DA1SB-077M-0204-SO	10-Nov-10	12	-	16	Exp, Gen Chem, Metals
DA1-002	DA1so-002-0004-SO	19-Oct-99	1	-	3	Exp, Gen Chem, Metals
DA1-003	DA1so-003-0006-SO	19-Oct-99	1	-	3	Exp, Gen Chem, Metals
DA1-014	DA1so-014-0030-SO	21-Oct-99	1	-	3	Exp, Gen Chem, Metals
DA1-014	DA1so-014-0031-SO	21-Oct-99	3	-	5	Exp, Gen Chem, Metals
DA1-015	DA1so-015-0033-SO	21-Oct-99	1	-	3	Exp, Gen Chem, Metals

Table 7-2
Subsurface Soil (1-13 ft bgs) Human Health Risk Evaluation Data Set for Residential Land Use
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Sample Location	Sample Number	Sample Date	Depth of Sample (ft bgs)			Analyses
DA1-015	DA1so-015-0034-SO	21-Oct-99	3	-	5	Exp, Gen Chem, Metals
DA1-016	DA1so-016-0037-SO	21-Oct-99	1	-	3	Exp, Gen Chem, Metals
DA1-016	DA1so-016-0038-SO	21-Oct-99	3	-	5	Exp, Gen Chem, Metals
DA1-017	DA1so-017-0040-SO	21-Oct-99	1	-	3	Exp, Gen Chem, Metals
DA1-017	DA1so-017-0041-SO	21-Oct-99	3	-	5	Exp, Gen Chem, Metals
DA1-018	DA1so-018-0043-SO	22-Oct-99	1	-	3	Exp, Gen Chem, Metals
DA1-018	DA1so-018-0044-SO	22-Oct-99	3	-	5	Exp, Gen Chem, Metals
DA1-018	DA1so-018-0160-SO	22-Oct-99	6	-	8	Exp, Gen Chem, Metals
DA1-019	DA1so-019-0046-SO	22-Oct-99	1	-	3	Exp, Gen Chem, Metals
DA1-019	DA1so-019-0047-SO	22-Oct-99	3	-	5	Exp, Gen Chem, Metals
DA1-019	DA1so-019-0161-SO	22-Oct-99	6	-	8	Exp, Gen Chem, Metals
DA1-020	DA1so-020-0162-SO	22-Oct-99	6	-	8	Exp, Gen Chem, Metals
DA1-026	DA1so-026-0067-SO	25-Oct-99	1	-	3	Exp, Gen Chem, Metals
DA1-026	DA1so-026-0068-SO	25-Oct-99	3	-	5	Exp, Gen Chem, Metals
DA1-027	DA1so-027-0070-SO	20-Oct-99	1	-	3	Exp, Gen Chem, Metals
DA1-027	DA1so-027-0071-SO	20-Oct-99	3	-	5	Exp, Gen Chem, Metals
DA1-028	DA1so-028-0074-SO	26-Oct-99	1	-	3	Exp, Gen Chem, Metals
DA1-028	DA1so-028-0075-SO	26-Oct-99	3	-	5	Exp, Gen Chem, Metals
DA1-030	DA1so-030-0080-SO	26-Oct-99	1	-	3	Exp, Gen Chem, Metals
DA1-031	DA1so-031-0083-SO	26-Oct-99	1	-	3	Exp, Gen Chem, Metals
DA1-031	DA1so-031-0084-SO	26-Oct-99	3	-	5	Exp, Gen Chem, Metals
DA1-032	DA1so-032-0086-SO	27-Oct-99	1	-	3	Exp, Gen Chem, Metals
DA1-032	DA1so-032-0087-SO	27-Oct-99	3	-	5	Exp, Gen Chem, Metals
DA1-033	DA1so-033-0089-SO	27-Oct-99	1	-	3	Exp, Gen Chem, Metals
DA1-033	DA1so-033-0090-SO	27-Oct-99	3	-	5	Exp, Gen Chem, Metals
DA1-034	DA1so-034-0092-SO	27-Oct-99	1	-	3	Exp, Gen Chem, Metals
DA1-034	DA1so-034-0093-SO	27-Oct-99	3	-	5	Exp, Gen Chem, Metals

Table 7-2
Subsurface Soil (1-13 ft bgs) Human Health Risk Evaluation Data Set for Residential Land Use
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Sample Location	Sample Number	Sample Date	Depth of Sample (ft bgs)			Analyses
DA1-035	DA1so-035-0095-SO	1-Nov-99	1	-	3	Exp, Gen Chem, Metals
DA1-035	DA1so-035-0096-SO	1-Nov-99	3	-	5	Exp, Gen Chem, Metals
DA1-036	DA1so-036-0098-SO	2-Nov-99	1	-	3	Exp, Gen Chem, Metals
DA1-036	DA1so-036-0099-SO	2-Nov-99	3	-	5	Exp, Gen Chem, Metals
DA1-037	DA1so-037-0101-SO	2-Nov-99	1	-	3	Exp, Gen Chem, Metals
DA1-037	DA1so-037-0102-SO	2-Nov-99	3	-	5	Exp, Gen Chem, Metals
DA1-039	DA1so-039-0107-SO	2-Nov-99	1	-	3	Exp, Gen Chem, Metals
DA1-039	DA1so-039-0108-SO	2-Nov-99	3	-	5	Exp, Gen Chem, Metals
DA1-041	DA1so-041-0164-SO	3-Nov-99	6	-	8	Exp, Gen Chem, Metals
DA1-042	DA1so-042-0165-SO	3-Nov-99	6	-	8	Exp, Gen Chem, Metals

Table 7-2
Subsurface Soil (1-13 ft bgs) Human Health Risk Evaluation Data Set for Residential Land Use
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Sample Location	Sample Number	Sample Date	Depth of Sample (ft bgs)			Analyses
ISM Subsurface Soil						
OD1gd-001	OD1gd-001-0001-SO	25-Oct-00	4	-	4	Exp, Metals
OD1gd-002	OD1gd-002-0001-SO	27-Oct-00	4	-	4	Exp, Metals
OD1gd-004	OD1gd-004-0001-SO	30-Oct-00	4	-	4	Exp, Metals
OD1gd-006	OD1gd-006-0001-SO	1-Nov-00	4	-	4	Exp, Gen Chem, Metals, PCBs, Pest, SVOCs, VOCs
OD1gd-007	OD1gd-007-0001-SO	18-Jul-01	4	-	4	Exp, Metals
OD1gd-008	OD1gd-008-0001-SO	10-Jul-01	4	-	4	Exp, Metals
OD1gd-011	OD1gd-011-0001-SO	13-Jun-01	4	-	4	Exp, Metals
OD1gd-013	OD1gd-013-0001-SO	20-Nov-00	4	-	4	Exp, Metals
OD1gd-016	OD1gd-016-0001-SO	6-Jul-01	4	-	4	Exp, Metals
OD1gd-018	OD1gd-018-0001-SO	12-Jul-01	2	-	2	Exp, Metals
OD1gd-020	OD1gd-020-0001-SO	5-Jun-01	2	-	2	Exp, Metals
OD1gd-021	OD1gd-021-0001-SO	23-Jul-01	2	-	4	Exp, Metals

ft bgs denotes feet below ground surface.
D denotes discrete sample.
DA1 denotes Open Demolition Area # 1 area of concern.
Exp denotes explosives.
gd denotes grid location.
Gen Chem denotes General Chemistry.
ISM denotes incremental sampling method.
M denotes multi-incremental sample.
OD1 denotes Open Demolition Area # 1 area of concern.
PCB denotes polychlorinated biphenyl.
Pest denotes pesticides.
SB denotes soil boring.
SO, so denotes soil sample.
SVOC denotes semivolatile organic compound.
VOC denotes volatile organic compound.

Table 7-3
Summary of Screening Results for COPCs in ISM Surface Soil (0-1 foot) for Residential Land Use
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Chemical	Detection Frequency	Percent Detection	Range of Values, mg/kg						Mean (mg/kg)	BSV (mg/kg)	SRC Yes or No?	RRSL (mg/kg)	COPC Yes or No?	COPC Justification	Location of MDC
			Detected Concentrations				Reporting Limits								
			Minimum	VQ	Maximum	VQ	Minimum	Maximum							
Inorganics															
Aluminum	5 / 5	100	6,870		10,900		0.12	0.25	8486	17,700	No		No	Below background	DA1SS-050
Antimony	5 / 5	100	0.69		2.7		0.28	0.55	1	0.96	Yes	3.1	No	Below risk screening criteria	DA1SS-053
Arsenic	5 / 5	100	3.9		9.7		0.46	0.92	7.7	15.4	No		No	Below background	DA1SS-053
Barium	5 / 5	100	47		78.8		0.028	0.055	58.8	88.4	No		No	Below background	DA1SS-050
Beryllium	5 / 5	100	0.23		0.4		0.012	0.025	0	0.88	No		No	Below risk screening criteria	DA1SS-054
Cadmium	5 / 5	100	0.35		2.6		0.021	0.043	1.2	ND	Yes	7.1	No	Below risk screening criteria	DA1SS-050
Calcium	5 / 5	100	552		2,500		0.51	1	1340	15,800	No		No	Essential nutrient	DA1SS-050
Chromium*	5 / 5	100	56.2		153	J	0.064	0.13	101	17.4	Yes	1200	No	Below risk screening criteria	DA1SS-053
Cobalt	5 / 5	100	4.3		20.6	J	0.05	0.1	10	10.4	Yes	2.3	Yes	Above risk screening criteria	DA1SS-053
Copper	5 / 5	100	16.4		188		0.2	0.41	98	17.7	Yes	310	No	Below risk screening criteria	DA1SS-050
Iron	5 / 5	100	11,300		23,700		1	2	18240	23,100	No		No	Essential nutrient	DA1SS-050
Lead	5 / 5	100	11.6		23.4		0.14	0.29	16	26.1	No	400	No	Below background	DA1SS-050
Magnesium	5 / 5	100	1,360		2,860		0.41	0.82	2036	3,030	No		No	Essential nutrient	DA1SS-050
Manganese	5 / 5	100	373		535		0.051	0.1	424	1,450	No		No	Below background	DA1SS-051
Mercury	5 / 5	100	0.032		0.079		0.008	0.0081	0	0.036	Yes	2.3	No	Below risk screening criteria	DA1SS-052
Nickel	5 / 5	100	8		18.4		0.062	0.12	15.1	21.1	No		No	Below background	DA1SS-050
Potassium	5 / 5	100	542		1,050		37	37	827	927	No		No	Essential nutrient	DA1SS-053
Selenium	5 / 5	100	0.52		2.4		0.43	0.86	1	1.4	Yes	39	No	Below risk screening criteria	DA1SS-054
Sodium	5 / 5	100	21.7		106	J	13	13	51.5	123	No		No	Essential nutrient	DA1SS-053
Thallium	4 / 5	80	0.38		1.6		0.14	0.29	1	0.89	Yes	0.078	Yes	Above risk screening criteria	DA1SS-050
Vanadium	5 / 5	100	8.5		16.1		0.035	0.07	13.8	31.1	No		No	Below background	DA1SS-050
Zinc	5 / 5	100	54.5		191		0.12	0.25	126	61.8	Yes	2,300	No	Below risk screening criteria	DA1SS-050
General Chemistry															
Cyanide, Total	1 / 1	100	0.16	J	0.16	J	0.39	0.39	0.2		Yes	16	No	Below risk screening criteria	DA1SS-052
Explosives															
2,4,6-Trinitrotoluene	1 / 5	20	7.1		7.1		0.43	0.44	1.6		Yes	21	No	Below risk screening criteria	DA1SS-051
2-Amino-4,6-Dinitrotoluene	1 / 5	20	0.25	J	0.25	J	0.43	0.44	0.2		Yes	15	No	Below risk screening criteria	DA1SS-051
Nitroguanidine	1 / 1	100	0.59		0.59		0.16	0.16	0.6		Yes	610	No	Below risk screening criteria	DA1SS-052
Pesticides															
4,4'-DDE	1 / 1	100	0.00082	J	0.00082	J	0.0041	0.0041	0.001		Yes	2	No	Below risk screening criteria	DA1SS-052
4,4'-DDT	1 / 1	100	0.00072	J	0.00072	J	0.0025	0.0025	0.001		Yes	1.9	No	Below risk screening criteria	DA1SS-052
gamma-Chlordane	1 / 1	100	0.0052	J	0.0052	J	0.0041	0.0041	0.005		Yes	1.7	No	Below risk screening criteria	DA1SS-052
Heptachlor	1 / 1	100	0.0019	J	0.0019	J	0.0025	0.0025	0.002		Yes	1.3	No	Below risk screening criteria	DA1SS-052
Semivolatile Organic Compounds															
Di-n-Butyl Phthalate	1 / 1	100	0.21	J	0.21	J	0.41	0.41	0.2		Yes	630	No	Below risk screening criteria	DA1SS-052

Table 7-3 (continued)
Summary of Screening Results for COPCs in ISM Surface Soil (0-1 foot) for Residential Land Use
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

** denotes total chromium assumed to be trivalent, since hexavalent chromium was not detected.*
B denotes substance detected in one of the associated blanks.
BSV denotes background screening value.
SRC denotes site-related chemical.
COPC denotes chemical(s) of potential concern.
DA1SS denotes surface soil sample from Open Demolition Area # 1 area of concern.
DDE denotes dichlorodiphenyldichloroethylene.
DDT denotes dichlorodiphenyltrichloroethane.
HI denotes hazard index.
ISM denotes incremental sampling method.
J denotes result should be considered estimated.
MDC denotes maximum detected concentration.
mg/kg denotes milligrams per kilogram.
NA denotes no FWCUG calculated or available
ND denotes not detected.
RRSL for residential soil (Nov. 2015), those based on noncancer risk are adjusted to a HI of 0.1 (as opposed to published value based on HI of 1), except lead.
RSL for chlordane used for gamma chlordane.
VQ denotes validation qualifier.

Table 7-4
Summary of Screening Results for COPCs in Discrete Surface Soil (0-1 foot) for Residential Land Use
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Chemical	Detection Frequency	Percent Detection	Range of Values, mg/kg						Mean (mg/kg)	BSV (mg/kg)	SRC Yes or No?
			Detected Concentrations			Reporting Limits					
			Minimum	VQ	Maximum	VQ	Minimum	Maximum			
Inorganics											
Aluminum	18 / 18	100	1,730		16,200	J	NA	NA	8,871	17,700	No
Antimony	2 / 16	13	0.54	J	0.63	J	1.1	1.2	0.6	0.96	No
Arsenic	18 / 18	100	5		15.1		NA	NA	10	15.4	No
Barium	18 / 18	100	35.8		252		NA	NA	81	88.4	Yes
Beryllium	7 / 18	39	0.15	J	0.94		0.19	0.7	0.2	0.88	Yes
Cadmium	3 / 18	17	0.27	J	1.1		0.54	0.62	0.4	ND	Yes
Calcium	18 / 18	100	250	J	248,000	J	NA	NA	49,759	15,800	No
Chromium*	18 / 18	100	3.4		22.6		NA	NA	12	17.4	Yes
Cobalt	18 / 18	100	2.7	J	14		NA	NA	6.5	10.4	Yes
Copper	18 / 18	100	5.8	J	69.8	J	NA	NA	22	17.7	Yes
Iron	18 / 18	100	5,820	J	33,400	J	NA	NA	17,576	23,100	No
Lead	18 / 18	100	8.2		20.2	J	NA	NA	15	26.1	No
Magnesium	18 / 18	100	797		5,280		NA	NA	2,177	3,030	No
Manganese	18 / 18	100	138	J	947		NA	NA	477	1,450	No
Mercury	12 / 18	67	0.0078	J	0.076	J	0.0072	0.051	0.0	0.036	Yes
Nickel	18 / 18	100	7.9	J	31.9		NA	NA	14	21.1	Yes
Potassium	18 / 18	100	332	J	1,870		NA	NA	824	927	No
Selenium	2 / 18	11	0.88		1.2		0.54	0.97	0.4	1.4	No
Thallium	17 / 18	94	0.14	J	0.48	J	0.43	0.43	0.3	0.89	No
Vanadium	18 / 18	100	3.8	J	26.6		NA	NA	16	31.1	No
Zinc	18 / 18	100	31.9	J	317		NA	NA	69	61.8	Yes
Explosives											
2,4-Dinitrotoluene	1 / 18	6	0.13	J	0.13	J	0.25	0.25	0.1		Yes
HMX	1 / 18	6	0.2	J	0.2	J	0.5	0.5	0.2		Yes

Table 7-4
Summary of Screening Results for COPCs in Discrete Surface Soil (0-1 foot) for Residential Land Use
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Chemical	Detection Frequency	Percent Detection	Range of Values, mg/kg						Mean (mg/kg)	BSV (mg/kg)	SRC Yes or No?
			Detected Concentrations			Reporting Limits					
			Minimum	VQ	Maximum	VQ	Minimum	Maximum			

** denotes total chromium assumed to be trivalent, since hexavalent chromium was not detected.*

o

No (d) = Even though the chemical is bioaccumulative, the BSV is pr

BSV denotes background screening value.
SRC denotes site-related chemical.
COPC denotes chemical(s) of potential concern.
DA1 denotes Open Demolition Area # 1 area of concern.
HI denotes hazard index.
HMX denotes octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
J denotes result should be considered estimated.

MDC denotes maximum detected concentration.

mg/kg denotes milligrams per kilogram.

NA denotes not applicable/available.

ND denotes not detected.

RRSL for residential soil (Nov. 2015), those based on noncancer risk are adjusted to a HI of 0.1 (as opposed to published value based on HI of 1), except lead.

VQ denotes validation qualifier.

Table 7-4
Summary of Screening Results for COPCs in Discrete Surface Soil (0-1 foot) for Residential Land Use
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

SRC Justification	RRSL (mg/kg)	COPC Yes or No?	COPC Justification	Location of MDC
Below background		No	Below background	DA1-018
Below background		No	Below background	DA1-031
Below background		No	Below background	DA1-018
Above background	1,500	No	Below risk screening criteria	DA1-008
Above background	16	No	Below risk screening criteria	DA1-008
Above background	7.1	No	Below risk screening criteria	DA1-008
Essential nutrient		No	Essential nutrient	DA1-009
Above background		No	Below risk screening criteria	DA1-018
Above background	2.3	Yes	Above risk screening criteria	DA1-018
Above background	310	No	Below risk screening criteria	DA1-031
Essential nutrient		No	Essential nutrient	DA1-018
Below background		No	Below background	DA1-036
Essential nutrient		No	Essential nutrient	DA1-008
Below background		No	Below background	DA1-008
Above background	2.3	No	Below risk screening criteria	DA1-008
Above background	No	Below risk screening criteria	DA1-018	
Essential nutrient		No	Essential nutrient	DA1-018
Below background		No	Below risk screening criteria	DA1-028
Below background		No	Below risk screening criteria	DA1-015
Below background		No	Below background	DA1-019
Above background	No	Below risk screening criteria	DA1-031	
Detected organic	1.7	No	Below risk screening criteria	DA1-014
Detected organic	390	No	Below risk screening criteria	DA1-003

Table 7-5
Summary of Screening Results for COPCs in ISM Subsurface Soil (1-13 feet) for Residential Land Use
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Chemical	Detection Frequency	Percent Detection	Range of Values, mg/kg						Mean (mg/kg)	BSV (mg/kg)	SRC Yes or No?
			Detected Concentrations			Reporting Limits					
			Minimum	VQ	Maximum	VQ	Minimum	Maximum			
Inorganics											
Aluminum	12 / 12	100	9,950		16,100		NA	NA	13,596	19,500	No
Antimony	3 / 12	25	0.25		0.61		0.16	0.24	0.2	0.96	No
Arsenic	12 / 12	100	1.2		17.1		NA	NA	13	19.8	No
Barium	12 / 12	100	56.4		94.8		NA	NA	76	124	No
Beryllium	12 / 12	100	0.53		0.83		NA	NA	0.7	0.88	No
Cadmium	3 / 12	25	0.15		0.56		0.072	0.18	0.1	ND	Yes
Calcium	12 / 12	100	579		17,100		NA	NA	4,437	35,500	No
Chromium*	12 / 12	100	14.7		20.5		NA	NA	19	27.2	No
Cobalt	12 / 12	100	7.7		16.2		NA	NA	10.8	23.2	No
Copper	12 / 12	100	17		94.8		NA	NA	27	32.3	Yes
Iron	12 / 12	100	23,000		31,200		NA	NA	26,742	35,200	No
Lead	12 / 12	100	11.1		19		NA	NA	14	19.1	No
Magnesium	12 / 12	100	2,940		5,360		NA	NA	4,033	8,790	No
Manganese	12 / 12	100	228		396		NA	NA	335	3,030	No
Mercury	7 / 12	58	0.0083	J	0.055		0.04	0.04	0.0	0.044	Yes
Nickel	12 / 12	100	19.4		31.7		NA	NA	25	60.7	No
Potassium	12 / 12	100	1,160		2,720		NA	NA	2,019		No
Selenium	5 / 12	42	0.4	J	0.97		0.16	0.46	0.4	1.5	No
Silver	1 / 12	8	0.18	J	0.18	J	0.14	0.45	0.1	ND	Yes
Sodium	11 / 12	92	53.3		965		79.1	79.1	301		No
Thallium	3 / 12	25	0.17		0.22		0.15	0.22	0	0.91	No
Vanadium	12 / 12	100	16.8		25		NA	NA	22	37.6	No
Zinc	12 / 12	100	50.7		103		NA	NA	65	93.3	Yes
Explosives											
2,4,6-Trinitrotoluene	1 / 12	8	0.18		0.18		0.033	0.1	5.22E-02		Yes

** denotes total chromium assumed to be trivalent, since hexavalent chromium was not detected.*
BSV denotes background screening value.
SRC denotes site-related chemical.

Table 7-5
Summary of Screening Results for COPCs in ISM Subsurface Soil (1-13 feet) for Residential Land Use
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Chemical	Detection Frequency	Percent Detection	Range of Values, mg/kg						Mean (mg/kg)	BSV (mg/kg)	SRC Yes or No?
			Detected Concentrations			Reporting Limits					
			Minimum	VQ	Maximum	VQ	Minimum	Maximum			

COPC denotes chemical(s) of potential concern.
gd denotes grid location.
HI denotes hazard index.
ISM denotes incremental sampling method.
J denotes result should be considered estimated.
MDC denotes maximum detected concentration.
mg/kg denotes milligrams per kilogram.
NA denotes not applicable/available.
ND denotes not detected.
OD1 denotes Open Demolition Area # 1 area of concern.
RRSL for residential soil (Nov. 2015), those based on noncancer risk are adjusted to a HI of 0.1 (as opposed to published value based on HI of 1), except lead.
VQ denotes validation qualifier.

Table 7-5
Summary of Screening Results for COPCs in ISM Subsurface Soil (1-13 feet) for Residential Land Use
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

SRC Justification	RRSL (mg/kg)	COPC Yes or No?	COPC Justification	Location of MDC
Below background		No	Below background	OD1gd-021
Below background		No	Below background	OD1gd-006
Below background		No	Below background	OD1gd-008
Below background		No	Below background	OD1gd-004
Below background		No	Below background	OD1gd-013
Above background	7.1	No	Below risk screening criteria	OD1gd-018
Essential nutrient		No	Essential nutrient	OD1gd-006
Below background		No	Below background	OD1gd-007
Below background		No	Below background	OD1gd-018
Above background	310	No	Below risk screening criteria	OD1gd-021
Essential nutrient		No	Essential nutrient	OD1gd-007
Below background		No	Below background	OD1gd-018
Essential nutrient		No	Essential nutrient	OD1gd-006
Below background		No	Below background	OD1gd-011
Above background	2.3	No	Below risk screening criteria	OD1gd-021
Below background		No	Below background	OD1gd-013
Essential nutrient		No	Essential nutrient	OD1gd-006
Below background		No	Below background	OD1gd-021
Above background	39	No	Below risk screening criteria	OD1gd-021
Essential nutrient		No	Essential nutrient	OD1gd-006
Below background		No	Below risk screening criteria	OD1gd-011
Below background		No	Below risk screening criteria	OD1gd-021
Above background	2,300	No	Below risk screening criteria	OD1gd-021
Detected organic	21	No	Below risk screening criteria	OD1gd-021

Table 7-6 (continued)
Summary of Screening Results for COPCs in Discrete Surface Soil (1-13 feet) for Residential Land Use
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Chemical	Detection Frequency	Percent Detection	Range of Values, mg/kg						Mean (mg/kg)	BSV (mg/kg)	SRC Yes or No?
			Detected Concentrations			Reporting Limits					
			Minimum	VQ	Maximum	VQ	Minimum	Maximum			
Inorganics											
Aluminum	125 / 125	100	1,990		28600		0.12	0.61	11650	19,500	Yes
Antimony	43 / 113	38	0.22	J	20.5		0.27	1.4	1.0	0.96	Yes
Arsenic	124 / 124	100	0.4	J	33		0.45	2.3	10	19.8	Yes
Barium	125 / 125	100	9.5		869		0.027	0.14	70	124	Yes
Beryllium	102 / 125	82	0.069		0.95		0.012	0.72	0.4	0.88	Yes
Cadmium	25 / 125	20	0.026	J	18.4		0.021	0.64	0.4	ND	Yes
Calcium	125 / 125	100	367		36,000		0.5	2.6	11206	35,500	No
Chromium*	125 / 125	100	10.1		589		0.063	0.32	52	27.2	Yes
Cobalt	125 / 125	100	4.5	J	20.5		0.049	0.25	10.1	23.2	No
Copper	125 / 125	100	9	J	1290		0.2	1	35	32.3	Yes
Iron	125 / 125	100	4660		44,300	J	1	5.1	27679	35,200	No
Lead	125 / 125	100	3.6		416		0.14	0.72	17	19.1	Yes
Magnesium	125 / 125	100	777		9,170	J	0.4	2	4555	8,790	No
Manganese	125 / 125	100	26.6		2,180		0.05	0.26	367	3,030	No
Mercury	107 / 125	86	0.0063	J	0.25		0.0078	0.12	0.0	0.044	Yes
Nickel	125 / 125	100	10		55.9	J	0.061	0.31	24	60.7	No
Potassium	125 / 125	100	479		4,430		36	37	1503		No
Selenium	76 / 125	61	0.14	J	2.4		0.42	2.1	0.6	1.5	Yes
Silver	9 / 125	7	0.048	J	115		0.056	57	1.2	ND	Yes
Sodium	83 / 125	66	23.6		166		13	644	91		No
Thallium*	108 / 125	86	0.14		3.2		0.14	0.72	1	0.91	Yes
Vanadium	125 / 125	100	3.7		39.9		0.034	0.17	18	37.6	Yes
Zinc	125 / 125	100	31.4		475		0.12	0.61	64	93.3	Yes
General Chemistry											
Cyanide, Total	3 / 50	6	0.11	J	0.4		0.38	0.64	0.3		Yes
Explosives											
2,4,6-Trinitrotoluene	2 / 125	2	0.2	J	64	J	0.25	4.4	0.69768		Yes

Table 7-6 (continued)
Summary of Screening Results for COPCs in Discrete Surface Soil (1-13 feet) for Residential Land Use
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Chemical	Detection Frequency	Percent Detection	Range of Values, mg/kg						Mean (mg/kg)	BSV (mg/kg)	SRC Yes or No?
			Detected Concentrations			Reporting Limits					
			Minimum	VQ	Maximum	VQ	Minimum	Maximum			
2-Amino-4,6-Dinitrotoluene	1 / 83	1	0.31	J	0.31	J	0.43	0.45	0.22036		Yes
Pesticides											
4,4'-DDE	1 / 8	13	0.0003	J	0.0003	J	0.00161	0.0041	0.00151		Yes
4,4'-DDT	2 / 8	25	0.0005	J	0.00061	J	0.00161	0.0025	0.00096		Yes
Aldrin	1 / 8	13	0.00071	J	0.00071	J	0.00161	0.0025	0.00106		Yes
delta-BHC	1 / 8	13	0.0027	J	0.0027	J	0.00161	0.0025	0.00130		Yes
Endosulfan II	2 / 8	25	0.0003	J	0.00091	J	0.00161	0.0025	0.00097		Yes
gamma-Chlordane	2 / 8	25	0.0049	J	0.0058	J	0.00161	0.0041	0.00255		Yes
Heptachlor	4 / 8	50	0.0014	J	0.0073	j	0.00161	0.0025	0.00210		Yes
Heptachlor Epoxide	1 / 8	13	0.00061	J	0.00061	J	0.00161	0.0041	0.00155		Yes
Semivolatile Organic Compounds											
2-Methylnaphthalene	1 / 9	11	0.053	J	0.053	J	0.4	0.41	0.19		Yes
Bis(2-Ethylhexyl)phthalate	3 / 9	33	0.1	J	2.7		1	1	0.67		Yes
Di-n-Butyl Phthalate	7 / 9	78	0.082	J	0.11	J	0.4	0.41	0.12		Yes
Isophorone	1 / 9	11	0.054	J	0.054	J	0.4	0.41	0.19		Yes
Volatile Organic Compounds											
Acetone	2 / 19	11	210	JB	240	JB	0.97	1,100	24		Yes

** denotes total chromium assumed to be trivalent, since hexavalent chromium was not detected.*
B denotes substance detected in one of the associated blanks.
**Used oral-specific toxicity value since RRSL was less than background*
BHC denotes benzene hexachloride.
BSV denotes background screening value.
SRC denotes site-related chemical.
COPC denotes chemical(s) of potential concern.
DA1 denotes Open Demolition Area # 1 area of concern.
DDE denotes dichlorodiphenyldichloroethylene.
DDT denotes dichlorodiphenyltrichloroethane.
HI denotes hazard index.
J denotes result should be considered estimated.
MDC denotes maximum detected concentration.
mg/kg denotes milligrams per kilogram.
ND denotes not detected.

Table 7-6 (continued)
Summary of Screening Results for COPCs in Discrete Surface Soil (1-13 feet) for Residential Land Use
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Chemical	Detection Frequency	Percent Detection	Range of Values, mg/kg						Mean (mg/kg)	BSV (mg/kg)	SRC Yes or No?
			Detected Concentrations			Reporting Limits					
			Minimum	VQ	Maximum	VQ	Minimum	Maximum			

RRSL for residential soil (Nov. 2015), those based on noncancer risk are adjusted to a HI of 0.1 (as opposed to published value based on HI of 1), except lead.

RSL for endosulfan used for endosulfan II.

RSL for CN^- used for cyanide.

RSL for chlordane used for gamma chlordane.

RSL for technical grade hexachlorocyclohexane (HCH) for delta BHC.

SB denotes soil boring sample.

VQ denotes validation qualifier.

Table 7-6 (continued)
Summary of Screening Results for COPCs in Discrete Surface Soil (1-13 feet) for Residential Land Use
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

SRC Justification	RRSL (mg/kg)	COPC Yes or No?	COPC Justification	Location of MDC
Above background	7,700	Yes	Above risk screening criteria	DA1-027
Above background	3.1	Yes	Above risk screening criteria	DA1SB-059
Above background	0.68	Yes	Above risk screening criteria	DA1SB-059
Above background	No	No	Below risk screening criteria	DA1SB-059
Above background	16	No	Below risk screening criteria	DA1SB-059
Above background	7.1	Yes	Above risk screening criteria	DA1SB-059
Essential nutrient		No	Essential nutrient	DA1SB-055
Above background	No	No	Below risk screening criteria	DA1SB-072
Below background		No	Below background	DA1-027
Above background	310	Yes	Above risk screening criteria	DA1SB-072
Essential nutrient		No	Essential nutrient	DA1-027
Above background	400	Yes	Above risk screening criteria	DA1SB-059
Essential nutrient		No	Essential nutrient	DA1-020
Below background		No	Below background	DA1-037
Above background	2.3	No	Below risk screening criteria	DA1SB-064
Below background		No	Below background	DA1-037
Essential nutrient		No	Essential nutrient	DA1-027
Above background	39	No	Below risk screening criteria	DA1SB-073
Above background	39	Yes	Above risk screening criteria	DA1SB-059
Essential nutrient		No	Essential nutrient	DA1SB-073
Above background	1.6	Yes	Above risk screening criteria	DA1SB-056
Above background	39	No	Below risk screening criteria	DA1-027
Above background	No	No	Below risk screening criteria	DA1SB-072
No background data	160	No	Below risk screening criteria	DA1SB-068
Detected organic	21	No	Below risk screening criteria	DA1SB-070

Table 7-6 (continued)
Summary of Screening Results for COPCs in Discrete Surface Soil (1-13 feet) for Residential Land Use
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

SRC Justification	RRSL (mg/kg)	COPC Yes or No?	COPC Justification	Location of MDC
Detected organic	15	No	Below risk screening criteria	DA1SB-070
Detected organic	2	No	Below risk screening criteria	DA1SB-064
Detected organic	1.7	No	Below risk screening criteria	DA1SB-069
Detected organic	0.03	No	Below risk screening criteria	DA1SB-064
Detected organic	0.27	No	Below risk screening criteria	DA1SB-064
Detected organic	47	No	Below risk screening criteria	DA1SB-068
Detected organic	1.7	No	Below risk screening criteria	DA1SB-071
Detected organic	1.3	No	Below risk screening criteria	DA1SB-068
Detected organic	0.07	No	Below risk screening criteria	DA1SB-068
Detected organic	24	No	Below risk screening criteria	DA1SB-072
Detected organic	39	No	Below risk screening criteria	DA1SB-074
Detected organic	630	No	Below risk screening criteria	DA1SB-069
Detected organic	570	No	Below risk screening criteria	DA1SB-071
Detected organic	6,100	No	Below risk screening criteria	DA1SB-073

Table 7-7
Summary of COC Evaluation of Noncancer Effects and Cancer Risk in ISM and Discrete Surface Soil (0-1 Foot) for Residential Land Use
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

	Cancer Evaluation				Noncancer Evaluation				
Parameter	**Max EPC (mg/kg)**	**RRSLa (mg/kg)**	**Ratio of EPC to RRSL**	**% Contribution to the Total Sum**	**RRSL[b] (mg/kg)**	**Ratio of EPC to RRSL**	**% Contribution to the Total Sum**	**COC Yes or No?**	**COC Justification**
Vascular and Skin Effects									
Cobalt	**20.6**				**23**	**0.90**	**NA since one chemical**	**No**	**Sum of ratios<1 per target effect**
Sum of Ratios						**0.90**			
Liver, Renal, and Gastrointestinal Effects									
Thallium*	**1.6**				**1.6**	**1.00**	**NA since one one chemical**	**No**	**Sum of ratios<1 per target effect**
Sum of Ratios									
Discrete									
Parameter	**95% UCL**				**RRSL**				
Cobalt	**6.5**				**23**	**0.28**	**NA since one chemical**	**No**	**Sum of ratios <1**
Sum of Ratios			**0.00**			**0.28**			

[a] RRSL is cancer risk Screening Level risk of 10^{-5}
[b] RRSL is noncarcinogenic Screening Level at HI of 1
COC denotes chemical(s) of concern.
EPC denotes exposure point concentration. EPC is maximum concentration for ISM.
RRSL denotes Residential Regoinal Screening Level
HI denotes hazard index.
ISM denotes incremental sampling method.
NA - Not Applicable
mg/kg denotes milligrams per kilogram.

Table 7-8 (continued)
Summary of COC Evaluation of Noncancer Effects and Cancer Risk in Subsurface Soil (1-13 Feet) for Residential Land Use
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Noncancer Evaluation by Target Organ							
Parameter	**UCL EPC (mg/kg)**	**RRSL[a] (mg/kg)**	**Target Organ**	**Ratio of EPC to RRSL**	**% Contribution to the Total Sum**	**COC Yes or No?**	**COC Justification**
Neurotoxicity							
Aluminum	12,225	77,000	Neurotoxicity in offspring	0.16	67%	No	Sum of ratios by target organ < 1
Lead	31.1	400	Neurotoxicity, behavioral effects	0.08	33%	No	Sum of ratios by target organ < 1
Sum or Ratios - Neurotoxicity				**0.24**			
Gastrointestinal Effects							
Copper	82.5	3100	Gastrointestinal effects	0.03	3%	No	Sum of ratios by target organ ≤ 1
Silver	115	390	Gastrointestinal effects	0.29	29%	No	Sum of ratios by target organ ≤ 1
Thallium	1.10	1.6	Gastrointestinal effects, central nervous system effects, lungs, heart, liver, and kidneys	0.69	68%	No	Sum of ratios by target organ ≤ 1
Sum or Ratios - Gastrointestinal Effects				**1.0**			
Vascular Effects							
Antimony	1.35	31	Longevity, blood glucose, and cholesterol	0.04	11%	No	Sum of ratios by target organ < 1
Arsenic	12.4	35	Hyperpigmentation, kertosis, and possible vascular complications	0.35	89%	No	Sum of ratios by target organ < 1
Sum or Ratios - Vascular Effects				**0.40**			
Renal Effects							
Cadmium	0.690	21,000	Significant proteinuria	0.00	0%	No	Sum of ratios by target organ < 1
Thallium	1.00	1.6	Temporary hair loss, gastrointestinal effects, central nervous system effects, lungs, heart, liver, and kidneys	0.63	100%	No	Sum of ratios by target organ < 1
Sum or Ratios - Renal Effects				**0.63**			

Table 7-8 (continued)
Summary of COC Evaluation of Noncancer Effects and Cancer Risk in Subsurface Soil (1-13 Feet) for Residential Land Use
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Noncancer Evaluation by Target Organ							
Parameter	**UCL EPC (mg/kg)**	**RRSL[a] (mg/kg)**	**Target Organ**	**Ratio of EPC to RRSL**	**% Contribution to the Total Sum**	**COC Yes or No?**	**COC Justification**
Liver Effects							
Copper	82.5	3100	Necrosis, fibrosis, damage to biomarkers	0.03	4%	No	Sum of ratios by target organ < 1
Thallium*	1.00	1.6	Temporary hair loss, gastrointestinal effects, central nervous system effects, lungs, heart, liver, and kidneys	0.63	96%	No	Sum of ratios by target organ < 1
Sum or Ratios - Liver Effects				**0.65**			
Skin Effects							
Arsenic	12.4	20.2	Hyperpigmentation, kertosis, and possible vascular complications	0.61	100%	No	Sum of ratios by target organ < 1
Sum of Ratios - Skin Effects				**0.61**			
Cancer Evaluation - Only carcinogenic compounds depicted							
Parameter	**EPC (mg/kg)**	**BSV (mg/kg)**	**RRSL[b] (mg/kg)**	**Ratio of EPC to RRSL**	**% Contribution to the Total Sum**	**COC Yes or No?**	**COC Justification**
Arsenic	12.4	19.8	7.5	0.63	99.99%	No	EPC < background
Cadmium	0.691	ND	12,491	0.0001	0.009%	No	Contribution to sum < 5%
Sum of Ratios				**0.63**			

[a] RRSL is cancer risk Screening Level risk of 10^{-5}

[b] RRSL is noncarcinogenic Screening Level at HI of 1

BSV denotes background screening value.

COC denotes chemical(s) of concern.

EPC denotes exposure point concentration. EPC is 95% UCL. See Appendix F; maximum is used for silver and 2,4,6-TNT due to low frequency of detection.

**The Background of Thallium was used since the RSL is less than background*

mg/kg denotes milligrams per kilogram.

8.0 SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT

8.1 Introduction

This SLERA evaluates the potential for adverse effects posed to ecological receptors from potential releases at ODA1 at the former RVAAP/Camp Ravenna. This SLERA is consistent with the ecological risk assessment process described in EPA guidance (i.e., EPA, 1997), with Ohio EPA Division of Emergency and Remedial Response (DERR) (Ohio EPA, 2008) guidance, USACE environmental evaluation handbook (USACE, 1996), and with the facility-wide ecological risk assessment work plan (USACE, 2003). A SLERA presents a conservative analysis of the potential for ecological risk. Ohio EPA guidance describes four levels of ERA: Level I Scoping, Level II Screening, Level III Baseline, and Level IV Field Baseline. This SLERA for ODA1 includes the equivalent of Ohio EPA's Level I Scoping through Level II Screening. Following the Level II, a determination is made whether to move to a Level III Baseline and/or Level IV Field Baseline (often referred to as a baseline ecological risk assessment), which requires additional site-specific exposure and effects information, and often uses less conservative assumptions.

The goal of the SLERA is to evaluate the potential for adverse ecological effects to ecological receptors from SRCs at ODA1. This objective is met by characterizing the ecological communities in the vicinity of the site, determining the particular contaminants present, identifying pathways for receptor exposure, and estimating the magnitude of the likelihood of potential adverse effects to identified receptors. The SLERA addresses the potential for adverse effects to vegetation, wildlife, threatened and endangered (T&E) species, and wetlands or other sensitive habitats associated with the site.

The objective of this SLERA is to provide an estimate of the potential for adverse ecological effects associated with contamination resulting from former activities at ODA1. The results of the SLERA will contribute to the overall characterization of the site and may be used to determine the need for additional investigations, or to develop, evaluate, and select appropriate remedial alternatives. Guidance documents used to perform the SLERA include the general guidelines of the *Tri-Service Procedural Guidelines for Ecological Risk Assessments* (Wentsel et al., 1996), as well as the *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (EPA, 1997), *Region 5 Biological Technical Assistance Group (BTAG) Ecological Risk Assessment Guidance Bulletin No. 1* (EPA, 1996b), and *Guidance for Conducting Ecological Risk Assessments* (Ohio EPA, 2008). The SLERA fits into Steps 1 and 2 of the ecological risk assessment guidance for Superfund process (EPA, 1997), and Level I through a

maximum of Level III evaluation using the Ohio EPA (2008) process (although, as noted previously, this ODA1 SLERA includes only Level II).

The SLERA uses site-specific analyte concentration data for surface soil from ODA1. The evaluation of surface water and sediment was not necessary as the Phase I RI (SAIC, 2001a) deemed surface water/sediment not to be impacted as a result of historical ODA1 operations. Risks to ecological receptors were evaluated by performing a multistep screening process in which, after each step, the detected analytes in the media were either deemed to pose negligible risk and eliminated from further consideration, or carried forward to the next step in the screening process to a final conclusion of being a chemical of potential ecological concern (COPEC). COPECs are analytes whose concentrations are great enough to pose potential adverse effects to ecological receptors. Following the determination of COPECs, an ecological CSM is developed that describes the selection of receptors, exposure pathways, and assessment and measurement endpoints.

8.2 Problem Formulation

The problem formulation step of the SLERA includes descriptions of habitats, biota, T&E species, selection of EUs, and identification of COPECs at the site.

8.3 Facility Description and Location

A description of the former RVAAP/Camp Ravenna is presented in Sections 2.1 of this RI. A description of ODA1 is presented in Section 2.2. Briefly, ODA1 is approximately six acres in size and was formerly used during the 1940s primarily for OB/OD of munitions, explosives, and associated materials. The OB/OD area within ODA1 was surrounded by an oval shaped earthen berm. Recent visual inspections of the site indicate that OB/OD activities associated with ODA1 may have also been conducted in small areas within the NTA plane storage area adjacent to ODA1. Burning areas at ODA1 may have been cleared by pushing debris and scrap to the periphery of ODA1 using heavy equipment. ODA1 is currently covered with grass and the berms around the OB/OD area essentially removed. ODA1 has been unused since the cessation of OB/OD activities, although Military Training by the OHARNG has been ongoing at the surrounding NTA site since 1969.

A Phase I RI for ODA1 was conducted in 1999 (SAIC, 2001a). The RI results indicated the primary media of concern were surface and subsurface soil, and the primary contaminants were metals, low levels of explosives and propellants, and isolated low level detections of VOCs and SVOCs. An IRA was performed in 2000–2001 (MKM, 2004) to address impacted soils identified in the Phase I RI. The extent of contamination was determined not to be defined, and supplemental sampling activities associated with the current environmental investigation were performed to more accurately determine contamination nature and extent.

8.4 Ecological Site Description

Topography across ODA1 is relatively flat with little change in elevation. The AOC is slightly elevated as compared to its immediate surroundings and surface drainage is to the east, west, and south. Drainage from within the bermed OB/OD area is south via a culvert towards a shallow ditch, which ultimately discharges at ground surface within the Hinkley Creek drainage area.

ODA1 is within a dry, upland fields plant community and the dry, Early Successional Herbaceous Field Herbaceous Alliance (AMEC, 2008). The Early Successional Herbaceous Field Herbaceous Alliance is associated with recently disturbed areas lacking sufficient recovery time for further successional (shrub) development. Goldenrod, clasping-leaf dogbane, self-heal, yarrow, strawberry, black-eyed Susan, sheep sorrel, and fescue are the dominant species. Additional details pertaining to the ecological setting are provided in the following sections.

8.4.1 Special Interest Areas and Sensitive Areas

No sensitive habitats were identified on or near ODA1 during the natural heritage data searches (AMEC, 2008). No Special Interest Areas have been designated within or include any portion of ODA1 (AMEC, 2008). Special Interest Areas include communities that host state-listed species, are representative of historic ecosystems, or are otherwise noteworthy (AMEC, 2008).

8.4.2 Wetlands and Vegetation

A wetlands delineation has not been specifically done at ODA1. However, a planning level survey for wetlands has been conducted across the entire facility. The planning level survey identifies wetlands based on a desktop review of multiple wetlands sources, such as National Wetland Inventory maps and aerial photographs. Based on the planning level survey data for wetlands provided in the INRMP, no wetland areas were identified at ODA1 (AMEC, 2008).

The former RVAAP/Camp Ravenna has a diverse range of vegetation and habitat resources. Habitats present within the facility include large tracts of closed-canopy hardwood forest, scrub/shrub open areas, grasslands, wetlands, open-water ponds and lakes, and semi-improved administration areas (AMEC, 2008).

Vegetation at Camp Ravenna can be grouped into three categories: herb-dominated, shrub-dominated, and tree-dominated. Approximately 60 percent of the facility is covered by forest or tree-dominated vegetation. The facility has a total of seven forest formations, four shrub formations, eight herbaceous formations, and one nonvegetated formation (AMEC, 2008).

Surface water features within former RVAAP/Camp Ravenna include a variety of streams, ponds, floodplains, and wetlands. Numerous streams drain the facility, including 19 miles of perennial streams. The total combined stream length of streams at the facility is 212 linear miles.

8.4.3 Animal Populations

Approximately 153 acres of ponds are found on the facility. These ponds generally provide valuable wildlife habitat. The ponds generally support wood ducks, hooded mergansers, mallards, Canada goose, and many other birds and wildlife species. Some ponds have been stocked with fish and are used for fishing and hunting (AMEC, 2008). Wetlands are abundant and prevalent throughout the facility. These wetland areas include seasonal wetlands, wet fields, and forested wetlands. Most of the wetland areas on the facility are the result of natural drainage and beaver activity; however, some wetland areas are associated with anthropogenic settling ponds and drainage areas.

An abundance of wildlife is present on the facility. A total of 35 species of land mammals, 214 species of birds, 41 species of fish, and 34 species of amphibians and reptiles have been identified on the facility (AMEC, 2008).

8.4.4 Threatened and Endangered Species Information

The relative isolation and protection of habitat at former RVAAP/Camp Ravenna has provided for a diverse range of habitat and wildlife including some T&E species. There are currently no federally listed species or critical habitat on the facility. There are a few species currently under federal observation for listing, but none listed. State-listed species have been confirmed to be present on the former RVAAP/Camp Ravenna property through biological and confirmed sightings (AMEC, 2008). These species are listed in **Table 3-1** of Section 3. ODA1 has not been previously surveyed for rare species. There are no known documented sightings of rare, or threatened or endangered species at the AOC.

8.4.5 Selection of EUs

From the ecological assessment viewpoint, an EU is the area where ecological receptors potentially are exposed to the site constituents. Although some ecological receptors are likely to gather food, seek shelter, reproduce, and move around, spatial boundaries of the ecological EUs are the same as the spatial boundaries of aggregates defined for historical use, nature and extent of contamination, fate and transport, and the HHRA.

Soil at ODA1 represents the terrestrial EU. No other EUs are identified for this site.

8.5 Selection of COPCs

A list of ODA1 samples used for the SLERA is presented in Table 8-1 by medium and sample type. Sample locations are presented on Figures 5-2 through 5-13. The available data set consists of discrete soil samples collected as part of the 1999 Phase I RI (SAIC, 2001a) as well as ISM collected recently as part of the current supplemental Phase II RI.

The SLERA data set for ODA1 includes both the discrete soil samples collected as part of the Phase I RI and ISM samples. The ISM samples were collected in 2010 as part of the current Phase II RI from multiple depth intervals (0–1 ft bgs, as well as deeper intervals) and from five decision units (Figure 5-2) as described in the *Addendum* (Shaw, 2010a). Each ISM sample was comprised of 30 ISM samples that were combined and homogenized. When available, for this SLERA, the ISM data were considered to be the most relevant for estimating ecological exposure because they are the most recently collected data (and therefore provide the best representation of current site conditions); and because the ISM approach provides a better estimate of average concentrations than discrete samples. Therefore, for areas where both ISM and discrete samples were collected, the ISM data were preferentially used in this SLERA. The 1999 Phase I RI discrete samples that did not occur in areas where surface soil was removed during subsequent removal were used to characterize the remaining portions of ODA1 that were outside of the ISM decision units. Thus, both the ISM samples and the discrete samples that occurred outside of the ISM footprint were used in this SLERA. Data from the ISM samples and discrete samples were analyzed separately, and not combined. Only surface soil (0–1 ft bgs sampling interval) samples were used in the SLERA because most ecological exposure occurs within the top 1 ft of soil. Also, as a former demolition area, it is expected that much of the native soil has been reworked, removed, or used as cover material, which would likely decrease the attractiveness to burrowing receptors. Therefore, the 0–1 ft bgs interval is assumed to represent the zone of maximum exposure for most ecological receptors.

From the chemical results of samples described above, a COPEC selection process was performed to develop a subset of SRCs. These chemicals are also present at sufficient frequencies, concentrations, and spatial areas to pose a potential risk to ecological receptors. COPECs were identified by using methods described for a Level II Screening in Ohio EPA's Ecological Risk Assessment Guidance Document (Ohio EPA, 2008). Identification of COPECs entails a multistep process that begins with the detected COIs that are identified in the site characterization process, then proceeds to a data evaluation, media evaluation, and media screening as part of the Level II Screening. This selection process is described in more detail in the following sections.

8.5.1 Data Organization

Chemical analytical data, as well as all previous and ongoing investigations, were reviewed and evaluated for quality, usefulness, and uncertainty. Data identified as being of acceptable quality for use in the SLERA were summarized in a manner that presents the pertinent information to be applied in the SLERA. Any data rejected during the data evaluation as a result of the data evaluation ("R"-qualified data) were identified along with the rejection rationale. All data used in the SLERA were validated.

The data for each chemical were sorted by medium. Chemicals not detected at least once in a medium were not included in the risk assessment. Available background data were determined for each medium. Potential sources of background information include data from previous and current investigations.

8.5.2 Data Evaluation

The data evaluation of COIs normally entails two components: a frequency of detection analysis and an evaluation of common laboratory contaminants. The purpose of the frequency of detection analysis is to eliminate from further consideration any COIs detected in five percent or less of the samples for a given medium, excluding COIs present in multiple media, or deemed to be persistent, bioaccumulative, and toxic (PBT). However, for this site, no frequency of detection screening was performed because fewer than 20 samples were available for the discrete surface soil data set. Because ISM samples represent an average concentration over a given area, using a frequency of detection is not an appropriate criterion for ISM samples.

Common laboratory contaminants include acetone, 2-butanone (methyl ethyl ketone), carbon disulfide, methylene chloride, toluene, and phthalate esters. If blanks contained detectable concentrations of these contaminants, then the sample results were considered positive results if the sample concentrations were greater than 10-times the maximum amount detected in any blank. For other chemicals, the sample results must be greater than 5-times the blank concentration to be considered valid detections. Laboratory contaminants are typically identified (and rejected) using data qualifiers. The analytical data included qualifiers from the analytical laboratory QC, or from the data validation process that reflect the level of confidence in the data. Some of the more common qualifiers and their meanings are as follows (EPA, 1989):

- U—Chemical was analyzed, but not detected; the associated value is the sample quantitation limit.
- J—Value is estimated, probably below the contract-required quantitation limit.
- R—QC indicates that the data are unusable (chemical may or may not be present).

"J"-qualified data are used in the risk assessment; "R"-qualified data are not. "U"-qualified data were treated as nondetects.

8.5.3 Media Evaluation

The media evaluation was performed after the frequency of detection and common laboratory contaminant evaluation, using the COIs that were not eliminated during those two steps. The purpose of the media evaluation is to determine whether SRCs have impacted media associated with the site. The evaluation methods were media-specific, and included comparison against background concentrations for all media. Maximum detected concentration (MDC) of COIs in soil were compared to selected background concentrations and eliminated from further consideration in the Level II Screening if the maximum concentrations were less than background values and the COIs were not PBT compounds. If the MDCs of COIs were greater than background values, and/or the COIs were PBT compounds, the COIs were carried forward to the media screening step.

8.5.4 COPEC Selection Criteria

The criteria used to identify COPECs in the SLERA are described in the following sections.

8.5.4.1 Comparison to Ecological Screening Values

MDCs of chemicals detected in various media were compared with Ecological Screening Values (ESVs) for ecological endpoints following recommendations obtained from Ohio EPA (2008). Chemical concentrations that are greater than the ESVs, or for which no ESVs are available, were retained as COPECs. The following ESV hierarchy was used for the ecological evaluation of soil:

1. EPA ecological SSLs (EcoSSL) (EPA, 2008);
2. Preliminary Remediation Goals for Ecological Endpoints (Efroymson, et al., 1997a);
3. EPA Region 5 ecological screening levels (EPA, 2003);
4. Los Alamos National Laboratory (2010) ESVs; and
5. Talmage et al. (1999)

ESVs used for the SLERA are presented in **Appendix H**.

8.5.4.2 Essential Nutrients

Evaluating essential nutrients is a special form of risk-based screening applied to certain ubiquitous elements that are generally considered to be required nutrients. Essential nutrients such as calcium, iron, magnesium, potassium, and sodium are usually eliminated as COPECs because they are generally considered to be innocuous in environmental media. Other

essential nutrients, including chloride, iodine, and phosphorus, may be eliminated as COPECs, provided that their presence in a particular medium is unlikely to cause adverse effects to biological health.

8.5.4.3 Persistent, Bioaccumulative, and Toxic Pollutants

PBT compounds listed in Ohio EPA (2008), including chemicals whose log octanol-water partition coefficient (K_{ow}) values are greater than or equal to 3, are retained as COPECs. However, if the chemical's ESV is based on an endpoint that is protective of bioaccumulation effects, the chemical may be eliminated as a COPEC if its MDC is below its ESV (Ohio EPA, 2008). Although they typically have Log K_{ow} values greater than 3, polycyclic aromatic hydrocarbons (PAH) (including carbazole, a PAH heterocycle) exhibit little tendency to biomagnify in food chains, despite their high lipid solubility, possibly due to their tendency to be rapidly metabolized by most organisms (Eisler, 1987; EPA, 2008). Furthermore, low molecular weight PAHs (i.e., anthracene and phenanthrene) are subject to chemical degradation and biodegradation, and the hydrophobic, higher molecular weight PAHs (i.e., benzo[a]pyrene) show a high affinity for binding to dissolved humic materials and tend to have rapid biotransformation rates, which may lessen or negate bioaccumulation and food chain transfer (Eisler, 1987). For these reasons, PAHs are not considered PBT chemicals in this SLERA.

8.5.5 Summary of COPEC Selection

The results of the COPEC screening for surface soil are presented in Tables 8-2 and 8-3 for the discrete and ISM samples, respectively. The tables present the following information for each medium:

- Chemical name;
- Frequency of detection;
- Range of detected concentrations;
- Range of detection limits;
- Arithmetic mean (average) of site concentrations;
- Site background concentration;
- Determination as to whether the chemical is site related;
- ESV;
- HQ;
- Determination as to whether the chemical is a PBT; and

- Determination as to whether the chemical is a COPEC.

One-half the reporting limit was used as a surrogate concentration for nondetects for calculating the arithmetic mean of concentrations.

The HQ is calculated as the detected concentration divided by the ESV. An HQ greater than 1 indicates that the concentration in the medium is greater than the conservative ESV, and may indicate that a potential ecological threat exists. Chemicals with HQs less than 1 are considered to be of low concern, and are not carried forward as COPECs, unless the chemical is a PBT pollutant and its screening value is not protective of food chain effects.

A description and summary of COPECs identified in surface soil is presented in the following section.

8.5.5.1 Soil COPEC Selection

For discrete surface soil samples, a total of 23 chemicals were detected and evaluated, including 21 metals and 2 explosives compounds (Table 8-2). Seven metals (aluminum, antimony, arsenic, lead, manganese, selenium, and vanadium) were detected at concentrations below their BSVs and determined not to be site related. Five metals and both explosives compounds were eliminated because they are not PBT compounds and their MDCs were lower than their ESVs. Four inorganic chemicals were eliminated because they are essential nutrients. Following the screen, five inorganic chemicals (cadmium, cobalt, copper, mercury, and zinc) were identified as COPECs (Table 8-2).

For the ISM surface soil samples, a total of 31 chemicals were detected and evaluated, including 22 metals, 1 general chemistry parameter, 3 explosives compounds, 4 pesticides, and 1 SVOC (Table 8-3). Eleven metals were detected at concentrations below their BSCs and determined not to be site related. The general chemistry parameter and one explosive compound were eliminated because they were not PBT compounds and their MDCs were lower than their ESVs. One additional pesticide PBT compound was eliminated during the toxicity screen because it was detected at a concentration less than an ESV that is protective of food chain effects. Two inorganic chemicals were eliminated because they are essential nutrients. Following the screen, nine inorganic chemicals, two explosives compounds, three pesticides, and one SVOC were identified as COPECs (Table 8-3). The three pesticides and the SVOC were selected as COPECs solely because they are PBT pollutants (i.e., their detected concentrations are less than their ESVs). One propellant compound (nitroguanidine) was selected as a COPEC because it lacked an ESV.

Table 8-4 presents the number of COPECs identified in each ISM sampling unit. All soil sampling units had at least one chemical that failed the background (metals only) and/or

toxicity screening criteria (note that chemicals selected as COPECs because they lacked ESVs, or that were detected at concentrations below their ESVs, but retained because they were PBT compounds are not represented in Table 8-4).

8.5.5.2 COPEC Selection Conclusions

Ohio EPA guidance (2008) states, "For a site to present a potential for hazard, it must exhibit the following three conditions: (a) contain COPECs in media at detectable and biologically significant concentrations, (b) provide exposure pathways linking COPECs to ecological receptors, and (c) have endpoint species that either utilize the site, are not observed to utilize the site but habitat is such that the endpoints species should be present, are present nearby, or can potentially come into contact with site-related COPECs." This Level II Screening has shown that these three conditions are met at ODA1.

The Level II Screening identifies site-specific receptors, relevant and complete exposure pathways, and other pertinent information (Ohio EPA, 2008). These components represent preliminary information for a Level III ERA. The following section presents the ecological CSM, including selection of site-specific ecological receptor species, relevant and complete exposure pathways, and candidate ecological assessment endpoints and measures.

8.6 Ecological CSM

The ecological CSM depicts and describes the known and expected relationships among the stressors, pathways, and assessment endpoints that are considered in the risk assessment, along with a rationale for their inclusion. Two ecological CSMs are presented for this Level II Screening. One ecological CSM is associated with the media screening conducted during the Level II Screening (Figure 8-1). The other ecological CSM (Figure 8-2) represents a preliminary CSM for a Level III Baseline, should one be considered necessary. The ecological CSMs for ODA1 were developed using the available site-specific information and professional judgment. The contamination mechanism, source media, transport mechanisms, exposure media, exposure routes, and ecological receptors for the ecological CSMs are described below.

8.6.1 Contamination Source

The contamination source includes releases from OB/OD operations that occurred at the site. Section 2.2.1 describes the types of historical operations that took place at the site.

8.6.2 Source Medium

The source medium is soil. For the SLERA, surface soil is defined as 0–1 ft bgs. Contaminants released from explosives demolition activities were historically released directly into the surrounding soil.

8.6.3 Transport Mechanisms

Potential transport mechanisms at the site include volatilization into the air, biota uptake, erosion to surface water and sediment, and leaching to groundwater. Biota uptake is a transport mechanism because some of the site contaminants are known to accumulate in biota, which may act as a vehicle to spatially disperse contaminants, as well as represent a secondary exposure medium for upper trophic level receptors that prey on the biota.

8.6.4 Exposure Media

Sufficient time has elapsed for contaminants in the source medium to have migrated to potential exposure media, resulting in possible exposure of plants and animals that come in contact with these media. Potential exposure media include air, surface soil, and the food chain. Subsurface soil includes soil at depths that ecological receptors typically do not come into contact with, and is not being evaluated at ODA1. Groundwater is not considered an exposure medium because ecological receptors are unlikely to contact groundwater. Therefore, soil and biota comprising prey items for higher trophic level receptors are the two principal exposure media for ODA1.

8.6.5 Exposure Routes

Exposure routes are functions of the characteristics of the media in which the sources occur, and reflect how both the released chemicals and receptors interact with those media. For example, for sites with aquatic habitat, chemicals in surface water may be dissolved or suspended as particulates and be highly mobile; whereas those same constituents in soil may be much more stationary. The ecology of the receptors is important because it dictates their home range, whether the organism is mobile or immobile, local or migratory, burrowing or aboveground, plant eating, animal eating, or omnivorous.

For the Level II Screening CSM (Figure 8-1), specific exposure routes were not identified because the screening is not receptor-specific and only focuses on comparison of MDCs of chemicals in the exposure media against published ecological toxicological benchmark concentrations derived for those media. However, the preliminary Level III Baseline ecological CSM (Figure 8-2) identifies specific exposure routes and indicates whether the exposure routes from the exposure media to the ecological receptors are major or minor. Major exposure routes are evaluated quantitatively, whereas minor routes are evaluated qualitatively. The preliminary Level III Baseline ecological CSM (Figure 8-2) shows major exposure routes of soil to ecological receptors and an incomplete exposure route of groundwater. The major exposure routes for chemical toxicity from surface soil include ingestion (for terrestrial invertebrates, voles, shrews, robins, foxes, and hawks) and direct contact (for terrestrial plants and invertebrates). The ingestion exposure routes for voles, shrews, robins, foxes, and hawks include soil, as well as plant and/or animal food (i.e., food

chain), that was exposed to the surface soil. Minor exposure routes for surface soil include direct contact and inhalation of fugitive dust.

Exposure to groundwater is an incomplete pathway for all ecological receptors because receptors typically do not come into direct contact with groundwater. If the groundwater outcrops via seeps or springs into wetlands or ditches, it becomes part of the surface water and would be evaluated as surface water.

8.7 Ecological Receptors

For the Level II Screening, specific ecological receptors were not identified; rather, terrestrial biota are considered as a whole. However, for the Level III Baseline evaluation, specific terrestrial ecological receptors are identified as part of the ecological CSM (Figure 8-2). The terrestrial receptors include plants, terrestrial invertebrates (earthworms), voles, shrews, robins, foxes, and hawks. These receptors are discussed in more detail in Section 8.7.1.

8.7.1 Selection of Site-Specific Ecological Receptor Species

The selection of ecological receptors for the site-specific analysis screening was based on plant and animal species that are likely to occur in the terrestrial and aquatic habitats at the site. Three criteria were used to identify the site-specific receptors.

1. **Ecological Relevance.** The receptor has or represents a role in an important function such as energy fixation (i.e., plants), nutrient cycling (i.e., earthworms), and population regulation (i.e., hawks). Receptor species were chosen to include representatives of all applicable trophic levels identified by the ecological CSM for the site. These species were selected to be predictive of assessment endpoints (including protected species/species of special concern and recreational species).
2. **Susceptibility.** The receptor is known to be sensitive to the chemicals detected at the site, and given their food and habitat preferences, their exposure is expected to be high. The species have a likely potential for exposure based upon their residency status, home range size, sedentary nature of the organism, habitat compatibility, exposure to contaminated media, exposure route, and/or exposure mechanism compatibility. Ecological receptor species were also selected based on the availability of toxicological effects and exposure information.
3. **Management Goals.** Valuable roles in erosion control (i.e., plants), societal values (i.e., trapping for fur and regulatory protection [i.e., Migratory Bird Act-robins, hawks]). The ecosystem functions of the ecological receptor species (food web interactions, keystone species, vital to ecosystem function, dominant species or tolerant/intolerant species) were considered during the selection process.

At ODA1, the following types of ecological receptors are likely to be present: terrestrial vegetation, terrestrial invertebrates, meadow voles (*Microtus pennsylvanicus*), short-tailed shrews (*Blarina brevicauda*), American robins (*Turdus migratoris*), red foxes (*Vulpes vulpes*), and red-tailed hawks (*Buteo jamaicensis*). Each of these receptors is described in the following paragraphs.

Terrestrial Vegetation Exposure to Soil

Terrestrial vegetation exposure to soil is applicable to ODA1. Terrestrial plants have ecological relevance because they represent the base of the food web, and are the primary producers that turn energy from the sun into organic material (plants) that provides food for many animals. There is sufficient habitat present for them at the site. In addition, plants are important in providing shelter and nesting materials to many animals; thus, plants are a major component of habitat. Plants provide natural cover and stability to soil and stream banks, thereby reducing soil erosion.

Terrestrial plants are susceptible to toxicity from chemicals. Plants have roots that are in direct contact with surface soil, which provides them with direct exposure to contaminants in the soil. They also can have exposure to contaminants via direct contact on the leaves. There are published toxicity benchmarks for plants (Efroymson et al., 1997b), and there are management goals for plants because of their importance in erosion control. Thus, there is sufficient justification to warrant plants as a candidate receptor for ODA1.

Terrestrial Invertebrate Exposure to Soil

Terrestrial invertebrate exposure to soil is applicable to soils for ODA1. Earthworms represent the receptor for the terrestrial invertebrate class, and there is sufficient habitat present for them on site. Earthworms have ecological relevance because they are important for decomposition of detritus and for energy and nutrient cycling in soil (Efroymson et al., 1997c), and as prey items for other species. Earthworms are probably the most important of the terrestrial invertebrates for promoting soil fertility due to the volume of soil that they process.

Earthworms are susceptible to exposure to, and toxicity from, COPECs in soil. Earthworms are nearly always in contact with soil and ingest soil, which results in constant exposure. Earthworms are sensitive to various chemicals. Toxicity benchmarks are available for earthworms (Efroymson et al., 1997b). Although management goals for earthworms are not immediately obvious, the role of earthworms in soil fertility and as a food source is significant. Thus, there is sufficient justification to warrant earthworms as a candidate receptor for ODA1.

Mammalian Herbivore Exposure to Soil

Mammalian herbivore exposure to soil is applicable to ODA1. Cottontail rabbits and meadow voles represent mammalian herbivore receptors, and there is suitable habitat present for them at the site. Both species have ecological relevance by consuming vegetation, which helps in the regulation of plant populations and in the dispersion of some plant seeds. Small herbivorous mammals such as cottontail rabbits and voles are prey items for top terrestrial predators. Both cottontail rabbits and meadow voles are susceptible to exposure to, and toxicity from, COPCs in soil and vegetation. Herbivorous mammals are exposed primarily through ingestion of plant material and incidental ingestion of contaminated surface soil containing chemicals. Exposures by inhalation of COPECs, in air or on suspended particulates, as well as exposures by direct contact with soil, were assumed to be negligible. Dietary toxicity benchmarks are available for many COPECs for mammals (Sample et al., 1996), and there are management goals for rabbits because they are an upland small game species protected under Ohio hunting regulations. There are no specific management goals for meadow voles at ODA1. Meadow voles have smaller home ranges than rabbits, which makes them potentially more susceptible to localized contamination. Therefore, they are a more conservative selection as a representative mammalian herbivore than rabbits, and are selected as candidate receptors for ODA1.

Insectivorous Mammal and Bird Exposure to Soil

Insectivorous mammal and bird exposure to soil is applicable to ODA1. Short-tailed shrews and American robins represent the receptors for the insectivorous mammal and bird terrestrial exposure class, respectively. There is sufficient, suitable habitat present at the site for these receptors. Both species have ecological relevance because they help to control aboveground invertebrate community size by consuming large numbers of invertebrates. Shrews and robins are a prey item for terrestrial top predators.

Both short-tailed shrews and American robins are susceptible to exposure to, and toxicity from, COPECs in soil, as well as contaminants in vegetation and terrestrial invertebrate. Insectivorous mammals such as short-tailed shrews and birds such as American robins are primarily exposed by ingestion of contaminated prey (i.e., earthworms, insect larvae, and slugs), as well as ingestion of soil. In addition, shrews ingest a small amount of leafy vegetation, and the robin's diet consists of 50 percent each of seeds and fruit. Dietary toxicity benchmarks are available for mammals and birds (Sample et al., 1996). Both species are recommended as receptors because there can be different toxicological sensitivity between mammals and birds exposed to the same contaminants. There are management goals for robins because they are federally protected under the Migratory Bird Treaty Act of 1993, as amended. There are no specific management goals for shrews at the site. Based on the management goals for robins, plus the susceptibility to contamination and ecological

relevance for both species, there is sufficient justification to warrant shrews and robins as candidate receptors for ODA1.

Terrestrial Top Predators

Exposure of terrestrial top predators is applicable to ODA1. Red foxes and red-tailed hawks represent the mammal and bird receptors for the terrestrial top predator exposure class, and there is a limited amount of suitable habitat available for them at the site. Both species have ecological relevance; as representatives of the top of the food chain for the site terrestrial EUs, they control populations of prey animals such as small mammals and birds.

Both red foxes and red-tailed hawks are susceptible to exposure to, and toxicity from, COPECs in soil, vegetation, and/or animal prey. Terrestrial top predators feed on small mammals and birds that may accumulate constituents in their tissues following exposure at the site. There is a potential difference in toxicological sensitivity between mammals and birds exposed to the same COPECs; so it is prudent to examine a species from each taxon (Mammalia and Aves, respectively). Red foxes are primarily carnivorous, but consume some plant material and may incidentally consume soil. The red-tailed hawk consumes only animal prey. There are management goals for both species. Laws (Ohio trapping season regulations for foxes, and federal protection of raptors under the Migratory Bird Treaty Act) also protect these species. In addition, both species are susceptible to contamination and have ecological relevance as top predators in the terrestrial ecosystem. Thus, there is sufficient justification to warrant these two species as candidate receptors for ODA1.

8.7.2 Relevant and Complete Exposure Pathways

Relevant and complete exposure pathways for the ecological receptors at ODA1 were described in Section 8.6.5. As previously discussed, there are relevant and complete exposure pathways for various ecological receptors including terrestrial vegetation and invertebrates, and terrestrial herbivores, insectivores, and carnivores. Thus, these types of receptors could be exposed to COPECs in surface soil at ODA1.

8.8 Ecological Endpoint (Assessment and Measurement) Identification

The protection of ecological resources, such as habitats and species of plants and animals, is a primary motivation for conducting SLERAs. Key aspects of ecological protection are presented as management goals. These are general goals established by legislation or agency policy that are based on societal concern for the protection of certain environmental resources. For example, environmental protection is mandated by a variety of legislation and government agency policies (i.e., the CERCLA, National Environmental Policy Act). Other legislation includes the ESA 16 USC 1531-1544 (1993, as amended) and the Migratory Bird Treaty Act 16 USC 703-711 (1993, as amended). To evaluate whether a management goal

has been met, assessment endpoints, measures of effects, and decision rules were formulated. The management goals, assessment endpoints, measures of effects, and decision rules are discussed below.

Because only terrestrial habitat is present at ODA1, there is only one primary management goal for this AOC. However, the assessment endpoints differ between the general screen and the site-specific analysis screen. The management goal for the SLERA is Management Goal 1: Protect terrestrial plant and animal populations from adverse effects due to the release or potential release of chemical substances associated with past site activities.

Ecological assessment endpoints are selected to determine whether this management goal is met at the unit. An ecological assessment endpoint is a characteristic of an ecological component that may be affected by exposure to a stressor (i.e., COPEC). Assessment endpoints are "explicit expressions of the actual environmental value that is to be protected" (EPA, 1992). Assessment endpoints often reflect environmental values that are protected by law, provide critical resources, or provide an ecological function that would be significantly impaired if the resource was altered. Unlike the HHRA process, which focuses on individual receptors, the SLERA focuses on populations or groups of interbreeding nonhuman, nondomesticated receptors. Accordingly, assessment endpoints generally refer to characteristics of populations and communities. In the SLERA process, risks to individuals are assessed only if they are protected under the ESA or other species-specific legislation, or if the species is a candidate for listing as a T&E species. Because T&E species are not a concern at ODA1 (see Section 8.4.4), potential impacts to populations is the appropriate criterion for consideration at ODA1.

Due to the uniqueness of local flora and fauna communities, as well as varying societal values placed on these ecological features, a universally applicable list of assessment endpoints does not exist. The Ohio EPA's *Ecological Risk Assessment Guidance Document* (Ohio EPA, 2008) was used to select endpoints for this SLERA. For the Level II Screening, the assessment endpoints are any potential adverse effects on ecological receptors, where receptors are defined as any plant or animal population, communities, habitats, and sensitive environments (Ohio EPA, 2008). Although the assessment endpoints for the Level II Screening are associated with Management Goal 1, specific receptors are not identified with the assessment endpoints.

Table 8-5 shows the management goals for terrestrial resources, associated assessment endpoints, measures of effect, and decision rule by assessment endpoint number. Furthermore, the table provides definitions of Assessment Endpoints 1, 2, 3, and 4 for terrestrial receptors. As stated, the assessment endpoint table includes a column describing the conditions for making a decision depending on whether the HQ is less than or more than

one. If the HQ is greater than one, the Scientific Management Decision Point options from Ohio EPA/U.S. Army guidance are provided; for example, NFA, risk management, monitoring, remediation, or further investigation.

For the Level III Baseline evaluation, the assessment endpoints are more specific and stated in terms of types of specific ecological receptors associated with each of the two management goals. Assessment endpoints 1, 2, 3, and 4 entail the growth, survival, and reproduction of terrestrial receptors such as vegetation and terrestrial invertebrates, herbivorous mammals, worm-eating/insectivorous mammals and birds, and carnivorous top predator mammals and birds, respectively. Assessment endpoints 1 through 4 are associated with Management Goal 1, protection of terrestrial populations and communities.

The assessment endpoints are evaluated through the use of measurement endpoints. EPA defines measurement endpoints as ecological characteristics used to quantify and predict change in the assessment endpoints. They consist of measures of receptor and population characteristics, measures of exposure, and measures of effect. For example, measures of receptor characteristics include parameters such as home range, food intake rate, and dietary composition. Measures of exposure include attributes of the environment such as contaminant concentrations in soil, sediment, surface water, and biota. The measurement endpoints of effect for the Level II screening evaluation consist of the comparison of the MDCs of each contaminant in soil to ESV benchmarks.

Measurement endpoints for the Level III Baseline include the comparison of estimated doses of chemicals in various receptor animals such as voles, shrews, and American robins to toxicity reference values.

In the Level II Screening, MDCs in soil were used as the EPCs for comparison to generic soil or sediment screening values that are expected not to cause harm to ecological populations. Any COPECs retained following the Level II screening are potentially subject to a Level III baseline analysis using EPCs that are more representative of the exposures expected for the representative receptors. The Level III baseline analysis includes evaluation of exposure of a variety of receptors to the reasonable maximum exposure concentrations of COPECs at each EU, using default dietary and uptake factors. The representative ecological receptors may not all be present at each EU. However, all representative receptors are evaluated at this step.

For the Level III Baseline, decision rules for COPECs were obtained from Ohio EPA's guidance for chemicals (Ohio EPA, 2008). For COPECs, the first decision rule is based on the ratio (or HQ) of the dose to a given receptor species (i.e., a vole, representing herbivorous mammals) associated with a chemical's concentration in the environment (numerator) to the ecological effects or toxicity reference value (denominator) of the same chemical. A ratio of

one or less means that ecological risk is negligible, while a ratio of greater than one means that ecological risk from that individual chemical is possible and that additional investigation should follow to confirm or refute this prediction. The second decision rule is that if "no other observed significant adverse effects on the health or viability of the local individuals or populations of species are identified" (Ohio EPA, 2008) and the hazard index (HI) does not exceed 1, "the site is highly unlikely to present significant risks to endpoint species" (Ohio EPA, 2008). Potential outcomes for the Level III Baseline are (1) no significant risks to endpoint species, so no further analysis is needed; (2) conduct field baseline assessment to quantify adverse effects to populations of representative species that were shown to be potentially impacted based on hazard calculations in the Level III Baseline; and (3) remedial action taken without further study.

8.9 Level II Screening Weight of Evidence Discussion

Prior to making the determination as to whether a Level III Baseline is warranted, it is appropriate to evaluate various lines of evidence that might suggest whether or not additional ecological investigation is needed at this AOC. Due to the highly conservative nature of the Level II Screening, the identification of COPECs does not necessarily indicate that potential for adverse effects is realistic at this site. For example, HQs developed during the initial (screening) steps of a SLERA assume that receptors are exposed daily to the concentration equal to the MDC of the COPEC. However, ecological receptors (other than plants) are mobile, and most (if not all) of their exposure would be to soil or other media where much lower concentrations are present.

Another source of uncertainty in the Level II Screening results from the fact that toxicity studies upon which the benchmark values are based are highly conservative. These studies typically use naive (i.e., laboratory) organisms comprised of a single genetic strain that have no inherent resistance to chemical insults. Nonlaboratory organisms have both a more diverse genetic makeup and exposure history to ambient levels of chemicals (both natural and anthropogenic in origin) that favor the development of resistances to chemical exposure in nature. Also, toxicity studies usually dose the test organisms with a chemical that is fully bioavailable (i.e., in solution) and that uses the most toxic chemical form. However, when a chemical is released to the environment, it reacts with other compounds and is affected by ambient conditions that often reduce the chemical's ability to be absorbed by and/or retained in an organism (i.e., metals released to terrestrial systems often sorb to soil, reducing their bioavailability). The form of the chemical may change in the natural environment as well, which often results in the reduction of its toxic properties. For example, under reducing conditions, hexavalent chromium is readily transformed to less toxic trivalent chromium in soil (however, it should be noted that conversion to a more toxic form in the environment is

also possible, such as the conversion of inorganic mercury to methyl mercury by microorganisms under certain conditions; see the discussion of mercury in Section 8.9.1).

Because of these factors, the correlation between total concentration of a chemical in a given medium and its toxic effect is often quite poor, and predictions regarding potential toxicity must be used with caution. Although any chemical with an HQ greater than 1 must be identified as a COPEC and is recognized as being a potential concern (Ohio EPA, 2008), the uncertainties associated with the HQs must be considered when making recommendations based on the results of the SLERA, particularly with regards to the interpretation of the HQ values. HQs are not measures of risk, are not population-based statistics, and are not linearly scaled statistics. Therefore, an HQ greater than 1, even exceedingly so, does not definitively indicate that there is even one individual expressing the toxicological effect associated with a given chemical to which it was exposed (Tannenbaum, 2005; Bartell, 1996). Furthermore, the spatial area affected and the magnitude of the HQ exceedance must be taken into account when considering the potential for local populations (rather than individuals) to experience adverse effects, because population-level effects are the endpoints of concern in the SLERA (see Table 8-5). To account for some of these uncertainties, HQs less than 10 are considered to represent a low potential for environmental effects, HQs from 10 up to, but less than 100 are considered to represent a significant potential that effects could result from greater exposure, and HQs greater than 100 represent the highest potential for expected effects (Wentsel et al., 1996). It should be noted that Ohio EPA considers HQs greater than 1 to be potentially significant. The findings of the Level II Screening are discussed in additional detail in this section to support final recommendations for this stage of the risk assessment process.

8.9.1 Weight of Evidence Discussion for Discrete Soil Samples

As presented in Section 8.5.5.1, five COPECs were identified in discrete soil samples. All five COPECs were metals, including cadmium, cobalt, copper, mercury, and zinc. Table 8-6 presents the concentrations of all COPECs by soil sample, and Table 8-7 presents the HQs associated with each COPEC in the individual samples.

Cadmium, cobalt, copper, and zinc all had HQs below 10 (range equals 1.1–6.9; Table 8-2). The spatial distribution of samples with concentrations greater than their BSVs and ESVs was not extensive: 1 out of 18 samples for cadmium, 1 out of 18 samples for cobalt, 4 out of 18 samples for copper, and 7 out of 18 samples for zinc met these criteria (Table 8-7). Therefore, these chemicals are considered to have a low potential for adverse ecological impacts due to their low magnitude of detected concentrations and their limited spatial distribution. Mercury was the only COPEC with an HQ greater than 10 (HQ of 149; Table 8-2). However, the MDC for mercury of 0.076 mg/kg was only approximately a factor

of 2 greater than the BSV of 0.036 mg/kg, and only 4 out of 18 discrete surface soil samples had concentrations of mercury that were greater than its BSV (range equals 0.05–0.076 mg/kg). Also, the average concentration of samples with detectable levels of mercury is 0.034 mg/kg, which is below the BSV of 0.036 mg/kg. Therefore, on average, concentrations at the site approximate naturally occurring concentrations. Because this average value does not include nondetect results, the value is likely biased high (i.e., conservative).

Although the concentrations of mercury in ODA1 discrete soil samples are only slightly elevated above background, the extremely low ESV of 0.00051 mg/kg results in an HQ value that exceeds 100. The mercury ESV was calculated using the toxicity properties of methylmercury (Efroymson et al., 1997a), which may not be appropriate for a soil benchmark value. Methylmercury is a highly toxic, organometallic form of mercury that forms naturally in water from the bioconversion of inorganic forms of mercury (Hazardous Substances Data Bank, 2007). Inorganic mercury compounds can be methylated by microorganisms indigenous to soil under both aerobic and anaerobic conditions; however, the methylation rate is generally considered to be quite low (EPA, 2005) and the process is balanced by microbial processes that reduce inorganic cationic mercury and methylmercury to elemental mercury, which is free to volatilize from soil. Therefore, methylmercury is not the dominant form of mercury in terrestrial systems. EPA (2005) assumes that 98 percent of the mercury in soil exists as cationic compounds and that 2 percent exists as methylmercury, except in wetland areas. Thus, the use of methylmercury toxicity values to calculate an ESV protective of soil receptors is highly conservative. It is noted that alternate mercury ESVs available for the former RVAAP/Camp Ravenna are approximately 3 orders of magnitude greater than the selected ESV, likely because they were based on forms of mercury more likely to be found in terrestrial systems (Table H-1, Appendix H). If the EPA Region 5 (EPA, 2003) alternate ESV of 0.1 mg/kg is used, mercury would have an HQ of less than 1.

8.9.2 Weight of Evidence Discussion for ISM Soil Samples

As presented in Section 8.5.5.1, 15 COPECs were identified in ISM samples, including nine metals (antimony, cadmium, chromium, cobalt, copper, mercury, selenium, thallium, and zinc), two explosives (2,4,6-TNT and nitroguanidine), three pesticides (4,4'-DDE, gamma-chlordane, and heptachlor), and one SVOC (di-n-butyl phthalate [Table 8-3]). Table 8-8 presents the concentrations of all COPECs by soil sampling unit, and Table 8-9 presents the HQs associated with each COPEC in the individual decision units.

None of the HQ values for the metals selected as COPECs exceeded 10, with the exception of mercury (Table 8-3). Similar to the discrete samples, the mercury HQ exceeded 100 due to the conservative ESV that was used. The MDC for mercury in the ISM data set of

0.079 mg/kg is nearly identical to the MDC detected in the discrete sample data set, and the same uncertainties with regards to its ESV described in Section 8.9.1 apply to the ISM evaluation as well. Cobalt and selenium were each detected in only one decision unit at concentrations greater than their BSVs and ESVs. All other concentrations of metal COPECs were greater than their screening values at multiple units. However, because ISM samples represent average concentration over a larger area, there is greater opportunity for ecological receptors to be exposed to sample units with elevated metals concentrations compared with discrete samples. Therefore, considerations regarding the number of sampling units that exceed criteria have a reduced importance for these types of samples.

Two explosives were identified as COPECs in ISM samples (Table 8-3). 2,4,6-TNT was only detected in 1 out of 5 samples, did not have an HQ that exceeded 1 when rounded, and is unlikely to be present at ecologically relevant concentrations. Nitroguanidine could not be evaluated because no ESV was identified for this chemical. This chemical was detected in the only sample it was analyzed for at a concentration of 0.59 mg/kg, which is slightly greater than its reporting limit (Table 8-3). Explosives compounds typically are not bioaccumulative, and this chemical was not identified as a PBT compound. Therefore, although the presence of this chemical represents a small uncertainty in this SLERA, nitroguanidine is unlikely to pose a significant threat to ecological receptors.

Three pesticides were identified as COPECs in ISM samples, all of which were only selected as COPECs because they are PBT chemicals (Table 8-3). The greatest HQ for these three pesticides was 0.3, for heptachlor (Table 8-3). Pesticides were routinely used at the former RVAAP/Camp Ravenna for pest control consistent with standard and legal application procedures at the time. Due to their relatively low concentrations, and the lack of an obvious site-related source, these chemicals are considered to be of low significance to ecological receptors.

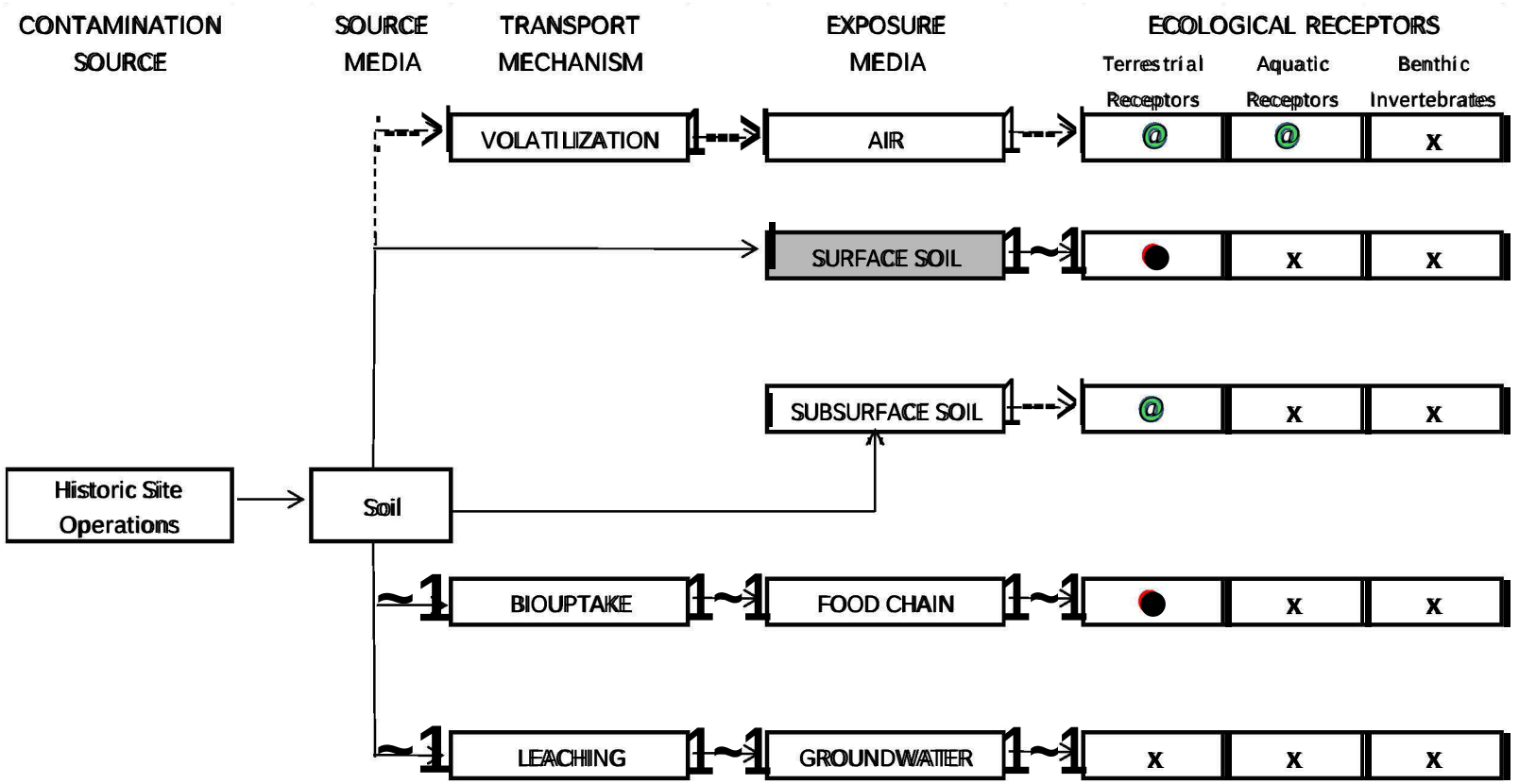
One SVOC, di-n-butyl-phthalate, was detected at an estimated concentration of 0.00021 mg/kg, and was identified as a COPEC only because it is a PBT compound. Its HQ value was many orders of magnitude below unity (Table 8-3). Concentrations at these levels are unlikely to be ecologically relevant.

8.10 Level II Screening Recommendations

Most chemicals detected in ODA1 soil were detected at concentrations that are unlikely to be ecologically relevant. For the discrete samples, all five identified COPECs were detected at relatively low concentrations that, with the exception of mercury, approximated their BSVs, or ESVs, or both. Mercury had an elevated HQ value of over 100, which is attributable to its extremely conservative ESV, even though it was only greater than natural concentrations by a factor of approximately two. However, it is noted that the mean concentration of mercury

in discrete samples was lower than its BSV; therefore, the average detected concentrations were below naturally occurring levels. Also, when a more realistic ESV was used, the mercury HQ was less than one. Similarly, although 14 chemicals were identified as COPECs in the ISM surface soil samples, none appear to warrant further investigation for ecological purposes alone. Eight of the nine metal COPECs had HQs that did not exceed 10, which, given the conservative nature of the Level II Screening, suggests that they are not present at sufficiently high concentrations to warrant concern. The HQ for mercury exceeded 100, but this HQ is likely overestimated due to the conservative ESV that was used for this SLERA. Of the six organic chemicals identified as COPECs, only 2,4,6-TNT had an HQ slightly greater than one; the other five chemicals were selected as COPECs either because they lacked an ESV or because they are PBT compounds that were detected at low concentrations below their ESVs. However, given their low concentrations, it is unlikely that these chemicals have the potential to cause adverse ecological effects to populations.

In summary, slightly elevated concentrations were detected in both discrete and ISM samples, and the potential for localized ecological impacts cannot be completely discounted. However, given the fact that the terrestrial area evaluated for ODA1 is less than one acre in size, and that the Phase II Screening uses highly conservative assumptions, it is unlikely that exposure to the surface soil COPECs identified in this SLERA would adversely impact populations of ecological receptors at ODA1. Therefore, no further investigation (i.e., a Level III Baseline) or action is considered necessary at ODA1 for ecological purposes.



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RAVENNA ARMY AMMUNITION PLANT, RAVENNA, OHIO

RVAAP-03
OPEN DEMOLITION AREA #1

Shaw Environmental & Infrastructure, Inc.
(A CB&I Company)

Project Number: 136147

FIGURE 8-1 CONCEPTUAL SITE MODEL FOR LEVEL II SCREENING

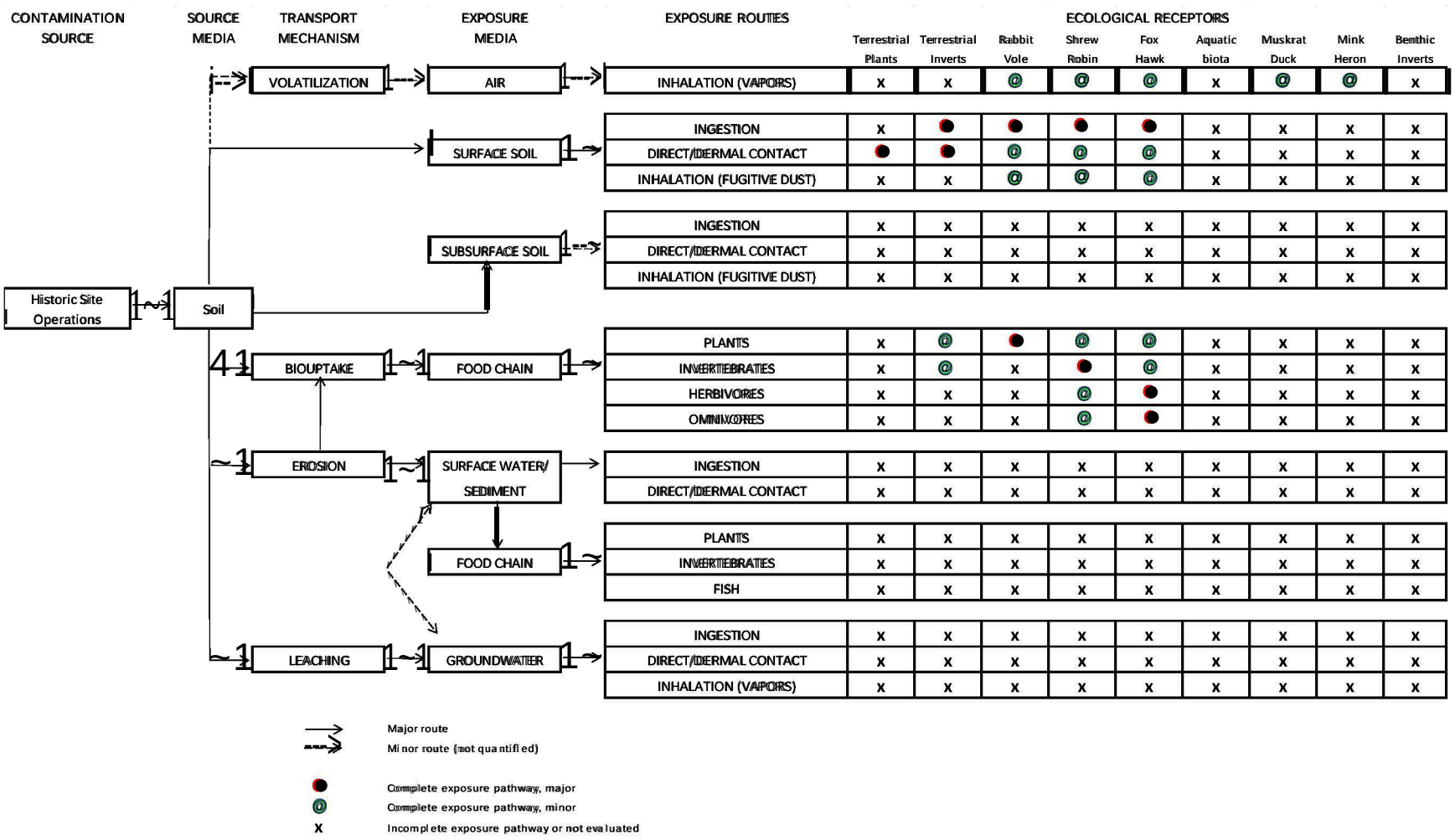

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FIGURE 8-2 PRELIMINARY CONCEPTUAL SITE MODEL FOR LEVEL III BASELINE

Table 8-9
Summary of Hazard Quotients for COPECs in ISM Surface Soil Sample Units (0-1 ft bgs)
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Sample Location:	DA1SS-050	DA1SS-051	DA1SS-052	DA1SS-053	DA1SS-054
Sample Number:	DA1SS-050M-0201-SO	DA1SS-051M-0201-SO	DA1SS-052M-0201-SO	DA1SS-053M-0201-SO	DA1SS-054M-0201-SO
Sample Date:	27-Sep-10	27-Sep-10	27-Sep-10	10-Nov-10	10-Nov-10
Sample Depth (ft bgs):	0 - 1	0 - 1	0 - 1	0 - 1	0 - 1
COPEC	Result	Result	Result	Result	Result
Inorganics					
Antimony	4.4	5.6		10.0	
Cadmium	7.2		2.6	4.7	1.4
Chromium	4.2	4.2	2.8	5.9	2.2
Cobalt				1.6	
Copper	6.7	1.1	6.4	2.6	
Mercury	**72.5**		**154.9**	**74.5**	
Selenium					4.6
Thallium	1.6	1.5			
Zinc	4.2		2.6	3.1	2.6
Explosives					
2,4,6-Trinitrotoluene					
Nitroguanidine					
Pesticides					
4,4'-DDE [a]					
gamma-Chlordane [a]					
Heptachlor [a]					
Semivolatile Organic Compounds					
Di-n-Butyl Phthalate [a]					

[a] *denotes MDC is below ESV; COPEC is retained for bioaccumulative effects.*
Cells in bold exceed an HQ of 10; Cells shaded gray exceed an HQ of 100. Only results that exceeded background and ecological screening values are presented.
COPEC denotes chemical(s) of potential ecological concern.
DA1 denotes Open Demolition Area # 1 area of concern.
DDE denotes dichlorodiphenyldichloroethylene.
ft bgs denotes feet below ground surface.
HQ denotes hazard quotient.
ISM denotes incremental sampling method.
M (in sample ID) denotes multi-incremental sample.
MDC denotes maximum detected concentration.
SO denotes soil sample.
SS denotes surface soil.

Table 8-4
Number of COPECs Identified for ISM Surface Soil Samples (0–1 ft bgs)
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Sample Unit	Metals	Explosives	Pesticides	SVOCs
DA1SS-050	7	0	0	0
DA1SS-051	4	1	0	0
DA1SS-052	5	1	0	0
DA1SS-053	7	0	0	0
DA1SS-054	3	0	0	0

** denotes screening criteria include the BSV and the ESV screening steps.*
DA1 denotes Open Demolition Area # 1 area of concern.
COPECs denotes chemicals(s) of potential ecological concern.
SS denotes soil sample.
SVOC denotes semivolatile organic compound.

9.0 RI SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This section summarizes the significant results obtained and conclusions reached as a result of the IRP Phase II RI activities conducted at ODA1. Only the most significant findings are presented in this section and are reproduced directly or abstracted from information contained in the report. The conclusions provide general and comparative interpretations of the findings, in terms of the general objectives of the Phase II RI.

9.1 Summary of the Phase II RI Findings

The Phase II RI has resulted in the collection, evaluation, and synthesis of a large amount of information regarding past activities at ODA1, current conditions on site with respect to the presence of contaminants, and physical setting of the land. A summary of the description, materials disposed/potential contaminant sources/data gaps investigated, dates of operation, RI activities conducted, and overall site recommendations are summarized in Table 9-1.

9.2 RI Conclusions and Recommendations

Conclusions and recommendations for ODA1 evaluated as part of this RI is summarized in Tables 9-1.

Based on results of this RI, an NFA is warranted for soil, surface water, and sediment for the Unrestricted (Residential) Land Use:

- Surface Soil (0–1 ft. bgs)—No further evaluation of constituents was recommended in the human health risk assessment as none of the COPCs (thallium and cobalt) were identified as COCs since their ratio of the EPC (maximum in ISM samples) to the Residential RSLs were less than one for both cancer and noncancer effects (based on an evaluation of chemicals and the specific target organ for effects.
- Subsurface Soil (1–13 ft. bgs)—No further evaluation of constituents was recommended in the human health risk assessment as the SORs were less than one for both cancer and noncancer effects for the COPCs (aluminum, antimony, arsenic. cadmium, copper, lead, silver, and thallium) identified.
- Surface water and sediment—No further evaluation of consitiuents was recommended since no SRCs were identified in either of these media.

An NFA decision is warranted for the Unrestricted (Residential) Land Use for soil, surface water, and sediment for chemicals. No further evaluation of constituents was recommended

in the human health risk assessment for soil since the ratios of the EPC to the applicable RSLs were less than one for both cancer and noncancer effects for all COPCs identified. Since no SRCs were identified in the surface water and sediment on the AOC, NFA determination was also recommended.

In summary, slightly elevated concentrations were detected in both discrete and ISM samples, and the potential for localized ecological impacts cannot be completely discounted. However, given the fact that the terrestrial area evaluated for ODA1 is less than one acre in size, and that the Phase II Screening uses highly conservative assumptions, it is unlikely that exposure to the surface soil COPECs identified in this SLERA would adversely impact populations of ecological receptors at ODA1. Therefore, no further investigation (i.e., a Level III Baseline) or remedial action is considered necessary at ODA1 for ecological purposes.

From a chemical prospective (munition constituents - MC) and based on the IRP requirements for an NFA decision, no additional remedial actions are needed for ODA1. The AOC meets the IRP requirements of the Unrestricted (Residential) Land Use. As demonstrated in this RI, the AOC was determined to be NFA, or no further action required. However, the AOC still has potential for Munitions and Explosives of Concern (MEC) in areas that were not cleared in previously completed studies on the AOC. The ODA1 was identified in the real property records and the OHARNG Federal Installation Support Plan as an operational (active) range and not a demolition range. It was included as part of the larger adjacent maneuver area (Training Area – TA G) and deemed to be an "operational range". Under this classification, ODA1 is not eligible to be included in the Military Munitions Response (MMRP). Because it is part of the maneuver area which is an operational and active range, the additional MEC clearance will be completed by the OHARNG. It is believed that little if any MEC remains but this cannot be confirmed until a complete MEC clearance is conducted. Therefore, the AOC will be properly managed and maintained according to Army policy. The maintenance of active (operational) ranges is not part of CERCLA and active ranges are not allowed to be used by the Army except for like purposes.

Table 9-1
Conclusions and Recommendations for ODA1 Phase II Remedial Investigation, Unrestricted (Residential) Land Use
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Site	RI Conclusions	Recommendations
ODA1 (RVAAP-03)	**Analytical Results:** SRCs were identified for deep surface soil and included: 19 metals (aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, cyanide, lead, manganese, mercury, nickel, selenium, silver, thallium, vanadium, and zinc), 4 explosives (2,4,6-TNT, 2,4-DNT, 2-amino-4,6-DNT, and HMX),1 propellant (nitroguanidine), 6 pesticides (4,4'-DDT, 4,4'-DDE, Endosulfan II, gamma-chlordane, heptachlor, and heptachlor epoxide), 3 SVOCs (bis[2-Ethylhexyl]phthalate, di-n-butylphalate, and 2-methylnapthalene), and one VOC (acetone). SRCs were identified for subsurface soil and included: 13 metals (antimony, arsenic, barium, beryllium, cadmium, chromium, copper, cyanide, lead, selenium, silver, thallium, and zinc), 1 explosive (2,4,6-TNT), 7 pesticides (4,4'-DDT, 4,4'-DDE, gamma-chlordane, heptachlor, Endosulfan II, delta-BHC, and Aldrin), and 3 SVOCs (bis[2-Ethylhexyl]phthalate, isophorone, and di-n-butylphalate). **Human Health Risk Results:** The AOC meets the requirements for NFA for Unrestricted (Residential) Land Use since no COCs were identified in soil, surface water, or sediment **Ecological Risk Screening Results:** No further evaluation required.	NFA for soil, sediment and surface water MEC will be managed in accordance with DoD safety procedures and policies as they relate to operational ranges. MEC will be addressed in the future if the operational range is no longer used and is closed."

BHC denotes benzene hexachloride.
COC denotes chemical of concern.
DDE denotes dichlorodiphenyldichloroethylene.
DDT denotes dichlorodiphenyltrichloroethane.
DNT denotes dinitrotoluene.
HMX denotes octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
NFA denotes no further action.
SRC denotes site-related contaminant.
SVOC denotes semivolatile organic compound.
TNT denotes trinitrotoluene.
VOC denotes volatile organic compound.

10.0 REFERENCES

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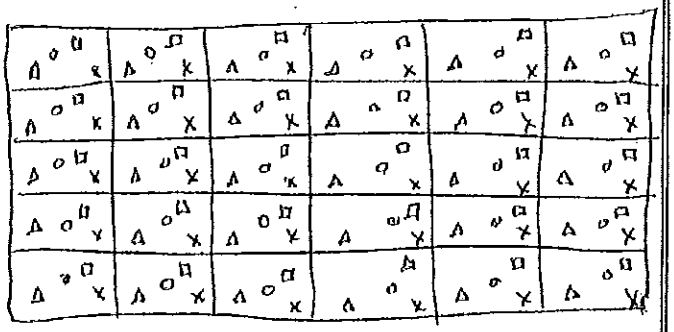
Appendix A
Boring Logs

Soil / Sediment Field Logsheet

Shaw™ Shaw E&I

Site Name: Ravenna, OH ODA1 Project #: 133616

Sample ID: DA1ss-050m-0201-SO	Sample Location Sketch: N ↑  X = node for DA1ss-050m-0201-SO; ○ = node for DA1ss-080m-0201-SO; Δ = node for DA1ss-050m-0201-MS; □ = node for DA1ss-050m-0201-MD
Sample Type*: SUR, ISM	
*: SED=Sediment; SUR=Surface soil; SUB=Subsurface Soil; OTH=Other. grab=Grab, comp=Composite	
Date Sampled: 9/27/10	
Time Sampled: 1020	
Depth (ft bgs): 1 ft.	
Physical description: Light brown loam w/ mixed clay	
Analyses requested: TAL metals, Explosives, Hex Chrome	Photograph Log #: NA
PID: NA	Calibration Date: NA
O2/LEL: NA	Calibration Date: NA
Weather: Cloudy, drizzle, cool	
Temperature: 60 °F	
Sampling Equipment: Stainless Steel push probe	
Equipment Decontamination Technique: Liquinox, Isopropyl Alcohol, DI rinse	
QC Samples: DA1ss-080m-0201-SO; DA1ss-050m-0201-MS / DA1ss-050m-0201-MD	
Analytical Laboratory: CT Laboratories	
Comments: Flat terrain,	
Field Technician: (Print) Joseph Rasnack	Date: 9/27/10

Page 2 of 4

Shaw™ Shaw E & I

Soil / Sediment Field Logsheet

Site Name: Ravenna, OH ODA1 Project #: 133616

Sample ID: DA1ss-080m-0201-SO	Sample Location Sketch: See page 1 for Sample location sketch
Sample Type*: SUR, ISM	
*: SED=Sediment; SUR=Surface soil; SUB=Subsurface Soil; OTH=Other. grab=Grab, comp=Composite	
Date Sampled: 9/27/10	
Time Sampled: N15	
Depth (ft bgs): 1 ft.	
Physical description: Light brown loam w/ mixed clay	
Analyses requested: TAL Metals, Explosives, Hex Cr.	Photograph Log #: NA
PID: NA	Calibration Date: NA
O2/LEL: NA	Calibration Date: NA
Weather: Cloudy, drizzel, cool	
Temperature: 60 °F	
Sampling Equipment: Stainless Steel push probe	
Equipment Decontamination Technique: Liquinox, Isopropyl Alcohol, DI rinse	
QC Samples: This is FD for DA1ss-050m-0201-SO	
Analytical Laboratory: CT Laboratories	
Comments: Flat terrain	
Field Technician: (Print) Joseph Rasnack	Date: 9/27/10

Page 3 of 4

Shaw™ Shaw E&I

Soil / Sediment Field Logsheet

Site Name: Ravenna, OH ODA1 Project #: 133616

Sample ID: DA1ss-050m-0201-MS	Sample Location Sketch: See page 1 for Sample Location Sketch
Sample Type*: SUR, ISM	
*: SED=Sediment; SUR=Surface soil; SUB=Subsurface Soil; OTH=Other. grab=Grab, comp=Composite	
Date Sampled: 9/27/10	
Time Sampled: 1125	
Depth (ft bgs): 1 ft.	
Physical description: Light brown loam w/ mixed clay	
Analyses requested: TAL metals, Explosives Hex Chrom	Photograph Log #: NA
PID: NA	Calibration Date: NA
O2/LEL: NA	Calibration Date: NA
Weather: Cloudy, drizzle, cool	
Temperature: 60 °F	
Sampling Equipment: Stainless steel push probe	
Equipment Decontamination Technique: Liquinox, Isopropyl Alcohol, DI rinse	
QC Samples: this is MS for DA1ss-050m-0201-SO	
Analytical Laboratory: CT Laboratories	
Comments: Flat terrain	
Field Technician: (Print) Joseph Rasnack	Date: 9/27/10

Shaw™ Shaw E&I

Soil / Sediment Field Logsheet

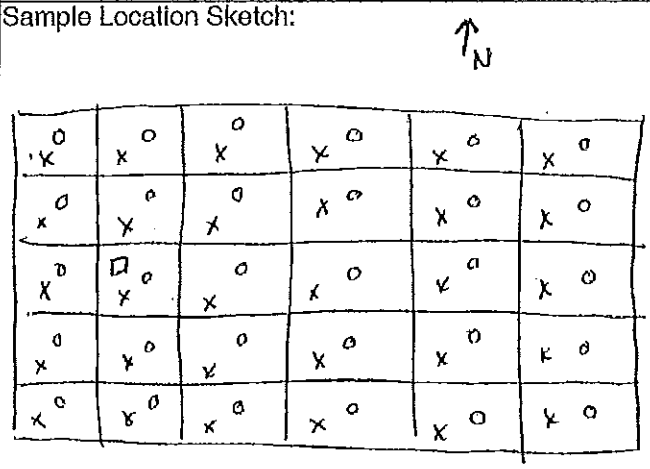
Site Name: Project #: 133616

Sample ID: DA1ss-050m-0201-MD	Sample Location Sketch: See page 1 for Sample Location Sketch
Sample Type*: SUR, ISM	
*: SED=Sediment; SUR=Surface soil; SUB=Subsurface Soil; OTH=Other. grab=Grab, comp=Composite	
Date Sampled: 9/27/10	
Time Sampled: 1145	
Depth (ft bgs): 1 ft.	
Physical description: Light brown loam w/ mixed clay	
Analyses requested: TAL Metals, Explosives, Hex. Cr.	Photograph Log #: NA
PID: NA	Calibration Date: NA
O2/LEL: NA	Calibration Date: NA
Weather: Cloudy, drizzle, cool	
Temperature: 60 °F	
Sampling Equipment: Stainless Steel push probe	
Equipment Decontamination Technique: Liquinox, Isopropyl Alcohol, DI rinse	
QC Samples: This MD for DA1ss-050m-0201-SO	
Analytical Laboratory: CT Laboratories	
Comments: Flat terrain	
Field Technician: (Print) Joseph Rasnack	Date: 9/27/10

Soil / Sediment Field Logsheet

Shaw™ Shaw E&I

Site Name: Ravenna, OH Open Demolition Area 1 Project #: 133616

Sample ID: DA1ss-052m-0201-SO	Sample Location Sketch: 
Sample Type*: SUR, ISM	
*: SED=Sediment; SUR=Surface soil; SUB=Subsurface Soil; OTH=Other. grab=Grab, comp=Composite	
Date Sampled: 9/27/10	
Time Sampled: 0840	
Depth (ft bgs): 1 foot	
Physical description: light brown, loam w/ mixed clay, dry	
Analyses requested: TAL Metals, Explosives, Hex Chrom, Propellants, SVOCs, Pesticides, PCBs, Cyanide	Photograph Log #: NA
PID: NA	Calibration Date: NA
O2/LEL: NA	Calibration Date: NA
Weather: Cloudy, 60°F, no breeze	
Temperature: 60 °F	
Sampling Equipment: Stainless steel push probe	
Equipment Decontamination Technique: Liquinox, Isopropyl Alcohol, DI rinse	
QC Samples: DA1ss-052m-0201-SO (Army Dup)	
Analytical Laboratory: CT Laboratories,	
Comments: Clear, open (grass) terrain.	
Field Technician: (Print) Joseph Rasnack	Date: 9/27/10

Shaw™ Shaw E & I

Soil / Sediment Field Logsheet

Site Name: Ravenna, OH ODA 1 Project #: 133616

Sample ID: DA1ss-052m-0201-SO (Army Dup.)	Sample Location Sketch: See Page 1 for Sample Location sketch
Sample Type*: SUR, ISM	
*: SED=Sediment; SUR=Surface soil; SUB=Subsurface Soil; OTH=Other. grab=Grab, comp=Composite	
Date Sampled: 9/27/10	
Time Sampled: 0905	
Depth (ft bgs): 1 ft.	
Physical description: light brown loam w/ mixed clay; dry	
Analyses requested: TAL metals, Explosives, Hex Chrom, Propellants, SVOCs, Pesticides, PCBs Cyanide	Photograph Log #: NA
PID: (NA) NA	Calibration Date: NA
O2/LEL: NA	Calibration Date: NA
Weather: Cloudy, light breeze	
Temperature: 60 °F	
Sampling Equipment: Stainless Steel push probe	
Equipment Decontamination Technique: Liquinox, Isopropyl Alcohol, DI rinse	
QC Samples: This is Army Dup QA Sample for DA1ss-052m-0201-SO	
Analytical Laboratory: CT Laboratories	
Comments: Clear, open terrain	
Field Technician: (Print) Joseph Rasrock	Date: 9/27/10

Shaw™ Shaw E&I

Soil / Sediment Field Logsheet

Site Name: Ravenna OH UDA 1 Project #: 133616

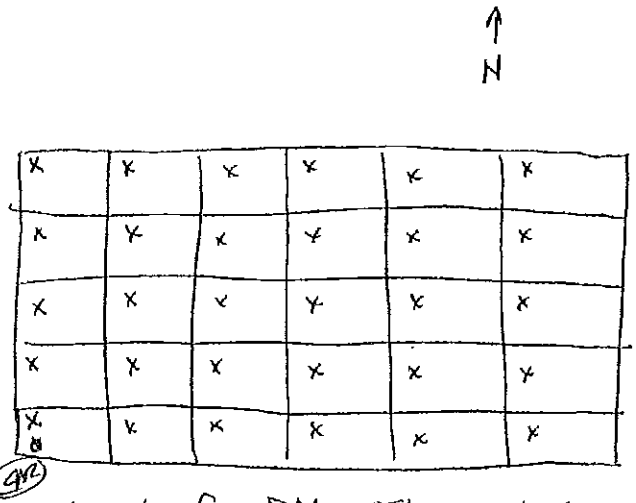
Sample ID: DA1ss-052d-0201-SO	Sample Location Sketch: See page 1 for Sample location Sketch
Sample Type*: SUR, DISCRETE	
*: SED=Sediment; SUR=Surface soil; SUB=Subsurface Soil; OTH=Other. grab=Grab, comp=Composite	
Date Sampled: 9/27/10	
Time Sampled: 0915	
Depth (ft bgs): 1 ft.	
Physical description: light brown loam w/ mixed clay; dry	
Analyses requested: VOCs	Photograph Log #: NA
PID: NA	Calibration Date: NA
O2/LEL: NA	Calibration Date: NA
Weather: Cloudy, light breeze	
Temperature: 60 °F	
Sampling Equipment: Terra Core	
Equipment Decontamination Technique: NA	
QC Samples: DA1ss-052d-0201-SO (Army Dup) @ 0920	
Analytical Laboratory: CT Laboratories	
Comments: Clear, open terrain	
Field Technician: (Print) Joseph Rasnack	Date: 9/27/10

Shaw™ Shaw E&I

Soil / Sediment Field Logsheet

Site Name: Ravenna, OH ODA 1 Project #: 133616

Sample ID: DA1ss-051m-0201-SO	Sample Location Sketch:
Sample Type*: SUR, ISM	
*: SED=Sediment; SUR=Surface soil; SUB=Subsurface Soil; OTH=Other. grab=Grab, comp=Composite	
Date Sampled: 9/27/10	
Time Sampled: 0940	
Depth (ft bgs): 1 foot	
Physical description: light brown loose loam w/ some clay	
Analyses requested: TAL metals, Explosives, Hex Chromic	Photograph Log #: NA
PID: NA	Calibration Date: NA
O2/LEL: NA	Calibration Date: NA



Weather:	Cloudy, cool
Temperature:	60 °F
Sampling Equipment:	Stainless Steel push probe
Equipment Decontamination Technique:	Liquinox, Isopropyl Alcohol, DI rinse
QC Samples:	none (QA samples moved to area DA1ss-050)
Analytical Laboratory:	CT Laboratories
Comments:	Thick vegetation in certain areas.
Field Technician: (Print)	Joseph Rasnack Date: 9/27/10

11/10/10 RAVENNA 133616

0700 ON SITE
MOBILIZE, H+S TAILGATE MEETING

0820 ARRIVE AT ODA1

0840 SET UP DE-CON AREA

0900 SET UP GRID FOR DA1 SS-053m
ASSIST W/ GEOPROBE SAMPLING

1025 BEGIN SAMPLING OF DA1 SS-053m

1100 COMPLETE SAMPLING OF DA1 SS-053m
PAPERWORK, DE-CON PUSH PROBE
ASSIST W/ GEOPROBE SAMPLING /DE-CON

1145 LAY OUT GRID FOR DA1 SS-054
ASSIST WITH GEOPROBE SAMPLING /DE-CON

1200 LOCATE GEOPROBE SAMPLE POINTS

1300 BEGIN SAMPLING OF DA1 SS-054

1400 COMPLETE SAMPLING OF DA1 SS-054
PAPER WORK, DE-CON
ASSIST IN GEOPROBE SAMPLING

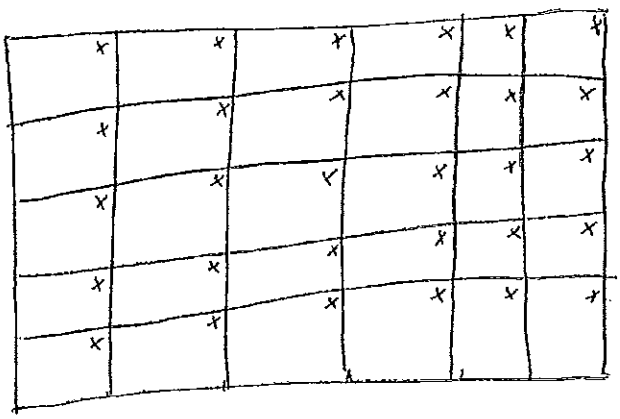
1500 EXIT ODA1

1515 ARRIVE AT BLDG. 1036
DRUM SOIL, IDW PPE, & DE-CON WATER
PACK ICE, PACK SAMPLE COOLERS

Shaw™ Shaw E & I

Soil / Sediment Field Logsheet

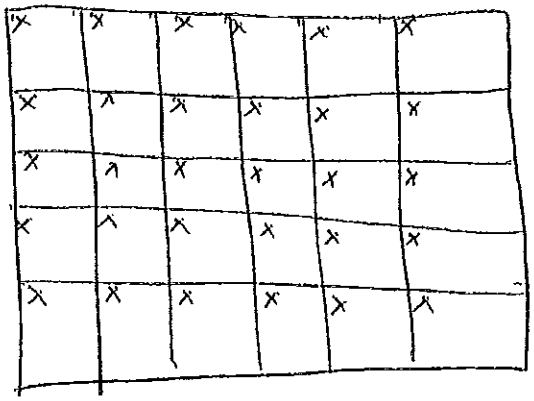
Site Name: RAVENNA, OH ODA1 Project #: 133616

Sample ID: DA1ss-053m-0201-SO	Sample Location Sketch: N ↑ 
Sample Type*: SUR, ISM	
*: SED=Sediment; SUR=Surface soil; SUB=Subsurface Soil; OTH=Other. grab=Grab, comp=Composite	
Date Sampled: 11 | 10 | 10	
Time Sampled: 1100	
Depth (ft bgs): 1ft.	
Physical description: MIX OF CLAY & SAND SOME SILTY CLAY	
Analyses requested: TAL METALS, EXPLOSIVES, HEXAVALENT CHROMIUM	X- NODE FOR DA1ss-053m-0201-SO
	Photograph Log #: NA
PID: NA	Calibration Date: NA
O2/LEL: NA	Calibration Date: NA
Weather: CLEAR	
Temperature: 56 °F	
Sampling Equipment: PUSH PROBE TO 1 ft.	
Equipment Decontamination Technique: LIQUINOX, DI, ISOPROPYL	
QC Samples: NA	
Analytical Laboratory: CT LABORATORIES	
Comments: SOIL VARIES FROM CLAY TO SAND W/ SOME SILTY CLAY	
Field Technician: (Print) KYLE HAVENS	Date: 11 | 10 | 10

Shaw™ Shaw E & I

Soil / Sediment Field Logsheet

Site Name: RAVENNA, OH ODA1 Project #: 133616

Sample ID: DA1ss-054m-0201-SO	Sample Location Sketch: N ↑  X - NODE FOR DA1ss-054m-0201-SO
Sample Type*: SUR, ISM	
*: SED=Sediment; SUR=Surface soil; SUB=Subsurface Soil; OTH=Other, grab=Grab, comp=Composite	
Date Sampled: 11/10/10	
Time Sampled: 1400	
Depth (ft bgs): 1 ft	
Physical description: CLAY, SILTY CLAY, SAND	
Analyses requested: TAL METALS, EXPLOSIVES, HEXAVALENT CHROMIUM	Photograph Log #: NA
PID: NA	Calibration Date: NA
O2/LEL: NA	Calibration Date: NA
Weather: CLEAR	
Temperature: 58 °F	
Sampling Equipment: PUSH PROBE TO 1 ft.	
Equipment Decontamination Technique: LIQUINOX, DI, ISOPROPYL	
QC Samples: NA	
Analytical Laboratory: CT LABORATORIES	
Comments: SOIL VARIES FROM CLAY, SILTY CLAY, TO SAND	
Field Technician: (Print) KYLE HAVENS	Date: 11/10/10

HTRW DRILLING LOG

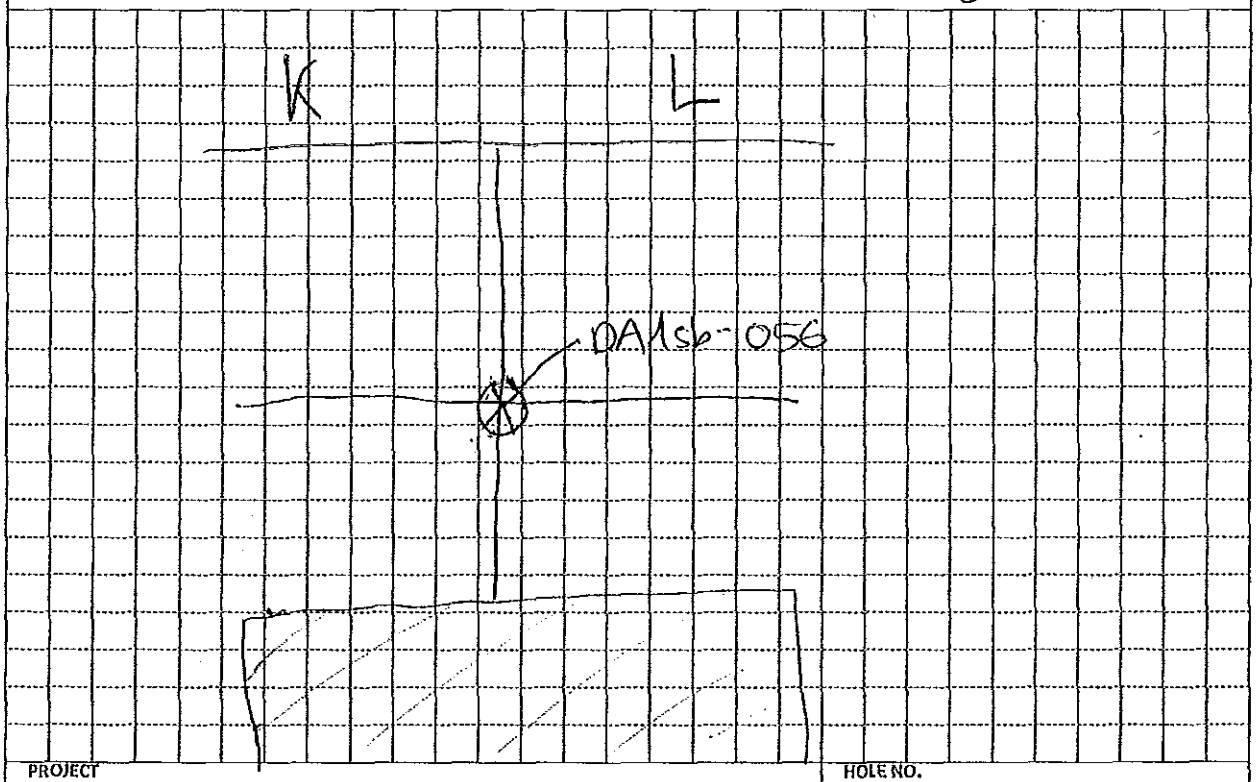
DISTRICT		HOLE NUMBER: DA1sb-056
1. COMPANY NAME: The Shaw Group - Shaw E&I	2. DRILL CONTRACTOR: Frontz Drilling	SHEET 1 OF 2
3. PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)	4. LOCATION: Ravenna, Ohio	
5. NAME OF DRILLER: Jeremy L.	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 6620DT	
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Geoprobe 6620DT Truckmounted rig	8. HOLE LOCATION	
	9. SURFACE ELEVATION	
	10. DATE STARTED: 9/22/10	11. DATE COMPLETED: 9/22/10
12. OVERBURDEN THICKNESS: NA	15. DEPTH OF GROUNDWATER ENCOUNTERED: ~~NA~~ ~6'?	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 16'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. OTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
		✓	Explosives			100 %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite ✓			

LOCATION SKETCH/COMMENTS — SCALE:



PROJECT	HOLE NO.
RVAAP - MI Sampling (Ravenna A/E: 133616)	DA1sb-056

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: DA1Sb-056

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

INSPECTOR: S. Barry, R. Harrison

SHEET 2 OF 2

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIAL (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	1–4	Light brown/gray, dry, dense, FINE SAND, trace silt	0.0 ppm	NA	0001	NA	DA1Sb-056m-0001-SO 1545
~6' ▽	5–8	Light brown, dry, dense, F. SAND, trace silt (4-6'); Light brown, wet, dense, SILTY SAND (6-8')	0.0 ppm		0002		DA1Sb-056m-0002-SO 1550
	9–12	Light brown, moist, dense, SILTY CLAY (BPH)	0.0 ppm		0003		DA1Sb-056m-0003-SO 1555
	13–16	(BPH) Brown/gray, moist, dense, SILTY CLAY	0.0 ppm		0004		DA1Sb-056m-0004-SO ~~1500~~ (BPH) 1600
				EOB 16'			

USCS Class: SP; SM; CL/ML

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

HOLE NO.: DA1Sb-056

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

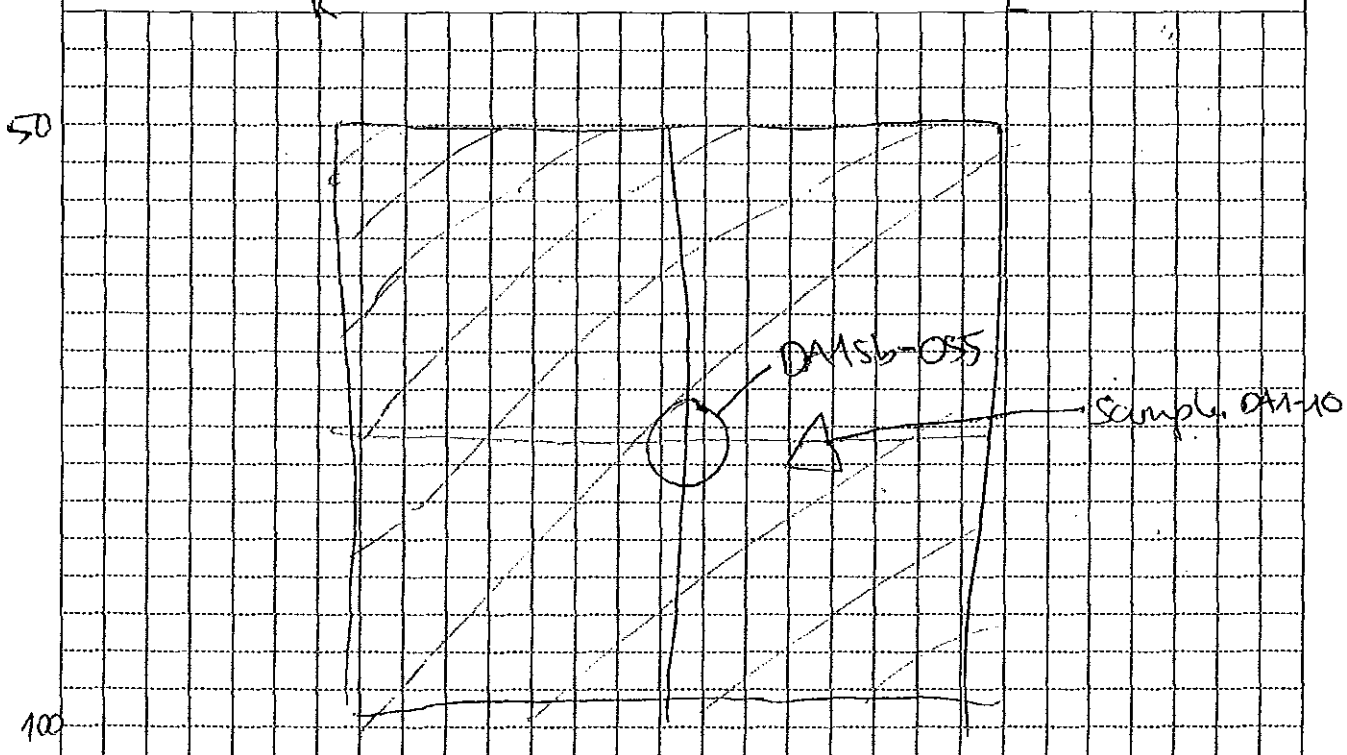
DISTRICT		HOLE NUMBER: DAMSb-055
1. COMPANY NAME: The Shaw Group - Shaw E&I	2. DRILL CONTRACTOR: Frontz Drilling	SHEET 1 OF 2
3. PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)	4. LOCATION: Ravenna, Ohio	
5. NAME OF DRILLER	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 6620DT	
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Geoprobe 6620DT Truck mounted rig	8. HOLE LOCATION	
	9. SURFACE ELEVATION: —	
	10. DATE STARTED: 9/22/10	11. DATE COMPLETED: 9/22/10
12. OVERBURDEN THICKNESS: NA	15. DEPTH OF GROUNDWATER ENCOUNTERED: NA ~6'?	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —	
14. TOTAL DEPTH OF HOLE: TD 16'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): —	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. OTAL NUMBER OF CORE BOXES
NA			

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
		✓	Explosives			100' %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite			

LOCATION SKETCH/COMMENTS — SCALE: 1"



PROJECT	HOLE NO.
RVAAP - MI Sampling (Ravenna A/E: 133616)	DAMSb-055

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: DA1SB-055

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

INSPECTOR: S. Barry, R. Harrison

SHEET 2 OF 2

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIAL (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)	USCS Class
	1–3	Light brown, dry, dense (no sample collected)	No Sample 0.0 ppm	NA	No Sample	NA	—	(NA)
~617 ▽	4–7	Light brown, moist, dense, SILTY SAND (4-6') Light brown, wet, dense, SILT (6-8')	0.0 ppm	NA	0001	NA	DA1SB-055M-0001-SO 1605	SM → ML
	8–11	Light brown, moist, dense, SILT	0.0 ppm	NA	0002	NA	DA1SB-055M-0002-SO 1610	ML
	12–15	Light brown, moist, dense, MED. SAND (12–13') Light brown/gray, moist, dense, SILTY CLAY	0.0 ppm	NA	0003	N/A	DA1SB-055M-0003-SO 1615	SP → CL/ML
	16	EOD 16'						

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

HOLE NO: DA1SB-055

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

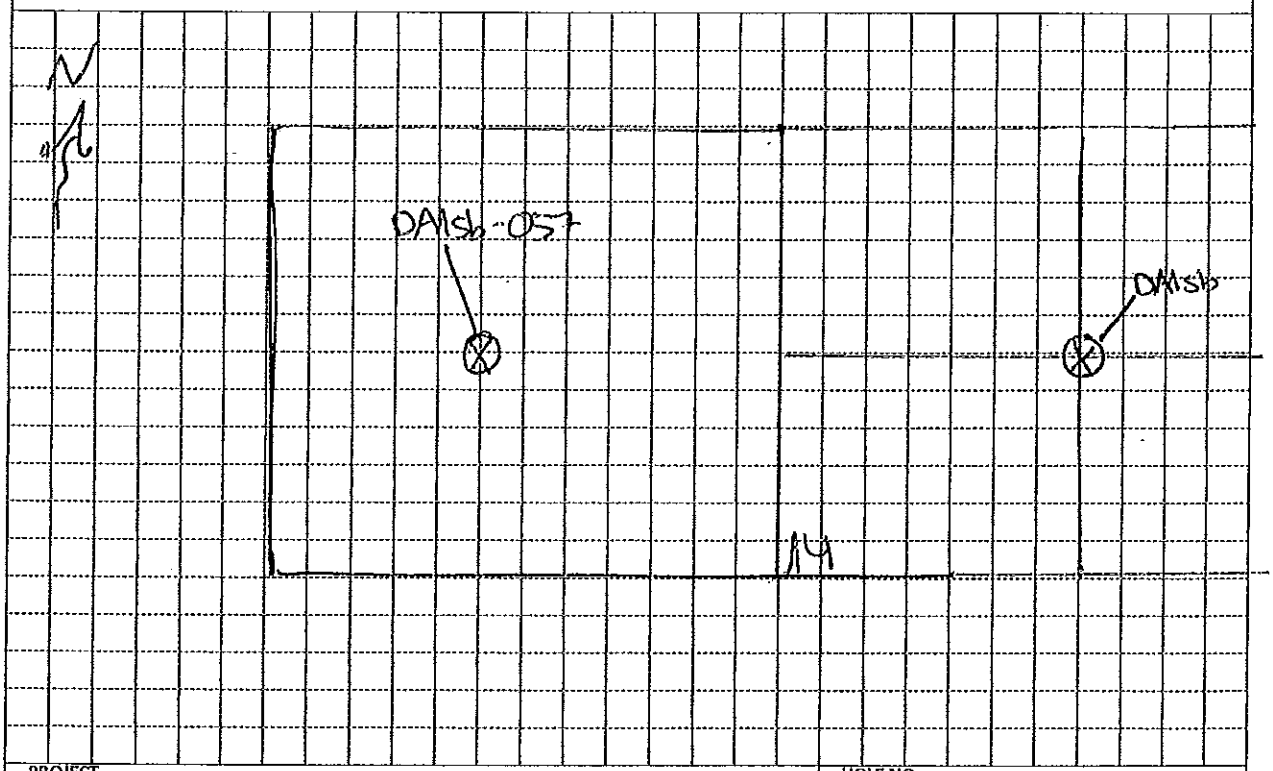
DISTRICT		HOLE NUMBER: DA1sb-057
1. COMPANY NAME: The Shaw Group - Shaw E&I	2. DRILL CONTRACTOR: Frontz Drilling	SHEET 1 OF 2 SHEET
3. PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)	4. LOCATION: Ravenna, Ohio	
5. NAME OF DRILLER: Jeremy L.	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 6620DT	
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Geoprobe 6620DT Trackmounted w/g Acetate sample liner (4')	8. HOLE LOCATION	
	9. SURFACE ELEVATION: —	
	10. DATE STARTED: 9/23/10	11. DATE COMPLETED: 9/23/10
12. OVERBURDEN THICKNESS: NA	15. DEPTH OF GROUNDWATER ENCOUNTERED	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —	
14. TOTAL DEPTH OF HOLE: 16'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): —	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. OTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
		✓	explosives			

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite	NA	NA	Still Pg

LOCATION SKETCH/COMMENTS — SCALE:



PROJECT	HOLE NO.
RVAAP - MI Sampling (Ravenna A/E: 133616)	DA1sb-057

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: DA156-057

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

INSPECTOR: J. Berry, R. Harrison

SHEET 2 OF 2

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIAL (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)	USCS CLASS
	1–4	Brown, dry, loose, organic material (roots), MED-F SAND, trace gravel (1–1.5'); Light brown, dry, loose, FINE SAND & SILT	0.0 ppm	NA		NA	DA156-057m-0201-SO; 0900	SW; ML
@6"	5–8	Brown, moist, dense, FINE SAND & SILT (4–6'); Brown, moist, dense FINE & SILT (6–8')	0.0 ppm				DA156-057m-0202-SO; (~70% Recovery) 0905	
	9–12	Brown, moist, dense, SILTY CLAY (wet lens @10' -3")	0.0ppm				DA156-057m-0203-SO; 0910	CL/ML
	13–16	Gray, moist, dense, SILTY CLAY (12–13'); Brown/gray, dense, SILTY CLAY (13–14.5'); Brown, moist, dense, M-F SAND (14.5–16)	0.0 ppm				DA156-057m-0204-SO; 0915	SW
		EOB 16'						

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

HOLE NO. DA156-057

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

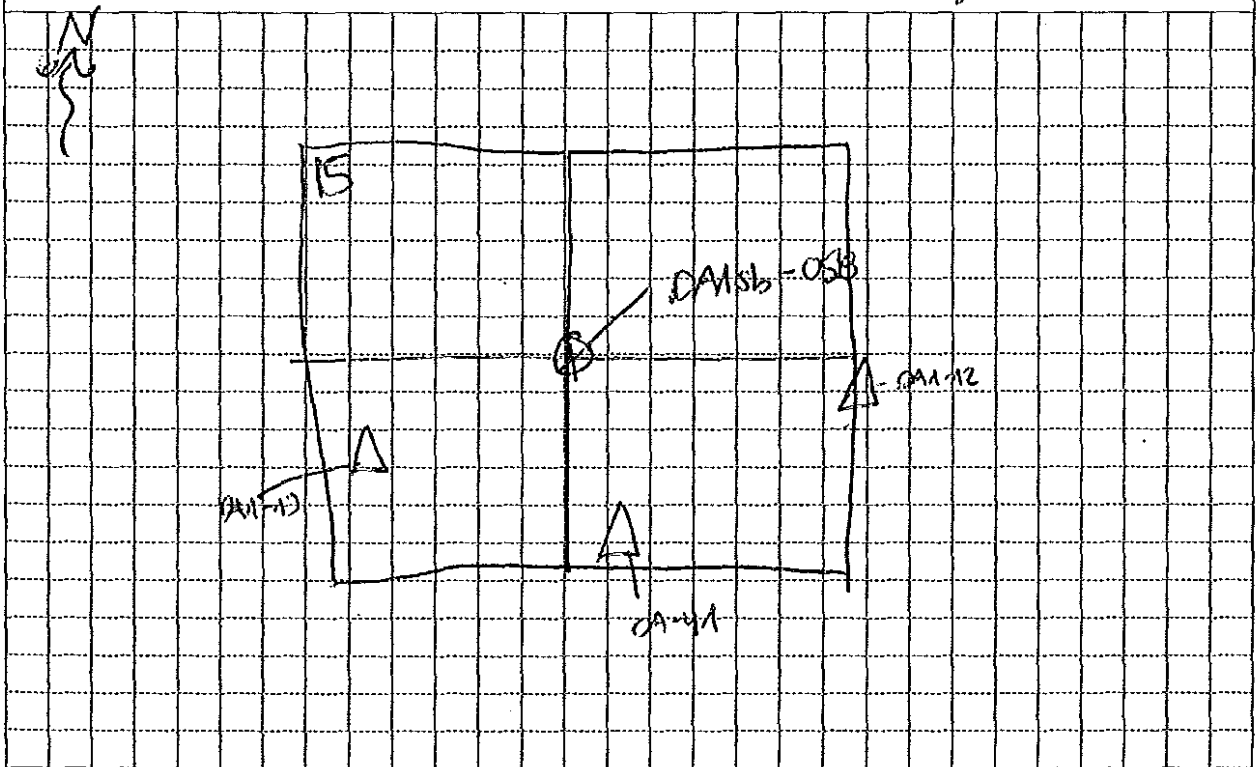
DISTRICT		HOLE NUMBER: DA1sb-058
1. COMPANY NAME: The Shaw Group - Shaw E&I	2. DRILL CONTRACTOR: Frontz Drilling	SHEET 1 OF 2
3. PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)	4. LOCATION: Ravenna, Ohio	
5. NAME OF DRILLER	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 6620DT	
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Geoprobe 6620DT Truck mounted rig	8. HOLE LOCATION	
	9. SURFACE ELEVATION: —	
	10. DATE STARTED: 9/23/10	11. DATE COMPLETED: 9/23/10
12. OVERBURDEN THICKNESS: NA	15. DEPTH OF GROUNDWATER ENCOUNTERED	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 16'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. OTAL NUMBER OF CORE BOXES

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
		✓	Explosive			100 %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite	NA	NA	Signature

LOCATION SKETCH/COMMENTS — SCALE:



PROJECT	HOLE NO.
RVAAP - MI Sampling (Ravenna A/E: 133616)	DA1sb-058

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: DA156-058

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

INSPECTOR: S. Bamy, R. Harrison

SHEET 2 OF 2

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIAL (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)	USCS Class
	1–4	Brown, moist, dense, FINE SAND, trace silt + gravel & org material (roots)	0.0 ppm	NA	No Sample	NM	No Sample	SP
~6' V	5–8	Brown, moist, dense, FINE SAND (4-6') trace silt Brown, wet, dense, FINE SAND trace silt (6-8')	0.0 ppm		0001		DA156-058M-0001-SO 0845	
	8–12	Brown, moist, dense, SILTY CLAY	0.0 ppm		0002		DA156-058M-0002-SO 0850	CL/ML
	13–16	Brown, moist, dense, SILTY CLAY	0.0 ppm		0003		DA156-058M-0003-SO 0855	
	17	EOB 16'						

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

HOLE NO.: DA156-058

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

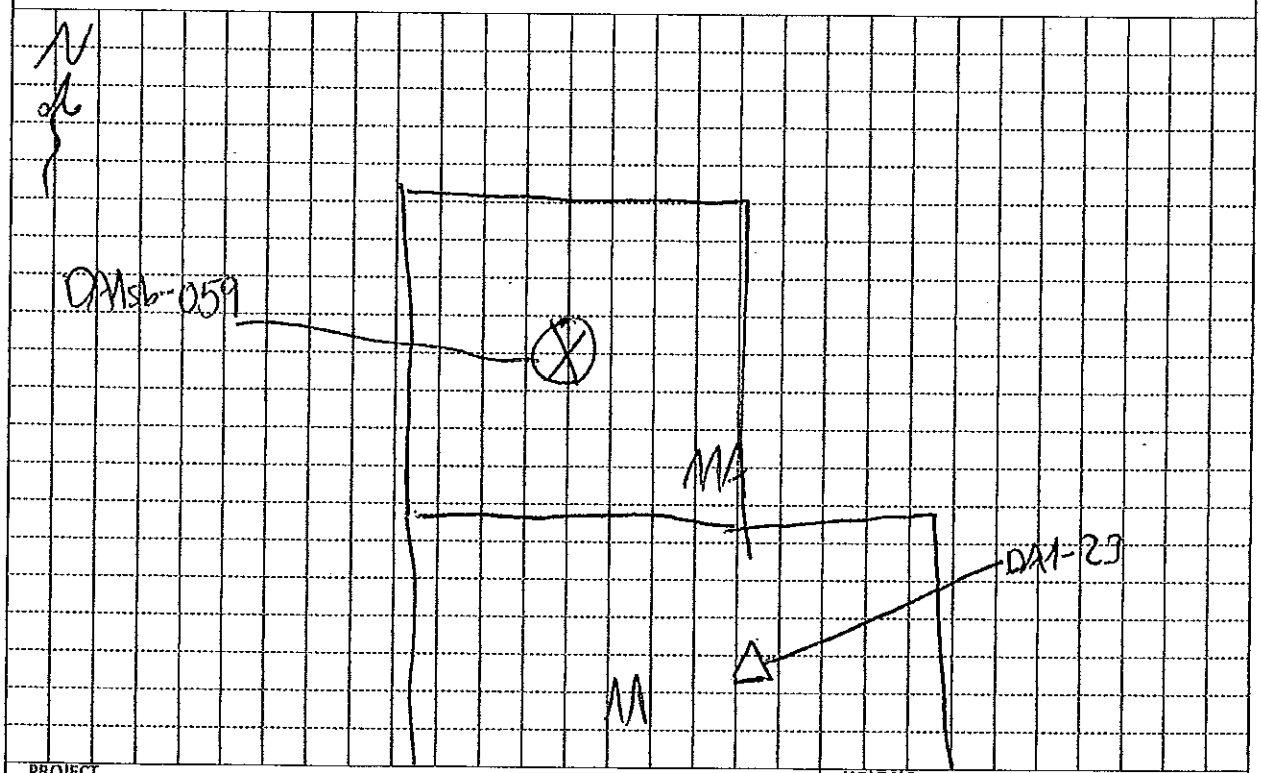
DISTRICT		HOLE NUMBER DAMS 059
1. COMPANY NAME: The Shaw Group - Shaw E&I	2. DRILL CONTRACTOR: Frontz Drilling	SHEET 1 OF 2
3. PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)	4. LOCATION: Ravenna, Ohio	
5. NAME OF DRILLER	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 6620DT	
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Geoprobe 7720DT Trackmounted rig; Acetate Sample Liners (4')	8. HOLE LOCATION	
	9. SURFACE ELEVATION: —	
	10. DATE STARTED: 9/23/10	11. DATE COMPLETED: 9/23/10
12. OVERBURDEN THICKNESS: NA	15. DEPTH OF GROUNDWATER ENCOUNTERED: 15'	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —	
14. TOTAL DEPTH OF HOLE: 16'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): —	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. OTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Pesticides PCB	Cyanide Perchlorate	SVOC Hex Chrome	100% except Sec 0% (50)

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite	NA	NA	

LOCATION SKETCH/COMMENTS — SCALE:



PROJECT	HOLE NO.
RVAAP - MI Sampling (Ravenna A/E: 133616)	DAMS6-059

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: DAMSb-059

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

INSPECTOR: S Bamy, R. Harrison

SHEET 2 OF 2

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIAL (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)	USCS CLASS
1		Brown, dry, ~~gravelly~~, M-F SAND, trace org. (roots) (1-2')	0.0ppm	NA	NO sample	NA	No sample	SP
2		Brown, dry, dense, FINE SAND & SILT (2-5')						SM
3								
4								
5								
6		Brown, dry, dense, ~~FINE~~ FINE SAND & SILT	0.0ppm		0201		DAMSb-059m-0201-SO DAMSb-059d-0201-SO (VOC) Hex Chrome 0915	
7								
8								
9		~~Light~~ brown, wet, med. dense, CLAY (8-9')	0.0ppm		0202		DAMSb-059m-0202-SOL	CL/ML
10		~~Light~~ brown, moist, dense, SILTY CLAY (9-11')						
11		Light brown/blonde, moist, dense, F SAND, trace med. sand (11-12')					~~Moisture~~ 0920	SP
12		Brown, wet, M-F SAND, little gravel (12-13.5')	0.0ppm		0203		DAMSb-059m-0203-SOL(W) DAMSb-059m-0203-SO(QA) DAMSb-059m-0203-SO(DUP)	
13								
14		Blonde, wet, M-F SAND, little gravel (13.5'-14')						
15		Brown, wet, C-M SAND, little gravel (14-16')					65% Recovery 0925	
16		EOB 16'						

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

HOLE NO.: DAMSb-059

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

DISTRICT		HOLE NUMBER: DA1Sb-060
1. COMPANY NAME: The Shaw Group - Shaw E&I	2. DRILL CONTRACTOR: Frontz Drilling	SHEET 1 OF 2

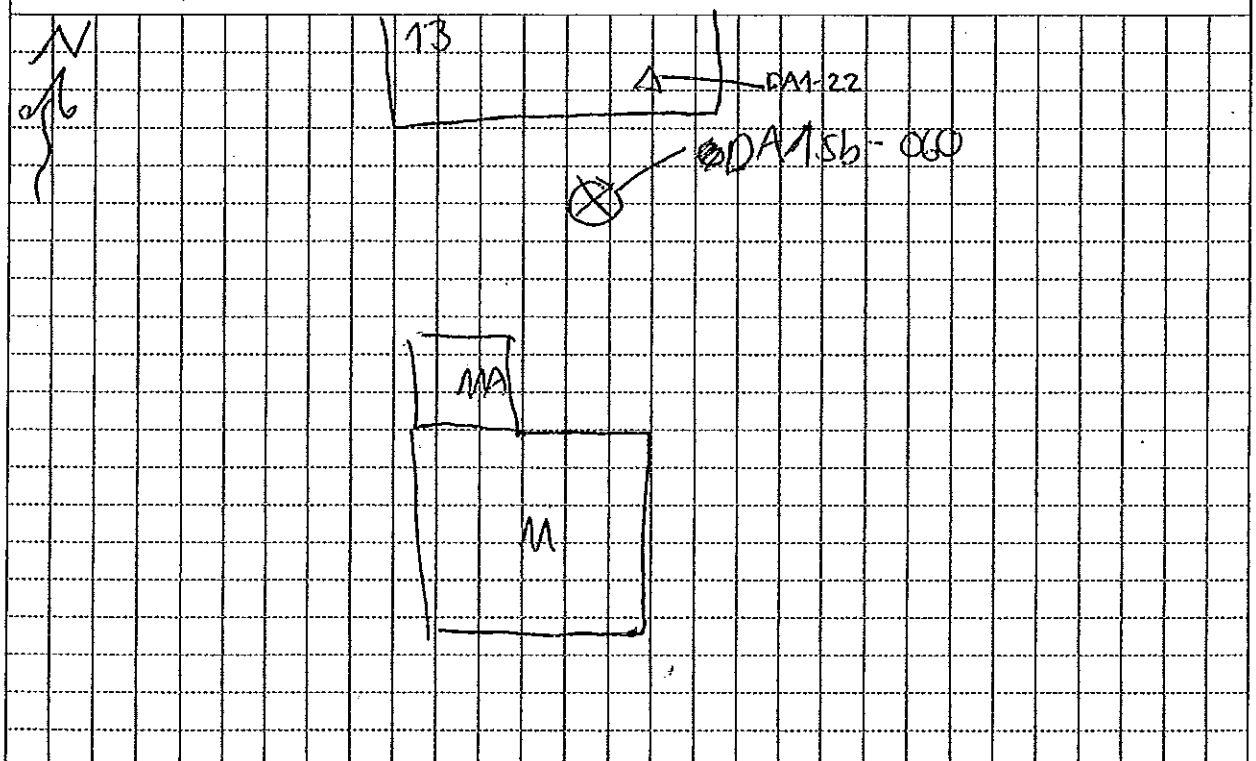
3. PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)	4. LOCATION: Ravenna, Ohio
5. NAME OF DRILLER	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 6620DT
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Geoprobe 6620DT Trackmounted rig; Acetate sample liners (4')	8. HOLE LOCATION
	9. SURFACE ELEVATION: —
	10. DATE STARTED: 9/23/10 — 11. DATE COMPLETED: 9/23/10
12. OVERBURDEN THICKNESS: NA	15. DEPTH OF GROUNDWATER ENCOUNTERED: 4.5'
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —
14. TOTAL DEPTH OF HOLE: 16	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): —

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. OTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
		✓	Explosives			

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite	NA		Steve Ray

LOCATION SKETCH/COMMENTS — SCALE:



PROJECT	HOLE NO.
RVAAP - MI Sampling (Ravenna A/E: 133616)	DA1Sb-060

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: DA1Sb-060

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

INSPECTOR: S. Barry, R. Hamson

SHEET 2 OF 2

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIAL (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)	USCS CLASS
	1–4	Brown, dry, loose, M-F SAND, trace organics (roots) (1-2') Brown, dry, loose, M-F SAND, little silt & gravel, trace organics (2-4')	0.0 ppm	NA	0201	NA	DA1Sb-060m-0201-SO 0930	SP (org) SW
4.5' ▽	5–8	Light brown, wet, dense, SILTY CLAY (4-5.5') Light brown, ~~brown~~, wet, dense, SILT (5.5'-8')	0.0 ppm		0202		DA1Sb-060m-0202-SO 0935	CL/ML ML
	9–12	Light brown, wet, dense, SILTY CLAY (8-10') Light brown, ~~brown~~ moist, dense, SILT (10-12')	0.0 ppm		0203		DA1Sb-060m-0203-SO 0940	CL/ML ML
	13–16	browngray, moist, ~~brown~~ SANDY SILT (12-14') Brown, wet, dense, M-F SAND, trace coarse sand & small gravel (14-16')	0.0 ppm		0204		DA1Sb-060-0204-SO 0945	SW
		EOB 16'						

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

HOLE NO. DA1Sb-060

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

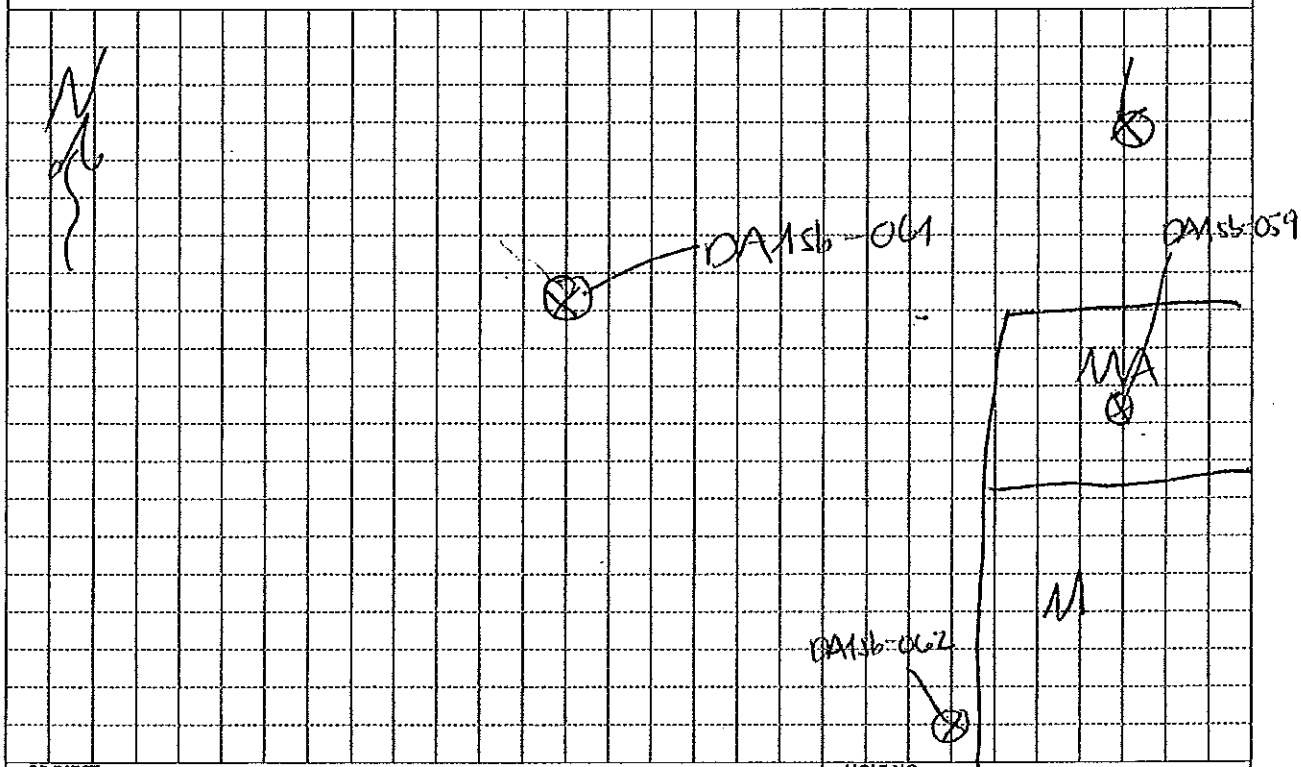
DISTRICT		HOLE NUMBER: DA156-061
1. COMPANY NAME: The Shaw Group - Shaw E&I	2. DRILL CONTRACTOR: Frontz Drilling	SHEET 1 OF 2
3. PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)	4. LOCATION: Ravenna, Ohio	
5. NAME OF DRILLER	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 6620DT	
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Truckmounted Drill Rig; Acetate Sample Liners (4')	8. HOLE LOCATION	
	9. SURFACE ELEVATION: —	
	10. DATE STARTED: 9/23/10	11. DATE COMPLETED: 9/23/10
12. OVERBURDEN THICKNESS: NA	15. DEPTH OF GROUNDWATER ENCOUNTERED: 5'	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —	
14. TOTAL DEPTH OF HOLE: 16'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): —	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. OTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
		✓	Explosives			

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
NA	Bentonite	NA		

LOCATION SKETCH/COMMENTS — SCALE:



PROJECT	HOLE NO.
RVAAP - MI Sampling (Ravenna A/E: 133616)	DA156-061

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: DA1SB 061

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

INSPECTOR: S. Barry, R. Harrison

SHEET 2 OF 2

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIAL (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)	USCS CLASS
	1	Brown, dry, loose, M-F SAND, trace organic (roots) (1-2)	0.0 ppm	NA	0201	NA	DA1SB-061M-0201	SP (org)
	2	Brown, moist, dense, FINE SAND & CLAY						
	3	(2-5) + wet soil at 5'						SM
	4						1030	
5'	5	Light brown, wet, dense, SILTY CLAY (4-6.5')	0.0 ppm		0202		DA1SB-061M-0202	CL/ML
	6							
	7	Brown, wet, dense, CLAY (6.5-8')					1035	CL
	8							
	9	L. brown, moist, dense, SILTY CLAY (8'-10')	0.0 ppm		0203		DA1SB-061M-0203	CL/ML
	10							
	11	Brown, moist, dense, MED SAND, little coarse to fine sand, trace small gravel (10-12)					90% Recovery 1040	SW
	12							
	13	Brown, wet, loose, MED. SAND, little small gravel (12-14')	0.0 ppm		0204		DA1SB-061M-0204	
	14							SW
	15	Brown, wet, loose, MED to FINE SAND, little silt (14-16')					50% Recovery 1045	
	16	EOB 16'						

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

HOLE NO. SB-061

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

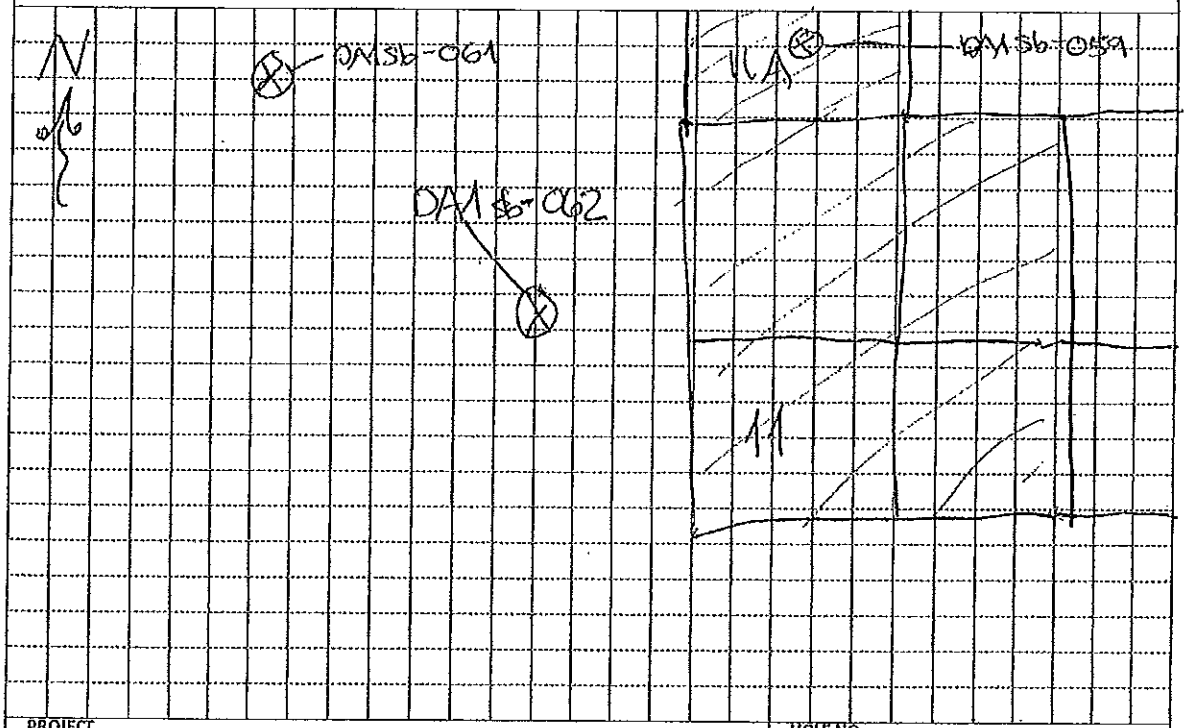
DISTRICT		HOLE NUMBER: DAMSb-062
1. COMPANY NAME: The Shaw Group - Shaw E&I	2. DRILL CONTRACTOR: Frontz Drilling	SHEET 1 OF 2
3. PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)	4. LOCATION: Ravenna, Ohio	
5. NAME OF DRILLER	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 6620DT	
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Trackmounted rig; Acetate liner (4')	8. HOLE LOCATION	
	9. SURFACE ELEVATION: —	
	10. DATE STARTED: 9/23/10	11. DATE COMPLETED: 9/23/10
12. OVERBURDEN THICKNESS: NA	15. DEPTH OF GROUNDWATER ENCOUNTERED: ~5'	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —	
14. TOTAL DEPTH OF HOLE: 16'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): —	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. OTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
						100 %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	BENTONITE	NA		

LOCATION SKETCH/COMMENTS — SCALE:



PROJECT	HOLE NO.
RVAAP - MI Sampling (Ravenna A/E: 133616)	DAMSb-062

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: DA1Sb-062

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

INSPECTOR: S. Barry, R. Harrison

SHEET 2 OF 2

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIAL (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)	USCS Class
	1–4	Brown, dry, dense, SILTY SAND 5" F. SAND, trace organic material	0.0 ppm	NA	0201	NA	DA1Sb-062m-0201-SO 1325	SM (org)
5' ▽ =	5–8	Light brown, moist, dense, SILTY CLAY w/ wet lens 5" @ 5' & 6.5'	0.0 ppm		0202		DA1Sb-062m-0202-SO DA1Sb-062m-0202-SO (QA) 1330	CL/ML
	9–11	Brown, moist, dense, SILT (8-10.5') ~~M~~ Brown, moist, dense, M-F SAND, trace small gravel (10.5-12')	0.0 ppm		0203		DA1Sb-062m-0203-SO 1335	ML SW
	12–16	Brown, gray, wet, loose, M-F SAND, trace small gravel (12-13') Light brown/orange, wet, loose, M-F SAND, trace gravel (13-14.5') Brown/gray, wet, loose, M-F SAND, trace gravel (14.5-16')	0.0 ppm		0204		DA1Sb-062m-0204-SO 1340.	
		EOB 16'						

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

HOLE NO.: DA1Sb-062

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

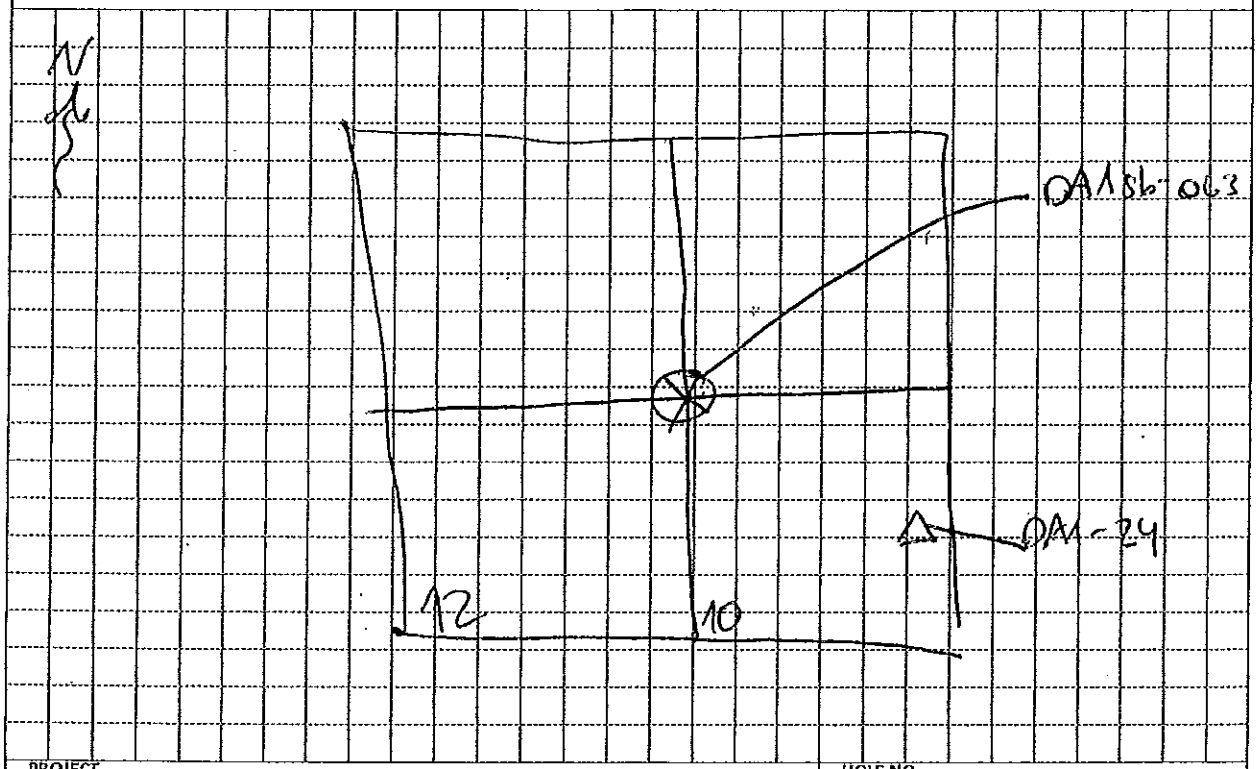
DISTRICT		HOLE NUMBER: ~~DA15b-057~~ DA15b-063
1. COMPANY NAME: The Shaw Group - Shaw E&I	2. DRILL CONTRACTOR: Frontz Drilling	SHEET 1 OF 2
3. PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)	4. LOCATION: Ravenna, Ohio	
5. NAME OF DRILLER: Jeremy L.	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 6620 DT	
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Geoprobe 6620 DT Track mounted rig; Acetate liners (4')	8. HOLE LOCATION	
	9. SURFACE ELEVATION: —	
	10. DATE STARTED: 9/23/10	11. DATE COMPLETED: 9/23/10
12. OVERBURDEN THICKNESS: NA	15. DEPTH OF GROUNDWATER ENCOUNTERED	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —	
14. TOTAL DEPTH OF HOLE: 16'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. OTAL NUMBER OF CORE BOXES
NA			

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	NA	✓	Explosives Propellants			

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite	NA		Steve Boy

LOCATION SKETCH/COMMENTS — SCALE:



PROJECT	HOLE NO.
RVAAP - MI Sampling (Ravenna A/E: 133616)	DA15b 063

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: DA1Sb-063

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

INSPECTOR: S. Barry, R. Harrison

SHEET 2 OF 2

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIAL (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	1–4	Brown, dry, ~~loose~~ dense, SILTY SAND 5" F. SAND, trace organic material (roots)	0.0ppm	NA	—	NA	NO sample
~6' ▽ =	5–8	L. brown moist, dense, SILTY CLAY w/ Wet lens @ ~6'	0.0ppm		0201		DA1Sb-063m-0201-SO DA1Sb-063m-0201-MS DA1Sb-063m-0201-MD 1345
	8–12	Brown, Moist, dense, SANDY SILT	0.0ppm		0202		DA1Sb-063m-0202-SO DA1Sb-082m-0202-SO (DUP) 1350
	12–16	~~Brn~~ Gray/brown, MOIST/dense SILTY CLAY (12-13') L. Brown, moist, ~~M-F~~ SILTY CLAY (13-14.5') Brown, moist, M-F SAND, trace small gravel (14.5-16')	0.0ppm		0203		DA1Sb-063m-0203-SO 1395
	EOH 16'						

USCS
<1995

5M

CL/ML

ML

CL/ML

SW

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

HOLE NO.: DA1Sb-063

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

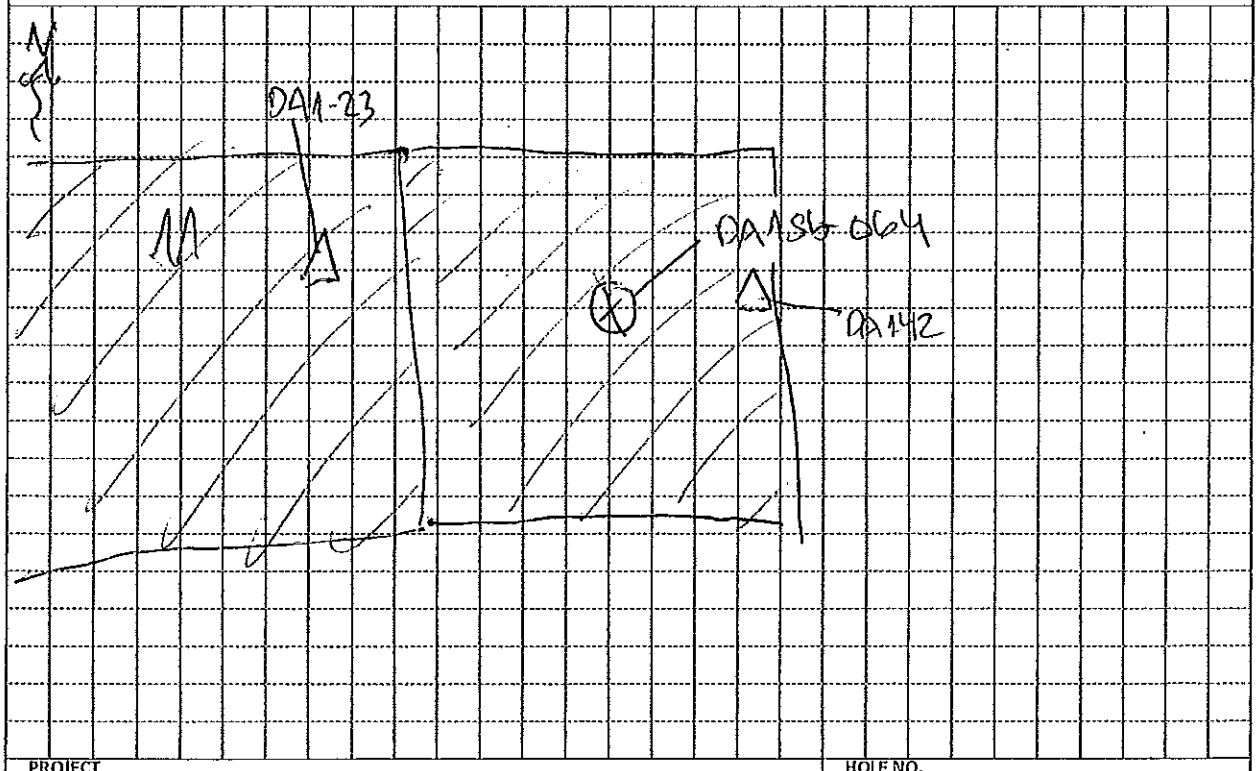
DISTRICT		HOLE NUMBER: DA156-064
1. COMPANY NAME: The Shaw Group - Shaw E&I	2. DRILL CONTRACTOR: Frontz Drilling	SHEET 2 OF 2
3. PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)	4. LOCATION: Ravenna, Ohio	
5. NAME OF DRILLER: Jeremy L.	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 6620 DT	
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Track Rig; Acetate liner (4')	8. HOLE LOCATION	
	9. SURFACE ELEVATION: —	
	10. DATE STARTED: 9/23/10	11. DATE COMPLETED: 9/23/10
12. OVERBURDEN THICKNESS: NA	15. DEPTH OF GROUNDWATER ENCOUNTERED: ~6'	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —	
14. TOTAL DEPTH OF HOLE: 16'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): —	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. OTAL NUMBER OF CORE BOXES
NA			

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Explosives Perc. Chlorate	Pesticides PCBs	Organics PCBs SVOC	100%

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite	NM	NA	

LOCATION SKETCH/COMMENTS — SCALE:



PROJECT	HOLE NO.
RVAAP - MI Sampling (Ravenna A/E: 133616)	DA156-064

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: DA1sb-064

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

INSPECTOR: S. Darry, R. Harrison

SHEET 2 OF 2

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIAL (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)	USCS CLASS
	1–4	Brown, dry, dense, SILTY SAND, 5" FINE SAND & trace ~~leaves~~ organic material (roots)	0.0 ppm	NA	No Sample	NS	~~DA1sb-064M-~~ No Sample ~~1345 1405~~	SM
6' ▽ =	5–7	Light brown, moist, dense SILTY CLAY w/ 5" wet lens @ 6'	0.0 ppm		0201		DA1sb-064M-0201-SO DA1sb-064d-0201-SO (VOC) + Hex. Chrom ~~1350~~ 1405	CL/ML
	8–11	Brown, moist, dense, SILTY CLAY (8–11.5') Brown, moist, dense, FINE SAND, little silt, trace med. gravel (11.5–12')	0.0 ppm		0202		DA1sb-064M-0202-SO ~~1325 1400~~ 1405	SM
	12–15	Brown/gray, moist, dense, FINE SAND, trace small gravel; Light blonde, lens @ 14.5' (3") Black fine sand & gravel @ 14.5' Brown/gray, wet, loose, M-F SAND, trace gravel (14.5–16')	0.0 ppm		0203		DA1sb-064M-0203-SO ~~1400~~ 1410	SP SW
	16	EOB 16'						

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

HOLE NO.: DA1sb-064

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

DISTRICT

HOLE NUMBER: DA15-065

1. COMPANY NAME: The Shaw Group - Shaw E&I
2. DRILL CONTRACTOR: Frontz Drilling
SHEET 1 OF 2

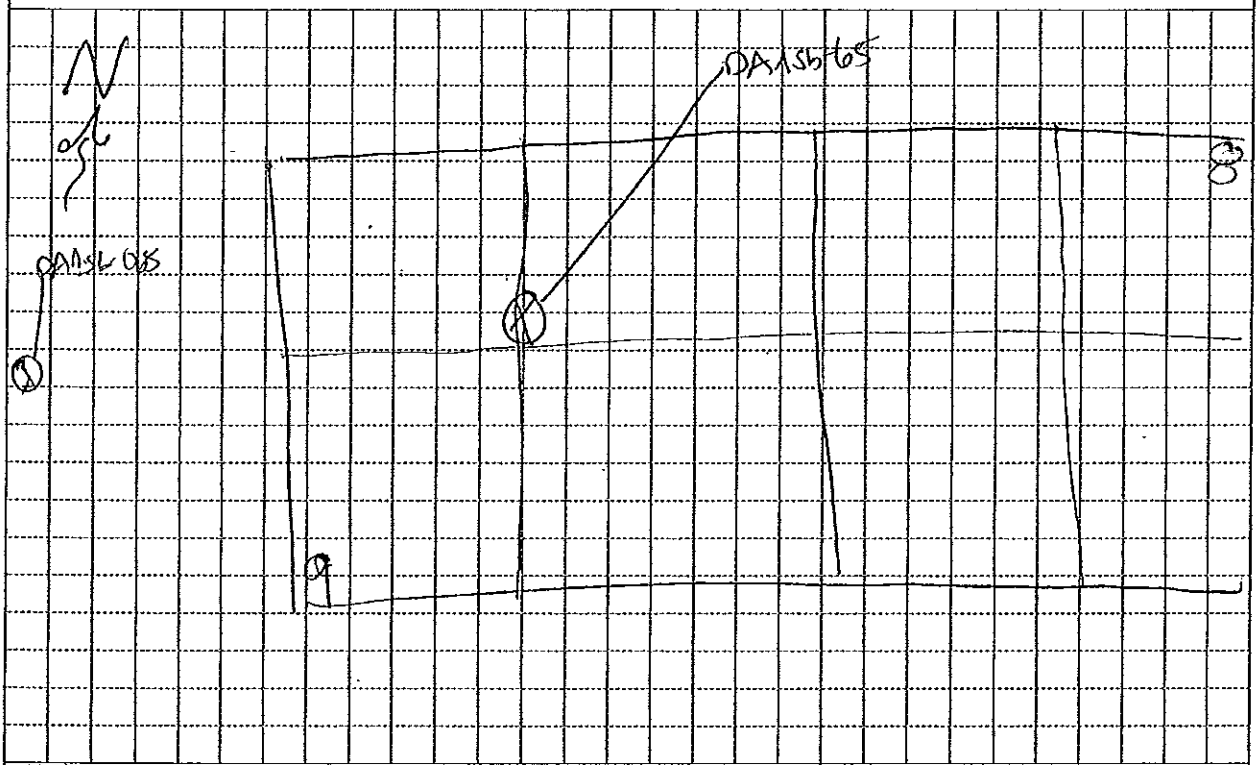
3. PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)
4. LOCATION: Ravenna, Ohio
5. NAME OF DRILLER: Jeremy L.
6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 6620DT
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Trackmanted rig; Acetate sample liners (4')
8. HOLE LOCATION: —
9. SURFACE ELEVATION: —
10. DATE STARTED: 9/23/10
11. DATE COMPLETED: 9/23/10
12. OVERBURDEN THICKNESS: NA
13. DEPTH DRILLED INTO ROCK: NA
14. TOTAL DEPTH OF HOLE: 16'
15. DEPTH OF GROUNDWATER ENCOUNTERED: ~6.5'
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. OTAL NUMBER OF CORE BOXES
NA			

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA		✓	explosives			100 %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
NA	Bentonite	NA	NA	[signature]

LOCATION SKETCH/COMMENTS — SCALE:



PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)
HOLE NO.: DA15-065

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: DA15b-065

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

INSPECTOR: ~~S.Barry~~ S.Barry / R. Harrison

SHEET 2 OF 2

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIAL (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)	USCS CLASS
	1–4	Brown, dry, dense, SILTY SAND w/ F SAND, trace roots (Organic material) SM	0.0 ppm	NA	No Sample	NA	~~DA15b-065m-0201-SO~~ No sample	SM
665' ▽ =	5–8	Brown, moist, dense, SILTY CLAY & wet lens @ 6.5' (SM)	0.0 ppm		0201		DA15b-065m-0201-SO 1415	CL/ML
	9–12	Brown/gray, moist, dense, SILTY SAND	0.0 ppm		0202		DA15b-065m-0202-SO DA15b-065m-0202-SO (QA) DA15b-065m-0202-SO (DUP) 1420	SM
	13–16	Brown/gray, moist, dense, SILTY CLAY (12-15') Brown/Blonde, moist, dense, FINE SAND trace Iron & small gravel (15-16')	0.0 ppm		0203		DA15b-065m-0203-SO 1425 SA	CL/ML
		EOB 16'						

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

HOLE NO.: DA15b-065

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

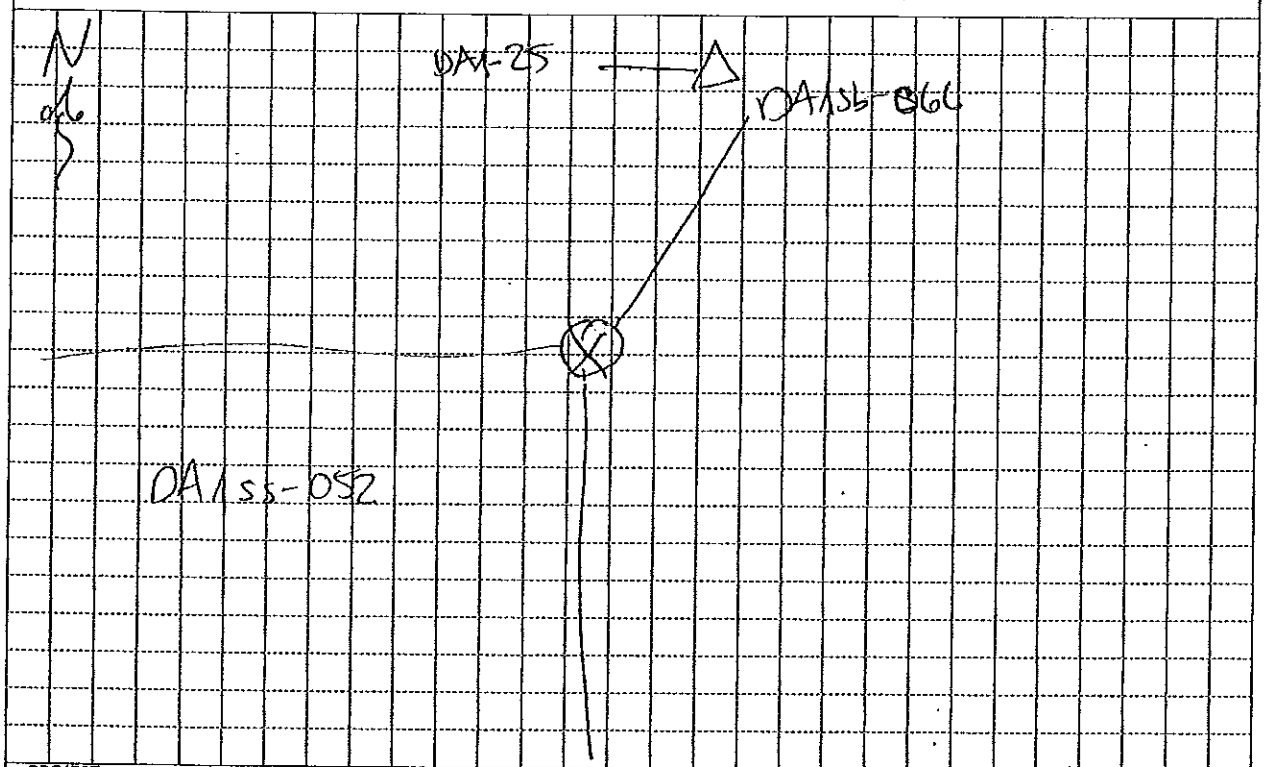
DISTRICT		HOLE NUMBER: DA1-SB066
1. COMPANY NAME: The Shaw Group - Shaw E&I	2. DRILL CONTRACTOR: Frontz Drilling	SHEET 1 OF 2
3. PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)	4. LOCATION: Ravenna, Ohio	
5. NAME OF DRILLER	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 6620DT	
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Tracmounted rig; Acetate Sample Liners (4')	8. HOLE LOCATION	
	9. SURFACE ELEVATION: —	
	10. DATE STARTED: 9/23/10	11. DATE COMPLETED: 9/23/10
12. OVERBURDEN THICKNESS: NA	15. DEPTH OF GROUNDWATER ENCOUNTERED: 45'	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —	
14. TOTAL DEPTH OF HOLE: 16'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): —	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. OTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
		✓	explosives	propellants		100 %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite			S Zeb...

LOCATION SKETCH/COMMENTS — SCALE:



PROJECT	HOLE NO.
RVAAP - MI Sampling (Ravenna A/E: 133616)	DA1-SB066

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: DM1SB-066

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

INSPECTOR: S. Barry; R. Harrison

SHEET 2 OF 2

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIAL (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)	USCS CLASS
	1–4	Dk. brown, dry, loose, F. SAND, little med. sand, trace organics (roots), gravel (small) (0-2'); Brown, dry, loose, SANDY SILT (2-4')	0.0 ppm	NA	0201	NA	DM1SB-066M-0201-SO 1430	SW / ML
5' ▽	5–8	Light brown, moist, dense, SILTY CLAY w/ wet lens 5'-6'	0.0 ppm		0202		DM1SB-066M-0202-SO 1435 ~~1425~~	CL/ML
	9–12	Brown, moist, dense, SILTY CLAY; Brown, moist, SILTY SAND @ 11.5-12'	0.0 ppm		0203		DM1SB-066M-0203-SO 1440 ~~1435-1430~~	SM
	12–16	Gray, moist, dense, SILTY CLAY (12-13'); Brown, moist, dense, SILTY CLAY (13-14.5'); Brown, moist, M-FSAND, trace small gravel (14.5-16')	~~0.0~~ 0.0 ppm		0204		DM1SB-066M-0204-SO 1445 ~~1440-1435~~	CL/ML / SW
		EOD 16'	0.0 ppm Brown, moist, loose, M-FSAND, trace gravel w/ blonde fine gravelly lens @ 14'					

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

HOLE NO. DM1SB-066

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

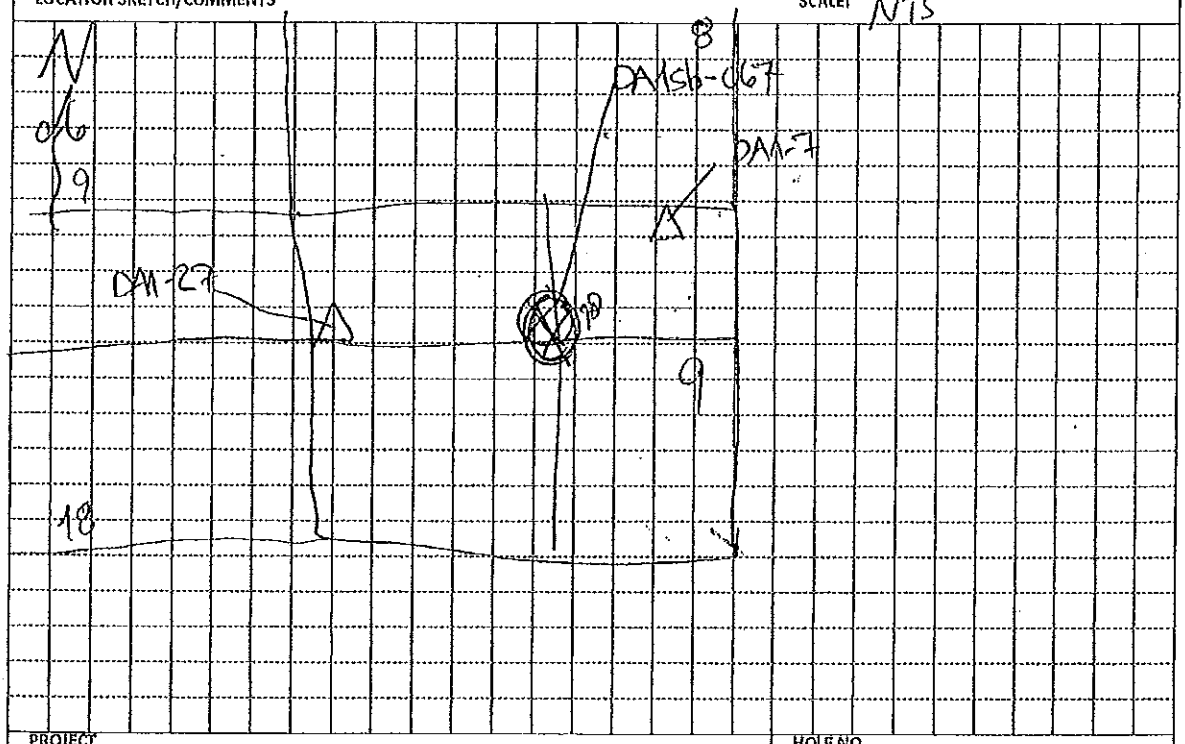
DISTRICT		HOLE NUMBER: DA71sb-067
1. COMPANY NAME: The Shaw Group - Shaw E&I	2. DRILL CONTRACTOR: Frontz Drilling	SHEET 1 OF 2
3. PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)	4. LOCATION: Ravenna, Ohio	
5. NAME OF DRILLER	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 6620 DT	
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Trackmounted rig; Acetate Sample Liner (4'); Hand clear 5'	8. HOLE LOCATION: —	
	9. SURFACE ELEVATION: —	
	10. DATE STARTED: 9/24/10	11. DATE COMPLETED: 9/24/10
12. OVERBURDEN THICKNESS: —	15. DEPTH OF GROUNDWATER ENCOUNTERED: ~4'	
13. DEPTH DRILLED INTO ROCK: —	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —	
14. TOTAL DEPTH OF HOLE: 16'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): —	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. OTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
NA	✓	✓	explosives	Hex chrom.		

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
NA	BENTONITE	NA		

LOCATION SKETCH/COMMENTS — SCALE: NTS



PROJECT	HOLE NO.
RVAAP - MI Sampling (Ravenna A/E: 133616)	DA71sb-067

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: DA1Sb-067

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

INSPECTOR: Barry, Hamson

SHEET 2 OF 2

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIAL (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)	USCS Class
	2			N/A	~~0200~~	N/A	~~SA115~~ No sample	
	2							
	3	Brown, dry, loose F SAND, trace silt & gravel	0.0 ppm		0201		DA1Sb-067d-0201-SO (VOC) @3.5' ~~Hold~~ SO DA1Sb-067m-0201-SO 1405	SP
~4' V =	4							
	5	Brown, wet, dense, SILTY CLAY (4-6')	0.0 ppm		0202		DA1Sb-067d-0202-SO (VOC) @6.3' DA1Sb-067-M-0202-S.0 *Hex. chrome* 1410	CL/ML
	6							
	7	Brown, moist, dense, SILTY CLAY (6-8')						
	8							
	9	Brown, moist, dense, SILTY CLAY	0.0 ppm		0203		DA1Sb-DA1Sb-067d-0203-SO VOC @ 10' DA1Sb-067m-0203-SO 1415	
	10							
	11							
	12							
	13	Brown, moist, dense SILTY CLAY (12-14.5')	0.0 ppm		0204		DA1Sb-067d-0204-SO VOC@14' DA1Sb-067m-0204-SO 1420	
	14							
	15	Brown, wet, dense F. SAND, trace gravel (14.5-16')						SP
	16							
		EOB 16'						

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

HOLE NO.: DA1Sb-067

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

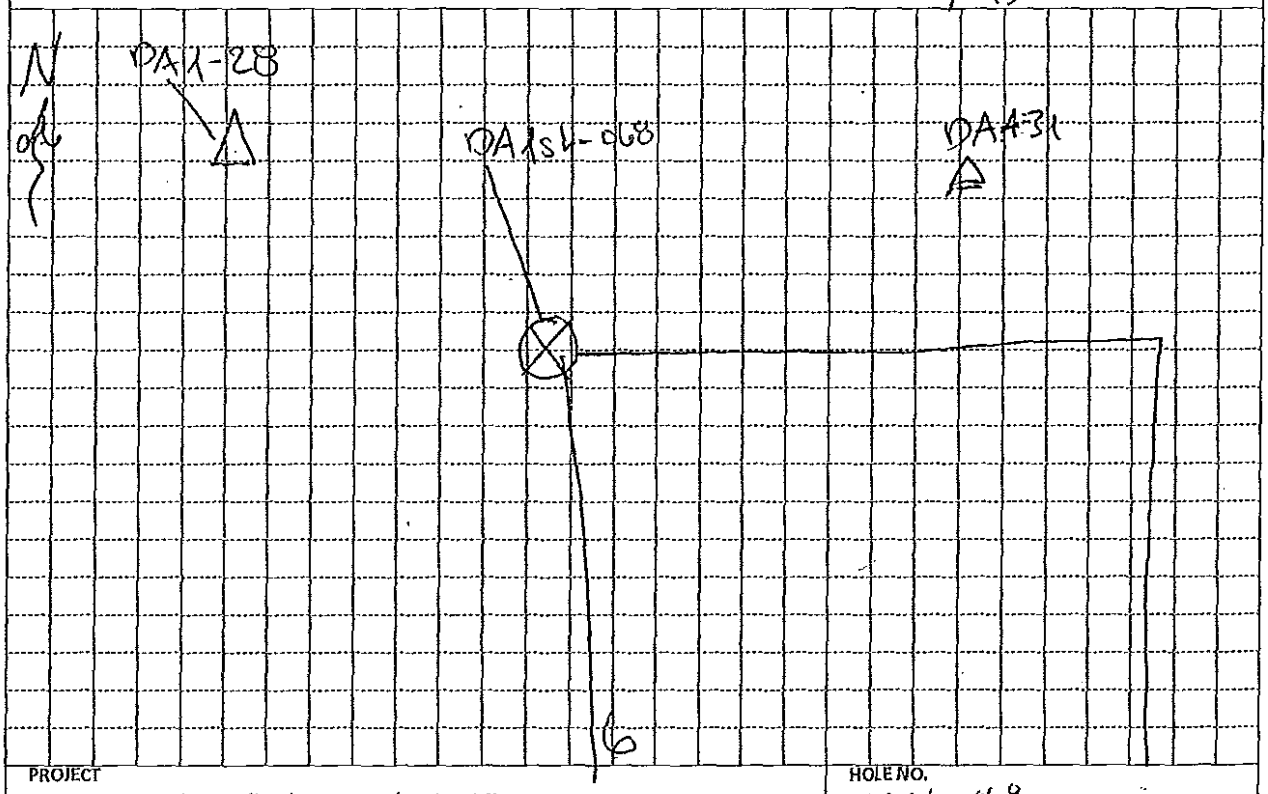
DISTRICT		HOLE NUMBER: DA1SL-068
1. COMPANY NAME: The Shaw Group - Shaw E&I	2. DRILL CONTRACTOR: Frontz Drilling	SHEET 1 OF 2
3. PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)	4. LOCATION: Ravenna, Ohio	
5. NAME OF DRILLER: Jeremy L.	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 6620 DT	
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Trackmounted rig; Acetate sample liner (4'); Hand Clear 5'	8. HOLE LOCATION	
	9. SURFACE ELEVATION	
	10. DATE STARTED: 9/24/10	11. DATE COMPLETED: 9/24/10
12. OVERBURDEN THICKNESS: NA	15. DEPTH OF GROUNDWATER ENCOUNTERED	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 16'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. OTAL NUMBER OF CORE BOXES
NA			

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	Explosives Propellants	SVOC's Pesticides	PCB's Cyanide	See pg 2

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
NA	Bentonite	NA	NA	

LOCATION SKETCH/COMMENTS — SCALE: NTS



PROJECT	HOLE NO.
RVAAP - MI Sampling (Ravenna A/E: 133616)	DA1SL-068

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: OA1Sb-068

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

INSPECTOR: BARRY, Harrison

SHEET 2 OF 2

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIAL (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	1	Light brown, moist, loose FINE SAND, trace silt, organ. mat. (roots) (1-2')	0.0 ppm	NA	0201	NA	OA1Sb-068M-0201-SO OA1Sb-068d-0201-SO (VOC) @ 2'
	2	Brown, moist, dense, SANDY SILT (2-4')					OA1Sb-084M-0201-SO (QA) OA1Sb-084d-0201-SO (QA) (VOC) @ 2' OA1Sb-068M-0201-SO OA1Sb-068M-0201-SO (QA) OA1Sb-068d-0201-SO (QA) 0855
	3						
	4						
	5	L. Brown, moist, dense, SANDY SILT (4-6')	0.0 ppm		0202		OA1Sb-068M-0202-SO OA1Sb-068d-0202-SO (VOC)
	6	L. brown, wet, dense, SANDY SILT, some clay (4-6')					@ 2' 70%
	7						0900
	8						
	9	L. brown, moist, dense, SILTY CLAY	0.0 ppm		0203		OA1Sb-068M-0203-SO OA1Sb-068d-0203-SO (VOC)
	10						
	11						70% 0905
	12						
	13	L. brown, moist, dense, SILTY CLAY (12-13.5')	0.0 ppm		0204		OA1Sb-068M-0204-SO OA1Sb-068d-0204-SO (VOC)
	14						
	15	Tan Brown, wet, dense, F. SAND, trace silt & small gravel (13.5-16')					70% 0910
	16	EOB 16'					

T

USCS CLASS

SP

ML

CL/ML

SP

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

HOLE NO. OA1Sb-068

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

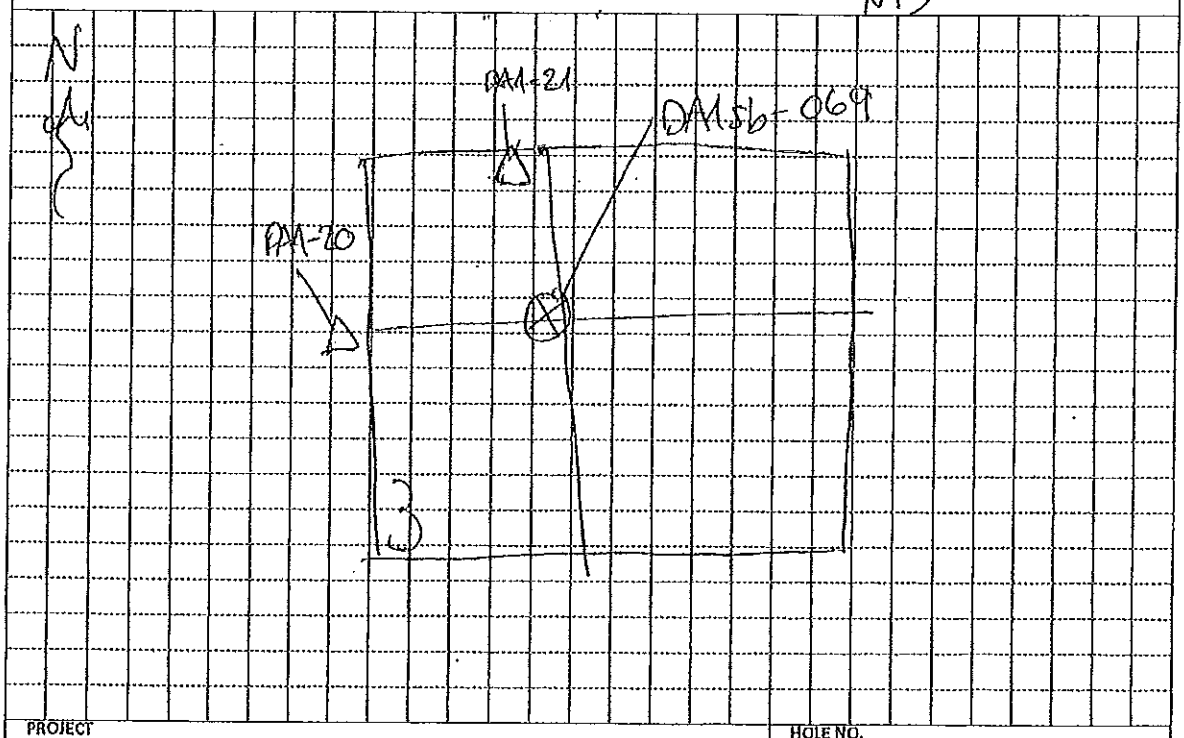
HTRW DRILLING LOG

DISTRICT		HOLE NUMBER: DA15-069
1. COMPANY NAME: The Shaw Group - Shaw E&I	2. DRILL CONTRACTOR: Frontz Drilling	SHEET 1 OF 2
3. PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)	4. LOCATION: Ravenna, Ohio	
5. NAME OF DRILLER	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 6620DT	
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Acetate sample liner (4') Hand clear 5' Trackmounted rig	8. HOLE LOCATION: —	
	9. SURFACE ELEVATION: —	
	10. DATE STARTED: 9/24/10	11. DATE COMPLETED: 9/24/10
12. OVERBURDEN THICKNESS: NA	15. DEPTH OF GROUNDWATER ENCOUNTERED: ~6'	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —	
14. TOTAL DEPTH OF HOLE: 16'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): —	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. OTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	explosives Perchlorate	SVOC Pesticides	PCB cyanide	See pg 2 %
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
	BENTONITE	NA				

LOCATION SKETCH/COMMENTS — SCALE: NTS



PROJECT	HOLE NO.
RVAAP - MI Sampling (Ravenna A/E: 133616)	DA15-069

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: DA156-069

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

INSPECTOR: Barry, Harrison

SHEET 2 OF 2

USCS: CL/ML

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIAL (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	0–4	L. brown, moist dense, SANDY SILT	0.0 ppm	NA	—	NA	No Sample
6'	5–8	Light brown, moist, dense, SANDY SILT. (4-6'); L. Brown, wet, SANDY SILT (6-8')	0.0 ppm		0201		DA156-069d-0201 -SO (VOC) 901. 0915
	9–12	L. brown, moist, dense, SILTY CLAY (8-10'); gray/brown, moist, dense, SILTY CLAY (10-12')	0.0 ppm		0202		DA156-069d-0202 -SO (VOC) 901. 0920
	13–16	L. brown, moist, dense, SILTY CLAY (12-13.5'); gray, moist, dense, CLAY (13.5-16')	0.0 ppm		0203		DA156-069d-0203 -SO (VOC) @~15' 901. 0925
	16	EOB 16'					

USCS: ML

USCS: CL

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

HOLE NO.: DA156-069

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

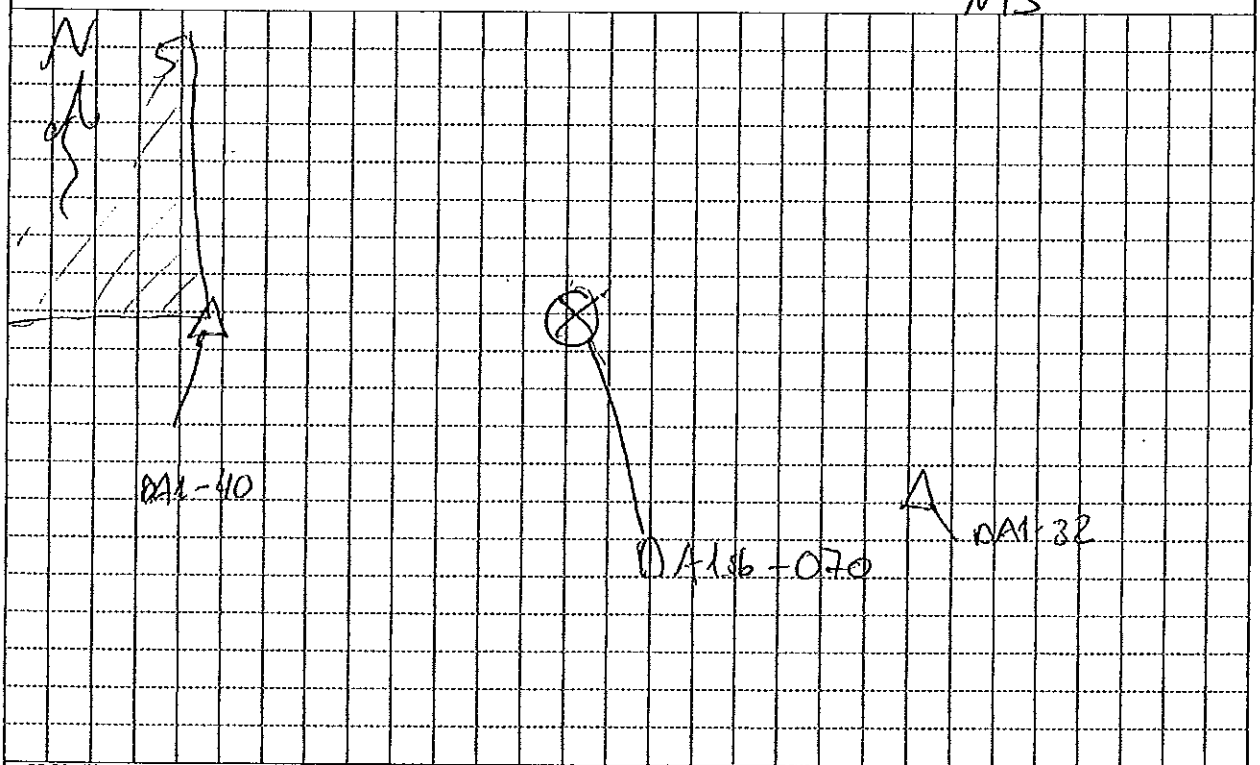
DISTRICT		HOLE NUMBER: DA1SB-070
1. COMPANY NAME: The Shaw Group - Shaw E&I	2. DRILL CONTRACTOR: Frontz Drilling	SHEET 1 OF 2
3. PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)	4. LOCATION: Ravenna, Ohio	
5. NAME OF DRILLER: Jeremy L.	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 6620DT	
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Trackmounted rig; Acetate sample liner (4'); Hand clear 5'	8. HOLE LOCATION	
	9. SURFACE ELEVATION: —	
	10. DATE STARTED: 9/24/10	11. DATE COMPLETED: 9/24/10
12. OVERBURDEN THICKNESS: NA	15. DEPTH OF GROUNDWATER ENCOUNTERED: ~5'	
13. DEPTH DRILLED INTO ROCK: ~~NA~~ NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —	
14. TOTAL DEPTH OF HOLE: 16'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): —	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. OTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	✓	explosives SVOC	propellants pesticides	PCBs cyanide	

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite	NA	NA	Shile Bry

LOCATION SKETCH/COMMENTS — SCALE: NTS



PROJECT	HOLE NO.
RVAAP - MI Sampling (Ravenna A/E: 133616)	DA1SB-070

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: DA156-070

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

INSPECTOR: Barry, Harrison

SHEET 2 OF 2

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIAL (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
WS V =	1	Brown, dry, loose, FSAND, trace organic material (roots) (1-2')	0.0 ppm	NA	0201	NA	DA156-070d-0201-SO (VOC) @~3.5' DA156-070d-0201-MS (VOC) DA156-070d-0201-MD (VOC) DA156-070M-0201-SO DA156-070M-0201-MS DA156-070M-0201-MD 0930
	2	Brown/gray, dry, loose, F. SAND, trace organic material (roots) (2-2.5')					
	3	Brown, dry, dense, SILTY SAND (2.5-4')					
	4	L. Brown, wet, dense, SANDY SILT (4-5')	0.0 ppm		0202		DA156-070d-0202-SO (VOC) @~4.5' DA156-070M-0202-SO
	5						
	6	L. brown/gray, moist, dense, SILTY CLAY (7-8')					
	7						0935
	8	Brown/gray, moist, dense, SILTY CLAY	0.0 ppm		0203		DA156-070d-0203-SO (VOC) @~10' DA156-070M-0203-SO
	9						
	10						
	11						
	12						0940
	13	Brown, grey, moist, dense, SILTY, CLAY (12-15.5')	0.0 ppm		0204		DA156-070d-0204-SO (VOC) @~14' DA156-085d-0204-SO (VOC) DUP DA156-070M-0204-SO DA156-085M-0204-SO DA156-070M-0201-SO (QA)
	14	Brown, moist, dense, FINE SAND (15.5-16')					
	15						0945
	16						
		EOB 16'					

T
USCS CLASS
@~3.5'
SM
ML
CL/ML
SP

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

HOLE NO.: DA156-070

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

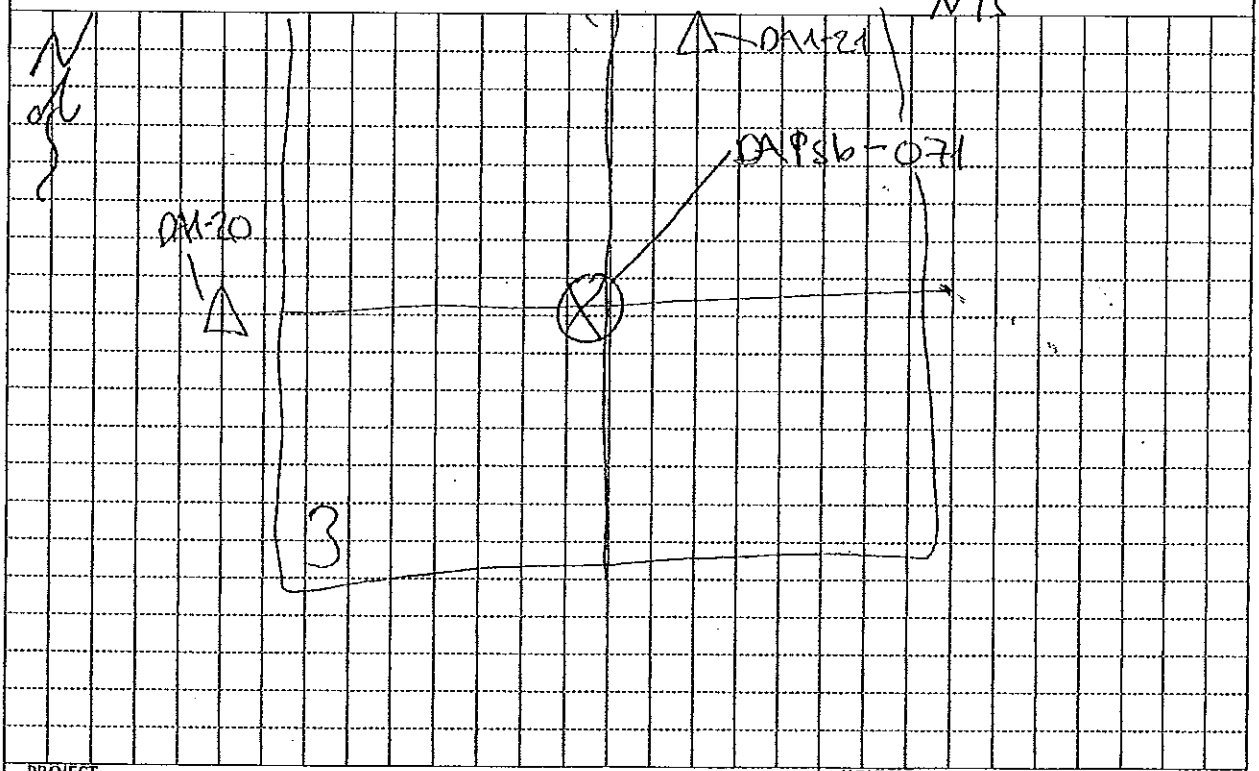
	DISTRICT	HOLE NUMBER: OA1sb-071
1. COMPANY NAME: The Shaw Group - Shaw E&I	2. DRILL CONTRACTOR: Frontz Drilling	SHEET 2 OF 2
3. PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)	4. LOCATION: Ravenna, Ohio	
5. NAME OF DRILLER: Jeremy L.	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 6620DT	
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Track Mounted rig; Hand clear 5'	8. HOLE LOCATION: —	
	9. SURFACE ELEVATION: —	
	10. DATE STARTED: 9/24/10	11. DATE COMPLETED: 9/24/10
12. OVERBURDEN THICKNESS: NA	15. DEPTH OF GROUNDWATER ENCOUNTERED	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —	
14. TOTAL DEPTH OF HOLE: 16'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. OTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	explosives propellants	svoc pesticides	PCB cyanide	100 %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite	NA		

LOCATION SKETCH/COMMENTS — SCALE: NTS



PROJECT	HOLE NO.
RVAAP - MI Sampling (Ravenna A/E: 133616)	OA1sb-071

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: DA15b-071

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

INSPECTOR: Barry, Hamson

SHEET 2 OF 2

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIAL (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)	USCS Class
	0–4	Brown, ~~moist~~ dry, loose, F. SAND, trace organic material (roots), gravel (small)	0.0 ppm	NA	—	NA	No Sample	SP
~5' V =	5–8	Brown, moist, dense, SILTY CLAY w/ wet lenses 5" @5' & 7.5'	0 ppm		0201		DA15b-071m-0201-SO DA15b-071d-0201-SO (VOC) @ 4' 1350	CL/ML
	8–12	Brown, wet, dense, SILTY CLAY (8–9') Gray, wet, dense, CLAY (9–12')	0.0 ppm		0202		DA15b-071m-0202-SO 1355	CL
	12–16	Gray, wet, med. dense, CLAY	0.0 ppm		0203		DA15b-071m-0203 1400	
	16	EOB 16'						

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

HOLE NO.: DA15b-071

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

DISTRICT		HOLE NUMBER: DA156-072
1. COMPANY NAME: The Shaw Group - Shaw E&I	2. DRILL CONTRACTOR: Frontz Drilling	SHEET 1 OF 2

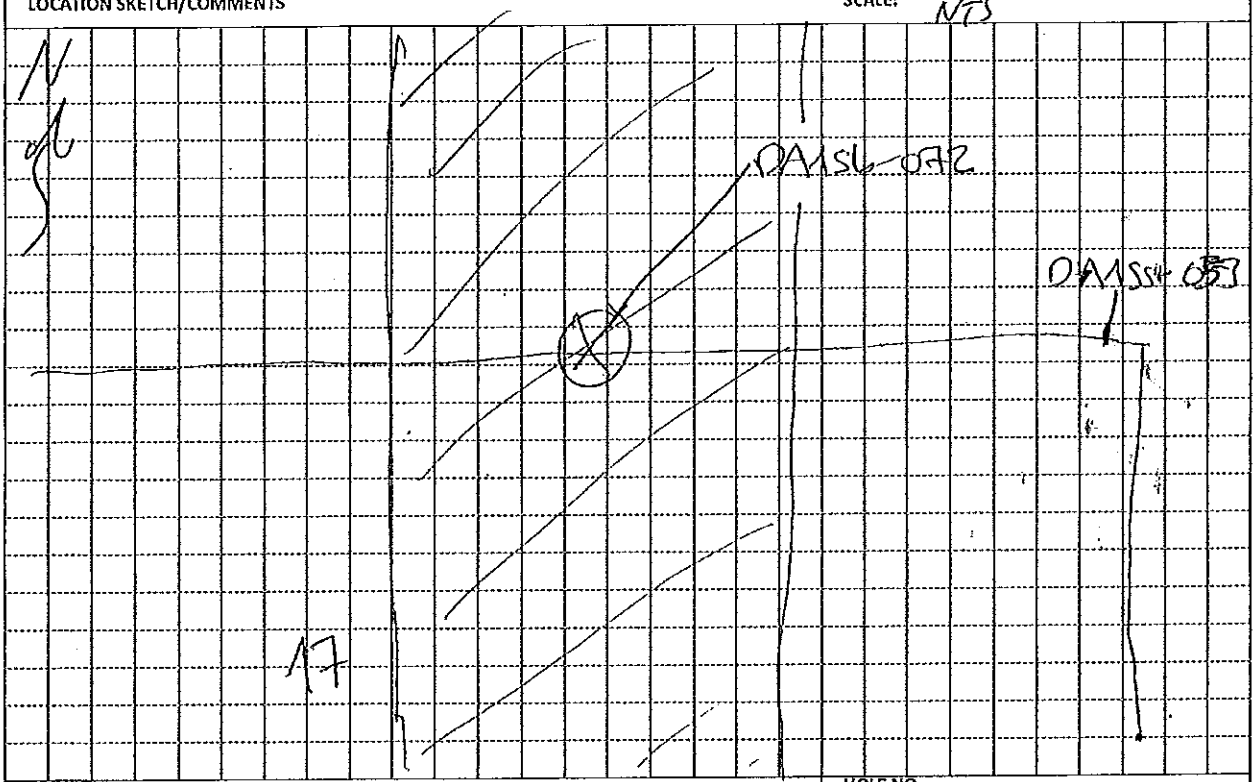
3. PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)	4. LOCATION: Ravenna, Ohio
5. NAME OF DRILLER: Jeremy L.	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 6620 DT
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Track mounted rig; Acetate Sample liner (4'); Hand clear 5'	8. HOLE LOCATION
	9. SURFACE ELEVATION: —
	10. DATE STARTED: 9/24/10 — 11. DATE COMPLETED: 9/24/10
12. OVERBURDEN THICKNESS: NA	15. DEPTH OF GROUNDWATER ENCOUNTERED: 16'
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: —
14. TOTAL DEPTH OF HOLE: 16'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. OTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
		✓	Explosives	Hex chrom		See pg 2

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite	NA	NA	[signature]

LOCATION SKETCH/COMMENTS — SCALE: NTS



PROJECT	HOLE NO.
RVAAP - MI Sampling (Ravenna A/E: 133616)	DA156-072

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: DA156-072

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

INSPECTOR: Barry Harrison

SHEET 2 OF 2

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIAL (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	1		~~0.0 ppm~~ 80	NA	—	NA	~~DA156-072m-SB~~ No Sample
	2	Brown, dry, loose, F SAND; trace gravel & organic material (roots)	0.0 ppm		0201		DA156-072m-0201-SO
	3						1330
	4	Brown, dry, ~~loose~~ dense, FINE SAND, little silt	0.0 ppm		0202		DA156-072m-0202-SO
6'	5						
D =	6						
	7	Brown, moist, dense, SILTY CLAY wet lens @ 6'					
	8						1335
	9	Brown, moist, dense, SILTY CLAY (8-11')	0.0 ppm		0203		DA156-072m-0203-SO
	10						
	11	Brown, moist, dense, F. SAND, trace gravel (11-12')					
	12						1340
	13	Brown, wet, dense, F. SAND, ~~little~~ trace med. sand & gravel	0.0 ppm		0204		DA156-072m-0204-SO DA156-072m-0204-SO (DUP)
	14						
	15						70% Recovery
	16						1345
		EOB 16'					

USCS

< 1955

SP

SM

< CL/ML

SP

PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)

HOLE NO.: DA156-072

ENG FORM 5056A-R. AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: DA1sb-073

PROJECT: RVAAP

INSPECTOR: Phil McCarren

SHEET 1 OF 1

USCS CLASS

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIAL (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)	
	1	0'-1' Dark grey Clayey silt, medium stiff, moist Top soil					DA1sb-073M-0201-SO 1240 Dup(DA1sb-073D-0201-SO) MS MSD	ML
	2	1'-7' Light Brown silty clay, stiff, moist	0.0ppm					CL
	4	4.5' sandstone cobbles					DA1sb-073M-0202-SO	GW
	6		0.0ppm					
	7	7'-9.5' Dark brown poorly graded coarse sand to silt, dense, wet					7' ▽	SP/SM
	8							
	9	9'-16' Dark grey poorly graded coarse sand to silt, dense, wet					DA1sb-073M-0203-SO	
	10		0.0ppm					
	12						DA1sb-073M-0204-SO	
	13							
	14		0.0ppm					
	15							
	16			EOB				

PROJECT: RVAAP - MI sampling (Range NE: 1330'E)

HOLE NO.: DA1sb-073

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

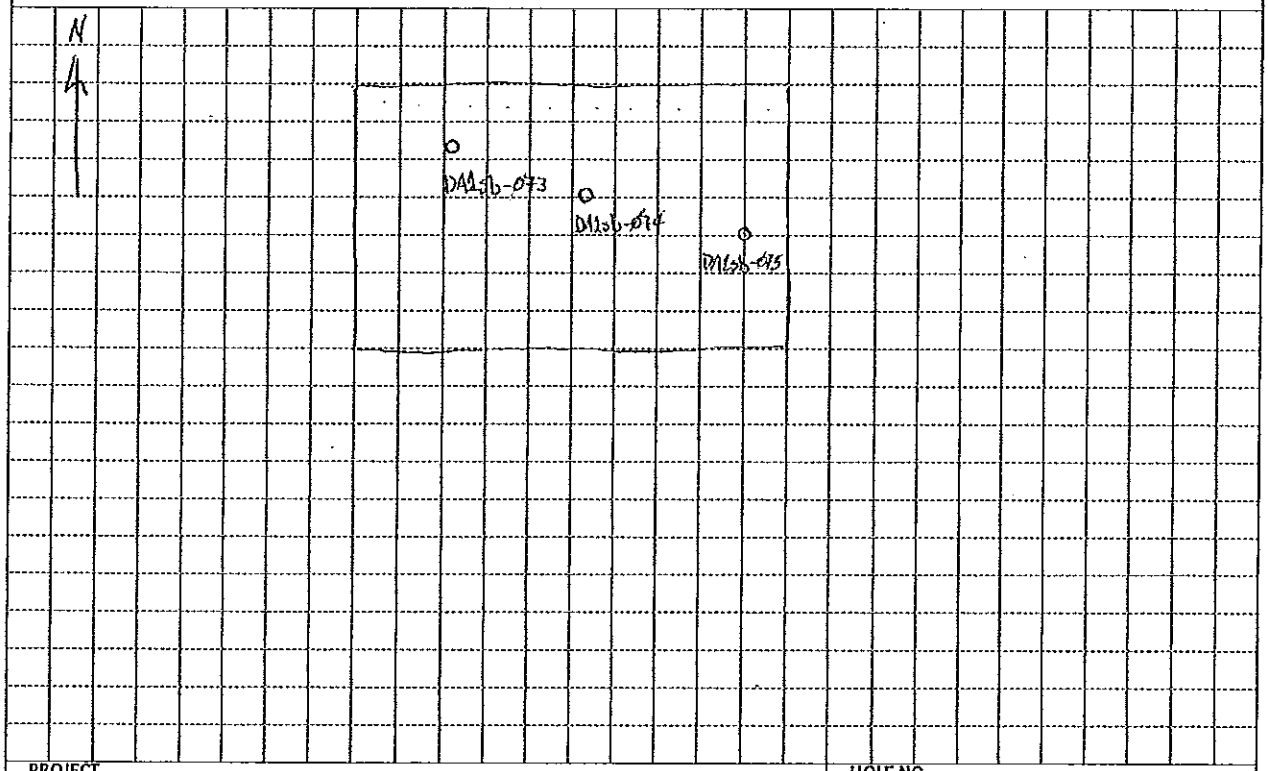
DISTRICT		HOLE NUMBER: DA15b-073
1. COMPANY NAME: The Shaw Group - Shaw E&I	2. DRILL CONTRACTOR: Frontz Drilling	SHEET 1 OF 1
3. PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)	4. LOCATION: Ravenna, Ohio	
5. NAME OF DRILLER: Jeremy Lockyone	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 6620 DT	
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Track Mount Direct Push Macro Core	8. HOLE LOCATION: ODA	
	9. SURFACE ELEVATION: —	
	10. DATE STARTED: 10 NOV 2010	11. DATE COMPLETED: 10 NOV 2010
12. OVERBURDEN THICKNESS	15. DEPTH OF GROUNDWATER ENCOUNTERED	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 16'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. OTAL NUMBER OF CORE BOXES
NA			

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	TAL	Explosives	Pest/PCB	SVOL	

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite	NA	Chamber/Propellants	

LOCATION SKETCH/COMMENTS — SCALE:



PROJECT	HOLE NO.
RVAAP - MI Sampling (Ravenna A/E: 133616)	DA15b-073

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: DA1sb-074

PROJECT: RVAAP

INSPECTOR: Paul McCarren

SHEET 1 OF 1

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIAL (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)	USCS CLASS
	0–4	0'-1' Dark grey clayey silt, medium stiff, moist Topsoil 1'-7' Light Brown silty clay, stiff, moist 4' sandstone cobbles	0.0ppm				DA1sb-074M-0001-SO 1145	ML CL/ML SW
	5–8	7'-9' Dark Brown Poorly graded coarse sand to silt, dense, wet	0.0ppm				DA1sb-074M-0202-SO 1155 7' ▽	CL/ML
	9–12	9'-16' Dark grey Poorly graded coarse sand to silt, dense, wet	0.0ppm				DA1sb-074M-0203-SO 1205	SP/SM
	13–16		0.0ppm				DA1sb-074M-0204-SO 1215	
				EOB				

PROJECT: RVAAP-MC Sampling (Rhuenna A/E: 133616

HOLE NO.: DA1sb-043

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

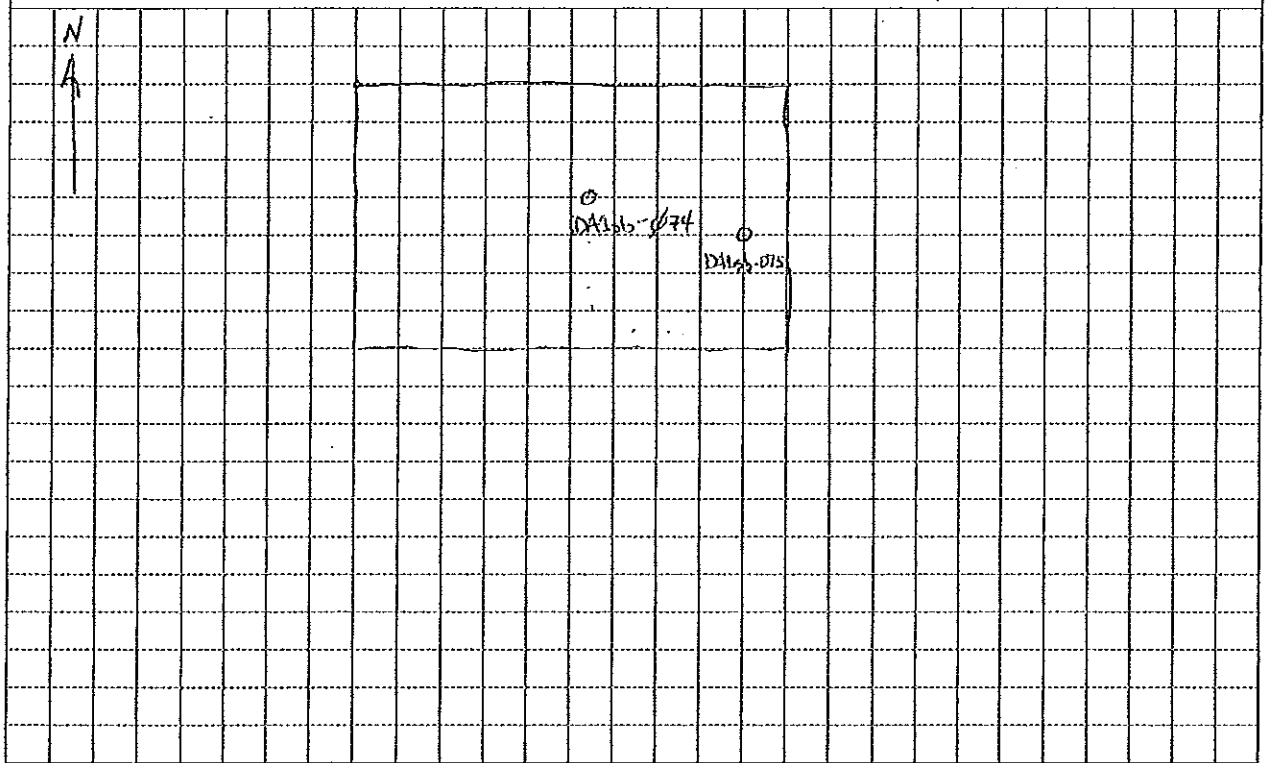
DISTRICT		HOLE NUMBER: DA15-074
1. COMPANY NAME: The Shaw Group - Shaw E&I	2. DRILL CONTRACTOR: Frontz Drilling	SHEET 1 OF 1
3. PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)	4. LOCATION: Ravenna, Ohio	
5. NAME OF DRILLER: JEREMY LOCKSTONE	6. MANUFACTURER'S DESIGNATION OF DRILL: GEOPROBE 6620 DT	
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: TRACK MOUNT DIRECT PUSH MACRO CORE	8. HOLE LOCATION: ODA	
	9. SURFACE ELEVATION: —	
	10. DATE STARTED: 10NOV2010	11. DATE COMPLETED: 10NOV2010
12. OVERBURDEN THICKNESS	15. DEPTH OF GROUNDWATER ENCOUNTERED: 7' ft bgs	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 16'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. OTAL NUMBER OF CORE BOXES
NA			

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	TAL	Explosives	SVOC/Pest/PCB	Cyanide	

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	BENTONITE	NA	NA	Paul C. Miller

LOCATION SKETCH/COMMENTS — SCALE:



PROJECT	HOLE NO.
RVAAP - MI Sampling (Ravenna A/E: 133616)	DA15-074

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: DA1sb-Ø75

PROJECT: RVAAP

INSPECTOR: Paul McCotten

SHEET 1 OF 1 SHEET

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIAL (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	0-4	0'-1' Dark grey clayey SILT, medium stiff moist, Top soil 1'-10' Light Brown silty clay, stiff, moist	0.0 ppm				DA1sb-075M-0201-SO DA1sb-075A-0201-SO Army Dup DA1sb-087M-0201-SO 1040
	4-8		0.0 ppm				DA1sb-075M-0202-SO 1050
	8-12	10'-16' Dark brown poorly graded coarse sand to silt, dense, wet	0.0 ppm				DA1sb-075M-0203-SO 1100 10' ▽
	12-16		0.0 ppm				DA1sb-075M-0204-SO 1110
				EOB			

USCS Class
ML
CL/ML
SP/SM

PROJECT: RVAAP-MI Sampling CRANE#2 A/E: 133616

HOLE NO.: DA1sb-Ø75

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

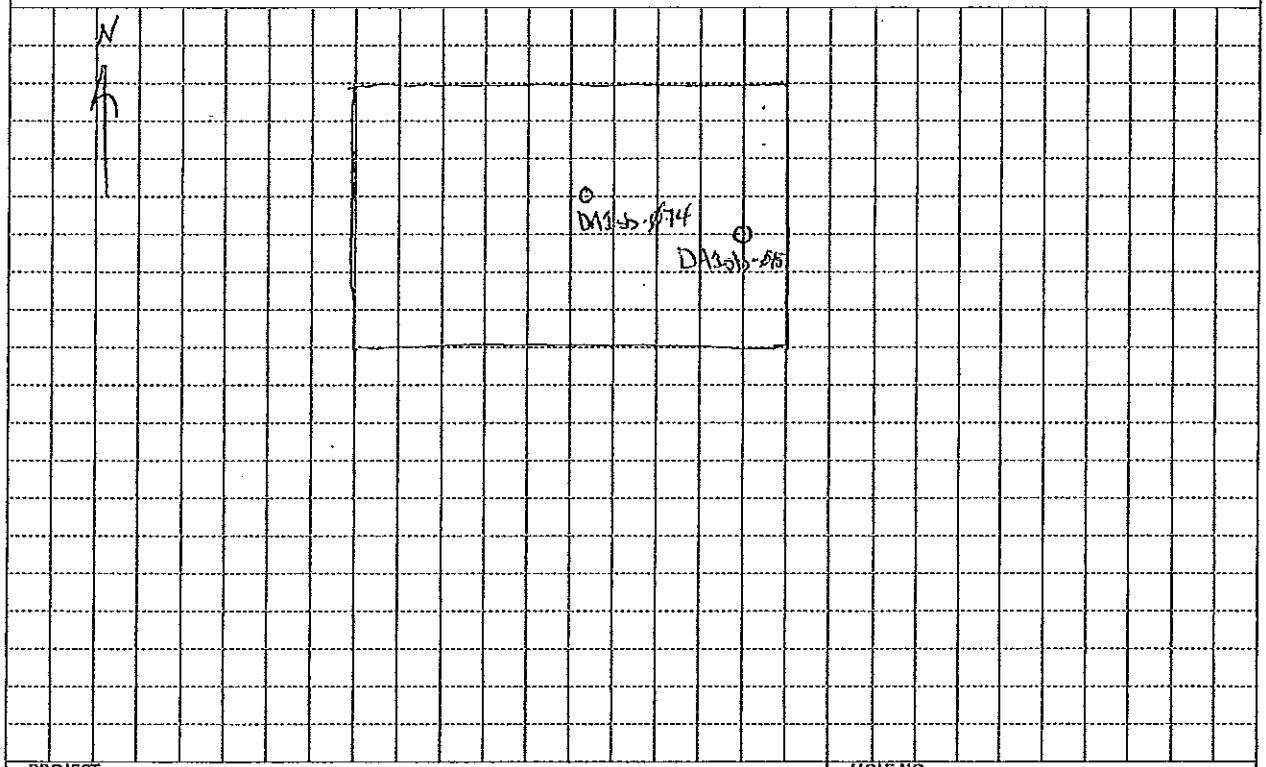
DISTRICT		HOLE NUMBER: DA15b-B75
1. COMPANY NAME: The Shaw Group - Shaw E&I	2. DRILL CONTRACTOR: Frontz Drilling	SHEET 1 OF 1
3. PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)	4. LOCATION: Ravenna, Ohio	
5. NAME OF DRILLER: Jeremy Locktone	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 6620 DT	
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Track Mount - Direct push - Micro core	8. HOLE LOCATION: ODA	
	9. SURFACE ELEVATION: —	
	10. DATE STARTED: 10 NOV 2010	11. DATE COMPLETED: 10 NOV 2010
12. OVERBURDEN THICKNESS	15. DEPTH OF GROUNDWATER ENCOUNTERED	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 16'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. OTAL NUMBER OF CORE BOXES

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	TAL	Explosives			100 %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite	NA	NA	

LOCATION SKETCH/COMMENTS — SCALE:



PROJECT	HOLE NO.
RVAAP - MI Sampling (Ravenna A/E: 133616)	DA15b-B75

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: DA1sb-Ø76

PROJECT: RVAAP

INSPECTOR: Paul McCarren

SHEET 1 OF 1 SHEET

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIAL (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	1–4	0'-1' Dark grey clayey silt, medium stiff, moist, "Topsoil" 1'-11' Light brown silty clay, stiff moist	0.0 ppm				DA1sb-Ø76M-0201 -SO 0930
	5–8		0.0 ppm				DA1sb-Ø76M-0202 -SO 0940
	9–12	11'-12' dark brown silty gravel, dense Poorly graded	0.0 ppm				DA1sb-Ø76M-0203 -SO DA1sb-Ø76M-0203 -SO 11' ▽ 0950
				EOB			

USCS CLASS
ML
CL/ML
GP/GM

PROJECT: RVAAP-MI Sampling (Revend A/E: 133616

HOLE NO.: DA1sb-Ø76

ENG FORM 5056A-R, AUG 94

(Proponent: CECW-EG)

HTRW DRILLING LOG

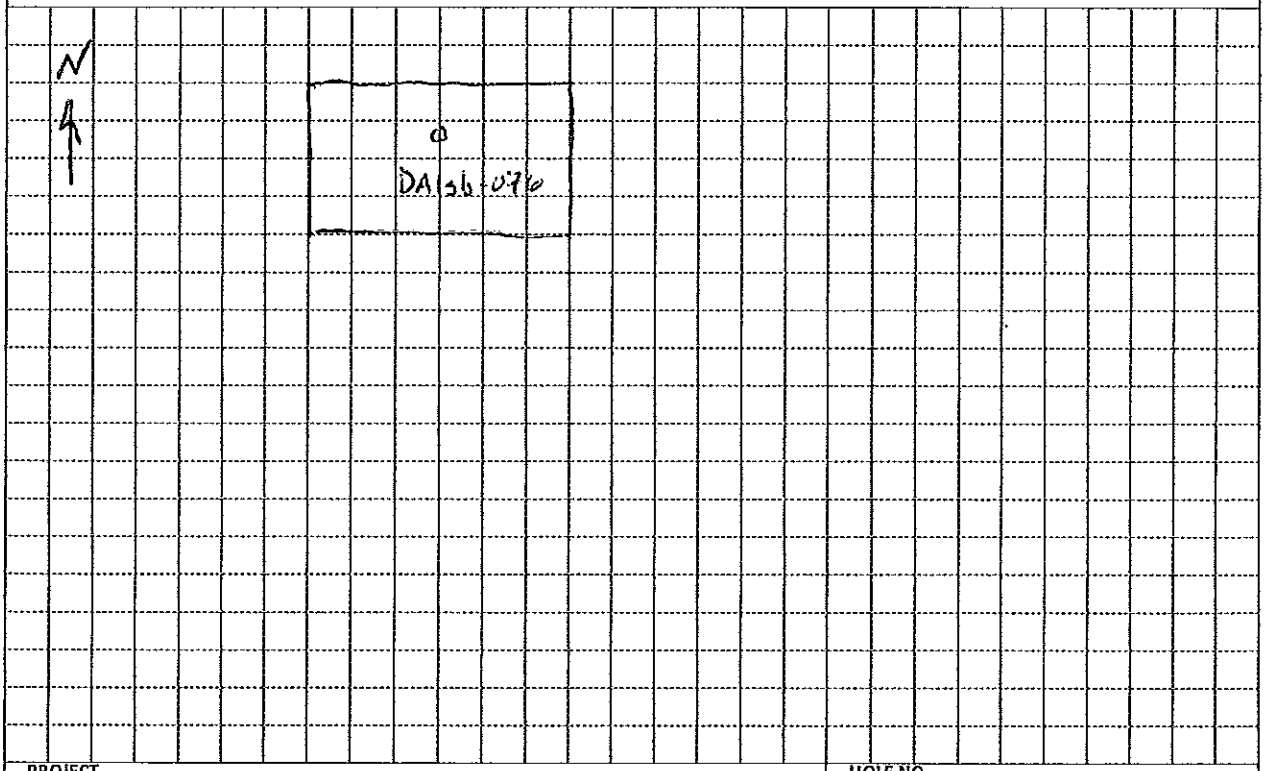
DISTRICT		HOLE NUMBER: DA1sb-076
1. COMPANY NAME: The Shaw Group - Shaw E&I	2. DRILL CONTRACTOR: Frontz Drilling	SHEET 1 OF 1
3. PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)	4. LOCATION: Ravenna, Ohio	
5. NAME OF DRILLER: Jeremy Lockrone	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 6620 DT	
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Track Mount - Direct Push - Macrocore	8. HOLE LOCATION: ODA	
	9. SURFACE ELEVATION: —	
	10. DATE STARTED: 10 NOV 2010	11. DATE COMPLETED: 10 NOV 2010
12. OVERBURDEN THICKNESS	15. DEPTH OF GROUNDWATER ENCOUNTERED: 11 ft bgs	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 10 ft bgs 10 NOV 2010 12'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. OTAL NUMBER OF CORE BOXES
NA			

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NO	TAL	Explosives			100 %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Bentonite	NO	NO	Paul C. Hefner

LOCATION SKETCH/COMMENTS — SCALE:



PROJECT	HOLE NO.
RVAAP - MI Sampling (Ravenna A/E: 133616)	DA1sb-076

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

HOLE NUMBER: DA15b-077

PROJECT: RVAAP

INSPECTOR: Paul McCarten

SHEET 1 OF 1

ELEV. (a)	DEPTH (b)	DESCRIPTION OF MATERIAL (c)	FIELD SCREENING RESULTS (d)	GEOTECH SAMPLE OR CORE BOX NO. (e)	ANALYTICAL SAMPLE NO. (f)	BLOW COUNT (g)	REMARKS (h)
	0-4	0'-1' Dark grey clayey silt, medium stiff, moist Top soil 1'-7' Lighter Brown silty clay, stiff, moist	0.0ppm				DA15b-077M-0201-SO 1400
	4-8	7'-14' Dark Brown silt stiff, wet	0.0ppm				DA15b-077M-0202-SO 1410 7' ▽
	8-12		0.0ppm				DA15b-077M-0203-SO 1420
	12-16	14'-16 Dark Brown poorly graded coarse sand to silt, dense, wet	0.0ppm				DA15b-077M-0204-SO 1430
				EOB			

USCS CLASS: ML; CL/ML; ML; SP/SM

PROJECT: RVAAP-MI sampling (Ravenna A/E: 133616

HOLE NO.: DA15b-077

ENG FORM 5056A-R, AUG 94 (Proponent: CECW-EG)

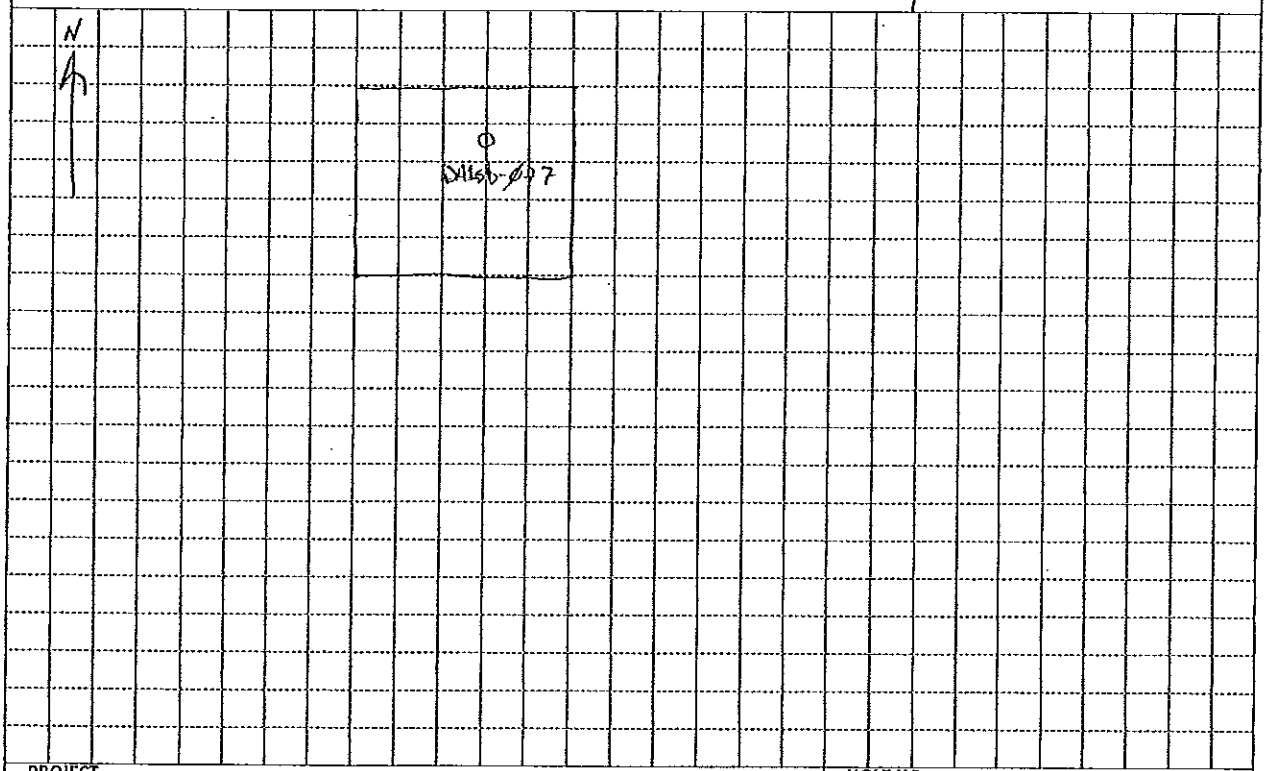
HTRW DRILLING LOG

1. COMPANY NAME: The Shaw Group - Shaw E&I	2. DRILL CONTRACTOR: Frontz Drilling	DISTRICT:	HOLE NUMBER: DA36-077
3. PROJECT: RVAAP - MI Sampling (Ravenna A/E: 133616)	4. LOCATION: Ravenna, Ohio		SHEET 1 OF 1
5. NAME OF DRILLER: Jeremy Lockhart	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 6620 DT		
7. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	8. HOLE LOCATION: ODA		
	9. SURFACE ELEVATION: —		
	10. DATE STARTED: 10NOV2010	11. DATE COMPLETED: 10NOV2010	
12. OVERBURDEN THICKNESS	15. DEPTH OF GROUNDWATER ENCOUNTERED		
13. DEPTH DRILLED INTO ROCK	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED		
14. TOTAL DEPTH OF HOLE: 16'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)		

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. OTAL NUMBER OF CORE BOXES

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	NA	TAL	EXPLOSIVES			
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
	BENTONITE	NA		[signature]		

LOCATION SKETCH/COMMENTS — SCALE: 1



PROJECT	HOLE NO.
RVAAP - MI Sampling (Ravenna A/E: 133616)	DA36-077

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

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Appendix B
Quality Assurance Summary Report

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Acronyms and Abbreviations

AOC	Area of Concern
CERCLA	Comprehensive, Environmental Compensation and Liability Act
CFR	Code of Federal Regulations
DOD	Department of Defense
ELAP	Environmental Laboratory Accreditation Program
FCR	Field Change Request
FSAP	Facility-Wide Sampling and Analysis Plan
FSP	Field Sampling Plan
FWQAPP	Quality Assurance Project Plan
LCG	Louisville Chemistry Guideline
M&TE	measuring and testing equipment
NCR	Noncomformance Report
NELAC	National Environmental Laboratory Accreditation Conference
Ohio EPA	Ohio Environmental Protection Agency
OSHA	Occupational Safety and Health Administration
QA	quality assurance
QC	quality control
QCSR	Quality Control Summary Report
QSM	Quality Systems Manual
RI	Remedial Investigation
RVAAP	Ravenna Army Ammunition Plant
SAIC	Science Applications International Corporation
Shaw	Shaw Environmental & Infrastructure, Inc.
SOW	Scope of Work
SSHP	Site Safety and Health Plan
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency

PROJECT QUALITY ASSURANCE SUMMARY

This Project *Quality Assurance Summary Report*; hereafter, referred to as the *QASR*, has been prepared by Shaw Environmental & Infrastructure, Inc. (Shaw) to meet the quality assurance/quality control (QA/QC) objectives for the Phase II Remedial Investigation (RI) activities at the RVAAP-03 Open Demolition Area #1 (ODA1) at the Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio. These objectives were established in accordance with the *Scope of Work for Environmental Services at RVAAP-34 Sand Creek Disposal Road Landfill, RVAAP-03 Open Demolition Area 1, and RVAAP-28 Mustard Agent Burial Site* and the *Sampling and Analysis Plan Addendum No.1* (hereafter referred to as "*Addendum*"). The *Addendum* supplements the *Facility-Wide Sampling and Analysis Plan* (*FSAP*) *for Environmental Investigations at the RVAAP* (SAIC, 2001a). The *FSAP* provides the base documentation (i.e., technical and investigative protocols) for conducting a RI under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) at RVAAP. Field activities at the ODA1 Area of Concern (AOC) were conducted in two mobilizations that occurred in October and November, 2010, respectively and included RI sampling activities for the collection of environmental media from the following matrices: surface soil, subsurface soil and dry sediment.

Field Quality Control

This section outlines the implementation of procedures and practices by Shaw to ensure project QC objectives were achieved.

Readiness Review/Pre-Mobilization

Shaw coordinated pre-mobilization actions to ensure the following elements of the proposed field activities were implemented prior to mobilization the field: 1) project documents and procedures were approved, controlled and properly distributed; 2) assigned personnel were trained for their intended activities; 3) mobilization and site logistics were established; 4) laboratories were notified as to when sample shipment would commence and were able to meet turn-around requirements; 5) subcontractors were properly notified to mobilize, submitted the required certifications, and were ready to begin work; and 6) QC systems were in place.

Procedures

Standard operating methods for field activities performed during the Phase II RI are incorporated into the governing documents for the project. The FSAP (SAIC, 2001) describes the overall approach and methodologies to be used for projects at RVAAP, and the Addendum (Shaw, 2010) details project-specific requirements for field implementation. The Unites States Army Corps of Engineers (USACE), Louisville District and the Ohio

Environmental Protection Agency (Ohio EPA) reviewed and approved these documents prior to implementation of RI field activities. Clarifications and/or planned deviations from either plan in the described methods of implementation are typically documented as field change requests (FCRs); however, no FCRs were submitted for this Phase II RI effort. Any variances from the approved plans were documented as Nonconformance Reports (NCRs). There were no variances identified or FCRs submitted during the implementation of the RI at the Sand Creek Disposal Road Landfill AOC.

Training

All field personnel were required to attend a safety orientation meeting prior to working at any project site associated with the RVAAP project. The safety orientation training was documented on the Site Safety Health Plan (SSHP) Acknowledgement Form and included the following topics:

- Names of personnel responsible for site safety;
- Responsibilities for accident prevention and maintaining safe and healthful work environments;
- Procedures for reporting and correcting unsafe conditions or practices;
- Safety and health hazards on site and the means to control/eliminate those hazards;
- Personal protection equipment use and care;
- Morning safety and preparatory meeting procedures;
- Review of pertinent sections including emergency response procedures as outlined in the Emergency Response Plan and Emergency Response Training;
- Responsibilities for reporting all accidents and illnesses;
- Provisions for medical care and facilities and the names of cardiopulmonary resuscitation and first-aid trained personnel assigned to the project;
- Fire prevention;
- Housekeeping;
- Hazard Communication Program, includes discussion of Material Safety Data Sheets for hazardous chemicals used on site;
- Review of applicable Activity Hazard Analyses;
- Standard operating procedures, safety rules, and safe work practices for the project; and
- Location of safety equipment (e.g., fire extinguishers, first-aid kits, eyewash stations).

All site personnel working in regulated areas at this project were required to meet the minimum Occupational Safety and Health Administration (OSHA) training requirements as specified in 29 CFR 1926.65 and 29 CFR 1910.120. Copies of the OSHA-required training and medical records were provided to the RVAAP Facility Manager prior to commencing field activities and were maintained on-site by Shaw as well during field activities.

Equipment Calibration

Several types of measuring and testing equipment (M&TE) were used during the field investigation that included the following:

- Schonstedt Model GA-52Cx magnetometer;
- Photoionization detector (MiniRAE 3000); and
- Global Positioning System (Trimble GeoXH Handheld)

These M&TE consisted of both Shaw-owned and rented units from a reputable provider. Only equipment having verifiable traceability to nationally recognized standards was used in the field and was maintained in the project file. Last and next calibration recall dates were recorded and maintained for each instrument used in the instrumentation log book. Instruments were calibrated daily by the M&TE Coordinator (or designee) according to the manufacturer's instructions and frequency. Daily calibration activities and results, as well as source information for all calibration standards and reagents were documented in the logbooks dedicated to that particular piece of equipment.

Equipment that did not calibrate within manufacturer’s specifications or operate properly in the field was taken out of service and was replaced promptly. Replacement equipment was placed into service upon calibration.

Quality Control Samples

Field QC samples collected for this project included trip blanks, equipment rinsate blanks, source water (potable and deionized), and field duplicates, as specified in the Addendum (Shaw, 2010). Field QA split samples were also collected and sent to a USACE QA laboratory for independent analysis and evaluation of analytical results by the contracted laboratory. The Shaw Field Operations Manager was responsible for implementing the QA program in the field. Appendix E of this RI report presents data verification reports that evaluate data quality and analytical performance with respect to field QC results. Field QC data and analyses of QC samples are presented in Appendix C of the Phase II RI report.

Field Records

Field data, observations, activities, and information were recorded on daily activity logs and sampling forms, and bound in 3-ring binders (i.e., logbooks). Each field team possessed a

binder with applicable sampling forms and activity logs. The use of structured logbooks ensured that all necessary data were entered consistently. Logbook entries were checked for accuracy and completeness by independent reviewers. Field records were collected upon completion of the project and likewise maintained by the Shaw Field Operations Manager. Other records included equipment/material certifications and invoices, and air-bill forms.

Analytical Laboratory Quality Assurance

Shaw subcontracted CT Laboratories, Inc. of Baraboo, Wisconsin to perform chemical analysis of samples collected during this RI. CT Laboratories has current Environmental Laboratory Accreditation Program (ELAP) and National Environmental Laboratory Accreditation Conference (NELAC) accreditations and/or approvals. CT Laboratories has Navy certification approvals to meet the Department of Defense (DoD) Quality Systems Manual (QSM) Version 4.1 (DoD, 2009) requirements. QA split samples were collected and submitted to an independent USACE, Louisville District QA laboratory (RTI Laboratory in Livonia, Michigan). Primary analytical direction for these projects was obtained from the identified USEPA publication SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA, 2007) and the *DoD QSM* (DoD, 2009). The *Louisville Chemistry Guideline* (*LCG*), Version 5 (USACE, 2002) was used as a guidance document for data review and data validation

Readiness Review

Laboratory QA/QC activities were initiated during the readiness review. The readiness review ensured that: 1) governing documents and approved analytical methods were controlled and properly distributed; 2) CT Laboratories was notified as to when sample shipment would commence and were able to meet turn-around requirements; 3) logistical coordination was established between the laboratory and the field team; and 4) the laboratory QA program was consistent and compatible with the project requirements.

Procedures

Prior to initiation of analytical support for this RI, CT Laboratories and Shaw reviewed and negotiated a contract based on a comprehensive laboratory Statement of Work (SOW). The laboratory SOW detailed project-specific requirements including the following:

- Parameters to be measured;
- Analytical methods;
  - Adherence to USEPA SW-846 protocols; and
  - DoD QSM for Environmental Laboratories, Version 4.1 requirements
- Project quantitation goals (sensitivity); and

- Data deliverables requirements.

All laboratory comments and questions were resolved before analytical work proceeded.

Laboratory Quality Control

To document laboratory data quality and to measure the quality of the analytical process, laboratory QC samples (e.g., method blanks, laboratory control samples, laboratory duplicates, and matrix spike/matrix spike duplicates) and data verification/validation were employed. The results of laboratory QC are discussed in the Data Validation Report in Appendix D. Analytical results of laboratory QC samples are included in Appendix C and form the basis of the data verification and evaluation process (Section D.1.2).

Laboratory Documentation

CT Laboratories maintains comprehensive information regarding the entire analytical process. The laboratory delivered summary data packages and electronic deliverables to Shaw consistent with those identified in the USEPA SW-846 and DoD QSM 4.1 protocols for validation and verification. Laboratory QC sample analyses were cross-referenced to the appropriate environmental field sample analyses in the laboratory deliverables.

Data Verification/Validation

Shaw subjected analytical data generated during this project to a rigorous process of data verification, as specified in the Facility-Wide Quality Assurance Project Plan (FWQAPP) (SAIC, 2001) and the Addendum (Shaw, 2009). For verification of data, criteria were established against which the analytical results were compared and from which a judgment was rendered regarding the acceptability and qualification of the data (Appendix D). Upon receipt of data packages from the laboratory, the information was subjected to a systematic examination following standardized checklists and procedures to ensure content, presentation, administrative validity, and technical validity. Routine data changes were documented through data change forms. Data deficiencies or formal laboratory related nonconformances are typically documented through an NCR process, as required; however, no NCRs were issued to CT Laboratories for this project.

Following data verification, the Shaw Project Chemist performed 100 percent data validation of all field samples, a comprehensive validation of the QA split sample dataset, and a comparison of primary sample, field duplicate sample, and field QA split sample information.

Quality Assurance Documentation

Primary methods for documenting QA during the RI process at RVAAP include the completion of FCRs requiring USACE and Ohio EPA concurrence and NCRs generated in

accordance with Shaw QA procedures. There were no FCRs or NCRs generated during the implementation of this RI.

References

Science Applications International Corporation (SAIC), 2001. *Final Facility-Wide Sampling and Analysis Plan for Environmental Investigations at the Ravenna Army Ammunition Plant, Ravenna, Ohio*. March 2001.

Shaw Environmental & Infrastructure, Inc. (Shaw). *Final Sampling and Analysis Plan Addendum No. 1 for Environmental Services at RVAAP-34 Sand Creek Disposal Road Landfill, RVAAP-03 Open Demolition Area #1, and RVAAP-28 Mustard Agent Burial Site, Ravenna Army Ammunition Plant, Ravenna, Ohio*. February, 2010.

U.S. Department of Defense (DoD), 2009. *DoD Quality Systems Manual for Environmental Laboratories*, Version 4.1, Environmental Data Quality Workgroup. April 22, 2009.

U.S. Army Corps of Engineers (USACE), 2002. *Louisville Chemistry Guideline*, Louisville District, Environmental Engineering Branch, Revision 5. June 2002.

U.S. Environmental Protection Agency (EPA), 2007. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, publication SW-846, Revision 6. February 2007.

Appendix C
Analytical Results

Note: Data submitted on compact disc.

Appendix D
Data Validation Summary

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Attachment A Data Validation Checklist
Attachment B Summary of Remedial Investigation Sample Data Qualifications

Acronyms and Abbreviations

%D	percent differences
AOC	Area of Concern
B	blank contamination.
BFB	bromofluorobenzene
CCB	calibration blank
CCC	calibration check compounds
CCV	continuing calibration verification
COC	chain-of-custody
DFTPP	decafluorotriphenylphosphine
DL	detection limit
DOD	Department of Defense
DUP	duplicate sample
ELAP	Environmental Laboratory Accreditation Program
ER	equipment rinsate sample
GC/MS	gas chromatography/mass spectrometry
ICB	initial calibration blank
ICS	interelement check standard
ICP	inductively coupled plasma
ISM	incremental sampling method
J	estimated value or one or more quality control criteria failed
LCG	Louisville Chemistry Guideline, Version V
LCS	laboratory control sample
LOD	limit of detection
LOQ	limit of quantitiation
MB	method blank
MS	matrix spike
MSD	matrix spike duplicate
NA	not applicable
NELAC	National Environmental Laboratory Accreditation Conference
PCBs	polychlorinated biphenyls
PDS	post-digestion spike
QC	quality control
QSM	DoD Quality Systems Manual, Version 4.1
RF	response factor
RI	Remedial Investigation
RL	reporting limit
RPD	relative percent difference
RSD	relative standard deviation
RVAAP	Ravenna Army Ammunition Plant
SDG	sample data group
Shaw	Shaw Environmental & Infrastructure, Inc.
SPCC	system performance check compounds
SSR	spiked sample result

Acronyms and Abbreviations (continued)

SR	sample result
SVOCs	semivolatile organic compounds
TB	trip blank sample
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VOCs	volatile organic compounds

1.0 INTRODUCTION

This Data Validation Report presents the results of an analytical data review and validation conducted by Shaw Environmental & Infrastructure, Inc. (Shaw) in support of Phase II Remedial Investigation (RI) field activities for the RVAAP-03 Open Demolition Area #1 (ODA1) Area of Concern (AOC) located at the Ravenna Army Ammunition Plant (RVAAP) in Ravenna, Ohio. Shaw subcontracted CT Laboratories, Inc. of Baraboo, Wisconsin to perform chemical analysis of samples collected during the Phase II RI. CT Laboratories has current Environmental Laboratory Accreditation Program (ELAP) and National Environmental Laboratory Accreditation Conference (NELAC) accreditations and/or approvals. CT Laboratories has Navy certification approvals to meet the Department of Defense (DoD) *Quality Systems Manual (QSM) Version 4.1* (DoD, 2009) requirements. Primary analytical direction for this project was obtained from the identified U.S. Environmental Protection Agency (USEPA) publication SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (USEPA, 2007) and the DoD QSM 4.1 (DoD, 2009). The *Louisville Chemistry Guideline* (*LCG*), Version 5 (USACE, 2002) was used as a guidance document for data review and data validation.

The Phase II RI field sampling was conducted at ODA1 between September 22, 2010 and November 10, 2010. Shaw collected a total of six surface soil samples (0 to 1 feet below ground surface [ft bgs]) using the incremental sampling method (ISM), one discrete surface soil sample (0 to 1 ft bgs) for volatile organic compound (VOC) analysis only, 91 subsurface soil samples (1 to 16 ft bgs in 4-ft intervals) using modified ISM, and 21 discrete subsurface soil samples (1 to 16 ft bgs) for VOC analysis only. The sample summary is provided in **Table 1-1** at the end of this section. The qualified analytical data are summarized in data tables provided in Appendix C of the RI/FS.

CT Laboratories separated the ODA1 data from the original laboratory reports into new AOC-specific laboratory reports. New sample delivery group (SDG) numbers were identified for the new reports which are subsets of the originals. New SDG 81575 is a subset of original report SDG 81543. New SDG 81623 is a subset of original report SDG 81613. New SDG 82452 is a subset of original report SDG 82400. The original SDGs are referenced in the text, tables, and attachments of this Data Validation Report.

1.1 Data Review and Validation Steps

The following steps are involved in the data review and validation process.

- **Step 1**—Laboratory Data Review: The laboratory reviews its data before releasing data packages to Shaw. This review verifies that project specific reporting requirements were satisfied.
- **Step 2**—Data Verification by Shaw: Shaw performs a detailed verification process as described in Section 1.2. Shaw also reviews the analytical data packages for completeness, consistency, and compliance with the project quality assurance requirements presented in the RVAAP Final Facility-Wide Sampling and Analysis Plan (SAIC, 2001) and the project-specific Final Quality Assurance Project Plan Addendum No.1 (Shaw, 2009).
- **Step 3**—Data Validation by Shaw: Shaw assigned data qualifiers in accordance with DoD QSM 4.1.

1.2 Data Verification Process

Shaw completed Step 2 (Data Verification) of the data review/verification process. The purpose of data verification was to evaluate the completeness, consistency, and compliance of data packages with quality objectives stated in SW-846, as well as the DoD QSM 4.1. Data qualifiers were assigned based on data verification findings. The verification process reviewed the data elements listed below.

- **Holding Times [volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), explosives, and metals]**: Holding times were verified by comparing sampling dates on the chain of custody (COC) form with the dates of analysis and/or extraction on the analytical data sheet. The sample records documents were examined to determine if the samples had been properly preserved.
- **Gas chromatography (GC)/mass spectrometry (MS) Tune Check (VOCs, SVOCs)**: The GC/MS system tunes were evaluated using standard compounds [bromofluorobenzene (BFB) for VOCs and decafluorotriphenylphosphine (DFTPP) for SVOCs]. The BFB and DFTPP mass intensity criteria must be met before analysis can begin. The BFB and DFTPP tune acceptance criteria are provided in SW-846. The evaluation process involved the following steps:
  a. Verifying that the mass calibration was correct by reviewing the raw data.
  b. Verifying the data presented on each GC/MS tuning and mass calibration were compared with each mass listing submitted.

c. Verifying that a Mass Calibration Form was completed for each 12-hour period in which samples were analyzed.

d. Verifying that the laboratory made no transcription errors.

e. Verifying that the appropriate number of significant figures was reported.

f. Verifying that analytical calculations were error free. For example, the percent mass of m/z 443 relative to the mass of m/z 442 was calculated using the following equation:

$$\%\ \text{abundance} = \frac{\text{relative abundance of m/z 443}}{\text{relative abundance of m/z 442}} \times 100$$

- **Initial and Continuing Calibrations (VOCs, SVOCs, pesticides, PCBs, and explosives)**: DoD QSM 4.1 requirements for satisfactory instrument calibration were established to verify that the instrument was capable of producing acceptable quantitative data prior to sample analysis. The evaluation process involved the following:

  a. VOCs and SVOCs:

     i) Verifying that all response factors (RFs) and their mean were calculated accurately and the RFs of the system performance check compounds (SPCCs) met the method criteria requirement.

     ii) Verifying that relative standard deviations (RSDs) were calculated accurately and %RSDs of the calibration check compounds (CCCs) during initial calibration met the method requirements.

     iii) Verifying that percent differences (%Ds) of the CCCs during continuing calibration verifications were within the method requirements.

  b. Pesticides, PCBs (Aroclor-1016 and -1260), and explosives: verifying that the correlation coefficients were greater than 0.995.

  c. Checking the calculation of %RSD and verifying that all analytical method criteria were met.

The continuing calibration demonstrated the satisfactory maintenance of the instrument on a day-to-day basis. The evaluation process involved verifying the average RF and verifying the %Ds.

1.2.1 DoD QSM 4.1 Requirements

The DoD Environmental Quality Workshop (EDQW) has developed the manual "DoD Quality Systems Manual for Environmental Laboratories version 4.1" to provide baseline

requirements for the establishment and management of quality systems for environmental testing laboratories performing services for the Department of Defense. The manual contains the minimum requirements DoD considers essential to ensure the generation of definitive environmental data of known quality, appropriate for intended uses.

- **Limit of Detection (LOD)**: An estimate of the minimum amount of a substance that an analytical process can reliably detect. An LOD is analyte- and matrix-specific and may be laboratory-dependent.
- **LOD (Clarification)**: The smallest amount or concentration of a substance that must be present in a sample in order to be detected at a high level of confidence (99%). At the LOD, the false negative rate (Type II error) is 1%.
- **Determination and Verification of LOD (Requirement)**: A laboratory shall establish a detection limit (DL) using a scientifically valid and documented procedure for each suite of analyte-matrix-method, including surrogates. The detection limit shall be used to determine the LOD for each analyte and matrix as well as for all preparatory and cleanup methods routinely used on samples, as follows:

  a. After each detection limit determination, the laboratory must immediately establish the LOD by spiking a quality system matrix at approximately two to three times the detection limit (for a single-analyte standard) or one to four times the detection limit (for a multi-analyte standard). This spike concentration establishes the LOD. It is specific to each combination of analyte, matrix, method (including sample preparation), and instrument configuration. The LOD must be verified quarterly. The following requirements apply to the initial detection limit/LOD determinations and to the quarterly LOD verifications.

  b. The apparent signal to noise ratio at the LOD must be at least three and the results must meet all method requirements for analyte identification (e.g., ion abundance, second-column confirmation, or pattern recognition.) For data systems that do not provide a measure of noise, the signal produced by the verification sample must produce a result that is at least three standard deviations greater than the mean method blank concentrations.

  c. If a laboratory uses multiple instruments for a given method the LOD must be verified on each.

  d. If the LOD verification fails, then the laboratory must repeat the detection limit determination and LOD verification at a higher concentration or perform and

pass two consecutive LOD verifications at a higher concentration and set the LOD at the higher concentration.

e. The laboratory shall maintain documentation for all detection limit determinations and LOD verifications.

- **Limits of Quantitation (LOQ)**: The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence.
- **LOQ (Clarification)**: The lowest concentration that produces a quantitative result within specified limits of precision and bias. For DoD projects, the LOQ shall be set at or above the concentration of the lowest initial calibration standard.
- **Establishment and Verification of LOQ (Requirement)**: For DoD projects, the LOQ must be set within the calibration range prior to sample analysis. At a minimum, the LOQ must be verified quarterly. The laboratory procedure for establishing the LOQ must empirically demonstrate precision and bias at the LOQ. The LOQ and associated precision and bias must meet client requirements and must be reported. If the method is modified, precision and bias at the new LOQ must be demonstrated and reported.

1.2.2 Data Reduction

The data reduction process consisted of the following procedures:

- **Initial Calibration (metals)**: Ensure initial calibrations demonstrated that the instrument was capable of acceptable performance at the beginning of an analytical run. The evaluation process involved:
  a. Verifying that the instrument was calibrated daily and each time the instrument was set up.
  b. Verifying that at least three standards and a blank were used to generate initial calibration.
  c. Verifying that the correlation coefficients were greater than 0.995.
- **Continuing calibration verification (CCV)**: Ensure CCV documented that the initial calibrations were still valid. The evaluation process involved:
  a. Verifying that CCVs were conducted after every ten samples.
  b. Verifying that a CCV was conducted at the end of the analytical sequence.
  c. Verifying that the percent recoveries (% Rs) for the CCVs were within 90 to 110%.

- **Instrument Performance (pesticides)**: Pesticide data packages were evaluated to verify that the total percentage breakdown of either DDT or eldrin did not exceed 15%.
- **Initial Calibration Verification (ICV)**: Initial calibration verifications were reviewed to verify that an ICV was prepared from a second source and that the recoveries were within acceptable ranges.
- **Interelement Check Standard (metals)**: The laboratory's interelement and background correction factors were evaluated by recalculation of one or more recoveries from the raw data and verifying that the recalculated values agreed with the laboratory report. The following points were established:
  a. No interference was observed in the Interelement Check Standard A (ICSA) analysis, and
  b. 80 to 120% was observed for the Interelement Check Standard B (ICSB) analysis.
- **Blanks (VOCs, SVOCs, pesticides, PCBs, and explosives)**: Blank analytical results were assessed to determine the existence and magnitude of contamination problems. The criteria for evaluation of blanks applied to any blank associated with the samples. The evaluation process involved the following:
  a. Reviewing the results of all associated blanks, summary sheet, and raw data (chromatograms and quantitation reports),
  b. Verifying that the method blank analysis had been reported per matrix, per concentration level, for each instrument used to analyze samples, and for each extraction batch, and
  c. Verifying that there is a method blank present for each preparatory batch and that no target analyte was detected greater than one-half the reporting limit and greater than one-tenth the amount measured in any sample or greater than one-tenth the regulatory limit, whichever is greater.
- **Blanks (metals)**: Blank analytical results were assessed to determine the existence and magnitude of contamination problems. The criteria for evaluation of blanks applied to any blank associated with the samples. If a problem with any blank existed, all data associated with the sample batch was evaluated to determine whether or not there was an inherent variability in the data for the sample batch, or if the problem was an isolated occurrence not affecting other data.

- **Laboratory Control Sample (LCS)**: The LCS monitored overall performance of all steps in the analytical process, including sample preparation. The evaluation included:
  a. Reviewing the summary form and verifying that the results were within the control limits, and
  b. Checking the raw data to verify recoveries reported on the summary form.
- **Internal Standard (VOCs and SVOCs)**: Internal standard performance was evaluated to determine whether the GC/MS sensitivity and response was stable during every run. The evaluation involved the following:
  a. Checking raw data (i.e., chromatograms, quantitation lists etc.) to verify that recoveries reported on the internal standard area summary report were within acceptable limits, and
  b. Verifying that all retention times and internal standard areas were acceptable.
- **Surrogate Recovery (VOCs, SVOCs, pesticides, PCBs, and explosives)**: Surrogate recovery data were reviewed in accordance with DoD QSM 4.1 specifications. The evaluation involved the following:
  a. Checking raw data to verify the recoveries reported on the surrogate recovery summary form.
  b. Determining whether any two surrogates within a base/neutral or acid SVOC fraction, or one surrogate for a VOC fraction were out of specification.
  c. Determining whether the laboratory took appropriate corrective action when surrogate recoveries were outside of specification (e.g., evidence of re-purging, re-injection or re-extraction).
  d. Verifying that blanks did not exhibit surrogates outside the criteria.
- **Matrix Spike and Matrix Spike Duplicate (MS/MSD) [VOCs, SVOCs, pesticides, PCBs, and explosives]**: MS/MSD analytical results were reviewed in accordance with DoD QSM 4.1 specifications. The evaluation process involved the following:
  a. Inspecting matrix spike/matrix spike duplicate results.
  b. Verifying transcriptions from raw data, and
  c. Verifying calculations.
- **Matrix Spike (metals)**: The matrix spike analytical results were reviewed for conformance to LCG specifications. The matrix spike recovery was verified by:

a. Reviewing the matrix spike recovery summary form to verify that the results were within specified limits.

b. Checking the data and recalculating at least one %R using the following equation:

$$\%R = \frac{(SSR - SR)}{SA} \times 100$$

Where: SSR = spiked sample result
SR = sample result
SA = spike added

- **Matrix Duplicate (metals)**: Matrix duplicate analytical results were reviewed for conformance to LCG specifications. The evaluation process involved:

  a. Reviewing the summary form and verifying that the results fall within the control limits.

  b. Checking the raw data and recalculating one or more relative percent difference (RPD) using the following equation:

$$RPD = \frac{|S-D|}{|S+D|/2} \times 100$$

Where: S = first sample value (original)
D = second sample value (duplicate)

  c. Verifying that the field blank was not used for duplicate analysis.

- **Inductively Coupled Plasma (ICP) Serial Dilution (metals)**: Serial dilution data were reviewed to determine whether significant physical or chemical interference's existed due to the sample matrix.

1.3 Documentation

Shaw has prepared validation checklists for methods addressed in the LCG (VOCs, SVOCs, pesticides/PCBs, explosives, and metals). The checklist and format has been reviewed and approved by the USACE Project Chemist. The validation checklists are presented in **Attachment A**. The validation qualification assignment table is provided in **Attachment B**.

Table 1-1
ODA1 2010 Phase II RI Sample Summary Table

Sample Location/Soil Boring	Sample ID	SDG	Matrix	Top Depth (ft)	Bottom Depth (ft)	Date Collected	Sampling Method	TAL Metals	Explosives	Hexavalent Chromium	VOCs	SVOCs	Pesticides	PCBs	Cyanide	Propellants
Trip Blank	DA1qc-003-0001-TB	81613	QC	NA	NA	09/27/10	NA				1					
Trip Blank	DA1qc-004-0001-TB	81613	QC	NA	NA	09/27/10	NA				1					
Trip Blank	DA1qc-005-0001-TB	81613	QC	NA	NA	09/27/10	NA				1					
DA1ss-050	DA1ss-050m-0201-SO	81613	SS	0.0	1.0	09/27/10	Increment	1	1	1						
DA1ss-051	DA1ss-051m-0201-SO	81613	SS	0.0	1.0	09/27/10	Increment	1	1	1						
DA1ss-052																
DA1ss-053	DA1ss-053m-0201-SO	82400	SS	0.0	1.0	11/10/10	Increment	1	1	1						
DA1ss-054	DA1ss-054m-0201-SO	82400	SS	0.0	1.0	11/10/10	Increment	1	1	1						
DA1sb-055	DA1sb-055m-0001-SO	81543	SB	4.0	8.0	09/22/10	Modified ISM	1	1							
	DA1sb-055m-0002-SO	81543	SB	8.0	12.0	09/22/10	Modified ISM	1	1							
	DA1sb-055m-0003-SO	81543	SB	12.0	16.0	09/22/10	Modified ISM	1	1							
DA1sb-056	DA1sb-056m-0001-SO	81543	SB	1.0	4.0	09/22/10	Modified ISM	1	1							
	DA1sb-056m-0002-SO	81543	SB	4.0	8.0	09/22/10	Modified ISM	1	1							
	DA1sb-056m-0003-SO	81543	SB	8.0	12.0	09/22/10	Modified ISM	1	1							
	DA1sb-056m-0004-SO	81543	SB	12.0	16.0	09/22/10	Modified ISM	1	1							

Table 1-1 (continued)
ODA1 2010 Phase II RI Sample Summary Table

Sample Location/Soil Boring	Sample ID	SDG	Matrix	Top Depth (ft)	Bottom Depth (ft)	Date Collected	Sampling Method	TAL Metals	Explosives	Hexavalent Chromium	VOCs	SVOCs	Pesticides	PCBs	Cyanide	Propellants
DA1sb-057	DA1sb-057m-0201-SO	81543	SB	1.0	4.0	09/23/10	Modified ISM	1	1							
	DA1sb-057m-0202-SO	81543	SB	4.0	8.0	09/23/10	Modified ISM	1	1							
	DA1sb-057m-0203-SO	81543	SB	8.0	12.0	09/23/10	Modified ISM	1	1							
	DA1sb-057m-0204-SO	81543	SB	12.0	16.0	09/23/10	Modified ISM	1	1							
DA1sb-058	DA1sb-058m-0201-SO	81543	SB	4.0	8.0	09/23/10	Modified ISM	1	1							
	DA1sb-058m-0202-SO	81543	SB	8.0	12.0	09/23/10	Modified ISM	1	1							
	DA1sb-058m-0203-SO	81543	SB	12.0	16.0	09/23/10	Modified ISM	1	1							
DA1sb-059																
	DA1sb-059m-0201-SO	81543	SB	5.0	8.0	09/23/10	Modified ISM	1	1	1		1	1	1	1	1
	DA1sb-059m-0202-SO	81543	SB	8.0	12.0	09/23/10	Modified ISM	1	1							
DA1sb-060	DA1sb-060m-0201-SO	81543	SB	1.0	4.0	09/23/10	Modified ISM	1	1							
	DA1sb-060m-0202-SO	81543	SB	4.0	8.0	09/23/10	Modified ISM	1	1							
	DA1sb-060m-0203-SO	81543	SB	8.0	12.0	09/23/10	Modified ISM	1	1							
	DA1sb-060m-0204-SO	81543	SB	12.0	16.0	09/23/10	Modified ISM	1	1							
DA1sb-061	DA1sb-061m-0201-SO	81543	SB	1.0	4.0	09/23/10	Modified ISM	1	1							
	DA1sb-061m-0202-SO	81543	SB	4.0	8.0	09/23/10	Modified ISM	1	1							
	DA1sb-061m-0203-SO	81543	SB	8.0	12.0	09/23/10	Modified ISM	1	1							
	DA1sb-061m-0204-SO	81543	SB	12.0	16.0	09/23/10	Modified ISM	1	1							
DA1sb-062	DA1sb-062m-0201-SO	81543	SB	1.0	4.0	09/23/10	Modified ISM	1	1							

Table 1-1 (continued)
ODA1 2010 Phase II RI Sample Summary Table

Sample Location/Soil Boring	Sample ID	SDG	Matrix	Top Depth (ft)	Bottom Depth (ft)	Date Collected	Sampling Method	TAL Metals	Explosives	Hexavalent Chromium	VOCs	SVOCs	Pesticides	PCBs	Cyanide	Propellants
	DA1sb-062m-0203-SO	81543	SB	8.0	12.0	09/23/10	Modified ISM	1	1							
	DA1sb-062m-0204-SO	81543	SB	12.0	16.0	09/23/10	Modified ISM	1	1							
DA1sb-063																
	DA1sb-063m-0201-SO	81543	SB	4.0	8.0	09/23/10	Modified ISM	1	1							1
	DA1sb-063m-0202-SO	81543	SB	8.0	12.0	09/23/10	Modified ISM	1	1							1
	DA1sb-063m-0203-SO	81543	SB	12.0	16.0	09/23/10	Modified ISM	1	1							1
DA1sb-064																
	DA1sb-064m-0201-SO	81543	SB	4.0	8.0	09/23/10	Modified ISM	1	1	1		1	1	1	1	1
	DA1sb-064m-0202-SO	81543	SB	8.0	12.0	09/23/10	Modified ISM	1	1							1
	DA1sb-064m-0203-SO	81543	SB	12.0	16.0	09/23/10	Modified ISM	1	1							1
DA1sb-065	DA1sb-065m-0201-SO	81543	SB	4.0	8.0	09/23/10	Modified ISM	1	1							
	DA1sb-065m-0203-SO	81543	SB	12.0	16.0	09/23/10	Modified ISM	1	1							
DA1sb-066	DA1sb-066m-0201-SO	81543	SB	1.0	4.0	09/23/10	Modified ISM	1	1							1
	DA1sb-066m-0202-SO	81543	SB	4.0	8.0	09/23/10	Modified ISM	1	1							1
	DA1sb-066m-0203-SO	81543	SB	8.0	12.0	09/23/10	Modified ISM	1	1							1
	DA1sb-066m-0204-SO	81543	SB	12.0	16.0	09/23/10	Modified ISM	1	1							1
Trip Blank	DA1qc-001-0001-TB	81613	QC	NA	NA	09/24/10	NA				1					
Trip Blank	DA1qc-002-0001-TB	81613	QC	NA	NA	09/24/10	NA				1					
DA1sb-067																

Table 1-1 (continued)
ODA1 2010 Phase II RI Sample Summary Table

Sample Location/Soil Boring	Sample ID	SDG	Matrix	Top Depth (ft)	Bottom Depth (ft)	Date Collected	Sampling Method	TAL Metals	Explosives	Hexavalent Chromium	VOCs	SVOCs	Pesticides	PCBs	Cyanide	Propellants
DA1sb-067																
	DA1sb-067m-0201-SO	81613	SB	2.0	4.0	09/24/10	Modified ISM	1	1							
	DA1sb-067m-0202-SO	81613	SB	4.0	8.0	09/24/10	Modified ISM	1	1	1						
	DA1sb-067m-0203-SO	81613	SB	8.0	12.0	09/24/10	Modified ISM	1	1							
	DA1sb-067m-0204-SO	81613	SB	12.0	16.0	09/24/10	Modified ISM	1	1							
DA1sb-068																
	DA1sb-084m-0201-SOa	81613	SB	1.0	4.0	11/10/10	Modified ISM	1	1						1	
	DA1sb-068m-0202-SO	81613	SB	4.0	8.0	09/24/10	Modified ISM	1	1							1
	DA1sb-068m-0203-SO	81613	SB	8.0	12.0	09/24/10	Modified ISM	1	1							1
	DA1sb-068m-0204-SO	81613	SB	12.0	16.0	09/24/10	Modified ISM	1	1							1
DA1sb-069																
	DA1sb-069m-0201-SO	81613	SB	4.0	8.0	09/24/10	Modified ISM	1	1			1	1	1	1	1
	DA1sb-069m-0202-SO	81613	SB	8.0	12.0	09/24/10	Modified ISM	1	1							1

Table 1-1 (continued)
ODA1 2010 Phase II RI Sample Summary Table

Sample Location/Soil Boring	Sample ID	SDG	Matrix	Top Depth (ft)	Bottom Depth (ft)	Date Collected	Sampling Method	TAL Metals	Explosives	Hexavalent Chromium	VOCs	SVOCs	Pesticides	PCBs	Cyanide	Propellants
DA1sb-069	DA1sb-069m-0203-SO	81613	SB	12.0	16.0	09/24/10	Modified ISM	1	1							1
DA1sb-070																
	DA1sb-070m-0201-SO	81613	SB	1.0	4.0	09/24/10	Modified ISM	1	1							1
	DA1sb-070m-0202-SO	81613	SB	4.0	8.0	09/24/10	Modified ISM	1	1							1
	DA1sb-070m-0203-SO	81613	SB	8.0	12.0	09/24/10	Modified ISM	1	1			1	1	1	1	1
DA1sb-071																
	DA1sb-071m-0201-SO	81613	SB	4.0	8.0	09/24/10	Modified ISM	1	1	1		1	1	1	1	1
	DA1sb-071m-0202-SO	81613	SB	8.0	12.0	09/24/10	Modified ISM	1	1							
	DA1sb-071m-0203-SO	81613	SB	12.0	16.0	09/24/10	Modified ISM	1	1							
DA1sb-072	DA1sb-072m-0201-SO	81613	SB	2.0	4.0	09/24/10	Modified ISM	1	1	1		1				
	DA1sb-072m-0202-SO	81613	SB	4.0	8.0	09/24/10	Modified ISM	1	1							
	DA1sb-072m-0203-SO	81613	SB	8.0	12.0	09/24/10	Modified ISM	1	1							

Table 1-1 (continued)
ODA1 2010 Phase II RI Sample Summary Table

Sample Location/Soil Boring	Sample ID	SDG	Matrix	Top Depth (ft)	Bottom Depth (ft)	Date Collected	Sampling Method	TAL Metals	Explosives	Hexavalent Chromium	VOCs	SVOCs	Pesticides	PCBs	Cyanide	Propellants
Trip Blank	DA1qc-006-0001-TB	82400	QC	NA	NA	11/10/10	NA				1					
DA1sb-073																
	DA1sb-073m-0201-SO	82400	SB	1.0	4.0	11/10/10	Modified ISM	1	1		1	1	1	1	1	
	DA1sb-073m-0202-SO	82400	SB	4.0	8.0	11/10/10	Modified ISM	1	1							
	DA1sb-073m-0203-SO	82400	SB	8.0	12.0	11/10/10	Modified ISM	1	1							
	DA1sb-073m-0204-SO	82400	SB	12.0	16.0	11/10/10	Modified ISM	1	1							
DA1sb-074																
	DA1sb-074m-0201-SO	82400	SB	1.0	4.0	11/10/10	Modified ISM	1	1							
	DA1sb-074m-0202-SO	82400	SB	4.0	8.0	11/10/10	Modified ISM	1	1		1	1	1	1	1	1
	DA1sb-074m-0203-SO	82400	SB	8.0	12.0	11/10/10	Modified ISM	1	1							
	DA1sb-074m-0204-SO	82400	SB	12.0	16.0	11/10/10	Modified ISM	1	1							
DA1sb-075	DA1sb-075m-0201-SO	82400	SB	1.0	4.0	11/10/10	Modified ISM	1	1							
	DA1sb-075m-0202-SO	82400	SB	4.0	8.0	11/10/10	Modified ISM	1	1							
	DA1sb-075m-0203-SO	82400	SB	8.0	12.0	11/10/10	Modified ISM	1	1							
	DA1sb-075m-0204-SO	82400	SB	12.0	16.0	11/10/10	Modified ISM	1	1							
DA1sb-076	DA1sb-076m-0201-SO	82400	SB	1.0	4.0	11/10/10	Modified ISM	1	1							
	DA1sb-076m-0202-SO	82400	SB	4.0	8.0	11/10/10	Modified ISM	1	1							
	DA1sb-076m-0203-SO	82400	SB	8.0	12.0	11/10/10	Modified ISM	1	1							
DA1sb-077	DA1sb-077m-0201-SO	82400	SB	1.0	4.0	11/10/10	Modified ISM	1	1							
	DA1sb-077m-0202-SO	82400	SB	4.0	8.0	11/10/10	Modified ISM	1	1							
	DA1sb-077m-0203-SO	82400	SB	8.0	12.0	11/10/10	Modified ISM	1	1							
	DA1sb-077m-0204-SO	82400	SB	12.0	16.0	11/10/10	Modified ISM	1	1							
Trip Blank	DA1qc-007-0001-TB	82400	QC	NA	NA	11/11/10	NA				1					

Table 1-1 (continued)
ODA1 2010 Phase II RI Sample Summary Table

Sample Location/Soil Boring	Sample ID	SDG	Matrix	Top Depth (ft)	Bottom Depth (ft)	Date Collected	Sampling Method	TAL Metals	Explosives	Hexavalent Chromium	VOCs	SVOCs	Pesticides	PCBs	Cyanide	Propellants
	DA1sb-088m-0203-SO	82400	SB	8.0	12.0	11/10/10	Modified ISM	1	1							
Surface Soil	DA1QC-001-0001-ER	81613	GW	NA	NA	09/27/10	NA	1	1	1	1	1	1	1	1	1
Surface Soil	DA1QC-002-0001-ER	81613	GW	NA	NA	09/27/10	NA	1	1	1	1	1	1	1	1	1
Subsurface Soil	DA1QC-003-0001-ER	82400	GW	NA	NA	11/10/10	NA	1	1	1	1	1	1	1	1	1

Color Coding:

Primary ISM Sample

Matrix Types:

AQ - aqueous
GW – groundwater
QC – quality control
SB –subsurface soil
SO –soil
SS – surface soil

Note(s):
AOC – area of concern.
DA1 - Open Demolition Area # 1 AOC.
ft – feet.
ISM – incremental sampling method.
MS/MSD – matrix spike/matrix spike duplicate.
NA – Not Applicable.
PCBs – polychlorinated biphenyls.
QA – quality assurance.
SDG – sample delivery group.
SVOCs – semivolatile organic compounds.
TAL – Target Analyte List.
VOCs – volatile organic compounds.

2.0 DATA VALIDATION RESULTS

The data validation process described in Section 1.0 was completed on all analytical data provided by CT Laboratories. **Attachment A** presents the data validation documentation for all environmental and quality control (QC) samples collected at ODA1 during the Phase II RI. The reason codes for qualification are presented in **Attachment B**. The following subsections summarize validation qualifiers and significant findings from the data validation process.

2.1 Validation Qualifiers

Table 2-1 summarizes the validation qualifiers for VOCs and SVOCs by USEPA SW-846 methods 8260B and 8270C, respectively. Both methods utilize GC/MS.

Table 2-1
Validation Qualifiers for VOC Method 8260B and SVOC Method 8270C

Flag	Flagging Criteria
J	Any of the following: • Matrix spike (MS) recovery outside allowable limit • Matrix spike duplicate (MSD) recovery outside allowable limit • Sample result between detection limit (DL) and level of quantitation (LOQ) Or NOT fulfilling any of the following: • Continuing calibration validation (CCV) response factor (RF) criteria for system performance check compounds (SPCCs) • CCV % difference/drift for all analytes and surrogates • Internal standard validation criteria • Laboratory control sample (LCS) recovery • Surrogate recovery
B	Method blank contamination
U	Non-detects
N	Non-target analyte
Flagging not appropriate	NOT fulfilling any of the following: • Tuning criteria • DDT breakdown requirement • Normal responses for benzidine and pentachlorophenol • Initial calibration requirements • Second source/initial calibration validation (ICV) requirements • Relative retention time requirements

Table 2-2 summarizes the validation qualifiers for organochlorine pesticides and PCBs by USEPA SW-846 methods 8081B and 8082, respectively. Both methods utilize GC.

Table 2-2
Validation Qualifiers for Organochlorine Pesticide Moethod 8081B and PCB Method 8082

Flag	Flagging Criteria
J	Any of the following: • Results between primary and secondary column relative percent difference (RPD) ≤ 40% • MS recovery/recoveries outside allowable limit • MSD recovery/recoveries outside allowable limit • Sample result between DL and LOQ Or NOT fulfilling any of the following: • CCV requirement • LCS recovery/recoveries • Surrogate recovery/recoveries
B	Method blank contamination
U	Non-detects
N	Non-target analyte
Flagging not appropriate	NOT fulfilling any of the following: • DDT/Endrin breakdown requirement • Initial calibration requirements • ICV requirements

Table 2-3 summarizes the validation qualifiers for nitroaromatics, nitramines, and nitrate esters by USEPA SW-846 method 8330B. This method utilizes high performance liquid chromatography (HPLC).

Table 2-3
Validation Qualifiers for Explosives (Nitroaromatics, Nitramines, and Nitrate Esters) Method 8330B

Flag	Flagging Criteria
J	Any of the following: • Results between primary and secondary column RPD ≤ 40% • MS recovery/recoveries outside allowable limit • MSD recovery/recoveries outside allowable limit • Sample result between DL and LOQ • Soil sample triplicate relative standard deviation (RSD) ≤ 20% Or NOT fulfilling any of the following: • CCV requirements • LCS recovery/recoveries
B	Method blank contamination
U	Non-detects
N	Non-target analyte
Flagging not appropriate	NOT fulfilling any of the following: • DDT/Endrin breakdown requirement • Initial calibration requirements • ICV requirements

Table 2-4 summarizes the validation qualifiers for metals by USEPA SW-846 method 6010C. This method utilizes inductively coupled plasma-atomic emission spectrometry.

Table 2-4
Validation Qualifiers for Metals Method 6010C

Flag	Flagging Criteria
J	Any of the following: • MS recovery/recoveries outside allowable limit • MSD recovery/recoveries outside allowable limit • Sample result between DL and LOQ • Post digestion spike recovery outside the allowable limit. • Graphite furnace recovery test (when applicable) not fulfilling the requirement Or NOT fulfilling any of the following: • CCV requirement • Interference check standard/solution requirement • LCS recovery/recoveries
B	Method blank contamination
U	Non-detects
N	Non-target analyte
Flagging not appropriate	NOT fulfilling any of the following: • Low level calibration check standard • Initial calibration requirements • ICV requirements

2.2Volatiles

The data validation indicated that all sample data groups (SDGs) were complete (e.g., required data elements were reported) and all analyses were in compliance with SW-846 Method 8260B and DoD QSM 4.1 requirements. Data validation findings include the following:

- SDG 81613:
  a. The RPD between the matrix spike (MS) and the matrix spike duplicate (MSD) for sample DA1SB-070D-0201-SO (#852294) for 2-butanone, 2-hexanone, and acetone were 36%, 36% and 37%, respectively, and were above the allowable limit of 30%. These compounds were not detected in the parent sample and therefore the data were not qualified.
  b. The method blank #856016 yielded a surrogate recovery for bromofluorobenzene of 121%, which is and just above the allowable range of 75-120%. Since the recovery was less 1% over the allowable range it can be considered as a marginal error and therefore, no qualifier was added.

- SDG 81543: No QC outlier to be reported.
- SDG 82400:
  a. Acetone was detected in the initial calibration blank (ICB) and the method blank. Associated samples (DA1SB-073D-0201-SO and DA1SB-074D-0203-SO) were reanalyzed to confirm the presence of acetone and the original analysis as reported. The results were between the MDL and LOD and the associated samples were qualified as non detects.
  b. The Continuing Calibration Verification 1 (CCV1) analyzed on November 11, 2010 had a low recovery (27% deviation) which was beyond the allowable limit of 20%. The data for this compound was qualified with a "J" flag for the associated samples which are both trip blanks (DA1QC-007-0001-TB and DA1QC-006-0001-TB).

2.3 Semi-Volatiles

Validation of the SVOC data indicated that the SDGs were complete (e.g., required data elements were reported) and all analyses were in compliance with SW-846 Method 8270C and DoD QSM 4.1 requirements with the following exceptions:

- SDG 81613:
  a. The continuing calibration verification 1CCV13 analyzed on October 4, 2010 had a low recovery for 3,3'-dichlorobenzidine (22% low) which was beyond the allowable limit of 20%. Data for this compound was qualified with a "J" in the associated samples.
  b. LCS 851609 had a high recovery of 3,3'-dichlorobenzidine. The recovery was confirmed by repeat analysis and the data for this compound was qualified with a "J" in the associated samples.
  c. The MS and MSD recoveries and RPDs were all within the QC limits.
  d. Continuing calibration verification 2CCV30 analyzed on October 19, 2010 had a recovery outside of specified criteria for benzoic acid (32.6% high). The data was not qualified since no analyte was detected.
  e. Samples DA1SB-070M-0203-SO, DA1SB-071M-0201-SO, and DA1SB-072M-0201-SO had low surrogate recoveries for 2,4,6-Tribromophenol. These low surrogate recoveries were confirmed by reanalysis. Since only one acid surrogate recovery was low, and the LCS acid fraction recoveries were within limits, using professional judgment, no qualifiers were assigned.

- SDG 82400: Continuing calibration verification 1CCV40 analyzed on November 18, 2010 has high recovery for hexachloropropene (%D 24.1) and was outside the allowable limit of 20%. This compound was not detected in the samples and the data was not qualified.
- SDG 81543: No QC outliers.

2.4 PCBs

Validation of PCB data indicated that all SDGs were complete (e.g., required data elements were reported) and all analyses were in compliance with SW-846 Method 8082 and DoD QSM 4.1 requirements. There were no QC outliers.

2.5 Pesticides

Validation of pesticide data indicated that all SDGs were complete (e.g., required data elements were reported) and all analyses were in compliance with SW-846 Method 8081B and DoD QSM 4.1 requirements. The data validation findings are follows:

- SDG 81613:
  f. 4,4'-DDT was detected in the method blank 852473 at a concentration of 0.02 ug/L. This compound was not detected in the associated sample and no qualifier was assigned.
  g. Method blank 852916 had a low TCMX surrogate recovery, which was confirmed by repeat analysis. Ending toxaphene/chlordane CCV 016 analyzed on November 11, 2010 had a low decachlorobiphenyl surrogate response. Toxaphene and technical chlordane were not detected in the associated samples.
  h. The following compounds were qualified with a "J" because concentrations differ more than 40% between channels A and B:
     i) DA1SB-068M-0201-SO heptachlor, endosulfan II;
     ii) DA1SB-069M-0201-SO heptachlor;
     iii) DA1SB-070M-0203-SO heptachlor, gamma-chlordane;
     iv) DA1SB-071M-0201-SO heptachlor, gamma-chlordane; and
     v) DA1QC-001-0001-ER methoxychlor.
- SDG 82400: In sample DA1QC-0003-0001-ER (#871058) the Lindane result was qualified with a "J" because the concentration differed more than 40% between channels A and B.

- SDG 81543:

  i. The matrix spike associated with sample DA1SB-059M-0201-SO (#851528) had a low surrogate recovery for 2,4,5,6-tetrachloro-m-xylene, which was confirmed by reanalysis. The surrogate was qualified with an "J."

  j. For sample DA1SB-064M-0201-SO (#851529) , 4,4'-DDE, endosulfan II, and delta-BHC were qualified with a "J" because the concentrations differed more than 40% between channels A and B.

  k. The MS and/or MSD associated with sample DA1QC-059M-0201-SO (#851528) had low recoveries of endrin aldehyde and endrin ketone, which were confirmed by repeat analysis. These compounds were qualified with an "J" in the parent sample.

2.6 Explosives

Data validation for explosives indicated that all SDGs were complete (e.g., required data elements were reported) and all analyses were performed following SW-846 Method 8330B and DoD QSM 4.1 requirements. No QC outliers were identified for SDGs 81643 and 82400. Data verification findings for SDG 81613 include the following:

- The surrogate recovery in the MS sample DA1QC-002-0001-ER (#852564) had high failing surrogates in the primary analysis. In the confirmation analysis, all surrogates were within normal range. This is due to interference with surrogate analysis by the sample matrix on the primary column. The interfering contaminant elutes at a different time on the confirmation column. All samples had a lot of miscellaneous peaks and baseline disturbances on both column analyses. The surrogate was reported from the primary analysis and qualified with a "J" flag.
- There was no MS or MSD recovery for 4-amino-2,6-dinitrotoluene (4-AM-26-DNT) because the 2,4,6-trinitrotoluene (246-TNT) was so large that it masked the 4-AM-26-DNT peak. The nitroglycerin (NG) recovery was also very high because of interference in channel B from the large 246-TNT peak. Confirmation analysis of the MS and MSD showed that both the 4-AM-26-DNT and nitroglycerine peaks had passing recoveries when the 246-TNT peak was not causing interference with them. Data was reported from the primary analysis and the parent sample was qualified with a "J" flag for 4-AM-26-DNT.

2.7 Metals

Data validation of metals indicated that all SDGs were complete (e.g., all required data elements were reported) and all analyses were performed following SW-846 Method 6010C and DoD QSM 4.1 requirements. Data validation findings include the following:

2.7.1 SDG 81613

Barium was detected in the calibration blank (ICB #860519); but the affected sample results were greater than 10 times the amount present in this blank, so the samples were not reanalyzed. No qualification was needed, since the results were greater than 5 times the amount present in the associated blank.

Magnesium was detected above the LOD, and aluminum, barium, calcium, and iron were detected above ½ of the RL in the MB (#858603). The results for these elements in the associated samples were all greater than 10 times the MB results; therefore, the associated sample data was not qualified.

Barium was detected above the LOD in three calibration blanks (CCB #s 860524, 860528, and 860530); but the sample results were greater than 10 times the amount present in the blanks, so the samples were not reanalyzed. The sample results for this element were not qualified.

Aluminum and barium were detected above the LOD in the calibration blank (CCB #860532); but the sample results were greater than 10 times the amount present in this blank, so the samples were not reanalyzed again. The associated aluminum and barium sample results were not qualified.

Aluminum, barium, calcium, chromium, iron, magnesium, and nickel were detected above the LOD in the calibration blank (ICB #863780); but the sample results were greater than 10 times the amount present in this blank for these elements, so the samples were not reanalyzed. The sample result for these seven elements was not qualified.

Serial Dilution #860525 failed (greater than 10% RPD) for silver, aluminum, arsenic, barium, calcium, cadmium, cobalt, chromium, copper, magnesium, manganese, nickel, lead, thallium, and zinc. Arsenic, cadmium, and thallium were not applicable to the Serial Dilution test because the parent sample (#852338, sample from another SDG) results for these elements were not greater than 50 times the LOQ.

A PDS (#860526) was analyzed on this sample. The elements with failing PDS recoveries were qualified with an “J” flag in the parent sample.

Barium and magnesium were detected above the LOD in the calibration blank (CCB #863787); but the sample results were greater than 10 times the amount present in this blank for these elements, so the samples were not reanalyzed. The sample result for these two elements was not qualified.

The samples were analyzed at two different dilutions to reduce matrix interferences and to obtain the results for some of the target elements within the calibration range of the instrument. Silver, cadmium, selenium, and antimony were not detected in some samples.

Aluminum and magnesium were detected above the calibration blank (ICB #863231); but the affected sample result was greater than 10 times the amount present in this blank, so the sample was not reanalyzed. The sample result for these elements was not qualified.

Serial Dilution #863235 failed (greater than 10% RPD) for arsenic, beryllium, calcium, cadmium, cobalt, chromium, copper, magnesium, nickel, lead, thallium, vanadium, and zinc. Arsenic, cadmium, beryllium, and thallium were not applicable to the Serial Dilution test because the parent sample (#852380) results for these elements were not greater than 50 times the LOQ. A PDS (#862236) was analyzed on this sample. The elements with failing PDS recoveries were qualified with a "J" flag in the parent sample.

The MS and/or MSD for sample DA1SB-070M-0201-SO (#852380) failed for arsenic, cadmium, cobalt, chromium, nickel, thallium, vanadium, zinc, selenium, antimony, iron, silver, aluminum, and manganese. These matrix spikes were also analyzed at a dilution. The PDS had acceptable recoveries for arsenic, antimony, silver, and aluminum. Those elements with acceptable recoveries were reported without qualification in the parent sample. The elements with failing PDS recoveries and applicable Serial Dilution test failures were qualified with a "J" flag in the parent sample.

The Duplicate (DUP) results for sample DA1SB-070M-0201-SO (#852380) were not applicable for selenium and antimony because their results were not greater than 5 times the LOQ in the parent sample. A MSD was analyzed to demonstrate precision. However, the Ravenna Facility Wide Sampling and Analysis Plan suggests using $\pm$ RL criteria. The difference between the original and duplicate analysis was less than the reporting limit. Subsequently, no qualifier was assigned (fulfills the Ravenna Facility Wide Sampling and Analysis Plan criteria).

The DUP result for sample DA1SB-070M-0201-SO (#852380) failed RPD limits for cadmium. The parent sample result for this element was qualified with a "J" flag.

Thallium was detected above the LOD in the MB (#860784). The results for this element in the associated samples were all greater than 10 times the MB result; therefore, the sample data was not qualified because of the MB contamination.

Barium and thallium were detected above the LOD in the calibration blank (CCB #863238); but the sample results were greater than 10 times the amount present in this blank for these elements, so the samples were not reanalyzed. The sample results for these two elements were not qualified.

Barium was detected above the LOD in the calibration blank (CCB #863240); but the sample results were greater than 10 times the amount present in this blank for this element, so the samples were not reanalyzed. The sample results for this element were not qualified.

Thallium was detected above the LOD in the calibration blank (CCB #863242); but the sample results were greater than 10 times the amount present in this blank for this element, so the samples were not reanalyzed. The sample results for this element were not qualified.

The samples were analyzed at a dilution to reduce matrix interferences and to obtain the results for some of the target elements within the calibration range of the instrument. Silver, cadmium, selenium, and antimony were not detected in some samples.

Serial Dilution # 864142 failed (greater than 10% RPD) for sodium and potassium, but was not applicable because the sample results were not greater than 50 times the LOQ for these elements. A PDS (#864143) was analyzed and had acceptable recoveries for these elements.

The MS and/or MSD for sample DA1SB-070MN-0201-SO (#852380) failed for sodium and potassium. A PDS (# 864143) had acceptable recoveries for sodium and potassium. These sodium and potassium were reported without qualification the parent sample.

2.7.2 SDG 81543

Selenium was detected above the LOD, and barium, calcium, magnesium, and vanadium were detected above ½ of the RL in the MB (#855985). The results for barium, calcium, magnesium, and vanadium in the associated samples were all greater than 5 times the MB results; therefore, the sample data was not qualified because of the MB contamination. The results for selenium were less than 5 times the MB contamination and qualified as non-detects at the reported concentration. Associated sample detections that are reported as estimated concentrations below the RL are qualified as non-detects at the RL. There were no selenium detections greater than 5 time the levels in the method blank in any of the associated samples.

Serial Dilution # 860049 failed (greater than 10% RPD) for barium, beryllium, calcium, cobalt, chromium, copper, magnesium, nickel, lead, thallium, vanadium, and zinc. Beryllium and thallium were not applicable to the Serial Dilution test because the parent sample (#851518) results for these elements were not greater than 50 times the LOQ. Three Post Digestion Spikes (PDS #'s 860050, 863292, and 863449) were analyzed on this sample. The PDS results were acceptable.

The MS and/or MSD for sample DA1SB-055M-0001-SO (#851518) failed for cobalt, chromium, copper, magnesium, thallium, zinc, cadmium, iron, manganese, selenium, aluminum, and antimony. The first PDS (#860050) analyzed had an acceptable recovery for antimony. The second PDS (#863292) analyzed had acceptable recoveries for magnesium

and thallium. The third PDS (#863449) analyzed had acceptable recoveries for cadmium, cobalt, chromium, copper, and zinc. The Serial Dilution (#860049) analyzed had an acceptable result for aluminum, iron, and manganese. These elements were reported without qualification in the parent sample. Calcium had a failing PDS recovery on sample DA1SB-055M-0001-SO (#851518). The Serial Dilution test failed for this element. Although the MS and MSD recoveries met the acceptance criteria, this element was qualified with a "J" flag in the parent sample.

Aluminum and vanadium were detected above the LOD in the calibration blank (CCB #860052); but the affected sample result was greater than 10 times the amount present in this blank, so the sample was not reanalyzed. The sample result for these elements was not qualified.

Aluminum, iron, magnesium, and vanadium were detected above the LOD in the calibration blank (ICB #862490); but the sample results were greater than 10 times the amount present in this blank for these elements, so the samples were not reanalyzed. The sample results for these four elements were not qualified.

Barium was detected above the calibration blank (CCB #862497); but the affected sample results were greater than 10 times the amount present in this blank, so the samples were not reanalyzed. The sample results for this element were not qualified.

Barium and thallium were detected above the LOD in the calibration blank (CCB #864030). Only a QC sample (PDS #863292) was bracketed by this calibration blank; therefore, it was reported without qualification.

Thallium was detected above the LOD in the calibration blank (CCB #863188); but the samples on this run were not affected by this blank contamination.

Serial Dilution # 860906 failed (greater than 10% RPD) for potassium. A PDS (#860907) was analyzed and had an acceptable result.

Aluminum and lead were detected above the LOD in the calibration blank (CCB #860029); but the affected sample results were greater than 10 times the amount present in this blank, so the samples were not reanalyzed. The sample results for these elements were not qualified.

Barium and vanadium were detected above the LOD, and aluminum, calcium, and magnesium were detected above ½ of the RL in the MB (#857031). The results for these elements in the associated samples were all greater than 10 times the MB results; therefore, the sample data was not qualified because of the MB contamination.

Aluminum and manganese were detected above the LOD in the calibration blank (CCB #860031); but the affected sample results were greater than 10 times the amount present in this blank, so the samples were not reanalyzed. The sample results for these elements were not qualified.

Aluminum and magnesium were detected above the LOD in the calibration blank (CCB #860034); but the affected sample results were greater than 10 times the amount present in this blank, so the samples were not reanalyzed. The sample results for these elements were not qualified.

Silver and vanadium were detected above the LOD in the calibration blank (CCB #860037); but the affected sample results were greater than 10 times the amount present in this blank, so the samples were not reanalyzed. The sample results for these elements were not qualified.

Serial Dilution #860032 failed (greater than 10% RPD) for aluminum, arsenic, barium, beryllium, calcium, cobalt, chromium, copper, iron, magnesium, manganese, nickel, lead, thallium, vanadium, and zinc.

Arsenic and thallium were not applicable to the Serial Dilution test because the parent sample (#851881) results for these elements were not greater than 50 times the LOQ. Two Post Digestion Spikes (PDS #'s 860035 and 863473) were analyzed on this sample.

The MS and/or MSD for sample DA1SB-063M-0201-SO (#851881) failed for aluminum, calcium, cobalt, chromium, copper, iron, magnesium, manganese, thallium, zinc, cadmium, selenium, and antimony. The first PDS (#860035) analyzed had an acceptable recovery for antimony. The second PDS (#863473) analyzed had acceptable recoveries for aluminum, calcium, magnesium, and manganese. Those elements with acceptable recoveries were reported without qualification in the parent sample. The elements with failing recoveries (i.e., Cd, Co, Cr, Cu, Fe, Tl and Zn) were qualified with a "J" flag in the parent sample.

Nickel and vanadium had failing PDS recoveries on sample DA1SB-063M-0201-SO (#851881). The Serial Dilution test failed for these elements. Although the MS and MSD recoveries met the acceptance criteria, these elements were qualified with a "J" flag in the parent sample.

The Duplicate (DUP) result for sample DA1SB-063M-0201-SO (#851881) was not applicable for selenium because its result was not greater than 5 times the LOQ in the parent sample. A MSDS was analyzed to demonstrate precision.

The samples were analyzed at two different dilutions to reduce matrix interferences and to obtain the results for some of the target elements within the calibration range of the instrument. Silver, cadmium, arsenic, selenium, and antimony were not detected in some samples. No qualifier was assigned.

Aluminum was detected above the LOD in the calibration blank (ICB #863192). Only a QC sample (PDS #863473) was bracketed by this calibration blank; therefore, it was reported without qualification.

Serial Dilution #860950 failed (greater than 10% RPD) for sodium and potassium. Sodium and potassium were not applicable to the Serial Dilution test because the parent sample (#851881) results for these elements were not greater than 50 times the LOQ. There was a PDS (#860953) analyzed on this sample with acceptable results for these elements.

Barium was detected above the calibration blank (ICB #860519); but the affected sample results were greater than 10 times the amount present in this blank, so the samples were not reanalyzed. The sample results for this element were not qualified.

Magnesium was detected above the LOD, and aluminum, barium, calcium, and iron were detected above ½ of the RL in the MB (#858603). The results for these elements in the associated samples were all greater than 5 times the MB results; therefore, the sample data was not qualified because of the MB contamination.

Barium was detected above the LOD in three calibration blanks (CCB #s 860524, 860528, and 860530); but the sample results were greater than 10 times the amount present in the blanks, so the samples were not reanalyzed. The sample results for this element were not qualified.

Aluminum and barium were detected above the LOD in the calibration blank (CCB #860532); but the sample results were greater than 10 times the amount present in this blank, so the samples were not reanalyzed again. The sample results for these two elements were not qualified.

Aluminum, barium, calcium, chromium, iron, magnesium, and nickel were detected above the LOD in the calibration blank (ICB #863780); but the sample results were greater than 10 times the amount present in this blank for these elements, so the samples were not reanalyzed. The sample result for these seven elements was not qualified.

Barium and magnesium were detected above the LOD in the calibration blank (CCB #863787); but the sample results were greater than 10 times the amount present in this blank

for these elements, so the samples were not reanalyzed. The sample result for these two elements was not qualified.

Aluminum, barium, calcium, iron, magnesium, manganese, nickel, and vanadium were detected above ½ of the RL in the MB (#855271). The results for these elements in the associated samples were all greater than 10 times the MB results; therefore, the sample data was not qualified because of the MB contamination.

Magnesium and vanadium were detected above the LOD in the calibration blank (ICB #862499). Only a QC sample (PDS #862503) was bracketed by this calibration blank for magnesium and vanadium; therefore, it was reported without qualification.

Selenium and thallium were detected above the LOD in the calibration blank (CCB #863227). Only a QC sample (PDS #863445) was bracketed by this calibration blank; therefore, it was reported without qualification.

Thallium was detected above the LOD in the calibration blank (CCB #863229). Only a QC sample (PDS #863445) was bracketed by this calibration blank; therefore, it was reported without qualification.

2.7.3 SDG 82400

Barium and magnesium were detected above the LOD in the calibration blank (ICB #874836) that was analyzed prior to the sample analysis. No affected sample results were bracketed by this calibration blank.

Barium and vanadium were detected above the LOD in the calibration blank (CCB #874820). Only preparatory QC samples were bracketed by this blank and their results were either 10 times greater than the CCB result or less than the LOD. The data were reported without qualification.

Calcium, copper, and magnesium were detected above the LOD in the calibration blank (CCB #874825). These elements were all less than the LOD in the affected sample (#871058). Subsequently, the data were qualified as non-detects at the reporting limit.

Silver was not applicable to the Serial Dilution (L) test because the parent sample DA1SB-074M-0202-SO (#871058) result for this element was not greater than 50 times the LOQ. A Post Digestion Spike (PDS #874823) was analyzed and had a failing recovery for silver. This element was qualified with a "J" flag in the parent sample.

Barium and magnesium were detected above the LOD in the calibration blank (ICB #874885). The associated sample results were greater than 10 times the amount present in

the blank and the samples were not reanalyzed. The sample results for these two elements were not qualified.

The Continuing Calibration Validation (CCV) #875742 failed high for cadmium, copper, and thallium, while CCV #875744 failed for silver, cadmium, copper, antimony, thallium, and cobalt. The associated sample DA1SB-074M-0202-SO (# 871039) was reanalyzed for these elements.

Barium, chromium, and manganese were detected above the LOD in the calibration blank (CCB #874261). The associated sample results were greater than 10 times the amount present in the blank and the samples were not reanalyzed. The sample results for these three elements were not qualified.

Barium, chromium, aluminum, and manganese were detected above the LOD in the calibration blank (CCB #874263). The associated sample results were greater than 10 times the amount present in the blank and the samples were not reanalyzed. The sample results for these four elements were not qualified.

Barium, vanadium, and manganese were detected above the LOD in the calibration blank (CCB #874898). The associated sample results were greater than 10 times the amount present in the blank and the samples were not reanalyzed. The sample results for these three elements were not qualified.

Selenium and vanadium were detected above the LOD in the calibration blank (CCB #875743). The affected sample result DA1SB-074M-0202-SO (#871039) was less than the LOD for selenium and greater than ten times the amount present in the blank for vanadium; therefore, these elements were not reanalyzed. The selenium result was reported without qualification, while the vanadium result was reported without qualification.

Vanadium was detected above the LOD in the calibration blank (CCB #874905). The affected sample result DA1SB-074M-0202-SO (#871039) was greater than 10 times the amount present in the blank, so the sample was not reanalyzed. The sample result for this element was not qualified.

Silver was detected above the LOD, and aluminum, barium, calcium, iron, magnesium, and manganese were detected above ½ the Reporting Limit (RL) in the Method Blank (MB #872318).

The associated sample results for aluminum, barium, calcium, iron, magnesium, and manganese were all greater than 10 times the MB results. The sample data was not qualified for the MB contamination for these elements. The associated sample results less than the

LOD or greater than 10 times the MB contamination for silver were reported without qualification. Sample results greater than the LOD but less than ten times MB result were reported as non-detects.

The Serial Dilution #874895 failed (greater than 10% RPD) for silver, aluminum, cadmium, cobalt, chromium, copper, iron, nickel, lead, antimony, and zinc. Silver, cadmium, copper, and antimony were not applicable to the Serial Dilution test because the parent sample DA1SB-073M-0201-SO (#871026) results for these elements were not greater than 50 times the LOQ. A PDS (#874896) was analyzed with an acceptable recovery for cadmium and iron and failing recoveries for silver, aluminum, cobalt, chromium, copper, nickel, lead, antimony, and zinc. Those elements with acceptable recoveries were reported without qualification in the parent sample. The elements with failing recoveries were qualified with an "J" flag in the parent sample.

The MS and MSD for sample DA1SB-073M-0201-SO (#871026) failed for aluminum, chromium, iron, lead, antimony, zinc, selenium, and thallium. A PDS (#874896) was analyzed with an acceptable recovery for iron and failing recoveries for aluminum, chromium, lead, antimony, zinc, selenium, and thallium. Those elements with acceptable recoveries were reported without qualification in the parent sample. The elements with failing recoveries were qualified with a "J" flag in the parent sample.

The MS, MSD, and/or PDS for sample DA1SB-073M-0201-SO (#871026) failed for magnesium, manganese, and vanadium. The Serial Dilution test was applicable for these elements and had acceptable results. Since PDS confirmed the matrix effect, Al, Cr, Pb, Sb and Zn were "J' qualified.

The DUP result for sample DA1SB-073M-0201-SO (#871026) was not applicable for antimony because the parent sample results for these elements were not greater than 5 times the LOQ. An MSD was analyzed to demonstrate precision and had acceptable results for these elements. The difference between the original and duplicate analysis was less than the RL.

The DUP for sample DA1SB-073M-0201-SO (#871026) failed RPD limits for cadmium, chromium, and copper. The differences between the original and duplicate for these elements were greater than the RLs. The parent sample results for these elements were qualified with a "J" flag.

Serial Dilution #873958 failed (greater than 10% RPD) for potassium. Potassium was not applicable to the Serial Dilution test because the parent sample DA1SB-073M-0202-SO

(#871026) result for this element was not greater than 50 times the LOQ. A Post Digestion Spike (PDS #873961) was analyzed and had an acceptable result for potassium.

Aluminum and magnesium were detected above the LOD in the calibration blank (ICB #877331) that was analyzed prior to the sample analysis. There were no affected sample results bracketed by this calibration blank.

Iron was detected above the LOD in the calibration blank (CCB #875359). The associated sample result (#871007) was greater than 10 times the amount present in the blank and the sample was not reanalyzed. The sample result for this element was not qualified.

Chromium was detected above the LOD in the calibration blank (CCB #874272). The associated sample results were greater than 10 times the amount present in the blank and the sample was not reanalyzed. The sample results for this element were not qualified.

Barium, chromium, and manganese were detected above the LOD in the calibration blank (CCB #874275). The associated sample results were greater than 10 times the amount present in the blank and the samples were not reanalyzed. The sample results for these three elements were not qualified.

Barium, cobalt, chromium, and manganese were detected above the LOD in the calibration blank (CCB #874277). The associated sample results were greater than 10 times the amount present in the blank and the samples were not reanalyzed. The sample results for these four elements were not qualified.

Magnesium was detected above the LOD, and aluminum, calcium, and iron were detected above ½ the Reporting Limit (RL) in the Method Blank (MB #872887). The results for these elements in the associated sample were all greater than 10 times the MB results. The sample data not qualified because of the MB contamination.

Serial Dilution #874270 failed (greater than 10% RPD) for aluminum, arsenic, barium, calcium, cadmium, cobalt, chromium, copper, iron, magnesium, manganese, nickel, lead, selenium, antimony, vanadium, and zinc. Arsenic, barium, selenium, and antimony were not applicable to the Serial Dilution test because the parent sample DA1SS-053M-0201-SO (#871007) results for these elements were not greater than 50 times the LOQ. A PDS (#874273) was analyzed with an acceptable recovery for aluminum, arsenic, barium, calcium, cadmium, magnesium, manganese, nickel, lead, selenium, antimony, vanadium, and zinc and failing recoveries for cobalt, chromium, copper, and iron. Those elements with acceptable recoveries were reported without qualification in the parent sample. The elements with failing recoveries were qualified with a "J" flag in the parent sample.

The MS and/or MSD for sample DA1SS-053M-0201-SO (#871007) failed for aluminum, arsenic, cadmium, cobalt, chromium, iron, manganese, nickel, lead, selenium, antimony, thallium, silver, and zinc. A PDS (#874273) was analyzed with an acceptable recovery for aluminum, arsenic, cadmium, manganese, nickel, lead, selenium, and antimony and failing recoveries for cobalt, chromium, iron, thallium, and silver. Those elements with acceptable recoveries were reported without qualification in the parent sample. The elements with failing recoveries were qualified with a "J" flag in the parent sample.

The DUP result for sample DA1SS-053M-0201-SO (#871007) was not applicable for selenium because the parent sample result for this element was not greater than 5 times the LOQ. An MSD was analyzed to demonstrate precision and had acceptable results for this element. The difference between the original and duplicate analysis was less than the RL.

2.8 Cyanide

- SDG 81543: No QC outlier to report.
- SDG 82400: No QC outlier to report.
- SDG 81613: No QC outlier to report.

2.9 Hexavalent Chromium:

- SDG 81543: No QC outlier to report
- SDG 82400: The MS for sample DA1SB-073M-0201-SO had a low recovery, possibly due to the reducing sample conditions. The PDS was run with unacceptable results. The result for the parent sample (DA1SB-073M-0201-SO) was qualified with a "J" flag.
- SDG 81613: No QC outlier to report.

2.10 Completeness and Usability

Usable data are validated data that may be used for risk assessment purposes without restriction. Since no data were rejected, 100 percent of the data is considered valid which achieves the completeness criteria presented in Table 3-1 of the *Facility Wide Quality Assurance Project Plan* (SAIC, 2001). Therefore, the completeness and usability criteria for the data collected for ODA1 have been satisfied.

3.0 REFERENCES

Science Applications International Corporation (SAIC), 2001. *Final Facility-Wide Sampling and Analysis Plan for Environmental Investigations at the Ravenna Army Ammunition Plant, Ravenna, Ohio*. March 2001.

Shaw Environmental & Infrastructure, Inc. (Shaw). *Final Quality Assurance Project Plan Addendum No. 1 for Environmental Services at RVAAP-34 Sand Creek Disposal Road Landfill, RVAAP-03 Open Demolition Area #1, and RVAAP-28 Mustard Agent Burial Site, Ravenna Army Ammunition Plant, Ravenna, Ohio*. February, 2010.

U.S. Department of Defense (DoD), 2009. *DoD Quality Systems Manual for Environmental Laboratories*, Version 4.1, Environmental Data Quality Workgroup. April 22, 2009.

U.S. Army Corps of Engineers (USACE), 2002. *Louisville Chemistry Guideline*, Louisville District, Environmental Engineering Branch, Revision 5. June 2002.

U.S. Environmental Protection Agency (USEPA), 2007. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, publication SW-846, Revision 6. February 2007.

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Attachment A
Data Validation Checklist

DATA VERIFICATION USING DoD QSM 4.1
US ARMY CORPS OF ENGINEERS
RAVENNA ARMY AMMUNITION PLANT
NITROAROMATICS AND NITRAMINE ANALYSIS
CHECKLIST

Project Name: Ravenna Army Ammunition Plant, ODA1

Laboratory: CT Laboratory

Report No.: 81613, 81543, 82400

Analytical Method: SW-846 8330B

Analyte: Nitroaromatics and Nitromine **SDGs:** 81613, 81543, 82400

SAMPLE PREPARATION

	Yes	No
1. Analytical Capability		
Was analytical capability demonstrated?	[x]	[ ]
2. Limit of Detection (LOD)		
Were LODs determined and verified?	[x]	[ ]
3. Limit of Quantitation (LOQ)		
a) Were LOQs determined and verified?	[x]	[ ]
b) Were the samples dried to a constant weight?	[x]	[ ]
c) Were the dates, times and ambient temperatures recorded on a daily basis?	[x]	[ ]
d) Were the samples sieved and ground?	[x]	[ ]
4. Soil Grinding Blank		
a) Was a grinding blank processed in-between samples?	[x]	[ ]
b) Were any target analyte present at >1/2 of the RL?		
5. Soil Subsampling Process	[x]	[ ]
a) Was any subsampling process followed?		
6. Soil Sample Triplicate		
a) Was a triplicate analysis performed?	[ ]	[ ]
b) Was the RSD ≤20%?		
7. Aqueous Sample Preparation (when applicable)		
Was a SPE performed?		

SAMPLE ANALYSIS

8. Sample Holding Time		
Were samples analyzed within holding times?	[x]	[ ]
9. Initial Calibration		
a) Did the initial calibration consist of five or more standards?	[x]	[ ]
b) Was the lowest standard concentration at or below the RL?	[x]	[ ]
c) Was the apparent signal to noise ratio at the RL at least 5:1?	[x]	[ ]
d) Was r ≥0.995 (if using linear regression)?	[x]	[ ]

	Yes	No
e) Was the RSD ≤15 (if using internal standardization)?	[x]	[ ]
f) Was the lowest standard reanalyzed after the generation of the calibration curve?	[x]	[ ]

10. Initial Calibration Verification (ICV)

a) Was the ICV run immediately following the ICAL?	[x]	[ ]
b) Was the ICV made of a 2nd source?	[x]	[ ]
c) Was the mid-level (2nd source) recovery within 80-120%?	[x]	[ ]
	[ ]	[ ]
	[ ]	[ ]
		[ ]

11. Continuing Calibration Verification (CCV)/Mid-Point Calibration

a) Was a CCV conducted prior to sample analysis?	[x]	[ ]
b) Was a CCV conducted after every ten samples or every 12 hours?	[x]	[ ]
c) Was a CCV conducted after the last sample of the day?	[x]	[ ]
d) Did the CCV meet the minimum requirements (D ≤20%)?	[x]	[ ]

12. Method Blank

a) Was a method blank present in every preparatory batch?	[x]	[ ]
b) Were target analytes detected >1/2 the RL and >1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater)?	[ ]	[x]
c) Did the method blank fail the project-specific objectives (>1/2 the RL or > the RL)?	[ ]	[x]

13. Laboratory Control Sample

a) Was an LCS present in every preparatory batch?	[x]	[ ]
b) Did the LCS contain all analytes to be reported?	[x]	[ ]
c) LCS: Were the percent recoveries for LCS within the limits? (Enter out of control recoveries only)	[x]	[ ]

Identification of LCS Standard

Spiked Compound	LCS %R	Acceptable Range (%)
	.	
	.	

14. Matrix Spike/Matrix Spike Duplicate

a) MS/MSD: were the percent recoveries within limits? (Enter out of control recoveries only)	[x]	[ ]
b) Were the RPDs within control limits?	[x]	[ ]

Identification of Original Sample Used for QC

DA1SB-070M-0201-SO

Spiked compound	MS %R	MSD%R	%RPD	RPD Control Limits
4-Amino-4,6-dinitrotoluene	0 (72-123)	0 (72-123)	Not applicable	
Nitroglycerine	2494 (76-130)	2316 (76-130)	7	

15. Confirmation Analysis
    a) Was the RPD <40% between the two column results? [ ] [x]

16. Analyte Detection
    a) Were results reported between the DL and the LOQ? [x] [ ]
    b) Were results reported between the DL and the LOQ flagged as estimated? [x] [ ]

Comments (attach additional sheets if necessary):

No surrogate recovery criteria has been provided in the DoD QSM 4.1for method 8330B. CT Laboratory limits have been used.

A number of samples contained confirmed positive hits with primary and conformational analysis values that were greater than 40% different from each other. In those instances, the values were reported from the primary column and qualified with a "J" flag.

Validated/Reviewed by:

Signature: Maqsud Rahman Date: April 18, 2011

Name: Maqsud Rahman

Overall Assessment of the Data Package: Complete

DATA VERIFICATION USING DoD QSM 4.1
US ARMY CORPS OF ENGINEERS
RAVENNA ARMY AMMUNITION PLANT
ICP METALS ANALYSIS BY 6010C
CHECKLIST

Project Name: Ravenna Army Ammunition Plant, ODA1

Laboratory: CT Laboratory

Report No.: 81613, 81543, 82400

Analytical Method: 6010C

Analyte: Metals **SDGs:** 81613,81543, 82400

	Yes	No
1. Analytical Capability		
Was analytical capability demonstrated?	[x]	[ ]
2. Limit of Detection (LOD)		
Were LODs determined and verified?	[x]	[ ]
3. Limit of Quantitation (LOQ)		
Were LOQs determined and verified?	[x]	[ ]
4. Instrument Detection Limit (IDL) study		
Was an IDL study performed?	[x]	[ ]
5. Sample Holding Time		
Were samples analyzed within holding times?	[x]	[ ]
6. Initial Calibration		
Did the initial calibration consist of:		
a) One high calibration standard and a blank?	[x]	[ ]
b) More than one standard and a blank?	[x]	[ ]
7. Low Level Calibration Check Standard (daily after 1 point ICAL)		
Was the percentage "D" ≤20%?	[x]	[ ]
8. Initial Calibration Verification (ICV)		
a) Was it analyzed after each ICAL and the beginning of each analytical run?	[x]	[ ]
b) Was the mid-level (2^{nd} source) within 90-110?	[x]	[ ]
9. Linear Dynamic Range or High Level Check Standard (every 6 months)		
Was recovery within 90-110?	[x]	[ ]
10. Interelement Check Standard (ICS)		
a) Was ICS-A (interferents only) conducted at the beginning of the analytical sequence?	[x]	[ ]
b) Were concentrations (absolute values) of all non-spiked analytes <LOD?	[x]	[ ]
c) Was ICS-B (interferents and target analytes) within QC limits		

	Yes	No
(80-120)?	[x]	[ ]

11. Continuing Calibration Blank (CCB)

a)	Was a CCB conducted at least every 10 samples?	[x]	[ ]
b)	Was a CCB conducted at the end of the analytical sequence?	[x]	[ ]
c)	Were all analyte concentrations >LOD?	[ ]	[ ]

12. Continuing Calibration Verification (CCV)

a)	Was a CCV conducted at least every 10 samples?	[x]	[ ]
b)	Was a CCV conducted at the end of the analytical sequence?	[x]	[ ]
c)	Were recoveries between 90-110%?	[x]	[ ]

13. Sample Quality Control

a) Method Blanks

1)	Was a method blank present in every preparatory batch?	[x]	[ ]
2)	Were target analytes detected >1/2 RL, and >1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater?	See validation report	

b) Laboratory Control Sample (LCS)

1)	Was an LCS present in every preparatory batch?	[x]	[ ]
2)	Did the LCS contain all analytes to be reported?	[x]	[ ]
3)	Were percent recoveries for the LCS within the limits? (Enter out of control recoveries only)	[x]	[ ]

Identification of LCS Standard

Spiked Compound	LCS %R	LCSD %R	%RPD
	.		
	.		

c) Matrix Spike (MS)

Were the percent recoveries within limits? (Enter out of control recoveries only)	[ ]	[x]

Identification of Original Sample Used for QC

Spiked compound	MS %R	%RPD
.		

d) Matrix Spike Duplicate (MSD) or Sample Duplicate (SD)

Were the relative percent differences (RPDs) within the acceptable limit? (Enter out of control recoveries only)	[ ]	[x]

Identification of Original Sample Used for QC

Analyte	Original Sample	Duplicate Sample	RPD
.			

14. Dilution Test

a) Was a 5-fold serial dilution conducted (one per preparatory batch)?	[ ]	[ ]
b) Was there an agreement between diluted and undiluted results (<10%)?	[ ]	[ ]
15. Post Digestion Spike Addition		
a) Was a post-digestion spike addition necessary?	[x]	[ ]
b) Were recoveries within acceptable limits?	[x]	[ ]
16. Method of Standard Addition (MSA)		
a) Was MSA performed on samples when matrix interference is confirmed?	[ ] N/A	[ ]
17. Analyte Detection		
a) Were any results between the DL and the LOQ?	[x]	[ ]
b) Were any results between the DL and LOQ J flagged?	[x]	[ ]
18. Sample Analysis		
a) Were samples with analyte concentrations higher than the calibration range (E), diluted and re-analyzed?	[x]	[ ]

Comments (attach additional sheets if necessary):

a) All calibrations criteria were completely fulfilled.

b) There has been a number instances when matrix interference was observed.

c) There appears to be a large of blank contamination from various metals. The laboratory was asked to address this issue.

d) Details of matrix interferences and contamination are described in the data verification report.

Validated/Reviewed by:

Signature: Maqsud Rahman Date: April 18, 2011

Name: Maqsud Rahman

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DATA VERIFICATION USING DoD QSM 4.1
US ARMY CORPS OF ENGINEERS
RAVENNA ARMY AMMUNITION PLANT
POLYCHLORINATED BIPHENYL (PCB) ANALYSIS
CHECKLIST

Project Name: Ravenna Army Ammunition Plant, ODA1

Laboratory: CT Labsoratory

Report No.: 81613, 81543, 82400

Analytical Method: 8082 **Matrix:** Soil/Water

Analyte: PCBs **SDGs:** 81613, 81543, 82400

	Yes	No
1. Analytical Capability Was analytical capability demonstrated?	[x]	[ ]
2. Limit of Detection (LOD) Were LODs determined and verified?	[x]	[ ]
3. Limit of Quantitation (LOQ) Were LOQs determined and verified?	[x]	[ ]
4. Sample Holding Time		
a) Were samples extracted within holding times?	[x]	[ ]
b) Were samples analyzed within holding times?	[x]	[ ]
5. DDT Breakdown Was DDT Breakdown < 15%?	[x]	[ ]
6. Initial Calibration: a) Did the initial calibration consist of five or more standards?	[x]	[ ]
b) Did the initial calibration meet any of the three acceptance criteria:		
Option 1 - RSD for each analyte $\leq$ 20%?	[x]	[ ]
Option 2 - Linear least square regression r $\geq$ 0.995%?		
Option 3 - Non-linear regression coefficient of determination (COD) $r^2 \geq 0.99$ (6 points shall be used for second order, 7 points shall be used for third order)?		

	Yes	No
7. Retention Time Window Were retention time window positions established for each analyte and surrogate?	[x]	[ ]
8. Initial Calibration Verification (ICV):		
a) Was an ICV run immediately after each ICAL?	[x]	[ ]
b) Is the mid-level (2^{nd} source) within $\pm$ 20% of the true value?	[x]	[ ]
9. Continuing Calibration Verification (CCV): Was a CCV conducted at least every 10 samples and at the end of the analytical sequence?	[x]	[ ]
10. Sample Quality Control		
a) Method Blanks 1) Was a method blank present for each preparatory batch?	[x]	[ ]
2) Were target analytes detected >1/2 RL, and >1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater?	[ ]	[ ]
3) Did the method blank fail project-specific objectives (>1/2 the RL or > the RL)?	[ ]	[x]
a) *Laboratory Control Sample (LCS)* 1) Was an LCS included in each preparatory batch?	[x]	[ ]
2) Did the LCS contain all arochlors to be reported?	[x]	[ ]
3) Were the percent recoveries for LCS within the limits? (Enter out of control recoveries only)	[x]	[ ]

Identification of LCS Standard

Spiked Compound	LCS %R	LCSD %R	%RPD
	.		
	.		

b) Matrix Spike/Matrix Spike Duplicate (MS/MSD)			
1) Were the percent recoveries within limits? (Enter out of control recoveries only)	[x]	[ ]	
2) Were the RPD within limits?	[x]	[ ]	

Identification of Original Sample Used for QC

Spiked compound	MS %R	MSD%R	%RPD
.			

	Yes	No
c) *System Monitoring Compounds (Surrogates)*		
Are surrogate recoveries within QC limits? (Enter out of control recoveries only)	[x]	[ ]

Sample ID	%R

11. Analyte Detection

a) Were results reported between the DL and the LOQ?	[ ]	[x]
b) Were results reported between the DL and the LOQ J flagged?	[ ]	[ ]

Comments (attach additional sheets if necessary):

No QC outlier to report.

Validated/Reviewed by:

Signature: Maqsud Rahman Date: April 18, 2011

Name: Maqsud Rahman

Overall Assessment of the Data Package: complete

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DATA VERIFICATION USING DoD QSM 4.1
US ARMY CORPS OF ENGINEERS
RAVENNA ARMY AMMUNITION PLANT
PESTICIDE ANALYSIS
CHECKLIST

Project Name: Ravenna Army Ammunition Plant, ODA1

Laboratory: CT Labs

Report No.: 81613, 81643, 82400

Analytical Method: 8081B

Analyte: Pesticides **SDGss:** 81613, 81643, 82400

	Yes	No
1. Analytical Capability Was analytical capability demonstrated?	[x]	[ ]
2. Limit of Detection (LOD) Were LODs determined and verified?	[x]	[ ]
3. Limit of Quantitation (LOQ) Were LOQs determined and verified?	[x]	[ ]
4. Sample Holding Time a) Were samples extracted within holding times?	[x]	[ ]
b) Were samples analyzed within holding times?	[x]	[ ]
5. DDT Breakdown Was DDT Breakdown < 15%	[x]	[ ]
6. Initial Calibration: a) Did the initial calibration consist of five or more standards?	[x]	[ ]
b) Did the initial calibration meet any of the three acceptance criteria:		
Option 1 - RSD for each analyte ≤ 20%?	[x]	[ ]
Option 2 - Linear least square regression r ≥ 0.995%?		
Option 3 - Non-linear regression coefficient of determination (COD) $r^2 \geq 0.99$ (6 points shall be used for second order, 7 points shall be used for third order)?		
7. Retention Time Window Were retention time window positions established for each analyte and surrogate?	[x]	[ ]
8. Initial Calibration Verification (ICV): Is the mid-level (2nd source) within ± 20% of the true value?	[x]	[ ]
9. Continuing Calibration Verification (CCV):		

	Yes	No
Was a CCV conducted at least every 10 samples and at the end of the analytical sequence?	[x]	[ ]

10. Sample Quality Control:

a) *Method Blanks*
Were target analytes detected >1/2 RL, and >1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater? [x]See comments [ ]

b) *Common Contaminants*
Were any analytes present >RL? [ ] [ ]

c) *Laboratory Control Sample (LCS)*
Were the percent recoveries for LCS within the limits? [ ] [x]
(Enter out of control recoveries only)

Identification of LCS Standard

Spiked Compound	LCS %R	LCSD %R	%RPD
LCS 855458/Endosulfan	118 (50-110)		
	.		
	.		

d) *Matrix Spike/Matrix Spike Duplicate (MS/MSD)*
Were the percent recoveries within limits? [ ] [ ]
(Enter out of control recoveries only)

Parent Sample	Compound	MS %R	MSD%R	%RPD
		35-145	35-145	
DA1QC-059M-0201-SO	Endrin aldehyde	18 (35-145)	16 (35-145)	
DA1QC-059M-0201-SO	Endrin ketone	63 (65-135)		

e) System Monitoring Compounds (Surrogates)
Are surrogate recoveries within QC limits? [ ] [x]
(Enter out of control recoveries only)

Sample ID	Surrogate	%R	Allowable
Method Blank 853916	2,4,5,6-tetrachloro-m-xylene	67.7	70-125
DA1SB-059M-0201-SO	**2**,4,5,6-tetrachloro-m-xylene	68.9	70-125

11. Results reported between the DL and the LOQ? [x] [ ]

12. Results between Channel A and Channel B over 40% [x] [ ]

Sample Description	Compound
DA1SB-068M-0201-SO	Heptachlor, Endosulfan II
DA1SB-069M-0201-SO	Heptachlor
DA1SB-070M-0203-SO	Heptachlor, gamma-chlordane
DA1SB-071M-0203-SO	Heptachlor, gamma-Chlordane
DA!QC-001-0001-ER	Methoxychlor
DA1QC-0003-0001-ER	Lindane
DA1SB-064M-0201-SO	4,4'-DDE, Endosulfan II, dela-BHC I,

Comments (attach additional sheets if necessary):

(a) Method Blank 852473 had 4,4'-DDT detected at a concentration of 0.02 ug/L. The compound was not detected in the associated samples and no qualifier was assigned.

(b) Ending toxaphene/chlordane CCV 016 analyzed on November 11, 2011 had a low decachlorobiphenyl recovery surrogate response. Toxaphene and technical chlordane were not detected in the associated samples and no qualifier was assigned.

Validated/Reviewed by:

Signature: Maqsud Rahman Date: April 18, 2011

Name: Maqsud Rahman

Overall Assessment of the Data Package: Complete

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DATA VERIFICATION USING DoD QSM 4.1
US ARMY CORPS OF ENGINEERS
RAVENNA ARMY AMMUNITION PLANT
SEMIVOLATILE ORGANIC ANALYSIS
CHECKLIST

Project Name: Ravenna Army Ammunition Plant, ODA1

Laboratory: CT Laboratory **Sampling Date:** Multiple

Report No.: 81613, 82400, 81543

Analytical Method: SW-846-8270C **Matrix:** Soil, Water

Analyte: SVOCs

		Yes	No
1.	Analytical Capability Was analytical capability demonstrated?	[x]	[ ]
2.	Limit of Detection (LOD) Were LODs determined and verified?	[x]	[ ]
3.	Limit of Quantitation (LOQ) Were LOQs determined and verified?	[x]	[ ]
4.	Sample Holding Time a) Were samples extracted within holding times?	[x]	[ ]
	b) Were samples analyzed within holding times?	[x]	[ ]
5.	Instrument Tuning Was the DFTPP tune performed at the beginning of each 12-hour period during which samples were analyzed?	[x]	[ ]
6.	Ion Mass Assignments Was mass assignment based on m/z 198?	[x]	[ ]
7.	Ion Abundance Indicate if DFTPP ions abundance relative to m/z 198 base peak met the ions abundance criteria:		
	m/z — Acceptance Criteria		
	51 — 30.0 - 60.0 %	[x]	[ ]
	68 — < 2% of mass 69	[x]	[ ]
	70 — < 2% of mass 69	[x]	[ ]
	127 — 40-60%	[x]	[ ]
	197 — < 1%	[x]	[ ]
	198 — 100%, Base peak	[x]	[ ]
	199 — 5-9%	[x]	[ ]
	275 — 5.0 - 9.0%	[x]	[ ]
	365 — > 1%	[x]	[ ]
	441 — present but < mass 443	[x]	[ ]
	442 — > 40%	[x]	[ ]
	443 — 17-23% of mass 442	[x]	[ ]

		Yes	No
8.	DDT Breakdown Was DDT Breakdown ≤ 20%	[x]	[ ]
9.	Initial Calibration		
	a) Did the initial calibration consist of five or more standards? (If the calibration curve consisted of 5-standards, check validity of the calibration model)	[x]	[ ]
	b) Did the following System Performance Check Compounds (SPCC) meet the minimum mean response factor (RF)?		
	RF		
	N-nitroso-di-n-propylamine 0.05	[x]	[ ]
	Hexachlorocyclopentadiene 0.05	[x]	[ ]
	2,4-dinitrophenol 0.05		[ ]
	4-nitrophenol 0.05	[x]	[ ]
		[x]	
	c) Did the RSD meet the criteria ≤ 30% for the following individual Calibration Check Compound (CCC)?		
	Base/Neutral Fraction		
	Acenaphthene	[x]	[ ]
	1,4-Dichlorobenzene	[x]	[ ]
	Hexachlorobutadiene	[x]	[ ]
	Diphenylamine	[x]	[ ]
	Di-n-octylphthalate	[x]	[ ]
	Fluoranthene	[x]	[ ]
	Benzo(a)pyrene	[x]	[ ]
	Acid Fraction		
	4-Chloro-3-methylphenol	[x]	[ ]
	2,4-Dichlorophenol	[x]	[ ]
	2-Nitrophenol	[x]	[ ]
	Phenol	[x]	[ ]
	Pentachlorophenol	[x]	[ ]
	2,4,6-Trichlorophenol	[x]	[ ]
	d) In addition, has met one of the following options: 1) RSD for each analyte ≤ 15% 2) Linear least square regression r ≥ 0.995 3) Non-linear regression-coefficient $r^2 \geq 0.99$	[x]	[ ]
10.	Retention Time Window Were retention time window position established for each analyte and surrogate?	[x]	[ ]
11.	Evaluation of relative retention time Was RRT of each target analyte within ± 0.06 RRT units	[x]	[ ]
12.	Initial Calibration Verification (ICV)		
	a) Was an ICV run immediately after each ICAL?	[x]	[ ]
	b) Is the mid-level (2^{nd} source) within ± 20% of the true value?	[x]	[ ]
13.	Continuing Calibration Verification (CCV)		

		Yes	No
a)	Was CCV conducted every 12 hours?	[x]	[ ]
b)	Did any of SPCC meet the minimum RF values?	[x]	[ ]

	RF		
N-nitroso-di-n-propylamine	0.05	[x]	[ ]
Hexachlorocyclopentadiene	0.05	[x]	[ ]
2,4-dinitrophenol	0.05	[x]	[ ]
4-nitrophenol	0.05	[x]	[ ]

c) Did the CCC meet the minimum requirements (D ≤ 20%) for the followings?

Base/Neutral Fraction		
Acenaphthene	[x]	[ ]
1,4-Dichlorobenzene	[x]	[ ]
Hexachlorobutadiene	[x]	[ ]
Diphenylamine	[x]	[ ]
Di-n-octylphthalate	[x]	[ ]
Fluoranthene	[x]	[ ]
Benzo(a)pyrene	[x]	[ ]

Acid Fraction		
4-Chloro-3-methylphenol	[x]	[ ]
2,4-Dichlorophenol	[x]	[ ]
2-Nitrophenol	[x]	[ ]
Phenol	[x]	[ ]
Pentachlorophenol	[x]	[ ]
2,4,6-Trichlorophenol	[x]	[ ]

d) Primary Evaluation Was Drift or D ≤ 20% calculated from the initial calibration? [ ] [ ]

14. Internal Standard Verification

a) Were retention times ± 30 seconds from the retention time of the mid- point standard in the ICAL? [x] [ ]

b) Were EICP areas within -50% to + 100% of the ICAL mid-point standard? [x] [ ]

15. Sample Quality Control

a) Method Blanks

1) Was a method blank present for each preparatory batch? [x] [ ]
2) Were target analytes detected >1/2 RL, and >1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater? [ ] [ ]
3) Did the method blank fail project-specific objectives (>1/2 the RL or > the RL)? [ ] [ ]

b) Common Contaminants

Were any analytes present >RL? [ ] [ ]

.

	Yes	No
c) LCS		
1) Was an LCS included in each preparatory batch?	[x]	[ ]
2) Did the LCS contain all analytes to be reported?	[x]	[ ]
3) Were the percent recoveries for LCS within the limits? (Enter out of control recoveries only)	[x]	[ ]

Identification of LCS Standard

LCS 851609

Spiked Compound	LCS %R	LCSD %R	%RPD
3,3'-dichlorobenzidine	112		
	.		
	.		

d) MS/MSD

1) Were the percent recoveries within limits? (Enter out of control recoveries only)	[x]	[ ]
2) Were the RPD within limits?	[x	[ ]

Identification of Original Sample Used for QC

Spiked compound	MS %R	MSD%R	%RPD
.			

e) System Monitoring Compounds (Surrogates)

Are surrogate recoveries within QC limits? (Enter out of control recoveries only)	[ ]	[x]

	%R					
	S1	**S2**	**S3**	**S4**	**S5**	**S6**
Sample ID	(35-125)	(45-105)	(35-105)	(35-100)	(30-125)	(40-100)
DA1SB-070M-0203-SO	31					
DA1SB-071M-0201-SO	31					
DA1SB-072M-0201-SO	27					

NOTE: S1=2,4,6-Tribromophenol, S2=2-Fluorobiphenyl, S3=2-Fluorophenol, S4=Nitrobenzene-d5, S5=p-Terphenyl-d14 S6: Phenol-d5

16. Analyte Detection

a) Were results reported between the DL and the LOQ?	[x]	[ ]
b) Were results reported between the DL and the LOQ J flagged?	[x]	[ ]

Comments (attach additional sheets if necessary)

1. Several CCVs have exceeded allowable limit of 20% as shown below:

ID & date	Compound	%D	Actions
ICCV13, 10/4/10	3,3'-dichlorobenzidine	22% low	Data for this compound was qualified with a "Q" in the associated samples
2CCV30, 10/19/10	Benzoic acid	32.6% high	Compound not detected in samples, No qualifier
1CCV40, 11/18/10	Hexachloropropene	24.1%, high	Compound not detected in samples, No qualifier

Validated/Reviewed by:

Signature: Maqsud Rahman Date: April 18, 2011

Name: Maqsud Rahman

Overall Assessment of the Data Package: Complete

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DATA VERIFICATION USING DoD QSM 4.1
US ARMY CORPS OF ENGINEERS
RAVENNA ARMY AMMUNITION PLANT
VOLATILE ORGANIC ANALYSIS
CHECKLIST

Project Name: **Ravenna Army Ammunition Plant, ODA1**

Laboratory: CT Laboratory

Report No. 81613,81543, 82400

Analytical Method: SW-846-8260B

Analyte: VOCs **Sample SDGs**; 81613, 81543, 82400

	Yes	No
1. Analytical Capability Was analytical capability demonstrated?	[x]	[ ]
2. Limit of Detection (LOD) Were LODs determined and verified?	[x]	[ ]
3. Limit of Quantitation (LOQ) Were LOQs determined and verified?	[x]	[ ]
4. Sample Holding Time a) Were samples preserved?	[x]	[ ]
b) Were samples analyzed within holding times?	[x]	[ ]
5. Instrument Tuning: Was the BFB tune performed at the beginning of each 12-hour period during which samples were analyzed?	[x]	[ ]
6. Ion Mass Assignments: Was mass assignment based on m/z 95?	[x]	[ ]
7. Ion Abundance: Indicate if BFB ions abundance relative to m/z 95 base peak met the ions abundance criteria:		

m/z	Acceptance Criteria		
50	15.0 - 40.0 %	[x]	[ ]
75	30.0 - 66.0 %	[x]	[ ]
95	100%, Base Peak	[x]	[ ]
96	5.0 - 9.0%	[x]	[ ]
173	<2.0% of m/z 174	[x]	[ ]
174	>50%	[x]	[ ]
175	5.0 - 9.0% of mass 174	[x]	[ ]
176	95.0 - 101.0% of m/z 174	[x]	[ ]
177	5.0 - 9.0% of m/z 176	[x]	[ ]

Note: The relative ion abundance of m/g 95/96, m/z 174/176, and

	Yes	No
176/177 are of critical importance. The relative ion abumndance of m/z 50 and 75 are of lower importance.		

8. Initial Calibration:

		Yes	No
a)	Did the initial calibration consist of five or more standards?	[x]	[ ]
b)	Did the following System Performance Check Compounds (SPCC) meet the minimum mean response factor (RF)?		
	Chloromethane (RF 0.1)	[x]	[ ]
	1,1-Dichloroethane (RF 0.1)	[x]	[ ]
	Bromoform (RF 0.1)	[x]	[ ]
	Chlorobenzene (RF 0.3)	[x]	[ ]
	1,1,2,2-Tetrachloroethane (RF 0.3)	[x]	[ ]
c)	Did the RSD meet the criteria ≤ 30% for the followings each individual Calibration Check Compound (CCC)?		
	1,1-Dichloroethene	[x]	[ ]
	Chloroform	[x]	[ ]
	1,2-Dichloropropane	[x]	[ ]
	Toluene	[x]	[ ]
	Ethylbenzene	[x]	[ ]
	Vinyl chloride	[x]	[ ]
d)	In addition, has met one of the following options: RSD for each analyte ≤ 15% Linear least square regression r ≥ 0.995 Non-linear regression-coefficient r^2 ≥ 0.99	[x]	[ ]

9. Retention Time Window

		Yes	No
	Were retention time window positions established for each analyte and surrogate?	[x]	[ ]

10. Evaluation of relative retention time

		Yes	No
	Was RRT of each target analyte within ± 0.06 RRT units?	[x]	[ ]

11. Initial Calibration Verification (ICV):

		Yes	No
a)	Was an ICV run immediately after each ICAL?	[x]	[ ]
b)	Is the mid-level (2^{nd} source) within ± 20% of the true value?	[x]	[ ]

12. Continuing Calibration Verification (CCV):

		Yes	No
a)	Was CCV conducted every 12 hours?	[x]	[ ]
b)	Did any of SPCC meet the minimum RF values?		
	Chloromethane (RF 0.1)	[x]	[ ]
	1,1-Dichloroethane (RF 0.1)	[x]	[ ]
	Bromoform (RF 0.1)	[x]	[ ]

		Yes	No
Chlorobenzene	0.3	[x]	[ ]
1,1,2,2-Tetrachloroethane	0.3	[x]	[ ]

c) Did the CCC meet the minimum requirements (D ≤ 20%) for the followings?

1,1-Dichloroethene	[x]	[ ]
Chloroform	[x]	[ ]
1,2-Dichloropropane	[x]	[ ]
Toluene	[x]	[ ]
Ethylbenzene	[x]	[ ]
Vinyl chloride	[x]	[ ]

d) Primary Evaluation: Was Drift or D ≤ 20% calculated from the initial calibration? [ ]See comments [x]

13. Internal Standard Verification:

a) Were retention times ± 30 seconds from the retention time of the mid-point standard in the ICAL? [x] [ ]

b) Were EICP areas within -50% to + 100% of the ICAL mid-point standard? [x] [ ]

14. Sample Quality Control:

a) Method Blanks:

1) Was a method blank present for each preparatory batch? [x] [ ]

2) Were target analytes detected >1/2 RL, and >1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater? [ ] [x]

3) Did the method blank fail project-specific objectives (>1/2 the RL or > the RL)? [x] [ ]

b) Common Contaminants
Were any analytes present >RL? [x] [ ]

.

c) Laboratory Control Sample (LCS)

1) Was an LCS included in each preparatory batch? [x] [ ]

2) Did the LCS contain all analytes to be reported? [x] [ ]

3) Were the percent recoveries for LCS within the limits? (Enter out of control recoveries only) [x] [ ]

Identification of LCS Standard

Spiked Compound	LCS %R (80-130)	LCSD %R (80-130)	%RPD (20)
	.		

	.		

d) MS/MSD
Were the percent recoveries within limits? [ ] See comments [x]
(Enter out of control recoveries only)

Identification of Original Sample Used for QC
DA1SB-070D-0201-SO

Spiked compound	MS %R	MSD%R	%RPD
	70-130%		(20)
2-butanome			36
2-hexanone			36
acetone			37

e) System Monitoring Compounds (Surrogates)
Are surrogate recoveries within QC limits? [ ]See comments [x]
(Enter out of control recoveries only)

Surrogate Recoveries

Sample ID	**%Recovery**			
	4-bromofluorobenzene			
	85-120%			
Method blank (856016)	121%			

15. Analyte Detection

a) Were results reported between the DL and the LOQ? [x] [ ]

b) Were results reported between the DL and the LOQ J flagged? [ ]See comments. [ ]

Comments (attach additional sheets if necessary):

SDG 81613: 1.The RPD between the MS and MSD for sample DA1SB-070D-0201-SO for 2-butanone, 2-hexanone,and acetone were 36%, 36%, and 37%, respectively, and were above the allowable limit of 30%. These Compounds were not detected in the parent sample and therefore the data were not qualified.
2. The method blank #856016 yielded a surrogate recovery for bromofluorobenzene of 121%, which is just above the allowable range of 75-120%. Since the recovery was less than 1% over the allowable range it can be as a marginal error and therefore no qualifier was added.
SDG 82400: 1. Acetone was detected in the calibration blank (ICB) and the method blank. Associated samples (DA1SB—073D-0201-SO and DA1SB-074D-0203-SO) were reanalyzed to conform the presence of acetone & the original analysis as reported. The results were between MDL and LOD and the associated samples were qualified with a “B” flag.
2. The Continuing Calibration verification (CCV1) analyzed on November 11, 2010had a low recovery (27% deviation) which was beyond the allowable limit of 20%. The data for this compound was qualified with a “Q” flag for the associated samples (DA1QC-007-0001-TB and DA1QC-006-0001-TB)

Validated/Reviewed by:

Signature: Maqsud Rahman Date: April 18, 2011

Name: Maqsud Rahman

Overall Assessment of the Data Package: Complete.

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Attachment B
Summary of Remedial Investigation Sample Data Qualifications

Attachment B
Summary of Remedial Investigation Samples Data Qualifications
Open Demolition Area #1
Phase II Remedial Investigation (2010)

Sample Location ID	SDG	Analyte	Result	Units	Laboratory Qualifier	Validation Qualifier	Reason Code 1	Reason Code 2
DA1SB-074M-0204-SO	82400	Mercury	0.0067	mg/kg	J	J	DL-LOQ	
DA1SB-077M-0202-SO	82400	Mercury	0.0072	mg/kg	J	J	DL-LOQ	
DA1SB-077M-0203-SO	82400	Mercury	0.0065	mg/kg	J	J	DL-LOQ	
DA1SB-077M-0204-SO	82400	Mercury	0.0073	mg/kg	J	J	DL-LOQ	
DA1QC-003-0001-ER	82400	Silver	0.7	ug/L	UM	UJ	MS/MSD	
DA1SB-073M-0201-SO	82400	Aluminum	7900	mg/kg	M	J	MS/MSD	
DA1SB-073M-0201-SO	82400	Antimony	1.1	mg/kg	M	J	MS/MSD	
DA1SB-073M-0201-SO	82400	Cadmium	0.59	mg/kg	Y	J	MS/SD	
DA1SB-073M-0201-SO	82400	Chromium	85.1	mg/kg	Y,M	J	MS/MSD	MS/SD
DA1SB-073M-0201-SO	82400	Cobalt	7.6	mg/kg	M	J	MS/MSD	
DA1SB-073M-0201-SO	82400	Lead	7.7	mg/kg	M	J	MS/MSD	
DA1SB-073M-0201-SO	82400	Nickel	14	mg/kg	M	J	MS/MSD	
DA1SB-073M-0201-SO	82400	Selenium	0.98	mg/kg	M	J	MS/MSD	
DA1SB-073M-0201-SO	82400	Thallium	0.081	mg/kg	UV,M	UJ	MS/MSD	
DA1SB-073M-0201-SO	82400	Zinc	53.2	mg/kg	M	J	MS/MSD	
DA1SB-073M-0204-SO	82400	Selenium	0.25	mg/kg	J	J	DL-LOQ	
DA1SB-076M-0202-SO	82400	Antimony	0.22	mg/kg	J	J	DL-LOQ	
DA1SB-076M-0203-SO	82400	Selenium	0.25	mg/kg	J	J	DL-LOQ	
DA1SB-076M-0203-SO	82400	Thallium	0.18	mg/kg	JV	J	DL-LOQ	
DA1SB-077M-0204-SO	82400	Thallium	0.23	mg/kg	J	J	DL-LOQ	
DA1SB-088M-0203-SO	82400	Thallium	0.12	mg/kg	JV	J	DL-LOQ	
DA1SS-053M-0201-SO	82400	Chromium	153	mg/kg	B,M	J	MS/MSD	
DA1SS-053M-0201-SO	82400	Cobalt	20.6	mg/kg	M	J	MS/MSD	
DA1SS-053M-0201-SO	82400	Copper	73.1	mg/kg	M	J	MS/MSD	
DA1SS-053M-0201-SO	82400	Iron	18400	mg/kg	M,B	J	MS/MSD	
DA1SS-053M-0201-SO	82400	Silver	0.035	mg/kg	UV,M	UJ	MS/MSD	
DA1SS-053M-0201-SO	82400	Sodium	106	mg/kg	Y	J	MS/SD	
DA1SB-073M-0201-SO	82400	Hexavalent Chromium	1.9	mg/kg	UM	UJ	MS/MSD	
DA1QC-003-0001-ER	82400	Lindane	0.016	ug/L	JP	J	Dl-LOQ	P
DA1QC-007-0001-TB	82400	Chloromethane	0.58	ug/L	J	J	DL-LOQ	
DA1SB-073M-0201-SO	82400	4-Chloroaniline	39	ug/kg	UM	UJ	MS/MSD	

Attachment B (continued)
Summary of Remedial Investigation Samples Data Qualifications
Open Demolition Area #1
Phase II Remedial Investigation (2010)

Sample Location ID	SDG	Analyte	Result	Units	Laboratory Qualifier	Validation Qualifier	Reason Code 1	Reason Code 2
DA1SB-073M-0201-SO	82400	Bis(2-Ethylhexyl)phthalate	210	ug/kg	J	J	DL-LOQ	
DA1SB-074M-0202-SO	82400	Di-n-Butyl Phthalate	92	ug/kg	J	J	DL-LOQ	
DA1SB-073M-0201-SO	82400	Cyanide, Total	0.17	mg/kg	J	J	DL-LOQ	
DA1SB-074M-0202-SO	82400	Cyanide, Total	0.11	mg/kg	J	J	DL-LOQ	
DA1SB-055M-0001-SO	81543	Calcium	18700	mg/kg	M	J	MS/MSD	
DA1SB-056M-0001-SO	81543	Selenium	0.42	mg/kg	JV	J	DL-LOQ	
DA1SB-056M-0002-SO	81543	Selenium	0.67	mg/kg	JV	J	DL-LOQ	
DA1SB-056M-0004-SO	81543	Selenium	0.58	mg/kg	JV	J	DL-LOQ	
DA1SB-056M-0004-SO	81543	Mercury	0.0063	mg/kg	J	J	DL-LOQ	
DA1SB-059M-0201-SO	81543	Endrin Ketone	0.82	ug/kg	UM	UJ	MS/MSD	
DA1SB-059M-0201-SO	81543	Endrin Aldehyde	1.1	ug/kg	UM	UJ	MS/MSD	
DA1SB-059M-0201-SO	81543	Di-n-Butyl Phthalate	110	ug/kg	J	J	DL-LOQ	
DA1SB-064M-0201-SO	81543	4,4'-DDE	0.3	ug/kg	JP	J	DL-LOQ	P
DA1SB-064M-0201-SO	81543	Endosulfan II	0.3	ug/kg	JP	J	DL-LOQ	P
DA1SB-064M-0201-SO	81543	Aldrin	0.71	ug/kg	J	J	DL-LOQ	
DA1SB-064M-0201-SO	81543	delta-BHC	2.7	ug/kg	P	J	DL-LOQ	P
DA1SB-064M-0201-SO	81543	Di-n-Butyl Phthalate	100	ug/kg	J	J	DL-LOQ	
DA1SB-057M-0201-SO	81543	Antimony	0.91	mg/kg	JV	J	DL-LOQ	
DA1SB-057M-0202-SO	81543	Antimony	0.72	mg/kg	JV	J	DL-LOQ	
DA1SB-058M-0202-SO	81543	Antimony	1.3	mg/kg	JV	J	DL-LOQ	
DA1SB-060M-0201-SO	81543	Selenium	0.77	mg/kg	JV	J	DL-LOQ	
DA1SB-060M-0202-SO	81543	Selenium	0.51	mg/kg	JV	J	DL-LOQ	
DA1SB-060M-0203-SO	81543	Selenium	0.38	mg/kg	JV	J	DL-LOQ	
DA1SB-060M-0204-SO	81543	Selenium	0.42	mg/kg	JV	J	DL-LOQ	
DA1SB-061M-0201-SO	81543	Selenium	0.51	mg/kg	JV	J	DL-LOQ	
DA1SB-061M-0202-SO	81543	Selenium	0.29	mg/kg	JV	J	DL-LOQ	
DA1SB-061M-0203-SO	81543	Selenium	0.44	mg/kg	JV	J	DL-LOQ	
DA1SB-061M-0204-SO	81543	Selenium	0.25	mg/kg	JV	J	DL-LOQ	
DA1SB-062M-0203-SO	81543	Selenium	0.47	mg/kg	JV	J	DL-LOQ	
DA1SB-062M-0204-SO	81543	Mercury	0.0078	mg/kg	J	J	DL-LOQ	
DA1SB-063M-0201-SO	81543	Nitrocellulose	7	mg/kg	UM	UJ	MS/MSD	

Attachment B (continued)
Summary of Remedial Investigation Samples Data Qualifications
Open Demolition Area #1
Phase II Remedial Investigation (2010)

Sample Location ID	SDG	Analyte	Result	Units	Laboratory Qualifier	Validation Qualifier	Reason Code 1	Reason Code 2
DA1SB-063M-0201-SO	81543	Cadmium	0.012	mg/kg	UVM	UJ	MS/MSD	
DA1SB-063M-0201-SO	81543	Selenium	0.18	mg/kg	JVM	J	DL-LOQ	
DA1SB-063M-0201-SO	81543	Cobalt	11.6	mg/kg	M	J	DL-LOQ	
DA1SB-063M-0201-SO	81543	Copper	19	mg/kg	M	J	DL-LOQ	
DA1SB-063M-0201-SO	81543	Thallium	2.4	mg/kg	M	J	DL-LOQ	
DA1SB-063M-0201-SO	81543	Vanadium	22.9	mg/kg	M	J	DL-LOQ	
DA1SB-063M-0201-SO	81543	Nickel	27.3	mg/kg	M	J	DL-LOQ	
DA1SB-063M-0201-SO	81543	Chromium	29.4	mg/kg	M	J	DL-LOQ	
DA1SB-063M-0201-SO	81543	Iron	37000	mg/kg	M	J	DL-LOQ	
DA1SB-063M-0201-SO	81543	Zinc	58.1	mg/kg	M	J	DL-LOQ	
DA1SB-063M-0202-SO	81543	Selenium	0.53	mg/kg	JV	J	DL-LOQ	
DA1SB-063M-0203-SO	81543	Arsenic	0.4	mg/kg	JV	J	DL-LOQ	
DA1SB-063M-0203-SO	81543	Selenium	0.74	mg/kg	JV	J	DL-LOQ	
DA1SB-064M-0202-SO	81543	Selenium	0.57	mg/kg	JV	J	DL-LOQ	
DA1SB-064M-0203-SO	81543	Selenium	0.37	mg/kg	JV	J	DL-LOQ	
DA1SB-064M-0203-SO	81543	Antimony	0.46	mg/kg	JV	J	DL-LOQ	
DA1SB-065M-0201-SO	81543	Arsenic	0.67	mg/kg	JV	J	DL-LOQ	
DA1SB-065M-0201-SO	81543	Selenium	0.77	mg/kg	JV	J	DL-LOQ	
DA1SB-065M-0202-SO	81543	Selenium	0.56	mg/kg	JV	J	DL-LOQ	
DA1SB-065M-0203-SO	81543	Selenium	0.45	mg/kg	JV	J	DL-LOQ	
DA1SB-066M-0201-SO	81543	Cadmium	0.026	mg/kg	JV	J	DL-LOQ	
DA1SB-066M-0201-SO	81543	Selenium	0.39	mg/kg	JV	J	DL-LOQ	
DA1SB-066M-0202-SO	81543	Selenium	0.31	mg/kg	JV	J	DL-LOQ	
DA1SB-066M-0203-SO	81543	Selenium	0.24	mg/kg	JV	J	DL-LOQ	
DA1SB-066M-0203-SO	81543	Antimony	0.35	mg/kg	JV	J	DL-LOQ	
DA1SB-066M-0204-SO	81543	Selenium	0.47	mg/kg	JV	J	DL-LOQ	
DA1SB-082M-0202-SO	81543	Selenium	0.36	mg/kg	JV	J	DL-LOQ	
DA1SB-083M-0202-SO	81543	Selenium	0.28	mg/kg	JV	J	DL-LOQ	
SCQC-003-0001-ER	81543	3,3'-Dichlorobenzidine	0.69	ug/L	UQZ	UJ	LCS	
DA1QC-001-0001-ER	81613	Calcium	61	ug/L	J	J	DL-LOQ	
DA1QC-001-0001-ER	81613	Chromium	0.79	ug/L	J	J	DL-LOQ	

Attachment B (continued)
Summary of Remedial Investigation Samples Data Qualifications
Open Demolition Area #1
Phase II Remedial Investigation (2010)

Sample Location ID	SDG	Analyte	Result	Units	Laboratory Qualifier	Validation Qualifier	Reason Code 1	Reason Code 2
DA1QC-001-0001-ER	81613	Magnesium	6.1	ug/L	J	J	DL-LOQ	
DA1QC-001-0001-ER	81613	Manganese	1.4	ug/L	J	J	DL-LOQ	
DA1QC-001-0001-ER	81613	Methoxychlor	0.016	ug/L	JP	J	P	
DA1QC-001-0001-ER	81613	Methylene Chloride	0.76	ug/L	J	J	DL-LOQ	
DA1QC-001-0001-ER	81613	4,6-Dinitro-2-Methylphenol	1.9	ug/L	UQ	UJ	LCS	
DA1QC-002-0001-ER	81613	Manganese	0.77	ug/L	J	J	DL-LOQ	
DA1QC-002-0001-ER	81613	Nickel	2	ug/L	J	J	DL-LOQ	
DA1QC-002-0001-ER	81613	Zinc	4.2	ug/L	J	J	DL-LOQ	
DA1QC-002-0001-ER	81613	Methylene Chloride	0.67	ug/L	J	J	DL-LOQ	
DA1SB-067M-0201-SO	81613	Selenium	0.5	mg/kg	JV	J	DL-LOQ	
DA1SB-067M-0202-SO	81613	Antimony	0.23	mg/kg	JV	J	DL-LOQ	
DA1SB-068M-0201-SO	81613	Antimony	0.49	mg/kg	JV	J	DL-LOQ	
DA1SB-068M-0201-SO	81613	Selenium	0.23	mg/kg	JV	J	DL-LOQ	
DA1SB-068M-0202-SO	81613	Selenium	0.4	mg/kg	JV	J	DL-LOQ	
DA1SB-068M-0204-SO	81613	Thallium	1.5	mg/kg		J	DL-LOQ	
DA1SB-069M-0201-SO	81613	Bis(2-Ethylhexyl)phthalate	100	ug/kg	J	J	DL-LOQ	
DA1SB-069M-0202-SO	81613	Selenium	0.14	mg/kg	JV	J	DL-LOQ	
DA1SB-070M-0201-SO	81613	Cadmium	0.2	mg/kg	MY	J	MS/MSD	MS/SD
DA1SB-070M-0201-SO	81613	Chromium	21.2	mg/kg	M	J	MS/MSD	
DA1SB-070M-0201-SO	81613	Cobalt	10.9	mg/kg	M	J	MS/MSD	
DA1SB-070M-0201-SO	81613	Copper	28.3	mg/kg	M	J	MS/MSD	
DA1SB-070M-0201-SO	81613	Nickel	17	mg/kg	M	J	MS/MSD	
DA1SB-070M-0201-SO	81613	Selenium	1.1	mg/kg	M	J	MS/MSD	
DA1SB-070M-0201-SO	81613	Thallium	2.2	mg/kg	MB	J	MS/MSD	
DA1SB-070M-0201-SO	81613	Vanadium	19.9	mg/kg	M	J	MS/MSD	
DA1SB-070M-0201-SO	81613	Zinc	60.3	mg/kg	M	J	MS/MSD	
DA1SB-070M-0201-SO	81613	2,4,6-Trinitrotoluene	64	mg/kg	M	J	MS/MSD	
DA1SB-070M-0201-SO	81613	2-Amino-4,6-Dinitrotoluene	0.31	mg/kg	J	J	DL-LOQ	
DA1SB-070M-0201-SO	81613	4-Amino-2,6-Dinitrotoluene	0.069	mg/kg	UM	UJ	MS/MSD	
DA1SB-070M-0202-SO	81613	2,4,6-Trinitrotoluene	0.2	mg/kg	J	J	DL-LOQ	
DA1SB-070M-0203-SO	81613	Selenium	0.36	mg/kg	JV	J	DL-LOQ	

Attachment B (continued)
Summary of Remedial Investigation Samples Data Qualifications
Open Demolition Area #1
Phase II Remedial Investigation (2010)

Sample Location ID	SDG	Analyte	Result	Units	Laboratory Qualifier	Validation Qualifier	Reason Code 1	Reason Code 2
DA1SB-070M-0203-SO	81613	Di-n-Butyl Phthalate	82	ug/kg	J	J	DL-LOQ	
DA1SB-070M-0204-SO	81613	Selenium	0.43	mg/kg	JV	J	DL-LOQ	
DA1SB-071M-0201-SO	81613	Selenium	0.53	mg/kg	JV	J	DL-LOQ	
DA1SB-071M-0201-SO	81613	Di-n-Butyl Phthalate	93	ug/kg	J	J	DL-LOQ	
DA1SB-071M-0201-SO	81613	Isophorone	54	ug/kg	J	J	DL-LOQ	
DA1SB-071M-0202-SO	81613	Antimony	0.43	mg/kg	JV	J	DL-LOQ	
DA1SB-071M-0202-SO	81613	Selenium	0.52	mg/kg	JV	J	DL-LOQ	
DA1SB-071M-0203-SO	81613	Selenium	0.45	mg/kg	JV	J	DL-LOQ	
DA1SB-072M-0201-SO	81613	Antimony	0.3	mg/kg	JV	J	DL-LOQ	
DA1SB-072M-0201-SO	81613	Selenium	0.6	mg/kg	JV	J	DL-LOQ	
DA1SB-072M-0201-SO	81613	2-Methylnaphthalene	53	ug/kg	J	J	DL-LOQ	
DA1SB-072M-0202-SO	81613	Selenium	0.39	mg/kg	JV	J	DL-LOQ	
DA1SB-072M-0204-SO	81613	Selenium	0.68	mg/kg	JV	J	DL-LOQ	
DA1SB-084M-0201-SO	81613	Cadmium	0.016	mg/kg	JV	J	DL-LOQ	
DA1SB-084M-0201-SO	81613	Selenium	0.63	mg/kg	JV	J	DL-LOQ	
DA1SB-084M-0201-SO	81613	Bis(2-Ethylhexyl)phthalate	110	ug/kg	J	J	DL-LOQ	
DA1SB-084M-0201-SO	81613	Isophorone	74	ug/kg	J	J	DL-LOQ	
DA1SB-085M-0204-SO	81613	Selenium	0.71	mg/kg	JV	J	DL-LOQ	
DA1SB-086M-0204-SO	81613	Selenium	0.45	mg/kg	JV	J	DL-LOQ	
DA1SS-050M-0201-SO	81613	Selenium	0.75	mg/kg	JV	J	DL-LOQ	
DA1SS-051M-0201-SO	81613	Selenium	0.73	mg/kg	JV	J	DL-LOQ	
DA1SS-051M-0201-SO	81613	2-Amino-4,6-Dinitrotoluene	0.25	mg/kg	J	J	DL-LOQ	
DA1SS-052M-0201-SO	81613	Di-n-Butyl Phthalate	210	ug/kg	J	J	DL-LOQ	
DA1SS-052M-0201-SO	81613	Cyanide, Total	0.16	mg/kg	J	J	DL-LOQ	
DA1SS-080M-0201-SO	81613	Selenium	0.62	mg/kg	JV	J	DL-LOQ	
DA1QC-001-0001-ER	81613	Calcium	61	ug/L	J	J	DL-LOQ	
DA1QC-001-0001-ER	81613	Chromium	0.79	ug/L	J	J	DL-LOQ	
DA1QC-001-0001-ER	81613	Magnesium	6.1	ug/L	J	J	DL-LOQ	
DA1QC-001-0001-ER	81613	Manganese	1.4	ug/L	J	J	DL-LOQ	
DA1QC-001-0001-ER	81613	Methoxychlor	0.016	ug/L	JP	J	DL-LOQ	P
DA1QC-001-0001-ER	81613	Methylene Chloride	0.76	ug/L	J	J	DL-LOQ	

Attachment B (continued)
Summary of Remedial Investigation Samples Data Qualifications
Open Demolition Area #1
Phase II Remedial Investigation (2010)

Sample Location ID	SDG	Analyte	Result	Units	Laboratory Qualifier	Validation Qualifier	Reason Code 1	Reason Code 2
DA1QC-001-0001-ER	81613	4,6-Dinitro-2-Methylphenol	1.9	ug/L	UQ	UJ	LCS	
DA1QC-001-0001-ER	81613	3,3'-Dichlorobenzidine	0.77	ug/L	UQZ	UJ	LCS	
DA1QC-002-0001-ER	81613	Manganese	0.77	ug/L	J	J	DL-LOQ	
DA1QC-002-0001-ER	81613	Nickel	2	ug/L	J	J	DL-LOQ	
DA1QC-002-0001-ER	81613	Zinc	4.2	ug/L	J	J	DL-LOQ	
DA1QC-002-0001-ER	81613	Methylene Chloride	0.67	ug/L	J	J	DL-LOQ	
DA1QC-002-0001-ER	81613	4,6-Dinitro-2-Methylphenol	1.7	ug/L	UQ	UJ	LCS	
DA1QC-002-0001-ER	81613	3,3'-Dichlorobenzidine	0.69	ug/L	UQZ	UJ	LCS	
DA1SB-067M-0201-SO	81613	Selenium	0.5	mg/kg	JV	J	DL-LOQ	
DA1SB-067M-0202-SO	81613	Antimony	0.23	mg/kg	JV	J	DL-LOQ	
DA1SB-068M-0201-SO	81613	Antimony	0.49	mg/kg	JV	J	DL-LOQ	
DA1SB-068M-0201-SO	81613	Selenium	0.23	mg/kg	JV	J	DL-LOQ	
DA1SB-068M-0201-SO	81613	Di-n-Butyl Phthalate	85	ug/kg	J	J	DL-LOQ	
DA1SB-068M-0202-SO	81613	Selenium	0.4	mg/kg	JV	J	DL-LOQ	
DA1SB-068M-0204-SO	81613	Thallium	1.5	mg/kg		J	DL-LOQ	
DA1SB-069M-0201-SO	81613	Bis(2-Ethylhexyl)phthalate	100	ug/kg	J	J	DL-LOQ	
DA1SB-069M-0201-SO	81613	Di-n-Butyl Phthalate	110	ug/kg	J	J	DL-LOQ	
DA1SB-069M-0202-SO	81613	Selenium	0.14	mg/kg	JV	J	DL-LOQ	
DA1SB-070M-0201-SO	81613	Cadmium	0.2	mg/kg	MY	J	MS/MSD	MS/SD
DA1SB-070M-0201-SO	81613	Chromium	21.2	mg/kg	M	J	MS/MSD	
DA1SB-070M-0201-SO	81613	Cobalt	10.9	mg/kg	M	J	MS/MSD	
DA1SB-070M-0201-SO	81613	Copper	28.3	mg/kg	M	J	MS/MSD	
DA1SB-070M-0201-SO	81613	Nickel	17	mg/kg	M	J	MS/MSD	
DA1SB-070M-0201-SO	81613	Selenium	1.1	mg/kg	M	J	MS/MSD	
DA1SB-070M-0201-SO	81613	Thallium	2.2	mg/kg	MB	J	MS/MSD	
DA1SB-070M-0201-SO	81613	Vanadium	19.9	mg/kg	M	J	MS/MSD	
DA1SB-070M-0201-SO	81613	Zinc	60.3	mg/kg	M	J	MS/MSD	
DA1SB-070M-0201-SO	81613	2,4,6-Trinitrotoluene	64	mg/kg	M	J	MS/MSD	
DA1SB-070M-0201-SO	81613	2-Amino-4,6-Dinitrotoluene	0.31	mg/kg	J	J	MS/MSD	
DA1SB-070M-0201-SO	81613	4-Amino-2,6-Dinitrotoluene	0.069	mg/kg	UM	UJ	MS/MSD	
DA1SB-070M-0202-SO	81613	Selenium	0.32	mg/kg	JBV	J	DL-LOQ	

Attachment B (continued)
Summary of Remedial Investigation Samples Data Qualifications
Open Demolition Area #1
Phase II Remedial Investigation (2010)

Sample Location ID	SDG	Analyte	Result	Units	Laboratory Qualifier	Validation Qualifier	Reason Code 1	Reason Code 2
DA1SB-070M-0202-SO	81613	2,4,6-Trinitrotoluene	0.2	mg/kg	J	J	DL-LOQ	
DA1SB-070M-0203-SO	81613	Selenium	0.36	mg/kg	JV	J	DL-LOQ	
DA1SB-070M-0203-SO	81613	Di-n-Butyl Phthalate	82	ug/kg	J	J	DL-LOQ	
DA1SB-070M-0204-SO	81613	Selenium	0.43	mg/kg	JV	J	DL-LOQ	
DA1SB-071M-0201-SO	81613	Selenium	0.53	mg/kg	JV	J	DL-LOQ	
DA1SB-071M-0201-SO	81613	Isophorone	54	ug/kg	J	J	DL-LOQ	
DA1SB-071M-0202-SO	81613	Antimony	0.43	mg/kg	JV	J	DL-LOQ	
DA1SB-071M-0202-SO	81613	Selenium	0.52	mg/kg	JV	J	DL-LOQ	
DA1SB-071M-0203-SO	81613	Selenium	0.45	mg/kg	JV	J	DL-LOQ	
DA1SB-072M-0201-SO	81613	Antimony	0.3	mg/kg	JV	J	DL-LOQ	
DA1SB-072M-0201-SO	81613	Selenium	0.6	mg/kg	JV	J	DL-LOQ	
DA1SB-072M-0201-SO	81613	2-Methylnaphthalene	53	ug/kg	J	J	DL-LOQ	
DA1SB-072M-0202-SO	81613	Selenium	0.39	mg/kg	JV	J	DL-LOQ	
DA1SB-072M-0204-SO	81613	Selenium	0.68	mg/kg	JV	J	DL-LOQ	
DA1SB-084M-0201-SO	81613	Cadmium	0.016	mg/kg	JV	J	DL-LOQ	
DA1SB-084M-0201-SO	81613	Selenium	0.63	mg/kg	JV	J	DL-LOQ	
DA1SB-084M-0201-SO	81613	Bis(2-Ethylhexyl)phthalate	110	ug/kg	J	J	DL-LOQ	
DA1SB-084M-0201-SO	81613	Isophorone	74	ug/kg	J	J	DL-LOQ	
DA1SB-085M-0204-SO	81613	Selenium	0.71	mg/kg	JV	J	DL-LOQ	
DA1SB-086M-0204-SO	81613	Selenium	0.45	mg/kg	JV	J	DL-LOQ	
DA1SS-050M-0201-SO	81613	Selenium	0.75	mg/kg	JV	J	DL-LOQ	
DA1SS-051M-0201-SO	81613	Selenium	0.73	mg/kg	JV	J	DL-LOQ	
DA1SS-051M-0201-SO	81613	2-Amino-4,6-Dinitrotoluene	0.25	mg/kg	J	J	DL-LOQ	
DA1SS-052M-0201-SO	81613	Di-n-Butyl Phthalate	210	ug/kg	J	J	DL-LOQ	
DA1SS-052M-0201-SO	81613	Cyanide, Total	0.16	mg/kg	J	J	DL-LOQ	
DA1SS-080M-0201-SO	81613	Selenium	0.62	mg/kg	JV	J	DL-LOQ	
DA1SB-068M-0201-SO	81613	4,4'-DDT	0.5	ug/kg	J	J	DL-LOQ	
DA1SB-068M-0201-SO	81613	Endosulfan II	0.91	ug/kg	JP	J	P	
DA1SB-068M-0201-SO	81613	Heptachlor	7.3	ug/kg	P	J	P	
DA1SB-068M-0201-SO	81613	Heptachlor Epoxide	0.61	ug/kg	J	J	DL-LOQ	
DA1SB-069M-0201-SO	81613	4,4'-DDT	0.61	ug/kg	J	J	DL-LOQ	

Attachment B (continued)
Summary of Remedial Investigation Samples Data Qualifications
Open Demolition Area #1
Phase II Remedial Investigation (2010)

Sample Location ID	SDG	Analyte	Result	Units	Laboratory Qualifier	Validation Qualifier	Reason Code 1	Reason Code 2
DA1SB-069M-0201-SO	81613	Heptachlor	1.4	ug/kg	JP	J	DL-LOQ	
DA1SB-070M-0203-SO	81613	gamma-Chlordane	4.9	ug/kg	P	J	DL-LOQ	
DA1SB-070M-0203-SO	81613	Heptachlor	1.5	ug/kg	JP	J	DL-LOQ	
DA1SB-071M-0201-SO	81613	gamma-Chlordane	5.8	ug/kg	P	J	DL-LOQ	
DA1SB-071M-0201-SO	81613	Heptachlor	2.5	ug/kg	P	J	DL-LOQ	
DA1SB-084M-0201-SO	81613	4,4'-DDT	0.61	ug/kg	J	J	DL-LOQ	
DA1SB-084M-0201-SO	81613	gamma-Chlordane	1.5	ug/kg	JP	J	DL-LOQ	
DA1SB-084M-0201-SO	81613	Heptachlor	5.8	ug/kg	P	J	DL-LOQ	
DA1SS-052M-0201-SO	81613	4,4'-DDE	0.82	ug/kg	JP	J	DL-LOQ	
DA1SS-052M-0201-SO	81613	4,4'-DDT	0.72	ug/kg	J	J	DL-LOQ	
DA1SS-052M-0201-SO	81613	gamma-Chlordane	5.2	ug/kg	P	J	DL-LOQ	
DA1SS-052M-0201-SO	81613	Heptachlor	1.9	ug/kg	J	J	DL-LOQ	

Attachment B (continued)
Summary of Remedial Investigation Samples Data Qualifications
Open Demolition Area #1
Phase II Remedial Investigation (2010)

mg/L denotes micrograms per Liter.
mg/kg denotes micrograms per kilogram.
mg/kg denotes milligrams per kilogram.
SDG denotes sample delivery group.

Laboratory Qualifier Definitions:
B denotes analyte detected in associated blank.
J denotes estimated value.
M denotes matrix spike and/or matrix spike duplicate recovery outside of acceptance limits.
P denotes concentration of analyte differs more than 40% between primary and confirmation analysis.
Q denotes laboratory control sample outside acceptance limits.
U denotes analyte concentration was not above the detection limit.
V denotes raised quanititation or reporting limit due to limited sample amount or dilution for matrix background interference.
Y denotes replicate/duplicate precision outside acceptance limits.
Z denotes calibration criteria exceeded.

Validation Qualifier Definitions:
J denotes estimated. The analyte was positively identified. The associated numerical value is the approximate concentration of the analyte in the sample.
UJ denotes not detected. The detection limits and quantitation limits are approximate.

Reason Code Description:
DL-LOQ denotes sample result between the detection limit and level of quantitation.
LCS denotes laboratory control sample evaluation criteria not met.
MS/MSD denotes matrix spike/matrix spike duplicate accuracy and/or precision criteria not met.
MS/SD denotes for inorganic methods, the matrix spike/matrix spike duplicate recovery is outside acceptance rang e.
P denotes the detected concentration difference between the primary and secondary column is greater than 40%.

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Appendix E
USACE Data Validation Report and Chemical Data Usability Assessment

MEMORANDUM FOR RECORD 18 June 2013

SUBJECT: CHEMICAL DATA USABILITY ASSESSMENT

PROJECT: Ravenna Army Ammunition Plant, Ravenna, Ohio
RVAAP-03 Open Demolition Area #1
Phase II Remedial Investigation and Feasibility Study

1. Purpose:

This memorandum represents and documents the evaluation of the quality and usability of the analytical data obtained during the Phase II Remedial Investigation (RI) and Feasibility Study for RVAAP-03, Open Demolition Area #1. This includes determination of contract compliance, data usability, and data quality objective attainment in accordance with EM 200-1-6, Chapter 5 (October 2006).

2. References:

2.1 *Final Data Validation Report, Ravenna Army Ammunition Plan, Sand Creek Disposal Road Landfill and Open Demolition Area #1 2010 Sampling, Ravenna, Ohio*, prepared by MEC^{x}, LP, April 2013.

2.2 Data Validation Report, Appendix D of the *Draft Phase II Remedial Investigation and Feasibility Study for RVAAP-03 Open Demolition Area #1*, prepared by Shaw, August 2, 2012.

2.3 *Final Sampling and Analysis Plan Addendum No. 1 for Environmental Services at RVAAP-34 Sand Creek Disposal Road Landfill, RVAAP-03 Open Demolition Area #1, and RVAAP-28 Mustard Agent Burial Site, Version 1.0, Ravenna Army Ammunition Plant, Ravenna, Ohio* (SAP Addendum), prepared by Shaw, February 2010.

2.4 *Facility-Wide Sampling and Analysis Plan for Environmental Investigations at the Ravenna Army Ammunition Plant, QAPP Appendix, Ravenna, Ohio* (FWQAPP), prepared by SAIC, March 2001.

2.5 *Louisville Chemistry Guideline* (LCG), prepared by the U.S. Army Corps of Engineers - Louisville District, June 2002

2.6 *Louisville DoD Quality Systems Manual Supplement, Version 1,* prepared by USACE – Louisville District, March 2007.

2.7 *DoD Quality Systems Manual for Environmental Laboratories*, Department of Defense (DoD QSM), Environmental Data Quality Workgroup, Version 4.1, 2009.

2.8 *National Functional Guidelines for Inorganic Superfund Data Review* (NFG), U.S. Environmental Protection Agency, 2004

2.9 EM 200-1-6, Chapter 5, Chemical Quality Assurance for Hazardous, Toxic and Radioactive Waste (HTRW) Projects, October 1997.

3. Project Description:

The purpose of the Phase II Remedial Investigation at the Open Demolition Area #1 (ODA 1)

was to address data gaps remaining after the Phase I RI. Sampling was conducted to further define the nature and extent of chemicals of potential concern in soil. The data was used to support the preparation of the Feasibility Study.

Sampling was conducted by Shaw Environmental & Infrastructure, Inc. (Shaw) between September and November 2010. A total of 6 surface soil samples and 91 subsurface soil samples were collected using incremental sampling method (ISM) procedures. Additionally, 1 discrete surface soil and 21 discrete subsurface soil samples were collected. Samples were analyzed for one or more of the following parameters: metals, explosives, propellants, pesticides, polychlorinated biphenyls (PCBs), semivolatile organic compounds (SVOCs), volatiles (VOCs), cyanide, and hexavalent chromium. Analytical services were provided by CT Laboratories located in Baraboo, Wisconsin.

4. Analytical Program Overview:
Below are excerpts from the Quality Assurance Project Plan (QAPP) provided as Part 2 in the SAP Addendum:

4.1 Data Quality Objectives

Data quality objective (DQO) summaries for this investigation will follow Tables 3-1 and 3-2 in the Facility-Wide QAPP. All QC parameters stated in the specific U.S. Environmental Protection Agency (USEPA) SW-846 methods will be adhered to for each chemical listed. The SW-846 method references found in the Facility-Wide QAPP have been revised to the Final Update IV methods, as appropriate. Laboratories are required to comply with all methods as written; recommendations are considered requirements. Concurrence with the DoD QSM for Environmental Laboratories (DoD, 2009), and the Louisville Chemistry Guidance (USACE, 2002) is expected.

4.2 Level of Quality Control Effort

QC efforts will follow Section 3.2 of the Facility-Wide QAPP. Field QC measurements will include field source water blanks, trip blanks, field duplicates, surrogates, and equipment rinsate blanks. Laboratory QC measurements will include method blanks, laboratory control samples (LCSs), laboratory duplicates, and matrix spike/matrix spike duplicate (MS/MSD) samples or matrix spike/matrix duplicate (MS/MD) samples for metals.

4.3 Accuracy, Precision, and Sensitivity of Analysis

Accuracy, precision, and sensitivity goals identified in Section 3.3 and Tables 3-1 through 3-9 of the Facility-Wide QAPP will be imposed for this investigation. As stated above, some of the analytical methods numbers have been updated (refer to Table 1-1 of this QAPP addendum). Quality objectives related to individual method QC protocol will also follow requirements given in the QSM and the LCG. Laboratories will make all reasonable attempts to meet the program and project reporting levels in Tables 3-1 through 3-9 of the Facility-Wide QAPP for each individual sample analysis.

4.4 Completeness, Representativeness, and Comparability

Completeness, representativeness, and comparability goals identified in Section 3.4 and Tables 3-1 and 3-2 of the Facility-Wide QAPP will be imposed for this investigation. The completeness goal for analytical data is 90%, as defined in Tables 3-1 and 3-2 of the FWQAPP.

5. Chemical Data Quality and Usability Assessment:
This assessment of the overall quality and usability of project data was based upon a thorough review of the associated Data Validation Reports as presented in Appendix D of the *Draft Phase II Remedial Investigation and Feasibility Study for RVAAP-03 Open Demolition Area #1* (Shaw, 2012) and Section 4 of the *Final Data Validation Report, Ravenna Army Ammunition Plant Sand Creek Disposal Road Landfill and Open Demolition Area #1, 2010 Sampling* (MEC^x, 2013).

Shaw performed a Level III validation of 100% of the project data. During the review process, data were assigned data qualifiers in accordance with the DoD QSM 4.1 to indicate the usability of the data.

Additionally, data validation was performed by MEC^x, a USACE-Louisville District contracted third-party. The associated Data Validation Report details their findings from the Level IV validation of 10% of the primary sample data, analysis of field duplicate results, and the determination of data usability. This evaluation includes review of the same QC elements as the primary contractor's review in addition to an in-depth look into the verification of sample results, target compound identification, and raw data. The intent is to verify the quality and the reliability of the primary data for its intended use.

The data were evaluated in the context of the data quality objective (DQOs) and measurement quality objectives (MQOs) as specified in the project specific SAP addendum and the FWQAPP referenced in item 2.

The subsections below present the U.S. Army Corps of Engineers – Louisville District's assessment of the chemical data quality for the Sand Creek RI including determination of contract compliance, data usability, and data quality objective attainment.

5.1 Contract Compliance
Samples were collected and analyzed in accordance with the procedures specified in the project QAPPs. With minor exceptions, data met the QC specifications outlined in the DoD QSM and project QAPPs. Specific non-conformances and their impact on data usability are noted and described in the associated data evaluation reports.

Detection limits (DLs) for some analytes exceeded applicable screening criteria. Results with DLs exceeding project criteria may still be usable during risk assessment; however, it is incumbent upon the final data user to make this determination on a case by case basis.

5.2 Data Quality Attainment
The quality of data generated for the ODA 1 Phase II RI met the project DQOs. Completeness surpassed the goal of 90%.

Some data were rejected during third party validation that was not rejected during the contractor's review. These were relegated to two hexachlorocyclopentadiene and two benzyl alcohol SVOC results; two chloroethane, two chloromethane, and one 2-hexanone VOC results ; and two

antimony results for the samples depicted below.

ODA 1
Rejected Data

Sample	SDG	Analyte	Reason	Review
DA1SB-059M-0201-SO DA1SB-068M-0201-SO	81543 81613	Hexachlorocyclopentadiene Benzyl alcohol	MRL Recoveries (<10%)	Level IV
DA1SB-059D-0201-S0	81543	Chloroethane Chloromethane	MRL Recoveries (<10%)	
DA1SB-068D-0201-SO	81613	2-Hexanone Chloroethane Chloromethane	MRL Recoveries (<10%)	
DA1SB-063M-0202-SO DA1SB-055M-0201-SO	81543	Antimony	MS/MSD Recovery (<30%)	

Three variances, as outlined below, were noted during USACE's review of the respective data validations. These were primarily due to differences in professional opinion and/or discrepancies within the guidance documents, particularly as the project transitions to newer updated guidance (i.e., from the LCG and NFG to the QSM). The qualification of some data depended on which document was assigned precedence; however, the professional judgments of both validators were within the purview of the guidance documents used.

- MRL recoveries:
  This was primarily associated with VOC and SVOC analyses. During third party validation data associated with MRL recoveries of < 10% were rejected (R) for use. Shaw did not reject this data if the laboratory ran an MDL check standard and the analytes were detected. This is consistent with the protocol established in the LCG.
- Several explosive analytes were reported by both Method 8270 for semivolatiles and Method 8330 for explosives. MECx selected (rejected) one result over another for use. However, both met reporting limit requirements and QC criteria. Therefore, both were reported and used by Shaw.
- MECx qualified antimony results associated with MS/MSD recovery failures on a batch/ sample delivery group basis allowed under the NFG (2004) and the LCG. Shaw qualified the results for the parent sample only in accordance with the QSM (Version 4.1). Additionally, if the laboratory subsequently performed a post digestion spike which met criteria, Shaw qualified results as estimated (J) rather than unusable (R).

5.3 Data Usability

Data were consistently reviewed and qualified by both the primary contractor and the third-party validator. Overall findings were compatible with the exceptions noted above. In a few instances differences in professional opinion and/or guidance utilized resulted in data being rejected (R) as unusable by one reviewer and not the other. This occurred most notably in regards to qualification of data due to low MRL recovery and MS failures.

6.0 Conclusion:

Through the proper implementation of the project data review, verification, and validation process that is outlined in the FWQAPP, the data for the ODA 1 Phase II RI are deemed acceptable for use. Based upon this assessment, all analytical results are usable to meet the project DQOs as qualified and presented by Shaw; can withstand scientific scrutiny; are technically defensible; and are of known and acceptable quality in terms of sensitivity, precision, and accuracy.

Kathy Krantz
Project Chemist
USACE – Louisville District

U.S. Army Corps of Engineers
Louisville District

Ravenna Army Ammunition Plant
Sand Creek Disposal Road Landfill
and Open Demolition Area #1
2010 Sampling
Ravenna, Ohio

Final Data Validation Report
Sample Delivery Groups:
81575, 881578, 811623, 8 1670, 822400, 824452

April 2, 2013

Prepared for:
U.S. Army Corps of Engineers
Louisville District
Contract No. W912QR-08-D-0001
Delivery Order 0021

Prepared by:
MEC^X, LP
12269 East Vassar Drive
Aurora, Colorado 80014

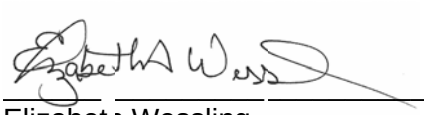
CONTRACTOR STATEMENT OF INDEPENDENT TECHNICAL REVIEW

MEC^X, LP (MEC^X) has completed the Data Validation Report for Multiple Sample Delivery Groups from the Ravenna Army Ammunition Plant Sand Creek Disposal Road Landfill and Open Demolition Area #1, 2010 Sampling. Notice is hereby given that an independent technical review has been conducted to determine the usability and bias of the analytical data.

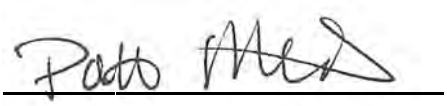
Significant concerns and the resolution are aas follows:

None

As noted above, all concerns resulting from this independent technical review have been considered.



Elizabeth Wessling
Senior Environmental Chemist
MEC^X Independent Technical Review Team Leader



Patti Meeks, Ph.D.
Senior Environmental Chemist
MEC^X Independent Technical Review Team Member

EXECUTIVE SUMMARY

The overall objective of the project described in this document was to define the nature and extent of contamination at the Sand Creek Disposal Road Landfill (Sand Creek) and Open Demolition Area #1 (ODA1) and complete a Remedial Investigation/Feasibility Study as applicable. Sampling was conducted by the Shaw Environmental and Infrastructure (Shaw) from September to November 2010. Samples collected are described in the table below.

Analysis	ODA1			Sand Creek					
	Soil			Soil			Sediment		
	MI	Discrete	Duplicate	MI	Discrete	Duplicate	MI	Discrete	Duplicate
Metals	90	0	7	77	0	8	1	0	0
Semivolatiles	11	0	2	77	0	8	1	0	0
Explosives	90	0	7	77	0	8	1	0	0
Volatiles	2	20	2	0	7	4	0	1	0
Pesticides	10	0	2	8	0	4	1	0	0
PCBs	10	0	2	8	0	4	1	0	0
Nitroguanidine	26	0	3	8	0	4	1	0	0
Nitrocellulose	26	0	3	8	0	4	1	0	0
Hexavalent Chromium	10	0	2	14	0	4	1	0	0
Cyanide	10	0	2	8	0	4	1	0	0

This report details the findings of the primary sample data validation, analysis of field duplicate results, and the determination of data usability performed by MEC^X, LP (MEC^X) on the samples described above.

One or more of the following analyses were performed for the primary samples by CT Laboratories (CT) located in Baraboo, Wisconsin:

- United States Environmental Protection Agency (USEPA) SW-846 Method 6010C for metals
- USEPA SW-846 Methods 7470A/7471A for mercury
- USEPA SW-846 Method 8330B for explosive compounds
- USEPA SW-846 8330 Modified for nitroguanidine
- USEPA SW-846 9056 Modified for nitrocellulose
- USEPA SW-846 Method 8260B for volatile organic compounds (VOCs)
- USEPA SW-846 Method 8270C for semivolatile compounds (SVOCs)
- USEPA SW-846 Method 8081 for pesticides
- USEPA SW-846 Method 8082 for polychlorinated biphenyls (PCBs)
- USEPA SW-846 Method 7196A for hexavalent chromium
- USEPA SW-846 Method 9012 for cyanide

A total of 18 quality assurance soil samples were submitted to RTI Laboratories (RTI) in Livonia, Michigan. The samples were analyzed for one or more of the aforementioned analyses and the results are discussed in a separate report, *Ravenna Army Ammunition Plant Sand Creek Disposal Road Landfill and Open Demolition Area #1 2010 Sampling Chemical Quality Assurance Report*.

Specific concerns regarding the data are noted below:

- 3 hexavalent chromium DLs exceeded the Facility-Wide Cleanup Goal (FWCUG) of 1.64 mg/Kg, at 1.9 mg/Kg.
- 5 benzo(a)pyrene DLs nominally exceeded the FWCUG of 0.023 mg/Kg, at 0.022 mg/Kg.
- Manual integrations performed for the MRL standards did not consistently adjust the baseline to account for a baseline anomaly that occurred just prior to the nitroguanidine retention time.
- Due to instrument limitations, the hexavalent chromium raw data did not list the sample absorbances; therefore, the reviewer was not able to calculate the sample results from the raw data.
- The actual temperature upon receipt was not noted by the laboratory. The temperature was noted only as being below some temperature (e.g. <4.2^{o}C).
- All explosive extractions were performed beyond the holding time.

Some data were rejected due to matrix spike/matrix spike duplicate recovery and calibration outliers. Rejected data are not usable. Results with DLs that exceed project criteria may be usable for their intended purposes; however, it is dependent on the final data user to make this determination on a case-by-case basis. All remaining results are usable for their intended purposes as qualified by MEC^{X}.

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Appendix A Qualified Sample Forms Is

Appendix B Sample Qualification Summary

Appendix C Primary/Field Duplicate Sample Comparisons

Appendix D Validator Checklists

ACRONYMS AND ABBREVIATIONS

AOC	Area of Concern
ARNG	Army National Guard
°C	Degrees Celsius
CCB	Continuing Calibration Blank
CCC	Calibration Check Compounds
CCV	Continuing Calibration Verification
CT	CT Laboratories
%D	Percent Difference
DL	Detection Limit
DoD	Department of Defense
EDD	Electronic Data Deliverable
FWCUG	Facility-Wide Cleanup Goals
FWQAPP	Facility-Wide Quality Assurance Project Plan
GC/MS	Gas Chromatography/Mass Spectrometry
ICSA	Interference Check Sample A
ICSAB	Interference Check Sample AB
ICV	Initial Calibration Verification
ICP	Inductively Coupled Plasma
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LOD	Limit of Detection
LOQ	Limit of Quantitation
MEC^X	MEC^X, LP
MRL	Method Reporting Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ODA1	Open Demolition Area #1
PCB	Polychlorinated Biphenyl
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
QSM	Quality Systems Manual
RPD	Relative Percent Difference
RRF	Relative Response Factor
RSD	Relative Standard Deviation
RSL	Regional Screening Level
RTI	RTI Laboratories
RVAAP	Ravenna Army Ammunition Plant
SAIC	Science Applications International Corporation
SAP	Sampling and Analysis Plan
SDG	Sample Delivery Group
Shaw	Shaw Environmental and Infrastructure
SPCC	System Performance Check Compound
SVOC	Semivolatile Organic Compounds
USACE	United State Army Corps of Engineers
USEPA	United State Environmental Protection Agency
VOC	Volatile Organic Compounds

1. INTRODUCTION

1.1 PROJECT OVERVIEW

The overall objective of the project described in this document was to define the nature and extent of contamination at the Sand Creek Disposal Road Landfill (Sand Creek) and Open Demolition Area #1 (ODA1) and complete a Remedial Investigation/Feasibility Study as applicable. Sampling was conducted by the Shaw Environmental and Infrastructure (Shaw) from September to November 2010. Samples collected are described in the table below.

Table 1. Sample analysis counts by Area of Concern

Analysis	ODA1			Sand Creek					
	Soil			Soil			Sediment		
	MI	Discrete	Duplicate	MI	Discrete	Duplicate	MI	Discrete	Duplicate
Metals	90	0	7	77	0	8	1	0	0
Semivolatiles	11	0	2	77	0	8	1	0	0
Explosives	90	0	7	77	0	8	1	0	0
Volatiles	2	20	2	0	7	4	0	1	0
Pesticides	10	0	2	8	0	4	1	0	0
PCBs	10	0	2	8	0	4	1	0	0
Nitroguanidine	26	0	3	8	0	4	1	0	0
Nitrocellulose	26	0	3	8	0	4	1	0	0
Hexavalent Chromium	10	0	2	14	0	4	1	0	0
Cyanide	10	0	2	8	0	4	1	0	0

One or more of the following analyses were performed for the primary samples by CT Laboratories (CT) located in Baraboo, Wisconsin:

- United States Environmental Protection Agency (USEPA) SW-846 Method 6010C for metals
- USEPA SW-846 Methods 7470A/7471A for mercury
- USEPA SW-846 Method 8330B for explosive compounds
- USEPA SW-846 8330 Modified for nitroguanidine
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- USEPA SW-846 Method 9012 for cyanide

A total of 18 quality assurance soil samples were submitted to RTI Laboratories (RTI) in Livonia, Michigan. The samples were analyzed for one or more of the aforementioned analyses and the results are discussed in a separate report, *Ravenna Army Ammunition Plant Sand Creek*

Disposal Road Landfill and Open Demolition Area #1 2010 Sampling Chemical Quality Assurance Report.

This report describes findings of the primary sample data validation, analysis of primary/field duplicate results, and the determination of data usability performed by MEC^X, LP (MEC^X) on the site samples reported in seven sample delivery groups (SDGs) from CT.

1.2 PREVIOUS ACTIVITIES AND DATA

The following summary was adapted from the *Facility-Wide Sampling and Analysis Plan for Environmental Investigations at the Ravenna Army Ammunition Plant, Ravenna, Ohio* (FWQAPP) prepared by Science Applications International Corporation (SAIC), March 2001 and the *Final Sampling and Analysis Plan Addendum No. 1 for Environmental Services at RVAAP-34 Sand Creek Disposal Road Landfill, RVAAP-03 Open Demolition Area #1, and RVAAP-28 Mustard Agent Burial Site* (SAP) prepared by Shaw Environment and Infrastructure (Shaw), November 2010.

Located in northeastern Ohio on approximately 21,000 acres, Ravenna Army Ammunitions Plant (RVAAP) was established in 1940 to load, store, and demilitarize conventional artillery ammunition, bombs, mines, fuses and boosters, primers and percussion elements. Originally RVAAP operated as two separate units, the Portage Ordnance Depot and the Ravenna Ordnance Plant. During World War II, a contractor operated the Ravenna Ordnance Depot and the government operated the Portage Ordnance Depot. Ordnance production and storage for World War II continued until August 1945, at which time the facility was renamed the Ravenna Arsenal, and the government assumed control of all operations. Then, from 1951 to 1999, the entire facility was operated by contractors. Ordnance production at the facility was phased out and sent to Plum Brook Ordnance Works in Sandusky, Ohio and Keystone Ordnance Works in Meadville, Pennsylvania. All production at the facility had ceased by 1957 and the plant was placed on standby. In 1961, the plant was operational for seven months, processing and performing explosive melt-out of bombs. After deactivation late in 1961, the facility was renamed RVAAP. From mid-1968 until 1971, the plant was reactivated to load, assemble, and pack munitions on three load lines and two component lines. Operations ceased at Load Lines 1, 2, 3, and 4 in 1971; however, the Lines were reactivated to perform demilitarization operations for several months in 1973 and 1974. In 1992, RVAAP was again placed on "Inactive" status. Salvage and demolition operations started in 1998 and administrative control of the facility was transferred to the Army National Guard (ARNG) in 1999.

Information specific to ODA1 and Sand Creek is provided in sections 4.1 and 5.1 of this report, respectively.

Samples collected in association with the project described in this document were from soils and sediments collected from Sand Creek and soils collected from ODA1. The samples were collected in order to provide the additional characterization of the nature and extent of contamination at Sand Creek and ODA1.

2. DESCRIPTION OF WORK PERFORMED

This section describes the data verification and data validation procedures used during the evaluation of the site samples reported in SDGs 81575, 81578, 81584, 81623, 81670, 82400, and 82452 from CT.

2.1 DATA VALIDATION PROCESS

Level IV validation was performed on 10% of the total number of primary samples collected. Primary samples with associated QA and field duplicate samples were prioritized for Level IV validation; however, not all samples validated at Level IV had associated QA or field duplicate samples. Samples validated at Level IV for ODA1 are listed in Section 4.2 and the samples validated at Level IV for Sand Creek are listed in Section 5.2.

Data validators assessed results based on the FWQAPP, the SAP, *Department of Defense Quality Systems Manual for Environmental Laboratories Version 4.1* (DoD QSM), FWQAPP, the specific EPA methods, the *National Functional Guidelines for Superfund Organic Methods Data Review* (2008), and the *National Functional Guidelines for Inorganic Data Review* (2004). The following were reviewed for Level IV validation:

- Sample management (collection techniques, sample containers, preservation, handling, transport, chain-of-custody, holding times),
- Calibration data summary forms (initial and continuing),
- Method reporting limit (MRL) standard recoveries,
- Blank sample results (method, calibration, equipment, field),
- Laboratory control sample (LCS) or LCS/LCS duplicate (LCS/LCSD) recoveries and/or precision,
- Laboratory duplicate precision,
- Surrogate recoveries (if applicable),
- Matrix spike/matrix spike duplicate (MS/MSD) recoveries and precision,
- Post digestion spike recoveries,
- Field QA/QC sample results,
- Inductively coupled plasma (ICP) interference check sample (ICS) recoveries,
- Serial dilution precision,
- Gas Chromatography/Mass Spectrometry (GC/MS) tuning, if a GC/MS is used,
- Internal standards performance (if applicable),
- Sample results verification,
- Target compound identification,
- Raw data.

Blanks – method, calibration, trip, field and equipment – were assessed using the National Functional Guidelines 5× and 10× rules. Target compounds detected in the samples at concentrations less than or equal to 5× a blank detect and common laboratory contaminant compounds detected in the samples at concentrations less than or equal to 10× a blank detect

were qualified as nondetected. Nondetected results were reported at the limit of detection (LOD) if the original detect was less than or equal to the LOD, or reported at the level of contamination if the original detect was greater than the LOD.

2.2 DATA VALIDATION QUALIFIERS

Data qualifiers, as defined below, were applied following the FWQAPP and the DoD QSM:

U Nondetected at the limit of detection
The analyte was analyzed for but not definitively detected.

J Estimated
The identification of the analyte is acceptable but the quality assurance criteria indicate that the quantitative values may be outside the normal expected range of precision. Additionally used to identify detects reported below the limit of quantitation (LOQ).

N Identity Presumptive and Tentative
There is presumptive evidence that the analyte is present but it has not been confirmed. There is an indication that the reported analyte is present; however, all quality control requirements necessary for confirmation were not met.

R Rejected
Data are considered to be rejected and shall not be used for environmental decisions.

2.3 DATA VALIDATION FLAGGING CODES

The qualification codes in the following table may have been used to flag the data described in this document: Sample qualifications are summarized in Appendix B. All qualifications and associated qualification codes have been entered into the electronic data deliverables (EDD) received from the laboratories and may be reviewed in the Appendix A of this report.

Table 2. Qualification code reference table

Qualifier	Organics	Inorganics
H	Holding times were exceeded.	Holding times were exceeded.
S	Surrogate recovery was outside QC limits.	The sequence or number of standards used for the calibration was incorrect.
C	Calibration %RSD or %D was noncompliant. MRL recovery outlier of missing MRL.	Correlation coefficient was noncompliant. MRL recovery outlier of missing MRL.
R	Calibration RRF was noncompliant.	%R for calibration is not within control limits.
B	Presumed contamination as indicated by the preparation (method) blank results.	Presumed contamination as indicated by the preparation (method) or calibration blank results.
L	Laboratory Blank Spike/Blank Spike Duplicate %R was not within control limits.	Laboratory Control Sample %R was not within control limits.
Q	MS/MSD recovery was poor or RPD high.	MS recovery was poor.
E	Not applicable	Duplicates showed poor agreement.
I	Internal standard performance was unsatisfactory.	ICP ICS results were unsatisfactory.
A	Not applicable.	ICP Serial Dilution %D were not within control

Qualifier	Organics	Inorganics
		limits.
M	Tuning (BFB or DFTPP) was noncompliant.	ICPMS tuning was noncompliant
T	Presumed contamination as indicated by the trip blank results.	Not applicable.
+	False positive – reported compound was not present.	False positive – reported compound was not present.
-	False negative – compound was present but not reported.	False negative – compound was present but not reported.
F	Presumed contamination as indicated by the FB or ER results.	Presumed contamination as indicated by the FB or ER results.
$	Reported result or other information was incorrect.	Reported result or other information was incorrect.
?	TIC identity or reported retention time has been changed.	Not applicable.
D	The analysis with this flag should not be used because another more technically sound analysis is available.	The analysis with this flag should not be used because another more technically sound analysis is available.
P	Instrument performance for pesticides was poor.	Post Digestion Spike recovery was not within control limits.
*II, *III	A deficiency was found that has been described in the "Sample Management," section (*II) or the "Method Analyses" section (*III).	A deficiency was found that has been described in the "Sample Management," section (*II) or the "Method Analyses" section (*III).

3. DATA ACQUISITION ACTIVITIES

3.1 SAMPLE COLLECTION

Soil samples were collected from September to November 2010. The samples were submitted under chain-of-custody to the primary laboratory, CT.

Unless otherwise noted in Sections 4.2.1 and 5.2.1, the chains-of-custody associated with the samples validated at Level IV were appropriately signed by both field and/or laboratory personnel with all samples and analyses accounted for, cooler custody seals intact, and within the temperature limits of 4±2°C. All documentation regarding sample handling as presented in the case narratives, chains-of-custody, correspondence, and sample condition upon receipt forms was evaluated.

3.2 SAMPLE ANALYSIS

CT, the primary laboratory, analyzed the samples shown in Table 1, and 9 equipment rinsate samples, 1 field blank, and 14 trip blank samples. Analyses performed by CT included USEPA SW-846 Method 6010C for various metals, USEPA SW-846 Methods 7470A/7471A for mercury, USEPA SW-846 Method 8270C for SVOCs, USEPA SW-846 Method 8081 for pesticides, USEPA SW-846 Method 8082 for PCBs, USEPA SW-846 Method 8260B for VOCs, USEPA Method SW-846 8330B for explosive compounds, USEPA Method SW-846 8330 Modified for nitroguanidine, USEPA Method SW-846 9056 Modified for nitrocellulose, USEPA Method SW-846 7196A for hexavalent chromium, and USEPA SW-846 Method 9012A for cyanide.

3.3 DATA COMPLETENESS

Data completeness for the project described in this report was found to be generally acceptable as no deliverables were missing.

3.4 SAMPLE PRESERVATION AND HOLDING TIME REQUIREMENTS

Unless noted otherwise in Sections 4.2.3 and 5.2.3, all method preservation requirements were met. The extraction and analytical holding times for the analyses reviewed in this document are as follows:

Table 3. Holding Times

Method	Analysis	Holding Time			
		Extraction		Analysis	
		Water	Soil	Water	Soil
6010C	Metals	N/A	N/A	180 days	180 days
7470A/7471A	Mercury	N/A	N/A	28 days	28 days
8260B	VOCs	N/A	N/A	14 days	14 days
8270C	SVOCs	7 days	14 days	40 days	40 days
8081	Pesticides	7 days	14 days	40 days	40 days
8082	PCBs	7 days	14 days	40 days	40 days
8330B	Explosives	7 days	14 days	40 days	40 days
8330 M	Nitroguanidine	7 days	14 days	40 days	40 days

Method	Analysis	Holding Time			
		Extraction		Analysis	
		Water	Soil	Water	Soil
9056 M	Nitrocellulose	N/A	N/A	28 days	28 days
7196A	Hexavalent chromium	24 hours	30 days	24 hours	24 hours
9012A	Cyanide	N/A	N/A	14 days	14 days

Unless noted otherwise in Sections 4.2.3 and 5.2.3, all holding times were met.

3.5 DETECTION LIMIT REQUIREMENTS

Please note: All hardcopy and EDD report nondetected results to the detection limit (DL). Correspondence with E. Korthals of CT indicated the laboratory had not completed its change to the LOQ/LOD/DL reporting system at the time these samples were analyzed. The DLs and LODs were appropriately set, but the laboratory information management system incorrectly reported nondetects to the DL instead of the LOD.

As per the SAP, the site specific cleanup goals (FWCUGs) for the Residential Farmer Adult, Residential Farmer Child, and National Guard Trainee, presented in the *Final Facility-Wide Human Health Remediation Goals at the RVAAP* (2010) were applicable to the ODA1 and Sand Creek sites. Due to the reporting issue noted above, MEC^{X} compared to the detection limit (DL) for the nondetected analytes to the most stringent FWCUG for each nondetected analyte. As per the SAP, if no FWCUG was listed, the USEPA Region 9 Residential Regional Screening Level (RSL) was utilized.

Some DLs exceeded project criteria. These are listed in Sections 4.2.4 and 5.2.4. Results with DLs that exceed project criteria may be usable for their intended purposes; however, it is dependent on the final data user to make this determination on a case-by-case basis.

4. OPEN DEMOLITION AREA #1

4.1 PREVIOUS ACTIVITIES AND DATA

ODA1 is approximately 6-acres in size and was used in the 1940s for open burning and open detonation of munitions, explosives and associated materials. Visual inspections of the site indicate that burning and detonation activities may have been conducted in small areas in the plane storage area adjacent to ODA1. The open burn sites at ODA1 may have been cleared by scraping debris and scrap to the periphery, using heavy equipment. Since the burning and detonation activities ceased, ODA1 has been unused although some ARNG troop training has occurred at the surrounding plane storage site since 1969.

A Phase I remedial Investigation was conducted at ODA1 by SAIC in 1999 and an interim removal action was performed by MKM Engineers (MKM) in 2000 and 2001. Shaw prepared a *Data Quality Objective Report* based on these investigations and determined additional sampling was necessary to address data gaps.

4.2 CURRENT INVESTIGATION

Samples collected in association with the project described in this document were from soils collected from ODA1. The samples were collected in order to provide the additional characterization of the nature and extent of contamination at ODA1.

Table 4. Total sample count for ODA1

Matrix	Primary Samples	Field Duplicates	Split Samples	Explosives	Propellants	Pesticides	PCBs	SVOCs	VOCs	Metals	Cr^{6+}	Cyanide
Soil	110	9	7	97	29	12	12	13	24	97	12	12

Table 5. ODA1 validated samples and methods

Sample ID	SDG	Matrix	Collected	Explosives	Propellants	Pesticides	PCBs	SVOCs	VOCs	Metals	Cr^{6+}	Cyanide
DA1SB-055M-0001-SO	81543	Soil	9/22/2010	x	--	--	--	--	--	x	--	--
DA1SB-059D-0201-SO	81543	Soil	9/23/2010	--	--	--	--	--	x	--	--	--
DA1SB-059M-0201-SO	81543	Soil	9/23/2010	x	x	x	x	x	--	x	x	x
DA1SB-063M-0202-SO	81543	Soil	9/23/2013	x	x	--	--	--	--	x	--	--
DA1SB-068D-0201-SO	81613	Soil	9/24/2010	--	--	--	--	--	x	--	--	--
DA1SB-068M-0201-SO	81613	Soil	9/24/2010	x	x	--	--	x	--	x	--	--
DA1SB-070D-0201-SO	81613	Soil	9/24/2010	--	--	--	--	--	x	--	--	--
DA1SB-070M-0204-SO	81613	Soil	9/24/2010	x	x	--	--	--	--	--	--	--
DA1SB-072M-0204-SO	81613	Soil	9/24/2010	x	x	--	--	--	--	--	--	--
DA1SB-074M-0202-SO	82400	Soil	11/10/2010	x	x	--	--	--	--	--	--	--

Sample ID	SDG	Matrix	Collected	Explosives	Propellants	Pesticides	PCBs	SVOCs	VOCs	Metals	Cr^{6+}	Cyanide
DA1SS-050M-0201-SO	81613	Soil	9/27/2010	x	x	--	--	--	--	--	--	--
DA1SS-054M-0201-SO	82400	Soil	11/10/2010	x	x	--	--	--	--	--	--	--

Table 6. ODA1 field duplicate samples

Duplicate Sample ID	Parent Sample
DA1SB-081M-0203-SO	DA1SB-059M-0203-SO
DA1SB-082M-0202-SO	DA1SB-063M-0202-SO
DA1SB-083M-0202-SO	DA1SB-065M-0202-SO
DA1SB-084D-0201-SO	DA1SB-068D-0201-SO
DA1SB-084M-0201-SO	DA1SB-068M-0201-SO
DA1SB-085D-0204-SO	DA1SB-070D-0203-SO
DA1SB-085M-0204-SO	DA1SB-070M-0204-SO
DA1SB-086M-0204-SO	DA1SB-072M-0204-SO
DA1SS-080M-0201-SO	DA1SS-050M-0201-SO

4.2.1 Sample Collection

Except as noted below, no sample collection issues were noted.

SDG	Issue
All	The sample receipt temperatures were listed by the laboratory only as <## °C (e.g. <2.6°C). As the samples were not received above 6.0°C and were not noted to be frozen or damaged, no qualifications were applied.
Most	Some corrections made to the chain-of-custody by the sampler or by the laboratory were overwritten and some correction were not initialed or dated.
81575	Some collection times listed on the chain-of-custody did not match the sample containers. Shaw advised the laboratory to use the times listed on the sample containers.
81623	Sample DA1SB-070M-0204-SO was listed on the chain-of-custody but was not received. As per Shaw, volume from the field duplicate, DA1SB-085M-0204-SO was used for the DA1SB-070M-0204-SO sample analyses. The field duplicate was not considered a valid replacement for the parent sample.

4.2.2 Data Completeness

Data completeness for the project described in this report was found to be generally acceptable as no deliverables were missing from the SDGs reviewed.

4.2.3 Preservation and Holding Time Requirements

All method preservation requirements were met. Except as noted in the table below, all holding times, as listed in Table 3, were met. Results listed in the table below were qualified as estimated, "UJ," for nondetects and estimated with a potential negative bias, "J-," for detects. The qualified results were coded with an "H" qualification code.

Samples qualified for exceeded holding time			
Method	Analytes	Sample	Days past extraction holding time
8330B	All	DA1SB-055M-0001-SO	5
		DA1SB-059M-0201-SO, DA1SB-063M-0202-SO	9
8330B	All	DA1SB-068M-0201-SO	9
		DA1SB-070M-0204-SO	
		DA1SB-072M-0204-SO	
8330B	All	DA1SS-050M-0201-SO	6
8330	Nitroguanidine	DA1SB-059M-0201-SO	9
8270C	All	DA1SB-059M-0201-SO	8
		DA1SB-068M-0201-SO	7
8330B	All	DA1SB-074M-0202-SO	1
8330	Nitroguanidine	DA1SB-068M-0201-SO	10
8330	Nitroguanidine	DA1SB-063M-0202-SO	9
9012	Cyanide	DA1SB-059M-0201-SO	16

4.2.4 Detection Limit Requirements

As per the SAP, the site specific cleanup goals (FWCUGs) for the Residential Farmer Adult, Residential Farmer Child, and National Guard Trainee, presented in the *Final Facility-Wide Human Health Remediation Goals at the RVAAP* (2010) were applicable to the ODA1 and Sand Creek sites. Due to the reporting issue noted in Section 3.5, MEC^{X} compared the DL for the nondetected analytes to the most stringent FWCUG for each nondetected analyte. As per the SAP, if no FWCUG was listed, the USEPA Region 9 Residential Regional Screening Level (RSL) was utilized.

These analytes had DLs which exceeded the FWCUG:

- 2 benzo(a)pyrene DLs (nominally exceeded by 0.01 mg/Kg)
- 1 hexavalent chromium DL exceeded the control limit of 1.9 mg/Kg by 0.26 mg/Kg

No analytes had DLs which exceeded the RSLs:

The following had no FWCUG or RSL:

- 1 metal: potassium (nutrient)
- 8 pesticide compounds: alpha-chlordane, chlordane, endosulfan I, endosulfan II, endosulfan sulfate, endrin aldehyde, endrin ketone, and gamma-chlordane
- 3 VOCs: chloroethane, cis-1,3-dichloropropene, trans-1,3-dichloropropene
- 2 PCBS: Aroclor 1262, Aroclor-1268
- 2 VOCs: cis-1,3-dichloropropene, trans-1,3-dichloropropene
- 9 SVOC compounds: acenaphthylene, benzo(g,h,i)perylene, dimethyl phthalate, phenanthrene, 1,3-dichlorobenzene, 2-nitrophenol, 3-nitroaniline, 4-bromophenyl phenyl ether, 4-chlorophenyl phenyl ether

Results with DLs that exceed project criteria may be usable for their intended purposes; it is dependent on the final data user to make this determination on a case-by-case basis.

4.3 ODA1 DATA QUALITY EVALUATION

4.3.1 Explosives

CT analyzed 90 primary MI soil samples, 7 soil field duplicate samples, 1 field blank, and 3 equipment rinsate samples for explosive compounds by USEPA SW-846 Method 8330B. MEC^X validated 9 soil samples at Level IV.

- Detection Limit (DL) studies were not evaluated as part of this project.
- Calibration:
    - Initial calibration average percent relative standard deviations (%RSDs) were within the control limits listed in DoD QSM Table F-3 of ≤20%, or the linear regression r^2 values were ≥0.990.
    - The second source initial calibration verification standard (ICV) recoveries for both the primary and confirmation calibrations were within the control limits listed in DoD QSM Table F-3 of ±20%.
    - The continuing calibration verification (CCV) standard recoveries were within the control limits listed in DoD QSM Table F-3 of ±20%.
    - As per FWQAPP Section 8.3.2.1.2, MRLs were analyzed. No control limits were listed in the FWQAPP; therefore, the reviewer utilized the reasonable control limits of 70-130%. One recovery for 2,6-dinitrotoluene was 60%; therefore, the nondetected results for 2,6-dinitrotluene in DA1SB-074M-0202-SO and DA1SS-054M-0201-SO were qualified as estimated, "UJ." Recoveries for 2,4-dinitrotoluene and nitroglycerin were 64% and 58%, respectively, in the MRL associated with DA1SB-074M-0202-SO; therefore, the nondetected results for these compounds in DA1SB-074M-0202-SO were qualified as estimated, "UJ." The qualified results were coded with a "C" qualification code. All remaining recoveries were within the control limits.
- Blanks: The method blanks associated with the validated samples had no target compound detects above the control limits listed in DoD QSM Table F-3 of one-half the LOQ or one-tenth the amount detected in a sample.
- Laboratory Control Samples: 4-Amino-2,6-dinitrotoluene (control limits: 80-125%) was recovered at 77% in the LCS associated with DA1SB-070M-0204-SO and DA1SB-072M-0204-SO; therefore, nondetected 4-amino-2,6-dinitrotluene in these samples was qualified as estimated, "UJ." The qualified results were coded with an "L" qualification code. The remaining recoveries were within the control limits listed in DoD QSM Tables

G-2 (poor performers) and G-13 for the listed compounds and within the reasonable laboratory control limits of 50-150% for nitroglycerin and PETN.

- Surrogate Recovery: As no surrogate control limit was listed in the DoD QSM, surrogate recoveries were assessed against the reasonable laboratory-established control limits of 50-150%. All surrogate recoveries were within the control limits.

- Matrix Spike/Matrix Spike Duplicate: MS/MSD analyses were performed on validated samples DA1SB-055M-0001-SO and DA1SS-050M-0201-SO. 4-Amino-2,6-dinitrotoluene was recovered above the control limit in the DA1SB-055M-0001-SO MS only and did not require qualification. Both 2,4-dinitrotoluene RPDs exceeded the control limit at 22% and 24%; respectively. The nondetected results for 2,4-dinitrotoluene in DA1SB-055M-0001-SO and DA1SS-050M-0201 were qualified as estimated, "UJ," and coded with a "Q" qualification code. All remaining recoveries were within the control limits listed in DoD QSM Tables G-2 (poor performers) and G-13 for the listed compounds and within the reasonable laboratory control limits for nitroglycerin and PETN. The remaining RPDs were within the control limits listed in DoD QSM Table F-3 of ≤20%.

- Triplicates: Triplicate analyses were performed on soil samples DA1SB-055M-0001-SO, DA1SB-063M-0202-SO and DA1SS-050M-0201-SO. The %RSDs were within the control limit listed in DoD QSM Table F-3 of ≤20%.

- Compound Identification: Compound identification was verified for those samples validated at a Level IV. Review of the sample chromatograms and retention times indicated no problems with target compound identification. As there were no primary column detects, no confirmation analyses were performed.

- Compound Quantification and Reported Detection Limits: Compound quantification was verified for those samples validated at a Level IV. The LOQs were supported by the low point of the initial calibration and the laboratory DLs. Any result reported between the DL and the LOQ was qualified as estimated, "J." Although all hardcopy and EDD reported nondetected results to the DL, reported nondetects are valid to the LOD.

  In some instances, nitrobenzene, 2,4-dinitrotoluene and 2,6-dinitrotoluene were reported by both Methods 8330B and 8270C and both methods were validated at Level IV. As there were no detects for these compounds in the 8330B analyses and the 8270C LOQs were lower, the results for these compounds were rejected, "R," in the 8330B analyses in favor of the 8270C results, for the samples validated at Level IV. All rejected analytes were coded with a "D" qualification code.

- System Performance: Review of the raw data indicated no problems with system performance.

- Manual integrations: Some manual integrations were performed for CCVs and sample data reviewed at Level IV. All manual integrations were performed in order to report incompletely resolved peaks and were deemed acceptable by the reviewer.

- Field QC Samples: Field QC samples were evaluated, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. Any remaining detects were used to evaluate the associated site samples. Following are findings associated with field QC samples:

    - Field Blanks and Equipment Rinsates: There were 3 equipment rinsates and one field blank sample collected in association with the ODA1 samples. There were no detects above the DL in these samples.

    - Field Duplicates: A total of 7 soil field duplicates were collected and analyzed for explosive compounds. The RPD criterion listed in FWQAPP Table 3-1 of ≤50% was only applied when both sample results were ≥5× the LOQ. In cases where results were <5× the LOQ, the reasonable control limit of ± the LOQ was applied. All results were within the control limits. See Appendix C for comparisons of all samples and analytes.

4.3.2 Propellants

CT analyzed 26 primary MI soil samples, 3 soil field duplicate samples, 1 field blank, and 3 equipment rinsate samples for nitroguanidine by USEPA SW-846 Method 8330 Modified and for nitrocellulose as nitrate/nitrite by modified SW-846 Method 9056. MEC^X validated 3 soil samples at Level IV.

- DL studies were not evaluated as part of this project.

- Calibration

    - Nitroguanidine initial calibration %RSDs were within the control limits listed in DoD QSM Table F-2 of ≤20%, or the linear regression r^2 values were ≥0.990. Nitrocellulose linear regression r values were within the control limit listed in the DoD QSM Table F-11 of ≥0.995.

    - The nitroguanidine second source ICV for both the primary and confirmation calibrations were within the control limits listed in DoD QSM Table F-2 of 85-115%. The nitrocellulose ICV recoveries were within the control limits listed in DoD QSM Table F-11 of 90-110%.

    - The nitroguanidine CCV standard %Ds were within the control limits listed in DoD QSM Table F-2 of ≤15%. The nitrocellulose CCV recoveries were within the control limits listed in DoD QSM Table F-11 of 90-110%.

    - As per FWQAPP Section 8.3.2.1.2, MRL standards are required and were analyzed. All recoveries were reported to be within the reasonable control limits of 70-130%; however, please see the Manual Integration bullet below.

- Blanks: The method blanks associated with the validated samples had no target compound detects above the control limits listed in DoD QSM Tables F-2 and F-11 of one-half the LOQ or one-tenth the amount detected in a sample.

- Laboratory Control Samples: No nitroguanidine LCS control limits are listed in the DoD QSM. All nitroguanidine recoveries were within the laboratory-established control limits of 50-150%. The nitrocellulose recoveries were within the control limits listed in DoD QSM Table F-11 of 80-120%.

- Surrogate Recovery: A surrogate is not required for the analyses of nitrocellulose. Surrogate control limits for 1,2-dinitrobenzene are not listed in the DoD QSM; therefore, the nitroguanidine surrogate recoveries were assessed against the laboratory control limits of 75-127%. The recoveries were within the control limits.

- Triplicates: Nitroguanidine triplicate analyses were performed on sample DA1SD-063M-0202-SO. The %RSD was within the control limit listed in DoD QSM Table F-3 of ≤20%.

- Matrix Spike/Matrix Spike Duplicate: No MS/MSD analyses were performed on a validated sample. Method accuracy was evaluated based on LCS results.

- Compound Identification: Compound identification was verified for those samples validated at a Level IV. Review of the sample chromatograms and retention times indicated no problems with target compound identification. As there were no primary column detects, no confirmation analyses were performed.

- Compound Quantification and Reported Detection Limits: Compound quantification was verified for those samples validated at a Level IV. The LOQs were supported by the low point of the initial calibration and the laboratory DLs. Any result reported between the DL and the LOQ was qualified as estimated, "J." The laboratory reported nitroguanidine nondetects to the DL instead of the LOD. Although all hardcopy and EDD reported nondetected results to the DL, reported nondetects are valid to the LOD.

- System Performance: Review of the raw data indicated no problems with system performance.

- Manual Integrations: Some manual integrations were performed for the nitroguanidine MRLs. Manual integrations performed for the MRL standards did not consistently adjust the baseline to account for a baseline anomaly that occurred just prior to the nitroguanidine retention time. As the inconsistent baseline may have affected the MRL recoveries, it was the reviewer's professional opinion that nondetected nitroguanidine in DA1SB-068M-0201-SO, DA1SB-059M-0201-SO and DA1SB-063M-0202-SO should be qualified as estimated, "UJ." The qualified results were coded with an "*III" qualification code. The low level calibration standard was also manually integrated to correct the baseline which was affected by a significant amount of noise.

- Field QC Samples: Field QC samples were evaluated, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. Any remaining detects were used to evaluate the associated site samples. Following are findings associated with field QC samples:

    - Field Blanks and Equipment Rinsates: There were 3 equipment rinsates and one field blank sample associated with the ODA1 site samples. Nitroguanidine was not detected above the DL in any of the equipment rinsates.

    - Field Duplicates: A total of 3 field duplicate pairs were collected and analyzed for nitroguanidine and nitrocellulose. The RPD criterion listed in FWQAPP Table 3-1 of ≤50% was only applied when both sample results were ≥5× the LOQ. In cases where results were <5× the LOQ, the reasonable control limit of ± the LOQ was applied. All results were within the control limits. See Appendix C for comparisons of all samples and analytes.

4.3.3 Polychlorinated Biphenyls (PCBS)

CT analyzed 10 primary MI soil samples, 2 soil field duplicate samples, 1 field blank, and 3 equipment rinsate samples for PCBs by USEPA SW-846 Method 8082. MEC^X validated 1 soil sample at Level IV.

- DL studies were not evaluated as part of this project.

- Calibration: Calibration criteria listed in the DoD QSM Table F-2 were met.

    - Initial calibration average %RSDs were within the control limits of ≤20% or r^2 values ≥0.990.

    - The second source ICV was within the control limit of ±20% of the true value for all applicable Aroclors.

    - The CCV standard %Ds were within the control limits of ±20%.

    - As per FWQAPP Section 8.3.2.1.2, MRL standards are required. Some recoveries were above the control limits; however, these did require qualification of nondetected results. All average MRL recoveries affecting sample data were within the reasonable control limits of 70-130%.

- Blanks: The method blanks had no target compound detects above the control limits listed in the DoD QSM Table F-2, of one-half the LOQ for target compounds or one-tenth the amount detected in a sample.

- Laboratory Control Samples: LCS recoveries were within the control limits listed in DoD QSM Table G-17 for soils, of 40-140% and 60-130% for Aroclors 1016 and 1260, respectively.

- Surrogate Recovery: Recoveries were within the control limits listed in DoD QSM Table G-3 of 60-125% for soils.

- Matrix Spike/Matrix Spike Duplicate: MS/MSD analyses were performed on soil sample DA1SB-059M-0201-SO. All recoveries were within the control limits listed in DoD QSM Table G-17 for soils, of 40-140% and 60-130% for Aroclors 1016 and 1260, respectively. The RPDs were within the control limit listed in the DoD QSM Table F-2 of ≤30%.

- Compound Identification: Compound identification was verified for the validated sample. Review of the sample chromatograms, standards, and retention times indicated no problems with target compound identification. The sample was analyzed on two analytical columns for target compound confirmation; however, the sample had no Aroclors detected on the primary column.

- Compound Quantification and Reported Detection Limits: Compound quantification was verified for the sample validated at a Level IV. The LOQs were supported by the low point of the initial calibration and the laboratory DLs. Any result reported between the DL and the LOQ was qualified as estimated, "J." Although all hardcopy and EDD reported nondetected results to the DL, reported nondetects are valid to the LOD.

- System Performance: Review of the raw data indicated no problems with system performance.

- Manual integrations were not performed for the sample or calibration and QC data associated with the sample data.

- Field QC Samples: Field QC samples were evaluated, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. Any remaining detects were used to evaluate the associated site samples. Following are findings associated with field QC samples:

    - Field Blanks and Equipment Rinsates: There were 3 equipment rinsates and one field blank sample associated with the ODA1 site samples. These samples had no detects above the DL.

    - Field Duplicates: There were 2 soil field duplicate pairs collected and analyzed for PCBs. The RPD criterion listed in FWQAPP Table 3-1 of ≤50% was only applied when both sample results were ≥5× the LOQ. In cases where results were <5× the LOQ, the reasonable control limit of ± the LOQ was applied. All results were within the control limits. See Appendix C for comparisons of all samples and analytes.

4.3.4 Pesticides

CT analyzed 10 primary MI soil samples, 2 soil field duplicate samples, 1 field blank, and 3 equipment rinsate samples for pesticides by USEPA SW-846 Method 8081. MEC^X validated 1 soil sample at Level IV.

- DL studies were not evaluated as part of this project.

- Calibration: Calibration criteria listed in the DoD QSM Table F-2 were met.

  - Initial calibration %RSDs were within the control limit of ≤20%, or r^2 values ≥0.990.

  - The ICV recoveries for all target analytes were within the control limit of ±20% of the true value.

  - The DDT/Endrin breakdown standards were within the control limit listed in the DoD QSM Table F-2 of ≤15%.

  - All bracketing CCV %Ds were within the control limit of ≤20%.

  - As per FWQAPP Section 8.3.2.1.2, MRL standards are required. All MRL recoveries affecting sample data were within the reasonable control limits of 70-130%.

- Blanks: The method blanks had no target compound detects above the control limits listed in the DoD QSM Table F-2, of one-half the LOQ or one-tenth the amount detected in a site sample.

- Laboratory Control Samples: Recoveries were within the control limits listed in the DoD QSM Table G-15.

- Surrogate Recovery: Recoveries were within the control limits listed in the DoD QSM Table G-3.

- Matrix Spike/Matrix Spike Duplicate: MS/MSD analyses were performed on soil sample DA1SB-059M-0201-SO. Endrin ketone was recovered below the control limits of 65-135%, at 63%, in the MS only, and did not require qualification. Endrin aldehyde was recovered below the control limits of 35-145% in both the MS and MSD, at 18% and 16%, respectively. The nondetected result for endrin aldehyde in sample DA1SB-059M-0201-SO was qualified as estimated, "UJ," and coded with a "Q" qualification code. Remaining recoveries were within the control limits listed in DoD QSM Table G-15 and all RPDs were within the control limit of ≤30% listed in the DoD QSM Table F-2.

- Compound Identification: Compound identification was verified for the sample validated at Level IV. Review of the sample chromatograms and retention times indicated no problems with target compound identification.

- Compound Quantification and Reported Detection Limits: Compound quantification was verified for the validated sample. The LOQs were supported by the low point of the initial calibration and the laboratory DLs. Any result reported between the DL and the LOQ was qualified as estimated, "J." Although all hardcopy and EDD reported nondetected results to the DL, reported nondetects are valid to the LOD.

The sample was analyzed on two analytical columns for target compound confirmation. The sample had no confirmed target compound detects.

- System Performance: Review of the raw data indicated no problems with system performance.

- Manual integrations were not performed for the sample validated at Level IV or calibration and QC data associated with the sample data.

- Field QC Samples: Field QC samples were evaluated, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. Any remaining detects were used to evaluate the associated site samples. Following are findings associated with field QC samples:

    o Field Blanks and Equipment Rinsates: There were 3 equipment rinsates and one field blank sample associated with the ODA1 site samples. These samples had no detects above the DL. One equipment rinsate had a detect between the DL and LOQ for methoxychlor; however, methoxychlor was not detected in the validated sample. There were no other target compound detects above the DL.

    o Field Duplicates: There were 2 soil field duplicate pairs collected and analyzed for PCBs. The RPD criterion listed in FWQAPP Table 3-1 of ≤50% was only applied when both sample results were ≥5× the LOQ. In cases where results were <5× the LOQ, the reasonable control limit of ± the LOQ was applied. All results were within the control limits. See Appendix C for comparisons of all samples and analytes.

4.3.5 Semivolatile Organic Compounds (SVOCs)

CT analyzed 11 primary MI soil samples, 2 field duplicate samples, 1 field blank, and 3 equipment rinsate samples for SVOCs by USEPA Method 8270C. MEC^X validated 2 soil samples at Level IV.

- DL studies were not evaluated as part of this project.

- GC/MS Tuning: The DFTPP tunes met the method abundance criteria. The samples were analyzed within 12 hours of the DFTPP injection time.

- Calibration: Calibration criteria listed in the DoD QSM Table F-4 were met for all target compounds of interest, with exceptions affecting sample data listed below.

    o Initial calibration average RRFs and ICV and CCV RRFs were within method control limits of ≥0.050 for system performance check compounds (SPCCs). All initial calibration %RSDs were within the method control limits listed in the DoD QSM Table F-4 of ≤30% for calibration check compounds (CCCs) and ≤15% for remaining compounds, or r^2 values ≥0.990.

- All second source ICV standard recoveries were within the control limit of ±20%.

- The CCV bracketing the sample analyses had a %D for 3,3'-dichlorobenzidine (25.8%) that exceeded the control limit; therefore, the nondetected results for these analytes were qualified as estimated, "UJ," in DA1SB-059M-0201-SO and DA1SB-068M-0201-SO. The qualified results were coded with a "C" qualification code. All remaining continuing calibration %Ds affecting sample data were within the control limit of ≤20%.

- As per FWQAPP Section 8.3.2.1.2, MRL standards are required. Recoveries were within the reasonable control limits of 70-130%, with exceptions affecting sample data listed in the table below. Nondetected results associated with recoveries less than 10% were rejected, "R." Remaining results listed in the table below, all nondetects, were qualified as estimated, "UJ." All results were coded with a "C" qualification code.

Samples qualified for MRL recovery outliers		
Analyte	**%R**	**Qualified Samples**
Hexachlorocyclopentadiene	9%	DA1SB-059M-0201-SO, DA1SB-068M-0201-SO
4-Nitroaniline	58%	
2,4-Dinitrophenol	66%	
Benzyl alcohol	5%	
4,6-Dinitro-2-methylphenol	50%	
Indeno(1,2,3-cd)pyrene	68%	
Benzo(g,h,i)perylene	54%	

Bold indicates rejected nondetect results

- Blanks: The method blanks had no target compound detects above the control limits listed in DoD QSM Table F-4 of one-half the LOQ for target compounds or one-tenth the amount detected in any sample, and no common laboratory contaminants.

- Laboratory Control Samples: Recoveries were within the control limits listed in the DoD QSM Tables G-2 (poor performers) and G-7, or within the laboratory-established control limits when no QSM limit was prescribed.

- Surrogate Recovery: Surrogate recoveries were within the control limits listed in the DoD QSM Table G-3.

- Matrix Spike/Matrix Spike Duplicate: No MS/MSD analyses were performed on a validated sample. Method accuracy was evaluated based on LCS results.

- Internal Standards Performance: The internal standard area counts and retention times were within the DoD QSM Table F-4 control limits established by the initial calibration midpoint standard: ±30 seconds for retention times and -50% / +100% for internal standard areas.

- Compound Identification: Compound identification was verified for the samples validated at Level IV. Review of the sample chromatograms, retention times, and spectra indicated no problems with target compound identification.

- Compound Quantification and Reported Detection Limits: Compound quantification was verified for the samples validated at Level IV. The LOQs were supported by the low point of the initial calibration and the laboratory DLs. Any result reported between the DL and the LOQ was qualified as estimated, "J," by the laboratory. Although all hardcopy and EDD reported nondetected results to the DL, reported nondetects are valid to the LOD.

- System Performance: Review of the raw data indicated no problems with system performance.

- Some routine manual integrations were performed for the samples and calibration and QC data associated with the sample data. All manual integrations reviewed at Level IV were considered appropriate.

- Field QC Samples: Field QC samples were evaluated, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. Any remaining detects were used to evaluate the associated site samples. Following are findings associated with field QC samples:

    - Field Blanks and Equipment Rinsates: There were 3 equipment rinsate samples collected and analyzed for SVOCs. There were no detects above the DL in these samples.

    - Field Duplicate Samples: A total of 2 field duplicate samples were collected and analyzed for SVOCs. The RPD criterion listed in FWQAPP Table 3-1 of ≤50% was only applied when both sample results were ≥5× the LOQ. In cases where results were <5× the LOQ, the reasonable control limit of ± the LOQ was applied. All results were within the control limits. See Appendix C for comparisons of all samples and analytes.

4.3.6 Volatile Organic Compounds (VOCs)

CT analyzed 2 primary MI soil samples, 20 primary discrete soil samples, 2 soil field duplicate samples, 1 field blank, 3 equipment rinsate samples, and 7 trip blank samples for volatile compounds by USEPA SW-846 Method 8260B. MEC^X validated 3 primary soil samples at Level IV.

- DL studies were not evaluated as part of this project.

- GC/MS Tuning: The BFB tunes met the method abundance criteria. Samples were analyzed within 12 hours of the BFB injection time.

- Calibration: Calibration criteria listed in the DoD QSM Table F-4 were met for all target compounds, with exceptions affecting sample data noted below.

- Initial calibration average RRFs were within the control limit of ≥0.05, and the %RSDs were within the control limit of ≤15%, or r values ≥0.995.

- The ICV RRFs were within the control limit of ≥0.05. Recoveries for all target analytes were within the control limits of ±20% of the true value.

- Continuing calibration RRFs were within the control limit of ≥0.05 for all target compounds, and %Ds were within the control limit of ≤20.

- As per FWQAPP Section 8.3.2.1.2, MRL standards are required. With exceptions noted in the table below, all recoveries affecting sample data were within the reasonable control limits of 70-130%. Some recoveries were above the control limit; however, these did not affect nondetected results. Nondetected results associated with recoveries less than 10% were rejected, "R," and remaining qualified results, all nondetects, were qualified as estimated, "UJ." All qualified results were coded with a "C" qualification code. Sample DA1SB-070D-0201-SO was not qualified for poor MRL recoveries, as all MS/MSD recoveries for the outliers listed in the table below were at or above 98%, indicating good method accuracy for the individual sample matrix.

Samples qualified for MRL recovery outliers		
Analyte	**MRL %Rs Begin / End**	**Qualified Samples**
2-hexanone	37% / 62%	DA1SB-059D-0201-SO
chloroethane	**5% / 4%**	
chloromethane	**0% / 0%**	
2-hexanone	38% / **3%**	DA1SB-068D-0201-SO
chloroethane	**0%** / 17%	
chloromethane	**0% / 0%**	
4-methyl-2-pentanone	--- / 69%	
acetone	--- / 67%	
m,p-xylenes	--- / 11%	

- Blanks: The method blanks had no target compound detects above the control limits listed in DoD QSM Table F-4 of one-half the LOQ for target compounds and no common laboratory contaminant detects above the LOQ.

- Laboratory Control Samples: Recoveries were within the control limits listed in DoD QSM Table G-5.

- Surrogate Recovery: Recoveries were within the control limits listed in DoD QSM Table G-3 or within laboratory-established control limits for those not listed in Table G-3.

- Matrix Spike/Matrix Spike Duplicate: MS/MSD analyses were performed on sample DA1SB-070D-0201-SO. All recoveries affecting parent sample data were within the control limits listed in DoD QSM Table G-5. The RPDs for 2-butanone, 2-hexanone, and

acetone exceeded the control limit; therefore, the nondetected results for those compounds were qualified as estimated, "UJ," in the parent sample and were coded with a "Q" qualification code. All remaining RPDs were within the control limit listed in DoD QSM Table F-4 of ≤30%.

- Internal Standards Performance: The internal standard area counts and retention times were within the DoD QSM Table F-4 control limits established by the initial calibration midpoint standard: ±30 seconds for retention times and -50%/+100% for internal standard areas.

- Compound Identification: Compound identification was verified for the samples validated at Level IV. Review of the sample chromatograms, retention times, and spectra indicated no problems with target compound identification.

- Compound Quantification and Reported Detection Limits: Compound quantification was verified for the samples validated at Level IV. The LOQs were supported by the low point of the initial calibration and the laboratory DLs. Any result reported between the DL and the LOQ was qualified as estimated, "J." Although all hardcopy and EDD reported nondetected results to the DL, reported nondetects are valid to the LOD.

- System Performance: Review of the raw data indicated no problems with system performance.

- Manual integrations were not performed for the samples validated at Level IV or the associated calibration or QC.

- Field QC Samples: Field QC samples were evaluated, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. Any remaining detects were used to evaluate the associated site samples. Following are findings associated with field QC samples:

    - Trip Blanks: The laboratory analyzed seven trip blank samples. Chloromethane was detected in one trip blank but was not detected in a validated sample. The trip blanks had no other target compounds detected above the DL.

    - Field Blanks and Equipment Rinsates: One field blank and three equipment rinsate samples were associated with the ODA1 samples. The field blank and equipment rinsates all had detects at or just above the LOQ for chloroform and detects between the DL and LOQ for methylene chloride, and the field blank also had a detect below the LOQ for chloromethane. None of the field QC contaminants were detected in the validated site samples. The field blank and equipment rinsates had no other target compound detects above the DL.

    - Field Duplicates and Field Split Samples: There were 2 soil field duplicate pairs collected and analyzed for VOCs. The RPD criterion listed in FWQAPP Table 3-1 of ≤50% was only applied when both sample results were ≥5× the LOQ. In cases

where results were <5× the LOQ, the reasonable control limit of ± the LOQ was applied. All results were within the control limits. See Appendix C for comparisons of all samples and analytes.

4.3.7 Metals

CT analyzed 90 primary MI soil samples, 7 soil field duplicate samples, 1 field blank, and 3 equipment rinsate samples for various metals by USEPA Methods 6010C and 7470A/7471A. MEC^X validated 9 primary soil samples at Level IV.

- DL studies were not evaluated as part of this project.
- Calibration: Except as noted below, calibration criteria were met.
  - Initial calibration: Linear regression r-values were within the control limit listed in the DoD QSM Tables F-7 and F-8 of ≥0.995.
  - The ICV recoveries were within the control limits listed in DoD QSM Table F-7 of 90-110%. The laboratory analyzed a pair of CCVs. The lower concentration CCV had analyte concentrations too high to be considered a low-level calibration check standard; therefore, it was assessed against the CCV control limits of 90-110%. CCV recoveries were within the control limits. The mercury ICV and CCV recoveries were within the control limits listed in DoD QSM Table F-7 of 90-110% and 80-120%, respectively.
  - The laboratory analyzed CRDL standards which ranged from nominally above the LOQ to more than 10× the LOQ. Except as noted below, the CRDL standard recoveries were within the reasonable control limits of 80-120%. Results listed in the table below were qualified as estimated, "UJ," for nondetects and, "J," for detects. In the absence of qualifications with conflicting bias, detected results associated with high recoveries were qualified as estimated with a potential high bias, "J+," and detects associated with low recoveries were qualified as estimated with a potential low bias, "J-." All qualified results were coded with a "C" qualification code.

Samples qualified for CRDL recovery outliers		
Analyte	**%R**	**Qualified Samples**
Thallium	78%	DA1SB-059M-0201-SO
Sodium	70%	DA1SB-070M-0204-SO, DA1SB-072M-0204-SO, DA1SS-050M-0201
Antimony	74%	DA1SB-074M-0202-SO
Selenium	129%	DA1SS-054M-0201-SO

The MRL required in DoD QSM Table F-7 is to be at or below the analyte LOQ. As no MRL was analyzed for beryllium, cadmium, manganese, potassium, and sodium, sample results for these analytes which were less than 10× the LOQ were qualified as estimated, "J," for detects and, "UJ," for nondetects. Results

higher than 10× the LOQ were not qualified as it was the reviewer professional opinion that at those concentrations, the CCVs were indicative of instrument performance.

- Blanks: Except as noted below, the method blanks and CCBs had no applicable detects above the control limit listed in DoD QSM Tables F-7 and F-8 of one-half the LOQ or one-tenth the amount detected in a sample.

  Results associated with negative blanks were qualified as estimated, "UJ," for nondetects. The remaining results listed in the table below were qualified as nondetected, "U," at the level of contamination. All qualified results were coded with a "B" qualification code.

Samples qualified for CCB detects		
Analyte	**Blank Detect**	**Qualified Samples**
Selenium	0.1 mg/Kg	DA1SB-055M-0001-SO, DA1SB-063M-0202-SO
Cadmium	-0.393 ug/L	DA1SB-070M-0204-SO, DA1SB-072M-0204-SO
Thallium	-3.03 ug/L	DA1SB-074M-0202-SO
Thallium	-4.91 ug/L	DA1SS-054M-0201-SO
Selenium	-2.68 ug/L	DA1SB-074M-0202-SO
Mercury	-0.08 ug/L	DA1SB-074M-0202-SO

- Interference Check Samples: ICP interference check sample A (ICSA) and AB (ICSAB) recoveries were within the control limits listed in DoD QSM Table F-8 of 80-120%. No analytes were detected in the ICSA above the control limit listed in DoD QSM Table F-8 of <LOD.

- Laboratory Control Samples: The recoveries were within the control limits listed in DoD QSM Tables G-18 and G-19 of 80-120%.

- Laboratory Duplicates: Laboratory duplicate analyses were performed on DA1SB-0 DA1SS-053M-0201-SO, DA1SB-070M-0201-SO, DA1SB-055M-0001-SO, and DA1SB-063M-0201-SO. Except as noted below, the laboratory duplicate RPDs were within the control limits listed in DoD QSM Table F-7 of ≤20%. The duplicate criterion was only applied when the original sample result was nominally ≥5× the LOQ. In cases where the original sample result was <5× the LOQ, the reasonable control limit of ± the LOQ was applied.

  Results listed in the table below were qualified as estimated, "J," for detects and, "UJ," for nondetects. All qualified results were coded with an "E" qualification code. As per the National Functional Guidelines, all samples of the same matrix in an SDG were qualified for a laboratory duplicate RPD outlier.

Samples qualified for laboratory duplicate RPD outliers			
Parent Sample	**Analyte**	**RPD**	**Qualified Samples**
DA1SB-073M-0201-SO	Antimony	38%	DA1SB-074M-0202-SO,

Samples qualified for laboratory duplicate RPD outliers			
Parent Sample	**Analyte**	**RPD**	**Qualified Samples**
	Cadmium	28%	DA1SS-054M-0201-SO
	Copper	22%	
	Mercury	27%	
DA1SS-053M-0201-SO	Sodium	36%	DA1SB-074M-0202-SO, DA1SS-054M-0201-SO

- Matrix Spike/Matrix Spike Duplicate: MS/MSD analyses were performed on DA1SB-0 DA1SS-053M-0201-SO, DA1SB-070M-0201-SO, DA1SB-055M-0001-SO, and DA1SB-063M-0201-SO. Except as noted below, recoveries were within the control limits listed in DoD QSM Table G-19 of 80-120%. Matrix spike control limits were not applied when the native sample concentration exceeded the spiked amount by a factor of four or more.

  Nondetected results listed in the table below associated with recoveries less than 30% were rejected, "R." The remaining results noted in the table below were qualified as estimated, "J," for detects and "UJ," for nondetects in the associated samples; however, nondetected results were not qualified for recoveries above the control limit. Results were qualified when one or both recoveries were outside the control limits. All qualified results were coded with a "Q" qualification code. When no other qualifications with conflicting bias were assigned to a result, detected results with low recoveries were assigned a negative bias, "J-," and detected results with high recoveries were assigned a positive bias, "J+." As per the National Functional Guidelines, all samples of the same matrix in an SDG were qualified for an MS/MSD recovery outlier. Parent samples were only qualified for outliers reported in that parent sample.

Samples qualified for MS/MSD recovery outliers			
Parent Sample	**Analyte**	**%Rs**	**Qualified Samples**
DA1SB-063M-0201-SO	Aluminum	14%, ---	DA1SB-063M-0202-SO, DA1SB-059M-0201-SO
	Antimony	**21%, 19%**	
	Cadmium	72%, 68%	
	Chromium	0%, 0%	
	Calcium	---, 79%	
	Cobalt	79%, 73%	
	Copper	76%, 64%	
	Magnesium	---, 76%	
	Manganese	1%, 0%	
	Thallium	55%, 52%	
	Zinc	78%, 62%	
DA1SB-055M-0001-SO	**Antimony**	**19%, 19%**	DA1SB-055M-0001-SO, DA1SB-059M-0201-SO
	Cadmium	64%, 72%	
	Chromium	0%, 0%	
	Cobalt	76%, 76%	
	Copper	66%, 66%	
	Manganese	0%, 0%	

Samples qualified for MS/MSD recovery outliers			
Parent Sample	**Analyte**	**%Rs**	**Qualified Samples**
	Selenium	78%, 0%	
	Thallium	54%, 55%	
	Zinc	64%, 66%	
	Manganese	---, 78%	
DA1SB-070M-0201-SO	Aluminum	13%, 36%	DA1SB-068M-0201-SO, DA1SB-070M-0204-SO, DA1SB-072M-0204-SO, DA1SS-050M-0201-SO
	Antimony	19%, 23%	
	Arsenic	79%, ---	
	Cadmium	73%, 77%	
	Chromium	69%, ---	
	Cobalt	70%, 70%	
	Manganese	0%, 2%	
	Nickel	69%, ---	
	Selenium	77%, ---	
	Silver	73%, ---	
	Thallium	60%, 65%	
	Vanadium	73%, ---	
	Zinc	68%, ---	
	Potassium	78%, ---	
	Sodium	73%, 78%	
DA1SB-073M-0201-SO	Aluminum	77%, 46%	DA1SB-074M-0202-SO, DA1SS-053M-0201-SO
	Antimony	24%, 24%	
	Iron	53%, 21%	
	Magnesium	11%, ---	
	Zinc	128%, ---	
	Lead	---, 75%	
	Selenium	---, 79%	
	Thallium	---, 75%	
DA1SS-053M-0201-SO	Antimony	4%, 21%	DA1SB-074M-0202-SO, DA1SS-054M-0201-SO
	Arsenic	78%, ---	
	Cadmium	72%, ---	
	Cobalt	29%, ---	
	Lead	69%, ---	
	Nickel	64%, ---	
	Selenium	---. 79%	
	Silver	60%, 64%	
	Thallium	65%, 70%	

Bold indicates rejected nondetected results
"- -" Indicates an acceptable sample recovery.

Except as noted below, MS/MSD RPDs were within the control limit listed in DoD QSM Tables G-7 and G-8 of ≤20%. Results noted in the table below were qualified as estimated, "J," for detects and "UJ," for nondetects. All qualified results were coded with an "*III" qualification code. As per the National Functional Guidelines, all samples of the same matrix in an SDG were qualified for an RPD outlier. Parent samples were only qualified for outliers reported in that parent sample.

Samples qualified for MS/MSD RPD outliers			
Parent Sample	**Analyte**	**RPD**	**Qualified Samples**
DA1SB-063M-0201-SO	Aluminum	19%	DA1SB-063M-0201-SO, DA1SB-059M-0201-SO
	Barium	30%	
	Beryllium	29%	
	Calcium	25%	
	Chromium	39%	
	Cobalt	42%	
	Copper	45%	
	Magnesium	34%	
	Manganese	20%	
	Nickel	44%	
	Vanadium	33%	
	Zinc	41%	
DA1SB-055M-0001-SO	Barium	14%	DA1SB-055M-0001-SO, DA1SB-059M-0201-SO
	Beryllium	11%	
	Calcium	11%	
	Chromium	22%	
	Cobalt	22%	
	Copper	25%	
	Lead	54%	
	Nickel	23%	
	Vanadium	18%	
	Zinc	22%	
DA1SS-053M-0201-SO	Antimony	77%	DA1SB-074M-0202-SO, DA1SS-054M-0201-SO
	Cobalt	38%	
	Lead	29%	

- Serial Dilution: Serial dilution analyses were performed on DA1SB-0 DA1SS-053M-0201-SO, DA1SB-070M-0201-SO, DA1SB-055M-0001-SO, and DA1SB-063M-0201-SO. Except as noted below, serial dilution %Ds were within the control limit listed in DoD QSM Table F-8 of ≤10%. The serial dilution control limit is only applicable when the original sample concentration is minimally ≥50× the DL for ICP analytes and ≥25× the DL for mercury.

  All detected results for the analytes noted in the table below were qualified as estimated, "J," and were coded with an "A" qualification code. When no other qualifications with conflicting bias were assigned to a result, detected results were assigned a negative bias, "J-." As per the National Functional Guidelines, all samples of the same matrix in an SDG were qualified for an associated %D outlier. Parent samples were only qualified for outliers reported in that parent sample.

Samples qualified for serial dilution %D outliers			
Parent Sample	**Analyte**	**%D**	**Qualified Samples**
DA1SB-063M-0201-SO	Aluminum	19%	DA1SB-063M-0201-SO, DA1SB-059M-0201-SO
	Barium	30%	

Samples qualified for serial dilution %D outliers			
Parent Sample	**Analyte**	**%D**	**Qualified Samples**
	Beryllium	29%	
	Calcium	25%	
	Chromium	39%	
	Cobalt	42%	
	Copper	45%	
	Magnesium	34%	
	Manganese	20%	
	Nickel	44%	
	Vanadium	33%	
	Zinc	41%	
DA1SB-055M-0001-SO	Barium	14%	DA1SB-055M-0001-SO, DA1SB-059M-0201-SO
	Beryllium	11%	
	Calcium	11%	
	Chromium	22%	
	Cobalt	22%	
	Copper	25%	
	Lead	54%	
	Nickel	23%	
	Vanadium	18%	
	Zinc	22%	
DA1SB-070M-0201-SO	Arsenic	20%	DA1SB-068M-0201-SO, DA1SB-070M-0204-SO, DA1SB-072M-0204-SO, DA1SS-050M-0201-SO
	Beryllium	16%	
	Calcium	19%	
	Chromium	16%	
	Cobalt	19%	
	Copper	23%	
	Lead	22%	
	Magnesium	13%	
	Nickel	21%	
	Vanadium	13%	
	Zinc	20%	
	Mercury	24%	
DA1SS-053M-0201-SO	Aluminum	20%	DA1SB-074M-0202-SO, DA1SS-053M-0201-SO
	Barium	12%	
	Cadmium	29%	
	Chromium	17%	
	Cobalt	23%	
	Copper	23%	
	Iron	12%	
	Magnesium	23%	
	Manganese	17%	
	Nickel	22%	
	Vanadium	18%	
	Zinc	21%	
	Mercury	33%	

Samples qualified for serial dilution %D outliers			
Parent Sample	**Analyte**	**%D**	**Qualified Samples**
DA1SB-073M-0201-SO	Aluminum	12%	DA1SB-074M-0202-SO, DA1SS-053M-0201-SO
	Cadmium	36%	
	Chromium	12%	
	Cobalt	16%	
	Copper	17%	
	Iron	12%	
	Lead	12%	
	Nickel	16%	
	Zinc	12%	

- Sample Result Verification: For Level IV validation, calculations were verified and the sample results reported on the sample result summary were verified against the raw data. Any result reported between the DL and the LOQ was qualified as estimated, "J." Although all hardcopy and EDD reported nondetected results to the DL, reported nondetects are valid to the LOD.

  During the raw data review, the reviewer noted negative results for cadmium and silver. In general, the absolute values of the cadmium results exceeded the sample LOQs and the absolute values of the silver results exceeded the DLs. It was the reviewer's professional opinion that all affected samples should have the results, DLs, and LOQs, as necessary, raised to the level of interference; therefore, the absolute value of the negative result was converted to soil units using the sample preparation factors. This revised result is listed in the table below. All changed results were denoted with a "$" qualification code.

Samples with negative results and raised DLs/LOQs			
Sample	Analyte	Negative result (ug/L)	Revised Result (mg/Kg)
DA1SB-055M-0001-SO	Cadmium	-5.25	0.26
	Silver	-1.60	0.08
DA1SB-063M-0202-SO	Cadmium	-4.15	0.20
	Silver	-1.94	0.10
DA1SB-068M-0201-SO	Silver	-1.81	0.10
DA1SB-070M-0204	Cadmium	-1.55	0.08
DA1SB-072M-0204-SO	Cadmium	-3.94	0.20

- Manual Integrations: No manual integrations were noted in the mercury analyses.

- Field QC Samples: Field QC samples were evaluated, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. Any remaining detects were used to evaluate the associated site samples. Following are findings associated with field QC samples:

  - Field Blanks and Equipment Rinsates: Three equipment rinsates and one field blank sample were collected in association with the samples in this field effort.

There were detects in these samples, but none at sufficient concentrations to qualify the soil samples.

- Field Duplicate Samples: Seven field duplicate samples were collected and analyzed for metals. The RPD criterion listed in FWQAPP Table 3-1 of ≤50% was only applied when both sample results were ≥5× the LOQ. In cases where results were <5× the LOQ, the reasonable control limit of ± the LOQ was applied. Except as noted below, all results were within the control limits. See Appendix C for comparisons of all samples and analytes.

Table 7. ODA1 metals field duplicate outliers

Metals field duplicate outliers				
Primary Sample	**Field Duplicate**	**Analyte**	**RPD**	**W/In LOQ**
DA1SB-059M-0203-SO	DA1SB-081M-0203-SO	Aluminum	91%	N/A
		Barium	83%	N/A
		Calcium	186%	N/A
		Chromium	120%	N/A
		Cobalt	63%	N/A
		Magnesium	116%	N/A
		Manganese	70%	N/A
		Vanadium	55%	N/A
		Beryllium	N/A	No
		Thallium	N/A	No
DA1SB-068M-0201-SO	DA1SB-084M-0201-SO	Arsenic	73%	N/A
		Chromium	116%	N/A
		Lead	75%	N/A
		Potassium	62%	N/A
		Cadmium	N/A	No
		Sodium	N/A	No
DA1SS-050M-0201-SO	DA1SS-080M-0201-SO	Chromium	88%	N/A
		Antimony	N/A	No
DA1SB-065M-0202-SO	DA1SB-083M-0202-SO	Arsenic	N/A	No
DA1SB-072M-0204-SO	DA1SB-086M-0204-SO	Mercury	N/A	No

4.3.8 General Chemistry - Hexavalent Chromium and Cyanide

CT analyzed 10 primary MI soil samples, 2 soil field duplicate samples, 1 field blank, and 3 equipment rinsate samples for hexavalent chromium by USEPA Method 7196A and cyanide by USEPA Method 9012A. MEC^X validated 1 hexavalent chromium sample and 1 cyanide sample at Level IV.

- DL studies were not evaluated as part of this project.
- Calibration: Calibration criteria were met.
  - Initial calibration: Initial calibration linear regression r values were within the control limit listed in the DoD QSM Tables F-9 and F-10 of ≥0.995.

- The ICV and CCV recoveries were within the control limits listed in DoD QSM Table F-9 of 90-110% for hexavalent chromium and Table F-10 of 85-115% for cyanide.

- As per FWQAPP Section 8.3.2.1.2, MRLs are required. Cyanide MRLs analyzed in association with the soil samples were recovered within the reasonable control limits of 70-130%. As the laboratory did not analyze hexavalent chromium MRLs, the hexavalent chromium result, a nondetect, was qualified as estimated, "UJ." The qualified result was coded with a "C" qualification code.

- Blanks: The method blanks and CCBs had no applicable detects above the control limit listed in the DoD QSM Table F-9 and F-10 of one-half the LOQ or one-tenth the amount detected in a sample.

- Laboratory Control Samples: There are no QSM control limits for hexavalent chromium or cyanide LCS recoveries. The hexavalent chromium recoveries were within the laboratory-established control limits of 83-115% and cyanide was within the laboratory-established control limits of 69-128%.

- Laboratory Duplicates: Laboratory duplicate analyses were performed on SCSS-057M-0001-SO for hexavalent chromium and cyanide. There were no detects in either the parent or duplicate samples.

- Matrix Spike/Matrix Spike Duplicate: Soluble and insoluble matrix spikes were performed on SCSS-057M-0001-SO for hexavalent chromium. The recoveries were 13% and 19%, respectively. As per the National Function Guidelines, because the hexavalent chromium post digestion spike was recovered within the control limits of 75-125%, the results were not rejected. Nondetected hexavalent chromium in DA1SB-059M-0201-SO was qualified as estimated, "UJ." The qualified result was coded with a "Q" qualification code.

- Sample Result Verification: For Level IV validation, calculations were verified and the sample results reported on the sample result summary were verified against the raw data. Any result reported between the DL and the LOQ was qualified as estimated, "J." Although all hardcopy and EDD reported nondetected results to the DL, reported nondetects are valid to the LOD.

  Due to the age of the hexavalent chromium instrument, sample absorbances were not reported. As such, the reviewer was not able to verify the sample results from the raw data.

- Manual Integrations: Manual integrations are not applicable to these analyses.

- Field QC Samples: Field QC samples were evaluated, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the

field QC data. Any remaining detects were used to evaluate the associated site samples. Following are findings associated with field QC samples:

- Field Blanks and Equipment Rinsates: Three equipment rinsates and one field blank were collected and analyzed for cyanide in association with the ODA1 site samples. Cyanide was not detected above the DL in any of these samples. No equipment rinsate samples were analyzed for hexavalent chromium.

- Field Duplicate Samples: A total of 2 field duplicate pairs were collected and analyzed for hexavalent chromium. All other RPDs were within the control limits in FWQAPP Table 3-of ≤50%. The RPD criterion was only applied when both sample results were ≥5× the LOQ. In cases where results were <5× the LOQ, the reasonable control limit of ± the LOQ was applied. See Appendix C for comparisons of all samples and analytes.

4.4 DATA USABILITY

One planned ODA1 sample was not received at the laboratory. The field completeness was, therefore, 99%.

Some data were rejected for poor MS/MSD and calibration standard recoveries. In instances where a data point had multiple results, the reviewer chose the most technically sound result to report and rejected the remaining data points. These data points rejected to choose the most technically sound data do not affect data quality or usability and are not included in the table below. Data with RLs that exceeded the established criteria and data estimated for quality control outliers or for detects between the DL and the LOQ were included in the table below for informational purposes only.

Table 8. Analytical completeness for ODA1 validated primary data

			Number of Results					Percent Complete
Analysis	**Samples Analyzed**	**Analytes per Sample**	**Total**	**Rejected**	**DLs Exceeding Criteria**	**Estimated for QC Outliers**	**Estimated for Detects <LOQ**	
Explosives	9	17	149	0	0	149	0	100%
PCBs	1	9	9	0	0	0	0	100%
Pesticides	1	22	22	0	0	1	0	100%
SVOCs*	2	66	130	4	2	126	2	96.9%
VOCs	3	37	111	5	0	7	0	96.4%
Metals	9	23	207	2	0	176	6	99.0%
Nitroguanidine	1	1	1	0	0	1	0	100%
Nitrocellulose	4	1	4	0	0	0	0	100%
Hexavalent chromium	1	1	1	0	1	1	0	100%
Cyanide	1	1	1	0	0	1	0	100%

Analysis	Samples Analyzed	Analytes per Sample	Number of Results: Total	Rejected	DLs Exceeding Criteria	Estimated for QC Outliers	Estimated for Detects <LOQ	Percent Complete
Totals			635	11	3	462	2	98.3%

* The reviewer chose to report nitrobenzene, 2,4-dinitrotoluene and 2,6-dinitrotoluene from either the 8330B analyses or the 8270C analyses; therefore, these compounds are not included in the analytes count.

The analytical completeness goal for the project established in the FWQAPP was 90% for each method. The completeness goal was met for all analyses.

4.5 PRIMARY AND FIELD DUPLICATE COMPARISON SUMMARY

Primary and field duplicate sample comparisons were considered to be in good agreement as only 4% of the field duplicate pair results were above the FWQAPP control limit of 50% for soils or +/- the RL for results below the LOQ.

All of the outliers were metals and most discrepancies occurred in field duplicate pairs DA1SB-059M-0201-SO/DA1SB-081M-0203-SO and DA1SB-068M-0201-SO/DA1SB-084M-0201-SO. According to documents supplied by Shaw, DA1SB-059M-0201-SO was collected from 5-8 feet below ground surface and DA1SB-081M-0203-SO was collected between 8-12 feet below ground surface. Some sample heterogeneity likely between these depths and may explain some of the comparison outliers. All comparison results are presented in Appendix C.

Table 9. ODA1 primary/field duplicate sample comparison summary

Method	Number of Analytes	Primary/Field Duplicate Pairs	Total Analytes	Number of results within control limits	Number of results above control limit
Explosives*	17	7	117	117	0
PCBs	9	1	9	9	0
Pesticides	22	1	22	22	0
SVOCs*	66	1	63	63	0
VOCs*	2	37	71	71	0
Metals*	23	7	160	140	20
Nitroguanidine	1	2	2	2	0
Nitrocellulose	1	2	2	2	0
Hexavalent chromium	1	1	1	1	0
Cyanide	1	1	1	1	0

*Total analyte count affected by rejected results

4.6 SPECIFIC DATA CONCERNS

Specific concerns regarding the data are noted below:

- 2 benzo(a)pyrene DLs nominally exceeded the FWCUG by 0.01 mg/Kg)
- 1 hexavalent chromium DL exceeded the FWCUG of 1.9 mg/Kg by 0.26 mg/Kg
- Manual integrations performed for the MRL standards did not consistently adjust the baseline to account for a baseline anomaly that occurred just prior to the nitroguanidine retention time.
- Due to instrument limitations, the hexavalent chromium raw data did not list the sample absorbances; therefore, the reviewer was not able to calculate the sample results from the raw data.
- The actual temperature upon receipt was not noted by the laboratory. The temperature was noted only as being below some temperature (e.g. <4.2^{o}C).
- All explosive analyses were performed beyond the holding time.

In order to avoid repetition of the issues noted above, the following actions should be taken:

- MEC^{X} recommends the laboratory be requested to review the nitroguanidine manual integrations and determine their accuracy and set a policy for consistent baseline manual integration of MRL and low level calibration standards.
- MEC^{X} recommends the laboratory be requested to alter the hexavalent chromium instrument set up, if possible, in order to capture the raw absorbance.

5. SAND CREEK

5.1 PREVIOUS ACTIVITIES AND DATA

Sand Creek is a former open dump area containing construction and demolition type material. This debris was delivered to the site and dumped over approximately 1,200 feet of embankment located immediately adjacent to Sand Creek. There are no records indicating the quantities or materials dumped at the site and the operational dates for the landfill are unknown. Several buildings associated with the former Sand Creek Sewage Treatment Plant are located northeast of the site.

A removal action was performed by MKM in 2003 and included the removal of most of the surface debris. Shaw prepared a *Data Quality Objective Report* based on confirmation sampling performed by MKM and determined additional sampling was necessary to address data gaps.

5.2 CURRENT INVESTIGATION

Samples collected in association with the project described in this document were from soils and sediments collected from Sand Creek. The samples were collected in order to provide the additional characterization of the nature and extent of contamination at Sand Creek.

Table 10. Total sample count for Sand Creek

Matrix	Primary Samples	Field Duplicates	Split Samples	Explosives	Propellants	Pesticides	PCBs	SVOCs	VOCs	Metals	Cr^{6+}	Cyanide
Sediment	1	0	0	1	1	1	1	1	1	1	1	1
Soil	86	12	11	85	12	12	12	85	11	85	18	12

Table 11. Sand Creek validated samples and methods

Sample ID	SDG	Matrix	Collected	Explosives	Propellants	Pesticides	PCBs	SVOCs	VOCs	Metals	Cr^{6+}	Cyanide
SCSB-037M-0001-SO	81578	Soil	9/22/2010	x	--	--	--	x	--	x		--
SCSB-038M-0005-SO	81578	Soil	9/22/2010	x	--	--	--	x	--	x		--
SCSB-042M-0003-SO	81578	Soil	9/21/2010	x	--	--	--	x	--	x		--
SCSB-048D-0001-SO	81670	Soil	9/29/2010	--	--	--	--	--	x	--	--	--
SCSB-048M-0001-SO	81670	Soil	9/29/2010	x	x	x	x	x	--	x	x	--
SCSD-070M-0001-SD	81670	Sediment	9/28/2010	x	--	--	--	x	--	x	x	x
SCSS-058M-0001-SO	81670	Soil	9/23/2010	x	--	--	--	x	--	x	--	--
SCSS-068M-0001-SO	81578	Soil	9/21/2010	x	--	--	--	x	--	x	--	--
SCSS-073M-0001-SO	82400	Soil	11/9/2010	x	--	--	--	x	--	x	--	--
SCSS-076M-0001-SO	82400	Soil	11/9/2010	x	--	--	--	--	--	x	--	--

Table 12. Sand Creek field duplicate samples

Duplicate Sample ID	Parent Sample
SCSB-080D-0001-SO	SCSB-037D-0001-SO
SCSB-080M-0001-SO	SCSB-037M-0001-SO
SCSB-081D-0005-SO	SCSB-038D-0005-SO
SCSB-081M-0005-SO	SCSB-038M-0005-SO
SCSB-082M-0002-SO	SCSB-040M-0002-SO
SCSB-083M-0003-SO	SCSB-042M-0003-SO
SCSB-084D-0001-SO	SCSB-048D-0001-SO
SCSB-084M-0001-SO	SCSB-048M-0001-SO
SCSS-085M-0001-SO	SCSS-058M-0001-SO
SCSS-086D-0001-SO	SCSS-068D-0001-SO
SCSS-086M-0001-SO	SCSS-068M-0001-SO
SCSS-087M-0001-SO	SCSS-073M-0001-SO

5.2.1 Sample Collection

Except as noted below, no sample collection issues were noted.

SDG	Issue
All	The sample receipt temperatures were listed by the laboratory only as <## °C (e.g. <2.6 °C). As the samples were not received above 6.0 °C and were not noted to be frozen or damaged, no qualifications were applied.
Most	Some corrections made to the chain-of-custody by the sampler or by the laboratory were overwritten and some corrections were not initialed or dated.
81578	Sample SCSB-042M-0003-SO was listed on the chain-of-custody but was not received. The sample was apparently received in a following shipment as it was listed in the sample log-in.
81578	Sample SCSB-038M-0005-SO was listed on the chain-of-custody twice and two samples were received. As per Shaw, one sample was sent to the QA laboratory.
81578	Some collection times listed on the chain-of-custody did not match the sample containers. Shaw advised the laboratory to use the times listed on the sample containers.

5.2.2 Data Completeness

Data completeness for the project described in this report was found to be generally acceptable as no deliverables were missing from the SDGs reviewed.

5.2.3 Preservation and Holding Time Requirements

All method preservation requirements were met. Except as noted in the table below, all holding times, as listed in Table 3, were met. Results listed in the table below were qualified as estimated, "UJ," for nondetects and estimated with a potential negative bias, "J-" for detects. All qualified results were coded with an "H" qualification code.

Samples qualified for exceeded holding time			
Method	Analytes	Sample	Days past extraction holding time
8330B	All	SCSB-038M-0005-SO	7
		SCSB-042M-0003-SO, SCSB-037M-0001-SO	8
8330	Nitroguanidine	SCSB-048M-0001-SO	4
8330B	All	SCSB-048M-0001-SO	3
8330B	All	SCSD-070M-0001-SD	5
8330B	All	SCSS-058M-0001-SO	10
9012	Cyanide	SCSD-070M-0001-SD	8
8270C	All	SCSB-048M-0001-SO	5
8270C	All	SCSD-070M-0001-SD	6
8270C	All	SCSS-058M-0001-SO	8
8270C	All	SCSB-042M-0003-SO	10

5.2.4 Detection Limit Requirements

As per the SAP, the site specific cleanup goals (FWCUGs) for the Residential Farmer Adult, Residential Farmer Child, and National Guard Trainee, presented in the *Final Facility-Wide Human Health Remediation Goals at the RVAAP* (2010) were applicable to the ODA1 and Sand Creek sites. Due to the reporting issue noted in Section 3.5, MEC^X compared to the DL for the nondetected analytes to the most stringent FWCUG for each nondetected analyte. As per the SAP, if no FWCUG was listed, the USEPA Region 9 Residential Regional Screening Levels (RSL) was utilized.

These analytes had DLs which exceeded the FWCUG:

- 3 benzo(a)pyrene DLs nominally exceeded the FWCUG by 0.01 mg/Kg
- 2 hexavalent chromium DLs exceeded the FWCUG of 1.9 mg/Kg by 0.26 mg/Kg

No analytes had DLs which exceeded the RSLs.

The following had no FWCUG or RSL:

- 1 metal: potassium (nutrient)
- 8 pesticide compounds: alpha-chlordane, chlordane, endosulfan I, endosulfan II, endosulfan sulfate, endrin aldehyde, endrin ketone, and gamma-chlordane
- 3 VOCs: chloroethane, cis-1,3-dichloropropene, trans-1,3-dichloropropene
- 2 PCBS: Aroclor 1262, Aroclor-1268
- 2 VOCs: cis-1,3-dichloropropene, trans-1,3-dichloropropene
- 9 SVOC compounds: acenaphthylene, benzo(g,h,i)perylene, dimethyl phthalate, phenanthrene, 1,3-dichlorobenzene, 2-nitrophenol, 3-nitroaniline, 4-bromophenyl phenyl ether, 4-chlorophenyl phenyl ether

Results with DLs that exceed project criteria may be usable for their intended purposes; it is dependent on the final data user to make this determination on a case-by-case basis.

5.3 SAND CREEK DATA QUALITY EVALUATION

5.3.1 Explosives

CT analyzed 77 primary MI soil samples, 1 primary MI sediment sample, 8 soil field duplicate samples, 1 field blank, and 6 equipment rinsate samples for explosive compounds by USEPA SW-846 Method 8330B. MEC^X validated 8 soil and 1 sediment sample at Level IV.

- Detection Limit (DL) studies were not evaluated as part of this project.
- Calibration
    - Initial calibration average percent relative standard deviations (%RSDs) were within the control limits listed in DoD QSM Table F-3 of ≤20%, or the linear regression r^2 values were ≥0.990.
    - The second source initial calibration verification standard (ICV) recoveries for both the primary and confirmation calibrations were within the control limits listed in DoD QSM Table F-3 of ±20%.
    - The %D for 4-amino-2,6-dinitrotoluene in one CCV bracketing SCSB-042M-0003-SO was 18%; therefore, nondetected 4-amino-2,6-dinitrotoluene in SCSB-042M-0003-SO was qualified as estimated, "UJ." The qualified result was coded with a "C" qualification code. The remaining continuing calibration verification (CCV) standard recoveries were within the control limits listed in DoD QSM Table F-3 of ±20%.
    - As per FWQAPP Section 8.3.2.1.2, MRLs were analyzed. No control limits were listed in the FWQAPP; therefore, the reviewer utilized the reasonable control limits of 70-130%. One recovery for 2,6-dinitrotoluene was 60%; therefore, nondetected 2,6-dinitrotoluene in SCSS-076M-0001-SO was qualified as estimated, "UJ." All remaining recoveries were within the control limits.
- Blanks: The method blanks associated with the validated samples had no target compound detects above the control limits listed in DoD QSM Table F-3 of one-half the LOQ or one-tenth the amount detected in a sample.
- Laboratory Control Samples: Recoveries were within the control limits listed in DoD QSM Tables G-2 (poor performers) and G-13 for the listed compounds and within the reasonable laboratory control limits of 50-150% for nitroglycerin and PETN.
- Surrogate Recovery: As no surrogate control limit was listed in the DoD QSM, surrogate recoveries were assessed against the reasonable laboratory-established control limits of 75-127%. All recoveries were within the control limits.

- Matrix Spike/Matrix Spike Duplicate: No MS/MSD analyses were performed on a validated sample. Method accuracy was evaluated based on LCS results.

- Triplicates: No triplicate analyses were performed on a validated sample.

- Compound Identification: Compound identification was verified for those samples validated at a Level IV. Review of the sample chromatograms and retention times indicated no problems with target compound identification.

  The laboratory reported detects from the primary column. As DoD QSM Table F-3 does not designate which column results are to be reported from, the reviewer assessed both columns. For those samples validated at Level IV, no interferences were noted on the primary column; however, co-eluting peaks were noted on the confirmation column. It was the reviewer's professional opinion that the results should stand as reported by the laboratory.

- Compound Quantification and Reported Detection Limits: Compound quantification was verified for those samples validated at a Level IV. The LOQs were supported by the low point of the initial calibration and the laboratory DLs. Any result reported between the DL and the LOQ was qualified as estimated, "J." Although all hardcopy and EDD reported nondetected results to the DL, reported nondetects are valid to the LOD.

  In some instances, nitrobenzene, 2,4-dinitrotoluene and 2,6-dinitrotoluene were reported by both Methods 8330B and 8270C and both methods were validated at Level IV. As there were no detects for these compounds in the 8330B analyses and the 8270C LOQs were lower, the results for these compounds were rejected, "R," in the 8330B analyses in favor of the 8270C results, for the samples validated at Level IV. All rejected analytes were coded with a "D" qualification code.

- Target compound confirmation was performed for detects in the validated samples. The intercolumn RPD for 2,4,6-trinitrotoluene in SCSS-058M-0001-SO was 73%; therefore, the result was qualified as estimated, "J," and coded with an "*III" qualification code. All remaining RPDs were within the criteria listed in DoD QSM Table F-3 of ≤40%.

- System Performance: Review of the raw data indicated no problems with system performance.

- Some manual integrations were performed for initial calibration standards, CCVs and sample data reviewed at Level IV. All manual integrations were performed in order to report incompletely resolved peaks and were deemed acceptable by the reviewer.

- Field QC Samples: Field QC samples were evaluated, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. Any remaining detects were used to evaluate the associated site samples. Following are findings associated with field QC samples:

- Field Blanks and Equipment Rinsates: There were 6 equipment rinsate samples and 1 field blank associated with the Sand Creek site samples. 2,4-Dinitrotoluene was detected in one of the equipment rinsates but was not detected in any of the site samples. There were no other detects above the DL in these samples.

- Field Duplicates: A total of 8 soil field duplicates were collected and analyzed for explosive compounds. The RPD criterion listed in FWQAPP Table 3-1 of ≤50% was only applied when both sample results were ≥5× the LOQ. In cases where results were <5× the LOQ, the reasonable control limit of ± the LOQ was applied. All results were within the control limits. See Appendix C for comparisons of all samples and analytes.

5.3.2 Propellants

CT analyzed 8 primary MI soil samples, 1 primary MI sediment sample, 4 soil field duplicate samples, 1 field blank, and 3 equipment rinsate samples for nitroguanidine by USEPA SW-846 Method 8330 and nitrocellulose as nitrate/nitrite by modified SW-846 Method 9056. MEC^X validated 1 soil sample at Level IV.

- DL studies were not evaluated as part of this project.

- Calibration

  - Nitroguanidine initial calibration average percent relative standard deviations (%RSDs) were within the control limits listed in DoD QSM Table F-2 of ≤20%, or the linear regression r^2 values were ≥0.990. Nitrocellulose linear regression r values were within the control limit listed in the DoD QSM Table F-11 of ≥0.995.

  - The nitroguanidine second source ICV for both the primary and confirmation calibrations were within the control limits listed in DoD QSM Table F-2 of 85-115%. The nitrocellulose ICV recoveries were within the control limits listed in DoD QSM Table F-11 of 90-110%.

  - The nitroguanidine CCV standard %Ds were within the control limits listed in DoD QSM Table F-2 of ≤15%. The nitrocellulose CCV recoveries were within the control limits listed in DoD QSM Table F-11 of 90-110%.

  - As per FWQAPP Section 8.3.2.1.2, MRL standards are required and were analyzed. All recoveries were within the reasonable control limits of 70-130%.

- Blanks: The method blanks associated with the validated samples had no target compound detects above the control limits listed in DoD QSM Tables F-2 and F-11 of one-half the LOQ or one-tenth the amount detected in a sample.

- Laboratory Control Samples: No nitroguanidine LCS control limits are listed in the DoD QSM. All nitroguanidine recoveries were within the laboratory-established control limits of

50-150%. The nitrocellulose recoveries were within the control limits listed in DoD QSM Table F-11 of 80-120%.

- Surrogate Recovery: A surrogate was not used for the analyses of nitrocellulose. Surrogate control limits for 1,2-dinitrobenzene are not listed in the DoD QSM; therefore, the nitroguanidine surrogate recoveries were assessed against the laboratory control limits of 75-127%. The recoveries were within the control limits.

- Triplicates: No triplicate analyses were performed on a validated sample in these SDGs.

- Matrix Spike/Matrix Spike Duplicate: No matrix spikes were performed on a validated sample. Method accuracy was evaluated based on LCS results.

- Compound Identification: Compound identification was verified for those samples validated at a Level IV. Review of the sample chromatograms and retention times indicated no problems with target compound identification. As there were no primary column detects, no confirmation column analyses were performed.

- Compound Quantification and Reported Detection Limits: Compound quantification was verified for those samples validated at a Level IV. The LOQs were supported by the low point of the initial calibration and the laboratory DLs. Any result reported between the DL and the LOQ was qualified as estimated, "J." Although all hardcopy and EDD reported nondetected results to the DL, reported nondetects are valid to the LOD.

- System Performance: Review of the raw data indicated no problems with system performance.

- Some manual integrations were performed for the nitroguanidine MRLs. Manual integrations performed for the MRL standards did not consistently adjust the baseline to account for a baseline anomaly that occurred just prior to the nitroguanidine retention time. As the inconsistent baseline may have affected the MRL recoveries, it was the reviewer's professional opinion that nondetected nitroguanidine in SCSB-048M-0001-SO should be qualified as estimated, "UJ." The qualified results were coded with an "*III" qualification code. The low level calibration standard was also manually integrated to correct the baseline which was affected by a significant amount of noise.

- Field QC Samples: Field QC samples were evaluated, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. Any remaining detects were used to evaluate the associated site samples. Following are findings associated with field QC samples:

    - Field Blanks and Equipment Rinsates: There were 3 equipment rinsate samples and 1 field blank associated with the Sand Creek site samples. There were no detects above the DL in any of these samples.

- Field Duplicates: A single field duplicate pair was collected and analyzed for nitroguanidine and nitrocellulose. The RPD criterion listed in FWQAPP Table 3-1 of ≤50% was only applied when both sample results were ≥5× the LOQ. In cases where results were <5× the LOQ, the reasonable control limit of ± the LOQ was applied. All results were within the control limits. See Appendix C for comparisons of all samples and analytes.

5.3.3 Polychlorinated Biphenyls (PCBS)

CT analyzed 8 primary MI soil samples, 1 primary MI sediment sample, 4 soil field duplicate samples, 1 field blank, and 3 equipment rinsate samples for PCBs by USEPA SW-846 Method 8082. MEC^X validated 1 soil sample at Level IV.

- DL studies were not evaluated as part of this project.
- Calibration: Calibration criteria listed in the DoD QSM Table F-2 were met.
  - Initial calibration average %RSDs were within the control limits of ≤20% or r^2 values ≥0.990.
  - The second source ICV was within the control limit of ±20% of the true value for all applicable Aroclors.
  - The CCV standard %Ds were within the control limits of ±20%.
  - As per FWQAPP Section 8.3.2.1.2, MRL standards are required. Some recoveries were above the control limit; however, these did not affect nondetected results. All average MRL recoveries affecting sample data were within the reasonable control limits of 70-130%.
- Blanks: The method blanks had no target compound detects above the control limits listed in the DoD QSM Table F-2, of one-half the LOQ for target compounds or one-tenth the amount detected in a sample.
- Laboratory Control Samples: LCS recoveries were within the control limits listed in DoD QSM Table G-17 for soils, of 40-140% and 60-130% for Aroclors 1016 and 1260, respectively.
- Surrogate Recovery: Recoveries were within the control limits listed in DoD QSM Table G-3 of 60-125% for soils.
- Matrix Spike/Matrix Spike Duplicate: MS/MSD analyses were not performed on the validated soil sample from this SDG. Evaluation of method accuracy was based on the LCS results.
- Compound Identification: Compound identification was verified for the sample validated at Level IV. Review of the sample chromatograms, standards, and retention times

indicated no problems with target compound identification. The sample was analyzed on two analytical columns for target compound confirmation; however, the sample had no Aroclors detected on the primary column.

- Compound Quantification and Reported Detection Limits: Compound quantification was verified for the sample validated at a Level IV. The LOQs were supported by the low point of the initial calibration and the laboratory DLs. Any result reported between the DL and the LOQ was qualified as estimated, "J." Although all hardcopy and EDD reported nondetected results to the DL, reported nondetects are valid to the LOD.

- System Performance: Review of the raw data indicated no problems with system performance.

- Manual integrations were not performed for the sample or calibration and QC data associated with the sample data.

- Field QC Samples: Field QC samples were evaluated, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. Any remaining detects were used to evaluate the associated site samples. Following are findings associated with field QC samples:

    - Field Blanks and Equipment Rinsates: There were 3 equipment rinsate samples and 1 field blank associated with the Sand Creek site samples. There were no Aroclor detects above the DL in these samples.

    - Field Duplicates: There was 1 soil field duplicate pair collected and analyzed for PCBs. The RPD criterion listed in FWQAPP Table 3-1 of ≤50% was only applied when both sample results were ≥5× the LOQ. In cases where results were <5× the LOQ, the reasonable control limit of ± the LOQ was applied. All results were within the control limits. See Appendix C for comparisons of all samples and analytes.

5.3.4 Pesticides

CT analyzed 8 primary MI soil samples, 1 primary MI sediment sample, 4 soil field duplicate samples, 1 field blank, and 3 equipment rinsate samples for pesticides by USEPA SW-846 Method 8081. MEC^X validated 1 soil sample at Level IV.

- DL studies were not evaluated as part of this project.

- Calibration: Calibration criteria listed in the DoD QSM Table F-2 were met.

    - Initial calibration %RSDs were within the control limit of ≤20%, or r^2 values ≥0.990.

    - The ICV recoveries for all target analytes were within the control limit of ±20% of the true value.

- The DDT/Endrin breakdown standards were within the control limit listed in the DoD QSM Table F-2 of ≤15%.

- All bracketing CCV %Ds were within the control limit of ≤20%.

- As per FWQAPP Section 8.3.2.1.2, MRL standards are required. All MRL recoveries affecting sample data were within the reasonable control limits of 70-130%, with the exception of recoveries in both the beginning and ending MRLs for endrin on the secondary column of 60.0% and 59.5%, respectively. The nondetected result for endrin in sample SCSB-048M-0001-SO was qualified as estimated, "J," and qualified with a "C" qualification code.

- Blanks: The method blanks had no target compound detects above the control limits listed in the DoD QSM Table F-2, of one-half the LOQ or one-tenth the amount detected in a site sample.

- Laboratory Control Samples: Recoveries were within the control limits listed in the DoD QSM Table G-15.

- Surrogate Recovery: Recoveries were within the control limits listed in the DoD QSM Table G-3.

- Matrix Spike/Matrix Spike Duplicate: MS/MSD analyses were not performed on the validated soil sample from this SDG. Evaluation of method accuracy was based on the LCS results.

- Compound Identification: Compound identification was verified for the sample validated at Level IV. Review of the sample chromatograms and retention times indicated no problems with target compound identification.

- Compound Quantification and Reported Detection Limits: Compound quantification was verified for the validated sample. The LOQs were supported by the low point of the initial calibration and the laboratory DLs. Any result reported between the DL and the LOQ was qualified as estimated, "J." Although all hardcopy and EDD reported nondetected results to the DL, reported nondetects are valid to the LOD.

  The sample was analyzed on two analytical columns for target compound confirmation. Intercolumn RPDs for sample detects were ≤40%.

- System Performance: Review of the raw data indicated no problems with system performance.

- Manual integrations were not performed for the sample validated at Level IV or calibration and QC data associated with the sample data.

- Field QC Samples: Field QC samples were evaluated, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. Any remaining detects were used to evaluate the associated site samples. Following are findings associated with field QC samples:

  - Field Blanks and Equipment Rinsates: There were 3 equipment rinsate samples and 1 field blank associated with the Sand Creek site samples. The field blank had no detects above the DL. One equipment rinsate had a detect between the DL and LOQ for methoxychlor; however, methoxychlor was not detected in the associated sample. There were no other target compound detects above the DL. .

  - Field Duplicates: There was 1 soil field duplicate pair collected and analyzed for PCBs. The RPD criterion listed in FWQAPP Table 3-1 of ≤50% was only applied when both sample results were ≥5× the LOQ. In cases where results were <5× the LOQ, the reasonable control limit of ± the LOQ was applied. All results were within the control limits. See Appendix C for comparisons of all samples and analytes.

5.3.5 Semivolatile Organic Compounds (SVOCs)

CT analyzed 77 primary MI soil samples, 1 primary MI sediment sample, 8 soil field duplicate samples, 1 field blank, and 3 equipment rinsate samples for SVOCs by USEPA Method 8270C. MEC^X validated 7 soil samples and 1 sediment sample at Level IV.

- DL studies were not evaluated as part of this project.

- GC/MS Tuning: The DFTPP tunes met the method abundance criteria. The samples were analyzed within 12 hours of the DFTPP injection time.

- Calibration: Calibration criteria listed in the DoD QSM Table F-4 were met for all target compounds of interest, with exceptions affecting sample data listed below.

  - Initial calibration average RRFs and ICV and CCV RRFs were within method control limits of ≥0.050 for system performance check compounds (SPCCs). All initial calibration %RSDs were within the method control limits listed in the DoD QSM Table F-4 of ≤30% for calibration check compounds (CCCs) and ≤15% for remaining compounds, or r^2 values ≥0.990.

  - All second source ICV standard recoveries were within the control limit of ±20%.

  - Except as noted below, the continuing calibration %Ds affecting sample data were ≤20%. Results listed in the table below, all nondetects, were qualified as estimated, "UJ." All qualified results were coded with a "C" qualification code.

Samples qualified for CCV %D outliers		
Analyte	**%D**	**Qualified Samples**
3,3'-Dichlorobenzidine	25.8%	SCSB-042M-0003-SO

Samples qualified for CCV %D outliers		
Analyte	**%D**	**Qualified Samples**
3,3'-Dichlorobenzidine	25.8%	SCSB-037M-0001-SO, SCSB-038M-0001-SO

- As per FWQAPP Section 8.3.2.1.2, MRL standards are required. Recoveries were within the reasonable control limits of 70-130%, with exceptions noted below. Nondetected results associated with recoveries less than 10% were rejected, "R." The remaining results listed in the table below were qualified as estimated, "UJ," for nondetects, and "J," for detects. In the absence of qualifications with conflicting bias, detected results were estimated with a potential negative bias, "J-," or a potential positive bias, "J+." All qualified results were coded with a "C" qualification code.

Samples qualified for MRL recovery outliers		
Analyte	**%R**	**Qualified Samples**
4-Nitrophenol	62%	SCSS-073M-0001-SO
Benzyl alcohol	59%	SCSB-048M-0001-SO, SCSD-070M-0001-SD
3-Nitroaniline	68%	
2,4-Dinitrophenol	**0%**	
4-Nitrophenol	58%	
2-Nitrophenol	59%	
Hexachlorocyclopentadiene	**0%**	
2,4,5-Trichlorophenol	39%	
4,6-Dinitro-2-methylphenol	**0%**	
Benzo(k)fluoranthene	141%	
Indeno(1,2,3-cd)pyrene	36%	
Dibenzo(a,h)anthracene	39%	
Benzo(g,h,i)perylene	28%	
Benzyl alcohol	**5%**	SCSS-058M-0001-SO
Hexachlorocyclopentadiene	**9%**	
2,4-Dinitrophenol	66%	
4,6-Dinitro-2-methylphenol	50%	
Indeno(1,2,3-cd)pyrene	68%	
Benzo(g,h,i)perylene	54%	
4-Nitroaniline	58%	
Hexachlorocyclopentadiene	45%	SCSS-068M-0001-SO
3-Nitroaniline	42%	
Benzyl alcohol	58%	SCSB-037M-0001-SO, SCSB-038M-0001-SO
Hexachlorocyclopentadiene	11%	
2,4-Dinitrophenol	66%	
Benzyl alcohol	49%	SCSB-042M-0003-SO
4-Nitroaniline	58%	

Bold indicates rejected nondetect result

- Blanks: The method blanks had no target compound detects above the control limits listed in DoD QSM Table F-4 of one-half the LOQ for target compounds or one-tenth the amount detected in any sample, and no common laboratory contaminants.

- Laboratory Control Samples: Recoveries were within the control limits listed in the DoD QSM Tables G-2 (poor performers) and G-7, or within the laboratory-established control limits when no QSM limit was prescribed.

- Surrogate Recovery: Surrogate recoveries were within the control limits listed in the DoD QSM Table G-3.

- Matrix Spike/Matrix Spike Duplicate: No MS/MSD analyses were performed on a validated sample. Method accuracy was evaluated based on LCS results.

- Internal Standards Performance: Perylene-d12 was recovered at 38% in the analysis of SCSB-048M-0001-SO; therefore, the associated target compounds benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene were qualified as estimated, "J," for detects and, "UJ," for nondetects. The qualified results were coded with an "I" qualification code. All remaining internal standard area counts and all retention times were within the DoD QSM Table F-4 control limits established by the initial calibration midpoint standard: ±30 seconds for retention times and -50% / +100% for internal standard areas.

- Compound Identification: Compound identification was verified for the samples validated at Level IV. Review of the sample chromatograms, retention times, and spectra indicated no problems with target compound identification.

- Compound Quantification and Reported Detection Limits: Compound quantification was verified for the samples validated at Level IV. The LOQs were supported by the low point of the initial calibration and the laboratory DLs. Any result reported between the DL and the LOQ was qualified as estimated, "J," by the laboratory. Although all hardcopy and EDD reported nondetected results to the DL, reported nondetects are valid to the LOD.

- System Performance: Review of the raw data indicated no problems with system performance.

- Some routine manual integrations were performed for the samples and calibration and QC data associated with the sample data. All manual integrations reviewed at Level IV were considered appropriate.

- Field QC Samples: Field QC samples were evaluated, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. Any remaining detects were used to evaluate the associated site samples. Following are findings associated with field QC samples:

- Field Blanks and Equipment Rinsates: A total of 6 equipment rinsate samples and 1 field blank were collected and analyzed for SVOCs. Benzyl alcohol was detected several of these samples but was not detected in the associated validated samples. Bis(2-ethylhexyl)phthalate was detected in the equipment rinsates associated with SCSS-068M-0001-SO and SCSB-037M-0001-SO at 1.7 and 1.9 µg/L, respectively; therefore, the detects for bis(2-ethylhexyl)phthalate in these samples were qualified as nondetected, "U," at the LOD. There were no other reportable detects above the DL in the equipment rinsates.

- Field Duplicate Samples: A total of 7 field duplicate samples were collected and analyzed for SVOCs. The control limit listed in FWQAPP Table 3-1 of ≤50% was only applied when both sample results were ≥5× the LOQ. In cases where results were <5× the LOQ, the reasonable control limit of ± the LOQ was applied. Except as noted below, all results were within the control limits. See Appendix C for comparisons of all samples and analytes.

SVOC field duplicate outliers				
Primary Sample	**Field Duplicate**	**Analyte**	**RPD**	**W/In LOQ**
SCSD-058M-0001-SO	SCSB-085M-0001-SO	Benzo(b)fluoranthene	N/A	No
		Fluoranthene	N/A	No
		Phenanthrene	N/A	No
		Pyrene	N/A	No

5.3.6 Volatile Organic Compounds (VOCs)

CT analyzed 7 primary discrete soil samples, 1 primary discrete sediment sample, 4 soil field duplicate samples, 1 field blank, 3 equipment rinsate samples, and 7 trip blank samples for volatile compounds by USEPA SW-846 Method 8260B. MEC^X validated 1 primary soil sample at Level IV.

- DL studies were not evaluated as part of this project.

- GC/MS Tuning: The BFB tunes met the method abundance criteria. Samples were analyzed within 12 hours of the BFB injection time.

- Calibration: Calibration criteria listed in the DoD QSM Table F-4 were met for all target compounds, with exceptions affecting sample data noted below.

  - Initial calibration average RRFs were within the control limit of ≥0.05, and the %RSDs were within the control limit of ≤15%, or r values ≥0.995.

  - The ICV RRFs were within the control limit of ≥0.05. Recoveries for all target analytes were within the control limits of ±20% of the true value.

  - Continuing calibration RRFs were within the control limit of ≥0.05 for all target compounds, and %Ds were within the control limit of ≤20.

- As per FWQAPP Section 8.3.2.1.2, MRL standards are required. With exceptions noted in the table below, all recoveries affecting sample data were within the reasonable control limits of 70-130%. Recoveries above the control limits did not affect nondetected results. The results listed in the table below, all nondetects, were qualified as estimated, "UJ." All qualified results were coded with a "C" qualification code.

Samples qualified for MRL recovery outliers		
Analyte	**MRL %Rs Begin / End**	**Qualified Samples**
Carbon disulfide	--- / 68%	SCSB-048D-0001-SO
Dibromochloromethane	--- / 63%	
trans-1,3-Dichloropropene	--- / 69%	

- Blanks: The method blank had no target compound detects above the control limits listed in DoD QSM Table F-4 of one-half the LOQ for target compounds and no common laboratory contaminant detects above the LOQ.

- Laboratory Control Samples: Recoveries were within the control limits listed in DoD QSM Table G-5.

- Surrogate Recovery: Recoveries were within the control limits listed in DoD QSM Table G-3 or within laboratory-established control limits for those not listed in Table G-3.

- Matrix Spike/Matrix Spike Duplicate: MS/MSD analyses were not performed on the validated sample in this SDG. Evaluation of method accuracy was based on the LCS results.

- Internal Standards Performance: The internal standard area counts and retention times were within the DoD QSM Table F-4 control limits established by the initial calibration midpoint standard: ±30 seconds for retention times and -50%/+100% for internal standard areas.

- Compound Identification: Compound identification was verified for the sample validated at Level IV. Review of the sample chromatogram, retention times, and spectra indicated no problems with target compound identification.

- Compound Quantification and Reported Detection Limits: Compound quantification was verified for the validated sample. The LOQs were supported by the low point of the initial calibration and the laboratory DLs. Any result reported between the DL and the LOQ was qualified as estimated, "J." Although all hardcopy and EDD reported nondetected results to the DL, reported nondetects are valid to the LOD.

- System Performance: Review of the raw data indicated no problems with system performance.

- Manual integrations were not performed for the samples validated at Level IV or the associated calibration or QC.

- Field QC Samples: Field QC samples were evaluated, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. Any remaining detects were used to evaluate the associated site samples. Following are findings associated with field QC samples:

  - Trip Blanks: The laboratory analyzed 7 trip blank samples. The trip blanks had no target compounds detected above the DL.

  - Field Blanks and Equipment Rinsates: There were 3 equipment rinsates and one field blank associated with the Sand Creek site samples. These samples had detects at or just above the LOQ for chloroform and detects between the DL and LOQ for methylene chloride and chloromethane. None of the field QC contaminants were detected in the validated site samples. The field blank and equipment rinsates had no other target compound detects above the DL.

  - Field Duplicates and Field Split Samples: There were 4 soil field duplicate pairs collected and analyzed for VOCs. The control limit listed in FWQAPP Table 3-1 of ≤50% was only applied when both sample results were ≥5× the LOQ. In cases where results were <5× the LOQ, the reasonable control limit of ± the LOQ was applied. Except as noted below, all results were within the control limits. See Appendix C for comparisons of all samples and analytes.

VOC field duplicate outliers				
Primary Sample	**Field Duplicate**	**Analyte**	**RPD**	**W/In LOQ**
SCSD-048D-0001-SO	SCSB-084D-0001-SO	Benzene	N/A	No
		Ethylbenzene	N/A	No
		m,p-Xylenes	N/A	No
		o-Xylene	N/A	No
		Toluene	N/A	No

5.3.7 Metals

CT analyzed 77 primary MI soil samples, 1 primary MI sediment sample, 8 soil field duplicate samples, 1 field blank, and 3 equipment rinsate samples for various metals by USEPA Methods 6010C and 7470A/7471A. MEC^X validated 8 soils and 1 sediment sample at Level IV.

- DL studies were not evaluated as part of this project.

- Calibration: Except as noted below, calibration criteria were met.

  - Initial calibration: Linear regression r-values were within the control limit listed in the DoD QSM Tables F-7 and F-8 of ≥0.995.

  - The ICV recoveries were within the control limits listed in DoD QSM Table F-7 of 90-110%. The laboratory analyzed a pair of CCVs. The lower concentration CCV

had analyte concentrations too high to be considered a low-level calibration check standard; therefore, it was assessed against the CCV control limits of 90-110%. Except as noted below, the CCVs were within the control limits. The mercury ICV and CCV recoveries were within the control limits listed in DoD QSM Table F-7 of 90-110% and 80-120%, respectively.

- The laboratory analyzed CRDL standards which ranged from nominally above the LOQ to almost 10× the LOQ. Except as noted below, the CRDL standard recoveries were within the reasonable control limits of 80-120%. Results listed in the table below were qualified as estimated, "UJ," for nondetects and, "J," for detects. All qualified results were coded with a "C" qualification code.

Samples qualified for CRDL recovery outliers		
Analyte	**%R**	**Qualified Samples**
Thallium	78%	SCSB-042M-0003-SO
Antimony	121%	SCSS-073M-0001-SO
Selenium	129%	SCSS-073M-0001-SO
Selenium	78%	SCSS-076M-0001-SO
Mercury	75%	SCSS-076M-0001-SO

The MRL required in DoD QSM Table F-7 is to be at or below analyte LOQ. As no MRL was analyzed for beryllium, cadmium, manganese, potassium, and sodium, sample results for these analytes which were less than 10× the LOQ were qualified as estimated, "J," for detects and, "UJ," for nondetects. Results higher than 10× the LOQ were not qualified as it was the reviewer professional opinion that at those concentrations, the CCVs were indicative of instrument performance.

- Blanks: Except as noted below, the method blanks and CCBs had no applicable detects above the control limit listed in DoD QSM Tables F-7 and F-8 of one-half the LOQ or one-tenth the amount detected in a sample.

  Results associated with negative blanks were qualified as estimated, "UJ," for nondetects and, "J," for detects. In the absence of qualifications with conflicting bias, detects were qualified as estimated with a potential negative bias, "J-." The remaining results listed in the table below were qualified as nondetected, "U," at the LOD if detected below the LOD or at the level of contamination if detected above. All qualified results were coded with a "B" qualification code.

Samples qualified for CCB detects			
Analyte	**Blank Detect**	**LOD**	**Qualified Samples**
Thallium	-4.91 µg/L	0.082 µg/L	SCSS-073M-0001-SO
Thallium	-8.33 µg/L	0.082 µg/L	SCSS-076M-0001-SO

- Interference Check Samples: ICP and ICPMS interference check sample A (ICSA) and AB (ICSAB) recoveries were within the control limits listed in DoD QSM Table F-8 of 80-

120%. No analytes were detected in the ICSA above the control limit listed in DoD QSM Table F-8 of <LOD.

- Laboratory Control Samples: The recoveries were within the control limits listed in DoD QSM Tables G-18 and G-19 of 80-120%.

- Laboratory Duplicates: Laboratory duplicate analyses were performed on SCSB-041M-0002-SO, SCSB-039M-0002-SO, SCSB-038M-0001-SO, and SCSS-057M-0001-SO. Except as noted below, the laboratory duplicate RPDs were within the control limits listed in DoD QSM Table F-7 of ≤20%. The duplicate criterion was only applied when the original sample result was nominally ≥5× the LOQ. In cases where the original sample result was <5× the LOQ, the reasonable control limit of ± the LOQ was applied.

  Results listed in the table below were qualified as estimated, "J," for detects and, "UJ," for nondetects. All qualified results were coded with an "E" qualification code. As per the National Functional Guidelines, all samples of the same matrix in an SDG were qualified for a laboratory duplicate RPD outlier.

Samples qualified for laboratory duplicate RPD outliers			
Parent Sample	**Analyte**	**RPD**	**Qualified Samples**
SCSB-038M-0001-SO	Arsenic	38%	SCSB-037M-0001-SO, SCSB-038M-0005-SO, SCSB-042M-0003-SO, SCSS-068M-0001-SO
	Copper	22%	
	Lead	28%	
	Nickel	21%	
	Thallium	22%	
	Vanadium	24%	
	Zinc	22%	
SCSB-038M-0005-SO	Arsenic	±LOQ	SCSB-037M-0001-SO, SCSB-038M-0005-SO, SCSB-042M-0003-SO, SCSS-068M-0001-SO
	Thallium	±LOQ	
SCSS-057M-0001-SO	Arsenic	32%	SCSB-048M-0001-SO, SCSD-070M-0001-SD, SCSS-058M-0001-SO
	Thallium	±LOQ	

- Matrix Spike/Matrix Spike Duplicate: MS/MSD analyses were performed on SCSB-041M-0002-SO, SCSB-039M-0002-SO, SCSB-038M-0001-SO, and SCSS-057M-0001-SO. Except as noted below, recoveries were within the control limits listed in DoD QSM Table G-19 of 80-120%. Matrix spike control limits were not applied when the native sample concentration exceeded the spiked amount by a factor of four or more.

  Nondetected cadmium results listed in the table below associated with recoveries less than 30% had post digestion spike recoveries greater than 75%; therefore, as per the National Functional Guidelines, nondetected cadmium results were qualified as estimated instead of rejected. The nondetected antimony results associated with recoveries less than 30% were rejected, "R." The remaining results noted in the table

below were qualified as estimated, "J," for detects and "UJ," for nondetects in the associated samples; however, nondetected results were not qualified for recoveries above the control limit. Results were qualified when one or both recoveries were outside the control limits. All qualified results were coded with a "Q" qualification code. When no other qualifications with conflicting bias were assigned to a result, detected results with low recoveries were assigned a negative bias, "J-," and detected results with high recoveries were assigned a positive bias, "J+." As per the National Functional Guidelines, all samples of the same matrix in an SDG were qualified for an MS/MSD recovery outlier. Parent samples were only qualified for outliers reported in that parent sample.

Samples qualified for MS/MSD recovery outliers			
Parent Sample	**Analyte**	**%Rs**	**Qualified Samples**
SCSB-041M-0002-SO	**Antimony**	**24%, 23%**	SCSB-037M-0001-SO, SCSB-038M-0005-SO, SCSB-042M-0003-SO, SCSS-068M-0001-SO
	Cobalt	12%, 10%	
	Copper	69%, 63%	
	Nickel	72%, 67%	
	Vanadium	79%, 74%	
	Zinc	74%, 68%	
	Manganese	14%, 10%	
	Thallium	74%, 73%	
	Aluminum	52%, 37%	
	Potassium	76%, 76%	
	Cadmium	---, 76%	
	Lead	---, 72%	
	Magnesium	---, 75%	
	Selenium	---, 78%	
SCSB-039M-0002-SO	**Antimony**	**0%, 0%**	SCSB-037M-0001-SO, SCSB-038M-0005-SO, SCSB-042M-0003-SO, SCSS-068M-0001-SO
	Cadmium	78%, 78%	
	Cobalt	50%, 50%	
	Copper	71%, 70%	
	Selenium	71%, 70%	
	Vanadium	68%, 66%	
	Zinc	71%, 67%	
	Thallium	70%, 75%	
	Potassium	78%, ---	
	Nickel	---, 78%	
SCSB-038M-0001-SO	**Antimony**	**0%, 0%**	SCSB-037M-0001-SO, SCSB-038M-0005-SO, SCSB-042M-0003-SO, SCSS-068M-0001-SO
	Cadmium	56%, 0%	
	Chromium	0%, 0%	
	Cobalt	63%, 0%	
	Copper	46%, 0%	
	Nickel	74%, 0%	
	Selenium	71%, 4%	
	Thallium	56%, 2%	
	Vanadium	75%, ---	

Samples qualified for MS/MSD recovery outliers			
Parent Sample	**Analyte**	**%Rs**	**Qualified Samples**
	Zinc	74%, ---	
	Arsenic	---, 7%	
	Lead	---, 0%	
SCSS-057M-0001-SO	**Antimony**	**26%, 29%**	SCSB-037M-0001-SO, SCSB-038M-0005-SO, SCSB-042M-0003-SO, SCSS-068M-0001-SO
	Potassium	67%, 59%	
	Sodium	72%, 72%	
SCSB-051M-0001-SO	Aluminum	28%, 23%	SCSB-048M-0001-SO, SCSD-070M-0001-SD, SCSS-058M-0001-SO
	Antimony	24%, 18%	
	Lead	179%, ---	
	Thallium	69%, 63%	
	Cadmium	---, 69%	
	Cobalt	---, 75%	
	Copper	---, 55%	
	Nickel	---, 75%	
	Zinc	---, 55%	

"- -" Indicates an acceptable sample recovery.

Except as noted below, MS/MSD RPDs were within the control limit listed in DoD QSM Tables G-7 and G-8 of ≤20%. Results noted in the table below were qualified as estimated, "J," for detects and "UJ," for nondetects. All qualified results were coded with an "*III" qualification code. As per the National Functional Guidelines, all samples of the same matrix in an SDG were qualified for an RPD outlier. Parent samples were only qualified for outliers reported in that parent sample.

Samples qualified for MS/MSD RPD outliers			
Parent Sample	**Analyte**	**RPD**	**Qualified Samples**
SCSB-038M-0001-SO	Arsenic	200%	SCSB-037M-0001-SO, SCSB-038M-0005-SO, SCSB-042M-0003-SO, SCSS-068M-0001-SO
	Cadmium	200%	
	Cobalt	199%	
	Copper	200%	
	Lead	200%	
	Nickel	200%	
	Thallium	174%	
	Zinc	200%	
SCSB-051M-0001-SO	Antimony	27%	SCSB-048M-0001-SO, SCSD-070M-0001-SD, SCSS-058M-0001-SO
	Cadmium	30%	
	Lead	57%	

- Serial Dilution: Serial dilution analyses were performed on SCSB-041M-0002-SO, SCSB-039M-0002-SO, SCSB-038M-0001-SO, and SCSS-057M-0001-SO. Except as noted below, serial dilution %Ds were within the control limit listed in DoD QSM Table F-8 of ≤10%. The serial dilution control limit is only applicable when the original sample concentration is minimally ≥50× the DL for ICP analytes and ≥25× the DL for mercury.

All detected results for the analytes noted in the table below were qualified as estimated, "J," and were coded with an "A" qualification code. When no other qualifications with conflicting bias were assigned to a result, detected results were assigned a negative bias, "J-." As per the National Functional Guidelines, all samples of the same matrix in an SDG were qualified for an associated %D outlier. Parent samples were only qualified for outliers reported in that parent sample.

Samples qualified for serial dilution %D outliers			
Parent Sample	**Analyte**	**%D**	**Qualified Samples**
SCSB-041M-0002-SO	Antimony	21%	SCSB-037M-0001-SO, SCSB-038M-0005-SO, SCSB-042M-0003-SO, SCSS-068M-0001-SO
	Arsenic	11%	
	Cobalt	20%	
	Copper	19%	
	Lead	79%	
	Magnesium	11%	
	Nickel	17%	
	Vanadium	24%	
	Zinc	21%	
	Iron	18%	
	Aluminum	13%	
SCSB-039M-0002-SO	Aluminum	11%	SCSB-037M-0001-SO, SCSB-038M-0005-SO, SCSB-042M-0003-SO, SCSS-068M-0001-SO
	Barium	11%	
	Beryllium	12%	
	Calcium	13%	
	Chromium	16%	
	Cobalt	27%	
	Copper	29%	
	Lead	73%	
	Magnesium	12%	
	Manganese	16%	
	Nickel	18%	
	Vanadium	18%	
	Zinc	28%	
SCSB-038M-0001-SO	Chromium	112%	SCSB-037M-0001-SO, SCSB-038M-0005-SO, SCSB-042M-0003-SO, SCSS-068M-0001-SO
	Cobalt	23%	
	Copper	26%	
	Lead	31%	
	Magnesium	13%	
	Nickel	25%	
	Vanadium	17%	
	Zinc	19%	
	Mercury	42%	
SCSS-057M-0001-SO	Aluminum	16%	SCSB-037M-0001-SO, SCSB-038M-0005-SO, SCSB-042M-0003-SO, SCSS-068M-0001-SO
	Barium	18%	
	Calcium	16%	
	Chromium	15%	
	Magnesium	16%	

Samples qualified for serial dilution %D outliers			
Parent Sample	**Analyte**	**%D**	**Qualified Samples**
	Manganese	15%	
	Nickel	11%	
	Zinc	17%	
SCSS-057M-0001-SO	Aluminum	16%	SCSB-048M-0001-SO, SCSD-070M-0001-SD, SCSS-058M-0001-SO
	Barium	18%	
	Calcium	16%	
	Chromium	15%	
	Magnesium	16%	
	Manganese	15%	
	Nickel	11%	
	Zinc	17%	
SCSB-051M-0001-SO	Zinc	16%	SCSB-048M-0001-SO, SCSD-070M-0001-SD, SCSS-058M-0001-SO

- Sample Result Verification: For Level IV validation, calculations were verified and the sample results reported on the sample result summary were verified against the raw data. Any result reported between the DL and the LOQ was qualified as estimated, "J." Although all hardcopy and EDD reported nondetected results to the DL, reported nondetects are valid to the LOD.

- Manual Integrations: No manual integrations were noted in the mercury analyses.

- Field QC Samples: Field QC samples were evaluated, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. Any remaining detects were used to evaluate the associated site samples. Following are findings associated with field QC samples:

  - Field Blanks and Equipment Rinsates: There were 3 equipment rinsate samples and 1 field blank associated with the Sand Creek site samples. There were detects in these samples, but not at sufficient concentrations to qualify the soil samples.

  - Field Duplicate Samples: There were 8 field duplicate samples collected and analyzed for metals. Except as noted below, the RPDs were within the control limits in FWQAPP Table 3-1 of ≤50%. The RPD criterion was only applied when both sample results were ≥5× the LOQ. In cases where results were <5× the LOQ, the reasonable control limit of ± the LOQ was applied. See Appendix C for a complete comparison of all primary and field duplicate results.

Metals field duplicate outliers				
Primary Sample	**Field Duplicate**	**Analyte**	**RPD**	**W/In LOQ**
SCSB-048M-0001-SO	SCSB-084M-0001-SO	Calcium	54%	N/A
		Chromium	100%	N/A
		Magnesium	55%	N/A
		Manganese	54%	N/A

Metals field duplicate outliers				
Primary Sample	**Field Duplicate**	**Analyte**	**RPD**	**W/In LOQ**
		Nickel	70%	N/A
		Potassium	54%	N/A
		Sodium	N/A	No
SCSB-042M-0003-SO	SCSB-083M-0003-SO	Barium	76%	N/A
		Lead	104%	N/A
		Cadmium	N/A	No
		Thallium	N/A	No
SCSB-037M-0001-SO	SCSB-080M-0001-SO	Chromium	52%	N/A
SCSS-058M-0001-SO	SCSS-085M-0001-SO	Calcium	70%	N/A
		Sodium	N/A	No
SCSS-068M-0001-SO	SCSS-086M-0001-SO	Chromium	131%	N/A
		Sodium	N/A	No
SCSB-040M-0002-SO	SCSB-082M-0002-SO	Antimony	N/A	No
		Thallium	N/A	No
SCSS-073M-0001-SO	SCSS-087M-0001-SO	Antimony	N/A	No
		Thallium	N/A	No

5.3.8 General Chemistry - Hexavalent Chromium and Cyanide

CT analyzed 14 primary MI soil samples, 1 primary sediment sample, and 4 soil field duplicate samples for hexavalent chromium by USEPA Method 7196A. CT analyzed 8 primary MI soil samples, 1 primary MI sediment samples, 4 field duplicate samples, 1 field blank, and 3 equipment rinsate samples by USEPA Method 9012A for cyanide. MEC^X validated 1 soil and 1 sediment sample for hexavalent chromium and 1 sediment sample for cyanide at Level IV.

- DL studies were not evaluated as part of this project.
- Calibration: Calibration criteria were met.
  - Initial calibration: Initial calibration linear regression r values were within the control limit listed in the DoD QSM Tables F-9 and F-10 of ≥0.995.
  - The ICV and CCV recoveries were within the control limits listed in DoD QSM Table F-9 of 90-110% for hexavalent chromium and Table F-10 of 85-115% for cyanide.
  - As per FWQAPP Section 8.3.2.1.2, MRLs are required. Cyanide MRLs analyzed in association with the soil samples were recovered within the reasonable control limits of 70-130%. As the laboratory did not analyze hexavalent chromium MRLs, the hexavalent chromium results, both nondetects, were qualified as estimated, "UJ." The qualified results were coded with a "C" qualification code.
- Blanks: The method blanks and CCBs had no applicable detects above the control limit listed in the DoD QSM Table F-9 and F-10 of one-half the LOQ or one-tenth the amount detected in a sample.

- Laboratory Control Samples: There are no QSM control limits for hexavalent chromium or cyanide LCS recoveries. The hexavalent chromium recoveries were within the laboratory-established control limits of 83-115% and cyanide was within the laboratory-established control limits of 69-128%.

- Laboratory Duplicates: Laboratory duplicate analyses were performed on SCSS-057M-0001-SO for hexavalent chromium and cyanide. There were no detects in either the parent or duplicate samples.

- Matrix Spike/Matrix Spike Duplicate: Soluble and insoluble matrix spikes were performed on SCSS-057M-0001-SO for hexavalent chromium. The recoveries were 13% and 19%, respectively. As per the National Function Guidelines, because the hexavalent chromium post digestion spike was recovered within the control limits of 75-125%, the results were not rejected. Nondetected hexavalent chromium in SCSB-048M-0001-SO and SCSD-070M-0001-SD was qualified as estimated, "UJ." The qualified results were coded with a "Q" qualification code.

- Sample Result Verification: For Level IV validation, calculations were verified and the sample results reported on the sample result summary were verified against the raw data. Any result reported between the DL and the LOQ was qualified as estimated, "J." Although all hardcopy and EDD reported nondetected results to the DL, reported nondetects are valid to the LOD.

  Due to the age of the hexavalent chromium instrument, sample absorbances are not reported. As such, the reviewer was not able to verify the sample results from the raw data.

- Manual Integrations: Manual integrations are not applicable to these analyses.

- Field QC Samples: Field QC samples were evaluated, and if necessary, qualified based on method blanks and other laboratory QC results affecting the usability of the field QC data. Any remaining detects were used to evaluate the associated site samples. Following are findings associated with field QC samples:

  - Field Blanks and Equipment Rinsates: There were 3 equipment rinsates and 1 field blank were collected and analyzed for cyanide in association with the Sand Creek site samples. Cyanide was not detected above the DL in any of the equipment rinsate samples. No equipment rinsate samples were analyzed for hexavalent chromium.

  - Field Duplicate Samples: There was 1 field duplicate pair collected and analyzed for hexavalent chromium. The RPD criterion listed in FWQAPP Table 3-1 of ≤50% was only applied when both sample results were ≥5× the LOQ. In cases where results were <5× the LOQ, the reasonable control limit of ± the LOQ was applied. All results were within the control limits. See Appendix C for comparisons of all samples and analytes.

5.4 DATA USABILITY

As all planned Sand Creek samples were collected, the field completeness was 100%.

Some data were rejected for poor MS/MSD and calibration standard recoveries. In instances where a data point had multiple results, the reviewer chose the most technically sound result to report and rejected the remaining data points. These data points rejected to choose the most technically sound data do not affect data quality or usability and are not included in the table below. Data with RLs that exceeded the established criteria and data estimated for quality control outliers or for detects between the MDL and the RL were included in the table below for informational purposes only.

Table 13. Analytical completeness for Sand Creek validated primary data

			Number of Results					
Analysis	**Samples Analyzed**	**Analytes per Sample**	**Total**	**Rejected**	**DLs Exceeding Criteria**	**Estimated for QC Outliers**	**Estimated for Detects <LOQ**	**Percent Complete**
Explosives	9	17	137	0	0	91	1	100%
PCBs	1	9	9	0	0	0	0	100%
Pesticides	1	22	22	0	0	1	2	100%
SVOCs*	8	66	520	8	3	272	89	98.5%
VOCs	1	37	37	0	0	3	0	100%
Metals	9	23	207	2	0	142	5	99.0%
Nitroguanidine	1	1	1	0	0	1	0	100%
Nitrocellulose	1	1	1	0	0	0	0	100%
Hexavalent chromium	2	1	2	0	2	2	0	100%
Cyanide	1	1	1	0	0	1	1	100%
		Totals	**937**	**10**	**5**	**513**	**98**	**98.9%**

*The reviewer chose to report nitrobenzene, 2,4-dinitrotoluene and 2,6-dinitrotoluene from either the 8330B analyses or the 8270C analyses; therefore, these compounds are not included in the analytes count.

The analytical completeness goal for the project established in the FWQAPP was 90% for each method. The completeness goal was met for all analyses.

5.5 PRIMARY AND FIELD DUPLICATE COMPARISON SUMMARY

Primary and field duplicate sample comparisons were considered to be in good agreement as only 3% of the field duplicate pair results were above the FWQAPP control limit of 50% for soils or +/- the RL for results below the RL.

Most of the outliers were metals and most discrepancies occurred in field duplicate pair SCSS-058M-0001-SO/SCSS-085M-0001-SO. In general, the parent samples had higher concentrations than the field duplicates. No sample depth information was listed in documents

provided by Shaw; therefore, no assessment of sample variability based on differing sample depths could be made. All comparison results are presented in Appendix C.

Table 14. Sand Creek primary/field duplicate sample comparison summary

Method	Number of Analytes	Primary/Field Duplicate Pairs	Total Analytes	Number of results within control limits	Number of results above control limit
Explosives*	8	17	122	122	0
PCBs	1	9	9	9	0
Pesticides	1	22	22	22	0
SVOCs*	7	66	451	447	4
VOCs	4	37	148	143	5
Metals*	8	23	182	162	20
Nitroguanidine	1	1	1	1	0
Nitrocellulose	1	1	1	1	0
Hexavalent chromium	1	1	1	1	0

*Total analyte count affected by rejected results

5.6 SPECIFIC DATA CONCERNS

Specific concerns regarding the data are noted below:

- 3 benzo(a)pyrene DLs (nominally exceeded the FWCUG by 0.01 mg/Kg)
- 2 hexavalent chromium DLs exceeded the FWCUG of 1.9 mg/Kg by 0.26 mg/Kg
- Manual integrations performed for the MRL standards did not consistently adjust the baseline to account for a baseline anomaly that occurred just prior to the nitroguanidine retention time.
- Due to instrument limitations, the hexavalent chromium raw data did not list the sample absorbances; therefore, the reviewer was not able to calculate the sample results from the raw data. Due to instrument limitations, the hexavalent chromium raw data did not list the sample absorbances; therefore, the reviewer was not able to calculate the sample results from the raw data.
- The actual temperature upon receipt was not noted by the laboratory. The temperature was noted only as being below some temperature (e.g. <4.2°C).
- All explosive analyses were performed beyond the holding time.

In order to avoid repetition of the issues noted above, the following actions should be taken:

- MEC^X recommends the laboratory be requested to review the nitroguanidine manual integrations and determine their accuracy and set a policy for consistent baseline manual integration of MRL and low level calibration standards.

- MEC^X recommends the laboratory be requested to alter the hexavalent chromium instrument set up, if possible, in order to capture the raw absorbance.

6. DATA USABILITY

A summary of the qualifications applied to the data can be found in Appendix B as can a summary of all rejected results.

AOC-specific field and analytical completeness results can be found in Sections 4 and 5.

Some data were rejected due to matrix spike/matrix spike duplicate recovery and calibration outliers. Rejected data are not usable. Results with DLs that exceed project criteria may be usable for their intended purposes; however, it is dependent on the final data user to make this determination on a case-by-case basis. All remaining results are usable for their intended purposes as qualified by MEC^X.

7. CONCLUSIONS AND RECOMMENDATIONS

Specific concerns regarding the data are noted below:

- 3 hexavalent chromium DLs exceeded the FWCUG of 1.64 mg/Kg, at 1.9 mg/Kg
- 5 benzo(a)pyrene DLs nominally exceeded the FWCUG of 0.023 mg/Kg, at 0.022 mg/Kg
- Manual integrations performed for the MRL standards did not consistently adjust the baseline to account for a baseline anomaly that occurred just prior to the nitroguanidine retention time.
- Due to instrument limitations, the hexavalent chromium raw data did not list the sample absorbances; therefore, the reviewer was not able to calculate the sample results from the raw data. Due to instrument limitations, the hexavalent chromium raw data did not list the sample absorbances; therefore, the reviewer was not able to calculate the sample results from the raw data.
- The actual temperature upon receipt was not noted by the laboratory. The temperature was noted only as being below some temperature (e.g. <4.2^{o}C).
- All explosive analyses were performed beyond the holding time.

In order to avoid repetition of the issues noted above, the following actions should be taken:

- MEC^{X} recommends the laboratory be requested to review the nitroguanidine manual integrations and determine their accuracy and set a policy for consistent baseline manual integration of MRL and low level calibration standards.
- MEC^{X} recommends the laboratory be requested to alter the hexavalent chromium instrument set up, if possible, in order to capture the raw absorbance.
- MEC^{X} recommends the laboratory be requested to record the temperature at receipt.

8. REFERENCES

Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review. United States Environmental Protection Agency Contract Laboratory Program (CLP). June 2008.

Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. United States Environmental Protection Agency. October 2004.

Department of Defense Quality Systems Manual for Environmental Laboratories, Version 4.1. DoD Data Quality Workgroup. April 2009.

Facility-Wide Sampling and Analysis Plan for Environmental Investigations at the Ravenna Army Ammunition Plant, Ravenna, Ohio. SAIC. March 2001.

Final Sampling and analysis Plan Addendum No. 1 for Environmental Services at RVAAP-34 Sand Creek Disposal Road Landfill, RVAAP-03 Open Demolition Area #1, and RVAAP-28 Mustard Agent Burial Site. Shaw Environment and Infrastructure. November 2010.

Quality Assurance Project Plan for Environmental Investigations at the Ravenna Army Ammunition Plant. SAIC. March 2001.

Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Revision 6. United States Environmental Protection Agency. February 2007.

APPENDIX A

Qualified Sample Result Forms

Qualification Code Reference Table

Qualifier	Organics	Inorganics
H	Holding times were exceeded.	Holding times were exceeded.
S	Surrogate recovery was outside QC limits.	The sequence or number of standards used for the calibration was incorrect.
C	Calibration %RSD or %D was noncompliant.	Correlation coefficient was noncompliant.
R	Calibration RRF was noncompliant.	%R for calibration is not within control limits.
B	Presumed contamination as indicated by the preparation (method) blank results.	Presumed contamination as indicated by the preparation (method) or calibration blank results.
L	Laboratory Blank Spike/Blank Spike Duplicate %R was not within control limits.	Laboratory Control Sample %R was not within control limits.
Q	MS/MSD recovery was poor or RPD high.	MS recovery was poor.
E	Not applicable	Duplicates showed poor agreement.
I	Internal standard performance was unsatisfactory.	ICP ICS results were unsatisfactory.
A	Not applicable	ICP Serial Dilution %D were not within control limits.
M	Tuning (BFB or DFTPP) was noncompliant.	ICPMS tuning was noncompliant
T	Presumed contamination as indicated by the trip blank results.	Not applicable
+	False positive – reported compound was not present.	False positive – reported compound was not present.
-	False negative – compound was present but not reported.	False negative – compound was present but not reported.
F	Presumed contamination as indicated by the FB or ER results.	Presumed contamination as indicated by the FB or ER results.
$	Reported result or other information was incorrect.	Reported result or other information was incorrect.
?	TIC identity or reported retention time has been changed.	Not applicable.
D	The analysis with this flag should not be used because another more technically sound analysis is available.	The analysis with this flag should not be used because another more technically sound analysis is available.
P	Instrument performance for pesticides was poor.	Post Digestion Spike recovery was not within control limits.
*II, *III	A deficiency was found that has been described in the "Sample Management," section (*II) or the "Method Analyses" section (*III).	A deficiency was found that has been described in the "Sample Management," section (*II) or the "Method Analyses" section (*III).

Open Demolition Area 1

Validated Sample Result Forms for Area: ODA1

Sample Delivery Group: 81543

Analysis Method SW846 6010

Sample Name DA1SB-055M-0001-SO **AnalysisType:** INORG

Lab Sample Name: 851518 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Aluminum	7429-90-5	14400	0.24	0.081	mg/kg			
Antimony	7440-36-0	0.16	0.55	0.16	mg/kg	UV	R	Q
Arsenic	7440-38-2	4.6	0.91	0.26	mg/kg			
Barium	7440-39-3	73.4	0.055	0.016	mg/kg		J	*III, A
Beryllium	7440-41-7	0.53	0.024	0.0081	mg/kg		J	*III, A
Cadmium	7440-43-9	0.26	0.26	0.26	mg/kg	UV	UJ	C, $
Calcium	7440-70-2	18700	1	0.12	mg/kg	M	J	*III, A
Chromium	7440-47-3	31.6	0.13	0.038	mg/kg		J-	Q, *III, A
Cobalt	7440-48-4	10.8	0.099	0.03	mg/kg		J-	Q, *III, A
Copper	7440-50-8	19.1	0.4	0.12	mg/kg		J-	Q, *III, A
Iron	7439-89-6	36300	2	0.61	mg/kg			
Lead	7439-92-1	21	0.28	0.081	mg/kg		J	*III, A
Magnesium	7439-95-4	6120	0.81	0.24	mg/kg			
Manganese	7439-96-5	387	0.1	0.032	mg/kg		J-	Q
Nickel	7440-02-0	26.3	0.12	0.036	mg/kg		J	*III, A
Potassium	7440-09-7	1470	36	11	mg/kg			
Selenium	7782-49-2	0.32	0.85	0.14	mg/kg	JVB	UJ	B, Q
Silver	7440-22-4	0.08	0.11	0.08	mg/kg	UV	U	$
Sodium	7440-23-5	61.2	13	4	mg/kg		J	C
Thallium	7440-28-0	2.1	0.28	0.081	mg/kg		J-	Q
Vanadium	7440-62-2	19.4	0.069	0.022	mg/kg		J	*III, A
Zinc	7440-66-6	55.2	0.24	0.081	mg/kg		J-	Q, *III, A

Sample Delivery Group: 81543

Sample Name DA1SB-059M-0201-SO **AnalysisType:** INORG

Lab Sample Name: 851528 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Aluminum	7429-90-5	12200	0.61	0.2	mg/kg	B	J-	Q, *III, A
Antimony	7440-36-0	20.5	1.4	0.41	mg/kg		J-	Q
Arsenic	7440-38-2	33	2.3	0.66	mg/kg			
Barium	7440-39-3	869	0.14	0.041	mg/kg		J	*III, A
Beryllium	7440-41-7	0.95	0.061	0.02	mg/kg		J	*III, A
Cadmium	7440-43-9	18.4	0.11	0.031	mg/kg		J-	Q
Calcium	7440-70-2	18800	2.6	0.31	mg/kg		J-	Q, *III, A
Chromium	7440-47-3	101	0.32	0.097	mg/kg		J-	Q, *III, A
Cobalt	7440-48-4	10.1	0.25	0.077	mg/kg		J-	Q, *III, A
Copper	7440-50-8	222	1	0.31	mg/kg		J-	Q, *III, A
Iron	7439-89-6	33000	5.1	1.5	mg/kg	B		
Lead	7439-92-1	416	0.71	0.2	mg/kg		J	*III, A
Magnesium	7439-95-4	3470	2	0.61	mg/kg	B	J-	Q, *III, A
Manganese	7439-96-5	1100	0.26	0.082	mg/kg		J-	Q, *III, A
Nickel	7440-02-0	40.7	0.31	0.092	mg/kg		J	*III, A
Potassium	7440-09-7	2060	37	11	mg/kg			
Selenium	7782-49-2	2.1	2.1	0.36	mg/kg	B	J-	Q
Silver	7440-22-4	115	57	17	mg/kg			
Sodium	7440-23-5	84.2	13	4.1	mg/kg		J	C
Thallium	7440-28-0	2	0.71	0.2	mg/kg		J-	C, Q
Vanadium	7440-62-2	16.5	0.17	0.056	mg/kg	B	J	*III, A
Zinc	7440-66-6	364	0.61	0.2	mg/kg		J-	Q, *III, A

Sample Name DA1SB-063M-0202-SO **AnalysisType:** INORG

Lab Sample Name: 851882 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Aluminum	7429-90-5	13300	0.24	0.081	mg/kg	B	J-	Q, *III, A
Antimony	7440-36-0	0.16	0.55	0.16	mg/kg	UV	R	Q

Sample Delivery Group: 81543

Arsenic	7440-38-2	4.5	0.91	0.26	mg/kg			
Barium	7440-39-3	56.6	0.055	0.016	mg/kg		J	*III, A
Beryllium	7440-41-7	0.43	0.024	0.0081	mg/kg		J	*III, A
Cadmium	7440-43-9	0.2	0.2	0.2	mg/kg	UV	UJ	C, Q, $
Calcium	7440-70-2	27500	1	0.12	mg/kg		J-	Q, *III, A
Chromium	7440-47-3	22.6	0.13	0.038	mg/kg		J-	Q, *III, A
Cobalt	7440-48-4	9.4	0.099	0.03	mg/kg		J-	Q, *III, A
Copper	7440-50-8	16.8	0.4	0.12	mg/kg		J-	Q, *III, A
Iron	7439-89-6	31300	2	0.61	mg/kg			
Lead	7439-92-1	5.8	0.28	0.081	mg/kg			
Magnesium	7439-95-4	7180	0.81	0.24	mg/kg	B	J-	Q, *III, A
Manganese	7439-96-5	299	0.1	0.032	mg/kg		J-	Q, *III, A
Nickel	7440-02-0	22.1	0.12	0.036	mg/kg		J	*III, A
Potassium	7440-09-7	1850	36	11	mg/kg			
Selenium	7782-49-2	0.53	0.85	0.14	mg/kg	JV	U	B
Silver	7440-22-4	0.1	0.11	0.1	mg/kg	UBV	U	$
Sodium	7440-23-5	82.7	13	4	mg/kg		J	C
Thallium	7440-28-0	2	0.28	0.081	mg/kg		J-	Q
Vanadium	7440-62-2	16.9	0.069	0.022	mg/kg	B	J	*III, A
Zinc	7440-66-6	51.1	0.24	0.081	mg/kg		J-	Q, *III, A

Analysis Method SW846 7196

Sample Name DA1SB-059M-0201-SO **AnalysisType:** MISC

Lab Sample Name: 851528 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Hexavalent Chromium	18540-29-9	1.9	6.5	1.9	mg/kg	U	UJ	C, Q

Sample Delivery Group: 81543

Analysis Method SW846 7471

Sample Name DA1SB-055M-0001-SO **AnalysisType:** INORG

Lab Sample Name: 851518 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Mercury	7439-97-6	0.012	0.008	0.0024	mg/kg			

Sample Name DA1SB-059M-0201-SO **AnalysisType:** INORG

Lab Sample Name: 851528 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Mercury	7439-97-6	0.012	0.0081	0.0024	mg/kg			

Sample Name DA1SB-063M-0202-SO **AnalysisType:** INORG

Lab Sample Name: 851882 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Mercury	7439-97-6	0.01	0.008	0.0024	mg/kg			

Sample Delivery Group: 81543

Analysis Method SW846 8081

Sample Name DA1SB-059M-0201-SO **AnalysisType:** ORSVO

Lab Sample Name: 851528 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
4,4'-DDD	72-54-8	0.31	2.5	0.31	ug/kg	U	U	
4,4'-DDE	72-55-9	0.31	4.1	0.31	ug/kg	U	U	
4,4'-DDT	50-29-3	0.51	2.5	0.51	ug/kg	U	U	
Aldrin	309-00-2	0.51	2.5	0.51	ug/kg	U	U	
alpha-BHC	319-84-6	0.61	4.1	0.61	ug/kg	U	U	
alpha-Chlordane	5103-71-9	0.31	4.1	0.31	ug/kg	U	U	
beta-BHC	319-85-7	0.61	4.1	0.61	ug/kg	U	U	
Chlordane (Technical)	57-74-9	4.1	77	4.1	ug/kg	U	U	
delta-BHC	319-86-8	0.31	2.5	0.31	ug/kg	U	U	
Dieldrin	60-57-1	0.31	2.5	0.31	ug/kg	U	U	
Endosulfan I	959-98-8	0.72	2.5	0.72	ug/kg	U	U	
Endosulfan II	33213-65-9	0.31	2.5	0.31	ug/kg	U	U	
Endosulfan sulfate	1031-07-8	0.92	4.1	0.92	ug/kg	U	U	
Endrin	72-20-8	0.41	2.5	0.41	ug/kg	U	U	
Endrin aldehyde	7421-93-4	1.1	4.1	1.1	ug/kg	UM	UJ	Q
Endrin ketone	53494-70-5	0.82	2.5	0.82	ug/kg	UM	U	
GAMMA-BHC	58-89-9	0.51	2.5	0.51	ug/kg	U	U	
gamma-Chlordane	5103-74-2	0.31	4.1	0.31	ug/kg	U	U	
Heptachlor	76-44-8	0.41	2.5	0.41	ug/kg	U	U	
Heptachlor epoxide	1024-57-3	0.51	4.1	0.51	ug/kg	U	U	
Methoxychlor	72-43-5	0.72	2.5	0.72	ug/kg	U	U	
Toxaphene	8001-35-2	5.1	51	5.1	ug/kg	U	U	

Sample Delivery Group: 81543

Analysis Method SW846 8082

Sample Name DA1SB-059M-0201-SO **AnalysisType:** ORPPB

Lab Sample Name: 851528 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Aroclor 1016	12674-11-2	10	51	10	ug/kg	U	U	
Aroclor 1221	11104-28-2	20	51	20	ug/kg	U	U	
Aroclor 1232	11141-16-5	28	51	28	ug/kg	U	U	
Aroclor 1242	53469-21-9	30	51	30	ug/kg	U	U	
Aroclor 1248	12672-29-6	30	51	30	ug/kg	U	U	
Aroclor 1254	11097-69-1	23	51	23	ug/kg	U	U	
Aroclor 1260	11096-82-5	12	51	12	ug/kg	U	U	
Aroclor 1262	37324-23-5	21	51	21	ug/kg	U	U	
Aroclor 1268	11100-14-4	29	51	29	ug/kg	U	U	

Sample Delivery Group: 81543

Analysis Method SW846 8260

Sample Name DA1SB-059D-0201-SO **AnalysisType:** ORVOA

Lab Sample Name: 851867 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,1,1-Trichloroethane	71-55-6	11	53	11	ug/kg	U	U	
1,1,2,2-Tetrachloroethane	79-34-5	6.4	53	6.4	ug/kg	U	U	
1,1,2-Trichloroethane	79-00-5	8.6	53	8.6	ug/kg	U	U	
1,1-Dichloroethane	75-34-3	12	53	12	ug/kg	U	U	
1,1-Dichloroethene	75-35-4	17	53	17	ug/kg	U	U	
1,2-Dibromoethane	106-93-4	11	53	11	ug/kg	U	U	
1,2-Dichloroethane	107-06-2	13	53	13	ug/kg	U	U	
1,2-Dichloropropane	78-87-5	7.5	53	7.5	ug/kg	U	U	
2-Butanone	78-93-3	110	530	110	ug/kg	U	U	
2-Hexanone	591-78-6	73	530	73	ug/kg	U	UJ	C
4-Methyl-2-pentanone	108-10-1	88	530	88	ug/kg	U	U	
Acetone	67-64-1	67	1100	67	ug/kg	U	U	
Benzene	71-43-2	5.3	53	5.3	ug/kg	U	U	
Bromochloromethane	74-97-5	8.6	53	8.6	ug/kg	U	U	
Bromodichloromethane	75-27-4	9.6	53	9.6	ug/kg	U	U	
Bromoform	75-25-2	6.4	53	6.4	ug/kg	U	U	
Bromomethane	74-83-9	32	110	32	ug/kg	U	U	
Carbon disulfide	75-15-0	16	110	16	ug/kg	U	U	
Carbon tetrachloride	56-23-5	12	53	12	ug/kg	U	U	
Chlorobenzene	108-90-7	8.6	53	8.6	ug/kg	U	U	
Chloroethane	75-00-3	20	110	20	ug/kg	U	R	C
Chloroform	67-66-3	9.6	53	9.6	ug/kg	U	U	
Chloromethane	74-87-3	27	110	27	ug/kg	U	R	C
cis-1,2-Dichloroethene	156-59-2	11	53	11	ug/kg	U	U	
cis-1,3-Dichloropropene	10061-01-5	11	53	11	ug/kg	U	U	
Dibromochloromethane	124-48-1	8.6	53	8.6	ug/kg	U	U	
Ethylbenzene	100-41-4	8.6	53	8.6	ug/kg	U	U	

Sample Delivery Group: 81543

m,p-Xylenes	1330-20-7	19	110	19	ug/kg	U	U
Methylene chloride	75-09-2	43	110	43	ug/kg	U	U
o-Xylene	95-47-6	8.6	53	8.6	ug/kg	U	U
Styrene	100-42-5	6.4	53	6.4	ug/kg	U	U
Tetrachloroethene	127-18-4	8.6	53	8.6	ug/kg	U	U
Toluene	108-88-3	7.5	53	7.5	ug/kg	U	U
trans-1,2-Dichloroethene	156-60-5	12	53	12	ug/kg	U	U
trans-1,3-Dichloropropene	10061-02-6	7.5	110	7.5	ug/kg	U	U
Trichloroethene	79-01-6	11	53	11	ug/kg	U	U
Vinyl chloride	75-01-4	15	53	15	ug/kg	U	U

Sample Delivery Group: 81543

Analysis Method SW846 8270

Sample Name DA1SB-059M-0201-SO **AnalysisType:** ORSVO

Lab Sample Name: 851528 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,2,4-Trichlorobenzene	120-82-1	21	410	21	ug/kg	U	UJ	H
1,2-Dichlorobenzene	95-50-1	25	410	25	ug/kg	U	UJ	H
1,3-Dichlorobenzene	541-73-1	20	410	20	ug/kg	U	UJ	H
1,4-Dichlorobenzene	106-46-7	19	410	19	ug/kg	U	UJ	H
2,4,5-Trichlorophenol	95-95-4	130	510	130	ug/kg	U	UJ	H
2,4,6-Trichlorophenol	88-06-2	130	510	130	ug/kg	U	UJ	H
2,4-Dichlorophenol	120-83-2	120	510	120	ug/kg	U	UJ	H
2,4-Dimethylphenol	105-67-9	100	410	100	ug/kg	U	UJ	H
2,4-Dinitrophenol	51-28-5	700	2000	700	ug/kg	U	UJ	H, C
2,4-Dinitrotoluene	121-14-2	25	410	25	ug/kg	U	UJ	H
2,6-Dinitrotoluene	606-20-2	25	410	25	ug/kg	U	UJ	H
2-Chloronaphthalene	91-58-7	23	410	23	ug/kg	U	UJ	H
2-Chlorophenol	95-57-8	350	510	350	ug/kg	U	UJ	H
2-Methyl-4,6-dinitrophenol	534-52-1	280	1000	280	ug/kg	U	UJ	H, C
2-Methylnaphthalene	91-57-6	26	410	26	ug/kg	U	UJ	H
2-Methylphenol	95-48-7	430	1000	430	ug/kg	U	UJ	H
2-Nitroaniline	88-74-4	23	410	23	ug/kg	U	UJ	H
2-Nitrophenol	88-75-5	290	510	290	ug/kg	U	UJ	H
3,3'-Dichlorobenzidine	91-94-1	150	510	150	ug/kg	U	UJ	H, C
3-Nitroaniline	99-09-2	22	1000	22	ug/kg	U	UJ	H
4-Bromophenyl phenyl ether	101-55-3	26	410	26	ug/kg	U	UJ	H
4-Chloro-3-methylphenol	59-50-7	390	510	390	ug/kg	U	UJ	H
4-Chloroaniline	106-47-8	40	410	40	ug/kg	U	UJ	H
4-Chlorophenyl phenyl ether	7005-72-3	27	410	27	ug/kg	U	UJ	H
4-Methylphenol	1319-77-3	660	2000	660	ug/kg	U	UJ	H
4-Nitroaniline	100-01-6	31	1000	31	ug/kg	U	UJ	H, C
4-Nitrophenol	100-02-7	410	1000	410	ug/kg	U	UJ	H

Sample Delivery Group: 81543

Acenaphthene	83-32-9	25	410	25	ug/kg	U	UJ	H
Acenaphthylene	208-96-8	25	410	25	ug/kg	U	UJ	H
Anthracene	120-12-7	25	410	25	ug/kg	U	UJ	H
Benzo(a)anthracene	56-55-3	26	410	26	ug/kg	U	UJ	H
Benzo(a)pyrene	50-32-8	23	410	23	ug/kg	U	UJ	H
Benzo(b)fluoranthene	205-99-2	26	410	26	ug/kg	U	UJ	H
Benzo(g,h,i)perylene	191-24-2	22	410	22	ug/kg	U	UJ	H, C
Benzo(k)fluoranthene	207-08-9	26	410	26	ug/kg	U	UJ	H
Benzoic acid	65-85-0	300	1000	300	ug/kg	U	UJ	H
Benzyl alcohol	100-51-6	85	1000	85	ug/kg	U	R	C
Bis(2-chloroethoxy)methane	111-91-1	23	410	23	ug/kg	U	UJ	H
Bis(2-chloroethyl) ether	111-44-4	26	410	26	ug/kg	U	UJ	H
Bis(2-chloroisopropyl) ether	108-60-1	31	410	31	ug/kg	U	UJ	H
Bis(2-ethylhexyl) phthalate	117-81-7	89	1000	89	ug/kg	U	UJ	H
Butylbenzyl phthalate	85-68-7	75	410	75	ug/kg	U	UJ	H
Carbazole	86-74-8	29	410	29	ug/kg	U	UJ	H
Chrysene	218-01-9	26	410	26	ug/kg	U	UJ	H
Dibenzo(a,h)anthracene	53-70-3	22	410	22	ug/kg	U	UJ	H
Dibenzofuran	132-64-9	25	410	25	ug/kg	U	UJ	H
Diethyl phthalate	84-66-2	65	410	65	ug/kg	U	UJ	H
Dimethyl phthalate	131-11-3	64	410	64	ug/kg	U	UJ	H
Di-n-butyl phthalate	84-74-2	110	410	81	ug/kg	J	J-	H
Di-n-octyl phthalate	117-84-0	60	410	60	ug/kg	U	UJ	H
Fluoranthene	206-44-0	27	410	27	ug/kg	U	UJ	H
Fluorene	86-73-7	26	410	26	ug/kg	U	UJ	H
Hexachlorobenzene	118-74-1	29	410	29	ug/kg	U	UJ	H
Hexachlorobutadiene	87-68-3	63	410	63	ug/kg	U	UJ	H
Hexachlorocyclopentadiene	77-47-4	53	410	53	ug/kg	U	R	C
Hexachloroethane	67-72-1	34	410	34	ug/kg	U	UJ	H
Indeno(1,2,3-cd)pyrene	193-39-5	23	410	23	ug/kg	U	UJ	H, C
Isophorone	78-59-1	51	410	51	ug/kg	U	UJ	H
Naphthalene	91-20-3	21	410	21	ug/kg	U	UJ	H
Nitrobenzene	98-95-3	60	410	60	ug/kg	U	UJ	H

Sample Delivery Group: 81543

N-Nitroso-di-n-propylamine	621-64-7	72	410	72	ug/kg	U	UJ	H
N-Nitrosodiphenylamine	86-30-6	51	820	51	ug/kg	U	UJ	H
Pentachlorophenol	87-86-5	250	1000	250	ug/kg	U	UJ	H
Phenanthrene	85-01-8	27	410	27	ug/kg	U	UJ	H
Phenol	108-95-2	160	510	160	ug/kg	U	UJ	H
Pyrene	129-00-0	27	410	27	ug/kg	U	UJ	H

Sample Delivery Group: 81543

Analysis Method SW846 8330B

Sample Name DA1SB-055M-0001-SO **AnalysisType:** OREXP

Lab Sample Name: 851518 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,3,5-Trinitrobenzene	99-35-4	0.13	0.44	0.13	mg/kg	U	UJ	H
1,3-Dinitrobenzene	99-65-0	0.079	0.44	0.079	mg/kg	U	UJ	H
2,4,6-Trinitrotoluene	118-96-7	0.089	0.44	0.089	mg/kg	U	UJ	H
2,4-Dinitrotoluene	121-14-2	0.2	0.44	0.2	mg/kg	U	UJ	H, Q
2,6-Dinitrotoluene	606-20-2	0.07	0.5	0.07	mg/kg	U	UJ	H
2-Amino-4,6-dinitrotoluene	35572-78-2	0.05	0.44	0.05	mg/kg	U	UJ	H
2-Nitrotoluene	88-72-2	0.089	0.44	0.089	mg/kg	U	UJ	H
3,5-Dinitroaniline	618-87-1	0.089	0.44	0.089	mg/kg	U	UJ	H
3-Nitrotoluene	99-08-1	0.07	0.44	0.07	mg/kg	U	UJ	H
4-Amino-2,6-dinitrotoluene	19406-51-0	0.07	0.44	0.07	mg/kg	U	UJ	H, Q
4-Nitrotoluene	99-99-0	0.07	0.5	0.07	mg/kg	U	UJ	H
HMX	2691-41-0	0.12	0.44	0.12	mg/kg	U	UJ	H
Nitrobenzene	98-95-3	0.04	0.44	0.04	mg/kg	U	UJ	H
Nitroglycerin	55-63-0	0.5	1.5	0.5	mg/kg	U	UJ	H
PETN	78-11-5	0.5	1.5	0.5	mg/kg	U	UJ	H
RDX	121-82-4	0.16	0.44	0.16	mg/kg	U	UJ	H
Tetryl	479-45-8	0.089	0.44	0.089	mg/kg	U	UJ	H

Sample Name DA1SB-059M-0201-SO **AnalysisType:** OREXP

Lab Sample Name: 851528 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,3,5-Trinitrobenzene	99-35-4	0.13	0.44	0.13	mg/kg	U	UJ	H
1,3-Dinitrobenzene	99-65-0	0.08	0.44	0.08	mg/kg	U	UJ	H
2,4,6-Trinitrotoluene	118-96-7	0.09	0.44	0.09	mg/kg	U	UJ	H
2,4-Dinitrotoluene	121-14-2	0.2	0.44	0.2	mg/kg	U	R	D
2,6-Dinitrotoluene	606-20-2	0.07	0.5	0.07	mg/kg	U	R	D
2-Amino-4,6-dinitrotoluene	35572-78-2	0.05	0.44	0.05	mg/kg	U	UJ	H

Sample Delivery Group: 81543

2-Nitrotoluene	88-72-2	0.09	0.44	0.09	mg/kg	U	UJ	H
3,5-Dinitroaniline	618-87-1	0.09	0.44	0.09	mg/kg	U	UJ	H
3-Nitrotoluene	99-08-1	0.07	0.44	0.07	mg/kg	U	UJ	H
4-Amino-2,6-dinitrotoluene	19406-51-0	0.07	0.44	0.07	mg/kg	U	UJ	H
4-Nitrotoluene	99-99-0	0.07	0.5	0.07	mg/kg	U	UJ	H
HMX	2691-41-0	0.12	0.44	0.12	mg/kg	U	UJ	H
Nitrobenzene	98-95-3	0.04	0.44	0.04	mg/kg	U	R	D
Nitroglycerin	55-63-0	0.5	1.5	0.5	mg/kg	U	UJ	H
Nitroguanidine	556-88-7	0.06	0.16	0.06	mg/kg	U	UJ	H, *III
PETN	78-11-5	0.5	1.5	0.5	mg/kg	U	UJ	H
RDX	121-82-4	0.16	0.44	0.16	mg/kg	U	UJ	H
Tetryl	479-45-8	0.09	0.44	0.09	mg/kg	U	UJ	H

Sample Name DA1SB-063M-0202-SO **AnalysisType:** OREXP

Lab Sample Name: 851882 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,3,5-Trinitrobenzene	99-35-4	0.13	0.44	0.13	mg/kg	U	UJ	H
1,3-Dinitrobenzene	99-65-0	0.079	0.44	0.079	mg/kg	U	UJ	H
2,4,6-Trinitrotoluene	118-96-7	0.089	0.44	0.089	mg/kg	U	UJ	H
2,4-Dinitrotoluene	121-14-2	0.2	0.44	0.2	mg/kg	U	UJ	H
2,6-Dinitrotoluene	606-20-2	0.07	0.5	0.07	mg/kg	U	UJ	H
2-Amino-4,6-dinitrotoluene	35572-78-2	0.05	0.44	0.05	mg/kg	U	UJ	H
2-Nitrotoluene	88-72-2	0.089	0.44	0.089	mg/kg	U	UJ	H
3,5-Dinitroaniline	618-87-1	0.089	0.44	0.089	mg/kg	U	UJ	H
3-Nitrotoluene	99-08-1	0.07	0.44	0.07	mg/kg	U	UJ	H
4-Amino-2,6-dinitrotoluene	19406-51-0	0.07	0.44	0.07	mg/kg	U	UJ	H
4-Nitrotoluene	99-99-0	0.07	0.5	0.07	mg/kg	U	UJ	H
HMX	2691-41-0	0.12	0.44	0.12	mg/kg	U	UJ	H
Nitrobenzene	98-95-3	0.04	0.44	0.04	mg/kg	U	UJ	H
Nitroglycerin	55-63-0	0.5	1.5	0.5	mg/kg	U	UJ	H
Nitroguanidine	556-88-7	0.059	0.16	0.059	mg/kg	U	UJ	H, *III
PETN	78-11-5	0.5	1.5	0.5	mg/kg	U	UJ	H
RDX	121-82-4	0.16	0.44	0.16	mg/kg	U	UJ	H

Sample Delivery Group: 81543

Tetryl	479-45-8	0.089	0.44	0.089	mg/kg	U	UJ	H

Analysis Method SW846 9012

Sample Name DA1SB-059M-0201-SO **AnalysisType:** MISC

Lab Sample Name: 851528 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Cyanide	57-12-5	0.11	0.39	0.11	mg/kg	U	UJ	H

Analysis Method SW846 9056M

Sample Name DA1SB-059M-0201-SO **AnalysisType:** MISC

Lab Sample Name: 851528 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Nitrocellulose	9004-70-0	7	100	7	mg/kg	U	U	

Sample Name DA1SB-063M-0202-SO **AnalysisType:** MISC

Lab Sample Name: 851882 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Nitrocellulose	9004-70-0	7	100	7	mg/kg	U	U	

Sample Delivery Group: 81613

Analysis Method EPA 7471A

Sample Name DA1SB-068M-0201-SO **AnalysisType:** INORG

Lab Sample Name: 852373 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Mercury	7439-97-6	0.019	0.008	0.0024	mg/kg		J-	A

Sample Name DA1SB-070M-0204-SO **AnalysisType:** INORG

Lab Sample Name: 852383 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Mercury	7439-97-6	0.01	0.008	0.0024	mg/kg		J-	A

Sample Name DA1SB-072M-0204-SO **AnalysisType:** INORG

Lab Sample Name: 852390 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Mercury	7439-97-6	0.037	0.0079	0.0024	mg/kg		J-	A

Sample Name DA1SS-050M-0201-SO **AnalysisType:** INORG

Lab Sample Name: 852568 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Mercury	7439-97-6	0.037	0.008	0.0024	mg/kg		J-	A

Sample Delivery Group: 81613

Analysis Method SW846 6010

Sample Name DA1SB-068M-0201-SO **AnalysisType:** INORG

Lab Sample Name: 852373 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Aluminum	7429-90-5	10900	0.24	0.081	mg/kg		J-	Q
Antimony	7440-36-0	0.49	0.55	0.16	mg/kg	JV	J-	Q
Arsenic	7440-38-2	5.4	0.91	0.26	mg/kg		J-	Q, A
Barium	7440-39-3	47.6	0.055	0.016	mg/kg	B		
Beryllium	7440-41-7	0.42	0.024	0.0081	mg/kg		J-	A
Cadmium	7440-43-9	0.096	0.043	0.012	mg/kg		J-	C, Q
Calcium	7440-70-2	420	1	0.12	mg/kg		J-	A
Chromium	7440-47-3	49.1	0.13	0.038	mg/kg		J-	Q, A
Cobalt	7440-48-4	8	0.099	0.03	mg/kg		J-	Q, A
Copper	7440-50-8	21.2	0.4	0.12	mg/kg		J-	A
Iron	7439-89-6	24600	2	0.61	mg/kg			
Lead	7439-92-1	24.5	0.28	0.081	mg/kg		J-	A
Magnesium	7439-95-4	2590	0.81	0.24	mg/kg		J-	A
Manganese	7439-96-5	293	0.1	0.032	mg/kg		J-	Q
Nickel	7440-02-0	15.9	0.12	0.036	mg/kg		J-	Q, A
Potassium	7440-09-7	1000	36	11	mg/kg		J-	Q
Selenium	7782-49-2	0.23	0.85	0.14	mg/kg	JV	J-	Q
Silver	7440-22-4	0.1	0.11	0.1	mg/kg	UV	UJ	Q, $
Sodium	7440-23-5	45.3	13	4	mg/kg		J-	C, Q
Thallium	7440-28-0	1.5	0.28	0.081	mg/kg		J-	Q
Vanadium	7440-62-2	15.2	0.069	0.022	mg/kg		J-	Q, A
Zinc	7440-66-6	51.6	0.24	0.081	mg/kg		J-	Q, A

Sample Name DA1SB-070M-0204-SO **AnalysisType:** INORG

Lab Sample Name: 852383 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Aluminum	7429-90-5	12900	0.24	0.081	mg/kg		J-	Q

Sample Delivery Group: 81613

Antimony	7440-36-0	0.57	0.55	0.16	mg/kg		J-	Q
Arsenic	7440-38-2	10.2	0.91	0.26	mg/kg		J-	Q, A
Barium	7440-39-3	62.9	0.055	0.016	mg/kg	B		
Beryllium	7440-41-7	0.46	0.024	0.0081	mg/kg		J-	A
Cadmium	7440-43-9	0.08	0.08	0.08	mg/kg	UV	UJ	C, B, Q, $
Calcium	7440-70-2	30200	1	0.12	mg/kg		J-	A
Chromium	7440-47-3	58.3	0.13	0.039	mg/kg		J-	Q, A
Cobalt	7440-48-4	9.8	0.099	0.03	mg/kg		J-	Q, A
Copper	7440-50-8	17.3	0.41	0.12	mg/kg		J-	A
Iron	7439-89-6	29000	2	0.61	mg/kg			
Lead	7439-92-1	10.9	0.28	0.081	mg/kg		J-	A
Magnesium	7439-95-4	8010	0.81	0.24	mg/kg		J-	A
Manganese	7439-96-5	311	0.1	0.032	mg/kg		J-	Q
Nickel	7440-02-0	24.1	0.12	0.037	mg/kg		J-	Q, A
Potassium	7440-09-7	1860	37	11	mg/kg		J-	Q
Selenium	7782-49-2	0.43	0.85	0.14	mg/kg	JV	J-	Q
Silver	7440-22-4	0.034	0.11	0.034	mg/kg	UV	UJ	Q
Sodium	7440-23-5	78.9	13	4.1	mg/kg		J-	C, Q
Thallium	7440-28-0	1.8	0.28	0.081	mg/kg	B	J-	Q
Vanadium	7440-62-2	18.9	0.069	0.022	mg/kg		J-	Q, A
Zinc	7440-66-6	51.2	0.24	0.081	mg/kg		J-	Q, A

Sample Name DA1SB-072M-0204-SO **AnalysisType:** INORG

Lab Sample Name: 852390 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Aluminum	7429-90-5	6790	0.24	0.08	mg/kg		J-	Q
Antimony	7440-36-0	7.6	0.54	0.16	mg/kg		J-	Q
Arsenic	7440-38-2	10.7	0.91	0.26	mg/kg		J-	Q, A
Barium	7440-39-3	40.2	0.054	0.016	mg/kg	B		
Beryllium	7440-41-7	0.24	0.024	0.008	mg/kg		J-	C, A
Cadmium	7440-43-9	0.2	0.2	0.2	mg/kg	UV	UJ	C, B, Q, $
Calcium	7440-70-2	1060	1	0.12	mg/kg		J-	A
Chromium	7440-47-3	589	0.13	0.038	mg/kg		J-	Q, A

Sample Delivery Group: 81613

Cobalt	7440-48-4	5.9	0.099	0.03	mg/kg		J-	Q, A
Copper	7440-50-8	26.5	0.4	0.12	mg/kg		J-	A
Iron	7439-89-6	25500	2	0.6	mg/kg			
Lead	7439-92-1	13.9	0.28	0.08	mg/kg		J-	A
Magnesium	7439-95-4	1750	0.8	0.24	mg/kg		J-	A
Manganese	7439-96-5	342	0.1	0.032	mg/kg		J-	Q
Nickel	7440-02-0	16	0.12	0.036	mg/kg		J-	Q, A
Potassium	7440-09-7	1330	36	11	mg/kg		J-	Q
Selenium	7782-49-2	0.68	0.85	0.14	mg/kg	JV	J-	Q
Silver	7440-22-4	0.034	0.11	0.034	mg/kg	UV	UJ	Q
Sodium	7440-23-5	115	13	4	mg/kg		J-	C, Q
Thallium	7440-28-0	1.3	0.28	0.08	mg/kg	B	J-	Q
Vanadium	7440-62-2	13.3	0.068	0.022	mg/kg		J-	Q, A
Zinc	7440-66-6	63.9	0.24	0.08	mg/kg		J-	Q, A

Sample Name DA1SS-050M-0201-SO **AnalysisType:** INORG

Lab Sample Name: 852568 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Aluminum	7429-90-5	10900	0.24	0.081	mg/kg		J-	Q
Antimony	7440-36-0	1.2	0.55	0.16	mg/kg		J-	Q
Arsenic	7440-38-2	9.1	0.92	0.26	mg/kg		J-	Q, A
Barium	7440-39-3	78.8	0.055	0.016	mg/kg	B		
Beryllium	7440-41-7	0.38	0.024	0.0081	mg/kg		J-	A
Cadmium	7440-43-9	2.6	0.043	0.012	mg/kg		J-	Q
Calcium	7440-70-2	2500	1	0.12	mg/kg		J-	A
Chromium	7440-47-3	110	0.13	0.039	mg/kg		J-	Q, A
Cobalt	7440-48-4	7.6	0.1	0.031	mg/kg		J-	Q, A
Copper	7440-50-8	188	0.41	0.12	mg/kg		J-	A
Iron	7439-89-6	23700	2	0.61	mg/kg			
Lead	7439-92-1	23.4	0.28	0.081	mg/kg		J-	A
Magnesium	7439-95-4	2860	0.81	0.24	mg/kg		J-	A
Manganese	7439-96-5	407	0.1	0.033	mg/kg		J-	Q
Nickel	7440-02-0	18.4	0.12	0.037	mg/kg		J-	Q, A

Sample Delivery Group: 81613

Potassium	7440-09-7	814	37	11	mg/kg		J-	Q
Selenium	7782-49-2	0.75	0.85	0.14	mg/kg	JV	J-	Q
Silver	7440-22-4	0.035	0.11	0.035	mg/kg	UV	UJ	Q
Sodium	7440-23-5	31.8	13	4.1	mg/kg		J-	C, Q
Thallium	7440-28-0	1.6	0.28	0.081	mg/kg	B	J-	Q
Vanadium	7440-62-2	16.1	0.069	0.022	mg/kg		J-	Q, A
Zinc	7440-66-6	191	0.24	0.081	mg/kg		J-	Q, A

Sample Delivery Group: 81613

Analysis Method SW846 8260B

Sample Name DA1SB-068D-0201-SO **AnalysisType:** ORVOA

Lab Sample Name: 852287 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,1,1-Trichloroethane	71-55-6	10	52	10	ug/kg	U	U	
1,1,2,2-Tetrachloroethane	79-34-5	6.2	52	6.2	ug/kg	U	U	
1,1,2-Trichloroethane	79-00-5	8.3	52	8.3	ug/kg	U	U	
1,1-Dichloroethane	75-34-3	11	52	11	ug/kg	U	U	
1,1-Dichloroethene	75-35-4	17	52	17	ug/kg	U	U	
1,2-Dibromoethane	106-93-4	10	52	10	ug/kg	U	U	
1,2-Dichloroethane	107-06-2	12	52	12	ug/kg	U	U	
1,2-Dichloropropane	78-87-5	7.3	52	7.3	ug/kg	U	U	
2-Butanone	78-93-3	100	520	100	ug/kg	U	U	
2-Hexanone	591-78-6	70	520	70	ug/kg	U	R	C
4-Methyl-2-pentanone	108-10-1	85	520	85	ug/kg	U	UJ	C
Acetone	67-64-1	65	1000	65	ug/kg	U	UJ	C
Benzene	71-43-2	5.2	52	5.2	ug/kg	U	U	
Bromochloromethane	74-97-5	8.3	52	8.3	ug/kg	U	U	
Bromodichloromethane	75-27-4	9.3	52	9.3	ug/kg	U	U	
Bromoform	75-25-2	6.2	52	6.2	ug/kg	U	U	
Bromomethane	74-83-9	31	100	31	ug/kg	U	U	
Carbon disulfide	75-15-0	16	100	16	ug/kg	U	U	
Carbon tetrachloride	56-23-5	11	52	11	ug/kg	U	U	
Chlorobenzene	108-90-7	8.3	52	8.3	ug/kg	U	U	
Chloroethane	75-00-3	20	100	20	ug/kg	U	R	C
Chloroform	67-66-3	9.3	52	9.3	ug/kg	U	U	
Chloromethane	74-87-3	26	100	26	ug/kg	U	R	C
cis-1,2-Dichloroethene	156-59-2	10	52	10	ug/kg	U	U	
cis-1,3-Dichloropropene	10061-01-5	10	52	10	ug/kg	U	U	
Dibromochloromethane	124-48-1	8.3	52	8.3	ug/kg	U	U	
Ethylbenzene	100-41-4	8.3	52	8.3	ug/kg	U	U	

Sample Delivery Group: 81613

m,p-Xylenes	1330-20-7	19	100	19	ug/kg	U	UJ	C
Methylene chloride	75-09-2	41	100	41	ug/kg	U	U	
o-Xylene	95-47-6	8.3	52	8.3	ug/kg	U	U	
Styrene	100-42-5	6.2	52	6.2	ug/kg	U	U	
Tetrachloroethene	127-18-4	8.3	52	8.3	ug/kg	U	U	
Toluene	108-88-3	7.3	52	7.3	ug/kg	U	U	
trans-1,2-Dichloroethene	156-60-5	11	52	11	ug/kg	U	U	
trans-1,3-Dichloropropene	10061-02-6	7.3	100	7.3	ug/kg	U	U	
Trichloroethene	79-01-6	10	52	10	ug/kg	U	U	
Vinyl chloride	75-01-4	15	52	15	ug/kg	U	U	

Sample Name DA1SB-070D-0201-SO **AnalysisType:** ORVOA

Lab Sample Name: 852294 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,1,1-Trichloroethane	71-55-6	12	58	12	ug/kg	U	U	
1,1,2,2-Tetrachloroethane	79-34-5	6.9	58	6.9	ug/kg	U	U	
1,1,2-Trichloroethane	79-00-5	9.3	58	9.3	ug/kg	U	U	
1,1-Dichloroethane	75-34-3	13	58	13	ug/kg	U	U	
1,1-Dichloroethene	75-35-4	19	58	19	ug/kg	U	U	
1,2-Dibromoethane	106-93-4	12	58	12	ug/kg	U	U	
1,2-Dichloroethane	107-06-2	14	58	14	ug/kg	U	U	
1,2-Dichloropropane	78-87-5	8.1	58	8.1	ug/kg	U	U	
2-Butanone	78-93-3	120	580	120	ug/kg	U	UJ	Q
2-Hexanone	591-78-6	79	580	79	ug/kg	U	UJ	Q
4-Methyl-2-pentanone	108-10-1	95	580	95	ug/kg	U	U	
Acetone	67-64-1	73	1200	73	ug/kg	U	UJ	Q
Benzene	71-43-2	5.8	58	5.8	ug/kg	U	U	
Bromochloromethane	74-97-5	9.3	58	9.3	ug/kg	U	U	
Bromodichloromethane	75-27-4	10	58	10	ug/kg	U	U	
Bromoform	75-25-2	6.9	58	6.9	ug/kg	U	U	
Bromomethane	74-83-9	35	120	35	ug/kg	U	U	
Carbon disulfide	75-15-0	17	120	17	ug/kg	U	U	
Carbon tetrachloride	56-23-5	13	58	13	ug/kg	U	U	

Sample Delivery Group: 81613

Chlorobenzene	108-90-7	9.3	58	9.3	ug/kg	U	U
Chloroethane	75-00-3	22	120	22	ug/kg	U	U
Chloroform	67-66-3	10	58	10	ug/kg	U	U
Chloromethane	74-87-3	29	120	29	ug/kg	U	U
cis-1,2-Dichloroethene	156-59-2	12	58	12	ug/kg	U	U
cis-1,3-Dichloropropene	10061-01-5	12	58	12	ug/kg	U	U
Dibromochloromethane	124-48-1	9.3	58	9.3	ug/kg	U	U
Ethylbenzene	100-41-4	9.3	58	9.3	ug/kg	U	U
m,p-Xylenes	1330-20-7	21	120	21	ug/kg	U	U
Methylene chloride	75-09-2	46	120	46	ug/kg	U	U
o-Xylene	95-47-6	9.3	58	9.3	ug/kg	U	U
Styrene	100-42-5	6.9	58	6.9	ug/kg	U	U
Tetrachloroethene	127-18-4	9.3	58	9.3	ug/kg	U	U
Toluene	108-88-3	8.1	58	8.1	ug/kg	U	U
trans-1,2-Dichloroethene	156-60-5	13	58	13	ug/kg	U	U
trans-1,3-Dichloropropene	10061-02-6	8.1	120	8.1	ug/kg	U	U
Trichloroethene	79-01-6	12	58	12	ug/kg	U	U
Vinyl chloride	75-01-4	16	58	16	ug/kg	U	U

Sample Delivery Group: 81613

Analysis Method SW846 8270

Sample Name DA1SB-068M-0201-SO **AnalysisType:** ORSVO

Lab Sample Name: 852373 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,2,4-Trichlorobenzene	120-82-1	21	400	21	ug/kg	U	UJ	H
1,2-Dichlorobenzene	95-50-1	24	400	24	ug/kg	U	UJ	H
1,3-Dichlorobenzene	541-73-1	20	400	20	ug/kg	U	UJ	H
1,4-Dichlorobenzene	106-46-7	19	400	19	ug/kg	U	UJ	H
2,4,5-Trichlorophenol	95-95-4	130	500	130	ug/kg	U	UJ	H
2,4,6-Trichlorophenol	88-06-2	130	500	130	ug/kg	U	UJ	H
2,4-Dichlorophenol	120-83-2	120	500	120	ug/kg	U	UJ	H
2,4-Dimethylphenol	105-67-9	100	400	100	ug/kg	U	UJ	H
2,4-Dinitrophenol	51-28-5	700	2000	700	ug/kg	U	UJ	H, C
2,4-Dinitrotoluene	121-14-2	24	400	24	ug/kg	U	UJ	H
2,6-Dinitrotoluene	606-20-2	24	400	24	ug/kg	U	UJ	H
2-Chloronaphthalene	91-58-7	23	400	23	ug/kg	U	UJ	H
2-Chlorophenol	95-57-8	340	500	340	ug/kg	U	UJ	H
2-Methyl-4,6-dinitrophenol	534-52-1	270	1000	270	ug/kg	U	UJ	H, C
2-Methylnaphthalene	91-57-6	25	400	25	ug/kg	U	UJ	H
2-Methylphenol	95-48-7	420	1000	420	ug/kg	U	UJ	H
2-Nitroaniline	88-74-4	23	400	23	ug/kg	U	UJ	H
2-Nitrophenol	88-75-5	280	500	280	ug/kg	U	UJ	H
3,3'-Dichlorobenzidine	91-94-1	150	500	150	ug/kg	U	UJ	H, C
3-Nitroaniline	99-09-2	22	1000	22	ug/kg	U	UJ	H
4-Bromophenyl phenyl ether	101-55-3	25	400	25	ug/kg	U	UJ	H
4-Chloro-3-methylphenol	59-50-7	380	500	380	ug/kg	U	UJ	H
4-Chloroaniline	106-47-8	39	400	39	ug/kg	U	UJ	H
4-Chlorophenyl phenyl ether	7005-72-3	26	400	26	ug/kg	U	UJ	H
4-Methylphenol	1319-77-3	660	2000	660	ug/kg	U	UJ	H
4-Nitroaniline	100-01-6	30	1000	30	ug/kg	U	UJ	H, C
4-Nitrophenol	100-02-7	400	1000	400	ug/kg	U	UJ	H

Sample Delivery Group: 81613

Acenaphthene	83-32-9	24	400	24	ug/kg	U	UJ	H
Acenaphthylene	208-96-8	24	400	24	ug/kg	U	UJ	H
Anthracene	120-12-7	24	400	24	ug/kg	U	UJ	H
Benzo(a)anthracene	56-55-3	25	400	25	ug/kg	U	UJ	H
Benzo(a)pyrene	50-32-8	23	400	23	ug/kg	U	UJ	H
Benzo(b)fluoranthene	205-99-2	25	400	25	ug/kg	U	UJ	H
Benzo(g,h,i)perylene	191-24-2	22	400	22	ug/kg	U	UJ	H, C
Benzo(k)fluoranthene	207-08-9	25	400	25	ug/kg	U	UJ	H
Benzoic acid	65-85-0	290	990	290	ug/kg	U	UJ	H
Benzyl alcohol	100-51-6	84	1000	84	ug/kg	U	R	C
Bis(2-chloroethoxy)methane	111-91-1	23	400	23	ug/kg	U	UJ	H
Bis(2-chloroethyl) ether	111-44-4	25	400	25	ug/kg	U	UJ	H
Bis(2-chloroisopropyl) ether	108-60-1	30	400	30	ug/kg	U	UJ	H
Bis(2-ethylhexyl) phthalate	117-81-7	88	1000	88	ug/kg	U	UJ	H
Butylbenzyl phthalate	85-68-7	74	400	74	ug/kg	U	UJ	H
Carbazole	86-74-8	28	400	28	ug/kg	U	UJ	H
Chrysene	218-01-9	25	400	25	ug/kg	U	UJ	H
Dibenzo(a,h)anthracene	53-70-3	22	400	22	ug/kg	U	UJ	H
Dibenzofuran	132-64-9	24	400	24	ug/kg	U	UJ	H
Diethyl phthalate	84-66-2	65	400	65	ug/kg	U	UJ	H
Dimethyl phthalate	131-11-3	64	400	64	ug/kg	U	UJ	H
Di-n-butyl phthalate	84-74-2	85	400	80	ug/kg	J	J-	H
Di-n-octyl phthalate	117-84-0	60	400	60	ug/kg	U	UJ	H
Fluoranthene	206-44-0	26	400	26	ug/kg	U	UJ	H
Fluorene	86-73-7	25	400	25	ug/kg	U	UJ	H
Hexachlorobenzene	118-74-1	28	400	28	ug/kg	U	UJ	H
Hexachlorobutadiene	87-68-3	63	400	63	ug/kg	U	UJ	H
Hexachlorocyclopentadiene	77-47-4	52	400	52	ug/kg	U	R	C
Hexachloroethane	67-72-1	33	400	33	ug/kg	U	UJ	H
Indeno(1,2,3-cd)pyrene	193-39-5	23	400	23	ug/kg	U	UJ	H, C
Isophorone	78-59-1	50	400	50	ug/kg	U	UJ	H
Naphthalene	91-20-3	21	400	21	ug/kg	U	UJ	H
Nitrobenzene	98-95-3	60	400	60	ug/kg	U	UJ	H

Sample Delivery Group: 81613

N-Nitroso-di-n-propylamine	621-64-7	71	400	71	ug/kg	U	UJ	H
N-Nitrosodiphenylamine	86-30-6	50	810	50	ug/kg	U	UJ	H
Pentachlorophenol	87-86-5	240	1000	240	ug/kg	U	UJ	H
Phenanthrene	85-01-8	26	400	26	ug/kg	U	UJ	H
Phenol	108-95-2	160	500	160	ug/kg	U	UJ	H
Pyrene	129-00-0	26	400	26	ug/kg	U	UJ	H

Sample Delivery Group: 81613

Analysis Method SW846 8330B

Sample Name DA1SB-068M-0201-SO **AnalysisType:** OREXP

Lab Sample Name: 852373 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,3,5-Trinitrobenzene	99-35-4	0.13	0.44	0.13	mg/kg	U	UJ	H
1,3-Dinitrobenzene	99-65-0	0.08	0.44	0.08	mg/kg	U	UJ	H
2,4,6-Trinitrotoluene	118-96-7	0.091	0.44	0.091	mg/kg	U	UJ	H
2,4-Dinitrotoluene	121-14-2	0.2	0.44	0.2	mg/kg	U	R	D
2,6-Dinitrotoluene	606-20-2	0.07	0.5	0.07	mg/kg	U	R	D
2-Amino-4,6-dinitrotoluene	35572-78-2	0.05	0.44	0.05	mg/kg	U	UJ	H
2-Nitrotoluene	88-72-2	0.091	0.44	0.091	mg/kg	U	UJ	H
3,5-Dinitroaniline	618-87-1	0.091	0.44	0.091	mg/kg	U	UJ	H
3-Nitrotoluene	99-08-1	0.07	0.44	0.07	mg/kg	U	UJ	H
4-Amino-2,6-dinitrotoluene	19406-51-0	0.07	0.44	0.07	mg/kg	U	UJ	H
4-Nitrotoluene	99-99-0	0.07	0.5	0.07	mg/kg	U	UJ	H
HMX	2691-41-0	0.12	0.44	0.12	mg/kg	U	UJ	H
Nitrobenzene	98-95-3	0.04	0.44	0.04	mg/kg	U	R	D
Nitroglycerin	55-63-0	0.5	1.5	0.5	mg/kg	U	UJ	H
Nitroguanidine	556-88-7	0.06	0.16	0.06	mg/kg	U	UJ	H, *III
PETN	78-11-5	0.5	1.5	0.5	mg/kg	U	UJ	H
RDX	121-82-4	0.16	0.44	0.16	mg/kg	U	UJ	H
Tetryl	479-45-8	0.091	0.44	0.091	mg/kg	U	UJ	H

Sample Name DA1SB-070M-0204-SO **AnalysisType:** OREXP

Lab Sample Name: 852383 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,3,5-Trinitrobenzene	99-35-4	0.13	0.44	0.13	mg/kg	U	UJ	H
1,3-Dinitrobenzene	99-65-0	0.08	0.44	0.08	mg/kg	U	UJ	H
2,4,6-Trinitrotoluene	118-96-7	0.09	0.44	0.09	mg/kg	U	UJ	H
2,4-Dinitrotoluene	121-14-2	0.2	0.44	0.2	mg/kg	U	UJ	H
2,6-Dinitrotoluene	606-20-2	0.07	0.5	0.07	mg/kg	U	UJ	H

Sample Delivery Group: 81613

2-Amino-4,6-dinitrotoluene	35572-78-2	0.05	0.44	0.05	mg/kg	U	UJ	H
2-Nitrotoluene	88-72-2	0.09	0.44	0.09	mg/kg	U	UJ	H
3,5-Dinitroaniline	618-87-1	0.09	0.44	0.09	mg/kg	U	UJ	H
3-Nitrotoluene	99-08-1	0.07	0.44	0.07	mg/kg	U	UJ	H
4-Amino-2,6-dinitrotoluene	19406-51-0	0.07	0.44	0.07	mg/kg	U	UJ	H, L
4-Nitrotoluene	99-99-0	0.07	0.5	0.07	mg/kg	U	UJ	H
HMX	2691-41-0	0.12	0.44	0.12	mg/kg	U	UJ	H
Nitrobenzene	98-95-3	0.04	0.44	0.04	mg/kg	U	UJ	H
Nitroglycerin	55-63-0	0.5	1.5	0.5	mg/kg	U	UJ	H
PETN	78-11-5	0.5	1.5	0.5	mg/kg	U	UJ	H
RDX	121-82-4	0.16	0.44	0.16	mg/kg	U	UJ	H
Tetryl	479-45-8	0.09	0.44	0.09	mg/kg	U	UJ	H

Sample Name DA1SB-072M-0204-SO **AnalysisType:** OREXP

Lab Sample Name: 852390 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,3,5-Trinitrobenzene	99-35-4	0.13	0.44	0.13	mg/kg	U	UJ	H
1,3-Dinitrobenzene	99-65-0	0.08	0.44	0.08	mg/kg	U	UJ	H
2,4,6-Trinitrotoluene	118-96-7	0.09	0.44	0.09	mg/kg	U	UJ	H
2,4-Dinitrotoluene	121-14-2	0.2	0.44	0.2	mg/kg	U	UJ	H
2,6-Dinitrotoluene	606-20-2	0.07	0.5	0.07	mg/kg	U	UJ	H
2-Amino-4,6-dinitrotoluene	35572-78-2	0.05	0.44	0.05	mg/kg	U	UJ	H
2-Nitrotoluene	88-72-2	0.09	0.44	0.09	mg/kg	U	UJ	H
3,5-Dinitroaniline	618-87-1	0.09	0.44	0.09	mg/kg	U	UJ	H
3-Nitrotoluene	99-08-1	0.07	0.44	0.07	mg/kg	U	UJ	H
4-Amino-2,6-dinitrotoluene	19406-51-0	0.07	0.44	0.07	mg/kg	U	UJ	H, L
4-Nitrotoluene	99-99-0	0.07	0.5	0.07	mg/kg	U	UJ	H
HMX	2691-41-0	0.12	0.44	0.12	mg/kg	U	UJ	H
Nitrobenzene	98-95-3	0.04	0.44	0.04	mg/kg	U	UJ	H
Nitroglycerin	55-63-0	0.5	1.5	0.5	mg/kg	U	UJ	H
PETN	78-11-5	0.5	1.5	0.5	mg/kg	U	UJ	H
RDX	121-82-4	0.16	0.44	0.16	mg/kg	U	UJ	H
Tetryl	479-45-8	0.09	0.44	0.09	mg/kg	U	UJ	H

Sample Delivery Group: 81613

Sample Name DA1SS-050M-0201-SO **AnalysisType:** OREXP

Lab Sample Name: 852568 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,3,5-Trinitrobenzene	99-35-4	0.13	0.44	0.13	mg/kg	U	UJ	H
1,3-Dinitrobenzene	99-65-0	0.08	0.44	0.08	mg/kg	U	UJ	H
2,4,6-Trinitrotoluene	118-96-7	0.09	0.44	0.09	mg/kg	U	UJ	H
2,4-Dinitrotoluene	121-14-2	0.2	0.44	0.2	mg/kg	U	UJ	H, Q
2,6-Dinitrotoluene	606-20-2	0.07	0.5	0.07	mg/kg	U	UJ	H
2-Amino-4,6-dinitrotoluene	35572-78-2	0.05	0.44	0.05	mg/kg	U	UJ	H
2-Nitrotoluene	88-72-2	0.09	0.44	0.09	mg/kg	U	UJ	H
3,5-Dinitroaniline	618-87-1	0.09	0.44	0.09	mg/kg	U	UJ	H
3-Nitrotoluene	99-08-1	0.07	0.44	0.07	mg/kg	U	UJ	H
4-Amino-2,6-dinitrotoluene	19406-51-0	0.07	0.44	0.07	mg/kg	U	UJ	H
4-Nitrotoluene	99-99-0	0.07	0.5	0.07	mg/kg	U	UJ	H
HMX	2691-41-0	0.12	0.44	0.12	mg/kg	U	UJ	H
Nitrobenzene	98-95-3	0.04	0.44	0.04	mg/kg	U	UJ	H
Nitroglycerin	55-63-0	0.5	1.5	0.5	mg/kg	U	UJ	H
PETN	78-11-5	0.5	1.5	0.5	mg/kg	U	UJ	H
RDX	121-82-4	0.16	0.44	0.16	mg/kg	U	UJ	H
Tetryl	479-45-8	0.09	0.44	0.09	mg/kg	U	UJ	H

Analysis Method SW846 9056M

Sample Name DA1SB-068M-0201-SO **AnalysisType:** MISC

Lab Sample Name: 852373 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Nitrocellulose	9004-70-0	7	100	7	mg/kg	U	U	

Sample Name DA1SB-070M-0204-SO **AnalysisType:** MISC

Lab Sample Name: 852383 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Nitrocellulose	9004-70-0	7	23	7	mg/kg	U	U	

Sample Delivery Group: 82400

Analysis Method SW846 6010

Sample Name DA1SB-074M-0202-SO **AnalysisType:** INORG

Lab Sample Name: 871039 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Aluminum	7429-90-5	5440	0.24	0.081	mg/kg		J-	Q, A
Antimony	7440-36-0	2.7	1.4	0.4	mg/kg		J-	C, E, Q, *III
Arsenic	7440-38-2	6	0.91	0.26	mg/kg		J-	Q
Barium	7440-39-3	31.5	0.054	0.016	mg/kg		J-	A
Beryllium	7440-41-7	0.24	0.024	0.0081	mg/kg		J	C
Cadmium	7440-43-9	0.31	0.11	0.03	mg/kg		J-	C, E, Q, A
Calcium	7440-70-2	387	1	0.12	mg/kg			
Chromium	7440-47-3	176	0.13	0.038	mg/kg		J-	A
Cobalt	7440-48-4	6.8	0.25	0.076	mg/kg		J-	Q, *III, A
Copper	7440-50-8	12.2	1	0.3	mg/kg		J-	E, A
Iron	7439-89-6	13300	2	0.6	mg/kg		J-	Q, A
Lead	7439-92-1	7.2	0.28	0.081	mg/kg		J-	Q, *III, A
Magnesium	7439-95-4	1790	0.81	0.24	mg/kg		J-	Q, A
Manganese	7439-96-5	148	0.1	0.032	mg/kg		J-	A
Nickel	7440-02-0	16.8	0.12	0.036	mg/kg		J-	Q, A
Potassium	7440-09-7	770	36	11	mg/kg			
Selenium	7782-49-2	0.14	0.85	0.14	mg/kg	UV	UJ	B, Q
Silver	7440-22-4	0.086	0.28	0.086	mg/kg	UV	UJ	Q
Sodium	7440-23-5	59.2	13	4	mg/kg		J	C, E
Thallium	7440-28-0	0.65	0.7	0.2	mg/kg	J	J-	B, Q
Vanadium	7440-62-2	10.4	0.068	0.022	mg/kg	B	J-	A
Zinc	7440-66-6	33	0.24	0.081	mg/kg		J	Q, A

Sample Name DA1SS-054M-0201-SO **AnalysisType:** INORG

Lab Sample Name: 871020 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code

Sample Delivery Group: 82400

Aluminum	7429-90-5	8490	0.25	0.082	mg/kg		J-	Q, A
Antimony	7440-36-0	0.92	0.55	0.16	mg/kg		J-	E, Q, *III
Arsenic	7440-38-2	8.4	0.92	0.27	mg/kg		J-	Q
Barium	7440-39-3	52.7	0.055	0.016	mg/kg	B	J-	A
Beryllium	7440-41-7	0.4	0.025	0.0082	mg/kg			
Cadmium	7440-43-9	0.52	0.043	0.012	mg/kg		J-	E, Q, A
Calcium	7440-70-2	552	1	0.12	mg/kg			
Chromium	7440-47-3	56.2	0.13	0.039	mg/kg	B	J-	A
Cobalt	7440-48-4	8.9	0.1	0.031	mg/kg		J-	Q, *III, A
Copper	7440-50-8	16.4	0.41	0.12	mg/kg		J-	E, A
Iron	7439-89-6	19400	2	0.61	mg/kg		J-	Q, A
Lead	7439-92-1	11.6	0.29	0.082	mg/kg		J-	Q, *III, A
Magnesium	7439-95-4	1940	0.82	0.25	mg/kg		J-	Q, A
Manganese	7439-96-5	398	0.1	0.033	mg/kg	B	J-	A
Nickel	7440-02-0	16.7	0.12	0.037	mg/kg		J-	Q, A
Potassium	7440-09-7	879	37	11	mg/kg			
Selenium	7782-49-2	2.4	0.86	0.14	mg/kg		J	C, Q
Silver	7440-22-4	0.035	0.11	0.035	mg/kg	UV	UJ	Q
Sodium	7440-23-5	62.1	13	4.1	mg/kg		J	C, E
Thallium	7440-28-0	0.38	0.29	0.082	mg/kg		J-	B, Q
Vanadium	7440-62-2	15.6	0.07	0.022	mg/kg		J-	A
Zinc	7440-66-6	121	0.25	0.082	mg/kg		J	Q, A

Sample Delivery Group: 82400

Analysis Method SW846 7471A

Sample Name DA1SB-074M-0202-SO **AnalysisType:** INORG

Lab Sample Name: 871039 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Mercury	7439-97-6	0.01	0.008	0.0024	mg/kg		J-	B, E, A

Sample Name DA1SS-054M-0201-SO **AnalysisType:** INORG

Lab Sample Name: 871020 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Mercury	7439-97-6	0.032	0.0081	0.0025	mg/kg		J-	E, A

Sample Delivery Group: 82400

Analysis Method SW846 8330B

Sample Name DA1SB-074M-0202-SO **AnalysisType:** OREXP

Lab Sample Name: 871039 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,3,5-Trinitrobenzene	99-35-4	0.13	0.44	0.13	mg/kg	U	UJ	H
1,3-Dinitrobenzene	99-65-0	0.08	0.44	0.08	mg/kg	U	UJ	H
2,4,6-Trinitrotoluene	118-96-7	0.091	0.44	0.091	mg/kg	U	UJ	H
2,4-Dinitrotoluene	121-14-2	0.2	0.44	0.2	mg/kg	U	UJ	H, C
2,6-Dinitrotoluene	606-20-2	0.07	0.5	0.07	mg/kg	U	UJ	H, C
2-Amino-4,6-dinitrotoluene	35572-78-2	0.05	0.44	0.05	mg/kg	U	UJ	H
2-Nitrotoluene	88-72-2	0.091	0.44	0.091	mg/kg	U	UJ	H
3,5-Dinitroaniline	618-87-1	0.091	0.44	0.091	mg/kg	U	UJ	H
3-Nitrotoluene	99-08-1	0.07	0.44	0.07	mg/kg	U	UJ	H
4-Amino-2,6-dinitrotoluene	19406-51-0	0.07	0.44	0.07	mg/kg	U	UJ	H
4-Nitrotoluene	99-99-0	0.07	0.5	0.07	mg/kg	U	UJ	H
HMX	2691-41-0	0.12	0.44	0.12	mg/kg	U	UJ	H
Nitrobenzene	98-95-3	0.04	0.44	0.04	mg/kg	U	UJ	H
Nitroglycerin	55-63-0	0.5	1.5	0.5	mg/kg	U	UJ	H, C
PETN	78-11-5	0.5	1.5	0.5	mg/kg	U	UJ	H
RDX	121-82-4	0.16	0.44	0.16	mg/kg	U	UJ	H
Tetryl	479-45-8	0.091	0.44	0.091	mg/kg	U	UJ	H

Sample Name DA1SS-054M-0201-SO **AnalysisType:** OREXP

Lab Sample Name: 871020 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,3,5-Trinitrobenzene	99-35-4	0.13	0.44	0.13	mg/kg	U	U	
1,3-Dinitrobenzene	99-65-0	0.081	0.44	0.081	mg/kg	U	U	
2,4,6-Trinitrotoluene	118-96-7	0.091	0.44	0.091	mg/kg	U	U	
2,4-Dinitrotoluene	121-14-2	0.2	0.44	0.2	mg/kg	U	U	
2,6-Dinitrotoluene	606-20-2	0.071	0.51	0.071	mg/kg	U	UJ	C
2-Amino-4,6-dinitrotoluene	35572-78-2	0.051	0.44	0.051	mg/kg	U	U	

Sample Delivery Group: 82400

2-Nitrotoluene	88-72-2	0.091	0.44	0.091	mg/kg	U	U
3,5-Dinitroaniline	618-87-1	0.091	0.44	0.091	mg/kg	U	U
3-Nitrotoluene	99-08-1	0.071	0.44	0.071	mg/kg	U	U
4-Amino-2,6-dinitrotoluene	19406-51-0	0.071	0.44	0.071	mg/kg	U	U
4-Nitrotoluene	99-99-0	0.071	0.51	0.071	mg/kg	U	U
HMX	2691-41-0	0.12	0.44	0.12	mg/kg	U	U
Nitrobenzene	98-95-3	0.04	0.44	0.04	mg/kg	U	U
Nitroglycerin	55-63-0	0.51	1.5	0.51	mg/kg	U	U
PETN	78-11-5	0.51	1.5	0.51	mg/kg	U	U
RDX	121-82-4	0.16	0.44	0.16	mg/kg	U	U
Tetryl	479-45-8	0.091	0.44	0.091	mg/kg	U	U

Sand Creek

Validated Sample Result Forms for Area: Sand

Sample Delivery Group: 81543

Analysis Method SW846 6010

Sample Name SCSB-037M-0001-SO **AnalysisType:** INORG

Lab Sample Name: 851488 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Aluminum	7429-90-5	14800	0.49	0.16	mg/kg		J-	Q, A
Antimony	7440-36-0	0.93	1.1	0.32	mg/kg	JV	J-	Q, A
Arsenic	7440-38-2	182	1.8	0.53	mg/kg		J-	Q, *III, A
Barium	7440-39-3	932	0.11	0.032	mg/kg		J-	A
Beryllium	7440-41-7	3.9	0.049	0.016	mg/kg		J-	A
Cadmium	7440-43-9	1.6	0.085	0.024	mg/kg		J-	Q, *III
Calcium	7440-70-2	13900	2	0.24	mg/kg		J-	A
Chromium	7440-47-3	112	0.26	0.077	mg/kg		J-	Q, A
Cobalt	7440-48-4	9	0.2	0.061	mg/kg		J-	Q, *III, A
Copper	7440-50-8	95.7	0.81	0.24	mg/kg		J-	Q, *III, A
Iron	7439-89-6	41500	4.1	1.2	mg/kg		J-	A
Lead	7439-92-1	325	0.57	0.16	mg/kg		J-	Q, *III, A
Magnesium	7439-95-4	3050	1.6	0.49	mg/kg		J-	Q, A
Manganese	7439-96-5	743	0.2	0.065	mg/kg		J-	Q, A
Nickel	7440-02-0	35.7	0.25	0.073	mg/kg		J-	Q, *III, A
Potassium	7440-09-7	1020	37	11	mg/kg		J-	Q
Selenium	7782-49-2	3.1	1.7	0.28	mg/kg		J-	Q
Silver	7440-22-4	1.2	0.23	0.069	mg/kg			
Sodium	7440-23-5	178	13	4.1	mg/kg		J-	Q
Thallium	7440-28-0	5.5	0.57	0.16	mg/kg		J-	Q, *III, E
Vanadium	7440-62-2	41	0.14	0.045	mg/kg		J-	Q, A, E
Zinc	7440-66-6	298	0.49	0.16	mg/kg		J-	Q, *III, A

Sample Delivery Group: 81543

Sample Name SCSB-038M-0005-SO **AnalysisType:** INORG

Lab Sample Name: 851510 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Aluminum	7429-90-5	10900	0.24	0.08	mg/kg		J-	Q, A
Antimony	7440-36-0	0.63	0.54	0.16	mg/kg		J-	Q, A
Arsenic	7440-38-2	6.1	0.91	0.26	mg/kg		J-	Q, *III, A
Barium	7440-39-3	43.8	0.054	0.016	mg/kg		J-	A
Beryllium	7440-41-7	0.38	0.024	0.008	mg/kg		J-	A
Cadmium	7440-43-9	0.012	0.042	0.012	mg/kg	UV	UJ	C, Q, *III
Calcium	7440-70-2	10900	1	0.12	mg/kg		J-	A
Chromium	7440-47-3	156	0.13	0.038	mg/kg		J-	Q, A
Cobalt	7440-48-4	9	0.099	0.03	mg/kg		J-	Q, *III, A
Copper	7440-50-8	18.6	0.4	0.12	mg/kg		J-	Q, *III, A
Iron	7439-89-6	29600	2	0.6	mg/kg		J-	A
Lead	7439-92-1	5.3	0.28	0.08	mg/kg		J-	Q, *III, A
Magnesium	7439-95-4	6840	0.8	0.24	mg/kg		J-	Q, A
Manganese	7439-96-5	369	0.1	0.032	mg/kg		J-	Q, A
Nickel	7440-02-0	20.4	0.12	0.036	mg/kg		J-	Q, *III, A
Potassium	7440-09-7	2020	36	11	mg/kg		J-	Q
Selenium	7782-49-2	0.6	0.85	0.14	mg/kg	JV	J-	Q
Silver	7440-22-4	0.034	0.11	0.034	mg/kg	UV	U	
Sodium	7440-23-5	134	13	4	mg/kg		J-	Q
Thallium	7440-28-0	1.7	0.28	0.08	mg/kg		J-	Q, *III, E, E
Vanadium	7440-62-2	14.3	0.068	0.022	mg/kg		J-	Q, A, E
Zinc	7440-66-6	48.1	0.24	0.08	mg/kg		J-	Q, *III, A

Sample Name SCSB-042M-0003-SO **AnalysisType:** INORG

Lab Sample Name: 851552 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Aluminum	7429-90-5	14000	0.61	0.2	mg/kg	B	J-	Q, A
Antimony	7440-36-0	0.4	1.4	0.4	mg/kg	UV	R	Q

Sample Delivery Group: 81543

Arsenic	7440-38-2	15.4	2.3	0.66	mg/kg		J-	Q, *III, A
Barium	7440-39-3	69.3	0.14	0.04	mg/kg		J-	A
Beryllium	7440-41-7	0.49	0.061	0.02	mg/kg		J-	C, A
Cadmium	7440-43-9	0.03	0.11	0.03	mg/kg	UV	UJ	C, Q, *III
Calcium	7440-70-2	5360	2.5	0.3	mg/kg		J-	A
Chromium	7440-47-3	19.8	0.32	0.096	mg/kg		J-	Q, A
Cobalt	7440-48-4	13	0.25	0.076	mg/kg		J-	Q, *III, A
Copper	7440-50-8	21	1	0.3	mg/kg		J-	Q, *III, A
Iron	7439-89-6	35600	5.1	1.5	mg/kg	B	J-	A
Lead	7439-92-1	11.2	0.71	0.2	mg/kg		J-	Q, *III, A
Magnesium	7439-95-4	5490	2	0.61	mg/kg	B	J-	Q, A
Manganese	7439-96-5	451	0.25	0.081	mg/kg		J-	Q, A
Nickel	7440-02-0	30.7	0.31	0.091	mg/kg		J-	Q, *III, A
Potassium	7440-09-7	1880	36	11	mg/kg		J-	Q
Selenium	7782-49-2	0.35	2.1	0.35	mg/kg	UV	UJ	Q
Silver	7440-22-4	0.086	0.28	0.086	mg/kg	UV	U	
Sodium	7440-23-5	92	13	4	mg/kg		J-	C, Q
Thallium	7440-28-0	2.1	0.71	0.2	mg/kg		J-	C, Q, *III, E
Vanadium	7440-62-2	20.5	0.17	0.056	mg/kg	B	J-	Q, A, E
Zinc	7440-66-6	67	0.61	0.2	mg/kg		J-	Q, *III, A

Sample Name SCSS-068M-0001-SO **AnalysisType:** INORG

Lab Sample Name: 850426 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Aluminum	7429-90-5	9150	0.12	0.041	mg/kg		J-	Q, A
Antimony	7440-36-0	0.082	0.28	0.082	mg/kg	U	R	Q
Arsenic	7440-38-2	11.2	0.46	0.13	mg/kg		J-	Q, *III, A
Barium	7440-39-3	49.7	0.028	0.0082	mg/kg		J-	A
Beryllium	7440-41-7	0.41	0.024	0.0082	mg/kg		J-	A
Cadmium	7440-43-9	0.057	0.021	0.0061	mg/kg		J-	C, Q, *III
Calcium	7440-70-2	1650	0.51	0.061	mg/kg		J-	A
Chromium	7440-47-3	24.2	0.064	0.019	mg/kg		J-	Q, A

Sample Delivery Group: 81543

Cobalt	7440-48-4	7.6	0.05	0.015	mg/kg		J-	Q, *III, A
Copper	7440-50-8	11	0.2	0.061	mg/kg		J-	Q, *III, A
Iron	7439-89-6	22500	1	0.31	mg/kg		J-	A
Lead	7439-92-1	29.8	0.14	0.041	mg/kg		J-	Q, *III, A
Magnesium	7439-95-4	2320	0.41	0.12	mg/kg		J-	Q, A
Manganese	7439-96-5	395	0.051	0.016	mg/kg		J-	Q, A
Nickel	7440-02-0	20.9	0.062	0.018	mg/kg		J-	Q, *III, A
Potassium	7440-09-7	693	37	11	mg/kg		J-	Q
Selenium	7782-49-2	0.24	0.43	0.071	mg/kg	J	J-	Q
Silver	7440-22-4	0.017	0.057	0.017	mg/kg	UB	U	
Sodium	7440-23-5	20.5	13	4.1	mg/kg		J-	C, Q
Thallium	7440-28-0	0.62	0.29	0.082	mg/kg		J-	Q, *III, E
Vanadium	7440-62-2	14.8	0.035	0.011	mg/kg		J-	Q, A, E
Zinc	7440-66-6	48.2	0.12	0.041	mg/kg		J-	Q, *III, A

Sample Delivery Group: 81543

Analysis Method SW846 7471

Sample Name SCSB-037M-0001-SO **AnalysisType:** INORG

Lab Sample Name: 851488 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Mercury	7439-97-6	0.24	0.008	0.0024	mg/kg		J-	A

Sample Name SCSB-038M-0005-SO **AnalysisType:** INORG

Lab Sample Name: 851510 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Mercury	7439-97-6	0.0079	0.0079	0.0024	mg/kg		J-	A

Sample Name SCSB-042M-0003-SO **AnalysisType:** INORG

Lab Sample Name: 851552 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Mercury	7439-97-6	0.008	0.008	0.0024	mg/kg		J-	A

Sample Name SCSS-068M-0001-SO **AnalysisType:** INORG

Lab Sample Name: 850426 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Mercury	7439-97-6	0.031	0.0081	0.0024	mg/kg		J-	A

Sample Delivery Group: 81543

Analysis Method SW846 8270

Sample Name SCSB-037M-0001-SO **AnalysisType:** ORSVO

Lab Sample Name: 851488 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,2,4-Trichlorobenzene	120-82-1	21	400	21	ug/kg	U	U	
1,2-Dichlorobenzene	95-50-1	49	400	24	ug/kg	J	J	
1,3-Dichlorobenzene	541-73-1	20	400	20	ug/kg	U	U	
1,4-Dichlorobenzene	106-46-7	19	400	19	ug/kg	U	U	
2,4,5-Trichlorophenol	95-95-4	130	510	130	ug/kg	U	U	
2,4,6-Trichlorophenol	88-06-2	130	510	130	ug/kg	U	U	
2,4-Dichlorophenol	120-83-2	120	510	120	ug/kg	U	U	
2,4-Dimethylphenol	105-67-9	100	400	100	ug/kg	U	U	
2,4-Dinitrophenol	51-28-5	700	2000	700	ug/kg	U	UJ	C
2,4-Dinitrotoluene	121-14-2	24	400	24	ug/kg	U	U	
2,6-Dinitrotoluene	606-20-2	24	400	24	ug/kg	U	U	
2-Chloronaphthalene	91-58-7	23	400	23	ug/kg	U	U	
2-Chlorophenol	95-57-8	340	510	340	ug/kg	U	U	
2-Methyl-4,6-dinitrophenol	534-52-1	270	1000	270	ug/kg	U	U	
2-Methylnaphthalene	91-57-6	260	400	25	ug/kg	J	J	
2-Methylphenol	95-48-7	420	1000	420	ug/kg	U	U	
2-Nitroaniline	88-74-4	23	400	23	ug/kg	U	U	
2-Nitrophenol	88-75-5	280	510	280	ug/kg	U	U	
3,3'-Dichlorobenzidine	91-94-1	150	510	150	ug/kg	U	UJ	C
3-Nitroaniline	99-09-2	22	1000	22	ug/kg	U	U	
4-Bromophenyl phenyl ether	101-55-3	25	400	25	ug/kg	U	U	
4-Chloro-3-methylphenol	59-50-7	380	510	380	ug/kg	U	U	
4-Chloroaniline	106-47-8	39	400	39	ug/kg	U	U	
4-Chlorophenyl phenyl ether	7005-72-3	26	400	26	ug/kg	U	U	
4-Methylphenol	1319-77-3	660	2000	660	ug/kg	U	U	
4-Nitroaniline	100-01-6	30	1000	30	ug/kg	U	U	
4-Nitrophenol	100-02-7	400	1000	400	ug/kg	U	U	

Sample Delivery Group: 81543

Acenaphthene	83-32-9	24	400	24	ug/kg	U	U	
Acenaphthylene	208-96-8	24	400	24	ug/kg	U	U	
Anthracene	120-12-7	32	400	24	ug/kg	J	J	
Benzo(a)anthracene	56-55-3	120	400	25	ug/kg	J	J	
Benzo(a)pyrene	50-32-8	140	400	23	ug/kg	J	J	
Benzo(b)fluoranthene	205-99-2	260	400	25	ug/kg	J	J	
Benzo(g,h,i)perylene	191-24-2	120	400	22	ug/kg	J	J	
Benzo(k)fluoranthene	207-08-9	69	400	25	ug/kg	J	J	
Benzoic acid	65-85-0	290	990	290	ug/kg	U	U	
Benzyl alcohol	100-51-6	84	1000	84	ug/kg	U	UJ	C
Bis(2-chloroethoxy)methane	111-91-1	23	400	23	ug/kg	U	U	
Bis(2-chloroethyl) ether	111-44-4	25	400	25	ug/kg	U	U	
Bis(2-chloroisopropyl) ether	108-60-1	30	400	30	ug/kg	U	U	
Bis(2-ethylhexyl) phthalate	117-81-7	88	1000	88	ug/kg	J	U	B
Butylbenzyl phthalate	85-68-7	74	400	74	ug/kg	U	U	
Carbazole	86-74-8	33	400	28	ug/kg	J	J	
Chrysene	218-01-9	160	400	25	ug/kg	J	J	
Dibenzo(a,h)anthracene	53-70-3	32	400	22	ug/kg	J	J	
Dibenzofuran	132-64-9	69	400	24	ug/kg	J	J	
Diethyl phthalate	84-66-2	65	400	65	ug/kg	U	U	
Dimethyl phthalate	131-11-3	64	400	64	ug/kg	U	U	
Di-n-butyl phthalate	84-74-2	120	400	80	ug/kg	J	J	
Di-n-octyl phthalate	117-84-0	60	400	60	ug/kg	U	U	
Fluoranthene	206-44-0	360	400	26	ug/kg	J	J	
Fluorene	86-73-7	25	400	25	ug/kg	U	U	
Hexachlorobenzene	118-74-1	28	400	28	ug/kg	U	U	
Hexachlorobutadiene	87-68-3	63	400	63	ug/kg	U	U	
Hexachlorocyclopentadiene	77-47-4	53	400	53	ug/kg	U	UJ	C
Hexachloroethane	67-72-1	33	400	33	ug/kg	U	U	
Indeno(1,2,3-cd)pyrene	193-39-5	93	400	23	ug/kg	J	J	
Isophorone	78-59-1	500	400	51	ug/kg			
Naphthalene	91-20-3	150	400	21	ug/kg	J	J	
Nitrobenzene	98-95-3	60	400	60	ug/kg	U	U	

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N-Nitroso-di-n-propylamine	621-64-7	71	400	71	ug/kg	U	U	
N-Nitrosodiphenylamine	86-30-6	51	810	51	ug/kg	U	U	
Pentachlorophenol	87-86-5	240	1000	240	ug/kg	U	U	
Phenanthrene	85-01-8	280	400	26	ug/kg	J	J	
Phenol	108-95-2	160	510	160	ug/kg	U	U	
Pyrene	129-00-0	280	400	26	ug/kg	J	J	

Sample Name SCSB-038M-0005-SO **AnalysisType:** ORSVO

Lab Sample Name: 851510 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,2,4-Trichlorobenzene	120-82-1	21	400	21	ug/kg	U	U	
1,2-Dichlorobenzene	95-50-1	24	400	24	ug/kg	U	U	
1,3-Dichlorobenzene	541-73-1	20	400	20	ug/kg	U	U	
1,4-Dichlorobenzene	106-46-7	19	400	19	ug/kg	U	U	
2,4,5-Trichlorophenol	95-95-4	130	500	130	ug/kg	U	U	
2,4,6-Trichlorophenol	88-06-2	130	500	130	ug/kg	U	U	
2,4-Dichlorophenol	120-83-2	120	500	120	ug/kg	U	U	
2,4-Dimethylphenol	105-67-9	100	400	100	ug/kg	U	U	
2,4-Dinitrophenol	51-28-5	690	2000	690	ug/kg	U	UJ	C
2,4-Dinitrotoluene	121-14-2	24	400	24	ug/kg	U	U	
2,6-Dinitrotoluene	606-20-2	24	400	24	ug/kg	U	U	
2-Chloronaphthalene	91-58-7	23	400	23	ug/kg	U	U	
2-Chlorophenol	95-57-8	340	500	340	ug/kg	U	U	
2-Methyl-4,6-dinitrophenol	534-52-1	270	1000	270	ug/kg	U	U	
2-Methylnaphthalene	91-57-6	35	400	25	ug/kg	J	J	
2-Methylphenol	95-48-7	420	1000	420	ug/kg	U	U	
2-Nitroaniline	88-74-4	23	400	23	ug/kg	U	U	
2-Nitrophenol	88-75-5	280	500	280	ug/kg	U	U	
3,3'-Dichlorobenzidine	91-94-1	150	500	150	ug/kg	U	UJ	C
3-Nitroaniline	99-09-2	22	1000	22	ug/kg	U	U	
4-Bromophenyl phenyl ether	101-55-3	25	400	25	ug/kg	U	U	
4-Chloro-3-methylphenol	59-50-7	380	500	380	ug/kg	U	U	
4-Chloroaniline	106-47-8	39	400	39	ug/kg	U	U	

Sample Delivery Group: 81543

4-Chlorophenyl phenyl ether	7005-72-3	26	400	26	ug/kg	U	U	
4-Methylphenol	1319-77-3	650	2000	650	ug/kg	U	U	
4-Nitroaniline	100-01-6	30	1000	30	ug/kg	U	U	
4-Nitrophenol	100-02-7	400	1000	400	ug/kg	U	U	
Acenaphthene	83-32-9	24	400	24	ug/kg	U	U	
Acenaphthylene	208-96-8	24	400	24	ug/kg	U	U	
Anthracene	120-12-7	24	400	24	ug/kg	U	U	
Benzo(a)anthracene	56-55-3	25	400	25	ug/kg	U	U	
Benzo(a)pyrene	50-32-8	23	400	23	ug/kg	U	U	
Benzo(b)fluoranthene	205-99-2	25	400	25	ug/kg	U	U	
Benzo(g,h,i)perylene	191-24-2	22	400	22	ug/kg	U	U	
Benzo(k)fluoranthene	207-08-9	25	400	25	ug/kg	U	U	
Benzoic acid	65-85-0	290	990	290	ug/kg	U	U	
Benzyl alcohol	100-51-6	84	1000	84	ug/kg	U	UJ	C
Bis(2-chloroethoxy)methane	111-91-1	23	400	23	ug/kg	U	U	
Bis(2-chloroethyl) ether	111-44-4	25	400	25	ug/kg	U	U	
Bis(2-chloroisopropyl) ether	108-60-1	30	400	30	ug/kg	U	U	
Bis(2-ethylhexyl) phthalate	117-81-7	88	1000	88	ug/kg	U	U	
Butylbenzyl phthalate	85-68-7	74	400	74	ug/kg	U	U	
Carbazole	86-74-8	28	400	28	ug/kg	U	U	
Chrysene	218-01-9	25	400	25	ug/kg	U	U	
Dibenzo(a,h)anthracene	53-70-3	22	400	22	ug/kg	U	U	
Dibenzofuran	132-64-9	24	400	24	ug/kg	U	U	
Diethyl phthalate	84-66-2	64	400	64	ug/kg	U	U	
Dimethyl phthalate	131-11-3	63	400	63	ug/kg	U	U	
Di-n-butyl phthalate	84-74-2	110	400	80	ug/kg	J	J	
Di-n-octyl phthalate	117-84-0	59	400	59	ug/kg	U	U	
Fluoranthene	206-44-0	26	400	26	ug/kg	U	U	
Fluorene	86-73-7	25	400	25	ug/kg	U	U	
Hexachlorobenzene	118-74-1	28	400	28	ug/kg	U	U	
Hexachlorobutadiene	87-68-3	62	400	62	ug/kg	U	U	
Hexachlorocyclopentadiene	77-47-4	52	400	52	ug/kg	U	UJ	C
Hexachloroethane	67-72-1	33	400	33	ug/kg	U	U	

Sample Delivery Group: 81543

Indeno(1,2,3-cd)pyrene	193-39-5	23	400	23	ug/kg	U	U
Isophorone	78-59-1	50	400	50	ug/kg	U	U
Naphthalene	91-20-3	21	400	21	ug/kg	U	U
Nitrobenzene	98-95-3	59	400	59	ug/kg	U	U
N-Nitroso-di-n-propylamine	621-64-7	70	400	70	ug/kg	U	U
N-Nitrosodiphenylamine	86-30-6	50	810	50	ug/kg	U	U
Pentachlorophenol	87-86-5	240	1000	240	ug/kg	U	U
Phenanthrene	85-01-8	26	400	26	ug/kg	U	U
Phenol	108-95-2	160	500	160	ug/kg	U	U
Pyrene	129-00-0	26	400	26	ug/kg	U	U

Sample Name SCSB-042M-0003-SO **AnalysisType:** ORSVO

Lab Sample Name: 851552 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,2,4-Trichlorobenzene	120-82-1	21	400	21	ug/kg	U	UJ	H
1,2-Dichlorobenzene	95-50-1	24	400	24	ug/kg	U	UJ	H
1,3-Dichlorobenzene	541-73-1	20	400	20	ug/kg	U	UJ	H
1,4-Dichlorobenzene	106-46-7	19	400	19	ug/kg	U	UJ	H
2,4,5-Trichlorophenol	95-95-4	130	510	130	ug/kg	U	UJ	H
2,4,6-Trichlorophenol	88-06-2	130	510	130	ug/kg	U	UJ	H
2,4-Dichlorophenol	120-83-2	120	510	120	ug/kg	U	UJ	H
2,4-Dimethylphenol	105-67-9	100	400	100	ug/kg	U	UJ	H
2,4-Dinitrophenol	51-28-5	700	2000	700	ug/kg	U	UJ	H
2,4-Dinitrotoluene	121-14-2	24	400	24	ug/kg	U	UJ	H
2,6-Dinitrotoluene	606-20-2	24	400	24	ug/kg	U	UJ	H
2-Chloronaphthalene	91-58-7	23	400	23	ug/kg	U	UJ	H
2-Chlorophenol	95-57-8	340	510	340	ug/kg	U	UJ	H
2-Methyl-4,6-dinitrophenol	534-52-1	270	1000	270	ug/kg	U	UJ	H
2-Methylnaphthalene	91-57-6	49	400	25	ug/kg	J	J-	H
2-Methylphenol	95-48-7	420	1000	420	ug/kg	U	UJ	H
2-Nitroaniline	88-74-4	23	400	23	ug/kg	U	UJ	H
2-Nitrophenol	88-75-5	280	510	280	ug/kg	U	UJ	H
3,3'-Dichlorobenzidine	91-94-1	150	510	150	ug/kg	U	UJ	H

Sample Delivery Group: 81543

3-Nitroaniline	99-09-2	22	1000	22	ug/kg	U	UJ	H
4-Bromophenyl phenyl ether	101-55-3	25	400	25	ug/kg	U	UJ	H
4-Chloro-3-methylphenol	59-50-7	380	510	380	ug/kg	U	UJ	H
4-Chloroaniline	106-47-8	39	400	39	ug/kg	U	UJ	H
4-Chlorophenyl phenyl ether	7005-72-3	26	400	26	ug/kg	U	UJ	H
4-Methylphenol	1319-77-3	660	2000	660	ug/kg	U	UJ	H
4-Nitroaniline	100-01-6	30	1000	30	ug/kg	U	UJ	H, C
4-Nitrophenol	100-02-7	400	1000	400	ug/kg	U	UJ	H
Acenaphthene	83-32-9	24	400	24	ug/kg	U	UJ	H
Acenaphthylene	208-96-8	24	400	24	ug/kg	U	UJ	H
Anthracene	120-12-7	24	400	24	ug/kg	U	UJ	H
Benzo(a)anthracene	56-55-3	25	400	25	ug/kg	U	UJ	H
Benzo(a)pyrene	50-32-8	23	400	23	ug/kg	U	UJ	H
Benzo(b)fluoranthene	205-99-2	25	400	25	ug/kg	U	UJ	H
Benzo(g,h,i)perylene	191-24-2	22	400	22	ug/kg	U	UJ	H
Benzo(k)fluoranthene	207-08-9	25	400	25	ug/kg	U	UJ	H
Benzoic acid	65-85-0	290	990	290	ug/kg	U	UJ	H
Benzyl alcohol	100-51-6	84	1000	84	ug/kg	U	UJ	H, C
Bis(2-chloroethoxy)methane	111-91-1	23	400	23	ug/kg	U	UJ	H
Bis(2-chloroethyl) ether	111-44-4	25	400	25	ug/kg	U	UJ	H
Bis(2-chloroisopropyl) ether	108-60-1	30	400	30	ug/kg	U	UJ	H
Bis(2-ethylhexyl) phthalate	117-81-7	88	1000	88	ug/kg	U	UJ	H
Butylbenzyl phthalate	85-68-7	74	400	74	ug/kg	U	UJ	H
Carbazole	86-74-8	28	400	28	ug/kg	U	UJ	H
Chrysene	218-01-9	25	400	25	ug/kg	U	UJ	H
Dibenzo(a,h)anthracene	53-70-3	22	400	22	ug/kg	U	UJ	H
Dibenzofuran	132-64-9	24	400	24	ug/kg	U	UJ	H
Diethyl phthalate	84-66-2	65	400	65	ug/kg	U	UJ	H
Dimethyl phthalate	131-11-3	64	400	64	ug/kg	U	UJ	H
Di-n-butyl phthalate	84-74-2	100	400	80	ug/kg	J	J-	H
Di-n-octyl phthalate	117-84-0	60	400	60	ug/kg	U	UJ	H
Fluoranthene	206-44-0	26	400	26	ug/kg	U	UJ	H
Fluorene	86-73-7	25	400	25	ug/kg	U	UJ	H

Sample Delivery Group: 81543

Hexachlorobenzene	118-74-1	28	400	28	ug/kg	U	UJ	H
Hexachlorobutadiene	87-68-3	63	400	63	ug/kg	U	UJ	H
Hexachlorocyclopentadiene	77-47-4	53	400	53	ug/kg	U	UJ	H
Hexachloroethane	67-72-1	33	400	33	ug/kg	U	UJ	H
Indeno(1,2,3-cd)pyrene	193-39-5	23	400	23	ug/kg	U	UJ	H
Isophorone	78-59-1	51	400	51	ug/kg	U	UJ	H
Naphthalene	91-20-3	35	400	21	ug/kg	J	J-	H
Nitrobenzene	98-95-3	60	400	60	ug/kg	U	UJ	H
N-Nitroso-di-n-propylamine	621-64-7	71	400	71	ug/kg	U	UJ	H
N-Nitrosodiphenylamine	86-30-6	51	810	51	ug/kg	U	UJ	H
Pentachlorophenol	87-86-5	240	1000	240	ug/kg	U	UJ	H
Phenanthrene	85-01-8	34	400	26	ug/kg	J	J-	H
Phenol	108-95-2	160	510	160	ug/kg	U	UJ	H
Pyrene	129-00-0	26	400	26	ug/kg	U	UJ	H

Sample Name SCSS-068M-0001-SO **AnalysisType:** ORSVO

Lab Sample Name: 850426 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,2,4-Trichlorobenzene	120-82-1	21	410	21	ug/kg	U	U	
1,2-Dichlorobenzene	95-50-1	24	410	24	ug/kg	U	U	
1,3-Dichlorobenzene	541-73-1	20	410	20	ug/kg	U	U	
1,4-Dichlorobenzene	106-46-7	19	410	19	ug/kg	U	U	
2,4,5-Trichlorophenol	95-95-4	130	510	130	ug/kg	U	U	
2,4,6-Trichlorophenol	88-06-2	130	510	130	ug/kg	U	U	
2,4-Dichlorophenol	120-83-2	120	510	120	ug/kg	U	U	
2,4-Dimethylphenol	105-67-9	100	410	100	ug/kg	U	U	
2,4-Dinitrophenol	51-28-5	700	2000	700	ug/kg	U	U	
2,4-Dinitrotoluene	121-14-2	24	410	24	ug/kg	U	U	
2,6-Dinitrotoluene	606-20-2	24	410	24	ug/kg	U	U	
2-Chloronaphthalene	91-58-7	23	410	23	ug/kg	U	U	
2-Chlorophenol	95-57-8	340	510	340	ug/kg	U	U	
2-Methyl-4,6-dinitrophenol	534-52-1	270	1000	270	ug/kg	U	U	
2-Methylnaphthalene	91-57-6	25	410	25	ug/kg	U	U	

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2-Methylphenol	95-48-7	430	1000	430	ug/kg	U	U	
2-Nitroaniline	88-74-4	23	410	23	ug/kg	U	U	
2-Nitrophenol	88-75-5	280	510	280	ug/kg	U	U	
3,3'-Dichlorobenzidine	91-94-1	150	510	150	ug/kg	U	U	
3-Nitroaniline	99-09-2	22	1000	22	ug/kg	U	U	
4-Bromophenyl phenyl ether	101-55-3	25	410	25	ug/kg	U	U	
4-Chloro-3-methylphenol	59-50-7	390	510	390	ug/kg	U	U	
4-Chloroaniline	106-47-8	40	410	40	ug/kg	U	U	
4-Chlorophenyl phenyl ether	7005-72-3	26	410	26	ug/kg	U	U	
4-Methylphenol	1319-77-3	660	2000	660	ug/kg	U	U	
4-Nitroaniline	100-01-6	30	1000	30	ug/kg	U	U	
4-Nitrophenol	100-02-7	410	1000	410	ug/kg	U	U	
Acenaphthene	83-32-9	24	410	24	ug/kg	U	U	
Acenaphthylene	208-96-8	24	410	24	ug/kg	U	U	
Anthracene	120-12-7	24	410	24	ug/kg	U	U	
Benzo(a)anthracene	56-55-3	25	410	25	ug/kg	U	U	
Benzo(a)pyrene	50-32-8	23	410	23	ug/kg	U	U	
Benzo(b)fluoranthene	205-99-2	25	410	25	ug/kg	U	U	
Benzo(g,h,i)perylene	191-24-2	22	410	22	ug/kg	U	U	
Benzo(k)fluoranthene	207-08-9	25	410	25	ug/kg	U	U	
Benzoic acid	65-85-0	290	990	290	ug/kg	U	U	
Benzyl alcohol	100-51-6	84	1000	84	ug/kg	U	U	
Bis(2-chloroethoxy)methane	111-91-1	23	410	23	ug/kg	U	U	
Bis(2-chloroethyl) ether	111-44-4	25	410	25	ug/kg	U	U	
Bis(2-chloroisopropyl) ether	108-60-1	30	410	30	ug/kg	U	U	
Bis(2-ethylhexyl) phthalate	117-81-7	100	1000	88	ug/kg	J	U	B
Butylbenzyl phthalate	85-68-7	74	410	74	ug/kg	U	U	
Carbazole	86-74-8	28	410	28	ug/kg	U	U	
Chrysene	218-01-9	25	410	25	ug/kg	U	U	
Dibenzo(a,h)anthracene	53-70-3	22	410	22	ug/kg	U	U	
Dibenzofuran	132-64-9	24	410	24	ug/kg	U	U	
Diethyl phthalate	84-66-2	65	410	65	ug/kg	U	U	
Dimethyl phthalate	131-11-3	64	410	64	ug/kg	U	U	

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Di-n-butyl phthalate	84-74-2	88	410	80	ug/kg	J	J	
Di-n-octyl phthalate	117-84-0	60	410	60	ug/kg	U	U	
Fluoranthene	206-44-0	26	410	26	ug/kg	U	U	
Fluorene	86-73-7	25	410	25	ug/kg	U	U	
Hexachlorobenzene	118-74-1	28	410	28	ug/kg	U	U	
Hexachlorobutadiene	87-68-3	63	410	63	ug/kg	U	U	
Hexachlorocyclopentadiene	77-47-4	53	410	53	ug/kg	U	UJ	C
Hexachloroethane	67-72-1	33	410	33	ug/kg	U	U	
Indeno(1,2,3-cd)pyrene	193-39-5	23	410	23	ug/kg	U	U	
Isophorone	78-59-1	51	410	51	ug/kg	J	J	
Naphthalene	91-20-3	21	410	21	ug/kg	U	U	
Nitrobenzene	98-95-3	60	410	60	ug/kg	U	U	
N-Nitroso-di-n-propylamine	621-64-7	71	410	71	ug/kg	U	U	
N-Nitrosodiphenylamine	86-30-6	51	810	51	ug/kg	U	U	
Pentachlorophenol	87-86-5	240	1000	240	ug/kg	U	U	
Phenanthrene	85-01-8	26	410	26	ug/kg	U	U	
Phenol	108-95-2	160	510	160	ug/kg	U	U	
Pyrene	129-00-0	26	410	26	ug/kg	U	U	

Sample Delivery Group: 81543

Analysis Method SW846 8330B

Sample Name SCSB-037M-0001-SO **AnalysisType:** OREXP

Lab Sample Name: 851488 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,3,5-Trinitrobenzene	99-35-4	0.13	0.44	0.13	mg/kg	U	UJ	H
1,3-Dinitrobenzene	99-65-0	0.081	0.44	0.081	mg/kg	U	UJ	H
2,4,6-Trinitrotoluene	118-96-7	0.091	0.44	0.091	mg/kg	U	UJ	H
2,4-Dinitrotoluene	121-14-2	0.2	0.44	0.2	mg/kg	U	R	D
2,6-Dinitrotoluene	606-20-2	0.071	0.51	0.071	mg/kg	U	R	D
2-Amino-4,6-dinitrotoluene	35572-78-2	0.051	0.44	0.051	mg/kg	U	UJ	H
2-Nitrotoluene	88-72-2	0.091	0.44	0.091	mg/kg	U	UJ	H
3,5-Dinitroaniline	618-87-1	0.091	0.44	0.091	mg/kg	U	UJ	H
3-Nitrotoluene	99-08-1	0.071	0.44	0.071	mg/kg	U	UJ	H
4-Amino-2,6-dinitrotoluene	19406-51-0	0.071	0.44	0.071	mg/kg	U	UJ	H
4-Nitrotoluene	99-99-0	0.071	0.51	0.071	mg/kg	U	UJ	H
HMX	2691-41-0	0.12	0.44	0.12	mg/kg	U	UJ	H
Nitrobenzene	98-95-3	0.04	0.44	0.04	mg/kg	U	R	D
Nitroglycerin	55-63-0	0.51	1.5	0.51	mg/kg	U	UJ	H
PETN	78-11-5	0.51	1.5	0.51	mg/kg	U	UJ	H
RDX	121-82-4	0.16	0.44	0.16	mg/kg	U	UJ	H
Tetryl	479-45-8	0.091	0.44	0.091	mg/kg	U	UJ	H

Sample Name SCSB-038M-0005-SO **AnalysisType:** OREXP

Lab Sample Name: 851510 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,3,5-Trinitrobenzene	99-35-4	0.13	0.44	0.13	mg/kg	U	UJ	H
1,3-Dinitrobenzene	99-65-0	0.08	0.44	0.08	mg/kg	U	UJ	H
2,4,6-Trinitrotoluene	118-96-7	0.09	0.44	0.09	mg/kg	U	UJ	H
2,4-Dinitrotoluene	121-14-2	0.2	0.44	0.2	mg/kg	U	R	D
2,6-Dinitrotoluene	606-20-2	0.07	0.5	0.07	mg/kg	U	R	D
2-Amino-4,6-dinitrotoluene	35572-78-2	0.05	0.44	0.05	mg/kg	U	UJ	H

Sample Delivery Group: 81543

2-Nitrotoluene	88-72-2	0.09	0.44	0.09	mg/kg	U	UJ	H
3,5-Dinitroaniline	618-87-1	0.09	0.44	0.09	mg/kg	U	UJ	H
3-Nitrotoluene	99-08-1	0.07	0.44	0.07	mg/kg	U	UJ	H
4-Amino-2,6-dinitrotoluene	19406-51-0	0.07	0.44	0.07	mg/kg	U	UJ	H
4-Nitrotoluene	99-99-0	0.07	0.5	0.07	mg/kg	U	UJ	H
HMX	2691-41-0	0.12	0.44	0.12	mg/kg	U	UJ	H
Nitrobenzene	98-95-3	0.04	0.44	0.04	mg/kg	U	R	D
Nitroglycerin	55-63-0	0.5	1.5	0.5	mg/kg	U	UJ	H
PETN	78-11-5	0.5	1.5	0.5	mg/kg	U	UJ	H
RDX	121-82-4	0.16	0.44	0.16	mg/kg	U	UJ	H
Tetryl	479-45-8	0.09	0.44	0.09	mg/kg	U	UJ	H

Sample Name SCSB-042M-0003-SO **AnalysisType:** OREXP

Lab Sample Name: 851552 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,3,5-Trinitrobenzene	99-35-4	0.13	0.44	0.13	mg/kg	U	UJ	H
1,3-Dinitrobenzene	99-65-0	0.08	0.44	0.08	mg/kg	U	UJ	H
2,4,6-Trinitrotoluene	118-96-7	0.09	0.44	0.09	mg/kg	U	UJ	H
2,4-Dinitrotoluene	121-14-2	0.2	0.44	0.2	mg/kg	U	R	D
2,6-Dinitrotoluene	606-20-2	0.07	0.5	0.07	mg/kg	U	R	D
2-Amino-4,6-dinitrotoluene	35572-78-2	0.05	0.44	0.05	mg/kg	U	UJ	H
2-Nitrotoluene	88-72-2	0.09	0.44	0.09	mg/kg	U	UJ	H
3,5-Dinitroaniline	618-87-1	0.09	0.44	0.09	mg/kg	U	UJ	H
3-Nitrotoluene	99-08-1	0.07	0.44	0.07	mg/kg	U	UJ	H
4-Amino-2,6-dinitrotoluene	19406-51-0	0.07	0.44	0.07	mg/kg	U	UJ	H, C
4-Nitrotoluene	99-99-0	0.07	0.5	0.07	mg/kg	U	UJ	H
HMX	2691-41-0	0.12	0.44	0.12	mg/kg	U	UJ	H
Nitrobenzene	98-95-3	0.04	0.44	0.04	mg/kg	U	R	D
Nitroglycerin	55-63-0	0.5	1.5	0.5	mg/kg	U	UJ	H
PETN	78-11-5	0.5	1.5	0.5	mg/kg	U	UJ	H
RDX	121-82-4	0.16	0.44	0.16	mg/kg	U	UJ	H
Tetryl	479-45-8	0.09	0.44	0.09	mg/kg	U	UJ	H

Sample Delivery Group: 81543

Sample Name SCSS-068M-0001-SO **AnalysisType:** OREXP

Lab Sample Name: 850426 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,3,5-Trinitrobenzene	99-35-4	0.13	0.44	0.13	mg/kg	U	U	
1,3-Dinitrobenzene	99-65-0	0.08	0.44	0.08	mg/kg	U	U	
2,4,6-Trinitrotoluene	118-96-7	0.09	0.44	0.09	mg/kg	U	U	
2,4-Dinitrotoluene	121-14-2	0.2	0.44	0.2	mg/kg	U	R	D
2,6-Dinitrotoluene	606-20-2	0.07	0.5	0.07	mg/kg	U	R	D
2-Amino-4,6-dinitrotoluene	35572-78-2	0.05	0.44	0.05	mg/kg	U	U	
2-Nitrotoluene	88-72-2	0.09	0.44	0.09	mg/kg	U	U	
3,5-Dinitroaniline	618-87-1	0.09	0.44	0.09	mg/kg	U	U	
3-Nitrotoluene	99-08-1	0.07	0.44	0.07	mg/kg	U	U	
4-Amino-2,6-dinitrotoluene	19406-51-0	0.07	0.44	0.07	mg/kg	U	U	
4-Nitrotoluene	99-99-0	0.07	0.5	0.07	mg/kg	U	U	
HMX	2691-41-0	0.12	0.44	0.12	mg/kg	U	U	
Nitrobenzene	98-95-3	0.04	0.44	0.04	mg/kg	U	R	D
Nitroglycerin	55-63-0	0.5	1.5	0.5	mg/kg	U	U	
PETN	78-11-5	0.5	1.5	0.5	mg/kg	U	U	
RDX	121-82-4	0.16	0.44	0.16	mg/kg	U	U	
Tetryl	479-45-8	0.09	0.44	0.09	mg/kg	U	U	

Sample Delivery Group: 81613

Analysis Method EPA 7471A

Sample Name SCSB-048M-0001-SO **AnalysisType:** INORG

Lab Sample Name: 854011 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Mercury	7439-97-6	0.046	0.008	0.0024	mg/kg			

Sample Name SCSD-070M-0001-SD **AnalysisType:** INORG

Lab Sample Name: 854000 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Mercury	7439-97-6	0.3	0.008	0.0024	mg/kg			

Sample Name SCSS-058M-0001-SO **AnalysisType:** INORG

Lab Sample Name: 852322 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Mercury	7439-97-6	11.1	0.81	0.24	mg/kg			

Sample Delivery Group: 81613

Analysis Method SW846 6010

Sample Name SCSB-048M-0001-SO **AnalysisType:** INORG

Lab Sample Name: 854011 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Aluminum	7429-90-5	13000	0.24	0.081	mg/kg		J-	Q, A
Antimony	7440-36-0	1.5	0.55	0.16	mg/kg		J-	Q, *III
Arsenic	7440-38-2	15	0.91	0.26	mg/kg		J	E
Barium	7440-39-3	137	0.055	0.016	mg/kg		J-	A
Beryllium	7440-41-7	1.5	0.024	0.0081	mg/kg			
Cadmium	7440-43-9	0.012	0.043	0.012	mg/kg	UV	UJ	C, Q, *III
Calcium	7440-70-2	37100	1	0.12	mg/kg		J-	A
Chromium	7440-47-3	109	0.13	0.038	mg/kg		J-	A
Cobalt	7440-48-4	6	0.099	0.03	mg/kg		J-	Q
Copper	7440-50-8	44.8	0.4	0.12	mg/kg		J-	Q
Iron	7439-89-6	22800	2	0.61	mg/kg			
Lead	7439-92-1	34.5	0.28	0.081	mg/kg		J+	Q, *III
Magnesium	7439-95-4	3580	0.81	0.24	mg/kg		J-	A
Manganese	7439-96-5	1150	0.1	0.032	mg/kg		J-	A
Nickel	7440-02-0	88.1	0.12	0.036	mg/kg		J-	Q, A
Potassium	7440-09-7	1020	36	11	mg/kg			
Selenium	7782-49-2	1.1	0.85	0.14	mg/kg			
Silver	7440-22-4	0.5	0.11	0.034	mg/kg			
Sodium	7440-23-5	227	13	4	mg/kg			
Thallium	7440-28-0	1.6	0.28	0.081	mg/kg	B	J-	E, Q
Vanadium	7440-62-2	13.3	0.069	0.022	mg/kg			
Zinc	7440-66-6	41.3	0.24	0.081	mg/kg		J-	Q, A

Sample Name SCSD-070M-0001-SD **AnalysisType:** INORG

Lab Sample Name: 854000 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Aluminum	7429-90-5	7240	0.61	0.2	mg/kg	B	J-	Q, A

Sample Delivery Group: 81613

Antimony	7440-36-0	8.4	1.4	0.41	mg/kg		J-	Q, *III
Arsenic	7440-38-2	9.4	2.3	0.66	mg/kg		J	E
Barium	7440-39-3	231	0.14	0.041	mg/kg	B	J-	A
Beryllium	7440-41-7	0.41	0.061	0.02	mg/kg			
Cadmium	7440-43-9	2.7	0.11	0.031	mg/kg		J-	C, Q, *III
Calcium	7440-70-2	3240	2.5	0.31	mg/kg		J-	A
Chromium	7440-47-3	40.9	0.32	0.097	mg/kg		J-	A
Cobalt	7440-48-4	7.8	0.25	0.076	mg/kg		J-	Q
Copper	7440-50-8	53.7	1	0.31	mg/kg		J-	Q
Iron	7439-89-6	23800	5.1	1.5	mg/kg	B		
Lead	7439-92-1	104	0.71	0.2	mg/kg		J+	Q, *III
Magnesium	7439-95-4	2840	2	0.61	mg/kg	B	J-	A
Manganese	7439-96-5	512	0.25	0.081	mg/kg		J-	A
Nickel	7440-02-0	21.1	0.31	0.092	mg/kg		J-	Q, A
Potassium	7440-09-7	1070	37	11	mg/kg			
Selenium	7782-49-2	1.4	2.1	0.36	mg/kg	JV	J	
Silver	7440-22-4	116	57	17	mg/kg			
Sodium	7440-23-5	221	13	4.1	mg/kg			
Thallium	7440-28-0	1.2	0.71	0.2	mg/kg		J-	E, Q
Vanadium	7440-62-2	11.5	0.17	0.056	mg/kg			
Zinc	7440-66-6	108	0.61	0.2	mg/kg		J-	Q, A

Sample Name SCSS-058M-0001-SO **AnalysisType:** INORG

Lab Sample Name: 852322 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Aluminum	7429-90-5	10400	0.24	0.082	mg/kg		J-	Q, A
Antimony	7440-36-0	3.1	0.55	0.16	mg/kg		J-	Q, *III
Arsenic	7440-38-2	4.5	0.92	0.27	mg/kg		J	E
Barium	7440-39-3	127	0.055	0.016	mg/kg	B	J-	A
Beryllium	7440-41-7	0.66	0.024	0.0082	mg/kg			
Cadmium	7440-43-9	1.9	0.043	0.012	mg/kg		J-	Q, *III
Calcium	7440-70-2	21500	1	0.12	mg/kg		J-	A
Chromium	7440-47-3	143	0.13	0.039	mg/kg		J-	A

Sample Delivery Group: 81613

Cobalt	7440-48-4	6.7	0.1	0.031	mg/kg		J-	Q
Copper	7440-50-8	33.7	0.41	0.12	mg/kg		J-	Q
Iron	7439-89-6	27100	2	0.61	mg/kg			
Lead	7439-92-1	139	0.29	0.082	mg/kg		J+	Q, *III
Magnesium	7439-95-4	3930	0.82	0.24	mg/kg		J-	A
Manganese	7439-96-5	729	0.1	0.033	mg/kg		J-	A
Nickel	7440-02-0	21.7	0.12	0.037	mg/kg		J-	Q, A
Potassium	7440-09-7	1180	37	11	mg/kg			
Selenium	7782-49-2	0.83	0.86	0.14	mg/kg	JV	J	
Silver	7440-22-4	3.8	0.11	0.035	mg/kg			
Sodium	7440-23-5	99.6	13	4.1	mg/kg		J	C
Thallium	7440-28-0	1.7	0.29	0.082	mg/kg		J-	E, Q
Vanadium	7440-62-2	14.8	0.069	0.022	mg/kg			
Zinc	7440-66-6	269	0.24	0.082	mg/kg		J-	Q, A

Analysis Method SW846 7196

Sample Name SCSB-048M-0001-SO **AnalysisType:** MISC

Lab Sample Name: 854011 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Hexavalent Chromium	18540-29-9	1.9	6.5	1.9	mg/kg	U	UJ	C, Q

Sample Name SCSD-070M-0001-SD **AnalysisType:** MISC

Lab Sample Name: 854000 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Hexavalent Chromium	18540-29-9	1.9	6.5	1.9	mg/kg	U	UJ	C, Q

Sample Delivery Group: 81613

Analysis Method SW846 8081

Sample Name SCSB-048M-0001-SO **AnalysisType:** ORSVO

Lab Sample Name: 854011 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
4,4'-DDD	72-54-8	1.5	12	1.5	ug/kg	UV	U	
4,4'-DDE	72-55-9	5.1	20	1.5	ug/kg	JV	J	
4,4'-DDT	50-29-3	13	12	2.5	ug/kg	V		
Aldrin	309-00-2	2.5	12	2.5	ug/kg	UV	U	
alpha-BHC	319-84-6	3.1	20	3.1	ug/kg	UV	U	
alpha-Chlordane	5103-71-9	1.5	20	1.5	ug/kg	UV	U	
beta-BHC	319-85-7	3.1	20	3.1	ug/kg	UV	U	
Chlordane (Technical)	57-74-9	20	380	20	ug/kg	UV	U	
delta-BHC	319-86-8	1.5	12	1.5	ug/kg	UV	U	
Dieldrin	60-57-1	1.5	12	1.5	ug/kg	UV	U	
Endosulfan I	959-98-8	3.6	12	3.6	ug/kg	UV	U	
Endosulfan II	33213-65-9	3.6	12	1.5	ug/kg	JV	J	
Endosulfan sulfate	1031-07-8	4.6	20	4.6	ug/kg	UV	U	
Endrin	72-20-8	2	12	2	ug/kg	UV	UJ	C
Endrin aldehyde	7421-93-4	5.6	20	5.6	ug/kg	UV	U	
Endrin ketone	53494-70-5	4.1	12	4.1	ug/kg	UV	U	
GAMMA-BHC	58-89-9	2.5	12	2.5	ug/kg	UV	U	
gamma-Chlordane	5103-74-2	1.5	20	1.5	ug/kg	UV	U	
Heptachlor	76-44-8	2	12	2	ug/kg	UV	U	
Heptachlor epoxide	1024-57-3	2.5	20	2.5	ug/kg	UV	U	
Methoxychlor	72-43-5	3.6	12	3.6	ug/kg	UV	U	
Toxaphene	8001-35-2	25	250	25	ug/kg	UV	U	

Sample Delivery Group: 81613

Analysis Method SW846 8082

Sample Name SCSB-048M-0001-SO **AnalysisType:** ORPPB

Lab Sample Name: 854011 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Aroclor 1016	12674-11-2	10	51	10	ug/kg	U	U	
Aroclor 1221	11104-28-2	20	51	20	ug/kg	U	U	
Aroclor 1232	11141-16-5	27	51	27	ug/kg	U	U	
Aroclor 1242	53469-21-9	29	51	29	ug/kg	U	U	
Aroclor 1248	12672-29-6	29	51	29	ug/kg	U	U	
Aroclor 1254	11097-69-1	23	51	23	ug/kg	U	U	
Aroclor 1260	11096-82-5	12	51	12	ug/kg	U	U	
Aroclor 1262	37324-23-5	21	51	21	ug/kg	U	U	
Aroclor 1268	11100-14-4	28	51	28	ug/kg	U	U	

Sample Delivery Group: 81613

Analysis Method SW846 8260B

Sample Name SCSB-048D-0001-SO **AnalysisType:** ORVOA

Lab Sample Name: 854012 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,1,1-Trichloroethane	71-55-6	11	53	11	ug/kg	U	U	
1,1,2,2-Tetrachloroethane	79-34-5	6.3	53	6.3	ug/kg	U	U	
1,1,2-Trichloroethane	79-00-5	8.5	53	8.5	ug/kg	U	U	
1,1-Dichloroethane	75-34-3	12	53	12	ug/kg	U	U	
1,1-Dichloroethene	75-35-4	17	53	17	ug/kg	U	U	
1,2-Dibromoethane	106-93-4	11	53	11	ug/kg	U	U	
1,2-Dichloroethane	107-06-2	13	53	13	ug/kg	U	U	
1,2-Dichloropropane	78-87-5	7.4	53	7.4	ug/kg	U	U	
2-Butanone	78-93-3	110	530	110	ug/kg	U	U	
2-Hexanone	591-78-6	72	530	72	ug/kg	U	U	
4-Methyl-2-pentanone	108-10-1	87	530	87	ug/kg	U	U	
Acetone	67-64-1	67	1100	67	ug/kg	U	U	
Benzene	71-43-2	60	53	5.3	ug/kg			
Bromochloromethane	74-97-5	8.5	53	8.5	ug/kg	U	U	
Bromodichloromethane	75-27-4	9.5	53	9.5	ug/kg	U	U	
Bromoform	75-25-2	6.3	53	6.3	ug/kg	U	U	
Bromomethane	74-83-9	32	110	32	ug/kg	U	U	
Carbon disulfide	75-15-0	16	110	16	ug/kg	U	UJ	C
Carbon tetrachloride	56-23-5	12	53	12	ug/kg	U	U	
Chlorobenzene	108-90-7	8.5	53	8.5	ug/kg	U	U	
Chloroethane	75-00-3	20	110	20	ug/kg	U	U	
Chloroform	67-66-3	9.5	53	9.5	ug/kg	U	U	
Chloromethane	74-87-3	26	110	26	ug/kg	U	U	
cis-1,2-Dichloroethene	156-59-2	11	53	11	ug/kg	U	U	
cis-1,3-Dichloropropene	10061-01-5	11	53	11	ug/kg	U	U	
Dibromochloromethane	124-48-1	8.5	53	8.5	ug/kg	U	UJ	C
Ethylbenzene	100-41-4	150	53	8.5	ug/kg			

Sample Delivery Group: 81613

m,p-Xylenes	1330-20-7	360	110	19	ug/kg			
Methylene chloride	75-09-2	42	110	42	ug/kg	U	U	
o-Xylene	95-47-6	350	53	8.5	ug/kg			
Styrene	100-42-5	6.3	53	6.3	ug/kg	U	U	
Tetrachloroethene	127-18-4	8.5	53	8.5	ug/kg	U	U	
Toluene	108-88-3	310	53	7.4	ug/kg			
trans-1,2-Dichloroethene	156-60-5	12	53	12	ug/kg	U	U	
trans-1,3-Dichloropropene	10061-02-6	7.4	110	7.4	ug/kg	U	UJ	C
Trichloroethene	79-01-6	11	53	11	ug/kg	U	U	
Vinyl chloride	75-01-4	15	53	15	ug/kg	U	U	

Sample Delivery Group: 81613

Analysis Method SW846 8270

Sample Name SCSB-048M-0001-SO **AnalysisType:** ORSVO

Lab Sample Name: 854011 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,2,4-Trichlorobenzene	120-82-1	21	400	21	ug/kg	U	UJ	H
1,2-Dichlorobenzene	95-50-1	24	400	24	ug/kg	U	UJ	H
1,3-Dichlorobenzene	541-73-1	20	400	20	ug/kg	U	UJ	H
1,4-Dichlorobenzene	106-46-7	19	400	19	ug/kg	U	UJ	H
2,4,5-Trichlorophenol	95-95-4	130	500	130	ug/kg	U	UJ	H, C
2,4,6-Trichlorophenol	88-06-2	130	500	130	ug/kg	U	UJ	H
2,4-Dichlorophenol	120-83-2	120	500	120	ug/kg	U	UJ	H
2,4-Dimethylphenol	105-67-9	100	400	100	ug/kg	U	UJ	H
2,4-Dinitrophenol	51-28-5	700	2000	700	ug/kg	U	R	C
2,4-Dinitrotoluene	121-14-2	24	400	24	ug/kg	U	UJ	H
2,6-Dinitrotoluene	606-20-2	24	400	24	ug/kg	U	UJ	H
2-Chloronaphthalene	91-58-7	23	400	23	ug/kg	U	UJ	H
2-Chlorophenol	95-57-8	340	500	340	ug/kg	U	UJ	H
2-Methyl-4,6-dinitrophenol	534-52-1	270	1000	270	ug/kg	U	R	C
2-Methylnaphthalene	91-57-6	490	400	25	ug/kg		J-	H
2-Methylphenol	95-48-7	420	1000	420	ug/kg	U	UJ	H
2-Nitroaniline	88-74-4	23	400	23	ug/kg	U	UJ	H
2-Nitrophenol	88-75-5	280	500	280	ug/kg	U	UJ	H, C
3,3'-Dichlorobenzidine	91-94-1	150	500	150	ug/kg	U	UJ	H
3-Nitroaniline	99-09-2	22	1000	22	ug/kg	U	UJ	H
4-Bromophenyl phenyl ether	101-55-3	25	400	25	ug/kg	U	UJ	H
4-Chloro-3-methylphenol	59-50-7	380	500	380	ug/kg	U	UJ	H
4-Chloroaniline	106-47-8	39	400	39	ug/kg	U	UJ	H
4-Chlorophenyl phenyl ether	7005-72-3	26	400	26	ug/kg	U	UJ	H
4-Methylphenol	1319-77-3	660	2000	660	ug/kg	U	UJ	H
4-Nitroaniline	100-01-6	30	1000	30	ug/kg	U	UJ	H
4-Nitrophenol	100-02-7	400	1000	400	ug/kg	U	UJ	H, C

Sample Delivery Group: 81613

Acenaphthene	83-32-9	24	400	24	ug/kg	U	UJ	H
Acenaphthylene	208-96-8	34	400	24	ug/kg	J	J-	H
Anthracene	120-12-7	65	400	24	ug/kg	J	J-	H
Benzo(a)anthracene	56-55-3	120	400	25	ug/kg	J	J-	H
Benzo(a)pyrene	50-32-8	150	400	23	ug/kg	JS	J-	H, I
Benzo(b)fluoranthene	205-99-2	410	400	25	ug/kg	S	J-	H, I
Benzo(g,h,i)perylene	191-24-2	22	400	22	ug/kg	US	UJ	H, C, I
Benzo(k)fluoranthene	207-08-9	160	400	25	ug/kg	JS	J	H, C, I
Benzoic acid	65-85-0	290	2000	290	ug/kg	U	UJ	H
Benzyl alcohol	100-51-6	84	1000	84	ug/kg	U	UJ	H, C
Bis(2-chloroethoxy)methane	111-91-1	23	400	23	ug/kg	U	UJ	H
Bis(2-chloroethyl) ether	111-44-4	25	400	25	ug/kg	U	UJ	H
Bis(2-chloroisopropyl) ether	108-60-1	30	400	30	ug/kg	U	UJ	H
Bis(2-ethylhexyl) phthalate	117-81-7	88	1000	88	ug/kg	U	UJ	H
Butylbenzyl phthalate	85-68-7	74	400	74	ug/kg	U	UJ	H
Carbazole	86-74-8	35	400	28	ug/kg	J	J-	H
Chrysene	218-01-9	180	400	25	ug/kg	J	J-	H
Dibenzo(a,h)anthracene	53-70-3	22	400	22	ug/kg	US	UJ	H, C, I
Dibenzofuran	132-64-9	93	400	24	ug/kg	J	J-	H
Diethyl phthalate	84-66-2	65	400	65	ug/kg	U	UJ	H
Dimethyl phthalate	131-11-3	64	400	64	ug/kg	U	UJ	H
Di-n-butyl phthalate	84-74-2	120	400	80	ug/kg	J	J-	H
Di-n-octyl phthalate	117-84-0	60	400	60	ug/kg	U	UJ	H
Fluoranthene	206-44-0	240	400	26	ug/kg	J	J-	H
Fluorene	86-73-7	41	400	25	ug/kg	J	J-	H
Hexachlorobenzene	118-74-1	28	400	28	ug/kg	U	UJ	H
Hexachlorobutadiene	87-68-3	63	400	63	ug/kg	U	UJ	H
Hexachlorocyclopentadiene	77-47-4	52	400	52	ug/kg	U	R	C
Hexachloroethane	67-72-1	33	400	33	ug/kg	U	UJ	H
Indeno(1,2,3-cd)pyrene	193-39-5	49	400	23	ug/kg	JS	J-	H, C, I
Isophorone	78-59-1	50	400	50	ug/kg	U	UJ	H
Naphthalene	91-20-3	330	400	21	ug/kg	J	J-	H
Nitrobenzene	98-95-3	60	400	60	ug/kg	U	UJ	H

Sample Delivery Group: 81613

N-Nitroso-di-n-propylamine	621-64-7	71	400	71	ug/kg	U	UJ	H
N-Nitrosodiphenylamine	86-30-6	50	810	50	ug/kg	U	UJ	H
Pentachlorophenol	87-86-5	240	1000	240	ug/kg	U	UJ	H
Phenanthrene	85-01-8	280	400	26	ug/kg	J	J-	H
Phenol	108-95-2	160	500	160	ug/kg	U	UJ	H
Pyrene	129-00-0	240	400	26	ug/kg	J	J-	H

Sample Name SCSD-070M-0001-SD **AnalysisType:** ORSVO

Lab Sample Name: 854000 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,2,4-Trichlorobenzene	120-82-1	21	400	21	ug/kg	U	UJ	H
1,2-Dichlorobenzene	95-50-1	44	400	24	ug/kg	J	J-	H
1,3-Dichlorobenzene	541-73-1	20	400	20	ug/kg	U	UJ	H
1,4-Dichlorobenzene	106-46-7	40	400	19	ug/kg	J	J-	H
2,4,5-Trichlorophenol	95-95-4	130	510	130	ug/kg	U	UJ	H, C
2,4,6-Trichlorophenol	88-06-2	130	510	130	ug/kg	U	UJ	H
2,4-Dichlorophenol	120-83-2	120	510	120	ug/kg	U	UJ	H
2,4-Dimethylphenol	105-67-9	100	400	100	ug/kg	U	UJ	H
2,4-Dinitrophenol	51-28-5	700	2000	700	ug/kg	U	R	C
2,4-Dinitrotoluene	121-14-2	24	400	24	ug/kg	U	UJ	H
2,6-Dinitrotoluene	606-20-2	24	400	24	ug/kg	U	UJ	H
2-Chloronaphthalene	91-58-7	23	400	23	ug/kg	U	UJ	H
2-Chlorophenol	95-57-8	340	510	340	ug/kg	U	UJ	H
2-Methyl-4,6-dinitrophenol	534-52-1	270	1000	270	ug/kg	U	R	C
2-Methylnaphthalene	91-57-6	43	400	25	ug/kg	J	J-	H
2-Methylphenol	95-48-7	420	1000	420	ug/kg	U	UJ	H
2-Nitroaniline	88-74-4	23	400	23	ug/kg	U	UJ	H
2-Nitrophenol	88-75-5	280	510	280	ug/kg	U	UJ	H, C
3,3'-Dichlorobenzidine	91-94-1	150	510	150	ug/kg	U	UJ	H
3-Nitroaniline	99-09-2	22	1000	22	ug/kg	U	UJ	H, C
4-Bromophenyl phenyl ether	101-55-3	25	400	25	ug/kg	U	UJ	H
4-Chloro-3-methylphenol	59-50-7	380	510	380	ug/kg	U	UJ	H
4-Chloroaniline	106-47-8	39	400	39	ug/kg	U	UJ	H

Sample Delivery Group: 81613

4-Chlorophenyl phenyl ether	7005-72-3	26	400	26	ug/kg	U	UJ	H
4-Methylphenol	1319-77-3	660	2000	660	ug/kg	U	UJ	H
4-Nitroaniline	100-01-6	30	1000	30	ug/kg	U	UJ	H
4-Nitrophenol	100-02-7	400	1000	400	ug/kg	U	UJ	H, C
Acenaphthene	83-32-9	24	400	24	ug/kg	U	UJ	H
Acenaphthylene	208-96-8	24	400	24	ug/kg	U	UJ	H
Anthracene	120-12-7	24	400	24	ug/kg	U	UJ	H
Benzo(a)anthracene	56-55-3	57	400	25	ug/kg	J	J-	H
Benzo(a)pyrene	50-32-8	67	400	23	ug/kg	J	J-	H
Benzo(b)fluoranthene	205-99-2	110	400	25	ug/kg	J	J-	H
Benzo(g,h,i)perylene	191-24-2	26	400	22	ug/kg	J	J-	H, C
Benzo(k)fluoranthene	207-08-9	47	400	25	ug/kg	J	J	H, C
Benzoic acid	65-85-0	290	2000	290	ug/kg	U	UJ	H
Benzyl alcohol	100-51-6	84	1000	84	ug/kg	U	UJ	H, C
Bis(2-chloroethoxy)methane	111-91-1	23	400	23	ug/kg	U	UJ	H
Bis(2-chloroethyl) ether	111-44-4	25	400	25	ug/kg	U	UJ	H
Bis(2-chloroisopropyl) ether	108-60-1	30	400	30	ug/kg	U	UJ	H
Bis(2-ethylhexyl) phthalate	117-81-7	88	1000	88	ug/kg	U	UJ	H
Butylbenzyl phthalate	85-68-7	74	400	74	ug/kg	U	UJ	H
Carbazole	86-74-8	28	400	28	ug/kg	U	UJ	H
Chrysene	218-01-9	70	400	25	ug/kg	J	J-	H
Dibenzo(a,h)anthracene	53-70-3	22	400	22	ug/kg	U	UJ	H, C
Dibenzofuran	132-64-9	24	400	24	ug/kg	U	UJ	H
Diethyl phthalate	84-66-2	65	400	65	ug/kg	U	UJ	H
Dimethyl phthalate	131-11-3	64	400	64	ug/kg	U	UJ	H
Di-n-butyl phthalate	84-74-2	300	400	80	ug/kg	J	J-	H
Di-n-octyl phthalate	117-84-0	60	400	60	ug/kg	U	UJ	H
Fluoranthene	206-44-0	89	400	26	ug/kg	J	J-	H
Fluorene	86-73-7	25	400	25	ug/kg	U	UJ	H
Hexachlorobenzene	118-74-1	28	400	28	ug/kg	U	UJ	H
Hexachlorobutadiene	87-68-3	63	400	63	ug/kg	U	UJ	H
Hexachlorocyclopentadiene	77-47-4	53	400	53	ug/kg	U	R	C
Hexachloroethane	67-72-1	33	400	33	ug/kg	U	UJ	H

Sample Delivery Group: 81613

Indeno(1,2,3-cd)pyrene	193-39-5	26	400	23	ug/kg	J	J-	H, C
Isophorone	78-59-1	51	400	51	ug/kg	U	UJ	H
Naphthalene	91-20-3	29	400	21	ug/kg	J	J-	H
Nitrobenzene	98-95-3	60	400	60	ug/kg	U	UJ	H
N-Nitroso-di-n-propylamine	621-64-7	71	400	71	ug/kg	U	UJ	H
N-Nitrosodiphenylamine	86-30-6	51	810	51	ug/kg	U	UJ	H
Pentachlorophenol	87-86-5	240	1000	240	ug/kg	U	UJ	H
Phenanthrene	85-01-8	53	400	26	ug/kg	J	J-	H
Phenol	108-95-2	160	510	160	ug/kg	U	UJ	H
Pyrene	129-00-0	89	400	26	ug/kg	J	J-	H

Sample Name SCSS-058M-0001-SO **AnalysisType:** ORSVO

Lab Sample Name: 852322 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,2,4-Trichlorobenzene	120-82-1	21	410	21	ug/kg	U	UJ	H
1,2-Dichlorobenzene	95-50-1	24	410	24	ug/kg	U	UJ	H
1,3-Dichlorobenzene	541-73-1	20	410	20	ug/kg	U	UJ	H
1,4-Dichlorobenzene	106-46-7	22	410	19	ug/kg	J	J-	H
2,4,5-Trichlorophenol	95-95-4	130	510	130	ug/kg	U	UJ	H
2,4,6-Trichlorophenol	88-06-2	130	510	130	ug/kg	U	UJ	H
2,4-Dichlorophenol	120-83-2	120	510	120	ug/kg	U	UJ	H
2,4-Dimethylphenol	105-67-9	100	410	100	ug/kg	U	UJ	H
2,4-Dinitrophenol	51-28-5	700	2000	700	ug/kg	U	UJ	H, C
2,4-Dinitrotoluene	121-14-2	24	410	24	ug/kg	U	UJ	H
2,6-Dinitrotoluene	606-20-2	24	410	24	ug/kg	U	UJ	H
2-Chloronaphthalene	91-58-7	23	410	23	ug/kg	U	UJ	H
2-Chlorophenol	95-57-8	350	510	350	ug/kg	U	UJ	H
2-Methyl-4,6-dinitrophenol	534-52-1	270	1000	270	ug/kg	U	UJ	H, C
2-Methylnaphthalene	91-57-6	370	410	25	ug/kg	J	J-	H
2-Methylphenol	95-48-7	430	1000	430	ug/kg	U	UJ	H
2-Nitroaniline	88-74-4	23	410	23	ug/kg	U	UJ	H
2-Nitrophenol	88-75-5	280	510	280	ug/kg	U	UJ	H
3,3'-Dichlorobenzidine	91-94-1	150	510	150	ug/kg	U	UJ	H

Sample Delivery Group: 81613

3-Nitroaniline	99-09-2	22	1000	22	ug/kg	U	UJ	H
4-Bromophenyl phenyl ether	101-55-3	25	410	25	ug/kg	U	UJ	H
4-Chloro-3-methylphenol	59-50-7	390	510	390	ug/kg	U	UJ	H
4-Chloroaniline	106-47-8	40	410	40	ug/kg	U	UJ	H
4-Chlorophenyl phenyl ether	7005-72-3	26	410	26	ug/kg	U	UJ	H
4-Methylphenol	1319-77-3	660	2000	660	ug/kg	U	UJ	H
4-Nitroaniline	100-01-6	31	1000	31	ug/kg	U	UJ	H, C
4-Nitrophenol	100-02-7	410	1000	410	ug/kg	U	UJ	H
Acenaphthene	83-32-9	43	410	24	ug/kg	J	J-	H
Acenaphthylene	208-96-8	160	410	24	ug/kg	J	J-	H
Anthracene	120-12-7	300	410	24	ug/kg	J	J-	H
Benzo(a)anthracene	56-55-3	740	410	25	ug/kg		J-	H
Benzo(a)pyrene	50-32-8	590	410	23	ug/kg		J-	H
Benzo(b)fluoranthene	205-99-2	1000	410	25	ug/kg		J-	H
Benzo(g,h,i)perylene	191-24-2	170	410	22	ug/kg	J	J-	H, C
Benzo(k)fluoranthene	207-08-9	330	410	25	ug/kg	J	J-	H
Benzoic acid	65-85-0	300	1000	300	ug/kg	U	UJ	H
Benzyl alcohol	100-51-6	84	1000	84	ug/kg	U	R	C
Bis(2-chloroethoxy)methane	111-91-1	23	410	23	ug/kg	U	UJ	H
Bis(2-chloroethyl) ether	111-44-4	25	410	25	ug/kg	U	UJ	H
Bis(2-chloroisopropyl) ether	108-60-1	31	410	31	ug/kg	U	UJ	H
Bis(2-ethylhexyl) phthalate	117-81-7	89	1000	89	ug/kg	U	UJ	H
Butylbenzyl phthalate	85-68-7	74	410	74	ug/kg	U	UJ	H
Carbazole	86-74-8	78	410	28	ug/kg	J	J-	H
Chrysene	218-01-9	700	410	25	ug/kg		J-	H
Dibenzo(a,h)anthracene	53-70-3	75	410	22	ug/kg	J	J-	H
Dibenzofuran	132-64-9	140	410	24	ug/kg	J	J-	H
Diethyl phthalate	84-66-2	65	410	65	ug/kg	U	UJ	H
Dimethyl phthalate	131-11-3	64	410	64	ug/kg	U	UJ	H
Di-n-butyl phthalate	84-74-2	120	410	80	ug/kg	J	J-	H
Di-n-octyl phthalate	117-84-0	60	410	60	ug/kg	U	UJ	H
Fluoranthene	206-44-0	1800	410	26	ug/kg		J-	H
Fluorene	86-73-7	190	410	25	ug/kg	J	J-	H

Sample Delivery Group: 81613

Hexachlorobenzene	118-74-1	28	410	28	ug/kg	U	UJ	H
Hexachlorobutadiene	87-68-3	63	410	63	ug/kg	U	UJ	H
Hexachlorocyclopentadiene	77-47-4	53	410	53	ug/kg	U	R	C
Hexachloroethane	67-72-1	34	410	34	ug/kg	U	UJ	H
Indeno(1,2,3-cd)pyrene	193-39-5	180	410	23	ug/kg	J	J-	H, C
Isophorone	78-59-1	110	410	51	ug/kg	J	J-	H
Naphthalene	91-20-3	240	410	21	ug/kg	J	J-	H
Nitrobenzene	98-95-3	60	410	60	ug/kg	U	UJ	H
N-Nitroso-di-n-propylamine	621-64-7	71	410	71	ug/kg	U	UJ	H
N-Nitrosodiphenylamine	86-30-6	51	810	51	ug/kg	U	UJ	H
Pentachlorophenol	87-86-5	240	1000	240	ug/kg	U	UJ	H
Phenanthrene	85-01-8	1200	410	26	ug/kg		J-	H
Phenol	108-95-2	160	510	160	ug/kg	U	UJ	H
Pyrene	129-00-0	1300	410	26	ug/kg		J-	H

Sample Delivery Group: 81613

Analysis Method SW846 8330B

Sample Name SCSB-048M-0001-SO **AnalysisType:** OREXP

Lab Sample Name: 854011 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,3,5-Trinitrobenzene	99-35-4	0.13	0.44	0.13	mg/kg	U	UJ	H
1,3-Dinitrobenzene	99-65-0	0.08	0.44	0.08	mg/kg	U	UJ	H
2,4,6-Trinitrotoluene	118-96-7	0.09	0.44	0.09	mg/kg	U	UJ	H
2,4-Dinitrotoluene	121-14-2	0.2	0.44	0.2	mg/kg	U	R	D
2,6-Dinitrotoluene	606-20-2	0.07	0.5	0.07	mg/kg	U	R	D
2-Amino-4,6-dinitrotoluene	35572-78-2	0.05	0.44	0.05	mg/kg	U	UJ	H
2-Nitrotoluene	88-72-2	0.09	0.44	0.09	mg/kg	U	UJ	H
3,5-Dinitroaniline	618-87-1	0.09	0.44	0.09	mg/kg	U	UJ	H
3-Nitrotoluene	99-08-1	0.07	0.44	0.07	mg/kg	U	UJ	H
4-Amino-2,6-dinitrotoluene	19406-51-0	0.07	0.44	0.07	mg/kg	U	UJ	H
4-Nitrotoluene	99-99-0	0.07	0.5	0.07	mg/kg	U	UJ	H
HMX	2691-41-0	0.12	0.44	0.12	mg/kg	U	UJ	H
Nitrobenzene	98-95-3	0.04	0.44	0.04	mg/kg	U	R	D
Nitroglycerin	55-63-0	0.5	1.5	0.5	mg/kg	U	UJ	H
Nitroguanidine	556-88-7	0.059	0.16	0.059	mg/kg	U	UJ	H, *III
PETN	78-11-5	0.5	1.5	0.5	mg/kg	U	UJ	H
RDX	121-82-4	0.16	0.44	0.16	mg/kg	U	UJ	H
Tetryl	479-45-8	0.09	0.44	0.09	mg/kg	U	UJ	H

Sample Name SCSD-070M-0001-SD **AnalysisType:** OREXP

Lab Sample Name: 854000 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,3,5-Trinitrobenzene	99-35-4	0.13	0.44	0.13	mg/kg	U	UJ	H
1,3-Dinitrobenzene	99-65-0	0.079	0.44	0.079	mg/kg	U	UJ	H
2,4,6-Trinitrotoluene	118-96-7	0.089	0.44	0.089	mg/kg	U	UJ	H
2,4-Dinitrotoluene	121-14-2	0.2	0.44	0.2	mg/kg	U	R	D
2,6-Dinitrotoluene	606-20-2	0.069	0.5	0.069	mg/kg	U	R	D

Sample Delivery Group: 81613

2-Amino-4,6-dinitrotoluene	35572-78-2	0.05	0.44	0.05	mg/kg	U	UJ	H
2-Nitrotoluene	88-72-2	0.089	0.44	0.089	mg/kg	U	UJ	H
3,5-Dinitroaniline	618-87-1	0.089	0.44	0.089	mg/kg	U	UJ	H
3-Nitrotoluene	99-08-1	0.069	0.44	0.069	mg/kg	U	UJ	H
4-Amino-2,6-dinitrotoluene	19406-51-0	0.069	0.44	0.069	mg/kg	U	UJ	H
4-Nitrotoluene	99-99-0	0.069	0.5	0.069	mg/kg	U	UJ	H
HMX	2691-41-0	0.12	0.44	0.12	mg/kg	U	UJ	H
Nitrobenzene	98-95-3	0.04	0.44	0.04	mg/kg	U	R	D
Nitroglycerin	55-63-0	0.5	1.5	0.5	mg/kg	U	UJ	H
PETN	78-11-5	0.5	1.5	0.5	mg/kg	U	UJ	H
RDX	121-82-4	0.16	0.44	0.16	mg/kg	U	UJ	H
Tetryl	479-45-8	0.089	0.44	0.089	mg/kg	U	UJ	H

Sample Name SCSS-058M-0001-SO **AnalysisType:** OREXP

Lab Sample Name: 852322 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,3,5-Trinitrobenzene	99-35-4	0.13	0.44	0.13	mg/kg	U	UJ	H
1,3-Dinitrobenzene	99-65-0	0.08	0.44	0.08	mg/kg	U	UJ	H
2,4,6-Trinitrotoluene	118-96-7	0.26	0.44	0.09	mg/kg	JP	J-	H, *III
2,4-Dinitrotoluene	121-14-2	0.2	0.44	0.2	mg/kg	U	R	D
2,6-Dinitrotoluene	606-20-2	0.07	0.5	0.07	mg/kg	U	R	D
2-Amino-4,6-dinitrotoluene	35572-78-2	0.05	0.44	0.05	mg/kg	U	UJ	H
2-Nitrotoluene	88-72-2	0.09	0.44	0.09	mg/kg	U	UJ	H
3,5-Dinitroaniline	618-87-1	0.09	0.44	0.09	mg/kg	U	UJ	H
3-Nitrotoluene	99-08-1	0.07	0.44	0.07	mg/kg	U	UJ	H
4-Amino-2,6-dinitrotoluene	19406-51-0	0.07	0.44	0.07	mg/kg	U	UJ	H
4-Nitrotoluene	99-99-0	0.07	0.5	0.07	mg/kg	U	UJ	H
HMX	2691-41-0	0.12	0.44	0.12	mg/kg	U	UJ	H
Nitrobenzene	98-95-3	0.04	0.44	0.04	mg/kg	U	R	D
Nitroglycerin	55-63-0	0.5	1.5	0.5	mg/kg	U	UJ	H
PETN	78-11-5	0.5	1.5	0.5	mg/kg	U	UJ	H
RDX	121-82-4	0.16	0.44	0.16	mg/kg	U	UJ	H
Tetryl	479-45-8	0.09	0.44	0.09	mg/kg	U	UJ	H

Sample Delivery Group: 81613

Analysis Method SW846 9012A

Sample Name SCSD-070M-0001-SD **AnalysisType:** MISC

Lab Sample Name: 854000 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Cyanide	57-12-5	0.36	0.39	0.11	mg/kg	J	J-	H

Analysis Method SW846 9056M

Sample Name SCSB-048M-0001-SO **AnalysisType:** MISC

Lab Sample Name: 854011 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Nitrocellulose	9004-70-0	7	23	7	mg/kg	U	U	

Sample Delivery Group: 82400

Analysis Method SW846 6010

Sample Name SCSS-073M-0001-SO **AnalysisType:** INORG

Lab Sample Name: 869558 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Aluminum	7429-90-5	9480	0.24	0.082	mg/kg	B		
Antimony	7440-36-0	2.9	0.55	0.16	mg/kg		J+	C
Arsenic	7440-38-2	21.8	0.92	0.27	mg/kg			
Barium	7440-39-3	94.3	0.055	0.016	mg/kg	B		
Beryllium	7440-41-7	0.77	0.024	0.0082	mg/kg			
Cadmium	7440-43-9	0.63	0.043	0.012	mg/kg			
Calcium	7440-70-2	10300	1	0.12	mg/kg			
Chromium	7440-47-3	130	0.13	0.039	mg/kg	B		
Cobalt	7440-48-4	10.8	0.1	0.031	mg/kg			
Copper	7440-50-8	24.3	0.41	0.12	mg/kg			
Iron	7439-89-6	24800	2	0.61	mg/kg			
Lead	7439-92-1	50.3	0.29	0.082	mg/kg			
Magnesium	7439-95-4	3040	0.82	0.24	mg/kg			
Manganese	7439-96-5	576	0.1	0.033	mg/kg	B		
Nickel	7440-02-0	32.7	0.12	0.037	mg/kg			
Potassium	7440-09-7	1350	37	11	mg/kg			
Selenium	7782-49-2	2.4	0.86	0.14	mg/kg		J+	C
Silver	7440-22-4	2	0.11	0.035	mg/kg			
Sodium	7440-23-5	101	13	4.1	mg/kg		J	C
Thallium	7440-28-0	0.082	0.29	0.082	mg/kg	UV	U	B
Vanadium	7440-62-2	19.8	0.069	0.022	mg/kg			
Zinc	7440-66-6	86.1	0.24	0.082	mg/kg			

Sample Name SCSS-076M-0001-SO **AnalysisType:** INORG

Lab Sample Name: 869562 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Aluminum	7429-90-5	7990	0.25	0.082	mg/kg			

Sample Delivery Group: 82400

Antimony	7440-36-0	3.1	0.55	0.16	mg/kg			
Arsenic	7440-38-2	10.3	0.92	0.27	mg/kg			
Barium	7440-39-3	74.8	0.055	0.016	mg/kg	B		
Beryllium	7440-41-7	0.48	0.025	0.0082	mg/kg			
Cadmium	7440-43-9	0.65	0.043	0.012	mg/kg			
Calcium	7440-70-2	18500	1	0.12	mg/kg			
Chromium	7440-47-3	188	0.13	0.039	mg/kg			
Cobalt	7440-48-4	8.7	0.1	0.031	mg/kg			
Copper	7440-50-8	10.1	0.41	0.12	mg/kg			
Iron	7439-89-6	19000	2	0.61	mg/kg			
Lead	7439-92-1	18.2	0.29	0.082	mg/kg			
Magnesium	7439-95-4	1750	0.82	0.25	mg/kg	B		
Manganese	7439-96-5	661	0.1	0.033	mg/kg	B		
Nickel	7440-02-0	25.3	0.13	0.037	mg/kg			
Potassium	7440-09-7	845	37	11	mg/kg			
Selenium	7782-49-2	2.2	0.86	0.14	mg/kg		J-	C
Silver	7440-22-4	0.11	0.11	0.035	mg/kg	V,B		
Sodium	7440-23-5	68.1	13	4.1	mg/kg		J	C
Thallium	7440-28-0	0.73	0.29	0.082	mg/kg		J-	B
Vanadium	7440-62-2	15.9	0.07	0.023	mg/kg	B		
Zinc	7440-66-6	46.9	0.25	0.082	mg/kg			

Analysis Method SW846 7471A

Sample Name SCSS-073M-0001-SO **AnalysisType:** INORG

Lab Sample Name: 869558 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Mercury	7439-97-6	0.27	0.0081	0.0024	mg/kg			

Sample Name SCSS-076M-0001-SO **AnalysisType:** INORG

Lab Sample Name: 869562 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
Mercury	7439-97-6	0.049	0.0081	0.0025	mg/kg		J-	C

Sample Delivery Group: 82400

Analysis Method SW846 8270

Sample Name SCSS-073M-0001-SO **AnalysisType:** ORSVO

Lab Sample Name: 869558 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,2,4-Trichlorobenzene	120-82-1	21	410	21	ug/kg	U	U	
1,2-Dichlorobenzene	95-50-1	39	410	24	ug/kg	J	J	
1,3-Dichlorobenzene	541-73-1	20	410	20	ug/kg	U	U	
1,4-Dichlorobenzene	106-46-7	19	410	19	ug/kg	U	U	
2,4,5-Trichlorophenol	95-95-4	130	510	130	ug/kg	U	U	
2,4,6-Trichlorophenol	88-06-2	130	510	130	ug/kg	U	U	
2,4-Dichlorophenol	120-83-2	120	510	120	ug/kg	U	U	
2,4-Dimethylphenol	105-67-9	100	410	100	ug/kg	U	U	
2,4-Dinitrophenol	51-28-5	700	2000	700	ug/kg	U	U	
2,4-Dinitrotoluene	121-14-2	24	410	24	ug/kg	U	U	
2,6-Dinitrotoluene	606-20-2	24	410	24	ug/kg	U	U	
2-Chloronaphthalene	91-58-7	23	410	23	ug/kg	U	U	
2-Chlorophenol	95-57-8	350	510	350	ug/kg	U	U	
2-Methyl-4,6-dinitrophenol	534-52-1	270	1000	270	ug/kg	U	U	
2-Methylnaphthalene	91-57-6	240	410	25	ug/kg	J	J	
2-Methylphenol	95-48-7	430	1000	430	ug/kg	U	U	
2-Nitroaniline	88-74-4	23	410	23	ug/kg	U	U	
2-Nitrophenol	88-75-5	290	510	290	ug/kg	U	U	
3,3'-Dichlorobenzidine	91-94-1	150	510	150	ug/kg	U	U	
3-Nitroaniline	99-09-2	22	1000	22	ug/kg	U	U	
4-Bromophenyl phenyl ether	101-55-3	25	410	25	ug/kg	U	U	
4-Chloro-3-methylphenol	59-50-7	390	510	390	ug/kg	U	U	
4-Chloroaniline	106-47-8	40	410	40	ug/kg	U	U	
4-Chlorophenyl phenyl ether	7005-72-3	26	410	26	ug/kg	U	U	
4-Methylphenol	1319-77-3	660	2000	660	ug/kg	U	U	
4-Nitroaniline	100-01-6	31	1000	31	ug/kg	U	U	
4-Nitrophenol	100-02-7	410	1000	410	ug/kg	U	UJ	C

Sample Delivery Group: 82400

Acenaphthene	83-32-9	35	410	24	ug/kg	J	J
Acenaphthylene	208-96-8	29	410	24	ug/kg	J	J
Anthracene	120-12-7	93	410	24	ug/kg	J	J
Benzo(a)anthracene	56-55-3	370	410	25	ug/kg	J	J
Benzo(a)pyrene	50-32-8	350	410	23	ug/kg	J	J
Benzo(b)fluoranthene	205-99-2	580	410	25	ug/kg		
Benzo(g,h,i)perylene	191-24-2	190	410	22	ug/kg	J	J
Benzo(k)fluoranthene	207-08-9	200	410	25	ug/kg	J	J
Benzoic acid	65-85-0	300	2000	300	ug/kg	U	U
Benzyl alcohol	100-51-6	85	1000	85	ug/kg	U	U
Bis(2-chloroethoxy)methane	111-91-1	23	410	23	ug/kg	U	U
Bis(2-chloroethyl) ether	111-44-4	25	410	25	ug/kg	U	U
Bis(2-chloroisopropyl) ether	108-60-1	31	410	31	ug/kg	U	U
Bis(2-ethylhexyl) phthalate	117-81-7	190	1000	89	ug/kg	J	J
Butylbenzyl phthalate	85-68-7	74	410	74	ug/kg	U	U
Carbazole	86-74-8	58	410	29	ug/kg	J	J
Chrysene	218-01-9	400	410	25	ug/kg	J	J
Dibenzo(a,h)anthracene	53-70-3	69	410	22	ug/kg	J	J
Dibenzofuran	132-64-9	72	410	24	ug/kg	J	J
Diethyl phthalate	84-66-2	65	410	65	ug/kg	U	U
Dimethyl phthalate	131-11-3	64	410	64	ug/kg	U	U
Di-n-butyl phthalate	84-74-2	140	410	80	ug/kg	J	J
Di-n-octyl phthalate	117-84-0	60	410	60	ug/kg	U	U
Fluoranthene	206-44-0	760	410	26	ug/kg		
Fluorene	86-73-7	33	410	25	ug/kg	J	J
Hexachlorobenzene	118-74-1	29	410	29	ug/kg	U	U
Hexachlorobutadiene	87-68-3	63	410	63	ug/kg	U	U
Hexachlorocyclopentadiene	77-47-4	53	410	53	ug/kg	U	U
Hexachloroethane	67-72-1	34	410	34	ug/kg	U	U
Indeno(1,2,3-cd)pyrene	193-39-5	170	410	23	ug/kg	J	J
Isophorone	78-59-1	51	410	51	ug/kg	U	U
Naphthalene	91-20-3	170	410	21	ug/kg	J	J
Nitrobenzene	98-95-3	60	410	60	ug/kg	U	U

Sample Delivery Group: 82400

N-Nitroso-di-n-propylamine	621-64-7	71	410	71	ug/kg	U	U
N-Nitrosodiphenylamine	86-30-6	51	810	51	ug/kg	U	U
Pentachlorophenol	87-86-5	240	1000	240	ug/kg	U	U
Phenanthrene	85-01-8	450	410	26	ug/kg		
Phenol	108-95-2	160	510	160	ug/kg	U	U
Pyrene	129-00-0	620	410	26	ug/kg		

Sample Delivery Group: 82400

Analysis Method SW846 8330B

Sample Name SCSS-073M-0001-SO **AnalysisType:** OREXP

Lab Sample Name: 869558 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,3,5-Trinitrobenzene	99-35-4	0.13	0.44	0.13	mg/kg	U	U	
1,3-Dinitrobenzene	99-65-0	0.081	0.44	0.081	mg/kg	U	U	
2,4,6-Trinitrotoluene	118-96-7	0.091	0.44	0.091	mg/kg	U	U	
2,4-Dinitrotoluene	121-14-2	0.2	0.44	0.2	mg/kg	U	R	D
2,6-Dinitrotoluene	606-20-2	0.07	0.5	0.07	mg/kg	U	R	D
2-Amino-4,6-dinitrotoluene	35572-78-2	0.05	0.44	0.05	mg/kg	U	U	
2-Nitrotoluene	88-72-2	0.091	0.44	0.091	mg/kg	U	U	
3,5-Dinitroaniline	618-87-1	0.091	0.44	0.091	mg/kg	U	U	
3-Nitrotoluene	99-08-1	0.07	0.44	0.07	mg/kg	U	U	
4-Amino-2,6-dinitrotoluene	19406-51-0	0.07	0.44	0.07	mg/kg	U	U	
4-Nitrotoluene	99-99-0	0.07	0.5	0.07	mg/kg	U	U	
HMX	2691-41-0	0.12	0.44	0.12	mg/kg	U	U	
Nitrobenzene	98-95-3	0.04	0.44	0.04	mg/kg	U	R	D
Nitroglycerin	55-63-0	0.5	1.5	0.5	mg/kg	U	U	
PETN	78-11-5	0.5	1.5	0.5	mg/kg	U	U	
RDX	121-82-4	0.16	0.44	0.16	mg/kg	U	U	
Tetryl	479-45-8	0.091	0.44	0.091	mg/kg	U	U	

Sample Name SCSS-076M-0001-SO **AnalysisType:** OREXP

Lab Sample Name: 869562 **Validation Level:** IV

	CAS No	Result Value	LOQ	DL	Result Units	Lab Qualifier	Validation Qualifier	Validation Qualifier Code
1,3,5-Trinitrobenzene	99-35-4	0.13	0.44	0.13	mg/kg	U	U	
1,3-Dinitrobenzene	99-65-0	0.08	0.44	0.08	mg/kg	U	U	
2,4,6-Trinitrotoluene	118-96-7	0.091	0.44	0.091	mg/kg	U	U	
2,4-Dinitrotoluene	121-14-2	0.2	0.44	0.2	mg/kg	U	U	
2,6-Dinitrotoluene	606-20-2	0.07	0.5	0.07	mg/kg	U	UJ	C
2-Amino-4,6-dinitrotoluene	35572-78-2	0.05	0.44	0.05	mg/kg	U	U	

Sample Delivery Group: 82400

2-Nitrotoluene	88-72-2	0.091	0.44	0.091	mg/kg	U	U
3,5-Dinitroaniline	618-87-1	0.091	0.44	0.091	mg/kg	U	U
3-Nitrotoluene	99-08-1	0.07	0.44	0.07	mg/kg	U	U
4-Amino-2,6-dinitrotoluene	19406-51-0	0.07	0.44	0.07	mg/kg	U	U
4-Nitrotoluene	99-99-0	0.07	0.5	0.07	mg/kg	U	U
HMX	2691-41-0	0.12	0.44	0.12	mg/kg	U	U
Nitrobenzene	98-95-3	0.04	0.44	0.04	mg/kg	U	U
Nitroglycerin	55-63-0	0.5	1.5	0.5	mg/kg	U	U
PETN	78-11-5	0.5	1.5	0.5	mg/kg	U	U
RDX	121-82-4	0.16	0.44	0.16	mg/kg	U	U
Tetryl	479-45-8	0.091	0.44	0.091	mg/kg	U	U

APPENDIX B

Sample Qualification Summary

Open Demolition Area 1

Sample	Analyte	Result	LOQ	DL	Units	Qualifier	Code
DA1SB-055M-0001-SO	Antimony	0.16	0.55	0.16	mg/kg	R	Q
DA1SB-055M-0001-SO	Barium	73.4	0.055	0.016	mg/kg	J	*III, A
DA1SB-055M-0001-SO	Beryllium	0.53	0.024	0.0081	mg/kg	J	*III, A
DA1SB-055M-0001-SO	Cadmium	0.26	0.26	0.26	mg/kg	UJ	C, $
DA1SB-055M-0001-SO	Calcium	18700	1	0.12	mg/kg	J	*III, A
DA1SB-055M-0001-SO	Chromium	31.6	0.13	0.038	mg/kg	J-	Q, *III, A
DA1SB-055M-0001-SO	Cobalt	10.8	0.099	0.03	mg/kg	J-	Q, *III, A
DA1SB-055M-0001-SO	Copper	19.1	0.4	0.12	mg/kg	J-	Q, *III, A
DA1SB-055M-0001-SO	Lead	21	0.28	0.081	mg/kg	J	*III, A
DA1SB-055M-0001-SO	Manganese	387	0.1	0.032	mg/kg	J-	Q
DA1SB-055M-0001-SO	Nickel	26.3	0.12	0.036	mg/kg	J	*III, A
DA1SB-055M-0001-SO	Selenium	0.32	0.85	0.14	mg/kg	UJ	B, Q
DA1SB-055M-0001-SO	Silver	0.08	0.11	0.08	mg/kg	U	$
DA1SB-055M-0001-SO	Sodium	61.2	13	4	mg/kg	J	C
DA1SB-055M-0001-SO	Thallium	2.1	0.28	0.081	mg/kg	J-	Q
DA1SB-055M-0001-SO	Vanadium	19.4	0.069	0.022	mg/kg	J	*III, A
DA1SB-055M-0001-SO	Zinc	55.2	0.24	0.081	mg/kg	J-	Q, *III, A
DA1SB-055M-0001-SO	1,3,5-Trinitrobenzene	0.13	0.44	0.13	mg/kg	UJ	H
DA1SB-055M-0001-SO	1,3-Dinitrobenzene	0.079	0.44	0.079	mg/kg	UJ	H
DA1SB-055M-0001-SO	2,4,6-Trinitrotoluene	0.089	0.44	0.089	mg/kg	UJ	H
DA1SB-055M-0001-SO	2,4-Dinitrotoluene	0.2	0.44	0.2	mg/kg	UJ	H, Q
DA1SB-055M-0001-SO	2,6-Dinitrotoluene	0.07	0.5	0.07	mg/kg	UJ	H
DA1SB-055M-0001-SO	2-Amino-4,6-dinitrotoluene	0.05	0.44	0.05	mg/kg	UJ	H
DA1SB-055M-0001-SO	2-Nitrotoluene	0.089	0.44	0.089	mg/kg	UJ	H
DA1SB-055M-0001-SO	3,5-Dinitroaniline	0.089	0.44	0.089	mg/kg	UJ	H
DA1SB-055M-0001-SO	3-Nitrotoluene	0.07	0.44	0.07	mg/kg	UJ	H
DA1SB-055M-0001-SO	4-Amino-2,6-dinitrotoluene	0.07	0.44	0.07	mg/kg	UJ	H, Q
DA1SB-055M-0001-SO	4-Nitrotoluene	0.07	0.5	0.07	mg/kg	UJ	H
DA1SB-055M-0001-SO	HMX	0.12	0.44	0.12	mg/kg	UJ	H
DA1SB-055M-0001-SO	Nitrobenzene	0.04	0.44	0.04	mg/kg	UJ	H
DA1SB-055M-0001-SO	Nitroglycerin	0.5	1.5	0.5	mg/kg	UJ	H
DA1SB-055M-0001-SO	PETN	0.5	1.5	0.5	mg/kg	UJ	H
DA1SB-055M-0001-SO	RDX	0.16	0.44	0.16	mg/kg	UJ	H
DA1SB-055M-0001-SO	Tetryl	0.089	0.44	0.089	mg/kg	UJ	H
DA1SB-059D-0201-SO	2-Hexanone	73	530	73	ug/kg	UJ	C
DA1SB-059D-0201-SO	Chloroethane	20	110	20	ug/kg	R	C
DA1SB-059D-0201-SO	Chloromethane	27	110	27	ug/kg	R	C
DA1SB-059M-0201-SO	Aluminum	12200	0.61	0.2	mg/kg	J-	Q, *III, A
DA1SB-059M-0201-SO	Antimony	20.5	1.4	0.41	mg/kg	J-	Q
DA1SB-059M-0201-SO	Barium	869	0.14	0.041	mg/kg	J	*III, A
DA1SB-059M-0201-SO	Beryllium	0.95	0.061	0.02	mg/kg	J	*III, A
DA1SB-059M-0201-SO	Cadmium	18.4	0.11	0.031	mg/kg	J-	Q
DA1SB-059M-0201-SO	Calcium	18800	2.6	0.31	mg/kg	J-	Q, *III, A
DA1SB-059M-0201-SO	Chromium	101	0.32	0.097	mg/kg	J-	Q, *III, A
DA1SB-059M-0201-SO	Cobalt	10.1	0.25	0.077	mg/kg	J-	Q, *III, A
DA1SB-059M-0201-SO	Copper	222	1	0.31	mg/kg	J-	Q, *III, A
DA1SB-059M-0201-SO	Lead	416	0.71	0.2	mg/kg	J	*III, A
DA1SB-059M-0201-SO	Magnesium	3470	2	0.61	mg/kg	J-	Q, *III, A
DA1SB-059M-0201-SO	Manganese	1100	0.26	0.082	mg/kg	J-	Q, *III, A
DA1SB-059M-0201-SO	Nickel	40.7	0.31	0.092	mg/kg	J	*III, A
DA1SB-059M-0201-SO	Selenium	2.1	2.1	0.36	mg/kg	J-	Q
DA1SB-059M-0201-SO	Sodium	84.2	13	4.1	mg/kg	J	C
DA1SB-059M-0201-SO	Thallium	2	0.71	0.2	mg/kg	J-	C, Q

Sample	Analyte	Result	LOQ	DL	Units	Qualifier	Code
DA1SB-059M-0201-SO	Vanadium	16.5	0.17	0.056	mg/kg	J	*III, A
DA1SB-059M-0201-SO	Zinc	364	0.61	0.2	mg/kg	J-	Q, *III, A
DA1SB-059M-0201-SO	Hexavalent Chromium	1.9	6.5	1.9	mg/kg	UJ	C, Q
DA1SB-059M-0201-SO	Endrin aldehyde	1.1	4.1	1.1	ug/kg	UJ	Q
DA1SB-059M-0201-SO	1,2,4-Trichlorobenzene	21	410	21	ug/kg	UJ	H
DA1SB-059M-0201-SO	1,2-Dichlorobenzene	25	410	25	ug/kg	UJ	H
DA1SB-059M-0201-SO	1,3-Dichlorobenzene	20	410	20	ug/kg	UJ	H
DA1SB-059M-0201-SO	1,4-Dichlorobenzene	19	410	19	ug/kg	UJ	H
DA1SB-059M-0201-SO	2,4,5-Trichlorophenol	130	510	130	ug/kg	UJ	H
DA1SB-059M-0201-SO	2,4,6-Trichlorophenol	130	510	130	ug/kg	UJ	H
DA1SB-059M-0201-SO	2,4-Dichlorophenol	120	510	120	ug/kg	UJ	H
DA1SB-059M-0201-SO	2,4-Dimethylphenol	100	410	100	ug/kg	UJ	H
DA1SB-059M-0201-SO	2,4-Dinitrophenol	700	2000	700	ug/kg	UJ	H, C
DA1SB-059M-0201-SO	2,4-Dinitrotoluene	25	410	25	ug/kg	UJ	H
DA1SB-059M-0201-SO	2,6-Dinitrotoluene	25	410	25	ug/kg	UJ	H
DA1SB-059M-0201-SO	2-Chloronaphthalene	23	410	23	ug/kg	UJ	H
DA1SB-059M-0201-SO	2-Chlorophenol	350	510	350	ug/kg	UJ	H
DA1SB-059M-0201-SO	2-Methyl-4,6-dinitrophenol	280	1000	280	ug/kg	UJ	H, C
DA1SB-059M-0201-SO	2-Methylnaphthalene	26	410	26	ug/kg	UJ	H
DA1SB-059M-0201-SO	2-Methylphenol	430	1000	430	ug/kg	UJ	H
DA1SB-059M-0201-SO	2-Nitroaniline	23	410	23	ug/kg	UJ	H
DA1SB-059M-0201-SO	2-Nitrophenol	290	510	290	ug/kg	UJ	H
DA1SB-059M-0201-SO	3,3'-Dichlorobenzidine	150	510	150	ug/kg	UJ	H, C
DA1SB-059M-0201-SO	3-Nitroaniline	22	1000	22	ug/kg	UJ	H
DA1SB-059M-0201-SO	4-Bromophenyl phenyl ether	26	410	26	ug/kg	UJ	H
DA1SB-059M-0201-SO	4-Chloro-3-methylphenol	390	510	390	ug/kg	UJ	H
DA1SB-059M-0201-SO	4-Chloroaniline	40	410	40	ug/kg	UJ	H
DA1SB-059M-0201-SO	4-Chlorophenyl phenyl ether	27	410	27	ug/kg	UJ	H
DA1SB-059M-0201-SO	4-Methylphenol	660	2000	660	ug/kg	UJ	H
DA1SB-059M-0201-SO	4-Nitroaniline	31	1000	31	ug/kg	UJ	H, C
DA1SB-059M-0201-SO	4-Nitrophenol	410	1000	410	ug/kg	UJ	H
DA1SB-059M-0201-SO	Acenaphthene	25	410	25	ug/kg	UJ	H
DA1SB-059M-0201-SO	Acenaphthylene	25	410	25	ug/kg	UJ	H
DA1SB-059M-0201-SO	Anthracene	25	410	25	ug/kg	UJ	H
DA1SB-059M-0201-SO	Benzo(a)anthracene	26	410	26	ug/kg	UJ	H
DA1SB-059M-0201-SO	Benzo(a)pyrene	23	410	23	ug/kg	UJ	H
DA1SB-059M-0201-SO	Benzo(b)fluoranthene	26	410	26	ug/kg	UJ	H
DA1SB-059M-0201-SO	Benzo(g,h,i)perylene	22	410	22	ug/kg	UJ	H, C
DA1SB-059M-0201-SO	Benzo(k)fluoranthene	26	410	26	ug/kg	UJ	H
DA1SB-059M-0201-SO	Benzoic acid	300	1000	300	ug/kg	UJ	H
DA1SB-059M-0201-SO	Benzyl alcohol	85	1000	85	ug/kg	R	C
DA1SB-059M-0201-SO	Bis(2-chloroethoxy)methane	23	410	23	ug/kg	UJ	H
DA1SB-059M-0201-SO	Bis(2-chloroethyl) ether	26	410	26	ug/kg	UJ	H
DA1SB-059M-0201-SO	Bis(2-chloroisopropyl) ether	31	410	31	ug/kg	UJ	H
DA1SB-059M-0201-SO	Bis(2-ethylhexyl) phthalate	89	1000	89	ug/kg	UJ	H
DA1SB-059M-0201-SO	Butylbenzyl phthalate	75	410	75	ug/kg	UJ	H
DA1SB-059M-0201-SO	Carbazole	29	410	29	ug/kg	UJ	H
DA1SB-059M-0201-SO	Chrysene	26	410	26	ug/kg	UJ	H
DA1SB-059M-0201-SO	Dibenzo(a,h)anthracene	22	410	22	ug/kg	UJ	H
DA1SB-059M-0201-SO	Dibenzofuran	25	410	25	ug/kg	UJ	H
DA1SB-059M-0201-SO	Diethyl phthalate	65	410	65	ug/kg	UJ	H
DA1SB-059M-0201-SO	Dimethyl phthalate	64	410	64	ug/kg	UJ	H
DA1SB-059M-0201-SO	Di-n-butyl phthalate	110	410	81	ug/kg	J-	H

Sample	Analyte	Result	LOQ	DL	Units	Qualifier	Code
DA1SB-059M-0201-SO	Di-n-octyl phthalate	60	410	60	ug/kg	UJ	H
DA1SB-059M-0201-SO	Fluoranthene	27	410	27	ug/kg	UJ	H
DA1SB-059M-0201-SO	Fluorene	26	410	26	ug/kg	UJ	H
DA1SB-059M-0201-SO	Hexachlorobenzene	29	410	29	ug/kg	UJ	H
DA1SB-059M-0201-SO	Hexachlorobutadiene	63	410	63	ug/kg	UJ	H
DA1SB-059M-0201-SO	Hexachlorocyclopentadiene	53	410	53	ug/kg	R	C
DA1SB-059M-0201-SO	Hexachloroethane	34	410	34	ug/kg	UJ	H
DA1SB-059M-0201-SO	Indeno(1,2,3-cd)pyrene	23	410	23	ug/kg	UJ	H, C
DA1SB-059M-0201-SO	Isophorone	51	410	51	ug/kg	UJ	H
DA1SB-059M-0201-SO	Naphthalene	21	410	21	ug/kg	UJ	H
DA1SB-059M-0201-SO	Nitrobenzene	60	410	60	ug/kg	UJ	H
DA1SB-059M-0201-SO	N-Nitroso-di-n-propylamine	72	410	72	ug/kg	UJ	H
DA1SB-059M-0201-SO	N-Nitrosodiphenylamine	51	820	51	ug/kg	UJ	H
DA1SB-059M-0201-SO	Pentachlorophenol	250	1000	250	ug/kg	UJ	H
DA1SB-059M-0201-SO	Phenanthrene	27	410	27	ug/kg	UJ	H
DA1SB-059M-0201-SO	Phenol	160	510	160	ug/kg	UJ	H
DA1SB-059M-0201-SO	Pyrene	27	410	27	ug/kg	UJ	H
DA1SB-059M-0201-SO	1,3,5-Trinitrobenzene	0.13	0.44	0.13	mg/kg	UJ	H
DA1SB-059M-0201-SO	1,3-Dinitrobenzene	0.08	0.44	0.08	mg/kg	UJ	H
DA1SB-059M-0201-SO	2,4,6-Trinitrotoluene	0.09	0.44	0.09	mg/kg	UJ	H
DA1SB-059M-0201-SO	2,4-Dinitrotoluene	0.2	0.44	0.2	mg/kg	R	D
DA1SB-059M-0201-SO	2,6-Dinitrotoluene	0.07	0.5	0.07	mg/kg	R	D
DA1SB-059M-0201-SO	2-Amino-4,6-dinitrotoluene	0.05	0.44	0.05	mg/kg	UJ	H
DA1SB-059M-0201-SO	2-Nitrotoluene	0.09	0.44	0.09	mg/kg	UJ	H
DA1SB-059M-0201-SO	3,5-Dinitroaniline	0.09	0.44	0.09	mg/kg	UJ	H
DA1SB-059M-0201-SO	3-Nitrotoluene	0.07	0.44	0.07	mg/kg	UJ	H
DA1SB-059M-0201-SO	4-Amino-2,6-dinitrotoluene	0.07	0.44	0.07	mg/kg	UJ	H
DA1SB-059M-0201-SO	4-Nitrotoluene	0.07	0.5	0.07	mg/kg	UJ	H
DA1SB-059M-0201-SO	HMX	0.12	0.44	0.12	mg/kg	UJ	H
DA1SB-059M-0201-SO	Nitrobenzene	0.04	0.44	0.04	mg/kg	R	D
DA1SB-059M-0201-SO	Nitroglycerin	0.5	1.5	0.5	mg/kg	UJ	H
DA1SB-059M-0201-SO	Nitroguanidine	0.06	0.16	0.06	mg/kg	UJ	H, *III
DA1SB-059M-0201-SO	PETN	0.5	1.5	0.5	mg/kg	UJ	H
DA1SB-059M-0201-SO	RDX	0.16	0.44	0.16	mg/kg	UJ	H
DA1SB-059M-0201-SO	Tetryl	0.09	0.44	0.09	mg/kg	UJ	H
DA1SB-059M-0201-SO	Cyanide	0.11	0.39	0.11	mg/kg	UJ	H
DA1SB-063M-0202-SO	Aluminum	13300	0.24	0.081	mg/kg	J-	Q, *III, A
DA1SB-063M-0202-SO	Antimony	0.16	0.55	0.16	mg/kg	R	Q
DA1SB-063M-0202-SO	Barium	56.6	0.055	0.016	mg/kg	J	*III, A
DA1SB-063M-0202-SO	Beryllium	0.43	0.024	0.0081	mg/kg	J	*III, A
DA1SB-063M-0202-SO	Cadmium	0.2	0.2	0.2	mg/kg	UJ	C, Q, $
DA1SB-063M-0202-SO	Calcium	27500	1	0.12	mg/kg	J-	Q, *III, A
DA1SB-063M-0202-SO	Chromium	22.6	0.13	0.038	mg/kg	J-	Q, *III, A
DA1SB-063M-0202-SO	Cobalt	9.4	0.099	0.03	mg/kg	J-	Q, *III, A
DA1SB-063M-0202-SO	Copper	16.8	0.4	0.12	mg/kg	J-	Q, *III, A
DA1SB-063M-0202-SO	Magnesium	7180	0.81	0.24	mg/kg	J-	Q, *III, A
DA1SB-063M-0202-SO	Manganese	299	0.1	0.032	mg/kg	J-	Q, *III, A
DA1SB-063M-0202-SO	Nickel	22.1	0.12	0.036	mg/kg	J	*III, A
DA1SB-063M-0202-SO	Selenium	0.53	0.85	0.14	mg/kg	U	B
DA1SB-063M-0202-SO	Silver	0.1	0.11	0.1	mg/kg	U	$
DA1SB-063M-0202-SO	Sodium	82.7	13	4	mg/kg	J	C
DA1SB-063M-0202-SO	Thallium	2	0.28	0.081	mg/kg	J-	Q
DA1SB-063M-0202-SO	Vanadium	16.9	0.069	0.022	mg/kg	J	*III, A

Sample	Analyte	Result	LOQ	DL	Units	Qualifier	Code
DA1SB-063M-0202-SO	Zinc	51.1	0.24	0.081	mg/kg	J-	Q, *III, A
DA1SB-063M-0202-SO	1,3,5-Trinitrobenzene	0.13	0.44	0.13	mg/kg	UJ	H
DA1SB-063M-0202-SO	1,3-Dinitrobenzene	0.079	0.44	0.079	mg/kg	UJ	H
DA1SB-063M-0202-SO	2,4,6-Trinitrotoluene	0.089	0.44	0.089	mg/kg	UJ	H
DA1SB-063M-0202-SO	2,4-Dinitrotoluene	0.2	0.44	0.2	mg/kg	UJ	H
DA1SB-063M-0202-SO	2,6-Dinitrotoluene	0.07	0.5	0.07	mg/kg	UJ	H
DA1SB-063M-0202-SO	2-Amino-4,6-dinitrotoluene	0.05	0.44	0.05	mg/kg	UJ	H
DA1SB-063M-0202-SO	2-Nitrotoluene	0.089	0.44	0.089	mg/kg	UJ	H
DA1SB-063M-0202-SO	3,5-Dinitroaniline	0.089	0.44	0.089	mg/kg	UJ	H
DA1SB-063M-0202-SO	3-Nitrotoluene	0.07	0.44	0.07	mg/kg	UJ	H
DA1SB-063M-0202-SO	4-Amino-2,6-dinitrotoluene	0.07	0.44	0.07	mg/kg	UJ	H
DA1SB-063M-0202-SO	4-Nitrotoluene	0.07	0.5	0.07	mg/kg	UJ	H
DA1SB-063M-0202-SO	HMX	0.12	0.44	0.12	mg/kg	UJ	H
DA1SB-063M-0202-SO	Nitrobenzene	0.04	0.44	0.04	mg/kg	UJ	H
DA1SB-063M-0202-SO	Nitroglycerin	0.5	1.5	0.5	mg/kg	UJ	H
DA1SB-063M-0202-SO	Nitroguanidine	0.059	0.16	0.059	mg/kg	UJ	H, *III
DA1SB-063M-0202-SO	PETN	0.5	1.5	0.5	mg/kg	UJ	H
DA1SB-063M-0202-SO	RDX	0.16	0.44	0.16	mg/kg	UJ	H
DA1SB-063M-0202-SO	Tetryl	0.089	0.44	0.089	mg/kg	UJ	H
DA1SB-068D-0201-SO	2-Hexanone	70	520	70	ug/kg	R	C
DA1SB-068D-0201-SO	4-Methyl-2-pentanone	85	520	85	ug/kg	UJ	C
DA1SB-068D-0201-SO	Acetone	65	1000	65	ug/kg	UJ	C
DA1SB-068D-0201-SO	Chloroethane	20	100	20	ug/kg	R	C
DA1SB-068D-0201-SO	Chloromethane	26	100	26	ug/kg	R	C
DA1SB-068D-0201-SO	m,p-Xylenes	19	100	19	ug/kg	UJ	C
DA1SB-068M-0201-SO	Mercury	0.019	0.008	0.0024	mg/kg	J-	A
DA1SB-068M-0201-SO	Aluminum	10900	0.24	0.081	mg/kg	J-	Q
DA1SB-068M-0201-SO	Antimony	0.49	0.55	0.16	mg/kg	J-	Q
DA1SB-068M-0201-SO	Arsenic	5.4	0.91	0.26	mg/kg	J-	Q, A
DA1SB-068M-0201-SO	Beryllium	0.42	0.024	0.0081	mg/kg	J-	A
DA1SB-068M-0201-SO	Cadmium	0.096	0.043	0.012	mg/kg	J-	C, Q
DA1SB-068M-0201-SO	Calcium	420	1	0.12	mg/kg	J-	A
DA1SB-068M-0201-SO	Chromium	49.1	0.13	0.038	mg/kg	J-	Q, A
DA1SB-068M-0201-SO	Cobalt	8	0.099	0.03	mg/kg	J-	Q, A
DA1SB-068M-0201-SO	Copper	21.2	0.4	0.12	mg/kg	J-	A
DA1SB-068M-0201-SO	Lead	24.5	0.28	0.081	mg/kg	J-	A
DA1SB-068M-0201-SO	Magnesium	2590	0.81	0.24	mg/kg	J-	A
DA1SB-068M-0201-SO	Manganese	293	0.1	0.032	mg/kg	J-	Q
DA1SB-068M-0201-SO	Nickel	15.9	0.12	0.036	mg/kg	J-	Q, A
DA1SB-068M-0201-SO	Potassium	1000	36	11	mg/kg	J-	Q
DA1SB-068M-0201-SO	Selenium	0.23	0.85	0.14	mg/kg	J-	Q
DA1SB-068M-0201-SO	Silver	0.1	0.11	0.1	mg/kg	UJ	Q, $
DA1SB-068M-0201-SO	Sodium	45.3	13	4	mg/kg	J-	C, Q
DA1SB-068M-0201-SO	Thallium	1.5	0.28	0.081	mg/kg	J-	Q
DA1SB-068M-0201-SO	Vanadium	15.2	0.069	0.022	mg/kg	J-	Q, A
DA1SB-068M-0201-SO	Zinc	51.6	0.24	0.081	mg/kg	J-	Q, A
DA1SB-068M-0201-SO	1,2,4-Trichlorobenzene	21	400	21	ug/kg	UJ	H
DA1SB-068M-0201-SO	1,2-Dichlorobenzene	24	400	24	ug/kg	UJ	H
DA1SB-068M-0201-SO	1,3-Dichlorobenzene	20	400	20	ug/kg	UJ	H
DA1SB-068M-0201-SO	1,4-Dichlorobenzene	19	400	19	ug/kg	UJ	H
DA1SB-068M-0201-SO	2,4,5-Trichlorophenol	130	500	130	ug/kg	UJ	H
DA1SB-068M-0201-SO	2,4,6-Trichlorophenol	130	500	130	ug/kg	UJ	H
DA1SB-068M-0201-SO	2,4-Dichlorophenol	120	500	120	ug/kg	UJ	H

Sample	Analyte	Result	LOQ	DL	Units	Qualifier	Code
DA1SB-068M-0201-SO	2,4-Dimethylphenol	100	400	100	ug/kg	UJ	H
DA1SB-068M-0201-SO	2,4-Dinitrophenol	700	2000	700	ug/kg	UJ	H, C
DA1SB-068M-0201-SO	2,4-Dinitrotoluene	24	400	24	ug/kg	UJ	H
DA1SB-068M-0201-SO	2,6-Dinitrotoluene	24	400	24	ug/kg	UJ	H
DA1SB-068M-0201-SO	2-Chloronaphthalene	23	400	23	ug/kg	UJ	H
DA1SB-068M-0201-SO	2-Chlorophenol	340	500	340	ug/kg	UJ	H
DA1SB-068M-0201-SO	2-Methyl-4,6-dinitrophenol	270	1000	270	ug/kg	UJ	H, C
DA1SB-068M-0201-SO	2-Methylnaphthalene	25	400	25	ug/kg	UJ	H
DA1SB-068M-0201-SO	2-Methylphenol	420	1000	420	ug/kg	UJ	H
DA1SB-068M-0201-SO	2-Nitroaniline	23	400	23	ug/kg	UJ	H
DA1SB-068M-0201-SO	2-Nitrophenol	280	500	280	ug/kg	UJ	H
DA1SB-068M-0201-SO	3,3'-Dichlorobenzidine	150	500	150	ug/kg	UJ	H, C
DA1SB-068M-0201-SO	3-Nitroaniline	22	1000	22	ug/kg	UJ	H
DA1SB-068M-0201-SO	4-Bromophenyl phenyl ether	25	400	25	ug/kg	UJ	H
DA1SB-068M-0201-SO	4-Chloro-3-methylphenol	380	500	380	ug/kg	UJ	H
DA1SB-068M-0201-SO	4-Chloroaniline	39	400	39	ug/kg	UJ	H
DA1SB-068M-0201-SO	4-Chlorophenyl phenyl ether	26	400	26	ug/kg	UJ	H
DA1SB-068M-0201-SO	4-Methylphenol	660	2000	660	ug/kg	UJ	H
DA1SB-068M-0201-SO	4-Nitroaniline	30	1000	30	ug/kg	UJ	H, C
DA1SB-068M-0201-SO	4-Nitrophenol	400	1000	400	ug/kg	UJ	H
DA1SB-068M-0201-SO	Acenaphthene	24	400	24	ug/kg	UJ	H
DA1SB-068M-0201-SO	Acenaphthylene	24	400	24	ug/kg	UJ	H
DA1SB-068M-0201-SO	Anthracene	24	400	24	ug/kg	UJ	H
DA1SB-068M-0201-SO	Benzo(a)anthracene	25	400	25	ug/kg	UJ	H
DA1SB-068M-0201-SO	Benzo(a)pyrene	23	400	23	ug/kg	UJ	H
DA1SB-068M-0201-SO	Benzo(b)fluoranthene	25	400	25	ug/kg	UJ	H
DA1SB-068M-0201-SO	Benzo(g,h,i)perylene	22	400	22	ug/kg	UJ	H, C
DA1SB-068M-0201-SO	Benzo(k)fluoranthene	25	400	25	ug/kg	UJ	H
DA1SB-068M-0201-SO	Benzoic acid	290	990	290	ug/kg	UJ	H
DA1SB-068M-0201-SO	Benzyl alcohol	84	1000	84	ug/kg	R	C
DA1SB-068M-0201-SO	Bis(2-chloroethoxy)methane	23	400	23	ug/kg	UJ	H
DA1SB-068M-0201-SO	Bis(2-chloroethyl) ether	25	400	25	ug/kg	UJ	H
DA1SB-068M-0201-SO	Bis(2-chloroisopropyl) ether	30	400	30	ug/kg	UJ	H
DA1SB-068M-0201-SO	Bis(2-ethylhexyl) phthalate	88	1000	88	ug/kg	UJ	H
DA1SB-068M-0201-SO	Butylbenzyl phthalate	74	400	74	ug/kg	UJ	H
DA1SB-068M-0201-SO	Carbazole	28	400	28	ug/kg	UJ	H
DA1SB-068M-0201-SO	Chrysene	25	400	25	ug/kg	UJ	H
DA1SB-068M-0201-SO	Dibenzo(a,h)anthracene	22	400	22	ug/kg	UJ	H
DA1SB-068M-0201-SO	Dibenzofuran	24	400	24	ug/kg	UJ	H
DA1SB-068M-0201-SO	Diethyl phthalate	65	400	65	ug/kg	UJ	H
DA1SB-068M-0201-SO	Dimethyl phthalate	64	400	64	ug/kg	UJ	H
DA1SB-068M-0201-SO	Di-n-butyl phthalate	85	400	80	ug/kg	J-	H
DA1SB-068M-0201-SO	Di-n-octyl phthalate	60	400	60	ug/kg	UJ	H
DA1SB-068M-0201-SO	Fluoranthene	26	400	26	ug/kg	UJ	H
DA1SB-068M-0201-SO	Fluorene	25	400	25	ug/kg	UJ	H
DA1SB-068M-0201-SO	Hexachlorobenzene	28	400	28	ug/kg	UJ	H
DA1SB-068M-0201-SO	Hexachlorobutadiene	63	400	63	ug/kg	UJ	H
DA1SB-068M-0201-SO	Hexachlorocyclopentadiene	52	400	52	ug/kg	R	C
DA1SB-068M-0201-SO	Hexachloroethane	33	400	33	ug/kg	UJ	H
DA1SB-068M-0201-SO	Indeno(1,2,3-cd)pyrene	23	400	23	ug/kg	UJ	H, C
DA1SB-068M-0201-SO	Isophorone	50	400	50	ug/kg	UJ	H
DA1SB-068M-0201-SO	Naphthalene	21	400	21	ug/kg	UJ	H
DA1SB-068M-0201-SO	Nitrobenzene	60	400	60	ug/kg	UJ	H

Sample	Analyte	Result	LOQ	DL	Units	Qualifier	Code
DA1SB-068M-0201-SO	N-Nitroso-di-n-propylamine	71	400	71	ug/kg	UJ	H
DA1SB-068M-0201-SO	N-Nitrosodiphenylamine	50	810	50	ug/kg	UJ	H
DA1SB-068M-0201-SO	Pentachlorophenol	240	1000	240	ug/kg	UJ	H
DA1SB-068M-0201-SO	Phenanthrene	26	400	26	ug/kg	UJ	H
DA1SB-068M-0201-SO	Phenol	160	500	160	ug/kg	UJ	H
DA1SB-068M-0201-SO	Pyrene	26	400	26	ug/kg	UJ	H
DA1SB-068M-0201-SO	1,3,5-Trinitrobenzene	0.13	0.44	0.13	mg/kg	UJ	H
DA1SB-068M-0201-SO	1,3-Dinitrobenzene	0.08	0.44	0.08	mg/kg	UJ	H
DA1SB-068M-0201-SO	2,4,6-Trinitrotoluene	0.091	0.44	0.091	mg/kg	UJ	H
DA1SB-068M-0201-SO	2,4-Dinitrotoluene	0.2	0.44	0.2	mg/kg	R	D
DA1SB-068M-0201-SO	2,6-Dinitrotoluene	0.07	0.5	0.07	mg/kg	R	D
DA1SB-068M-0201-SO	2-Amino-4,6-dinitrotoluene	0.05	0.44	0.05	mg/kg	UJ	H
DA1SB-068M-0201-SO	2-Nitrotoluene	0.091	0.44	0.091	mg/kg	UJ	H
DA1SB-068M-0201-SO	3,5-Dinitroaniline	0.091	0.44	0.091	mg/kg	UJ	H
DA1SB-068M-0201-SO	3-Nitrotoluene	0.07	0.44	0.07	mg/kg	UJ	H
DA1SB-068M-0201-SO	4-Amino-2,6-dinitrotoluene	0.07	0.44	0.07	mg/kg	UJ	H
DA1SB-068M-0201-SO	4-Nitrotoluene	0.07	0.5	0.07	mg/kg	UJ	H
DA1SB-068M-0201-SO	HMX	0.12	0.44	0.12	mg/kg	UJ	H
DA1SB-068M-0201-SO	Nitrobenzene	0.04	0.44	0.04	mg/kg	R	D
DA1SB-068M-0201-SO	Nitroglycerin	0.5	1.5	0.5	mg/kg	UJ	H
DA1SB-068M-0201-SO	Nitroguanidine	0.06	0.16	0.06	mg/kg	UJ	H, *III
DA1SB-068M-0201-SO	PETN	0.5	1.5	0.5	mg/kg	UJ	H
DA1SB-068M-0201-SO	RDX	0.16	0.44	0.16	mg/kg	UJ	H
DA1SB-068M-0201-SO	Tetryl	0.091	0.44	0.091	mg/kg	UJ	H
DA1SB-070D-0201-SO	2-Butanone	120	580	120	ug/kg	UJ	Q
DA1SB-070D-0201-SO	2-Hexanone	79	580	79	ug/kg	UJ	Q
DA1SB-070D-0201-SO	Acetone	73	1200	73	ug/kg	UJ	Q
DA1SB-070M-0204-SO	Mercury	0.01	0.008	0.0024	mg/kg	J-	A
DA1SB-070M-0204-SO	Aluminum	12900	0.24	0.081	mg/kg	J-	Q
DA1SB-070M-0204-SO	Antimony	0.57	0.55	0.16	mg/kg	J-	Q
DA1SB-070M-0204-SO	Arsenic	10.2	0.91	0.26	mg/kg	J-	Q, A
DA1SB-070M-0204-SO	Beryllium	0.46	0.024	0.0081	mg/kg	J-	A
DA1SB-070M-0204-SO	Cadmium	0.08	0.08	0.08	mg/kg	UJ	C, B, Q, $
DA1SB-070M-0204-SO	Calcium	30200	1	0.12	mg/kg	J-	A
DA1SB-070M-0204-SO	Chromium	58.3	0.13	0.039	mg/kg	J-	Q, A
DA1SB-070M-0204-SO	Cobalt	9.8	0.099	0.03	mg/kg	J-	Q, A
DA1SB-070M-0204-SO	Copper	17.3	0.41	0.12	mg/kg	J-	A
DA1SB-070M-0204-SO	Lead	10.9	0.28	0.081	mg/kg	J-	A
DA1SB-070M-0204-SO	Magnesium	8010	0.81	0.24	mg/kg	J-	A
DA1SB-070M-0204-SO	Manganese	311	0.1	0.032	mg/kg	J-	Q
DA1SB-070M-0204-SO	Nickel	24.1	0.12	0.037	mg/kg	J-	Q, A
DA1SB-070M-0204-SO	Potassium	1860	37	11	mg/kg	J-	Q
DA1SB-070M-0204-SO	Selenium	0.43	0.85	0.14	mg/kg	J-	Q
DA1SB-070M-0204-SO	Silver	0.034	0.11	0.034	mg/kg	UJ	Q
DA1SB-070M-0204-SO	Sodium	78.9	13	4.1	mg/kg	J-	C, Q
DA1SB-070M-0204-SO	Thallium	1.8	0.28	0.081	mg/kg	J-	Q
DA1SB-070M-0204-SO	Vanadium	18.9	0.069	0.022	mg/kg	J-	Q, A
DA1SB-070M-0204-SO	Zinc	51.2	0.24	0.081	mg/kg	J-	Q, A
DA1SB-070M-0204-SO	1,3,5-Trinitrobenzene	0.13	0.44	0.13	mg/kg	UJ	H
DA1SB-070M-0204-SO	1,3-Dinitrobenzene	0.08	0.44	0.08	mg/kg	UJ	H
DA1SB-070M-0204-SO	2,4,6-Trinitrotoluene	0.09	0.44	0.09	mg/kg	UJ	H
DA1SB-070M-0204-SO	2,4-Dinitrotoluene	0.2	0.44	0.2	mg/kg	UJ	H
DA1SB-070M-0204-SO	2,6-Dinitrotoluene	0.07	0.5	0.07	mg/kg	UJ	H

Sample	Analyte	Result	LOQ	DL	Units	Qualifier	Code
DA1SB-070M-0204-SO	2-Amino-4,6-dinitrotoluene	0.05	0.44	0.05	mg/kg	UJ	H
DA1SB-070M-0204-SO	2-Nitrotoluene	0.09	0.44	0.09	mg/kg	UJ	H
DA1SB-070M-0204-SO	3,5-Dinitroaniline	0.09	0.44	0.09	mg/kg	UJ	H
DA1SB-070M-0204-SO	3-Nitrotoluene	0.07	0.44	0.07	mg/kg	UJ	H
DA1SB-070M-0204-SO	4-Amino-2,6-dinitrotoluene	0.07	0.44	0.07	mg/kg	UJ	H, L
DA1SB-070M-0204-SO	4-Nitrotoluene	0.07	0.5	0.07	mg/kg	UJ	H
DA1SB-070M-0204-SO	HMX	0.12	0.44	0.12	mg/kg	UJ	H
DA1SB-070M-0204-SO	Nitrobenzene	0.04	0.44	0.04	mg/kg	UJ	H
DA1SB-070M-0204-SO	Nitroglycerin	0.5	1.5	0.5	mg/kg	UJ	H
DA1SB-070M-0204-SO	PETN	0.5	1.5	0.5	mg/kg	UJ	H
DA1SB-070M-0204-SO	RDX	0.16	0.44	0.16	mg/kg	UJ	H
DA1SB-070M-0204-SO	Tetryl	0.09	0.44	0.09	mg/kg	UJ	H
DA1SB-072M-0204-SO	Mercury	0.037	0.0079	0.0024	mg/kg	J-	A
DA1SB-072M-0204-SO	Aluminum	6790	0.24	0.08	mg/kg	J-	Q
DA1SB-072M-0204-SO	Antimony	7.6	0.54	0.16	mg/kg	J-	Q
DA1SB-072M-0204-SO	Arsenic	10.7	0.91	0.26	mg/kg	J-	Q, A
DA1SB-072M-0204-SO	Beryllium	0.24	0.024	0.008	mg/kg	J-	C, A
DA1SB-072M-0204-SO	Cadmium	0.2	0.2	0.2	mg/kg	UJ	C, B, Q, $
DA1SB-072M-0204-SO	Calcium	1060	1	0.12	mg/kg	J-	A
DA1SB-072M-0204-SO	Chromium	589	0.13	0.038	mg/kg	J-	Q, A
DA1SB-072M-0204-SO	Cobalt	5.9	0.099	0.03	mg/kg	J-	Q, A
DA1SB-072M-0204-SO	Copper	26.5	0.4	0.12	mg/kg	J-	A
DA1SB-072M-0204-SO	Lead	13.9	0.28	0.08	mg/kg	J-	A
DA1SB-072M-0204-SO	Magnesium	1750	0.8	0.24	mg/kg	J-	A
DA1SB-072M-0204-SO	Manganese	342	0.1	0.032	mg/kg	J-	Q
DA1SB-072M-0204-SO	Nickel	16	0.12	0.036	mg/kg	J-	Q, A
DA1SB-072M-0204-SO	Potassium	1330	36	11	mg/kg	J-	Q
DA1SB-072M-0204-SO	Selenium	0.68	0.85	0.14	mg/kg	J-	Q
DA1SB-072M-0204-SO	Silver	0.034	0.11	0.034	mg/kg	UJ	Q
DA1SB-072M-0204-SO	Sodium	115	13	4	mg/kg	J-	C, Q
DA1SB-072M-0204-SO	Thallium	1.3	0.28	0.08	mg/kg	J-	Q
DA1SB-072M-0204-SO	Vanadium	13.3	0.068	0.022	mg/kg	J-	Q, A
DA1SB-072M-0204-SO	Zinc	63.9	0.24	0.08	mg/kg	J-	Q, A
DA1SB-072M-0204-SO	1,3,5-Trinitrobenzene	0.13	0.44	0.13	mg/kg	UJ	H
DA1SB-072M-0204-SO	1,3-Dinitrobenzene	0.08	0.44	0.08	mg/kg	UJ	H
DA1SB-072M-0204-SO	2,4,6-Trinitrotoluene	0.09	0.44	0.09	mg/kg	UJ	H
DA1SB-072M-0204-SO	2,4-Dinitrotoluene	0.2	0.44	0.2	mg/kg	UJ	H
DA1SB-072M-0204-SO	2,6-Dinitrotoluene	0.07	0.5	0.07	mg/kg	UJ	H
DA1SB-072M-0204-SO	2-Amino-4,6-dinitrotoluene	0.05	0.44	0.05	mg/kg	UJ	H
DA1SB-072M-0204-SO	2-Nitrotoluene	0.09	0.44	0.09	mg/kg	UJ	H
DA1SB-072M-0204-SO	3,5-Dinitroaniline	0.09	0.44	0.09	mg/kg	UJ	H
DA1SB-072M-0204-SO	3-Nitrotoluene	0.07	0.44	0.07	mg/kg	UJ	H
DA1SB-072M-0204-SO	4-Amino-2,6-dinitrotoluene	0.07	0.44	0.07	mg/kg	UJ	H, L
DA1SB-072M-0204-SO	4-Nitrotoluene	0.07	0.5	0.07	mg/kg	UJ	H
DA1SB-072M-0204-SO	HMX	0.12	0.44	0.12	mg/kg	UJ	H
DA1SB-072M-0204-SO	Nitrobenzene	0.04	0.44	0.04	mg/kg	UJ	H
DA1SB-072M-0204-SO	Nitroglycerin	0.5	1.5	0.5	mg/kg	UJ	H
DA1SB-072M-0204-SO	PETN	0.5	1.5	0.5	mg/kg	UJ	H
DA1SB-072M-0204-SO	RDX	0.16	0.44	0.16	mg/kg	UJ	H
DA1SB-072M-0204-SO	Tetryl	0.09	0.44	0.09	mg/kg	UJ	H
DA1SB-074M-0202-SO	Aluminum	5440	0.24	0.081	mg/kg	J-	Q, A
DA1SB-074M-0202-SO	Antimony	2.7	1.4	0.4	mg/kg	J-	C, E, Q, *III
DA1SB-074M-0202-SO	Arsenic	6	0.91	0.26	mg/kg	J-	Q

Sample	Analyte	Result	LOQ	DL	Units	Qualifier	Code
DA1SB-074M-0202-SO	Barium	31.5	0.054	0.016	mg/kg	J-	A
DA1SB-074M-0202-SO	Beryllium	0.24	0.024	0.0081	mg/kg	J	C
DA1SB-074M-0202-SO	Cadmium	0.31	0.11	0.03	mg/kg	J-	C, E, Q, A
DA1SB-074M-0202-SO	Chromium	176	0.13	0.038	mg/kg	J-	A
DA1SB-074M-0202-SO	Cobalt	6.8	0.25	0.076	mg/kg	J-	Q, *III, A
DA1SB-074M-0202-SO	Copper	12.2	1	0.3	mg/kg	J-	E, A
DA1SB-074M-0202-SO	Iron	13300	2	0.6	mg/kg	J-	Q, A
DA1SB-074M-0202-SO	Lead	7.2	0.28	0.081	mg/kg	J-	Q, *III, A
DA1SB-074M-0202-SO	Magnesium	1790	0.81	0.24	mg/kg	J-	Q, A
DA1SB-074M-0202-SO	Manganese	148	0.1	0.032	mg/kg	J-	A
DA1SB-074M-0202-SO	Nickel	16.8	0.12	0.036	mg/kg	J-	Q, A
DA1SB-074M-0202-SO	Selenium	0.14	0.85	0.14	mg/kg	UJ	B, Q
DA1SB-074M-0202-SO	Silver	0.086	0.28	0.086	mg/kg	UJ	Q
DA1SB-074M-0202-SO	Sodium	59.2	13	4	mg/kg	J	C, E
DA1SB-074M-0202-SO	Thallium	0.65	0.7	0.2	mg/kg	J-	B, Q
DA1SB-074M-0202-SO	Vanadium	10.4	0.068	0.022	mg/kg	J-	A
DA1SB-074M-0202-SO	Zinc	33	0.24	0.081	mg/kg	J	Q, A
DA1SB-074M-0202-SO	Mercury	0.01	0.008	0.0024	mg/kg	J-	B, E, A
DA1SB-074M-0202-SO	1,3,5-Trinitrobenzene	0.13	0.44	0.13	mg/kg	UJ	H
DA1SB-074M-0202-SO	1,3-Dinitrobenzene	0.08	0.44	0.08	mg/kg	UJ	H
DA1SB-074M-0202-SO	2,4,6-Trinitrotoluene	0.091	0.44	0.091	mg/kg	UJ	H
DA1SB-074M-0202-SO	2,4-Dinitrotoluene	0.2	0.44	0.2	mg/kg	UJ	H, C
DA1SB-074M-0202-SO	2,6-Dinitrotoluene	0.07	0.5	0.07	mg/kg	UJ	H, C
DA1SB-074M-0202-SO	2-Amino-4,6-dinitrotoluene	0.05	0.44	0.05	mg/kg	UJ	H
DA1SB-074M-0202-SO	2-Nitrotoluene	0.091	0.44	0.091	mg/kg	UJ	H
DA1SB-074M-0202-SO	3,5-Dinitroaniline	0.091	0.44	0.091	mg/kg	UJ	H
DA1SB-074M-0202-SO	3-Nitrotoluene	0.07	0.44	0.07	mg/kg	UJ	H
DA1SB-074M-0202-SO	4-Amino-2,6-dinitrotoluene	0.07	0.44	0.07	mg/kg	UJ	H
DA1SB-074M-0202-SO	4-Nitrotoluene	0.07	0.5	0.07	mg/kg	UJ	H
DA1SB-074M-0202-SO	HMX	0.12	0.44	0.12	mg/kg	UJ	H
DA1SB-074M-0202-SO	Nitrobenzene	0.04	0.44	0.04	mg/kg	UJ	H
DA1SB-074M-0202-SO	Nitroglycerin	0.5	1.5	0.5	mg/kg	UJ	H, C
DA1SB-074M-0202-SO	PETN	0.5	1.5	0.5	mg/kg	UJ	H
DA1SB-074M-0202-SO	RDX	0.16	0.44	0.16	mg/kg	UJ	H
DA1SB-074M-0202-SO	Tetryl	0.091	0.44	0.091	mg/kg	UJ	H
DA1SS-050M-0201-SO	Mercury	0.037	0.008	0.0024	mg/kg	J-	A
DA1SS-050M-0201-SO	Aluminum	10900	0.24	0.081	mg/kg	J-	Q
DA1SS-050M-0201-SO	Antimony	1.2	0.55	0.16	mg/kg	J-	Q
DA1SS-050M-0201-SO	Arsenic	9.1	0.92	0.26	mg/kg	J-	Q, A
DA1SS-050M-0201-SO	Beryllium	0.38	0.024	0.0081	mg/kg	J-	A
DA1SS-050M-0201-SO	Cadmium	2.6	0.043	0.012	mg/kg	J-	Q
DA1SS-050M-0201-SO	Calcium	2500	1	0.12	mg/kg	J-	A
DA1SS-050M-0201-SO	Chromium	110	0.13	0.039	mg/kg	J-	Q, A
DA1SS-050M-0201-SO	Cobalt	7.6	0.1	0.031	mg/kg	J-	Q, A
DA1SS-050M-0201-SO	Copper	188	0.41	0.12	mg/kg	J-	A
DA1SS-050M-0201-SO	Lead	23.4	0.28	0.081	mg/kg	J-	A
DA1SS-050M-0201-SO	Magnesium	2860	0.81	0.24	mg/kg	J-	A
DA1SS-050M-0201-SO	Manganese	407	0.1	0.033	mg/kg	J-	Q
DA1SS-050M-0201-SO	Nickel	18.4	0.12	0.037	mg/kg	J-	Q, A
DA1SS-050M-0201-SO	Potassium	814	37	11	mg/kg	J-	Q
DA1SS-050M-0201-SO	Selenium	0.75	0.85	0.14	mg/kg	J-	Q
DA1SS-050M-0201-SO	Silver	0.035	0.11	0.035	mg/kg	UJ	Q
DA1SS-050M-0201-SO	Sodium	31.8	13	4.1	mg/kg	J-	C, Q

Sample	Analyte	Result	LOQ	DL	Units	Qualifier	Code
DA1SS-050M-0201-SO	Thallium	1.6	0.28	0.081	mg/kg	J-	Q
DA1SS-050M-0201-SO	Vanadium	16.1	0.069	0.022	mg/kg	J-	Q, A
DA1SS-050M-0201-SO	Zinc	191	0.24	0.081	mg/kg	J-	Q, A
DA1SS-050M-0201-SO	1,3,5-Trinitrobenzene	0.13	0.44	0.13	mg/kg	UJ	H
DA1SS-050M-0201-SO	1,3-Dinitrobenzene	0.08	0.44	0.08	mg/kg	UJ	H
DA1SS-050M-0201-SO	2,4,6-Trinitrotoluene	0.09	0.44	0.09	mg/kg	UJ	H
DA1SS-050M-0201-SO	2,4-Dinitrotoluene	0.2	0.44	0.2	mg/kg	UJ	H, Q
DA1SS-050M-0201-SO	2,6-Dinitrotoluene	0.07	0.5	0.07	mg/kg	UJ	H
DA1SS-050M-0201-SO	2-Amino-4,6-dinitrotoluene	0.05	0.44	0.05	mg/kg	UJ	H
DA1SS-050M-0201-SO	2-Nitrotoluene	0.09	0.44	0.09	mg/kg	UJ	H
DA1SS-050M-0201-SO	3,5-Dinitroaniline	0.09	0.44	0.09	mg/kg	UJ	H
DA1SS-050M-0201-SO	3-Nitrotoluene	0.07	0.44	0.07	mg/kg	UJ	H
DA1SS-050M-0201-SO	4-Amino-2,6-dinitrotoluene	0.07	0.44	0.07	mg/kg	UJ	H
DA1SS-050M-0201-SO	4-Nitrotoluene	0.07	0.5	0.07	mg/kg	UJ	H
DA1SS-050M-0201-SO	HMX	0.12	0.44	0.12	mg/kg	UJ	H
DA1SS-050M-0201-SO	Nitrobenzene	0.04	0.44	0.04	mg/kg	UJ	H
DA1SS-050M-0201-SO	Nitroglycerin	0.5	1.5	0.5	mg/kg	UJ	H
DA1SS-050M-0201-SO	PETN	0.5	1.5	0.5	mg/kg	UJ	H
DA1SS-050M-0201-SO	RDX	0.16	0.44	0.16	mg/kg	UJ	H
DA1SS-050M-0201-SO	Tetryl	0.09	0.44	0.09	mg/kg	UJ	H
DA1SS-054M-0201-SO	Aluminum	8490	0.25	0.082	mg/kg	J-	Q, A
DA1SS-054M-0201-SO	Antimony	0.92	0.55	0.16	mg/kg	J-	E, Q, *III
DA1SS-054M-0201-SO	Arsenic	8.4	0.92	0.27	mg/kg	J-	Q
DA1SS-054M-0201-SO	Barium	52.7	0.055	0.016	mg/kg	J-	A
DA1SS-054M-0201-SO	Cadmium	0.52	0.043	0.012	mg/kg	J-	E, Q, A
DA1SS-054M-0201-SO	Chromium	56.2	0.13	0.039	mg/kg	J-	A
DA1SS-054M-0201-SO	Cobalt	8.9	0.1	0.031	mg/kg	J-	Q, *III, A
DA1SS-054M-0201-SO	Copper	16.4	0.41	0.12	mg/kg	J-	E, A
DA1SS-054M-0201-SO	Iron	19400	2	0.61	mg/kg	J-	Q, A
DA1SS-054M-0201-SO	Lead	11.6	0.29	0.082	mg/kg	J-	Q, *III, A
DA1SS-054M-0201-SO	Magnesium	1940	0.82	0.25	mg/kg	J-	Q, A
DA1SS-054M-0201-SO	Manganese	398	0.1	0.033	mg/kg	J-	A
DA1SS-054M-0201-SO	Nickel	16.7	0.12	0.037	mg/kg	J-	Q, A
DA1SS-054M-0201-SO	Selenium	2.4	0.86	0.14	mg/kg	J	C, Q
DA1SS-054M-0201-SO	Silver	0.035	0.11	0.035	mg/kg	UJ	Q
DA1SS-054M-0201-SO	Sodium	62.1	13	4.1	mg/kg	J	C, E
DA1SS-054M-0201-SO	Thallium	0.38	0.29	0.082	mg/kg	J-	B, Q
DA1SS-054M-0201-SO	Vanadium	15.6	0.07	0.022	mg/kg	J-	A
DA1SS-054M-0201-SO	Zinc	121	0.25	0.082	mg/kg	J	Q, A
DA1SS-054M-0201-SO	Mercury	0.032	0.0081	0.0025	mg/kg	J-	E, A
DA1SS-054M-0201-SO	2,6-Dinitrotoluene	0.071	0.51	0.071	mg/kg	UJ	C
SCSB-037M-0001-SO	Aluminum	14800	0.49	0.16	mg/kg	J-	Q, A

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Sample	Analyte	Result	LOQ	DL	Units	Qualifier	Code
SCSB-037M-0001-SO	Antimony	0.93	1.1	0.32	mg/kg	J-	Q, A
SCSB-037M-0001-SO	Arsenic	182	1.8	0.53	mg/kg	J-	Q, *III, A
SCSB-037M-0001-SO	Barium	932	0.11	0.032	mg/kg	J-	A
SCSB-037M-0001-SO	Beryllium	3.9	0.049	0.016	mg/kg	J-	A
SCSB-037M-0001-SO	Cadmium	1.6	0.085	0.024	mg/kg	J-	Q, *III
SCSB-037M-0001-SO	Calcium	13900	2	0.24	mg/kg	J-	A
SCSB-037M-0001-SO	Chromium	112	0.26	0.077	mg/kg	J-	Q, A
SCSB-037M-0001-SO	Cobalt	9	0.2	0.061	mg/kg	J-	Q, *III, A
SCSB-037M-0001-SO	Copper	95.7	0.81	0.24	mg/kg	J-	Q, *III, A
SCSB-037M-0001-SO	Iron	41500	4.1	1.2	mg/kg	J-	A
SCSB-037M-0001-SO	Lead	325	0.57	0.16	mg/kg	J-	Q, *III, A
SCSB-037M-0001-SO	Magnesium	3050	1.6	0.49	mg/kg	J-	Q, A
SCSB-037M-0001-SO	Manganese	743	0.2	0.065	mg/kg	J-	Q, A
SCSB-037M-0001-SO	Nickel	35.7	0.25	0.073	mg/kg	J-	Q, *III, A
SCSB-037M-0001-SO	Potassium	1020	37	11	mg/kg	J-	Q
SCSB-037M-0001-SO	Selenium	3.1	1.7	0.28	mg/kg	J-	Q
SCSB-037M-0001-SO	Sodium	178	13	4.1	mg/kg	J-	Q
SCSB-037M-0001-SO	Thallium	5.5	0.57	0.16	mg/kg	J-	Q, *III, E
SCSB-037M-0001-SO	Vanadium	41	0.14	0.045	mg/kg	J-	Q, A, E
SCSB-037M-0001-SO	Zinc	298	0.49	0.16	mg/kg	J-	Q, *III, A
SCSB-037M-0001-SO	Mercury	0.24	0.008	0.0024	mg/kg	J-	A
SCSB-037M-0001-SO	2,4-Dinitrophenol	700	2000	700	ug/kg	UJ	C
SCSB-037M-0001-SO	3,3'-Dichlorobenzidine	150	510	150	ug/kg	UJ	C
SCSB-037M-0001-SO	Benzyl alcohol	84	1000	84	ug/kg	UJ	C
SCSB-037M-0001-SO	Bis(2-ethylhexyl) phthalate	88	1000	88	ug/kg	U	B
SCSB-037M-0001-SO	Hexachlorocyclopentadiene	53	400	53	ug/kg	UJ	C
SCSB-037M-0001-SO	1,3,5-Trinitrobenzene	0.13	0.44	0.13	mg/kg	UJ	H
SCSB-037M-0001-SO	1,3-Dinitrobenzene	0.081	0.44	0.081	mg/kg	UJ	H
SCSB-037M-0001-SO	2,4,6-Trinitrotoluene	0.091	0.44	0.091	mg/kg	UJ	H
SCSB-037M-0001-SO	2,4-Dinitrotoluene	0.2	0.44	0.2	mg/kg	R	D
SCSB-037M-0001-SO	2,6-Dinitrotoluene	0.071	0.51	0.071	mg/kg	R	D
SCSB-037M-0001-SO	2-Amino-4,6-dinitrotoluene	0.051	0.44	0.051	mg/kg	UJ	H
SCSB-037M-0001-SO	2-Nitrotoluene	0.091	0.44	0.091	mg/kg	UJ	H
SCSB-037M-0001-SO	3,5-Dinitroaniline	0.091	0.44	0.091	mg/kg	UJ	H
SCSB-037M-0001-SO	3-Nitrotoluene	0.071	0.44	0.071	mg/kg	UJ	H
SCSB-037M-0001-SO	4-Amino-2,6-dinitrotoluene	0.071	0.44	0.071	mg/kg	UJ	H
SCSB-037M-0001-SO	4-Nitrotoluene	0.071	0.51	0.071	mg/kg	UJ	H
SCSB-037M-0001-SO	HMX	0.12	0.44	0.12	mg/kg	UJ	H
SCSB-037M-0001-SO	Nitrobenzene	0.04	0.44	0.04	mg/kg	R	D
SCSB-037M-0001-SO	Nitroglycerin	0.51	1.5	0.51	mg/kg	UJ	H
SCSB-037M-0001-SO	PETN	0.51	1.5	0.51	mg/kg	UJ	H
SCSB-037M-0001-SO	RDX	0.16	0.44	0.16	mg/kg	UJ	H
SCSB-037M-0001-SO	Tetryl	0.091	0.44	0.091	mg/kg	UJ	H
SCSB-038M-0005-SO	Aluminum	10900	0.24	0.08	mg/kg	J-	Q, A
SCSB-038M-0005-SO	Antimony	0.63	0.54	0.16	mg/kg	J-	Q, A
SCSB-038M-0005-SO	Arsenic	6.1	0.91	0.26	mg/kg	J-	Q, *III, A
SCSB-038M-0005-SO	Barium	43.8	0.054	0.016	mg/kg	J-	A
SCSB-038M-0005-SO	Beryllium	0.38	0.024	0.008	mg/kg	J-	A
SCSB-038M-0005-SO	Cadmium	0.012	0.042	0.012	mg/kg	UJ	C, Q, *III
SCSB-038M-0005-SO	Calcium	10900	1	0.12	mg/kg	J-	A
SCSB-038M-0005-SO	Chromium	156	0.13	0.038	mg/kg	J-	Q, A
SCSB-038M-0005-SO	Cobalt	9	0.099	0.03	mg/kg	J-	Q, *III, A
SCSB-038M-0005-SO	Copper	18.6	0.4	0.12	mg/kg	J-	Q, *III, A

Sample	Analyte	Result	LOQ	DL	Units	Qualifier	Code
SCSB-038M-0005-SO	Iron	29600	2	0.6	mg/kg	J-	A
SCSB-038M-0005-SO	Lead	5.3	0.28	0.08	mg/kg	J-	Q, *III, A
SCSB-038M-0005-SO	Magnesium	6840	0.8	0.24	mg/kg	J-	Q, A
SCSB-038M-0005-SO	Manganese	369	0.1	0.032	mg/kg	J-	Q, A
SCSB-038M-0005-SO	Nickel	20.4	0.12	0.036	mg/kg	J-	Q, *III, A
SCSB-038M-0005-SO	Potassium	2020	36	11	mg/kg	J-	Q
SCSB-038M-0005-SO	Selenium	0.6	0.85	0.14	mg/kg	J-	Q
SCSB-038M-0005-SO	Sodium	134	13	4	mg/kg	J-	Q
SCSB-038M-0005-SO	Thallium	1.7	0.28	0.08	mg/kg	J-	Q, *III, E, E
SCSB-038M-0005-SO	Vanadium	14.3	0.068	0.022	mg/kg	J-	Q, A, E
SCSB-038M-0005-SO	Zinc	48.1	0.24	0.08	mg/kg	J-	Q, *III, A
SCSB-038M-0005-SO	Mercury	0.0079	0.0079	0.0024	mg/kg	J-	A
SCSB-038M-0005-SO	2,4-Dinitrophenol	690	2000	690	ug/kg	UJ	C
SCSB-038M-0005-SO	3,3'-Dichlorobenzidine	150	500	150	ug/kg	UJ	C
SCSB-038M-0005-SO	Benzyl alcohol	84	1000	84	ug/kg	UJ	C
SCSB-038M-0005-SO	Hexachlorocyclopentadiene	52	400	52	ug/kg	UJ	C
SCSB-038M-0005-SO	1,3,5-Trinitrobenzene	0.13	0.44	0.13	mg/kg	UJ	H
SCSB-038M-0005-SO	1,3-Dinitrobenzene	0.08	0.44	0.08	mg/kg	UJ	H
SCSB-038M-0005-SO	2,4,6-Trinitrotoluene	0.09	0.44	0.09	mg/kg	UJ	H
SCSB-038M-0005-SO	2,4-Dinitrotoluene	0.2	0.44	0.2	mg/kg	R	D
SCSB-038M-0005-SO	2,6-Dinitrotoluene	0.07	0.5	0.07	mg/kg	R	D
SCSB-038M-0005-SO	2-Amino-4,6-dinitrotoluene	0.05	0.44	0.05	mg/kg	UJ	H
SCSB-038M-0005-SO	2-Nitrotoluene	0.09	0.44	0.09	mg/kg	UJ	H
SCSB-038M-0005-SO	3,5-Dinitroaniline	0.09	0.44	0.09	mg/kg	UJ	H
SCSB-038M-0005-SO	3-Nitrotoluene	0.07	0.44	0.07	mg/kg	UJ	H
SCSB-038M-0005-SO	4-Amino-2,6-dinitrotoluene	0.07	0.44	0.07	mg/kg	UJ	H
SCSB-038M-0005-SO	4-Nitrotoluene	0.07	0.5	0.07	mg/kg	UJ	H
SCSB-038M-0005-SO	HMX	0.12	0.44	0.12	mg/kg	UJ	H
SCSB-038M-0005-SO	Nitrobenzene	0.04	0.44	0.04	mg/kg	R	D
SCSB-038M-0005-SO	Nitroglycerin	0.5	1.5	0.5	mg/kg	UJ	H
SCSB-038M-0005-SO	PETN	0.5	1.5	0.5	mg/kg	UJ	H
SCSB-038M-0005-SO	RDX	0.16	0.44	0.16	mg/kg	UJ	H
SCSB-038M-0005-SO	Tetryl	0.09	0.44	0.09	mg/kg	UJ	H
SCSB-042M-0003-SO	Aluminum	14000	0.61	0.2	mg/kg	J-	Q, A
SCSB-042M-0003-SO	Antimony	0.4	1.4	0.4	mg/kg	R	Q
SCSB-042M-0003-SO	Arsenic	15.4	2.3	0.66	mg/kg	J-	Q, *III, A
SCSB-042M-0003-SO	Barium	69.3	0.14	0.04	mg/kg	J-	A
SCSB-042M-0003-SO	Beryllium	0.49	0.061	0.02	mg/kg	J-	C, A
SCSB-042M-0003-SO	Cadmium	0.03	0.11	0.03	mg/kg	UJ	C, Q, *III
SCSB-042M-0003-SO	Calcium	5360	2.5	0.3	mg/kg	J-	A
SCSB-042M-0003-SO	Chromium	19.8	0.32	0.096	mg/kg	J-	Q, A
SCSB-042M-0003-SO	Cobalt	13	0.25	0.076	mg/kg	J-	Q, *III, A
SCSB-042M-0003-SO	Copper	21	1	0.3	mg/kg	J-	Q, *III, A
SCSB-042M-0003-SO	Iron	35600	5.1	1.5	mg/kg	J-	A
SCSB-042M-0003-SO	Lead	11.2	0.71	0.2	mg/kg	J-	Q, *III, A
SCSB-042M-0003-SO	Magnesium	5490	2	0.61	mg/kg	J-	Q, A
SCSB-042M-0003-SO	Manganese	451	0.25	0.081	mg/kg	J-	Q, A
SCSB-042M-0003-SO	Nickel	30.7	0.31	0.091	mg/kg	J-	Q, *III, A
SCSB-042M-0003-SO	Potassium	1880	36	11	mg/kg	J-	Q
SCSB-042M-0003-SO	Selenium	0.35	2.1	0.35	mg/kg	UJ	Q
SCSB-042M-0003-SO	Sodium	92	13	4	mg/kg	J-	C, Q
SCSB-042M-0003-SO	Thallium	2.1	0.71	0.2	mg/kg	J-	C, Q, *III, E
SCSB-042M-0003-SO	Vanadium	20.5	0.17	0.056	mg/kg	J-	Q, A, E

Sample	Analyte	Result	LOQ	DL	Units	Qualifier	Code
SCSB-042M-0003-SO	Zinc	67	0.61	0.2	mg/kg	J-	Q, *III, A
SCSB-042M-0003-SO	Mercury	0.008	0.008	0.0024	mg/kg	J-	A
SCSB-042M-0003-SO	1,2,4-Trichlorobenzene	21	400	21	ug/kg	UJ	H
SCSB-042M-0003-SO	1,2-Dichlorobenzene	24	400	24	ug/kg	UJ	H
SCSB-042M-0003-SO	1,3-Dichlorobenzene	20	400	20	ug/kg	UJ	H
SCSB-042M-0003-SO	1,4-Dichlorobenzene	19	400	19	ug/kg	UJ	H
SCSB-042M-0003-SO	2,4,5-Trichlorophenol	130	510	130	ug/kg	UJ	H
SCSB-042M-0003-SO	2,4,6-Trichlorophenol	130	510	130	ug/kg	UJ	H
SCSB-042M-0003-SO	2,4-Dichlorophenol	120	510	120	ug/kg	UJ	H
SCSB-042M-0003-SO	2,4-Dimethylphenol	100	400	100	ug/kg	UJ	H
SCSB-042M-0003-SO	2,4-Dinitrophenol	700	2000	700	ug/kg	UJ	H
SCSB-042M-0003-SO	2,4-Dinitrotoluene	24	400	24	ug/kg	UJ	H
SCSB-042M-0003-SO	2,6-Dinitrotoluene	24	400	24	ug/kg	UJ	H
SCSB-042M-0003-SO	2-Chloronaphthalene	23	400	23	ug/kg	UJ	H
SCSB-042M-0003-SO	2-Chlorophenol	340	510	340	ug/kg	UJ	H
SCSB-042M-0003-SO	2-Methyl-4,6-dinitrophenol	270	1000	270	ug/kg	UJ	H
SCSB-042M-0003-SO	2-Methylnaphthalene	49	400	25	ug/kg	J-	H
SCSB-042M-0003-SO	2-Methylphenol	420	1000	420	ug/kg	UJ	H
SCSB-042M-0003-SO	2-Nitroaniline	23	400	23	ug/kg	UJ	H
SCSB-042M-0003-SO	2-Nitrophenol	280	510	280	ug/kg	UJ	H
SCSB-042M-0003-SO	3,3'-Dichlorobenzidine	150	510	150	ug/kg	UJ	H
SCSB-042M-0003-SO	3-Nitroaniline	22	1000	22	ug/kg	UJ	H
SCSB-042M-0003-SO	4-Bromophenyl phenyl ether	25	400	25	ug/kg	UJ	H
SCSB-042M-0003-SO	4-Chloro-3-methylphenol	380	510	380	ug/kg	UJ	H
SCSB-042M-0003-SO	4-Chloroaniline	39	400	39	ug/kg	UJ	H
SCSB-042M-0003-SO	4-Chlorophenyl phenyl ether	26	400	26	ug/kg	UJ	H
SCSB-042M-0003-SO	4-Methylphenol	660	2000	660	ug/kg	UJ	H
SCSB-042M-0003-SO	4-Nitroaniline	30	1000	30	ug/kg	UJ	H, C
SCSB-042M-0003-SO	4-Nitrophenol	400	1000	400	ug/kg	UJ	H
SCSB-042M-0003-SO	Acenaphthene	24	400	24	ug/kg	UJ	H
SCSB-042M-0003-SO	Acenaphthylene	24	400	24	ug/kg	UJ	H
SCSB-042M-0003-SO	Anthracene	24	400	24	ug/kg	UJ	H
SCSB-042M-0003-SO	Benzo(a)anthracene	25	400	25	ug/kg	UJ	H
SCSB-042M-0003-SO	Benzo(a)pyrene	23	400	23	ug/kg	UJ	H
SCSB-042M-0003-SO	Benzo(b)fluoranthene	25	400	25	ug/kg	UJ	H
SCSB-042M-0003-SO	Benzo(g,h,i)perylene	22	400	22	ug/kg	UJ	H
SCSB-042M-0003-SO	Benzo(k)fluoranthene	25	400	25	ug/kg	UJ	H
SCSB-042M-0003-SO	Benzoic acid	290	990	290	ug/kg	UJ	H
SCSB-042M-0003-SO	Benzyl alcohol	84	1000	84	ug/kg	UJ	H, C
SCSB-042M-0003-SO	Bis(2-chloroethoxy)methane	23	400	23	ug/kg	UJ	H
SCSB-042M-0003-SO	Bis(2-chloroethyl) ether	25	400	25	ug/kg	UJ	H
SCSB-042M-0003-SO	Bis(2-chloroisopropyl) ether	30	400	30	ug/kg	UJ	H
SCSB-042M-0003-SO	Bis(2-ethylhexyl) phthalate	88	1000	88	ug/kg	UJ	H
SCSB-042M-0003-SO	Butylbenzyl phthalate	74	400	74	ug/kg	UJ	H
SCSB-042M-0003-SO	Carbazole	28	400	28	ug/kg	UJ	H
SCSB-042M-0003-SO	Chrysene	25	400	25	ug/kg	UJ	H
SCSB-042M-0003-SO	Dibenzo(a,h)anthracene	22	400	22	ug/kg	UJ	H
SCSB-042M-0003-SO	Dibenzofuran	24	400	24	ug/kg	UJ	H
SCSB-042M-0003-SO	Diethyl phthalate	65	400	65	ug/kg	UJ	H
SCSB-042M-0003-SO	Dimethyl phthalate	64	400	64	ug/kg	UJ	H
SCSB-042M-0003-SO	Di-n-butyl phthalate	100	400	80	ug/kg	J-	H
SCSB-042M-0003-SO	Di-n-octyl phthalate	60	400	60	ug/kg	UJ	H
SCSB-042M-0003-SO	Fluoranthene	26	400	26	ug/kg	UJ	H

Sample	Analyte	Result	LOQ	DL	Units	Qualifier	Code
SCSB-042M-0003-SO	Fluorene	25	400	25	ug/kg	UJ	H
SCSB-042M-0003-SO	Hexachlorobenzene	28	400	28	ug/kg	UJ	H
SCSB-042M-0003-SO	Hexachlorobutadiene	63	400	63	ug/kg	UJ	H
SCSB-042M-0003-SO	Hexachlorocyclopentadiene	53	400	53	ug/kg	UJ	H
SCSB-042M-0003-SO	Hexachloroethane	33	400	33	ug/kg	UJ	H
SCSB-042M-0003-SO	Indeno(1,2,3-cd)pyrene	23	400	23	ug/kg	UJ	H
SCSB-042M-0003-SO	Isophorone	51	400	51	ug/kg	UJ	H
SCSB-042M-0003-SO	Naphthalene	35	400	21	ug/kg	J-	H
SCSB-042M-0003-SO	Nitrobenzene	60	400	60	ug/kg	UJ	H
SCSB-042M-0003-SO	N-Nitroso-di-n-propylamine	71	400	71	ug/kg	UJ	H
SCSB-042M-0003-SO	N-Nitrosodiphenylamine	51	810	51	ug/kg	UJ	H
SCSB-042M-0003-SO	Pentachlorophenol	240	1000	240	ug/kg	UJ	H
SCSB-042M-0003-SO	Phenanthrene	34	400	26	ug/kg	J-	H
SCSB-042M-0003-SO	Phenol	160	510	160	ug/kg	UJ	H
SCSB-042M-0003-SO	Pyrene	26	400	26	ug/kg	UJ	H
SCSB-042M-0003-SO	1,3,5-Trinitrobenzene	0.13	0.44	0.13	mg/kg	UJ	H
SCSB-042M-0003-SO	1,3-Dinitrobenzene	0.08	0.44	0.08	mg/kg	UJ	H
SCSB-042M-0003-SO	2,4,6-Trinitrotoluene	0.09	0.44	0.09	mg/kg	UJ	H
SCSB-042M-0003-SO	2,4-Dinitrotoluene	0.2	0.44	0.2	mg/kg	R	D
SCSB-042M-0003-SO	2,6-Dinitrotoluene	0.07	0.5	0.07	mg/kg	R	D
SCSB-042M-0003-SO	2-Amino-4,6-dinitrotoluene	0.05	0.44	0.05	mg/kg	UJ	H
SCSB-042M-0003-SO	2-Nitrotoluene	0.09	0.44	0.09	mg/kg	UJ	H
SCSB-042M-0003-SO	3,5-Dinitroaniline	0.09	0.44	0.09	mg/kg	UJ	H
SCSB-042M-0003-SO	3-Nitrotoluene	0.07	0.44	0.07	mg/kg	UJ	H
SCSB-042M-0003-SO	4-Amino-2,6-dinitrotoluene	0.07	0.44	0.07	mg/kg	UJ	H, C
SCSB-042M-0003-SO	4-Nitrotoluene	0.07	0.5	0.07	mg/kg	UJ	H
SCSB-042M-0003-SO	HMX	0.12	0.44	0.12	mg/kg	UJ	H
SCSB-042M-0003-SO	Nitrobenzene	0.04	0.44	0.04	mg/kg	R	D
SCSB-042M-0003-SO	Nitroglycerin	0.5	1.5	0.5	mg/kg	UJ	H
SCSB-042M-0003-SO	PETN	0.5	1.5	0.5	mg/kg	UJ	H
SCSB-042M-0003-SO	RDX	0.16	0.44	0.16	mg/kg	UJ	H
SCSB-042M-0003-SO	Tetryl	0.09	0.44	0.09	mg/kg	UJ	H
SCSB-048D-0001-SO	Carbon disulfide	16	110	16	ug/kg	UJ	C
SCSB-048D-0001-SO	Dibromochloromethane	8.5	53	8.5	ug/kg	UJ	C
SCSB-048D-0001-SO	trans-1,3-Dichloropropene	7.4	110	7.4	ug/kg	UJ	C
SCSB-048M-0001-SO	Aluminum	13000	0.24	0.081	mg/kg	J-	Q, A
SCSB-048M-0001-SO	Antimony	1.5	0.55	0.16	mg/kg	J-	Q, *III
SCSB-048M-0001-SO	Arsenic	15	0.91	0.26	mg/kg	J	E
SCSB-048M-0001-SO	Barium	137	0.055	0.016	mg/kg	J-	A
SCSB-048M-0001-SO	Cadmium	0.012	0.043	0.012	mg/kg	UJ	C, Q, *III
SCSB-048M-0001-SO	Calcium	37100	1	0.12	mg/kg	J-	A
SCSB-048M-0001-SO	Chromium	109	0.13	0.038	mg/kg	J-	A
SCSB-048M-0001-SO	Cobalt	6	0.099	0.03	mg/kg	J-	Q
SCSB-048M-0001-SO	Copper	44.8	0.4	0.12	mg/kg	J-	Q
SCSB-048M-0001-SO	Lead	34.5	0.28	0.081	mg/kg	J+	Q, *III
SCSB-048M-0001-SO	Magnesium	3580	0.81	0.24	mg/kg	J-	A
SCSB-048M-0001-SO	Manganese	1150	0.1	0.032	mg/kg	J-	A
SCSB-048M-0001-SO	Nickel	88.1	0.12	0.036	mg/kg	J-	Q, A
SCSB-048M-0001-SO	Thallium	1.6	0.28	0.081	mg/kg	J-	E, Q
SCSB-048M-0001-SO	Zinc	41.3	0.24	0.081	mg/kg	J-	Q, A
SCSB-048M-0001-SO	Hexavalent Chromium	1.9	6.5	1.9	mg/kg	UJ	C, Q
SCSB-048M-0001-SO	Endrin	2	12	2	ug/kg	UJ	C
SCSB-048M-0001-SO	1,2,4-Trichlorobenzene	21	400	21	ug/kg	UJ	H

Sample	Analyte	Result	LOQ	DL	Units	Qualifier	Code
SCSB-048M-0001-SO	1,2-Dichlorobenzene	24	400	24	ug/kg	UJ	H
SCSB-048M-0001-SO	1,3-Dichlorobenzene	20	400	20	ug/kg	UJ	H
SCSB-048M-0001-SO	1,4-Dichlorobenzene	19	400	19	ug/kg	UJ	H
SCSB-048M-0001-SO	2,4,5-Trichlorophenol	130	500	130	ug/kg	UJ	H, C
SCSB-048M-0001-SO	2,4,6-Trichlorophenol	130	500	130	ug/kg	UJ	H
SCSB-048M-0001-SO	2,4-Dichlorophenol	120	500	120	ug/kg	UJ	H
SCSB-048M-0001-SO	2,4-Dimethylphenol	100	400	100	ug/kg	UJ	H
SCSB-048M-0001-SO	2,4-Dinitrophenol	700	2000	700	ug/kg	R	C
SCSB-048M-0001-SO	2,4-Dinitrotoluene	24	400	24	ug/kg	UJ	H
SCSB-048M-0001-SO	2,6-Dinitrotoluene	24	400	24	ug/kg	UJ	H
SCSB-048M-0001-SO	2-Chloronaphthalene	23	400	23	ug/kg	UJ	H
SCSB-048M-0001-SO	2-Chlorophenol	340	500	340	ug/kg	UJ	H
SCSB-048M-0001-SO	2-Methyl-4,6-dinitrophenol	270	1000	270	ug/kg	R	C
SCSB-048M-0001-SO	2-Methylnaphthalene	490	400	25	ug/kg	J-	H
SCSB-048M-0001-SO	2-Methylphenol	420	1000	420	ug/kg	UJ	H
SCSB-048M-0001-SO	2-Nitroaniline	23	400	23	ug/kg	UJ	H
SCSB-048M-0001-SO	2-Nitrophenol	280	500	280	ug/kg	UJ	H, C
SCSB-048M-0001-SO	3,3'-Dichlorobenzidine	150	500	150	ug/kg	UJ	H
SCSB-048M-0001-SO	3-Nitroaniline	22	1000	22	ug/kg	UJ	H
SCSB-048M-0001-SO	4-Bromophenyl phenyl ether	25	400	25	ug/kg	UJ	H
SCSB-048M-0001-SO	4-Chloro-3-methylphenol	380	500	380	ug/kg	UJ	H
SCSB-048M-0001-SO	4-Chloroaniline	39	400	39	ug/kg	UJ	H
SCSB-048M-0001-SO	4-Chlorophenyl phenyl ether	26	400	26	ug/kg	UJ	H
SCSB-048M-0001-SO	4-Methylphenol	660	2000	660	ug/kg	UJ	H
SCSB-048M-0001-SO	4-Nitroaniline	30	1000	30	ug/kg	UJ	H
SCSB-048M-0001-SO	4-Nitrophenol	400	1000	400	ug/kg	UJ	H, C
SCSB-048M-0001-SO	Acenaphthene	24	400	24	ug/kg	UJ	H
SCSB-048M-0001-SO	Acenaphthylene	34	400	24	ug/kg	J-	H
SCSB-048M-0001-SO	Anthracene	65	400	24	ug/kg	J-	H
SCSB-048M-0001-SO	Benzo(a)anthracene	120	400	25	ug/kg	J-	H
SCSB-048M-0001-SO	Benzo(a)pyrene	150	400	23	ug/kg	J-	H, I
SCSB-048M-0001-SO	Benzo(b)fluoranthene	410	400	25	ug/kg	J-	H, I
SCSB-048M-0001-SO	Benzo(g,h,i)perylene	22	400	22	ug/kg	UJ	H, C, I
SCSB-048M-0001-SO	Benzo(k)fluoranthene	160	400	25	ug/kg	J	H, C, I
SCSB-048M-0001-SO	Benzoic acid	290	2000	290	ug/kg	UJ	H
SCSB-048M-0001-SO	Benzyl alcohol	84	1000	84	ug/kg	UJ	H, C
SCSB-048M-0001-SO	Bis(2-chloroethoxy)methane	23	400	23	ug/kg	UJ	H
SCSB-048M-0001-SO	Bis(2-chloroethyl) ether	25	400	25	ug/kg	UJ	H
SCSB-048M-0001-SO	Bis(2-chloroisopropyl) ether	30	400	30	ug/kg	UJ	H
SCSB-048M-0001-SO	Bis(2-ethylhexyl) phthalate	88	1000	88	ug/kg	UJ	H
SCSB-048M-0001-SO	Butylbenzyl phthalate	74	400	74	ug/kg	UJ	H
SCSB-048M-0001-SO	Carbazole	35	400	28	ug/kg	J-	H
SCSB-048M-0001-SO	Chrysene	180	400	25	ug/kg	J-	H
SCSB-048M-0001-SO	Dibenzo(a,h)anthracene	22	400	22	ug/kg	UJ	H, C, I
SCSB-048M-0001-SO	Dibenzofuran	93	400	24	ug/kg	J-	H
SCSB-048M-0001-SO	Diethyl phthalate	65	400	65	ug/kg	UJ	H
SCSB-048M-0001-SO	Dimethyl phthalate	64	400	64	ug/kg	UJ	H
SCSB-048M-0001-SO	Di-n-butyl phthalate	120	400	80	ug/kg	J-	H
SCSB-048M-0001-SO	Di-n-octyl phthalate	60	400	60	ug/kg	UJ	H
SCSB-048M-0001-SO	Fluoranthene	240	400	26	ug/kg	J-	H
SCSB-048M-0001-SO	Fluorene	41	400	25	ug/kg	J-	H
SCSB-048M-0001-SO	Hexachlorobenzene	28	400	28	ug/kg	UJ	H
SCSB-048M-0001-SO	Hexachlorobutadiene	63	400	63	ug/kg	UJ	H

Sample	Analyte	Result	LOQ	DL	Units	Qualifier	Code
SCSB-048M-0001-SO	Hexachlorocyclopentadiene	52	400	52	ug/kg	R	C
SCSB-048M-0001-SO	Hexachloroethane	33	400	33	ug/kg	UJ	H
SCSB-048M-0001-SO	Indeno(1,2,3-cd)pyrene	49	400	23	ug/kg	J-	H, C, I
SCSB-048M-0001-SO	Isophorone	50	400	50	ug/kg	UJ	H
SCSB-048M-0001-SO	Naphthalene	330	400	21	ug/kg	J-	H
SCSB-048M-0001-SO	Nitrobenzene	60	400	60	ug/kg	UJ	H
SCSB-048M-0001-SO	N-Nitroso-di-n-propylamine	71	400	71	ug/kg	UJ	H
SCSB-048M-0001-SO	N-Nitrosodiphenylamine	50	810	50	ug/kg	UJ	H
SCSB-048M-0001-SO	Pentachlorophenol	240	1000	240	ug/kg	UJ	H
SCSB-048M-0001-SO	Phenanthrene	280	400	26	ug/kg	J-	H
SCSB-048M-0001-SO	Phenol	160	500	160	ug/kg	UJ	H
SCSB-048M-0001-SO	Pyrene	240	400	26	ug/kg	J-	H
SCSB-048M-0001-SO	1,3,5-Trinitrobenzene	0.13	0.44	0.13	mg/kg	UJ	H
SCSB-048M-0001-SO	1,3-Dinitrobenzene	0.08	0.44	0.08	mg/kg	UJ	H
SCSB-048M-0001-SO	2,4,6-Trinitrotoluene	0.09	0.44	0.09	mg/kg	UJ	H
SCSB-048M-0001-SO	2,4-Dinitrotoluene	0.2	0.44	0.2	mg/kg	R	D
SCSB-048M-0001-SO	2,6-Dinitrotoluene	0.07	0.5	0.07	mg/kg	R	D
SCSB-048M-0001-SO	2-Amino-4,6-dinitrotoluene	0.05	0.44	0.05	mg/kg	UJ	H
SCSB-048M-0001-SO	2-Nitrotoluene	0.09	0.44	0.09	mg/kg	UJ	H
SCSB-048M-0001-SO	3,5-Dinitroaniline	0.09	0.44	0.09	mg/kg	UJ	H
SCSB-048M-0001-SO	3-Nitrotoluene	0.07	0.44	0.07	mg/kg	UJ	H
SCSB-048M-0001-SO	4-Amino-2,6-dinitrotoluene	0.07	0.44	0.07	mg/kg	UJ	H
SCSB-048M-0001-SO	4-Nitrotoluene	0.07	0.5	0.07	mg/kg	UJ	H
SCSB-048M-0001-SO	HMX	0.12	0.44	0.12	mg/kg	UJ	H
SCSB-048M-0001-SO	Nitrobenzene	0.04	0.44	0.04	mg/kg	R	D
SCSB-048M-0001-SO	Nitroglycerin	0.5	1.5	0.5	mg/kg	UJ	H
SCSB-048M-0001-SO	Nitroguanidine	0.059	0.16	0.059	mg/kg	UJ	H, *III
SCSB-048M-0001-SO	PETN	0.5	1.5	0.5	mg/kg	UJ	H
SCSB-048M-0001-SO	RDX	0.16	0.44	0.16	mg/kg	UJ	H
SCSB-048M-0001-SO	Tetryl	0.09	0.44	0.09	mg/kg	UJ	H
SCSD-070M-0001-SD	Aluminum	7240	0.61	0.2	mg/kg	J-	Q, A
SCSD-070M-0001-SD	Antimony	8.4	1.4	0.41	mg/kg	J-	Q, *III
SCSD-070M-0001-SD	Arsenic	9.4	2.3	0.66	mg/kg	J	E
SCSD-070M-0001-SD	Barium	231	0.14	0.041	mg/kg	J-	A
SCSD-070M-0001-SD	Cadmium	2.7	0.11	0.031	mg/kg	J-	C, Q, *III
SCSD-070M-0001-SD	Calcium	3240	2.5	0.31	mg/kg	J-	A
SCSD-070M-0001-SD	Chromium	40.9	0.32	0.097	mg/kg	J-	A
SCSD-070M-0001-SD	Cobalt	7.8	0.25	0.076	mg/kg	J-	Q
SCSD-070M-0001-SD	Copper	53.7	1	0.31	mg/kg	J-	Q
SCSD-070M-0001-SD	Lead	104	0.71	0.2	mg/kg	J+	Q, *III
SCSD-070M-0001-SD	Magnesium	2840	2	0.61	mg/kg	J-	A
SCSD-070M-0001-SD	Manganese	512	0.25	0.081	mg/kg	J-	A
SCSD-070M-0001-SD	Nickel	21.1	0.31	0.092	mg/kg	J-	Q, A
SCSD-070M-0001-SD	Thallium	1.2	0.71	0.2	mg/kg	J-	E, Q
SCSD-070M-0001-SD	Zinc	108	0.61	0.2	mg/kg	J-	Q, A
SCSD-070M-0001-SD	Hexavalent Chromium	1.9	6.5	1.9	mg/kg	UJ	C, Q
SCSD-070M-0001-SD	1,2,4-Trichlorobenzene	21	400	21	ug/kg	UJ	H
SCSD-070M-0001-SD	1,2-Dichlorobenzene	44	400	24	ug/kg	J-	H
SCSD-070M-0001-SD	1,3-Dichlorobenzene	20	400	20	ug/kg	UJ	H
SCSD-070M-0001-SD	1,4-Dichlorobenzene	40	400	19	ug/kg	J-	H
SCSD-070M-0001-SD	2,4,5-Trichlorophenol	130	510	130	ug/kg	UJ	H, C
SCSD-070M-0001-SD	2,4,6-Trichlorophenol	130	510	130	ug/kg	UJ	H
SCSD-070M-0001-SD	2,4-Dichlorophenol	120	510	120	ug/kg	UJ	H

Sample	Analyte	Result	LOQ	DL	Units	Qualifier	Code
SCSD-070M-0001-SD	2,4-Dimethylphenol	100	400	100	ug/kg	UJ	H
SCSD-070M-0001-SD	2,4-Dinitrophenol	700	2000	700	ug/kg	R	C
SCSD-070M-0001-SD	2,4-Dinitrotoluene	24	400	24	ug/kg	UJ	H
SCSD-070M-0001-SD	2,6-Dinitrotoluene	24	400	24	ug/kg	UJ	H
SCSD-070M-0001-SD	2-Chloronaphthalene	23	400	23	ug/kg	UJ	H
SCSD-070M-0001-SD	2-Chlorophenol	340	510	340	ug/kg	UJ	H
SCSD-070M-0001-SD	2-Methyl-4,6-dinitrophenol	270	1000	270	ug/kg	R	C
SCSD-070M-0001-SD	2-Methylnaphthalene	43	400	25	ug/kg	J-	H
SCSD-070M-0001-SD	2-Methylphenol	420	1000	420	ug/kg	UJ	H
SCSD-070M-0001-SD	2-Nitroaniline	23	400	23	ug/kg	UJ	H
SCSD-070M-0001-SD	2-Nitrophenol	280	510	280	ug/kg	UJ	H, C
SCSD-070M-0001-SD	3,3'-Dichlorobenzidine	150	510	150	ug/kg	UJ	H
SCSD-070M-0001-SD	3-Nitroaniline	22	1000	22	ug/kg	UJ	H, C
SCSD-070M-0001-SD	4-Bromophenyl phenyl ether	25	400	25	ug/kg	UJ	H
SCSD-070M-0001-SD	4-Chloro-3-methylphenol	380	510	380	ug/kg	UJ	H
SCSD-070M-0001-SD	4-Chloroaniline	39	400	39	ug/kg	UJ	H
SCSD-070M-0001-SD	4-Chlorophenyl phenyl ether	26	400	26	ug/kg	UJ	H
SCSD-070M-0001-SD	4-Methylphenol	660	2000	660	ug/kg	UJ	H
SCSD-070M-0001-SD	4-Nitroaniline	30	1000	30	ug/kg	UJ	H
SCSD-070M-0001-SD	4-Nitrophenol	400	1000	400	ug/kg	UJ	H, C
SCSD-070M-0001-SD	Acenaphthene	24	400	24	ug/kg	UJ	H
SCSD-070M-0001-SD	Acenaphthylene	24	400	24	ug/kg	UJ	H
SCSD-070M-0001-SD	Anthracene	24	400	24	ug/kg	UJ	H
SCSD-070M-0001-SD	Benzo(a)anthracene	57	400	25	ug/kg	J-	H
SCSD-070M-0001-SD	Benzo(a)pyrene	67	400	23	ug/kg	J-	H
SCSD-070M-0001-SD	Benzo(b)fluoranthene	110	400	25	ug/kg	J-	H
SCSD-070M-0001-SD	Benzo(g,h,i)perylene	26	400	22	ug/kg	J-	H, C
SCSD-070M-0001-SD	Benzo(k)fluoranthene	47	400	25	ug/kg	J	H, C
SCSD-070M-0001-SD	Benzoic acid	290	2000	290	ug/kg	UJ	H
SCSD-070M-0001-SD	Benzyl alcohol	84	1000	84	ug/kg	UJ	H, C
SCSD-070M-0001-SD	Bis(2-chloroethoxy)methane	23	400	23	ug/kg	UJ	H
SCSD-070M-0001-SD	Bis(2-chloroethyl) ether	25	400	25	ug/kg	UJ	H
SCSD-070M-0001-SD	Bis(2-chloroisopropyl) ether	30	400	30	ug/kg	UJ	H
SCSD-070M-0001-SD	Bis(2-ethylhexyl) phthalate	88	1000	88	ug/kg	UJ	H
SCSD-070M-0001-SD	Butylbenzyl phthalate	74	400	74	ug/kg	UJ	H
SCSD-070M-0001-SD	Carbazole	28	400	28	ug/kg	UJ	H
SCSD-070M-0001-SD	Chrysene	70	400	25	ug/kg	J-	H
SCSD-070M-0001-SD	Dibenzo(a,h)anthracene	22	400	22	ug/kg	UJ	H, C
SCSD-070M-0001-SD	Dibenzofuran	24	400	24	ug/kg	UJ	H
SCSD-070M-0001-SD	Diethyl phthalate	65	400	65	ug/kg	UJ	H
SCSD-070M-0001-SD	Dimethyl phthalate	64	400	64	ug/kg	UJ	H
SCSD-070M-0001-SD	Di-n-butyl phthalate	300	400	80	ug/kg	J-	H
SCSD-070M-0001-SD	Di-n-octyl phthalate	60	400	60	ug/kg	UJ	H
SCSD-070M-0001-SD	Fluoranthene	89	400	26	ug/kg	J-	H
SCSD-070M-0001-SD	Fluorene	25	400	25	ug/kg	UJ	H
SCSD-070M-0001-SD	Hexachlorobenzene	28	400	28	ug/kg	UJ	H
SCSD-070M-0001-SD	Hexachlorobutadiene	63	400	63	ug/kg	UJ	H
SCSD-070M-0001-SD	Hexachlorocyclopentadiene	53	400	53	ug/kg	R	C
SCSD-070M-0001-SD	Hexachloroethane	33	400	33	ug/kg	UJ	H
SCSD-070M-0001-SD	Indeno(1,2,3-cd)pyrene	26	400	23	ug/kg	J-	H, C
SCSD-070M-0001-SD	Isophorone	51	400	51	ug/kg	UJ	H
SCSD-070M-0001-SD	Naphthalene	29	400	21	ug/kg	J-	H
SCSD-070M-0001-SD	Nitrobenzene	60	400	60	ug/kg	UJ	H

Sample	Analyte	Result	LOQ	DL	Units	Qualifier	Code
SCSD-070M-0001-SD	N-Nitroso-di-n-propylamine	71	400	71	ug/kg	UJ	H
SCSD-070M-0001-SD	N-Nitrosodiphenylamine	51	810	51	ug/kg	UJ	H
SCSD-070M-0001-SD	Pentachlorophenol	240	1000	240	ug/kg	UJ	H
SCSD-070M-0001-SD	Phenanthrene	53	400	26	ug/kg	J-	H
SCSD-070M-0001-SD	Phenol	160	510	160	ug/kg	UJ	H
SCSD-070M-0001-SD	Pyrene	89	400	26	ug/kg	J-	H
SCSD-070M-0001-SD	1,3,5-Trinitrobenzene	0.13	0.44	0.13	mg/kg	UJ	H
SCSD-070M-0001-SD	1,3-Dinitrobenzene	0.079	0.44	0.079	mg/kg	UJ	H
SCSD-070M-0001-SD	2,4,6-Trinitrotoluene	0.089	0.44	0.089	mg/kg	UJ	H
SCSD-070M-0001-SD	2,4-Dinitrotoluene	0.2	0.44	0.2	mg/kg	R	D
SCSD-070M-0001-SD	2,6-Dinitrotoluene	0.069	0.5	0.069	mg/kg	R	D
SCSD-070M-0001-SD	2-Amino-4,6-dinitrotoluene	0.05	0.44	0.05	mg/kg	UJ	H
SCSD-070M-0001-SD	2-Nitrotoluene	0.089	0.44	0.089	mg/kg	UJ	H
SCSD-070M-0001-SD	3,5-Dinitroaniline	0.089	0.44	0.089	mg/kg	UJ	H
SCSD-070M-0001-SD	3-Nitrotoluene	0.069	0.44	0.069	mg/kg	UJ	H
SCSD-070M-0001-SD	4-Amino-2,6-dinitrotoluene	0.069	0.44	0.069	mg/kg	UJ	H
SCSD-070M-0001-SD	4-Nitrotoluene	0.069	0.5	0.069	mg/kg	UJ	H
SCSD-070M-0001-SD	HMX	0.12	0.44	0.12	mg/kg	UJ	H
SCSD-070M-0001-SD	Nitrobenzene	0.04	0.44	0.04	mg/kg	R	D
SCSD-070M-0001-SD	Nitroglycerin	0.5	1.5	0.5	mg/kg	UJ	H
SCSD-070M-0001-SD	PETN	0.5	1.5	0.5	mg/kg	UJ	H
SCSD-070M-0001-SD	RDX	0.16	0.44	0.16	mg/kg	UJ	H
SCSD-070M-0001-SD	Tetryl	0.089	0.44	0.089	mg/kg	UJ	H
SCSD-070M-0001-SD	Cyanide	0.36	0.39	0.11	mg/kg	J-	H
SCSS-058M-0001-SO	Aluminum	10400	0.24	0.082	mg/kg	J-	Q, A
SCSS-058M-0001-SO	Antimony	3.1	0.55	0.16	mg/kg	J-	Q, *III
SCSS-058M-0001-SO	Arsenic	4.5	0.92	0.27	mg/kg	J	E
SCSS-058M-0001-SO	Barium	127	0.055	0.016	mg/kg	J-	A
SCSS-058M-0001-SO	Cadmium	1.9	0.043	0.012	mg/kg	J-	Q, *III
SCSS-058M-0001-SO	Calcium	21500	1	0.12	mg/kg	J-	A
SCSS-058M-0001-SO	Chromium	143	0.13	0.039	mg/kg	J-	A
SCSS-058M-0001-SO	Cobalt	6.7	0.1	0.031	mg/kg	J-	Q
SCSS-058M-0001-SO	Copper	33.7	0.41	0.12	mg/kg	J-	Q
SCSS-058M-0001-SO	Lead	139	0.29	0.082	mg/kg	J+	Q, *III
SCSS-058M-0001-SO	Magnesium	3930	0.82	0.24	mg/kg	J-	A
SCSS-058M-0001-SO	Manganese	729	0.1	0.033	mg/kg	J-	A
SCSS-058M-0001-SO	Nickel	21.7	0.12	0.037	mg/kg	J-	Q, A
SCSS-058M-0001-SO	Sodium	99.6	13	4.1	mg/kg	J	C
SCSS-058M-0001-SO	Thallium	1.7	0.29	0.082	mg/kg	J-	E, Q
SCSS-058M-0001-SO	Zinc	269	0.24	0.082	mg/kg	J-	Q, A
SCSS-058M-0001-SO	1,2,4-Trichlorobenzene	21	410	21	ug/kg	UJ	H
SCSS-058M-0001-SO	1,2-Dichlorobenzene	24	410	24	ug/kg	UJ	H
SCSS-058M-0001-SO	1,3-Dichlorobenzene	20	410	20	ug/kg	UJ	H
SCSS-058M-0001-SO	1,4-Dichlorobenzene	22	410	19	ug/kg	J-	H
SCSS-058M-0001-SO	2,4,5-Trichlorophenol	130	510	130	ug/kg	UJ	H
SCSS-058M-0001-SO	2,4,6-Trichlorophenol	130	510	130	ug/kg	UJ	H
SCSS-058M-0001-SO	2,4-Dichlorophenol	120	510	120	ug/kg	UJ	H
SCSS-058M-0001-SO	2,4-Dimethylphenol	100	410	100	ug/kg	UJ	H
SCSS-058M-0001-SO	2,4-Dinitrophenol	700	2000	700	ug/kg	UJ	H, C
SCSS-058M-0001-SO	2,4-Dinitrotoluene	24	410	24	ug/kg	UJ	H
SCSS-058M-0001-SO	2,6-Dinitrotoluene	24	410	24	ug/kg	UJ	H
SCSS-058M-0001-SO	2-Chloronaphthalene	23	410	23	ug/kg	UJ	H
SCSS-058M-0001-SO	2-Chlorophenol	350	510	350	ug/kg	UJ	H

Sample	Analyte	Result	LOQ	DL	Units	Qualifier	Code
SCSS-058M-0001-SO	2-Methyl-4,6-dinitrophenol	270	1000	270	ug/kg	UJ	H, C
SCSS-058M-0001-SO	2-Methylnaphthalene	370	410	25	ug/kg	J-	H
SCSS-058M-0001-SO	2-Methylphenol	430	1000	430	ug/kg	UJ	H
SCSS-058M-0001-SO	2-Nitroaniline	23	410	23	ug/kg	UJ	H
SCSS-058M-0001-SO	2-Nitrophenol	280	510	280	ug/kg	UJ	H
SCSS-058M-0001-SO	3,3'-Dichlorobenzidine	150	510	150	ug/kg	UJ	H
SCSS-058M-0001-SO	3-Nitroaniline	22	1000	22	ug/kg	UJ	H
SCSS-058M-0001-SO	4-Bromophenyl phenyl ether	25	410	25	ug/kg	UJ	H
SCSS-058M-0001-SO	4-Chloro-3-methylphenol	390	510	390	ug/kg	UJ	H
SCSS-058M-0001-SO	4-Chloroaniline	40	410	40	ug/kg	UJ	H
SCSS-058M-0001-SO	4-Chlorophenyl phenyl ether	26	410	26	ug/kg	UJ	H
SCSS-058M-0001-SO	4-Methylphenol	660	2000	660	ug/kg	UJ	H
SCSS-058M-0001-SO	4-Nitroaniline	31	1000	31	ug/kg	UJ	H, C
SCSS-058M-0001-SO	4-Nitrophenol	410	1000	410	ug/kg	UJ	H
SCSS-058M-0001-SO	Acenaphthene	43	410	24	ug/kg	J-	H
SCSS-058M-0001-SO	Acenaphthylene	160	410	24	ug/kg	J-	H
SCSS-058M-0001-SO	Anthracene	300	410	24	ug/kg	J-	H
SCSS-058M-0001-SO	Benzo(a)anthracene	740	410	25	ug/kg	J-	H
SCSS-058M-0001-SO	Benzo(a)pyrene	590	410	23	ug/kg	J-	H
SCSS-058M-0001-SO	Benzo(b)fluoranthene	1000	410	25	ug/kg	J-	H
SCSS-058M-0001-SO	Benzo(g,h,i)perylene	170	410	22	ug/kg	J-	H, C
SCSS-058M-0001-SO	Benzo(k)fluoranthene	330	410	25	ug/kg	J-	H
SCSS-058M-0001-SO	Benzoic acid	300	1000	300	ug/kg	UJ	H
SCSS-058M-0001-SO	Benzyl alcohol	84	1000	84	ug/kg	R	C
SCSS-058M-0001-SO	Bis(2-chloroethoxy)methane	23	410	23	ug/kg	UJ	H
SCSS-058M-0001-SO	Bis(2-chloroethyl) ether	25	410	25	ug/kg	UJ	H
SCSS-058M-0001-SO	Bis(2-chloroisopropyl) ether	31	410	31	ug/kg	UJ	H
SCSS-058M-0001-SO	Bis(2-ethylhexyl) phthalate	89	1000	89	ug/kg	UJ	H
SCSS-058M-0001-SO	Butylbenzyl phthalate	74	410	74	ug/kg	UJ	H
SCSS-058M-0001-SO	Carbazole	78	410	28	ug/kg	J-	H
SCSS-058M-0001-SO	Chrysene	700	410	25	ug/kg	J-	H
SCSS-058M-0001-SO	Dibenzo(a,h)anthracene	75	410	22	ug/kg	J-	H
SCSS-058M-0001-SO	Dibenzofuran	140	410	24	ug/kg	J-	H
SCSS-058M-0001-SO	Diethyl phthalate	65	410	65	ug/kg	UJ	H
SCSS-058M-0001-SO	Dimethyl phthalate	64	410	64	ug/kg	UJ	H
SCSS-058M-0001-SO	Di-n-butyl phthalate	120	410	80	ug/kg	J-	H
SCSS-058M-0001-SO	Di-n-octyl phthalate	60	410	60	ug/kg	UJ	H
SCSS-058M-0001-SO	Fluoranthene	1800	410	26	ug/kg	J-	H
SCSS-058M-0001-SO	Fluorene	190	410	25	ug/kg	J-	H
SCSS-058M-0001-SO	Hexachlorobenzene	28	410	28	ug/kg	UJ	H
SCSS-058M-0001-SO	Hexachlorobutadiene	63	410	63	ug/kg	UJ	H
SCSS-058M-0001-SO	Hexachlorocyclopentadiene	53	410	53	ug/kg	R	C
SCSS-058M-0001-SO	Hexachloroethane	34	410	34	ug/kg	UJ	H
SCSS-058M-0001-SO	Indeno(1,2,3-cd)pyrene	180	410	23	ug/kg	J-	H, C
SCSS-058M-0001-SO	Isophorone	110	410	51	ug/kg	J-	H
SCSS-058M-0001-SO	Naphthalene	240	410	21	ug/kg	J-	H
SCSS-058M-0001-SO	Nitrobenzene	60	410	60	ug/kg	UJ	H
SCSS-058M-0001-SO	N-Nitroso-di-n-propylamine	71	410	71	ug/kg	UJ	H
SCSS-058M-0001-SO	N-Nitrosodiphenylamine	51	810	51	ug/kg	UJ	H
SCSS-058M-0001-SO	Pentachlorophenol	240	1000	240	ug/kg	UJ	H
SCSS-058M-0001-SO	Phenanthrene	1200	410	26	ug/kg	J-	H
SCSS-058M-0001-SO	Phenol	160	510	160	ug/kg	UJ	H
SCSS-058M-0001-SO	Pyrene	1300	410	26	ug/kg	J-	H

Sample	Analyte	Result	LOQ	DL	Units	Qualifier	Code
SCSS-058M-0001-SO	1,3,5-Trinitrobenzene	0.13	0.44	0.13	mg/kg	UJ	H
SCSS-058M-0001-SO	1,3-Dinitrobenzene	0.08	0.44	0.08	mg/kg	UJ	H
SCSS-058M-0001-SO	2,4,6-Trinitrotoluene	0.26	0.44	0.09	mg/kg	J-	H, *III
SCSS-058M-0001-SO	2,4-Dinitrotoluene	0.2	0.44	0.2	mg/kg	R	D
SCSS-058M-0001-SO	2,6-Dinitrotoluene	0.07	0.5	0.07	mg/kg	R	D
SCSS-058M-0001-SO	2-Amino-4,6-dinitrotoluene	0.05	0.44	0.05	mg/kg	UJ	H
SCSS-058M-0001-SO	2-Nitrotoluene	0.09	0.44	0.09	mg/kg	UJ	H
SCSS-058M-0001-SO	3,5-Dinitroaniline	0.09	0.44	0.09	mg/kg	UJ	H
SCSS-058M-0001-SO	3-Nitrotoluene	0.07	0.44	0.07	mg/kg	UJ	H
SCSS-058M-0001-SO	4-Amino-2,6-dinitrotoluene	0.07	0.44	0.07	mg/kg	UJ	H
SCSS-058M-0001-SO	4-Nitrotoluene	0.07	0.5	0.07	mg/kg	UJ	H
SCSS-058M-0001-SO	HMX	0.12	0.44	0.12	mg/kg	UJ	H
SCSS-058M-0001-SO	Nitrobenzene	0.04	0.44	0.04	mg/kg	R	D
SCSS-058M-0001-SO	Nitroglycerin	0.5	1.5	0.5	mg/kg	UJ	H
SCSS-058M-0001-SO	PETN	0.5	1.5	0.5	mg/kg	UJ	H
SCSS-058M-0001-SO	RDX	0.16	0.44	0.16	mg/kg	UJ	H
SCSS-058M-0001-SO	Tetryl	0.09	0.44	0.09	mg/kg	UJ	H
SCSS-068M-0001-SO	Aluminum	9150	0.12	0.041	mg/kg	J-	Q, A
SCSS-068M-0001-SO	Antimony	0.082	0.28	0.082	mg/kg	R	Q
SCSS-068M-0001-SO	Arsenic	11.2	0.46	0.13	mg/kg	J-	Q, *III, A
SCSS-068M-0001-SO	Barium	49.7	0.028	0.0082	mg/kg	J-	A
SCSS-068M-0001-SO	Beryllium	0.41	0.024	0.0082	mg/kg	J-	A
SCSS-068M-0001-SO	Cadmium	0.057	0.021	0.0061	mg/kg	J-	C, Q, *III
SCSS-068M-0001-SO	Calcium	1650	0.51	0.061	mg/kg	J-	A
SCSS-068M-0001-SO	Chromium	24.2	0.064	0.019	mg/kg	J-	Q, A
SCSS-068M-0001-SO	Cobalt	7.6	0.05	0.015	mg/kg	J-	Q, *III, A
SCSS-068M-0001-SO	Copper	11	0.2	0.061	mg/kg	J-	Q, *III, A
SCSS-068M-0001-SO	Iron	22500	1	0.31	mg/kg	J-	A
SCSS-068M-0001-SO	Lead	29.8	0.14	0.041	mg/kg	J-	Q, *III, A
SCSS-068M-0001-SO	Magnesium	2320	0.41	0.12	mg/kg	J-	Q, A
SCSS-068M-0001-SO	Manganese	395	0.051	0.016	mg/kg	J-	Q, A
SCSS-068M-0001-SO	Nickel	20.9	0.062	0.018	mg/kg	J-	Q, *III, A
SCSS-068M-0001-SO	Potassium	693	37	11	mg/kg	J-	Q
SCSS-068M-0001-SO	Selenium	0.24	0.43	0.071	mg/kg	J-	Q
SCSS-068M-0001-SO	Sodium	20.5	13	4.1	mg/kg	J-	C, Q
SCSS-068M-0001-SO	Thallium	0.62	0.29	0.082	mg/kg	J-	Q, *III, E
SCSS-068M-0001-SO	Vanadium	14.8	0.035	0.011	mg/kg	J-	Q, A, E
SCSS-068M-0001-SO	Zinc	48.2	0.12	0.041	mg/kg	J-	Q, *III, A
SCSS-068M-0001-SO	Mercury	0.031	0.0081	0.0024	mg/kg	J-	A
SCSS-068M-0001-SO	Bis(2-ethylhexyl) phthalate	100	1000	88	ug/kg	U	B
SCSS-068M-0001-SO	Hexachlorocyclopentadiene	53	410	53	ug/kg	UJ	C
SCSS-068M-0001-SO	2,4-Dinitrotoluene	0.2	0.44	0.2	mg/kg	R	D
SCSS-068M-0001-SO	2,6-Dinitrotoluene	0.07	0.5	0.07	mg/kg	R	D
SCSS-068M-0001-SO	Nitrobenzene	0.04	0.44	0.04	mg/kg	R	D
SCSS-073M-0001-SO	Antimony	2.9	0.55	0.16	mg/kg	J+	C
SCSS-073M-0001-SO	Selenium	2.4	0.86	0.14	mg/kg	J+	C
SCSS-073M-0001-SO	Sodium	101	13	4.1	mg/kg	J	C
SCSS-073M-0001-SO	Thallium	0.082	0.29	0.082	mg/kg	U	B
SCSS-073M-0001-SO	4-Nitrophenol	410	1000	410	ug/kg	UJ	C
SCSS-073M-0001-SO	2,4-Dinitrotoluene	0.2	0.44	0.2	mg/kg	R	D
SCSS-073M-0001-SO	2,6-Dinitrotoluene	0.07	0.5	0.07	mg/kg	R	D
SCSS-073M-0001-SO	Nitrobenzene	0.04	0.44	0.04	mg/kg	R	D
SCSS-076M-0001-SO	Selenium	2.2	0.86	0.14	mg/kg	J-	C

Sample	Analyte	Result	LOQ	DL	Units	Qualifier	Code
SCSS-076M-0001-SO	Sodium	68.1	13	4.1	mg/kg	J	C
SCSS-076M-0001-SO	Thallium	0.73	0.29	0.082	mg/kg	J-	B
SCSS-076M-0001-SO	Mercury	0.049	0.0081	0.0025	mg/kg	J-	C
SCSS-076M-0001-SO	2,6-Dinitrotoluene	0.07	0.5	0.07	mg/kg	UJ	C

APPENDIX C

Primary/Field Duplicate Sample Comparisons

Open Demolition Area 1

ODA1 Field Duplicate Comparison

Sample	Analyte	Result	LOQ	Units	Qualifier	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
DA1SB-059M-0203-SO	Aluminum	13300	0.6	mg/kg		DA1SB-081M-0203-SO	4960	0.6		91	N/A
DA1SB-059M-0203-SO	Antimony	1.7	1.4	mg/kg		DA1SB-081M-0203-SO	0.4	1.4	U	N/A	Yes
DA1SB-059M-0203-SO	Arsenic	12.1	2.3	mg/kg		DA1SB-081M-0203-SO	14.9	2.3		21	N/A
DA1SB-059M-0203-SO	Barium	71.4	0.14	mg/kg		DA1SB-081M-0203-SO	29.4	0.14		83	N/A
DA1SB-059M-0203-SO	Beryllium	0.48	0.06	mg/kg		DA1SB-081M-0203-SO	0.17	0.06		N/A	No
DA1SB-059M-0203-SO	Cadmium	0.03	0.11	mg/kg	U	DA1SB-081M-0203-SO	0.03	0.11	U	N/A	Yes
DA1SB-059M-0203-SO	Calcium	31100	2.5	mg/kg		DA1SB-081M-0203-SO	1130	2.5		186	N/A
DA1SB-059M-0203-SO	Chromium	114	0.32	mg/kg		DA1SB-081M-0203-SO	28.7	0.32		120	N/A
DA1SB-059M-0203-SO	Cobalt	11.1	0.25	mg/kg		DA1SB-081M-0203-SO	5.8	0.25		63	N/A
DA1SB-059M-0203-SO	Copper	17.6	1	mg/kg		DA1SB-081M-0203-SO	19	1		8	N/A
DA1SB-059M-0203-SO	Iron	31300	5	mg/kg		DA1SB-081M-0203-SO	21100	5		39	N/A
DA1SB-059M-0203-SO	Lead	10.2	0.7	mg/kg		DA1SB-081M-0203-SO	11.9	0.7		15	N/A
DA1SB-059M-0203-SO	Magnesium	7170	2	mg/kg		DA1SB-081M-0203-SO	1900	2		116	N/A
DA1SB-059M-0203-SO	Manganese	449	0.25	mg/kg		DA1SB-081M-0203-SO	217	0.25		70	N/A
DA1SB-059M-0203-SO	Nickel	25.6	0.31	mg/kg		DA1SB-081M-0203-SO	15.3	0.31		50	N/A
DA1SB-059M-0203-SO	Potassium	502	36	mg/kg		DA1SB-081M-0203-SO	507	36		1	N/A
DA1SB-059M-0203-SO	Selenium	0.35	2.1	mg/kg	U	DA1SB-081M-0203-SO	0.35	2.1	U	N/A	Yes
DA1SB-059M-0203-SO	Silver	0.085	0.28	mg/kg	U	DA1SB-081M-0203-SO	0.085	0.28	U	N/A	Yes
DA1SB-059M-0203-SO	Sodium	26.9	13	mg/kg		DA1SB-081M-0203-SO	30.6	13		N/A	Yes
DA1SB-059M-0203-SO	Thallium	2.1	0.7	mg/kg		DA1SB-081M-0203-SO	1.1	0.7		N/A	No
DA1SB-059M-0203-SO	Vanadium	19.5	0.17	mg/kg		DA1SB-081M-0203-SO	11.1	0.17		55	N/A
DA1SB-059M-0203-SO	Zinc	57.5	0.6	mg/kg		DA1SB-081M-0203-SO	69.8	0.6		19	N/A
DA1SB-059M-0203-SO	Mercury	0.015	0.0079	mg/kg		DA1SB-081M-0203-SO	0.009	0.0079		N/A	Yes
DA1SB-059M-0203-SO	1,3,5-Trinitrobenzene	0.13	0.44	mg/kg	U	DA1SB-081M-0203-SO	0.13	0.44	U	N/A	Yes
DA1SB-059M-0203-SO	1,3-Dinitrobenzene	0.08	0.44	mg/kg	U	DA1SB-081M-0203-SO	0.079	0.44	U	N/A	Yes
DA1SB-059M-0203-SO	2,4,6-Trinitrotoluene	0.09	0.44	mg/kg	U	DA1SB-081M-0203-SO	0.089	0.44	U	N/A	Yes
DA1SB-059M-0203-SO	2,4-Dinitrotoluene	0.2	0.44	mg/kg	U	DA1SB-081M-0203-SO	0.2	0.44	U	N/A	Yes
DA1SB-059M-0203-SO	2,6-Dinitrotoluene	0.07	0.5	mg/kg	U	DA1SB-081M-0203-SO	0.07	0.5	U	N/A	Yes
DA1SB-059M-0203-SO	2-Amino-4,6-dinitrotoluene	0.05	0.44	mg/kg	U	DA1SB-081M-0203-SO	0.05	0.44	U	N/A	Yes
DA1SB-059M-0203-SO	2-Nitrotoluene	0.09	0.44	mg/kg	U	DA1SB-081M-0203-SO	0.089	0.44	U	N/A	Yes
DA1SB-059M-0203-SO	3,5-Dinitroaniline	0.09	0.44	mg/kg	U	DA1SB-081M-0203-SO	0.089	0.44	U	N/A	Yes
DA1SB-059M-0203-SO	3-Nitrotoluene	0.07	0.44	mg/kg	U	DA1SB-081M-0203-SO	0.07	0.44	U	N/A	Yes
DA1SB-059M-0203-SO	4-Amino-2,6-dinitrotoluene	0.07	0.44	mg/kg	U	DA1SB-081M-0203-SO	0.07	0.44	U	N/A	Yes
DA1SB-059M-0203-SO	4-Nitrotoluene	0.07	0.5	mg/kg	U	DA1SB-081M-0203-SO	0.07	0.5	U	N/A	Yes
DA1SB-059M-0203-SO	HMX	0.12	0.44	mg/kg	U	DA1SB-081M-0203-SO	0.12	0.44	U	N/A	Yes
DA1SB-059M-0203-SO	Nitrobenzene	0.04	0.44	mg/kg	U	DA1SB-081M-0203-SO	0.04	0.44	U	N/A	Yes
DA1SB-059M-0203-SO	Nitroglycerin	0.5	1.5	mg/kg	U	DA1SB-081M-0203-SO	0.5	1.5	U	N/A	Yes
DA1SB-059M-0203-SO	PETN	0.5	1.5	mg/kg	U	DA1SB-081M-0203-SO	0.5	1.5	U	N/A	Yes
DA1SB-059M-0203-SO	RDX	0.16	0.44	mg/kg	U	DA1SB-081M-0203-SO	0.16	0.44	U	N/A	Yes

ODA1 Field Duplicate Comparison

Sample	Analyte	Result	LOQ	Units	Qualifier	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
DA1SB-059M-0203-SO	Tetryl	0.09	0.44	mg/kg	U	DA1SB-081M-0203-SO	0.089	0.44	U	N/A	Yes
DA1SB-063M-0202-SO	Aluminum	13300	0.24	mg/kg	J-	DA1SB-082M-0202-SO	11200	0.24		17	N/A
DA1SB-063M-0202-SO	Antimony	0.16	0.55	mg/kg	R	DA1SB-082M-0202-SO	0.16	0.55	U	N/A	N/A
DA1SB-063M-0202-SO	Arsenic	4.5	0.91	mg/kg		DA1SB-082M-0202-SO	5.1	0.91		N/A	Yes
DA1SB-063M-0202-SO	Barium	56.6	0.055	mg/kg		DA1SB-082M-0202-SO	62.7	0.055		10	N/A
DA1SB-063M-0202-SO	Beryllium	0.43	0.024	mg/kg		DA1SB-082M-0202-SO	0.37	0.024		15	N/A
DA1SB-063M-0202-SO	Cadmium	0.2	0.2	mg/kg	UJ	DA1SB-082M-0202-SO	0.012	0.042	U	N/A	Yes
DA1SB-063M-0202-SO	Calcium	27500	1	mg/kg	J-	DA1SB-082M-0202-SO	23500	1		16	N/A
DA1SB-063M-0202-SO	Chromium	22.6	0.13	mg/kg	J-	DA1SB-082M-0202-SO	17.1	0.13		28	N/A
DA1SB-063M-0202-SO	Cobalt	9.4	0.099	mg/kg	J-	DA1SB-082M-0202-SO	9.5	0.099		1	N/A
DA1SB-063M-0202-SO	Copper	16.8	0.4	mg/kg	J-	DA1SB-082M-0202-SO	14.9	0.4		12	N/A
DA1SB-063M-0202-SO	Iron	31300	2	mg/kg		DA1SB-082M-0202-SO	27900	2		11	N/A
DA1SB-063M-0202-SO	Lead	5.8	0.28	mg/kg		DA1SB-082M-0202-SO	5.1	0.28		13	N/A
DA1SB-063M-0202-SO	Magnesium	7180	0.81	mg/kg	J-	DA1SB-082M-0202-SO	6170	0.81		15	N/A
DA1SB-063M-0202-SO	Manganese	299	0.1	mg/kg	J-	DA1SB-082M-0202-SO	486	0.1		48	N/A
DA1SB-063M-0202-SO	Nickel	22.1	0.12	mg/kg		DA1SB-082M-0202-SO	20.8	0.12		6	N/A
DA1SB-063M-0202-SO	Potassium	1850	36	mg/kg		DA1SB-082M-0202-SO	1620	36		13	N/A
DA1SB-063M-0202-SO	Selenium	0.53	0.85	mg/kg	U	DA1SB-082M-0202-SO	0.36	0.85	J	N/A	Yes
DA1SB-063M-0202-SO	Silver	0.1	0.11	mg/kg	U	DA1SB-082M-0202-SO	0.034	0.11	U	N/A	Yes
DA1SB-063M-0202-SO	Sodium	82.7	13	mg/kg	J	DA1SB-082M-0202-SO	72.5	13		13	N/A
DA1SB-063M-0202-SO	Thallium	2	0.28	mg/kg	J-	DA1SB-082M-0202-SO	1.8	0.28		11	N/A
DA1SB-063M-0202-SO	Vanadium	16.9	0.069	mg/kg		DA1SB-082M-0202-SO	14.2	0.069		17	N/A
DA1SB-063M-0202-SO	Zinc	51.1	0.24	mg/kg	J-	DA1SB-082M-0202-SO	45.9	0.24		11	N/A
DA1SB-063M-0202-SO	Mercury	0.01	0.008	mg/kg		DA1SB-082M-0202-SO	0.009	0.008		N/A	Yes
DA1SB-063M-0202-SO	1,3,5-Trinitrobenzene	0.13	0.44	mg/kg	UJ	DA1SB-082M-0202-SO	0.13	0.44	U	N/A	Yes
DA1SB-063M-0202-SO	1,3-Dinitrobenzene	0.079	0.44	mg/kg	UJ	DA1SB-082M-0202-SO	0.079	0.44	U	N/A	Yes
DA1SB-063M-0202-SO	2,4,6-Trinitrotoluene	0.089	0.44	mg/kg	UJ	DA1SB-082M-0202-SO	0.089	0.44	U	N/A	Yes
DA1SB-063M-0202-SO	2,4-Dinitrotoluene	0.2	0.44	mg/kg	UJ	DA1SB-082M-0202-SO	0.2	0.44	U	N/A	Yes
DA1SB-063M-0202-SO	2,6-Dinitrotoluene	0.07	0.5	mg/kg	UJ	DA1SB-082M-0202-SO	0.069	0.5	U	N/A	Yes
DA1SB-063M-0202-SO	2-Amino-4,6-dinitrotoluene	0.05	0.44	mg/kg	UJ	DA1SB-082M-0202-SO	0.05	0.44	U	N/A	Yes
DA1SB-063M-0202-SO	2-Nitrotoluene	0.089	0.44	mg/kg	UJ	DA1SB-082M-0202-SO	0.089	0.44	U	N/A	Yes
DA1SB-063M-0202-SO	3,5-Dinitroaniline	0.089	0.44	mg/kg	UJ	DA1SB-082M-0202-SO	0.089	0.44	U	N/A	Yes
DA1SB-063M-0202-SO	3-Nitrotoluene	0.07	0.44	mg/kg	UJ	DA1SB-082M-0202-SO	0.069	0.44	U	N/A	Yes
DA1SB-063M-0202-SO	4-Amino-2,6-dinitrotoluene	0.07	0.44	mg/kg	UJ	DA1SB-082M-0202-SO	0.069	0.44	U	N/A	Yes
DA1SB-063M-0202-SO	4-Nitrotoluene	0.07	0.5	mg/kg	UJ	DA1SB-082M-0202-SO	0.069	0.5	U	N/A	Yes
DA1SB-063M-0202-SO	HMX	0.12	0.44	mg/kg	UJ	DA1SB-082M-0202-SO	0.12	0.44	U	N/A	Yes
DA1SB-063M-0202-SO	Nitrobenzene	0.04	0.44	mg/kg	UJ	DA1SB-082M-0202-SO	0.04	0.44	U	N/A	Yes
DA1SB-063M-0202-SO	Nitroglycerin	0.5	1.5	mg/kg	UJ	DA1SB-082M-0202-SO	0.5	1.5	U	N/A	Yes
DA1SB-063M-0202-SO	Nitroguanidine	0.059	0.16	mg/kg	UJ	DA1SB-082M-0202-SO	0.06	0.16	U	N/A	Yes

ODA1 Field Duplicate Comparison

Sample	Analyte	Result	LOQ	Units	Qualifier	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
DA1SB-063M-0202-SO	PETN	0.5	1.5	mg/kg	UJ	DA1SB-082M-0202-SO	0.5	1.5	U	N/A	Yes
DA1SB-063M-0202-SO	RDX	0.16	0.44	mg/kg	UJ	DA1SB-082M-0202-SO	0.16	0.44	U	N/A	Yes
DA1SB-063M-0202-SO	Tetryl	0.089	0.44	mg/kg	UJ	DA1SB-082M-0202-SO	0.089	0.44	U	N/A	Yes
DA1SB-063M-0202-SO	Nitrocellulose	7	100	mg/kg	U	DA1SB-082M-0202-SO	7	100	U	N/A	Yes
DA1SB-065M-0202-SO	Aluminum	12900	0.24	mg/kg		DA1SB-083M-0202-SO	15900	0.24		21	N/A
DA1SB-065M-0202-SO	Antimony	0.16	0.55	mg/kg	U	DA1SB-083M-0202-SO	0.16	0.55	U	N/A	Yes
DA1SB-065M-0202-SO	Arsenic	2.5	0.91	mg/kg		DA1SB-083M-0202-SO	4.8	0.91		N/A	No
DA1SB-065M-0202-SO	Barium	58.8	0.055	mg/kg		DA1SB-083M-0202-SO	72.1	0.055		20	N/A
DA1SB-065M-0202-SO	Beryllium	0.47	0.024	mg/kg		DA1SB-083M-0202-SO	0.56	0.024		17	N/A
DA1SB-065M-0202-SO	Cadmium	0.012	0.043	mg/kg	U	DA1SB-083M-0202-SO	0.012	0.043	U	N/A	Yes
DA1SB-065M-0202-SO	Calcium	14800	1	mg/kg		DA1SB-083M-0202-SO	16100	1		8	N/A
DA1SB-065M-0202-SO	Chromium	25.8	0.13	mg/kg		DA1SB-083M-0202-SO	29.8	0.13		14	N/A
DA1SB-065M-0202-SO	Cobalt	8.6	0.099	mg/kg		DA1SB-083M-0202-SO	11.3	0.099		27	N/A
DA1SB-065M-0202-SO	Copper	13.6	0.41	mg/kg		DA1SB-083M-0202-SO	18.1	0.41		28	N/A
DA1SB-065M-0202-SO	Iron	28600	2	mg/kg		DA1SB-083M-0202-SO	34400	2		18	N/A
DA1SB-065M-0202-SO	Lead	4.4	0.28	mg/kg		DA1SB-083M-0202-SO	6.4	0.28		37	N/A
DA1SB-065M-0202-SO	Magnesium	5070	0.81	mg/kg		DA1SB-083M-0202-SO	6040	0.81		17	N/A
DA1SB-065M-0202-SO	Manganese	321	0.1	mg/kg		DA1SB-083M-0202-SO	372	0.1		15	N/A
DA1SB-065M-0202-SO	Nickel	19.8	0.12	mg/kg		DA1SB-083M-0202-SO	27	0.12		31	N/A
DA1SB-065M-0202-SO	Potassium	2200	36	mg/kg		DA1SB-083M-0202-SO	2390	37		8	N/A
DA1SB-065M-0202-SO	Selenium	0.56	0.85	mg/kg	J	DA1SB-083M-0202-SO	0.28	0.85	J	N/A	Yes
DA1SB-065M-0202-SO	Silver	0.034	0.11	mg/kg	U	DA1SB-083M-0202-SO	0.035	0.11	U	N/A	Yes
DA1SB-065M-0202-SO	Sodium	83.3	13	mg/kg		DA1SB-083M-0202-SO	87.6	13		5	N/A
DA1SB-065M-0202-SO	Thallium	1.8	0.28	mg/kg		DA1SB-083M-0202-SO	2.5	0.28		33	N/A
DA1SB-065M-0202-SO	Vanadium	15.7	0.069	mg/kg		DA1SB-083M-0202-SO	21.6	0.069		32	N/A
DA1SB-065M-0202-SO	Zinc	42.2	0.24	mg/kg		DA1SB-083M-0202-SO	55.8	0.24		28	N/A
DA1SB-065M-0202-SO	Mercury	0.011	0.008	mg/kg		DA1SB-083M-0202-SO	0.012	0.008		N/A	Yes
DA1SB-065M-0202-SO	1,3,5-Trinitrobenzene	0.13	0.44	mg/kg	U	DA1SB-083M-0202-SO	0.13	0.44	U	N/A	Yes
DA1SB-065M-0202-SO	1,3-Dinitrobenzene	0.079	0.44	mg/kg	U	DA1SB-083M-0202-SO	0.079	0.44	U	N/A	Yes
DA1SB-065M-0202-SO	2,4,6-Trinitrotoluene	0.089	0.44	mg/kg	U	DA1SB-083M-0202-SO	0.089	0.44	U	N/A	Yes
DA1SB-065M-0202-SO	2,4-Dinitrotoluene	0.2	0.44	mg/kg	U	DA1SB-083M-0202-SO	0.2	0.44	U	N/A	Yes
DA1SB-065M-0202-SO	2,6-Dinitrotoluene	0.069	0.5	mg/kg	U	DA1SB-083M-0202-SO	0.07	0.5	U	N/A	Yes
DA1SB-065M-0202-SO	2-Amino-4,6-dinitrotoluene	0.05	0.44	mg/kg	U	DA1SB-083M-0202-SO	0.05	0.44	U	N/A	Yes
DA1SB-065M-0202-SO	2-Nitrotoluene	0.089	0.44	mg/kg	U	DA1SB-083M-0202-SO	0.089	0.44	U	N/A	Yes
DA1SB-065M-0202-SO	3,5-Dinitroaniline	0.089	0.44	mg/kg	U	DA1SB-083M-0202-SO	0.089	0.44	U	N/A	Yes
DA1SB-065M-0202-SO	3-Nitrotoluene	0.069	0.44	mg/kg	U	DA1SB-083M-0202-SO	0.07	0.44	U	N/A	Yes
DA1SB-065M-0202-SO	4-Amino-2,6-dinitrotoluene	0.069	0.44	mg/kg	U	DA1SB-083M-0202-SO	0.07	0.44	U	N/A	Yes
DA1SB-065M-0202-SO	4-Nitrotoluene	0.069	0.5	mg/kg	U	DA1SB-083M-0202-SO	0.07	0.5	U	N/A	Yes
DA1SB-065M-0202-SO	HMX	0.12	0.44	mg/kg	U	DA1SB-083M-0202-SO	0.12	0.44	U	N/A	Yes

ODA1 Field Duplicate Comparison

Sample	Analyte	Result	LOQ	Units	Qualifier	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
DA1SB-065M-0202-SO	Nitrobenzene	0.04	0.44	mg/kg	U	DA1SB-083M-0202-SO	0.04	0.44	U	N/A	Yes
DA1SB-065M-0202-SO	Nitroglycerin	0.5	1.5	mg/kg	U	DA1SB-083M-0202-SO	0.5	1.5	U	N/A	Yes
DA1SB-065M-0202-SO	PETN	0.5	1.5	mg/kg	U	DA1SB-083M-0202-SO	0.5	1.5	U	N/A	Yes
DA1SB-065M-0202-SO	RDX	0.16	0.44	mg/kg	U	DA1SB-083M-0202-SO	0.16	0.44	U	N/A	Yes
DA1SB-065M-0202-SO	Tetryl	0.089	0.44	mg/kg	U	DA1SB-083M-0202-SO	0.089	0.44	U	N/A	Yes
DA1SB-068D-0201-SO	1,1,1-Trichloroethane	10	52	ug/kg	U	DA1SB-084D-0201-SO	11	53	U	N/A	Yes
DA1SB-068D-0201-SO	1,1,2,2-Tetrachloroethane	6.2	52	ug/kg	U	DA1SB-084D-0201-SO	6.4	53	U	N/A	Yes
DA1SB-068D-0201-SO	1,1,2-Trichloroethane	8.3	52	ug/kg	U	DA1SB-084D-0201-SO	8.5	53	U	N/A	Yes
DA1SB-068D-0201-SO	1,1-Dichloroethane	11	52	ug/kg	U	DA1SB-084D-0201-SO	12	53	U	N/A	Yes
DA1SB-068D-0201-SO	1,1-Dichloroethene	17	52	ug/kg	U	DA1SB-084D-0201-SO	17	53	U	N/A	Yes
DA1SB-068D-0201-SO	1,2-Dibromoethane	10	52	ug/kg	U	DA1SB-084D-0201-SO	11	53	U	N/A	Yes
DA1SB-068D-0201-SO	1,2-Dichloroethane	12	52	ug/kg	U	DA1SB-084D-0201-SO	13	53	U	N/A	Yes
DA1SB-068D-0201-SO	1,2-Dichloropropane	7.3	52	ug/kg	U	DA1SB-084D-0201-SO	7.4	53	U	N/A	Yes
DA1SB-068D-0201-SO	2-Butanone	100	520	ug/kg	U	DA1SB-084D-0201-SO	110	530	U	N/A	Yes
DA1SB-068D-0201-SO	2-Hexanone	70	520	ug/kg	R	DA1SB-084D-0201-SO	72	530	U	N/A	N/A
DA1SB-068D-0201-SO	4-Methyl-2-pentanone	85	520	ug/kg	UJ	DA1SB-084D-0201-SO	87	530	U	N/A	Yes
DA1SB-068D-0201-SO	Acetone	65	1000	ug/kg	UJ	DA1SB-084D-0201-SO	67	1100	U	N/A	Yes
DA1SB-068D-0201-SO	Benzene	5.2	52	ug/kg	U	DA1SB-084D-0201-SO	5.3	53	U	N/A	Yes
DA1SB-068D-0201-SO	Bromochloromethane	8.3	52	ug/kg	U	DA1SB-084D-0201-SO	8.5	53	U	N/A	Yes
DA1SB-068D-0201-SO	Bromodichloromethane	9.3	52	ug/kg	U	DA1SB-084D-0201-SO	9.5	53	U	N/A	Yes
DA1SB-068D-0201-SO	Bromoform	6.2	52	ug/kg	U	DA1SB-084D-0201-SO	6.4	53	U	N/A	Yes
DA1SB-068D-0201-SO	Bromomethane	31	100	ug/kg	U	DA1SB-084D-0201-SO	32	110	U	N/A	Yes
DA1SB-068D-0201-SO	Carbon disulfide	16	100	ug/kg	U	DA1SB-084D-0201-SO	16	110	U	N/A	Yes
DA1SB-068D-0201-SO	Carbon tetrachloride	11	52	ug/kg	U	DA1SB-084D-0201-SO	12	53	U	N/A	Yes
DA1SB-068D-0201-SO	Chlorobenzene	8.3	52	ug/kg	U	DA1SB-084D-0201-SO	8.5	53	U	N/A	Yes
DA1SB-068D-0201-SO	Chloroethane	20	100	ug/kg	R	DA1SB-084D-0201-SO	20	110	U	N/A	N/A
DA1SB-068D-0201-SO	Chloroform	9.3	52	ug/kg	U	DA1SB-084D-0201-SO	9.5	53	U	N/A	Yes
DA1SB-068D-0201-SO	Chloromethane	26	100	ug/kg	R	DA1SB-084D-0201-SO	26	110	U	N/A	N/A
DA1SB-068D-0201-SO	cis-1,2-Dichloroethene	10	52	ug/kg	U	DA1SB-084D-0201-SO	11	53	U	N/A	Yes
DA1SB-068D-0201-SO	cis-1,3-Dichloropropene	10	52	ug/kg	U	DA1SB-084D-0201-SO	11	53	U	N/A	Yes
DA1SB-068D-0201-SO	Dibromochloromethane	8.3	52	ug/kg	U	DA1SB-084D-0201-SO	8.5	53	U	N/A	Yes
DA1SB-068D-0201-SO	Ethylbenzene	8.3	52	ug/kg	U	DA1SB-084D-0201-SO	8.5	53	U	N/A	Yes
DA1SB-068D-0201-SO	m,p-Xylenes	19	100	ug/kg	UJ	DA1SB-084D-0201-SO	19	110	U	N/A	Yes
DA1SB-068D-0201-SO	Methylene chloride	41	100	ug/kg	U	DA1SB-084D-0201-SO	42	110	U	N/A	Yes
DA1SB-068D-0201-SO	o-Xylene	8.3	52	ug/kg	U	DA1SB-084D-0201-SO	8.5	53	U	N/A	Yes
DA1SB-068D-0201-SO	Styrene	6.2	52	ug/kg	U	DA1SB-084D-0201-SO	6.4	53	U	N/A	Yes
DA1SB-068D-0201-SO	Tetrachloroethene	8.3	52	ug/kg	U	DA1SB-084D-0201-SO	8.5	53	U	N/A	Yes
DA1SB-068D-0201-SO	Toluene	7.3	52	ug/kg	U	DA1SB-084D-0201-SO	7.4	53	U	N/A	Yes
DA1SB-068D-0201-SO	trans-1,2-Dichloroethene	11	52	ug/kg	U	DA1SB-084D-0201-SO	12	53	U	N/A	Yes

ODA1 Field Duplicate Comparison

Sample	Analyte	Result	LOQ	Units	Qualifier	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
DA1SB-068D-0201-SO	trans-1,3-Dichloropropene	7.3	100	ug/kg	U	DA1SB-084D-0201-SO	7.4	110	U	N/A	Yes
DA1SB-068D-0201-SO	Trichloroethene	10	52	ug/kg	U	DA1SB-084D-0201-SO	11	53	U	N/A	Yes
DA1SB-068D-0201-SO	Vinyl chloride	15	52	ug/kg	U	DA1SB-084D-0201-SO	15	53	U	N/A	Yes
DA1SB-068M-0201-SO	Aluminum	10900	0.24	mg/kg	J-	DA1SB-084M-0201-SO	9830	0.24		10	N/A
DA1SB-068M-0201-SO	Antimony	0.49	0.55	mg/kg	J-	DA1SB-084M-0201-SO	0.16	0.55	U	N/A	Yes
DA1SB-068M-0201-SO	Arsenic	5.4	0.91	mg/kg	J-	DA1SB-084M-0201-SO	11.6	0.91		73	N/A
DA1SB-068M-0201-SO	Barium	47.6	0.055	mg/kg	J-	DA1SB-084M-0201-SO	43.4	0.055		9	N/A
DA1SB-068M-0201-SO	Beryllium	0.42	0.024	mg/kg		DA1SB-084M-0201-SO	0.38	0.024		10	N/A
DA1SB-068M-0201-SO	Cadmium	0.096	0.043	mg/kg	J-	DA1SB-084M-0201-SO	0.016	0.043	J	N/A	No
DA1SB-068M-0201-SO	Calcium	420	1	mg/kg	J-	DA1SB-084M-0201-SO	438	1		4	N/A
DA1SB-068M-0201-SO	Chromium	49.1	0.13	mg/kg	J-	DA1SB-084M-0201-SO	13.1	0.13		116	N/A
DA1SB-068M-0201-SO	Cobalt	8	0.099	mg/kg	J-	DA1SB-084M-0201-SO	7.8	0.099		3	N/A
DA1SB-068M-0201-SO	Copper	21.2	0.4	mg/kg	J-	DA1SB-084M-0201-SO	19.7	0.41		7	N/A
DA1SB-068M-0201-SO	Iron	24600	2	mg/kg		DA1SB-084M-0201-SO	26500	2		7	N/A
DA1SB-068M-0201-SO	Lead	24.5	0.28	mg/kg	J-	DA1SB-084M-0201-SO	11.1	0.28		75	N/A
DA1SB-068M-0201-SO	Magnesium	2590	0.81	mg/kg	J-	DA1SB-084M-0201-SO	2720	0.81		5	N/A
DA1SB-068M-0201-SO	Manganese	293	0.1	mg/kg	J-	DA1SB-084M-0201-SO	343	0.1		16	N/A
DA1SB-068M-0201-SO	Nickel	15.9	0.12	mg/kg	J-	DA1SB-084M-0201-SO	15.2	0.12		5	N/A
DA1SB-068M-0201-SO	Potassium	1000	36	mg/kg	J-	DA1SB-084M-0201-SO	527	36		62	N/A
DA1SB-068M-0201-SO	Selenium	0.23	0.85	mg/kg	J-	DA1SB-084M-0201-SO	0.63	0.85	J	N/A	Yes
DA1SB-068M-0201-SO	Silver	0.1	0.11	mg/kg	UJ	DA1SB-084M-0201-SO	0.034	0.11	U	N/A	Yes
DA1SB-068M-0201-SO	Sodium	45.3	13	mg/kg	J-	DA1SB-084M-0201-SO	20	13		N/A	No
DA1SB-068M-0201-SO	Thallium	1.5	0.28	mg/kg	J-	DA1SB-084M-0201-SO	1.3	0.28		N/A	Yes
DA1SB-068M-0201-SO	Vanadium	15.2	0.069	mg/kg	J-	DA1SB-084M-0201-SO	13.9	0.069		9	N/A
DA1SB-068M-0201-SO	Zinc	51.6	0.24	mg/kg	J-	DA1SB-084M-0201-SO	48.6	0.24		6	N/A
DA1SB-068M-0201-SO	Mercury	0.019	0.008	mg/kg	J-	DA1SB-084M-0201-SO	0.022	0.008		N/A	Yes
DA1SB-068M-0201-SO	4,4'-DDD	0.3	2.4	ug/kg	U	DA1SB-084M-0201-SO	0.31	2.4	U	N/A	Yes
DA1SB-068M-0201-SO	4,4'-DDE	0.3	4	ug/kg	U	DA1SB-084M-0201-SO	0.31	4.1	U	N/A	Yes
DA1SB-068M-0201-SO	4,4'-DDT	0.5	2.4	ug/kg	J	DA1SB-084M-0201-SO	0.61	2.4	J	N/A	Yes
DA1SB-068M-0201-SO	Aldrin	0.5	2.4	ug/kg	U	DA1SB-084M-0201-SO	0.51	2.4	U	N/A	Yes
DA1SB-068M-0201-SO	alpha-BHC	0.61	4	ug/kg	U	DA1SB-084M-0201-SO	0.61	4.1	U	N/A	Yes
DA1SB-068M-0201-SO	alpha-Chlordane	0.3	4	ug/kg	U	DA1SB-084M-0201-SO	0.31	4.1	U	N/A	Yes
DA1SB-068M-0201-SO	beta-BHC	0.61	4	ug/kg	U	DA1SB-084M-0201-SO	0.61	4.1	U	N/A	Yes
DA1SB-068M-0201-SO	Chlordane (Technical)	4	76	ug/kg	U	DA1SB-084M-0201-SO	4.1	76	U	N/A	Yes
DA1SB-068M-0201-SO	delta-BHC	0.3	2.4	ug/kg	U	DA1SB-084M-0201-SO	0.31	2.4	U	N/A	Yes
DA1SB-068M-0201-SO	Dieldrin	0.3	2.4	ug/kg	U	DA1SB-084M-0201-SO	0.31	2.4	U	N/A	Yes
DA1SB-068M-0201-SO	Endosulfan I	0.71	2.4	ug/kg	U	DA1SB-084M-0201-SO	0.71	2.4	U	N/A	Yes
DA1SB-068M-0201-SO	Endosulfan II	0.91	2.4	ug/kg	J	DA1SB-084M-0201-SO	0.31	2.4	U	N/A	Yes
DA1SB-068M-0201-SO	Endosulfan sulfate	0.91	4	ug/kg	U	DA1SB-084M-0201-SO	0.92	4.1	U	N/A	Yes

ODA1 Field Duplicate Comparison

Sample	Analyte	Result	LOQ	Units	Qualifier	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
DA1SB-068M-0201-SO	Endrin	0.4	2.4	ug/kg	U	DA1SB-084M-0201-SO	0.41	2.4	U	N/A	Yes
DA1SB-068M-0201-SO	Endrin aldehyde	1.1	4	ug/kg	U	DA1SB-084M-0201-SO	1.1	4.1	U	N/A	Yes
DA1SB-068M-0201-SO	Endrin ketone	0.81	2.4	ug/kg	U	DA1SB-084M-0201-SO	0.81	2.4	U	N/A	Yes
DA1SB-068M-0201-SO	GAMMA-BHC	0.5	2.4	ug/kg	U	DA1SB-084M-0201-SO	0.51	2.4	U	N/A	Yes
DA1SB-068M-0201-SO	gamma-Chlordane	0.3	4	ug/kg	U	DA1SB-084M-0201-SO	1.5	4.1	J	N/A	Yes
DA1SB-068M-0201-SO	Heptachlor	7.3	2.4	ug/kg		DA1SB-084M-0201-SO	5.8	2.4		N/A	Yes
DA1SB-068M-0201-SO	Heptachlor epoxide	0.61	4	ug/kg	J	DA1SB-084M-0201-SO	0.51	4.1	U	N/A	Yes
DA1SB-068M-0201-SO	Methoxychlor	0.71	2.4	ug/kg	U	DA1SB-084M-0201-SO	0.71	2.4	U	N/A	Yes
DA1SB-068M-0201-SO	Toxaphene	5	50	ug/kg	U	DA1SB-084M-0201-SO	5.1	51	U	N/A	Yes
DA1SB-068M-0201-SO	Aroclor 1016	10	51	ug/kg	U	DA1SB-084M-0201-SO	10	51	U	N/A	Yes
DA1SB-068M-0201-SO	Aroclor 1221	20	51	ug/kg	U	DA1SB-084M-0201-SO	20	51	U	N/A	Yes
DA1SB-068M-0201-SO	Aroclor 1232	27	51	ug/kg	U	DA1SB-084M-0201-SO	27	51	U	N/A	Yes
DA1SB-068M-0201-SO	Aroclor 1242	29	51	ug/kg	U	DA1SB-084M-0201-SO	30	51	U	N/A	Yes
DA1SB-068M-0201-SO	Aroclor 1248	29	51	ug/kg	U	DA1SB-084M-0201-SO	30	51	U	N/A	Yes
DA1SB-068M-0201-SO	Aroclor 1254	23	51	ug/kg	U	DA1SB-084M-0201-SO	23	51	U	N/A	Yes
DA1SB-068M-0201-SO	Aroclor 1260	12	51	ug/kg	U	DA1SB-084M-0201-SO	12	51	U	N/A	Yes
DA1SB-068M-0201-SO	Aroclor 1262	21	51	ug/kg	U	DA1SB-084M-0201-SO	21	51	U	N/A	Yes
DA1SB-068M-0201-SO	Aroclor 1268	28	51	ug/kg	U	DA1SB-084M-0201-SO	29	51	U	N/A	Yes
DA1SB-068M-0201-SO	1,2,4-Trichlorobenzene	21	400	ug/kg	UJ	DA1SB-084M-0201-SO	21	400	U	N/A	Yes
DA1SB-068M-0201-SO	1,2-Dichlorobenzene	24	400	ug/kg	UJ	DA1SB-084M-0201-SO	24	400	U	N/A	Yes
DA1SB-068M-0201-SO	1,3-Dichlorobenzene	20	400	ug/kg	UJ	DA1SB-084M-0201-SO	20	400	U	N/A	Yes
DA1SB-068M-0201-SO	1,4-Dichlorobenzene	19	400	ug/kg	UJ	DA1SB-084M-0201-SO	19	400	U	N/A	Yes
DA1SB-068M-0201-SO	2,4,5-Trichlorophenol	130	500	ug/kg	UJ	DA1SB-084M-0201-SO	130	510	U	N/A	Yes
DA1SB-068M-0201-SO	2,4,6-Trichlorophenol	130	500	ug/kg	UJ	DA1SB-084M-0201-SO	130	510	U	N/A	Yes
DA1SB-068M-0201-SO	2,4-Dichlorophenol	120	500	ug/kg	UJ	DA1SB-084M-0201-SO	120	510	U	N/A	Yes
DA1SB-068M-0201-SO	2,4-Dimethylphenol	100	400	ug/kg	UJ	DA1SB-084M-0201-SO	100	400	U	N/A	Yes
DA1SB-068M-0201-SO	2,4-Dinitrophenol	700	2000	ug/kg	UJ	DA1SB-084M-0201-SO	700	2000	U	N/A	Yes
DA1SB-068M-0201-SO	2,4-Dinitrotoluene	24	400	ug/kg	UJ	DA1SB-084M-0201-SO	24	400	U	N/A	Yes
DA1SB-068M-0201-SO	2,6-Dinitrotoluene	24	400	ug/kg	UJ	DA1SB-084M-0201-SO	24	400	U	N/A	Yes
DA1SB-068M-0201-SO	2-Chloronaphthalene	23	400	ug/kg	UJ	DA1SB-084M-0201-SO	23	400	U	N/A	Yes
DA1SB-068M-0201-SO	2-Chlorophenol	340	500	ug/kg	UJ	DA1SB-084M-0201-SO	340	510	U	N/A	Yes
DA1SB-068M-0201-SO	2-Methyl-4,6-dinitrophenol	270	1000	ug/kg	UJ	DA1SB-084M-0201-SO	270	1000	U	N/A	Yes
DA1SB-068M-0201-SO	2-Methylnaphthalene	25	400	ug/kg	UJ	DA1SB-084M-0201-SO	25	400	U	N/A	Yes
DA1SB-068M-0201-SO	2-Methylphenol	420	1000	ug/kg	UJ	DA1SB-084M-0201-SO	420	1000	U	N/A	Yes
DA1SB-068M-0201-SO	2-Nitroaniline	23	400	ug/kg	UJ	DA1SB-084M-0201-SO	23	400	U	N/A	Yes
DA1SB-068M-0201-SO	2-Nitrophenol	280	500	ug/kg	UJ	DA1SB-084M-0201-SO	280	510	U	N/A	Yes
DA1SB-068M-0201-SO	3,3'-Dichlorobenzidine	150	500	ug/kg	UJ	DA1SB-084M-0201-SO	150	510	U	N/A	Yes
DA1SB-068M-0201-SO	3-Nitroaniline	22	1000	ug/kg	UJ	DA1SB-084M-0201-SO	22	1000	U	N/A	Yes
DA1SB-068M-0201-SO	4-Bromophenyl phenyl ether	25	400	ug/kg	UJ	DA1SB-084M-0201-SO	25	400	U	N/A	Yes

ODA1 Field Duplicate Comparison

Sample	Analyte	Result	LOQ	Units	Qualifier	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
DA1SB-068M-0201-SO	4-Chloro-3-methylphenol	380	500	ug/kg	UJ	DA1SB-084M-0201-SO	380	510	U	N/A	Yes
DA1SB-068M-0201-SO	4-Chloroaniline	39	400	ug/kg	UJ	DA1SB-084M-0201-SO	39	400	U	N/A	Yes
DA1SB-068M-0201-SO	4-Chlorophenyl phenyl ether	26	400	ug/kg	UJ	DA1SB-084M-0201-SO	26	400	U	N/A	Yes
DA1SB-068M-0201-SO	4-Methylphenol	660	2000	ug/kg	UJ	DA1SB-084M-0201-SO	660	2000	U	N/A	Yes
DA1SB-068M-0201-SO	4-Nitroaniline	30	1000	ug/kg	UJ	DA1SB-084M-0201-SO	30	1000	U	N/A	Yes
DA1SB-068M-0201-SO	4-Nitrophenol	400	1000	ug/kg	UJ	DA1SB-084M-0201-SO	400	1000	U	N/A	Yes
DA1SB-068M-0201-SO	Acenaphthene	24	400	ug/kg	UJ	DA1SB-084M-0201-SO	24	400	U	N/A	Yes
DA1SB-068M-0201-SO	Acenaphthylene	24	400	ug/kg	UJ	DA1SB-084M-0201-SO	24	400	U	N/A	Yes
DA1SB-068M-0201-SO	Anthracene	24	400	ug/kg	UJ	DA1SB-084M-0201-SO	24	400	U	N/A	Yes
DA1SB-068M-0201-SO	Benzo(a)anthracene	25	400	ug/kg	UJ	DA1SB-084M-0201-SO	25	400	U	N/A	Yes
DA1SB-068M-0201-SO	Benzo(a)pyrene	23	400	ug/kg	UJ	DA1SB-084M-0201-SO	23	400	U	N/A	Yes
DA1SB-068M-0201-SO	Benzo(b)fluoranthene	25	400	ug/kg	UJ	DA1SB-084M-0201-SO	25	400	U	N/A	Yes
DA1SB-068M-0201-SO	Benzo(g,h,i)perylene	22	400	ug/kg	UJ	DA1SB-084M-0201-SO	22	400	U	N/A	Yes
DA1SB-068M-0201-SO	Benzo(k)fluoranthene	25	400	ug/kg	UJ	DA1SB-084M-0201-SO	25	400	U	N/A	Yes
DA1SB-068M-0201-SO	Benzoic acid	290	990	ug/kg	UJ	DA1SB-084M-0201-SO	290	990	U	N/A	Yes
DA1SB-068M-0201-SO	Benzyl alcohol	84	1000	ug/kg	R	DA1SB-084M-0201-SO	84	1000	U	N/A	N/A
DA1SB-068M-0201-SO	Bis(2-chloroethoxy)methane	23	400	ug/kg	UJ	DA1SB-084M-0201-SO	23	400	U	N/A	Yes
DA1SB-068M-0201-SO	Bis(2-chloroethyl) ether	25	400	ug/kg	UJ	DA1SB-084M-0201-SO	25	400	U	N/A	Yes
DA1SB-068M-0201-SO	Bis(2-chloroisopropyl) ether	30	400	ug/kg	UJ	DA1SB-084M-0201-SO	30	400	U	N/A	Yes
DA1SB-068M-0201-SO	Bis(2-ethylhexyl) phthalate	88	1000	ug/kg	UJ	DA1SB-084M-0201-SO	110	1000	J	N/A	Yes
DA1SB-068M-0201-SO	Butylbenzyl phthalate	74	400	ug/kg	UJ	DA1SB-084M-0201-SO	74	400	U	N/A	Yes
DA1SB-068M-0201-SO	Carbazole	28	400	ug/kg	UJ	DA1SB-084M-0201-SO	28	400	U	N/A	Yes
DA1SB-068M-0201-SO	Chrysene	25	400	ug/kg	UJ	DA1SB-084M-0201-SO	25	400	U	N/A	Yes
DA1SB-068M-0201-SO	Dibenzo(a,h)anthracene	22	400	ug/kg	UJ	DA1SB-084M-0201-SO	22	400	U	N/A	Yes
DA1SB-068M-0201-SO	Dibenzofuran	24	400	ug/kg	UJ	DA1SB-084M-0201-SO	24	400	U	N/A	Yes
DA1SB-068M-0201-SO	Diethyl phthalate	65	400	ug/kg	UJ	DA1SB-084M-0201-SO	65	400	U	N/A	Yes
DA1SB-068M-0201-SO	Dimethyl phthalate	64	400	ug/kg	UJ	DA1SB-084M-0201-SO	64	400	U	N/A	Yes
DA1SB-068M-0201-SO	Di-n-butyl phthalate	85	400	ug/kg	J-	DA1SB-084M-0201-SO	80	400	U	N/A	Yes
DA1SB-068M-0201-SO	Di-n-octyl phthalate	60	400	ug/kg	UJ	DA1SB-084M-0201-SO	60	400	U	N/A	Yes
DA1SB-068M-0201-SO	Fluoranthene	26	400	ug/kg	UJ	DA1SB-084M-0201-SO	26	400	U	N/A	Yes
DA1SB-068M-0201-SO	Fluorene	25	400	ug/kg	UJ	DA1SB-084M-0201-SO	25	400	U	N/A	Yes
DA1SB-068M-0201-SO	Hexachlorobenzene	28	400	ug/kg	UJ	DA1SB-084M-0201-SO	28	400	U	N/A	Yes
DA1SB-068M-0201-SO	Hexachlorobutadiene	63	400	ug/kg	UJ	DA1SB-084M-0201-SO	63	400	U	N/A	Yes
DA1SB-068M-0201-SO	Hexachlorocyclopentadiene	52	400	ug/kg	R	DA1SB-084M-0201-SO	53	400	U	N/A	N/A
DA1SB-068M-0201-SO	Hexachloroethane	33	400	ug/kg	UJ	DA1SB-084M-0201-SO	33	400	U	N/A	Yes
DA1SB-068M-0201-SO	Indeno(1,2,3-cd)pyrene	23	400	ug/kg	UJ	DA1SB-084M-0201-SO	23	400	U	N/A	Yes
DA1SB-068M-0201-SO	Isophorone	50	400	ug/kg	UJ	DA1SB-084M-0201-SO	74	400	J	N/A	Yes
DA1SB-068M-0201-SO	Naphthalene	21	400	ug/kg	UJ	DA1SB-084M-0201-SO	21	400	U	N/A	Yes
DA1SB-068M-0201-SO	Nitrobenzene	60	400	ug/kg	R	DA1SB-084M-0201-SO	60	400	U	N/A	N/A

ODA1 Field Duplicate Comparison

Sample	Analyte	Result	LOQ	Units	Qualifier	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
DA1SB-068M-0201-SO	N-Nitroso-di-n-propylamine	71	400	ug/kg	UJ	DA1SB-084M-0201-SO	71	400	U	N/A	Yes
DA1SB-068M-0201-SO	N-Nitrosodiphenylamine	50	810	ug/kg	UJ	DA1SB-084M-0201-SO	51	810	U	N/A	Yes
DA1SB-068M-0201-SO	Pentachlorophenol	240	1000	ug/kg	UJ	DA1SB-084M-0201-SO	240	1000	U	N/A	Yes
DA1SB-068M-0201-SO	Phenanthrene	26	400	ug/kg	UJ	DA1SB-084M-0201-SO	26	400	U	N/A	Yes
DA1SB-068M-0201-SO	Phenol	160	500	ug/kg	UJ	DA1SB-084M-0201-SO	160	510	U	N/A	Yes
DA1SB-068M-0201-SO	Pyrene	26	400	ug/kg	UJ	DA1SB-084M-0201-SO	26	400	U	N/A	Yes
DA1SB-068M-0201-SO	1,3,5-Trinitrobenzene	0.13	0.44	mg/kg	UJ	DA1SB-084M-0201-SO	0.13	0.44	U	N/A	Yes
DA1SB-068M-0201-SO	1,3-Dinitrobenzene	0.08	0.44	mg/kg	UJ	DA1SB-084M-0201-SO	0.08	0.44	U	N/A	Yes
DA1SB-068M-0201-SO	2,4,6-Trinitrotoluene	0.091	0.44	mg/kg	UJ	DA1SB-084M-0201-SO	0.09	0.44	U	N/A	Yes
DA1SB-068M-0201-SO	2,4-Dinitrotoluene	0.2	0.44	mg/kg	R	DA1SB-084M-0201-SO	0.2	0.44	U	N/A	N/A
DA1SB-068M-0201-SO	2,6-Dinitrotoluene	0.07	0.5	mg/kg	R	DA1SB-084M-0201-SO	0.07	0.5	U	N/A	N/A
DA1SB-068M-0201-SO	2-Amino-4,6-dinitrotoluene	0.05	0.44	mg/kg	UJ	DA1SB-084M-0201-SO	0.05	0.44	U	N/A	Yes
DA1SB-068M-0201-SO	2-Nitrotoluene	0.091	0.44	mg/kg	UJ	DA1SB-084M-0201-SO	0.09	0.44	U	N/A	Yes
DA1SB-068M-0201-SO	3,5-Dinitroaniline	0.091	0.44	mg/kg	UJ	DA1SB-084M-0201-SO	0.09	0.44	U	N/A	Yes
DA1SB-068M-0201-SO	3-Nitrotoluene	0.07	0.44	mg/kg	UJ	DA1SB-084M-0201-SO	0.07	0.44	U	N/A	Yes
DA1SB-068M-0201-SO	4-Amino-2,6-dinitrotoluene	0.07	0.44	mg/kg	UJ	DA1SB-084M-0201-SO	0.07	0.44	U	N/A	Yes
DA1SB-068M-0201-SO	4-Nitrotoluene	0.07	0.5	mg/kg	UJ	DA1SB-084M-0201-SO	0.07	0.5	U	N/A	Yes
DA1SB-068M-0201-SO	HMX	0.12	0.44	mg/kg	UJ	DA1SB-084M-0201-SO	0.12	0.44	U	N/A	Yes
DA1SB-068M-0201-SO	Nitrobenzene	0.04	0.44	mg/kg	UJ	DA1SB-084M-0201-SO	0.04	0.44	U	N/A	Yes
DA1SB-068M-0201-SO	Nitroglycerin	0.5	1.5	mg/kg	UJ	DA1SB-084M-0201-SO	0.5	1.5	U	N/A	Yes
DA1SB-068M-0201-SO	Nitroguanidine	0.06	0.16	mg/kg	UJ	DA1SB-084M-0201-SO	0.059	0.16	U	N/A	Yes
DA1SB-068M-0201-SO	PETN	0.5	1.5	mg/kg	UJ	DA1SB-084M-0201-SO	0.5	1.5	U	N/A	Yes
DA1SB-068M-0201-SO	RDX	0.16	0.44	mg/kg	UJ	DA1SB-084M-0201-SO	0.16	0.44	U	N/A	Yes
DA1SB-068M-0201-SO	Tetryl	0.091	0.44	mg/kg	UJ	DA1SB-084M-0201-SO	0.09	0.44	U	N/A	Yes
DA1SB-068M-0201-SO	Cyanide	0.4	0.38	mg/kg		DA1SB-084M-0201-SO	0.11	0.39	U	N/A	Yes
DA1SB-068M-0201-SO	Nitrocellulose	7	100	mg/kg	U	DA1SB-084M-0201-SO	7	23	U	N/A	Yes
DA1SB-070D-0203-SO	1,1,1-Trichloroethane	9.9	50	ug/kg	U	DA1SB-085D-0204-SO	10	52	U	N/A	Yes
DA1SB-070D-0203-SO	1,1,2,2-Tetrachloroethane	6	50	ug/kg	U	DA1SB-085D-0204-SO	6.3	52	U	N/A	Yes
DA1SB-070D-0203-SO	1,1,2-Trichloroethane	8	50	ug/kg	U	DA1SB-085D-0204-SO	8.4	52	U	N/A	Yes
DA1SB-070D-0203-SO	1,1-Dichloroethane	11	50	ug/kg	U	DA1SB-085D-0204-SO	11	52	U	N/A	Yes
DA1SB-070D-0203-SO	1,1-Dichloroethene	16	50	ug/kg	U	DA1SB-085D-0204-SO	17	52	U	N/A	Yes
DA1SB-070D-0203-SO	1,2-Dibromoethane	9.9	50	ug/kg	U	DA1SB-085D-0204-SO	10	52	U	N/A	Yes
DA1SB-070D-0203-SO	1,2-Dichloroethane	12	50	ug/kg	U	DA1SB-085D-0204-SO	13	52	U	N/A	Yes
DA1SB-070D-0203-SO	1,2-Dichloropropane	7	50	ug/kg	U	DA1SB-085D-0204-SO	7.3	52	U	N/A	Yes
DA1SB-070D-0203-SO	2-Butanone	99	500	ug/kg	U	DA1SB-085D-0204-SO	100	520	U	N/A	Yes
DA1SB-070D-0203-SO	2-Hexanone	68	500	ug/kg	U	DA1SB-085D-0204-SO	71	520	U	N/A	Yes
DA1SB-070D-0203-SO	4-Methyl-2-pentanone	82	500	ug/kg	U	DA1SB-085D-0204-SO	86	520	U	N/A	Yes
DA1SB-070D-0203-SO	Acetone	63	990	ug/kg	U	DA1SB-085D-0204-SO	66	1000	U	N/A	Yes
DA1SB-070D-0203-SO	Benzene	5	50	ug/kg	U	DA1SB-085D-0204-SO	5.2	52	U	N/A	Yes

ODA1 Field Duplicate Comparison

Sample	Analyte	Result	LOQ	Units	Qualifier	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
DA1SB-070D-0203-SO	Bromochloromethane	8	50	ug/kg	U	DA1SB-085D-0204-SO	8.4	52	U	N/A	Yes
DA1SB-070D-0203-SO	Bromodichloromethane	8.9	50	ug/kg	U	DA1SB-085D-0204-SO	9.4	52	U	N/A	Yes
DA1SB-070D-0203-SO	Bromoform	6	50	ug/kg	U	DA1SB-085D-0204-SO	6.3	52	U	N/A	Yes
DA1SB-070D-0203-SO	Bromomethane	30	99	ug/kg	U	DA1SB-085D-0204-SO	31	100	U	N/A	Yes
DA1SB-070D-0203-SO	Carbon disulfide	15	99	ug/kg	U	DA1SB-085D-0204-SO	16	100	U	N/A	Yes
DA1SB-070D-0203-SO	Carbon tetrachloride	11	50	ug/kg	U	DA1SB-085D-0204-SO	11	52	U	N/A	Yes
DA1SB-070D-0203-SO	Chlorobenzene	8	50	ug/kg	U	DA1SB-085D-0204-SO	8.4	52	U	N/A	Yes
DA1SB-070D-0203-SO	Chloroethane	19	99	ug/kg	U	DA1SB-085D-0204-SO	20	100	U	N/A	Yes
DA1SB-070D-0203-SO	Chloroform	8.9	50	ug/kg	U	DA1SB-085D-0204-SO	9.4	52	U	N/A	Yes
DA1SB-070D-0203-SO	Chloromethane	25	99	ug/kg	U	DA1SB-085D-0204-SO	26	100	U	N/A	Yes
DA1SB-070D-0203-SO	cis-1,2-Dichloroethene	9.9	50	ug/kg	U	DA1SB-085D-0204-SO	10	52	U	N/A	Yes
DA1SB-070D-0203-SO	cis-1,3-Dichloropropene	9.9	50	ug/kg	U	DA1SB-085D-0204-SO	10	52	U	N/A	Yes
DA1SB-070D-0203-SO	Dibromochloromethane	8	50	ug/kg	U	DA1SB-085D-0204-SO	8.4	52	U	N/A	Yes
DA1SB-070D-0203-SO	Ethylbenzene	8	50	ug/kg	U	DA1SB-085D-0204-SO	8.4	52	U	N/A	Yes
DA1SB-070D-0203-SO	m,p-Xylenes	18	99	ug/kg	U	DA1SB-085D-0204-SO	19	100	U	N/A	Yes
DA1SB-070D-0203-SO	Methylene chloride	40	99	ug/kg	U	DA1SB-085D-0204-SO	42	100	U	N/A	Yes
DA1SB-070D-0203-SO	o-Xylene	8	50	ug/kg	U	DA1SB-085D-0204-SO	8.4	52	U	N/A	Yes
DA1SB-070D-0203-SO	Styrene	6	50	ug/kg	U	DA1SB-085D-0204-SO	6.3	52	U	N/A	Yes
DA1SB-070D-0203-SO	Tetrachloroethene	8	50	ug/kg	U	DA1SB-085D-0204-SO	8.4	52	U	N/A	Yes
DA1SB-070D-0203-SO	Toluene	7	50	ug/kg	U	DA1SB-085D-0204-SO	7.3	52	U	N/A	Yes
DA1SB-070D-0203-SO	trans-1,2-Dichloroethene	11	50	ug/kg	U	DA1SB-085D-0204-SO	11	52	U	N/A	Yes
DA1SB-070D-0203-SO	trans-1,3-Dichloropropene	7	99	ug/kg	U	DA1SB-085D-0204-SO	7.3	100	U	N/A	Yes
DA1SB-070D-0203-SO	Trichloroethene	9.9	50	ug/kg	U	DA1SB-085D-0204-SO	10	52	U	N/A	Yes
DA1SB-070D-0203-SO	Vinyl chloride	14	50	ug/kg	U	DA1SB-085D-0204-SO	15	52	U	N/A	Yes
DA1SB-070M-0204-SO	Aluminum	12900	0.24	mg/kg	J-	DA1SB-085M-0204-SO	12900	0.24		0	N/A
DA1SB-070M-0204-SO	Antimony	0.57	0.55	mg/kg	J-	DA1SB-085M-0204-SO	0.66	0.55		N/A	Yes
DA1SB-070M-0204-SO	Arsenic	10.2	0.91	mg/kg	J-	DA1SB-085M-0204-SO	9.8	0.91		4	N/A
DA1SB-070M-0204-SO	Barium	62.9	0.055	mg/kg	J-	DA1SB-085M-0204-SO	64.4	0.055		2	N/A
DA1SB-070M-0204-SO	Beryllium	0.46	0.024	mg/kg		DA1SB-085M-0204-SO	0.46	0.024		0	N/A
DA1SB-070M-0204-SO	Cadmium	0.08	0.08	mg/kg	UJ	DA1SB-085M-0204-SO	0.012	0.043	U	N/A	Yes
DA1SB-070M-0204-SO	Calcium	30200	1	mg/kg	J-	DA1SB-085M-0204-SO	30700	1		2	N/A
DA1SB-070M-0204-SO	Chromium	58.3	0.13	mg/kg	J-	DA1SB-085M-0204-SO	74	0.13		24	N/A
DA1SB-070M-0204-SO	Cobalt	9.8	0.099	mg/kg	J-	DA1SB-085M-0204-SO	9.3	0.099		5	N/A
DA1SB-070M-0204-SO	Copper	17.3	0.41	mg/kg	J-	DA1SB-085M-0204-SO	16.1	0.41		7	N/A
DA1SB-070M-0204-SO	Iron	29000	2	mg/kg		DA1SB-085M-0204-SO	29100	2		0	N/A
DA1SB-070M-0204-SO	Lead	10.9	0.28	mg/kg	J-	DA1SB-085M-0204-SO	11.2	0.28		3	N/A
DA1SB-070M-0204-SO	Magnesium	8010	0.81	mg/kg	J-	DA1SB-085M-0204-SO	7910	0.81		1	N/A
DA1SB-070M-0204-SO	Manganese	311	0.1	mg/kg	J-	DA1SB-085M-0204-SO	313	0.1		1	N/A
DA1SB-070M-0204-SO	Nickel	24.1	0.12	mg/kg	J-	DA1SB-085M-0204-SO	23	0.12		5	N/A

ODA1 Field Duplicate Comparison

Sample	Analyte	Result	LOQ	Units	Qualifier	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
DA1SB-070M-0204-SO	Potassium	1860	37	mg/kg	J-	DA1SB-085M-0204-SO	1950	37		5	N/A
DA1SB-070M-0204-SO	Selenium	0.43	0.85	mg/kg	J-	DA1SB-085M-0204-SO	0.71	0.85	J	N/A	Yes
DA1SB-070M-0204-SO	Silver	0.034	0.11	mg/kg	UJ	DA1SB-085M-0204-SO	0.034	0.11	U	N/A	Yes
DA1SB-070M-0204-SO	Sodium	78.9	13	mg/kg	J-	DA1SB-085M-0204-SO	78.9	13		0	N/A
DA1SB-070M-0204-SO	Thallium	1.8	0.28	mg/kg	J-	DA1SB-085M-0204-SO	1.8	0.28		0	N/A
DA1SB-070M-0204-SO	Vanadium	18.9	0.069	mg/kg	J-	DA1SB-085M-0204-SO	18.5	0.069		2	N/A
DA1SB-070M-0204-SO	Zinc	51.2	0.24	mg/kg	J-	DA1SB-085M-0204-SO	47.7	0.24		7	N/A
DA1SB-070M-0204-SO	Mercury	0.01	0.008	mg/kg	J-	DA1SB-085M-0204-SO	0.01	0.008		N/A	Yes
DA1SB-070M-0204-SO	1,3,5-Trinitrobenzene	0.13	0.44	mg/kg	UJ	DA1SB-085M-0204-SO	0.13	0.44	U	N/A	Yes
DA1SB-070M-0204-SO	1,3-Dinitrobenzene	0.08	0.44	mg/kg	UJ	DA1SB-085M-0204-SO	0.08	0.44	U	N/A	Yes
DA1SB-070M-0204-SO	2,4,6-Trinitrotoluene	0.09	0.44	mg/kg	UJ	DA1SB-085M-0204-SO	0.09	0.44	U	N/A	Yes
DA1SB-070M-0204-SO	2,4-Dinitrotoluene	0.2	0.44	mg/kg	UJ	DA1SB-085M-0204-SO	0.2	0.44	U	N/A	Yes
DA1SB-070M-0204-SO	2,6-Dinitrotoluene	0.07	0.5	mg/kg	UJ	DA1SB-085M-0204-SO	0.07	0.5	U	N/A	Yes
DA1SB-070M-0204-SO	2-Amino-4,6-dinitrotoluene	0.05	0.44	mg/kg	UJ	DA1SB-085M-0204-SO	0.05	0.44	U	N/A	Yes
DA1SB-070M-0204-SO	2-Nitrotoluene	0.09	0.44	mg/kg	UJ	DA1SB-085M-0204-SO	0.09	0.44	U	N/A	Yes
DA1SB-070M-0204-SO	3,5-Dinitroaniline	0.09	0.44	mg/kg	UJ	DA1SB-085M-0204-SO	0.09	0.44	U	N/A	Yes
DA1SB-070M-0204-SO	3-Nitrotoluene	0.07	0.44	mg/kg	UJ	DA1SB-085M-0204-SO	0.07	0.44	U	N/A	Yes
DA1SB-070M-0204-SO	4-Amino-2,6-dinitrotoluene	0.07	0.44	mg/kg	UJ	DA1SB-085M-0204-SO	0.07	0.44	U	N/A	Yes
DA1SB-070M-0204-SO	4-Nitrotoluene	0.07	0.5	mg/kg	UJ	DA1SB-085M-0204-SO	0.07	0.5	U	N/A	Yes
DA1SB-070M-0204-SO	HMX	0.12	0.44	mg/kg	UJ	DA1SB-085M-0204-SO	0.12	0.44	U	N/A	Yes
DA1SB-070M-0204-SO	Nitrobenzene	0.04	0.44	mg/kg	UJ	DA1SB-085M-0204-SO	0.04	0.44	U	N/A	Yes
DA1SB-070M-0204-SO	Nitroglycerin	0.5	1.5	mg/kg	UJ	DA1SB-085M-0204-SO	0.5	1.5	U	N/A	Yes
DA1SB-070M-0204-SO	PETN	0.5	1.5	mg/kg	UJ	DA1SB-085M-0204-SO	0.5	1.5	U	N/A	Yes
DA1SB-070M-0204-SO	RDX	0.16	0.44	mg/kg	UJ	DA1SB-085M-0204-SO	0.16	0.44	U	N/A	Yes
DA1SB-070M-0204-SO	Tetryl	0.09	0.44	mg/kg	UJ	DA1SB-085M-0204-SO	0.09	0.44	U	N/A	Yes
DA1SB-072M-0204-SO	Aluminum	6790	0.24	mg/kg	J-	DA1SB-086M-0204-SO	5940	0.24		13	N/A
DA1SB-072M-0204-SO	Antimony	7.6	0.54	mg/kg	J-	DA1SB-086M-0204-SO	5.1	0.54		39	N/A
DA1SB-072M-0204-SO	Arsenic	10.7	0.91	mg/kg	J-	DA1SB-086M-0204-SO	9.8	0.91		9	N/A
DA1SB-072M-0204-SO	Barium	40.2	0.054	mg/kg	J-	DA1SB-086M-0204-SO	35.7	0.054		12	N/A
DA1SB-072M-0204-SO	Beryllium	0.24	0.024	mg/kg	J	DA1SB-086M-0204-SO	0.25	0.024		4	N/A
DA1SB-072M-0204-SO	Cadmium	0.2	0.2	mg/kg	UJ	DA1SB-086M-0204-SO	0.012	0.042	U	N/A	Yes
DA1SB-072M-0204-SO	Calcium	1060	1	mg/kg	J-	DA1SB-086M-0204-SO	790	1		29	N/A
DA1SB-072M-0204-SO	Chromium	589	0.13	mg/kg	J-	DA1SB-086M-0204-SO	384	0.13		42	N/A
DA1SB-072M-0204-SO	Cobalt	5.9	0.099	mg/kg	J-	DA1SB-086M-0204-SO	6.1	0.099		3	N/A
DA1SB-072M-0204-SO	Copper	26.5	0.4	mg/kg	J-	DA1SB-086M-0204-SO	25.7	0.4		3	N/A
DA1SB-072M-0204-SO	Iron	25500	2	mg/kg		DA1SB-086M-0204-SO	22500	2		13	N/A
DA1SB-072M-0204-SO	Lead	13.9	0.28	mg/kg	J-	DA1SB-086M-0204-SO	10.5	0.28		28	N/A
DA1SB-072M-0204-SO	Magnesium	1750	0.8	mg/kg	J-	DA1SB-086M-0204-SO	1700	0.8		3	N/A
DA1SB-072M-0204-SO	Manganese	342	0.1	mg/kg	J-	DA1SB-086M-0204-SO	390	0.1		13	N/A

ODA1 Field Duplicate Comparison

Sample	Analyte	Result	LOQ	Units	Qualifier	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
DA1SB-072M-0204-SO	Nickel	16	0.12	mg/kg	J-	DA1SB-086M-0204-SO	16.4	0.12		2	N/A
DA1SB-072M-0204-SO	Potassium	1330	36	mg/kg	J-	DA1SB-086M-0204-SO	966	36		32	N/A
DA1SB-072M-0204-SO	Selenium	0.68	0.85	mg/kg	J-	DA1SB-086M-0204-SO	0.45	0.85	J	N/A	Yes
DA1SB-072M-0204-SO	Silver	0.034	0.11	mg/kg	UJ	DA1SB-086M-0204-SO	0.034	0.11	U	N/A	Yes
DA1SB-072M-0204-SO	Sodium	115	13	mg/kg	J-	DA1SB-086M-0204-SO	75.7	13		41	N/A
DA1SB-072M-0204-SO	Thallium	1.3	0.28	mg/kg	J-	DA1SB-086M-0204-SO	1.3	0.28		N/A	Yes
DA1SB-072M-0204-SO	Vanadium	13.3	0.068	mg/kg	J-	DA1SB-086M-0204-SO	11.6	0.068		14	N/A
DA1SB-072M-0204-SO	Zinc	63.9	0.24	mg/kg	J-	DA1SB-086M-0204-SO	59.9	0.24		6	N/A
DA1SB-072M-0204-SO	Mercury	0.037	0.0079	mg/kg	J-	DA1SB-086M-0204-SO	0.019	0.0079		N/A	No
DA1SB-072M-0204-SO	1,3,5-Trinitrobenzene	0.13	0.44	mg/kg	UJ	DA1SB-086M-0204-SO	0.13	0.44	U	N/A	Yes
DA1SB-072M-0204-SO	1,3-Dinitrobenzene	0.08	0.44	mg/kg	UJ	DA1SB-086M-0204-SO	0.08	0.44	U	N/A	Yes
DA1SB-072M-0204-SO	2,4,6-Trinitrotoluene	0.09	0.44	mg/kg	UJ	DA1SB-086M-0204-SO	0.089	0.44	U	N/A	Yes
DA1SB-072M-0204-SO	2,4-Dinitrotoluene	0.2	0.44	mg/kg	UJ	DA1SB-086M-0204-SO	0.2	0.44	U	N/A	Yes
DA1SB-072M-0204-SO	2,6-Dinitrotoluene	0.07	0.5	mg/kg	UJ	DA1SB-086M-0204-SO	0.07	0.5	U	N/A	Yes
DA1SB-072M-0204-SO	2-Amino-4,6-dinitrotoluene	0.05	0.44	mg/kg	UJ	DA1SB-086M-0204-SO	0.05	0.44	U	N/A	Yes
DA1SB-072M-0204-SO	2-Nitrotoluene	0.09	0.44	mg/kg	UJ	DA1SB-086M-0204-SO	0.089	0.44	U	N/A	Yes
DA1SB-072M-0204-SO	3,5-Dinitroaniline	0.09	0.44	mg/kg	UJ	DA1SB-086M-0204-SO	0.089	0.44	U	N/A	Yes
DA1SB-072M-0204-SO	3-Nitrotoluene	0.07	0.44	mg/kg	UJ	DA1SB-086M-0204-SO	0.07	0.44	U	N/A	Yes
DA1SB-072M-0204-SO	4-Amino-2,6-dinitrotoluene	0.07	0.44	mg/kg	UJ	DA1SB-086M-0204-SO	0.07	0.44	U	N/A	Yes
DA1SB-072M-0204-SO	4-Nitrotoluene	0.07	0.5	mg/kg	UJ	DA1SB-086M-0204-SO	0.07	0.5	U	N/A	Yes
DA1SB-072M-0204-SO	HMX	0.12	0.44	mg/kg	UJ	DA1SB-086M-0204-SO	0.12	0.44	U	N/A	Yes
DA1SB-072M-0204-SO	Nitrobenzene	0.04	0.44	mg/kg	UJ	DA1SB-086M-0204-SO	0.04	0.44	U	N/A	Yes
DA1SB-072M-0204-SO	Nitroglycerin	0.5	1.5	mg/kg	UJ	DA1SB-086M-0204-SO	0.5	1.5	U	N/A	Yes
DA1SB-072M-0204-SO	PETN	0.5	1.5	mg/kg	UJ	DA1SB-086M-0204-SO	0.5	1.5	U	N/A	Yes
DA1SB-072M-0204-SO	RDX	0.16	0.44	mg/kg	UJ	DA1SB-086M-0204-SO	0.16	0.44	U	N/A	Yes
DA1SB-072M-0204-SO	Tetryl	0.09	0.44	mg/kg	UJ	DA1SB-086M-0204-SO	0.089	0.44	U	N/A	Yes
DA1SS-050M-0201-SO	Aluminum	10900	0.24	mg/kg	J-	DA1SS-080M-0201-SO	11400	0.25		4	N/A
DA1SS-050M-0201-SO	Antimony	1.2	0.55	mg/kg	J-	DA1SS-080M-0201-SO	0.16	0.55	U	N/A	No
DA1SS-050M-0201-SO	Arsenic	9.1	0.92	mg/kg	J-	DA1SS-080M-0201-SO	8.9	0.92		2	N/A
DA1SS-050M-0201-SO	Barium	78.8	0.055	mg/kg	J-	DA1SS-080M-0201-SO	107	0.055		30	N/A
DA1SS-050M-0201-SO	Beryllium	0.38	0.024	mg/kg		DA1SS-080M-0201-SO	0.4	0.025		5	N/A
DA1SS-050M-0201-SO	Cadmium	2.6	0.043	mg/kg	J-	DA1SS-080M-0201-SO	3	0.043		14	N/A
DA1SS-050M-0201-SO	Calcium	2500	1	mg/kg	J-	DA1SS-080M-0201-SO	2260	1		10	N/A
DA1SS-050M-0201-SO	Chromium	110	0.13	mg/kg	J-	DA1SS-080M-0201-SO	43	0.13		88	N/A
DA1SS-050M-0201-SO	Cobalt	7.6	0.1	mg/kg	J-	DA1SS-080M-0201-SO	8.4	0.1		10	N/A
DA1SS-050M-0201-SO	Copper	188	0.41	mg/kg	J-	DA1SS-080M-0201-SO	150	0.41		22	N/A
DA1SS-050M-0201-SO	Iron	23700	2	mg/kg		DA1SS-080M-0201-SO	24300	2		3	N/A
DA1SS-050M-0201-SO	Lead	23.4	0.28	mg/kg	J-	DA1SS-080M-0201-SO	25.3	0.29		8	N/A
DA1SS-050M-0201-SO	Magnesium	2860	0.81	mg/kg	J-	DA1SS-080M-0201-SO	2890	0.82		1	N/A

ODA1 Field Duplicate Comparison

Sample	Analyte	Result	LOQ	Units	Qualifier	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
DA1SS-050M-0201-SO	Manganese	407	0.1	mg/kg	J-	DA1SS-080M-0201-SO	456	0.1		11	N/A
DA1SS-050M-0201-SO	Nickel	18.4	0.12	mg/kg	J-	DA1SS-080M-0201-SO	18	0.12		2	N/A
DA1SS-050M-0201-SO	Potassium	814	37	mg/kg	J-	DA1SS-080M-0201-SO	729	37		11	N/A
DA1SS-050M-0201-SO	Selenium	0.75	0.85	mg/kg	J-	DA1SS-080M-0201-SO	0.62	0.86	J	N/A	Yes
DA1SS-050M-0201-SO	Silver	0.035	0.11	mg/kg	UJ	DA1SS-080M-0201-SO	0.035	0.11	U	N/A	Yes
DA1SS-050M-0201-SO	Sodium	31.8	13	mg/kg	J-	DA1SS-080M-0201-SO	26.8	13		N/A	Yes
DA1SS-050M-0201-SO	Thallium	1.6	0.28	mg/kg	J-	DA1SS-080M-0201-SO	1.5	0.29		6	N/A
DA1SS-050M-0201-SO	Vanadium	16.1	0.069	mg/kg	J-	DA1SS-080M-0201-SO	16	0.07		1	N/A
DA1SS-050M-0201-SO	Zinc	191	0.24	mg/kg	J-	DA1SS-080M-0201-SO	187	0.25		2	N/A
DA1SS-050M-0201-SO	Hexavalent Chromium	1.9	6.5	mg/kg	U	DA1SS-080M-0201-SO	1.9	6.5	U	N/A	Yes
DA1SS-050M-0201-SO	Mercury	0.037	0.008	mg/kg	J-	DA1SS-080M-0201-SO	0.037	0.0081		N/A	Yes
DA1SS-050M-0201-SO	1,3,5-Trinitrobenzene	0.13	0.44	mg/kg	UJ	DA1SS-080M-0201-SO	0.13	0.44	U	N/A	Yes
DA1SS-050M-0201-SO	1,3-Dinitrobenzene	0.08	0.44	mg/kg	UJ	DA1SS-080M-0201-SO	0.08	0.44	U	N/A	Yes
DA1SS-050M-0201-SO	2,4,6-Trinitrotoluene	0.09	0.44	mg/kg	UJ	DA1SS-080M-0201-SO	0.09	0.44	U	N/A	Yes
DA1SS-050M-0201-SO	2,4-Dinitrotoluene	0.2	0.44	mg/kg	UJ	DA1SS-080M-0201-SO	0.2	0.44	U	N/A	Yes
DA1SS-050M-0201-SO	2,6-Dinitrotoluene	0.07	0.5	mg/kg	UJ	DA1SS-080M-0201-SO	0.07	0.5	U	N/A	Yes
DA1SS-050M-0201-SO	2-Amino-4,6-dinitrotoluene	0.05	0.44	mg/kg	UJ	DA1SS-080M-0201-SO	0.05	0.44	U	N/A	Yes
DA1SS-050M-0201-SO	2-Nitrotoluene	0.09	0.44	mg/kg	UJ	DA1SS-080M-0201-SO	0.09	0.44	U	N/A	Yes
DA1SS-050M-0201-SO	3,5-Dinitroaniline	0.09	0.44	mg/kg	UJ	DA1SS-080M-0201-SO	0.09	0.44	U	N/A	Yes
DA1SS-050M-0201-SO	3-Nitrotoluene	0.07	0.44	mg/kg	UJ	DA1SS-080M-0201-SO	0.07	0.44	U	N/A	Yes
DA1SS-050M-0201-SO	4-Amino-2,6-dinitrotoluene	0.07	0.44	mg/kg	UJ	DA1SS-080M-0201-SO	0.07	0.44	U	N/A	Yes
DA1SS-050M-0201-SO	4-Nitrotoluene	0.07	0.5	mg/kg	UJ	DA1SS-080M-0201-SO	0.07	0.5	U	N/A	Yes
DA1SS-050M-0201-SO	HMX	0.12	0.44	mg/kg	UJ	DA1SS-080M-0201-SO	0.12	0.44	U	N/A	Yes
DA1SS-050M-0201-SO	Nitrobenzene	0.04	0.44	mg/kg	UJ	DA1SS-080M-0201-SO	0.04	0.44	U	N/A	Yes
DA1SS-050M-0201-SO	Nitroglycerin	0.5	1.5	mg/kg	UJ	DA1SS-080M-0201-SO	0.5	1.5	U	N/A	Yes
DA1SS-050M-0201-SO	PETN	0.5	1.5	mg/kg	UJ	DA1SS-080M-0201-SO	0.5	1.5	U	N/A	Yes
DA1SS-050M-0201-SO	RDX	0.16	0.44	mg/kg	UJ	DA1SS-080M-0201-SO	0.16	0.44	U	N/A	Yes
DA1SS-050M-0201-SO	Tetryl	0.09	0.44	mg/kg	UJ	DA1SS-080M-0201-SO	0.09	0.44	U	N/A	Yes

Sand Creek

Sand Creek Field Duplicate Comparisons

Sample	Analyte	Result	LOQ	Units	Qualifier	Method	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
SCSB-037D-0001-SO	1,1,1-Trichloroethane	14	70	ug/kg	U	8260	SCSB-080D-0001-SO	12	58	U	N/A	Yes
SCSB-037D-0001-SO	1,1,2,2-Tetrachloroethane	8.3	70	ug/kg	U	8260	SCSB-080D-0001-SO	6.9	58	U	N/A	Yes
SCSB-037D-0001-SO	1,1,2-Trichloroethane	11	70	ug/kg	U	8260	SCSB-080D-0001-SO	9.3	58	U	N/A	Yes
SCSB-037D-0001-SO	1,1-Dichloroethane	15	70	ug/kg	U	8260	SCSB-080D-0001-SO	13	58	U	N/A	Yes
SCSB-037D-0001-SO	1,1-Dichloroethene	22	70	ug/kg	U	8260	SCSB-080D-0001-SO	19	58	U	N/A	Yes
SCSB-037D-0001-SO	1,2-Dibromoethane	14	70	ug/kg	U	8260	SCSB-080D-0001-SO	12	58	U	N/A	Yes
SCSB-037D-0001-SO	1,2-Dichloroethane	17	70	ug/kg	U	8260	SCSB-080D-0001-SO	14	58	U	N/A	Yes
SCSB-037D-0001-SO	1,2-Dichloropropane	9.7	70	ug/kg	U	8260	SCSB-080D-0001-SO	8.1	58	U	N/A	Yes
SCSB-037D-0001-SO	2-Butanone	140	700	ug/kg	U	8260	SCSB-080D-0001-SO	120	580	U	N/A	Yes
SCSB-037D-0001-SO	2-Hexanone	95	700	ug/kg	U	8260	SCSB-080D-0001-SO	79	580	U	N/A	Yes
SCSB-037D-0001-SO	4-Methyl-2-pentanone	110	700	ug/kg	U	8260	SCSB-080D-0001-SO	95	580	U	N/A	Yes
SCSB-037D-0001-SO	Acetone	88	1400	ug/kg	U	8260	SCSB-080D-0001-SO	73	1200	U	N/A	Yes
SCSB-037D-0001-SO	Benzene	7	70	ug/kg	U	8260	SCSB-080D-0001-SO	5.8	58	U	N/A	Yes
SCSB-037D-0001-SO	Bromochloromethane	11	70	ug/kg	U	8260	SCSB-080D-0001-SO	9.3	58	U	N/A	Yes
SCSB-037D-0001-SO	Bromodichloromethane	13	70	ug/kg	U	8260	SCSB-080D-0001-SO	10	58	U	N/A	Yes
SCSB-037D-0001-SO	Bromoform	8.3	70	ug/kg	U	8260	SCSB-080D-0001-SO	6.9	58	U	N/A	Yes
SCSB-037D-0001-SO	Bromomethane	42	140	ug/kg	U	8260	SCSB-080D-0001-SO	35	120	U	N/A	Yes
SCSB-037D-0001-SO	Carbon disulfide	21	140	ug/kg	U	8260	SCSB-080D-0001-SO	17	120	U	N/A	Yes
SCSB-037D-0001-SO	Carbon tetrachloride	15	70	ug/kg	U	8260	SCSB-080D-0001-SO	13	58	U	N/A	Yes
SCSB-037D-0001-SO	Chlorobenzene	11	70	ug/kg	U	8260	SCSB-080D-0001-SO	9.3	58	U	N/A	Yes
SCSB-037D-0001-SO	Chloroethane	26	140	ug/kg	U	8260	SCSB-080D-0001-SO	22	120	U	N/A	Yes
SCSB-037D-0001-SO	Chloroform	13	70	ug/kg	U	8260	SCSB-080D-0001-SO	10	58	U	N/A	Yes
SCSB-037D-0001-SO	Chloromethane	35	140	ug/kg	U	8260	SCSB-080D-0001-SO	29	120	U	N/A	Yes
SCSB-037D-0001-SO	cis-1,2-Dichloroethene	14	70	ug/kg	U	8260	SCSB-080D-0001-SO	12	58	U	N/A	Yes
SCSB-037D-0001-SO	cis-1,3-Dichloropropene	14	70	ug/kg	U	8260	SCSB-080D-0001-SO	12	58	U	N/A	Yes
SCSB-037D-0001-SO	Dibromochloromethane	11	70	ug/kg	U	8260	SCSB-080D-0001-SO	9.3	58	U	N/A	Yes
SCSB-037D-0001-SO	Ethylbenzene	11	70	ug/kg	U	8260	SCSB-080D-0001-SO	9.3	58	U	N/A	Yes
SCSB-037D-0001-SO	m,p-Xylenes	25	140	ug/kg	U	8260	SCSB-080D-0001-SO	21	120	U	N/A	Yes
SCSB-037D-0001-SO	Methylene chloride	56	140	ug/kg	U	8260	SCSB-080D-0001-SO	46	120	U	N/A	Yes
SCSB-037D-0001-SO	o-Xylene	13	70	ug/kg	J	8260	SCSB-080D-0001-SO	9.3	58	U	N/A	Yes
SCSB-037D-0001-SO	Styrene	8.3	70	ug/kg	U	8260	SCSB-080D-0001-SO	6.9	58	U	N/A	Yes
SCSB-037D-0001-SO	Tetrachloroethene	11	70	ug/kg	U	8260	SCSB-080D-0001-SO	9.3	58	U	N/A	Yes
SCSB-037D-0001-SO	Toluene	12	70	ug/kg	J	8260	SCSB-080D-0001-SO	8.1	58	U	N/A	Yes
SCSB-037D-0001-SO	trans-1,2-Dichloroethene	15	70	ug/kg	U	8260	SCSB-080D-0001-SO	13	58	U	N/A	Yes
SCSB-037D-0001-SO	trans-1,3-Dichloropropene	9.7	140	ug/kg	U	8260	SCSB-080D-0001-SO	8.1	120	U	N/A	Yes
SCSB-037D-0001-SO	Trichloroethene	14	70	ug/kg	U	8260	SCSB-080D-0001-SO	12	58	U	N/A	Yes
SCSB-037D-0001-SO	Vinyl chloride	19	70	ug/kg	U	8260	SCSB-080D-0001-SO	16	58	U	N/A	Yes
SCSB-037M-0001-SO	Aluminum	14800	0.49	mg/kg	J-	6010	SCSB-080M-0001-SO	14100	0.49		5	N/A

Sand Creek Field Duplicate Comparisons

Sample	Analyte	Result	LOQ	Units	Qualifier	Method	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
SCSB-037M-0001-SO	Antimony	0.93	1.1	mg/kg	J-	6010	SCSB-080M-0001-SO	0.67	1.1	J	N/A	Yes
SCSB-037M-0001-SO	Arsenic	182	1.8	mg/kg	J-	6010	SCSB-080M-0001-SO	214	1.8		16	N/A
SCSB-037M-0001-SO	Barium	932	0.11	mg/kg	J-	6010	SCSB-080M-0001-SO	1050	0.11		12	N/A
SCSB-037M-0001-SO	Beryllium	3.9	0.049	mg/kg	J-	6010	SCSB-080M-0001-SO	3.8	0.049		3	N/A
SCSB-037M-0001-SO	Cadmium	1.6	0.085	mg/kg	J-	6010	SCSB-080M-0001-SO	2.1	0.085		27	N/A
SCSB-037M-0001-SO	Calcium	13900	2	mg/kg	J-	6010	SCSB-080M-0001-SO	16700	2		18	N/A
SCSB-037M-0001-SO	Chromium	112	0.26	mg/kg	J-	6010	SCSB-080M-0001-SO	66	0.26		52	N/A
SCSB-037M-0001-SO	Cobalt	9	0.2	mg/kg	J-	6010	SCSB-080M-0001-SO	8.5	0.2		6	N/A
SCSB-037M-0001-SO	Copper	95.7	0.81	mg/kg	J-	6010	SCSB-080M-0001-SO	118	0.81		21	N/A
SCSB-037M-0001-SO	Iron	41500	4.1	mg/kg	J-	6010	SCSB-080M-0001-SO	38900	4.1		6	N/A
SCSB-037M-0001-SO	Lead	325	0.57	mg/kg	J-	6010	SCSB-080M-0001-SO	400	0.57		21	N/A
SCSB-037M-0001-SO	Magnesium	3050	1.6	mg/kg	J-	6010	SCSB-080M-0001-SO	3270	1.6		7	N/A
SCSB-037M-0001-SO	Manganese	743	0.2	mg/kg	J-	6010	SCSB-080M-0001-SO	770	0.2		4	N/A
SCSB-037M-0001-SO	Nickel	35.7	0.25	mg/kg	J-	6010	SCSB-080M-0001-SO	35.2	0.25		1	N/A
SCSB-037M-0001-SO	Potassium	1020	37	mg/kg	J-	6010	SCSB-080M-0001-SO	885	37		14	N/A
SCSB-037M-0001-SO	Selenium	3.1	1.7	mg/kg	J-	6010	SCSB-080M-0001-SO	3.4	1.7		N/A	Yes
SCSB-037M-0001-SO	Silver	1.2	0.23	mg/kg		6010	SCSB-080M-0001-SO	1.5	0.23		22	N/A
SCSB-037M-0001-SO	Sodium	178	13	mg/kg	J-	6010	SCSB-080M-0001-SO	175	13		2	N/A
SCSB-037M-0001-SO	Thallium	5.5	0.57	mg/kg	J-	6010	SCSB-080M-0001-SO	5.3	0.57		4	N/A
SCSB-037M-0001-SO	Vanadium	41	0.14	mg/kg	J-	6010	SCSB-080M-0001-SO	41.4	0.14		1	N/A
SCSB-037M-0001-SO	Zinc	298	0.49	mg/kg	J-	6010	SCSB-080M-0001-SO	337	0.49		12	N/A
SCSB-037M-0001-SO	Mercury	0.24	0.008	mg/kg	J-	7471	SCSB-080M-0001-SO	0.31	0.008		25	N/A
SCSB-037M-0001-SO	1,2,4-Trichlorobenzene	21	400	ug/kg	U	8270	SCSB-080M-0001-SO	21	410	U	N/A	Yes
SCSB-037M-0001-SO	1,2-Dichlorobenzene	49	400	ug/kg	J	8270	SCSB-080M-0001-SO	24	410	U	N/A	Yes
SCSB-037M-0001-SO	1,3-Dichlorobenzene	20	400	ug/kg	U	8270	SCSB-080M-0001-SO	20	410	U	N/A	Yes
SCSB-037M-0001-SO	1,4-Dichlorobenzene	19	400	ug/kg	U	8270	SCSB-080M-0001-SO	19	410	U	N/A	Yes
SCSB-037M-0001-SO	2,4,5-Trichlorophenol	130	510	ug/kg	U	8270	SCSB-080M-0001-SO	130	510	U	N/A	Yes
SCSB-037M-0001-SO	2,4,6-Trichlorophenol	130	510	ug/kg	U	8270	SCSB-080M-0001-SO	130	510	U	N/A	Yes
SCSB-037M-0001-SO	2,4-Dichlorophenol	120	510	ug/kg	U	8270	SCSB-080M-0001-SO	120	510	U	N/A	Yes
SCSB-037M-0001-SO	2,4-Dimethylphenol	100	400	ug/kg	U	8270	SCSB-080M-0001-SO	100	410	U	N/A	Yes
SCSB-037M-0001-SO	2,4-Dinitrophenol	700	2000	ug/kg	UJ	8270	SCSB-080M-0001-SO	700	2000	U	N/A	Yes
SCSB-037M-0001-SO	2,4-Dinitrotoluene	24	400	ug/kg	U	8270	SCSB-080M-0001-SO	24	410	U	N/A	Yes
SCSB-037M-0001-SO	2,6-Dinitrotoluene	24	400	ug/kg	U	8270	SCSB-080M-0001-SO	24	410	U	N/A	Yes
SCSB-037M-0001-SO	2-Chloronaphthalene	23	400	ug/kg	U	8270	SCSB-080M-0001-SO	23	410	U	N/A	Yes
SCSB-037M-0001-SO	2-Chlorophenol	340	510	ug/kg	U	8270	SCSB-080M-0001-SO	340	510	U	N/A	Yes
SCSB-037M-0001-SO	2-Methyl-4,6-dinitrophenol	270	1000	ug/kg	U	8270	SCSB-080M-0001-SO	270	1000	U	N/A	Yes
SCSB-037M-0001-SO	2-Methylnaphthalene	260	400	ug/kg	J	8270	SCSB-080M-0001-SO	25	410	U	N/A	Yes
SCSB-037M-0001-SO	2-Methylphenol	420	1000	ug/kg	U	8270	SCSB-080M-0001-SO	430	1000	U	N/A	Yes

Sand Creek Field Duplicate Comparisons

Sample	Analyte	Result	LOQ	Units	Qualifier	Method	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
SCSB-037M-0001-SO	2-Nitroaniline	23	400	ug/kg	U	8270	SCSB-080M-0001-SO	23	410	U	N/A	Yes
SCSB-037M-0001-SO	2-Nitrophenol	280	510	ug/kg	U	8270	SCSB-080M-0001-SO	280	510	U	N/A	Yes
SCSB-037M-0001-SO	3,3'-Dichlorobenzidine	150	510	ug/kg	UJ	8270	SCSB-080M-0001-SO	150	510	U	N/A	Yes
SCSB-037M-0001-SO	3-Nitroaniline	22	1000	ug/kg	UJ	8270	SCSB-080M-0001-SO	22	1000	U	N/A	Yes
SCSB-037M-0001-SO	4-Bromophenyl phenyl ether	25	400	ug/kg	U	8270	SCSB-080M-0001-SO	25	410	U	N/A	Yes
SCSB-037M-0001-SO	4-Chloro-3-methylphenol	380	510	ug/kg	U	8270	SCSB-080M-0001-SO	390	510	U	N/A	Yes
SCSB-037M-0001-SO	4-Chloroaniline	39	400	ug/kg	UJ	8270	SCSB-080M-0001-SO	40	410	U	N/A	Yes
SCSB-037M-0001-SO	4-Chlorophenyl phenyl ether	26	400	ug/kg	U	8270	SCSB-080M-0001-SO	26	410	U	N/A	Yes
SCSB-037M-0001-SO	4-Methylphenol	660	2000	ug/kg	U	8270	SCSB-080M-0001-SO	660	2000	U	N/A	Yes
SCSB-037M-0001-SO	4-Nitroaniline	30	1000	ug/kg	U	8270	SCSB-080M-0001-SO	30	1000	U	N/A	Yes
SCSB-037M-0001-SO	4-Nitrophenol	400	1000	ug/kg	U	8270	SCSB-080M-0001-SO	410	1000	U	N/A	Yes
SCSB-037M-0001-SO	Acenaphthene	24	400	ug/kg	U	8270	SCSB-080M-0001-SO	24	410	U	N/A	Yes
SCSB-037M-0001-SO	Acenaphthylene	24	400	ug/kg	U	8270	SCSB-080M-0001-SO	24	410	U	N/A	Yes
SCSB-037M-0001-SO	Anthracene	32	400	ug/kg	J	8270	SCSB-080M-0001-SO	24	410	U	N/A	Yes
SCSB-037M-0001-SO	Benzo(a)anthracene	120	400	ug/kg	J	8270	SCSB-080M-0001-SO	25	410	U	N/A	Yes
SCSB-037M-0001-SO	Benzo(a)pyrene	140	400	ug/kg	J	8270	SCSB-080M-0001-SO	23	410	U	N/A	Yes
SCSB-037M-0001-SO	Benzo(b)fluoranthene	260	400	ug/kg	J	8270	SCSB-080M-0001-SO	25	410	U	N/A	Yes
SCSB-037M-0001-SO	Benzo(g,h,i)perylene	120	400	ug/kg	J	8270	SCSB-080M-0001-SO	22	410	U	N/A	Yes
SCSB-037M-0001-SO	Benzo(k)fluoranthene	69	400	ug/kg	J	8270	SCSB-080M-0001-SO	25	410	U	N/A	Yes
SCSB-037M-0001-SO	Benzoic acid	290	990	ug/kg	U	8270	SCSB-080M-0001-SO	290	990	U	N/A	Yes
SCSB-037M-0001-SO	Benzyl alcohol	84	1000	ug/kg	UJ	8270	SCSB-080M-0001-SO	84	1000	U	N/A	Yes
SCSB-037M-0001-SO	Bis(2-chloroethoxy)methane	23	400	ug/kg	U	8270	SCSB-080M-0001-SO	23	410	U	N/A	Yes
SCSB-037M-0001-SO	Bis(2-chloroethyl) ether	25	400	ug/kg	U	8270	SCSB-080M-0001-SO	25	410	U	N/A	Yes
SCSB-037M-0001-SO	Bis(2-chloroisopropyl) ether	30	400	ug/kg	U	8270	SCSB-080M-0001-SO	30	410	U	N/A	Yes
SCSB-037M-0001-SO	Bis(2-ethylhexyl) phthalate	88	1000	ug/kg	U	8270	SCSB-080M-0001-SO	88	1000	U	N/A	Yes
SCSB-037M-0001-SO	Butylbenzyl phthalate	74	400	ug/kg	U	8270	SCSB-080M-0001-SO	74	410	U	N/A	Yes
SCSB-037M-0001-SO	Carbazole	33	400	ug/kg	J	8270	SCSB-080M-0001-SO	28	410	U	N/A	Yes
SCSB-037M-0001-SO	Chrysene	160	400	ug/kg	J	8270	SCSB-080M-0001-SO	25	410	U	N/A	Yes
SCSB-037M-0001-SO	Dibenzo(a,h)anthracene	32	400	ug/kg	J	8270	SCSB-080M-0001-SO	22	410	U	N/A	Yes
SCSB-037M-0001-SO	Dibenzofuran	69	400	ug/kg	J	8270	SCSB-080M-0001-SO	24	410	U	N/A	Yes
SCSB-037M-0001-SO	Diethyl phthalate	65	400	ug/kg	U	8270	SCSB-080M-0001-SO	65	410	U	N/A	Yes
SCSB-037M-0001-SO	Dimethyl phthalate	64	400	ug/kg	U	8270	SCSB-080M-0001-SO	64	410	U	N/A	Yes
SCSB-037M-0001-SO	Di-n-butyl phthalate	120	400	ug/kg	J	8270	SCSB-080M-0001-SO	92	410	J	N/A	Yes
SCSB-037M-0001-SO	Di-n-octyl phthalate	60	400	ug/kg	U	8270	SCSB-080M-0001-SO	60	410	U	N/A	Yes
SCSB-037M-0001-SO	Fluoranthene	360	400	ug/kg	J	8270	SCSB-080M-0001-SO	26	410	U	N/A	Yes
SCSB-037M-0001-SO	Fluorene	25	400	ug/kg	U	8270	SCSB-080M-0001-SO	25	410	U	N/A	Yes
SCSB-037M-0001-SO	Hexachlorobenzene	28	400	ug/kg	U	8270	SCSB-080M-0001-SO	28	410	U	N/A	Yes
SCSB-037M-0001-SO	Hexachlorobutadiene	63	400	ug/kg	U	8270	SCSB-080M-0001-SO	63	410	U	N/A	Yes

Sand Creek Field Duplicate Comparisons

Sample	Analyte	Result	LOQ	Units	Qualifier	Method	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
SCSB-037M-0001-SO	Hexachlorocyclopentadiene	53	400	ug/kg	UJ	8270	SCSB-080M-0001-SO	53	410	U	N/A	Yes
SCSB-037M-0001-SO	Hexachloroethane	33	400	ug/kg	U	8270	SCSB-080M-0001-SO	33	410	U	N/A	Yes
SCSB-037M-0001-SO	Indeno(1,2,3-cd)pyrene	93	400	ug/kg	J	8270	SCSB-080M-0001-SO	23	410	U	N/A	Yes
SCSB-037M-0001-SO	Isophorone	500	400	ug/kg		8270	SCSB-080M-0001-SO	180	410	J	N/A	Yes
SCSB-037M-0001-SO	Naphthalene	150	400	ug/kg	J	8270	SCSB-080M-0001-SO	21	410	U	N/A	Yes
SCSB-037M-0001-SO	Nitrobenzene	60	400	ug/kg	R	8270	SCSB-080M-0001-SO	60	410	U	N/A	N/A
SCSB-037M-0001-SO	N-Nitroso-di-n-propylamine	71	400	ug/kg	U	8270	SCSB-080M-0001-SO	71	410	U	N/A	Yes
SCSB-037M-0001-SO	N-Nitrosodiphenylamine	51	810	ug/kg	U	8270	SCSB-080M-0001-SO	51	810	U	N/A	Yes
SCSB-037M-0001-SO	Pentachlorophenol	240	1000	ug/kg	U	8270	SCSB-080M-0001-SO	240	1000	U	N/A	Yes
SCSB-037M-0001-SO	Phenanthrene	280	400	ug/kg	J	8270	SCSB-080M-0001-SO	26	410	U	N/A	Yes
SCSB-037M-0001-SO	Phenol	160	510	ug/kg	U	8270	SCSB-080M-0001-SO	160	510	U	N/A	Yes
SCSB-037M-0001-SO	Pyrene	280	400	ug/kg	J	8270	SCSB-080M-0001-SO	26	410	U	N/A	Yes
SCSB-037M-0001-SO	1,3,5-Trinitrobenzene	0.13	0.44	mg/kg	UJ	8330B	SCSB-080M-0001-SO	0.13	0.44	U	N/A	Yes
SCSB-037M-0001-SO	1,3-Dinitrobenzene	0.081	0.44	mg/kg	UJ	8330B	SCSB-080M-0001-SO	0.081	0.44	U	N/A	Yes
SCSB-037M-0001-SO	2,4,6-Trinitrotoluene	0.091	0.44	mg/kg	UJ	8330B	SCSB-080M-0001-SO	0.091	0.44	U	N/A	Yes
SCSB-037M-0001-SO	2,4-Dinitrotoluene	0.2	0.44	mg/kg	R	8330B	SCSB-080M-0001-SO	0.2	0.44	U	N/A	N/A
SCSB-037M-0001-SO	2,6-Dinitrotoluene	0.071	0.51	mg/kg	R	8330B	SCSB-080M-0001-SO	0.071	0.5	U	N/A	N/A
SCSB-037M-0001-SO	2-Amino-4,6-dinitrotoluene	0.051	0.44	mg/kg	UJ	8330B	SCSB-080M-0001-SO	0.05	0.44	U	N/A	Yes
SCSB-037M-0001-SO	2-Nitrotoluene	0.091	0.44	mg/kg	UJ	8330B	SCSB-080M-0001-SO	0.091	0.44	U	N/A	Yes
SCSB-037M-0001-SO	3,5-Dinitroaniline	0.091	0.44	mg/kg	UJ	8330B	SCSB-080M-0001-SO	0.091	0.44	U	N/A	Yes
SCSB-037M-0001-SO	3-Nitrotoluene	0.071	0.44	mg/kg	UJ	8330B	SCSB-080M-0001-SO	0.071	0.44	U	N/A	Yes
SCSB-037M-0001-SO	4-Amino-2,6-dinitrotoluene	0.071	0.44	mg/kg	UJ	8330B	SCSB-080M-0001-SO	0.071	0.44	U	N/A	Yes
SCSB-037M-0001-SO	4-Nitrotoluene	0.071	0.51	mg/kg	UJ	8330B	SCSB-080M-0001-SO	0.071	0.5	U	N/A	Yes
SCSB-037M-0001-SO	HMX	0.12	0.44	mg/kg	UJ	8330B	SCSB-080M-0001-SO	0.12	0.44	U	N/A	Yes
SCSB-037M-0001-SO	Nitrobenzene	0.04	0.44	mg/kg	UJ	8330B	SCSB-080M-0001-SO	0.04	0.44	U	N/A	Yes
SCSB-037M-0001-SO	Nitroglycerin	0.51	1.5	mg/kg	UJ	8330B	SCSB-080M-0001-SO	0.5	1.5	U	N/A	Yes
SCSB-037M-0001-SO	PETN	0.51	1.5	mg/kg	UJ	8330B	SCSB-080M-0001-SO	0.5	1.5	U	N/A	Yes
SCSB-037M-0001-SO	RDX	0.16	0.44	mg/kg	UJ	8330B	SCSB-080M-0001-SO	0.16	0.44	U	N/A	Yes
SCSB-037M-0001-SO	Tetryl	0.091	0.44	mg/kg	UJ	8330B	SCSB-080M-0001-SO	0.091	0.44	U	N/A	Yes
SCSB-038D-0005-SO	1,1,1-Trichloroethane	12	60	ug/kg	U	8260	SCSB-081D-0005-SO	11	57	U	N/A	Yes
SCSB-038D-0005-SO	1,1,2,2-Tetrachloroethane	7.2	60	ug/kg	U	8260	SCSB-081D-0005-SO	6.9	57	U	N/A	Yes
SCSB-038D-0005-SO	1,1,2-Trichloroethane	9.6	60	ug/kg	U	8260	SCSB-081D-0005-SO	9.2	57	U	N/A	Yes
SCSB-038D-0005-SO	1,1-Dichloroethane	13	60	ug/kg	U	8260	SCSB-081D-0005-SO	13	57	U	N/A	Yes
SCSB-038D-0005-SO	1,1-Dichloroethene	19	60	ug/kg	U	8260	SCSB-081D-0005-SO	18	57	U	N/A	Yes
SCSB-038D-0005-SO	1,2-Dibromoethane	12	60	ug/kg	U	8260	SCSB-081D-0005-SO	11	57	U	N/A	Yes
SCSB-038D-0005-SO	1,2-Dichloroethane	14	60	ug/kg	U	8260	SCSB-081D-0005-SO	14	57	U	N/A	Yes
SCSB-038D-0005-SO	1,2-Dichloropropane	8.4	60	ug/kg	U	8260	SCSB-081D-0005-SO	8	57	U	N/A	Yes
SCSB-038D-0005-SO	2-Butanone	120	600	ug/kg	U	8260	SCSB-081D-0005-SO	110	570	U	N/A	Yes

Sand Creek Field Duplicate Comparisons

Sample	Analyte	Result	LOQ	Units	Qualifier	Method	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
SCSB-038D-0005-SO	2-Hexanone	82	600	ug/kg	U	8260	SCSB-081D-0005-SO	78	570	U	N/A	Yes
SCSB-038D-0005-SO	4-Methyl-2-pentanone	99	600	ug/kg	U	8260	SCSB-081D-0005-SO	94	570	U	N/A	Yes
SCSB-038D-0005-SO	Acetone	76	1200	ug/kg	U	8260	SCSB-081D-0005-SO	72	1100	U	N/A	Yes
SCSB-038D-0005-SO	Benzene	6	60	ug/kg	U	8260	SCSB-081D-0005-SO	5.7	57	U	N/A	Yes
SCSB-038D-0005-SO	Bromochloromethane	9.6	60	ug/kg	U	8260	SCSB-081D-0005-SO	9.2	57	U	N/A	Yes
SCSB-038D-0005-SO	Bromodichloromethane	11	60	ug/kg	U	8260	SCSB-081D-0005-SO	10	57	U	N/A	Yes
SCSB-038D-0005-SO	Bromoform	7.2	60	ug/kg	U	8260	SCSB-081D-0005-SO	6.9	57	U	N/A	Yes
SCSB-038D-0005-SO	Bromomethane	36	120	ug/kg	U	8260	SCSB-081D-0005-SO	34	110	U	N/A	Yes
SCSB-038D-0005-SO	Carbon disulfide	18	120	ug/kg	U	8260	SCSB-081D-0005-SO	17	110	U	N/A	Yes
SCSB-038D-0005-SO	Carbon tetrachloride	13	60	ug/kg	U	8260	SCSB-081D-0005-SO	13	57	U	N/A	Yes
SCSB-038D-0005-SO	Chlorobenzene	9.6	60	ug/kg	U	8260	SCSB-081D-0005-SO	9.2	57	U	N/A	Yes
SCSB-038D-0005-SO	Chloroethane	23	120	ug/kg	U	8260	SCSB-081D-0005-SO	22	110	U	N/A	Yes
SCSB-038D-0005-SO	Chloroform	11	60	ug/kg	U	8260	SCSB-081D-0005-SO	10	57	U	N/A	Yes
SCSB-038D-0005-SO	Chloromethane	30	120	ug/kg	U	8260	SCSB-081D-0005-SO	29	110	U	N/A	Yes
SCSB-038D-0005-SO	cis-1,2-Dichloroethene	12	60	ug/kg	U	8260	SCSB-081D-0005-SO	11	57	U	N/A	Yes
SCSB-038D-0005-SO	cis-1,3-Dichloropropene	12	60	ug/kg	U	8260	SCSB-081D-0005-SO	11	57	U	N/A	Yes
SCSB-038D-0005-SO	Dibromochloromethane	9.6	60	ug/kg	U	8260	SCSB-081D-0005-SO	9.2	57	U	N/A	Yes
SCSB-038D-0005-SO	Ethylbenzene	9.6	60	ug/kg	U	8260	SCSB-081D-0005-SO	9.2	57	U	N/A	Yes
SCSB-038D-0005-SO	m,p-Xylenes	22	120	ug/kg	U	8260	SCSB-081D-0005-SO	21	110	U	N/A	Yes
SCSB-038D-0005-SO	Methylene chloride	48	120	ug/kg	U	8260	SCSB-081D-0005-SO	46	110	U	N/A	Yes
SCSB-038D-0005-SO	o-Xylene	9.6	60	ug/kg	U	8260	SCSB-081D-0005-SO	9.2	57	U	N/A	Yes
SCSB-038D-0005-SO	Styrene	7.2	60	ug/kg	U	8260	SCSB-081D-0005-SO	6.9	57	U	N/A	Yes
SCSB-038D-0005-SO	Tetrachloroethene	9.6	60	ug/kg	U	8260	SCSB-081D-0005-SO	9.2	57	U	N/A	Yes
SCSB-038D-0005-SO	Toluene	8.4	60	ug/kg	U	8260	SCSB-081D-0005-SO	8	57	U	N/A	Yes
SCSB-038D-0005-SO	trans-1,2-Dichloroethene	13	60	ug/kg	U	8260	SCSB-081D-0005-SO	13	57	U	N/A	Yes
SCSB-038D-0005-SO	trans-1,3-Dichloropropene	8.4	120	ug/kg	U	8260	SCSB-081D-0005-SO	8	110	U	N/A	Yes
SCSB-038D-0005-SO	Trichloroethene	12	60	ug/kg	U	8260	SCSB-081D-0005-SO	11	57	U	N/A	Yes
SCSB-038D-0005-SO	Vinyl chloride	17	60	ug/kg	U	8260	SCSB-081D-0005-SO	16	57	U	N/A	Yes
SCSB-038M-0005-SO	Aluminum	10900	0.24	mg/kg	J-	6010	SCSB-081M-0005-SO	10500	0.24		4	N/A
SCSB-038M-0005-SO	Antimony	0.63	0.54	mg/kg	J-	6010	SCSB-081M-0005-SO	0.57	0.54		N/A	Yes
SCSB-038M-0005-SO	Arsenic	6.1	0.91	mg/kg	J-	6010	SCSB-081M-0005-SO	5.5	0.9		10	N/A
SCSB-038M-0005-SO	Barium	43.8	0.054	mg/kg	J-	6010	SCSB-081M-0005-SO	43.3	0.054		1	N/A
SCSB-038M-0005-SO	Beryllium	0.38	0.024	mg/kg	J-	6010	SCSB-081M-0005-SO	0.38	0.024		0	N/A
SCSB-038M-0005-SO	Cadmium	0.012	0.042	mg/kg	UJ	6010	SCSB-081M-0005-SO	0.012	0.042	U	N/A	Yes
SCSB-038M-0005-SO	Calcium	10900	1	mg/kg	J-	6010	SCSB-081M-0005-SO	10200	1		7	N/A
SCSB-038M-0005-SO	Chromium	156	0.13	mg/kg	J-	6010	SCSB-081M-0005-SO	123	0.13		24	N/A
SCSB-038M-0005-SO	Cobalt	9	0.099	mg/kg	J-	6010	SCSB-081M-0005-SO	8.6	0.098		5	N/A
SCSB-038M-0005-SO	Copper	18.6	0.4	mg/kg	J-	6010	SCSB-081M-0005-SO	17.2	0.4		8	N/A

Sand Creek Field Duplicate Comparisons

Sample	Analyte	Result	LOQ	Units	Qualifier	Method	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
SCSB-038M-0005-SO	Iron	29600	2	mg/kg	J-	6010	SCSB-081M-0005-SO	28300	2		4	N/A
SCSB-038M-0005-SO	Lead	5.3	0.28	mg/kg	J-	6010	SCSB-081M-0005-SO	4.9	0.28		8	N/A
SCSB-038M-0005-SO	Magnesium	6840	0.8	mg/kg	J-	6010	SCSB-081M-0005-SO	6530	0.8		5	N/A
SCSB-038M-0005-SO	Manganese	369	0.1	mg/kg	J-	6010	SCSB-081M-0005-SO	347	0.1		6	N/A
SCSB-038M-0005-SO	Nickel	20.4	0.12	mg/kg	J-	6010	SCSB-081M-0005-SO	19.9	0.12		2	N/A
SCSB-038M-0005-SO	Potassium	2020	36	mg/kg	J-	6010	SCSB-081M-0005-SO	1960	36		3	N/A
SCSB-038M-0005-SO	Selenium	0.6	0.85	mg/kg	J-	6010	SCSB-081M-0005-SO	0.45	0.84	J	N/A	Yes
SCSB-038M-0005-SO	Silver	0.034	0.11	mg/kg	U	6010	SCSB-081M-0005-SO	0.034	0.11	U	N/A	Yes
SCSB-038M-0005-SO	Sodium	134	13	mg/kg	J-	6010	SCSB-081M-0005-SO	122	13		9	N/A
SCSB-038M-0005-SO	Thallium	1.7	0.28	mg/kg	J-	6010	SCSB-081M-0005-SO	1.6	0.28		6	N/A
SCSB-038M-0005-SO	Vanadium	14.3	0.068	mg/kg	J-	6010	SCSB-081M-0005-SO	13.7	0.068		4	N/A
SCSB-038M-0005-SO	Zinc	48.1	0.24	mg/kg	J-	6010	SCSB-081M-0005-SO	46.4	0.24		4	N/A
SCSB-038M-0005-SO	Mercury	0.0079	0.008	mg/kg	J-	7471	SCSB-081M-0005-SO	0.0076	0.008	J	N/A	Yes
SCSB-038M-0005-SO	1,3,5-Trinitrobenzene	0.13	0.44	mg/kg	UJ	8330B	SCSB-081M-0005-SO	0.13	0.43	U	N/A	Yes
SCSB-038M-0005-SO	1,3-Dinitrobenzene	0.08	0.44	mg/kg	UJ	8330B	SCSB-081M-0005-SO	0.079	0.43	U	N/A	Yes
SCSB-038M-0005-SO	2,4,6-Trinitrotoluene	0.09	0.44	mg/kg	UJ	8330B	SCSB-081M-0005-SO	0.089	0.43	U	N/A	Yes
SCSB-038M-0005-SO	2,4-Dinitrotoluene	0.2	0.44	mg/kg	R	8330B	SCSB-081M-0005-SO	0.2	0.43	U	N/A	N/A
SCSB-038M-0005-SO	2,6-Dinitrotoluene	0.07	0.5	mg/kg	R	8330B	SCSB-081M-0005-SO	0.069	0.49	U	N/A	N/A
SCSB-038M-0005-SO	2-Amino-4,6-dinitrotoluene	0.05	0.44	mg/kg	UJ	8330B	SCSB-081M-0005-SO	0.049	0.43	U	N/A	Yes
SCSB-038M-0005-SO	2-Nitrotoluene	0.09	0.44	mg/kg	UJ	8330B	SCSB-081M-0005-SO	0.089	0.43	U	N/A	Yes
SCSB-038M-0005-SO	3,5-Dinitroaniline	0.09	0.44	mg/kg	UJ	8330B	SCSB-081M-0005-SO	0.089	0.43	U	N/A	Yes
SCSB-038M-0005-SO	3-Nitrotoluene	0.07	0.44	mg/kg	UJ	8330B	SCSB-081M-0005-SO	0.069	0.43	U	N/A	Yes
SCSB-038M-0005-SO	4-Amino-2,6-dinitrotoluene	0.07	0.44	mg/kg	UJ	8330B	SCSB-081M-0005-SO	0.069	0.43	U	N/A	Yes
SCSB-038M-0005-SO	4-Nitrotoluene	0.07	0.5	mg/kg	UJ	8330B	SCSB-081M-0005-SO	0.069	0.49	U	N/A	Yes
SCSB-038M-0005-SO	HMX	0.12	0.44	mg/kg	UJ	8330B	SCSB-081M-0005-SO	0.12	0.43	U	N/A	Yes
SCSB-038M-0005-SO	Nitrobenzene	0.04	0.44	mg/kg	UJ	8330B	SCSB-081M-0005-SO	0.039	0.43	U	N/A	Yes
SCSB-038M-0005-SO	Nitroglycerin	0.5	1.5	mg/kg	UJ	8330B	SCSB-081M-0005-SO	0.49	1.5	U	N/A	Yes
SCSB-038M-0005-SO	PETN	0.5	1.5	mg/kg	UJ	8330B	SCSB-081M-0005-SO	0.49	1.5	U	N/A	Yes
SCSB-038M-0005-SO	RDX	0.16	0.44	mg/kg	UJ	8330B	SCSB-081M-0005-SO	0.16	0.43	U	N/A	Yes
SCSB-038M-0005-SO	Tetryl	0.09	0.44	mg/kg	UJ	8330B	SCSB-081M-0005-SO	0.089	0.43	U	N/A	Yes
SCSB-040M-0002-SO	Aluminum	11500	0.12	mg/kg		6010	SCSB-082M-0002-SO	14300	0.12		22	N/A
SCSB-040M-0002-SO	Antimony	1	0.27	mg/kg		6010	SCSB-082M-0002-SO	0.082	0.28	U	N/A	No
SCSB-040M-0002-SO	Arsenic	14.7	0.46	mg/kg		6010	SCSB-082M-0002-SO	15.2	0.46		3	N/A
SCSB-040M-0002-SO	Barium	49.8	0.027	mg/kg		6010	SCSB-082M-0002-SO	55.6	0.028		11	N/A
SCSB-040M-0002-SO	Beryllium	0.66	0.012	mg/kg		6010	SCSB-082M-0002-SO	0.68	0.024		3	N/A
SCSB-040M-0002-SO	Cadmium	0.28	0.021	mg/kg		6010	SCSB-082M-0002-SO	0.22	0.021		24	N/A
SCSB-040M-0002-SO	Calcium	4700	0.51	mg/kg		6010	SCSB-082M-0002-SO	5120	0.51		9	N/A
SCSB-040M-0002-SO	Chromium	54.9	0.064	mg/kg		6010	SCSB-082M-0002-SO	44.6	0.064		21	N/A

Sand Creek Field Duplicate Comparisons

Sample	Analyte	Result	LOQ	Units	Qualifier	Method	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
SCSB-040M-0002-SO	Cobalt	11.1	0.05	mg/kg		6010	SCSB-082M-0002-SO	12	0.05		8	N/A
SCSB-040M-0002-SO	Copper	17.1	0.2	mg/kg		6010	SCSB-082M-0002-SO	16.3	0.2		5	N/A
SCSB-040M-0002-SO	Iron	33700	2	mg/kg		6010	SCSB-082M-0002-SO	33400	2		1	N/A
SCSB-040M-0002-SO	Lead	42.5	0.14	mg/kg		6010	SCSB-082M-0002-SO	35.2	0.14		19	N/A
SCSB-040M-0002-SO	Magnesium	5690	0.4	mg/kg		6010	SCSB-082M-0002-SO	6750	0.41		17	N/A
SCSB-040M-0002-SO	Manganese	312	0.1	mg/kg		6010	SCSB-082M-0002-SO	347	0.051		11	N/A
SCSB-040M-0002-SO	Nickel	25.8	0.062	mg/kg		6010	SCSB-082M-0002-SO	31.9	0.062		21	N/A
SCSB-040M-0002-SO	Potassium	2070	36	mg/kg		6010	SCSB-082M-0002-SO	2220	37		7	N/A
SCSB-040M-0002-SO	Selenium	0.071	0.42	mg/kg	U	6010	SCSB-082M-0002-SO	0.071	0.43	U	N/A	Yes
SCSB-040M-0002-SO	Silver	0.017	0.057	mg/kg	U	6010	SCSB-082M-0002-SO	0.017	0.057	U	N/A	Yes
SCSB-040M-0002-SO	Sodium	124	13	mg/kg		6010	SCSB-082M-0002-SO	122	13		2	N/A
SCSB-040M-0002-SO	Thallium	0.081	0.28	mg/kg	U	6010	SCSB-082M-0002-SO	0.86	0.29		N/A	No
SCSB-040M-0002-SO	Vanadium	15.3	0.034	mg/kg		6010	SCSB-082M-0002-SO	18.9	0.035		21	N/A
SCSB-040M-0002-SO	Zinc	54.1	0.12	mg/kg		6010	SCSB-082M-0002-SO	58.4	0.12		8	N/A
SCSB-040M-0002-SO	Mercury	0.0064	0.008	mg/kg	J	7471	SCSB-082M-0002-SO	0.0053	0.008	J	N/A	Yes
SCSB-040M-0002-SO	1,2,4-Trichlorobenzene	21	410	ug/kg	U	8270	SCSB-082M-0002-SO	21	400	U	N/A	Yes
SCSB-040M-0002-SO	1,2-Dichlorobenzene	24	410	ug/kg	U	8270	SCSB-082M-0002-SO	24	400	U	N/A	Yes
SCSB-040M-0002-SO	1,3-Dichlorobenzene	20	410	ug/kg	U	8270	SCSB-082M-0002-SO	20	400	U	N/A	Yes
SCSB-040M-0002-SO	1,4-Dichlorobenzene	19	410	ug/kg	U	8270	SCSB-082M-0002-SO	19	400	U	N/A	Yes
SCSB-040M-0002-SO	2,4,5-Trichlorophenol	130	510	ug/kg	U	8270	SCSB-082M-0002-SO	130	510	U	N/A	Yes
SCSB-040M-0002-SO	2,4,6-Trichlorophenol	130	510	ug/kg	U	8270	SCSB-082M-0002-SO	130	510	U	N/A	Yes
SCSB-040M-0002-SO	2,4-Dichlorophenol	120	510	ug/kg	U	8270	SCSB-082M-0002-SO	120	510	U	N/A	Yes
SCSB-040M-0002-SO	2,4-Dimethylphenol	100	410	ug/kg	U	8270	SCSB-082M-0002-SO	100	400	U	N/A	Yes
SCSB-040M-0002-SO	2,4-Dinitrophenol	700	2000	ug/kg	U	8270	SCSB-082M-0002-SO	700	2000	U	N/A	Yes
SCSB-040M-0002-SO	2,4-Dinitrotoluene	24	410	ug/kg	U	8270	SCSB-082M-0002-SO	24	400	U	N/A	Yes
SCSB-040M-0002-SO	2,6-Dinitrotoluene	24	410	ug/kg	U	8270	SCSB-082M-0002-SO	24	400	U	N/A	Yes
SCSB-040M-0002-SO	2-Chloronaphthalene	23	410	ug/kg	U	8270	SCSB-082M-0002-SO	23	400	U	N/A	Yes
SCSB-040M-0002-SO	2-Chlorophenol	350	510	ug/kg	U	8270	SCSB-082M-0002-SO	340	510	U	N/A	Yes
SCSB-040M-0002-SO	2-Methyl-4,6-dinitrophenol	270	1000	ug/kg	U	8270	SCSB-082M-0002-SO	270	1000	U	N/A	Yes
SCSB-040M-0002-SO	2-Methylnaphthalene	25	410	ug/kg	U	8270	SCSB-082M-0002-SO	25	400	U	N/A	Yes
SCSB-040M-0002-SO	2-Methylphenol	430	1000	ug/kg	U	8270	SCSB-082M-0002-SO	420	1000	U	N/A	Yes
SCSB-040M-0002-SO	2-Nitroaniline	23	410	ug/kg	U	8270	SCSB-082M-0002-SO	23	400	U	N/A	Yes
SCSB-040M-0002-SO	2-Nitrophenol	280	510	ug/kg	U	8270	SCSB-082M-0002-SO	280	510	U	N/A	Yes
SCSB-040M-0002-SO	3,3'-Dichlorobenzidine	150	510	ug/kg	U	8270	SCSB-082M-0002-SO	150	510	U	N/A	Yes
SCSB-040M-0002-SO	3-Nitroaniline	22	1000	ug/kg	U	8270	SCSB-082M-0002-SO	22	1000	U	N/A	Yes
SCSB-040M-0002-SO	4-Bromophenyl phenyl ether	25	410	ug/kg	U	8270	SCSB-082M-0002-SO	25	400	U	N/A	Yes
SCSB-040M-0002-SO	4-Chloro-3-methylphenol	390	510	ug/kg	U	8270	SCSB-082M-0002-SO	380	510	U	N/A	Yes
SCSB-040M-0002-SO	4-Chloroaniline	40	410	ug/kg	U	8270	SCSB-082M-0002-SO	39	400	U	N/A	Yes

Sand Creek Field Duplicate Comparisons

Sample	Analyte	Result	LOQ	Units	Qualifier	Method	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
SCSB-040M-0002-SO	4-Chlorophenyl phenyl ether	26	410	ug/kg	U	8270	SCSB-082M-0002-SO	26	400	U	N/A	Yes
SCSB-040M-0002-SO	4-Methylphenol	660	2000	ug/kg	U	8270	SCSB-082M-0002-SO	660	2000	U	N/A	Yes
SCSB-040M-0002-SO	4-Nitroaniline	30	1000	ug/kg	U	8270	SCSB-082M-0002-SO	30	1000	U	N/A	Yes
SCSB-040M-0002-SO	4-Nitrophenol	410	1000	ug/kg	U	8270	SCSB-082M-0002-SO	400	1000	U	N/A	Yes
SCSB-040M-0002-SO	Acenaphthene	24	410	ug/kg	U	8270	SCSB-082M-0002-SO	24	400	U	N/A	Yes
SCSB-040M-0002-SO	Acenaphthylene	24	410	ug/kg	U	8270	SCSB-082M-0002-SO	24	400	U	N/A	Yes
SCSB-040M-0002-SO	Anthracene	24	410	ug/kg	U	8270	SCSB-082M-0002-SO	24	400	U	N/A	Yes
SCSB-040M-0002-SO	Benzo(a)anthracene	25	410	ug/kg	U	8270	SCSB-082M-0002-SO	25	400	U	N/A	Yes
SCSB-040M-0002-SO	Benzo(a)pyrene	23	410	ug/kg	U	8270	SCSB-082M-0002-SO	23	400	U	N/A	Yes
SCSB-040M-0002-SO	Benzo(b)fluoranthene	25	410	ug/kg	U	8270	SCSB-082M-0002-SO	25	400	U	N/A	Yes
SCSB-040M-0002-SO	Benzo(g,h,i)perylene	22	410	ug/kg	U	8270	SCSB-082M-0002-SO	22	400	U	N/A	Yes
SCSB-040M-0002-SO	Benzo(k)fluoranthene	25	410	ug/kg	U	8270	SCSB-082M-0002-SO	25	400	U	N/A	Yes
SCSB-040M-0002-SO	Benzoic acid	300	1000	ug/kg	U	8270	SCSB-082M-0002-SO	290	990	U	N/A	Yes
SCSB-040M-0002-SO	Benzyl alcohol	84	1000	ug/kg	U	8270	SCSB-082M-0002-SO	84	1000	U	N/A	Yes
SCSB-040M-0002-SO	Bis(2-chloroethoxy)methane	23	410	ug/kg	U	8270	SCSB-082M-0002-SO	23	400	U	N/A	Yes
SCSB-040M-0002-SO	Bis(2-chloroethyl) ether	25	410	ug/kg	U	8270	SCSB-082M-0002-SO	25	400	U	N/A	Yes
SCSB-040M-0002-SO	Bis(2-chloroisopropyl) ether	30	410	ug/kg	U	8270	SCSB-082M-0002-SO	30	400	U	N/A	Yes
SCSB-040M-0002-SO	Bis(2-ethylhexyl) phthalate	850	1000	ug/kg	J	8270	SCSB-082M-0002-SO	88	1000	U	N/A	Yes
SCSB-040M-0002-SO	Butylbenzyl phthalate	74	410	ug/kg	U	8270	SCSB-082M-0002-SO	74	400	U	N/A	Yes
SCSB-040M-0002-SO	Carbazole	28	410	ug/kg	U	8270	SCSB-082M-0002-SO	28	400	U	N/A	Yes
SCSB-040M-0002-SO	Chrysene	25	410	ug/kg	U	8270	SCSB-082M-0002-SO	25	400	U	N/A	Yes
SCSB-040M-0002-SO	Dibenzo(a,h)anthracene	22	410	ug/kg	U	8270	SCSB-082M-0002-SO	22	400	U	N/A	Yes
SCSB-040M-0002-SO	Dibenzofuran	24	410	ug/kg	U	8270	SCSB-082M-0002-SO	24	400	U	N/A	Yes
SCSB-040M-0002-SO	Diethyl phthalate	65	410	ug/kg	U	8270	SCSB-082M-0002-SO	65	400	U	N/A	Yes
SCSB-040M-0002-SO	Dimethyl phthalate	64	410	ug/kg	U	8270	SCSB-082M-0002-SO	64	400	U	N/A	Yes
SCSB-040M-0002-SO	Di-n-butyl phthalate	120	410	ug/kg	J	8270	SCSB-082M-0002-SO	100	400	J	N/A	Yes
SCSB-040M-0002-SO	Di-n-octyl phthalate	60	410	ug/kg	U	8270	SCSB-082M-0002-SO	60	400	U	N/A	Yes
SCSB-040M-0002-SO	Fluoranthene	26	410	ug/kg	U	8270	SCSB-082M-0002-SO	26	400	U	N/A	Yes
SCSB-040M-0002-SO	Fluorene	25	410	ug/kg	U	8270	SCSB-082M-0002-SO	25	400	U	N/A	Yes
SCSB-040M-0002-SO	Hexachlorobenzene	28	410	ug/kg	U	8270	SCSB-082M-0002-SO	28	400	U	N/A	Yes
SCSB-040M-0002-SO	Hexachlorobutadiene	63	410	ug/kg	U	8270	SCSB-082M-0002-SO	63	400	U	N/A	Yes
SCSB-040M-0002-SO	Hexachlorocyclopentadiene	53	410	ug/kg	U	8270	SCSB-082M-0002-SO	53	400	U	N/A	Yes
SCSB-040M-0002-SO	Hexachloroethane	34	410	ug/kg	U	8270	SCSB-082M-0002-SO	33	400	U	N/A	Yes
SCSB-040M-0002-SO	Indeno(1,2,3-cd)pyrene	23	410	ug/kg	U	8270	SCSB-082M-0002-SO	23	400	U	N/A	Yes
SCSB-040M-0002-SO	Isophorone	62	410	ug/kg	J	8270	SCSB-082M-0002-SO	180	400	J	N/A	Yes
SCSB-040M-0002-SO	Naphthalene	21	410	ug/kg	U	8270	SCSB-082M-0002-SO	21	400	U	N/A	Yes
SCSB-040M-0002-SO	Nitrobenzene	60	410	ug/kg	U	8270	SCSB-082M-0002-SO	60	400	U	N/A	Yes
SCSB-040M-0002-SO	N-Nitroso-di-n-propylamine	71	410	ug/kg	U	8270	SCSB-082M-0002-SO	71	400	U	N/A	Yes

Sand Creek Field Duplicate Comparisons

Sample	Analyte	Result	LOQ	Units	Qualifier	Method	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
SCSB-040M-0002-SO	N-Nitrosodiphenylamine	51	810	ug/kg	U	8270	SCSB-082M-0002-SO	51	810	U	N/A	Yes
SCSB-040M-0002-SO	Pentachlorophenol	240	1000	ug/kg	U	8270	SCSB-082M-0002-SO	240	1000	U	N/A	Yes
SCSB-040M-0002-SO	Phenanthrene	26	410	ug/kg	U	8270	SCSB-082M-0002-SO	26	400	U	N/A	Yes
SCSB-040M-0002-SO	Phenol	160	510	ug/kg	U	8270	SCSB-082M-0002-SO	160	510	U	N/A	Yes
SCSB-040M-0002-SO	Pyrene	26	410	ug/kg	U	8270	SCSB-082M-0002-SO	26	400	U	N/A	Yes
SCSB-040M-0002-SO	1,3,5-Trinitrobenzene	0.13	0.44	mg/kg	U	8330B	SCSB-082M-0002-SO	0.13	0.44	U	N/A	Yes
SCSB-040M-0002-SO	1,3-Dinitrobenzene	0.08	0.44	mg/kg	U	8330B	SCSB-082M-0002-SO	0.079	0.44	U	N/A	Yes
SCSB-040M-0002-SO	2,4,6-Trinitrotoluene	0.089	0.44	mg/kg	U	8330B	SCSB-082M-0002-SO	0.089	0.44	U	N/A	Yes
SCSB-040M-0002-SO	2,4-Dinitrotoluene	0.2	0.44	mg/kg	U	8330B	SCSB-082M-0002-SO	0.2	0.44	U	N/A	Yes
SCSB-040M-0002-SO	2,6-Dinitrotoluene	0.07	0.5	mg/kg	U	8330B	SCSB-082M-0002-SO	0.069	0.5	U	N/A	Yes
SCSB-040M-0002-SO	2-Amino-4,6-dinitrotoluene	0.05	0.44	mg/kg	U	8330B	SCSB-082M-0002-SO	0.05	0.44	U	N/A	Yes
SCSB-040M-0002-SO	2-Nitrotoluene	0.089	0.44	mg/kg	U	8330B	SCSB-082M-0002-SO	0.089	0.44	U	N/A	Yes
SCSB-040M-0002-SO	3,5-Dinitroaniline	0.089	0.44	mg/kg	U	8330B	SCSB-082M-0002-SO	0.089	0.44	U	N/A	Yes
SCSB-040M-0002-SO	3-Nitrotoluene	0.07	0.44	mg/kg	U	8330B	SCSB-082M-0002-SO	0.069	0.44	U	N/A	Yes
SCSB-040M-0002-SO	4-Amino-2,6-dinitrotoluene	0.07	0.44	mg/kg	U	8330B	SCSB-082M-0002-SO	0.069	0.44	U	N/A	Yes
SCSB-040M-0002-SO	4-Nitrotoluene	0.07	0.5	mg/kg	U	8330B	SCSB-082M-0002-SO	0.069	0.5	U	N/A	Yes
SCSB-040M-0002-SO	HMX	0.12	0.44	mg/kg	U	8330B	SCSB-082M-0002-SO	0.12	0.44	U	N/A	Yes
SCSB-040M-0002-SO	Nitrobenzene	0.04	0.44	mg/kg	U	8330B	SCSB-082M-0002-SO	0.04	0.44	U	N/A	Yes
SCSB-040M-0002-SO	Nitroglycerin	0.5	1.5	mg/kg	U	8330B	SCSB-082M-0002-SO	0.5	1.5	U	N/A	Yes
SCSB-040M-0002-SO	PETN	0.5	1.5	mg/kg	U	8330B	SCSB-082M-0002-SO	0.5	1.5	U	N/A	Yes
SCSB-040M-0002-SO	RDX	0.16	0.44	mg/kg	U	8330B	SCSB-082M-0002-SO	0.16	0.44	U	N/A	Yes
SCSB-040M-0002-SO	Tetryl	0.089	0.44	mg/kg	U	8330B	SCSB-082M-0002-SO	0.089	0.44	U	N/A	Yes
SCSB-042M-0003-SO	Aluminum	14000	0.61	mg/kg	J-	6010	SCSB-083M-0003-SO	12400	0.12		12	N/A
SCSB-042M-0003-SO	Antimony	0.4	1.4	mg/kg	R	6010	SCSB-083M-0003-SO	0.081	0.27	U	N/A	N/A
SCSB-042M-0003-SO	Arsenic	15.4	2.3	mg/kg	J-	6010	SCSB-083M-0003-SO	15.1	0.46		2	N/A
SCSB-042M-0003-SO	Barium	69.3	0.14	mg/kg	J-	6010	SCSB-083M-0003-SO	31.2	0.027		76	N/A
SCSB-042M-0003-SO	Beryllium	0.49	0.061	mg/kg	J-	6010	SCSB-083M-0003-SO	0.54	0.024		10	N/A
SCSB-042M-0003-SO	Cadmium	0.03	0.11	mg/kg	UJ	6010	SCSB-083M-0003-SO	0.15	0.021		N/A	No
SCSB-042M-0003-SO	Calcium	5360	2.5	mg/kg	J-	6010	SCSB-083M-0003-SO	6050	0.51		12	N/A
SCSB-042M-0003-SO	Chromium	19.8	0.32	mg/kg	J-	6010	SCSB-083M-0003-SO	29.6	0.064		40	N/A
SCSB-042M-0003-SO	Cobalt	13	0.25	mg/kg	J-	6010	SCSB-083M-0003-SO	11.6	0.05		11	N/A
SCSB-042M-0003-SO	Copper	21	1	mg/kg	J-	6010	SCSB-083M-0003-SO	15.8	0.2		28	N/A
SCSB-042M-0003-SO	Iron	35600	5.1	mg/kg	J-	6010	SCSB-083M-0003-SO	31900	2		11	N/A
SCSB-042M-0003-SO	Lead	11.2	0.71	mg/kg	J-	6010	SCSB-083M-0003-SO	35.7	0.14		104	N/A
SCSB-042M-0003-SO	Magnesium	5490	2	mg/kg	J-	6010	SCSB-083M-0003-SO	6840	0.41		22	N/A
SCSB-042M-0003-SO	Manganese	451	0.25	mg/kg	J-	6010	SCSB-083M-0003-SO	276	0.051		48	N/A
SCSB-042M-0003-SO	Nickel	30.7	0.31	mg/kg	J-	6010	SCSB-083M-0003-SO	30.9	0.062		1	N/A
SCSB-042M-0003-SO	Potassium	1880	36	mg/kg	J-	6010	SCSB-083M-0003-SO	1460	36		25	N/A

Sand Creek Field Duplicate Comparisons

Sample	Analyte	Result	LOQ	Units	Qualifier	Method	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
SCSB-042M-0003-SO	Selenium	0.35	2.1	mg/kg	UJ	6010	SCSB-083M-0003-SO	0.071	0.43	U	N/A	Yes
SCSB-042M-0003-SO	Silver	0.086	0.28	mg/kg	U	6010	SCSB-083M-0003-SO	0.017	0.057	U	N/A	Yes
SCSB-042M-0003-SO	Sodium	92	13	mg/kg	J-	6010	SCSB-083M-0003-SO	71.9	13		25	N/A
SCSB-042M-0003-SO	Thallium	2.1	0.71	mg/kg	J-	6010	SCSB-083M-0003-SO	0.61	0.28		N/A	No
SCSB-042M-0003-SO	Vanadium	20.5	0.17	mg/kg	J-	6010	SCSB-083M-0003-SO	16.1	0.034		24	N/A
SCSB-042M-0003-SO	Zinc	67	0.61	mg/kg	J-	6010	SCSB-083M-0003-SO	56.2	0.12		18	N/A
SCSB-042M-0003-SO	Mercury	0.008	0.008	mg/kg	J-	7471	SCSB-083M-0003-SO	0.0051	0.008	J	N/A	Yes
SCSB-042M-0003-SO	1,2,4-Trichlorobenzene	21	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	21	400	U	N/A	Yes
SCSB-042M-0003-SO	1,2-Dichlorobenzene	24	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	24	400	U	N/A	Yes
SCSB-042M-0003-SO	1,3-Dichlorobenzene	20	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	20	400	U	N/A	Yes
SCSB-042M-0003-SO	1,4-Dichlorobenzene	19	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	19	400	U	N/A	Yes
SCSB-042M-0003-SO	2,4,5-Trichlorophenol	130	510	ug/kg	UJ	8270	SCSB-083M-0003-SO	130	510	U	N/A	Yes
SCSB-042M-0003-SO	2,4,6-Trichlorophenol	130	510	ug/kg	UJ	8270	SCSB-083M-0003-SO	130	510	U	N/A	Yes
SCSB-042M-0003-SO	2,4-Dichlorophenol	120	510	ug/kg	UJ	8270	SCSB-083M-0003-SO	120	510	U	N/A	Yes
SCSB-042M-0003-SO	2,4-Dimethylphenol	100	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	100	400	U	N/A	Yes
SCSB-042M-0003-SO	2,4-Dinitrophenol	700	2000	ug/kg	UJ	8270	SCSB-083M-0003-SO	700	2000	U	N/A	Yes
SCSB-042M-0003-SO	2,4-Dinitrotoluene	24	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	24	400	U	N/A	Yes
SCSB-042M-0003-SO	2,6-Dinitrotoluene	24	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	24	400	U	N/A	Yes
SCSB-042M-0003-SO	2-Chloronaphthalene	23	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	23	400	U	N/A	Yes
SCSB-042M-0003-SO	2-Chlorophenol	340	510	ug/kg	UJ	8270	SCSB-083M-0003-SO	340	510	U	N/A	Yes
SCSB-042M-0003-SO	2-Methyl-4,6-dinitrophenol	270	1000	ug/kg	UJ	8270	SCSB-083M-0003-SO	270	1000	U	N/A	Yes
SCSB-042M-0003-SO	2-Methylnaphthalene	49	400	ug/kg	J-	8270	SCSB-083M-0003-SO	58	400	J	N/A	Yes
SCSB-042M-0003-SO	2-Methylphenol	420	1000	ug/kg	UJ	8270	SCSB-083M-0003-SO	420	1000	U	N/A	Yes
SCSB-042M-0003-SO	2-Nitroaniline	23	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	23	400	U	N/A	Yes
SCSB-042M-0003-SO	2-Nitrophenol	280	510	ug/kg	UJ	8270	SCSB-083M-0003-SO	280	510	U	N/A	Yes
SCSB-042M-0003-SO	3,3'-Dichlorobenzidine	150	510	ug/kg	UJ	8270	SCSB-083M-0003-SO	150	510	U	N/A	Yes
SCSB-042M-0003-SO	3-Nitroaniline	22	1000	ug/kg	UJ	8270	SCSB-083M-0003-SO	22	1000	U	N/A	Yes
SCSB-042M-0003-SO	4-Bromophenyl phenyl ether	25	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	25	400	U	N/A	Yes
SCSB-042M-0003-SO	4-Chloro-3-methylphenol	380	510	ug/kg	UJ	8270	SCSB-083M-0003-SO	380	510	U	N/A	Yes
SCSB-042M-0003-SO	4-Chloroaniline	39	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	39	400	U	N/A	Yes
SCSB-042M-0003-SO	4-Chlorophenyl phenyl ether	26	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	26	400	U	N/A	Yes
SCSB-042M-0003-SO	4-Methylphenol	660	2000	ug/kg	UJ	8270	SCSB-083M-0003-SO	660	2000	U	N/A	Yes
SCSB-042M-0003-SO	4-Nitroaniline	30	1000	ug/kg	UJ	8270	SCSB-083M-0003-SO	30	1000	U	N/A	Yes
SCSB-042M-0003-SO	4-Nitrophenol	400	1000	ug/kg	UJ	8270	SCSB-083M-0003-SO	400	1000	U	N/A	Yes
SCSB-042M-0003-SO	Acenaphthene	24	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	24	400	U	N/A	Yes
SCSB-042M-0003-SO	Acenaphthylene	24	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	24	400	U	N/A	Yes
SCSB-042M-0003-SO	Anthracene	24	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	24	400	U	N/A	Yes
SCSB-042M-0003-SO	Benzo(a)anthracene	25	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	25	400	U	N/A	Yes

Sand Creek Field Duplicate Comparisons

Sample	Analyte	Result	LOQ	Units	Qualifier	Method	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
SCSB-042M-0003-SO	Benzo(a)pyrene	23	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	23	400	U	N/A	Yes
SCSB-042M-0003-SO	Benzo(b)fluoranthene	25	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	25	400	U	N/A	Yes
SCSB-042M-0003-SO	Benzo(g,h,i)perylene	22	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	22	400	U	N/A	Yes
SCSB-042M-0003-SO	Benzo(k)fluoranthene	25	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	25	400	U	N/A	Yes
SCSB-042M-0003-SO	Benzoic acid	290	990	ug/kg	UJ	8270	SCSB-083M-0003-SO	290	990	U	N/A	Yes
SCSB-042M-0003-SO	Benzyl alcohol	84	1000	ug/kg	UJ	8270	SCSB-083M-0003-SO	84	1000	U	N/A	Yes
SCSB-042M-0003-SO	Bis(2-chloroethoxy)methane	23	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	23	400	U	N/A	Yes
SCSB-042M-0003-SO	Bis(2-chloroethyl) ether	25	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	25	400	U	N/A	Yes
SCSB-042M-0003-SO	Bis(2-chloroisopropyl) ether	30	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	30	400	U	N/A	Yes
SCSB-042M-0003-SO	Bis(2-ethylhexyl) phthalate	88	1000	ug/kg	UJ	8270	SCSB-083M-0003-SO	150	1000	J	N/A	Yes
SCSB-042M-0003-SO	Butylbenzyl phthalate	74	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	74	400	U	N/A	Yes
SCSB-042M-0003-SO	Carbazole	28	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	28	400	U	N/A	Yes
SCSB-042M-0003-SO	Chrysene	25	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	25	400	U	N/A	Yes
SCSB-042M-0003-SO	Dibenzo(a,h)anthracene	22	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	22	400	U	N/A	Yes
SCSB-042M-0003-SO	Dibenzofuran	24	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	24	400	U	N/A	Yes
SCSB-042M-0003-SO	Diethyl phthalate	65	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	65	400	U	N/A	Yes
SCSB-042M-0003-SO	Dimethyl phthalate	64	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	64	400	U	N/A	Yes
SCSB-042M-0003-SO	Di-n-butyl phthalate	100	400	ug/kg	J-	8270	SCSB-083M-0003-SO	130	400	J	N/A	Yes
SCSB-042M-0003-SO	Di-n-octyl phthalate	60	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	60	400	U	N/A	Yes
SCSB-042M-0003-SO	Fluoranthene	26	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	26	400	U	N/A	Yes
SCSB-042M-0003-SO	Fluorene	25	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	25	400	U	N/A	Yes
SCSB-042M-0003-SO	Hexachlorobenzene	28	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	28	400	U	N/A	Yes
SCSB-042M-0003-SO	Hexachlorobutadiene	63	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	63	400	U	N/A	Yes
SCSB-042M-0003-SO	Hexachlorocyclopentadiene	53	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	53	400	U	N/A	Yes
SCSB-042M-0003-SO	Hexachloroethane	33	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	33	400	U	N/A	Yes
SCSB-042M-0003-SO	Indeno(1,2,3-cd)pyrene	23	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	23	400	U	N/A	Yes
SCSB-042M-0003-SO	Isophorone	51	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	200	400	J	N/A	Yes
SCSB-042M-0003-SO	Naphthalene	35	400	ug/kg	J-	8270	SCSB-083M-0003-SO	41	400	J	N/A	Yes
SCSB-042M-0003-SO	Nitrobenzene	60	400	ug/kg	R	8270	SCSB-083M-0003-SO	60	400	U	N/A	N/A
SCSB-042M-0003-SO	N-Nitroso-di-n-propylamine	71	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	71	400	U	N/A	Yes
SCSB-042M-0003-SO	N-Nitrosodiphenylamine	51	810	ug/kg	UJ	8270	SCSB-083M-0003-SO	51	810	U	N/A	Yes
SCSB-042M-0003-SO	Pentachlorophenol	240	1000	ug/kg	UJ	8270	SCSB-083M-0003-SO	240	1000	U	N/A	Yes
SCSB-042M-0003-SO	Phenanthrene	34	400	ug/kg	J-	8270	SCSB-083M-0003-SO	36	400	J	N/A	Yes
SCSB-042M-0003-SO	Phenol	160	510	ug/kg	UJ	8270	SCSB-083M-0003-SO	160	510	U	N/A	Yes
SCSB-042M-0003-SO	Pyrene	26	400	ug/kg	UJ	8270	SCSB-083M-0003-SO	26	400	U	N/A	Yes
SCSB-042M-0003-SO	1,3,5-Trinitrobenzene	0.13	0.44	mg/kg	UJ	8330B	SCSB-083M-0003-SO	0.13	0.44	U	N/A	Yes
SCSB-042M-0003-SO	1,3-Dinitrobenzene	0.08	0.44	mg/kg	UJ	8330B	SCSB-083M-0003-SO	0.08	0.44	U	N/A	Yes
SCSB-042M-0003-SO	2,4,6-Trinitrotoluene	0.09	0.44	mg/kg	UJ	8330B	SCSB-083M-0003-SO	0.09	0.44	U	N/A	Yes

Sand Creek Field Duplicate Comparisons

Sample	Analyte	Result	LOQ	Units	Qualifier	Method	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
SCSB-042M-0003-SO	2,4-Dinitrotoluene	0.2	0.44	mg/kg	R	8330B	SCSB-083M-0003-SO	0.2	0.44	U	N/A	N/A
SCSB-042M-0003-SO	2,6-Dinitrotoluene	0.07	0.5	mg/kg	R	8330B	SCSB-083M-0003-SO	0.07	0.5	U	N/A	N/A
SCSB-042M-0003-SO	2-Amino-4,6-dinitrotoluene	0.05	0.44	mg/kg	UJ	8330B	SCSB-083M-0003-SO	0.05	0.44	U	N/A	Yes
SCSB-042M-0003-SO	2-Nitrotoluene	0.09	0.44	mg/kg	UJ	8330B	SCSB-083M-0003-SO	0.09	0.44	U	N/A	Yes
SCSB-042M-0003-SO	3,5-Dinitroaniline	0.09	0.44	mg/kg	UJ	8330B	SCSB-083M-0003-SO	0.09	0.44	U	N/A	Yes
SCSB-042M-0003-SO	3-Nitrotoluene	0.07	0.44	mg/kg	UJ	8330B	SCSB-083M-0003-SO	0.07	0.44	U	N/A	Yes
SCSB-042M-0003-SO	4-Amino-2,6-dinitrotoluene	0.07	0.44	mg/kg	UJ	8330B	SCSB-083M-0003-SO	0.07	0.44	U	N/A	Yes
SCSB-042M-0003-SO	4-Nitrotoluene	0.07	0.5	mg/kg	UJ	8330B	SCSB-083M-0003-SO	0.07	0.5	U	N/A	Yes
SCSB-042M-0003-SO	HMX	0.12	0.44	mg/kg	UJ	8330B	SCSB-083M-0003-SO	0.12	0.44	U	N/A	Yes
SCSB-042M-0003-SO	Nitrobenzene	0.04	0.44	mg/kg	UJ	8330B	SCSB-083M-0003-SO	0.04	0.44	U	N/A	Yes
SCSB-042M-0003-SO	Nitroglycerin	0.5	1.5	mg/kg	UJ	8330B	SCSB-083M-0003-SO	0.5	1.5	U	N/A	Yes
SCSB-042M-0003-SO	PETN	0.5	1.5	mg/kg	UJ	8330B	SCSB-083M-0003-SO	0.5	1.5	U	N/A	Yes
SCSB-042M-0003-SO	RDX	0.16	0.44	mg/kg	UJ	8330B	SCSB-083M-0003-SO	0.16	0.44	U	N/A	Yes
SCSB-042M-0003-SO	Tetryl	0.09	0.44	mg/kg	UJ	8330B	SCSB-083M-0003-SO	0.09	0.44	U	N/A	Yes
SCSB-048M-0001-SO	Aluminum	13000	0.24	mg/kg	J-	6010	SCSB-084M-0001-SO	20800	0.61		46	N/A
SCSB-048M-0001-SO	Antimony	1.5	0.55	mg/kg	J-	6010	SCSB-084M-0001-SO	0.41	1.4	U	N/A	Yes
SCSB-048M-0001-SO	Arsenic	15	0.91	mg/kg	J	6010	SCSB-084M-0001-SO	23.4	2.3		44	N/A
SCSB-048M-0001-SO	Barium	137	0.055	mg/kg	J-	6010	SCSB-084M-0001-SO	228	0.14		50	N/A
SCSB-048M-0001-SO	Beryllium	1.5	0.024	mg/kg		6010	SCSB-084M-0001-SO	2.5	0.061		50	N/A
SCSB-048M-0001-SO	Cadmium	0.012	0.043	mg/kg	UJ	6010	SCSB-084M-0001-SO	0.03	0.11	U	N/A	Yes
SCSB-048M-0001-SO	Calcium	37100	1	mg/kg	J-	6010	SCSB-084M-0001-SO	64800	2.5		54	N/A
SCSB-048M-0001-SO	Chromium	109	0.13	mg/kg	J-	6010	SCSB-084M-0001-SO	36.2	0.32		100	N/A
SCSB-048M-0001-SO	Cobalt	6	0.099	mg/kg	J-	6010	SCSB-084M-0001-SO	8	0.25		29	N/A
SCSB-048M-0001-SO	Copper	44.8	0.4	mg/kg	J-	6010	SCSB-084M-0001-SO	63.3	1		34	N/A
SCSB-048M-0001-SO	Iron	22800	2	mg/kg		6010	SCSB-084M-0001-SO	28200	5.1		21	N/A
SCSB-048M-0001-SO	Lead	34.5	0.28	mg/kg	J+	6010	SCSB-084M-0001-SO	57.2	0.71		50	N/A
SCSB-048M-0001-SO	Magnesium	3580	0.81	mg/kg	J-	6010	SCSB-084M-0001-SO	6280	2		55	N/A
SCSB-048M-0001-SO	Manganese	1150	0.1	mg/kg	J-	6010	SCSB-084M-0001-SO	2010	0.25		54	N/A
SCSB-048M-0001-SO	Nickel	88.1	0.12	mg/kg	J-	6010	SCSB-084M-0001-SO	42.3	0.31		70	N/A
SCSB-048M-0001-SO	Potassium	1020	36	mg/kg	J-	6010	SCSB-084M-0001-SO	584	37		54	N/A
SCSB-048M-0001-SO	Selenium	1.1	0.85	mg/kg		6010	SCSB-084M-0001-SO	1.7	2.1	J	N/A	Yes
SCSB-048M-0001-SO	Silver	0.5	0.11	mg/kg		6010	SCSB-084M-0001-SO	0.74	0.28		N/A	Yes
SCSB-048M-0001-SO	Sodium	227	13	mg/kg	J-	6010	SCSB-084M-0001-SO	20.2	13		N/A	No
SCSB-048M-0001-SO	Thallium	1.6	0.28	mg/kg	J-	6010	SCSB-084M-0001-SO	2.1	0.71		N/A	Yes
SCSB-048M-0001-SO	Vanadium	13.3	0.069	mg/kg		6010	SCSB-084M-0001-SO	17.6	0.17		28	N/A
SCSB-048M-0001-SO	Zinc	41.3	0.24	mg/kg	J-	6010	SCSB-084M-0001-SO	56.3	0.61		31	N/A
SCSB-048M-0001-SO	Hexavalent Chromium	1.9	6.5	mg/kg	UJ	7196	SCSB-084M-0001-SO	1.9	6.5	U	N/A	Yes
SCSB-048M-0001-SO	Mercury	0.046	0.008	mg/kg		7471	SCSB-084M-0001-SO	0.041	0.008		11	N/A

Sand Creek Field Duplicate Comparisons

Sample	Analyte	Result	LOQ	Units	Qualifier	Method	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
SCSB-048M-0001-SO	4,4'-DDD	1.5	12	ug/kg	U	8081	SCSB-084M-0001-SO	1.5	12	U	N/A	Yes
SCSB-048M-0001-SO	4,4'-DDE	5.1	20	ug/kg	J	8081	SCSB-084M-0001-SO	4.6	20	J	N/A	Yes
SCSB-048M-0001-SO	4,4'-DDT	13	12	ug/kg		8081	SCSB-084M-0001-SO	11	12	J	N/A	Yes
SCSB-048M-0001-SO	Aldrin	2.5	12	ug/kg	U	8081	SCSB-084M-0001-SO	2.5	12	U	N/A	Yes
SCSB-048M-0001-SO	alpha-BHC	3.1	20	ug/kg	U	8081	SCSB-084M-0001-SO	3.1	20	U	N/A	Yes
SCSB-048M-0001-SO	alpha-Chlordane	1.5	20	ug/kg	U	8081	SCSB-084M-0001-SO	1.5	20	U	N/A	Yes
SCSB-048M-0001-SO	beta-BHC	3.1	20	ug/kg	U	8081	SCSB-084M-0001-SO	3.1	20	U	N/A	Yes
SCSB-048M-0001-SO	Chlordane (Technical)	20	380	ug/kg	U	8081	SCSB-084M-0001-SO	20	380	U	N/A	Yes
SCSB-048M-0001-SO	delta-BHC	1.5	12	ug/kg	U	8081	SCSB-084M-0001-SO	1.5	12	U	N/A	Yes
SCSB-048M-0001-SO	Dieldrin	1.5	12	ug/kg	U	8081	SCSB-084M-0001-SO	1.5	12	U	N/A	Yes
SCSB-048M-0001-SO	Endosulfan I	3.6	12	ug/kg	U	8081	SCSB-084M-0001-SO	3.6	12	U	N/A	Yes
SCSB-048M-0001-SO	Endosulfan II	3.6	12	ug/kg	J	8081	SCSB-084M-0001-SO	3.6	12	J	N/A	Yes
SCSB-048M-0001-SO	Endosulfan sulfate	4.6	20	ug/kg	U	8081	SCSB-084M-0001-SO	4.6	20	U	N/A	Yes
SCSB-048M-0001-SO	Endrin	2	12	ug/kg	UJ	8081	SCSB-084M-0001-SO	2	12	U	N/A	Yes
SCSB-048M-0001-SO	Endrin aldehyde	5.6	20	ug/kg	U	8081	SCSB-084M-0001-SO	5.6	20	U	N/A	Yes
SCSB-048M-0001-SO	Endrin ketone	4.1	12	ug/kg	U	8081	SCSB-084M-0001-SO	4.1	12	U	N/A	Yes
SCSB-048M-0001-SO	GAMMA-BHC	2.5	12	ug/kg	U	8081	SCSB-084M-0001-SO	2.5	12	U	N/A	Yes
SCSB-048M-0001-SO	gamma-Chlordane	1.5	20	ug/kg	U	8081	SCSB-084M-0001-SO	1.5	20	U	N/A	Yes
SCSB-048M-0001-SO	Heptachlor	2	12	ug/kg	U	8081	SCSB-084M-0001-SO	2	12	U	N/A	Yes
SCSB-048M-0001-SO	Heptachlor epoxide	2.5	20	ug/kg	U	8081	SCSB-084M-0001-SO	2.5	20	U	N/A	Yes
SCSB-048M-0001-SO	Methoxychlor	3.6	12	ug/kg	U	8081	SCSB-084M-0001-SO	3.6	12	U	N/A	Yes
SCSB-048M-0001-SO	Toxaphene	25	250	ug/kg	U	8081	SCSB-084M-0001-SO	25	250	U	N/A	Yes
SCSB-048M-0001-SO	Aroclor 1016	10	51	ug/kg	U	8082	SCSB-084M-0001-SO	10	51	U	N/A	Yes
SCSB-048M-0001-SO	Aroclor 1221	20	51	ug/kg	U	8082	SCSB-084M-0001-SO	20	51	U	N/A	Yes
SCSB-048M-0001-SO	Aroclor 1232	27	51	ug/kg	U	8082	SCSB-084M-0001-SO	28	51	U	N/A	Yes
SCSB-048M-0001-SO	Aroclor 1242	29	51	ug/kg	U	8082	SCSB-084M-0001-SO	30	51	U	N/A	Yes
SCSB-048M-0001-SO	Aroclor 1248	29	51	ug/kg	U	8082	SCSB-084M-0001-SO	30	51	U	N/A	Yes
SCSB-048M-0001-SO	Aroclor 1254	23	51	ug/kg	U	8082	SCSB-084M-0001-SO	23	51	U	N/A	Yes
SCSB-048M-0001-SO	Aroclor 1260	12	51	ug/kg	U	8082	SCSB-084M-0001-SO	12	51	U	N/A	Yes
SCSB-048M-0001-SO	Aroclor 1262	21	51	ug/kg	U	8082	SCSB-084M-0001-SO	21	51	U	N/A	Yes
SCSB-048M-0001-SO	Aroclor 1268	28	51	ug/kg	U	8082	SCSB-084M-0001-SO	29	51	U	N/A	Yes
SCSB-048M-0001-SO	1,2,4-Trichlorobenzene	21	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	21	410	U	N/A	Yes
SCSB-048M-0001-SO	1,2-Dichlorobenzene	24	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	24	410	U	N/A	Yes
SCSB-048M-0001-SO	1,3-Dichlorobenzene	20	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	20	410	U	N/A	Yes
SCSB-048M-0001-SO	1,4-Dichlorobenzene	19	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	19	410	U	N/A	Yes
SCSB-048M-0001-SO	2,4,5-Trichlorophenol	130	500	ug/kg	UJ	8270	SCSB-084M-0001-SO	130	510	U	N/A	Yes
SCSB-048M-0001-SO	2,4,6-Trichlorophenol	130	500	ug/kg	UJ	8270	SCSB-084M-0001-SO	130	510	U	N/A	Yes
SCSB-048M-0001-SO	2,4-Dichlorophenol	120	500	ug/kg	UJ	8270	SCSB-084M-0001-SO	120	510	U	N/A	Yes

Sand Creek Field Duplicate Comparisons

Sample	Analyte	Result	LOQ	Units	Qualifier	Method	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
SCSB-048M-0001-SO	2,4-Dimethylphenol	100	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	100	410	U	N/A	Yes
SCSB-048M-0001-SO	2,4-Dinitrophenol	700	2000	ug/kg	R	8270	SCSB-084M-0001-SO	700	2000	U	N/A	N/A
SCSB-048M-0001-SO	2,4-Dinitrotoluene	24	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	24	410	U	N/A	Yes
SCSB-048M-0001-SO	2,6-Dinitrotoluene	24	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	24	410	U	N/A	Yes
SCSB-048M-0001-SO	2-Chloronaphthalene	23	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	23	410	U	N/A	Yes
SCSB-048M-0001-SO	2-Chlorophenol	340	500	ug/kg	UJ	8270	SCSB-084M-0001-SO	350	510	U	N/A	Yes
SCSB-048M-0001-SO	2-Methyl-4,6-dinitrophenol	270	1000	ug/kg	R	8270	SCSB-084M-0001-SO	270	1000	U	N/A	N/A
SCSB-048M-0001-SO	2-Methylnaphthalene	490	400	ug/kg	J-	8270	SCSB-084M-0001-SO	500	410		N/A	Yes
SCSB-048M-0001-SO	2-Methylphenol	420	1000	ug/kg	UJ	8270	SCSB-084M-0001-SO	430	1000	U	N/A	Yes
SCSB-048M-0001-SO	2-Nitroaniline	23	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	23	410	U	N/A	Yes
SCSB-048M-0001-SO	2-Nitrophenol	280	500	ug/kg	UJ	8270	SCSB-084M-0001-SO	280	510	U	N/A	Yes
SCSB-048M-0001-SO	3,3'-Dichlorobenzidine	150	500	ug/kg	UJ	8270	SCSB-084M-0001-SO	150	510	U	N/A	Yes
SCSB-048M-0001-SO	3-Nitroaniline	22	1000	ug/kg	UJ	8270	SCSB-084M-0001-SO	22	1000	U	N/A	Yes
SCSB-048M-0001-SO	4-Bromophenyl phenyl ether	25	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	25	410	U	N/A	Yes
SCSB-048M-0001-SO	4-Chloro-3-methylphenol	380	500	ug/kg	UJ	8270	SCSB-084M-0001-SO	390	510	U	N/A	Yes
SCSB-048M-0001-SO	4-Chloroaniline	39	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	40	410	U	N/A	Yes
SCSB-048M-0001-SO	4-Chlorophenyl phenyl ether	26	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	26	410	U	N/A	Yes
SCSB-048M-0001-SO	4-Methylphenol	660	2000	ug/kg	UJ	8270	SCSB-084M-0001-SO	660	2000	U	N/A	Yes
SCSB-048M-0001-SO	4-Nitroaniline	30	1000	ug/kg	UJ	8270	SCSB-084M-0001-SO	30	1000	U	N/A	Yes
SCSB-048M-0001-SO	4-Nitrophenol	400	1000	ug/kg	UJ	8270	SCSB-084M-0001-SO	410	1000	U	N/A	Yes
SCSB-048M-0001-SO	Acenaphthene	24	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	24	410	U	N/A	Yes
SCSB-048M-0001-SO	Acenaphthylene	34	400	ug/kg	J-	8270	SCSB-084M-0001-SO	47	410	J	N/A	Yes
SCSB-048M-0001-SO	Anthracene	65	400	ug/kg	J-	8270	SCSB-084M-0001-SO	73	410	J	N/A	Yes
SCSB-048M-0001-SO	Benzo(a)anthracene	120	400	ug/kg	J-	8270	SCSB-084M-0001-SO	160	410	J	N/A	Yes
SCSB-048M-0001-SO	Benzo(a)pyrene	150	400	ug/kg	J-	8270	SCSB-084M-0001-SO	210	410	J	N/A	Yes
SCSB-048M-0001-SO	Benzo(b)fluoranthene	410	400	ug/kg	J-	8270	SCSB-084M-0001-SO	570	410		N/A	Yes
SCSB-048M-0001-SO	Benzo(g,h,i)perylene	22	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	49	410	J	N/A	Yes
SCSB-048M-0001-SO	Benzo(k)fluoranthene	160	400	ug/kg	J	8270	SCSB-084M-0001-SO	260	410	J	N/A	Yes
SCSB-048M-0001-SO	Benzoic acid	290	2000	ug/kg	UJ	8270	SCSB-084M-0001-SO	300	2000	U	N/A	Yes
SCSB-048M-0001-SO	Benzyl alcohol	84	1000	ug/kg	UJ	8270	SCSB-084M-0001-SO	84	1000	U	N/A	Yes
SCSB-048M-0001-SO	Bis(2-chloroethoxy)methane	23	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	23	410	U	N/A	Yes
SCSB-048M-0001-SO	Bis(2-chloroethyl) ether	25	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	25	410	U	N/A	Yes
SCSB-048M-0001-SO	Bis(2-chloroisopropyl) ether	30	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	30	410	U	N/A	Yes
SCSB-048M-0001-SO	Bis(2-ethylhexyl) phthalate	88	1000	ug/kg	UJ	8270	SCSB-084M-0001-SO	88	1000	U	N/A	Yes
SCSB-048M-0001-SO	Butylbenzyl phthalate	74	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	74	410	U	N/A	Yes
SCSB-048M-0001-SO	Carbazole	35	400	ug/kg	J-	8270	SCSB-084M-0001-SO	37	410	J	N/A	Yes
SCSB-048M-0001-SO	Chrysene	180	400	ug/kg	J-	8270	SCSB-084M-0001-SO	240	410	J	N/A	Yes
SCSB-048M-0001-SO	Dibenzo(a,h)anthracene	22	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	22	410	U	N/A	Yes

Sand Creek Field Duplicate Comparisons

Sample	Analyte	Result	LOQ	Units	Qualifier	Method	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
SCSB-048M-0001-SO	Dibenzofuran	93	400	ug/kg	J-	8270	SCSB-084M-0001-SO	98	410	J	N/A	Yes
SCSB-048M-0001-SO	Diethyl phthalate	65	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	65	410	U	N/A	Yes
SCSB-048M-0001-SO	Dimethyl phthalate	64	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	64	410	U	N/A	Yes
SCSB-048M-0001-SO	Di-n-butyl phthalate	120	400	ug/kg	J-	8270	SCSB-084M-0001-SO	120	410	J	N/A	Yes
SCSB-048M-0001-SO	Di-n-octyl phthalate	60	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	60	410	U	N/A	Yes
SCSB-048M-0001-SO	Fluoranthene	240	400	ug/kg	J-	8270	SCSB-084M-0001-SO	280	410	J	N/A	Yes
SCSB-048M-0001-SO	Fluorene	41	400	ug/kg	J-	8270	SCSB-084M-0001-SO	47	410	J	N/A	Yes
SCSB-048M-0001-SO	Hexachlorobenzene	28	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	28	410	U	N/A	Yes
SCSB-048M-0001-SO	Hexachlorobutadiene	63	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	63	410	U	N/A	Yes
SCSB-048M-0001-SO	Hexachlorocyclopentadiene	52	400	ug/kg	R	8270	SCSB-084M-0001-SO	53	410	U	N/A	N/A
SCSB-048M-0001-SO	Hexachloroethane	33	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	34	410	U	N/A	Yes
SCSB-048M-0001-SO	Indeno(1,2,3-cd)pyrene	49	400	ug/kg	J	8270	SCSB-084M-0001-SO	52	410	J	N/A	Yes
SCSB-048M-0001-SO	Isophorone	50	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	51	410	U	N/A	Yes
SCSB-048M-0001-SO	Naphthalene	330	400	ug/kg	J-	8270	SCSB-084M-0001-SO	360	410	J	N/A	Yes
SCSB-048M-0001-SO	Nitrobenzene	60	400	ug/kg	R	8270	SCSB-084M-0001-SO	60	410	U	N/A	N/A
SCSB-048M-0001-SO	N-Nitroso-di-n-propylamine	71	400	ug/kg	UJ	8270	SCSB-084M-0001-SO	71	410	U	N/A	Yes
SCSB-048M-0001-SO	N-Nitrosodiphenylamine	50	810	ug/kg	UJ	8270	SCSB-084M-0001-SO	51	810	U	N/A	Yes
SCSB-048M-0001-SO	Pentachlorophenol	240	1000	ug/kg	UJ	8270	SCSB-084M-0001-SO	240	1000	U	N/A	Yes
SCSB-048M-0001-SO	Phenanthrene	280	400	ug/kg	J-	8270	SCSB-084M-0001-SO	270	410	J	N/A	Yes
SCSB-048M-0001-SO	Phenol	160	500	ug/kg	UJ	8270	SCSB-084M-0001-SO	160	510	U	N/A	Yes
SCSB-048M-0001-SO	Pyrene	240	400	ug/kg	J-	8270	SCSB-084M-0001-SO	270	410	J	N/A	Yes
SCSB-048M-0001-SO	1,3,5-Trinitrobenzene	0.13	0.44	mg/kg	UJ	8330B	SCSB-084M-0001-SO	0.13	0.44	U	N/A	Yes
SCSB-048M-0001-SO	1,3-Dinitrobenzene	0.08	0.44	mg/kg	UJ	8330B	SCSB-084M-0001-SO	0.08	0.44	U	N/A	Yes
SCSB-048M-0001-SO	2,4,6-Trinitrotoluene	0.09	0.44	mg/kg	UJ	8330B	SCSB-084M-0001-SO	0.09	0.44	U	N/A	Yes
SCSB-048M-0001-SO	2,4-Dinitrotoluene	0.2	0.44	mg/kg	R	8330B	SCSB-084M-0001-SO	0.2	0.44	U	N/A	N/A
SCSB-048M-0001-SO	2,6-Dinitrotoluene	0.07	0.5	mg/kg	R	8330B	SCSB-084M-0001-SO	0.07	0.5	U	N/A	N/A
SCSB-048M-0001-SO	2-Amino-4,6-dinitrotoluene	0.05	0.44	mg/kg	UJ	8330B	SCSB-084M-0001-SO	0.05	0.44	U	N/A	Yes
SCSB-048M-0001-SO	2-Nitrotoluene	0.09	0.44	mg/kg	UJ	8330B	SCSB-084M-0001-SO	0.09	0.44	U	N/A	Yes
SCSB-048M-0001-SO	3,5-Dinitroaniline	0.09	0.44	mg/kg	UJ	8330B	SCSB-084M-0001-SO	0.09	0.44	U	N/A	Yes
SCSB-048M-0001-SO	3-Nitrotoluene	0.07	0.44	mg/kg	UJ	8330B	SCSB-084M-0001-SO	0.07	0.44	U	N/A	Yes
SCSB-048M-0001-SO	4-Amino-2,6-dinitrotoluene	0.07	0.44	mg/kg	UJ	8330B	SCSB-084M-0001-SO	0.07	0.44	U	N/A	Yes
SCSB-048M-0001-SO	4-Nitrotoluene	0.07	0.5	mg/kg	UJ	8330B	SCSB-084M-0001-SO	0.07	0.5	U	N/A	Yes
SCSB-048M-0001-SO	HMX	0.12	0.44	mg/kg	UJ	8330B	SCSB-084M-0001-SO	0.12	0.44	U	N/A	Yes
SCSB-048M-0001-SO	Nitrobenzene	0.04	0.44	mg/kg	UJ	8330B	SCSB-084M-0001-SO	0.04	0.44	U	N/A	Yes
SCSB-048M-0001-SO	Nitroglycerin	0.5	1.5	mg/kg	UJ	8330B	SCSB-084M-0001-SO	0.5	1.5	U	N/A	Yes
SCSB-048M-0001-SO	Nitroguanidine	0.059	0.16	mg/kg	UJ	8330B	SCSB-084M-0001-SO	0.059	0.16	U	N/A	Yes
SCSB-048M-0001-SO	PETN	0.5	1.5	mg/kg	UJ	8330B	SCSB-084M-0001-SO	0.5	1.5	U	N/A	Yes
SCSB-048M-0001-SO	RDX	0.16	0.44	mg/kg	UJ	8330B	SCSB-084M-0001-SO	0.16	0.44	U	N/A	Yes

Sand Creek Field Duplicate Comparisons

Sample	Analyte	Result	LOQ	Units	Qualifier	Method	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
SCSB-048M-0001-SO	Tetryl	0.09	0.44	mg/kg	UJ	8330B	SCSB-084M-0001-SO	0.09	0.44	U	N/A	Yes
SCSB-048M-0001-SO	Cyanide	0.76	0.38	mg/kg		9012A	SCSB-084M-0001-SO	0.64	0.39		N/A	Yes
SCSB-048M-0001-SO	Nitrocellulose	7	23	mg/kg	U	9056M	SCSB-084M-0001-SO	7	23	U	N/A	Yes
SCSB-048D-0001-SO	1,1,1-Trichloroethane	11	53	ug/kg	U	8260	SCSB-084D-0001-SO	10	50	U	N/A	Yes
SCSB-048D-0001-SO	1,1,2,2-Tetrachloroethane	6.3	53	ug/kg	U	8260	SCSB-084D-0001-SO	6	50	U	N/A	Yes
SCSB-048D-0001-SO	1,1,2-Trichloroethane	8.5	53	ug/kg	U	8260	SCSB-084D-0001-SO	8	50	U	N/A	Yes
SCSB-048D-0001-SO	1,1-Dichloroethane	12	53	ug/kg	U	8260	SCSB-084D-0001-SO	11	50	U	N/A	Yes
SCSB-048D-0001-SO	1,1-Dichloroethene	17	53	ug/kg	U	8260	SCSB-084D-0001-SO	16	50	U	N/A	Yes
SCSB-048D-0001-SO	1,2-Dibromoethane	11	53	ug/kg	U	8260	SCSB-084D-0001-SO	10	50	U	N/A	Yes
SCSB-048D-0001-SO	1,2-Dichloroethane	13	53	ug/kg	U	8260	SCSB-084D-0001-SO	12	50	U	N/A	Yes
SCSB-048D-0001-SO	1,2-Dichloropropane	7.4	53	ug/kg	U	8260	SCSB-084D-0001-SO	7	50	U	N/A	Yes
SCSB-048D-0001-SO	2-Butanone	110	530	ug/kg	U	8260	SCSB-084D-0001-SO	100	500	U	N/A	Yes
SCSB-048D-0001-SO	2-Hexanone	72	530	ug/kg	U	8260	SCSB-084D-0001-SO	68	500	U	N/A	Yes
SCSB-048D-0001-SO	4-Methyl-2-pentanone	87	530	ug/kg	U	8260	SCSB-084D-0001-SO	82	500	U	N/A	Yes
SCSB-048D-0001-SO	Acetone	67	1100	ug/kg	U	8260	SCSB-084D-0001-SO	63	1000	U	N/A	Yes
SCSB-048D-0001-SO	Benzene	60	53	ug/kg		8260	SCSB-084D-0001-SO	5	50	U	N/A	No
SCSB-048D-0001-SO	Bromochloromethane	8.5	53	ug/kg	U	8260	SCSB-084D-0001-SO	8	50	U	N/A	Yes
SCSB-048D-0001-SO	Bromodichloromethane	9.5	53	ug/kg	U	8260	SCSB-084D-0001-SO	9	50	U	N/A	Yes
SCSB-048D-0001-SO	Bromoform	6.3	53	ug/kg	U	8260	SCSB-084D-0001-SO	6	50	U	N/A	Yes
SCSB-048D-0001-SO	Bromomethane	32	110	ug/kg	U	8260	SCSB-084D-0001-SO	30	100	U	N/A	Yes
SCSB-048D-0001-SO	Carbon disulfide	16	110	ug/kg	UJ	8260	SCSB-084D-0001-SO	15	100	U	N/A	Yes
SCSB-048D-0001-SO	Carbon tetrachloride	12	53	ug/kg	U	8260	SCSB-084D-0001-SO	11	50	U	N/A	Yes
SCSB-048D-0001-SO	Chlorobenzene	8.5	53	ug/kg	U	8260	SCSB-084D-0001-SO	8	50	U	N/A	Yes
SCSB-048D-0001-SO	Chloroethane	20	110	ug/kg	U	8260	SCSB-084D-0001-SO	19	100	U	N/A	Yes
SCSB-048D-0001-SO	Chloroform	9.5	53	ug/kg	U	8260	SCSB-084D-0001-SO	9	50	U	N/A	Yes
SCSB-048D-0001-SO	Chloromethane	26	110	ug/kg	U	8260	SCSB-084D-0001-SO	25	100	U	N/A	Yes
SCSB-048D-0001-SO	cis-1,2-Dichloroethene	11	53	ug/kg	U	8260	SCSB-084D-0001-SO	10	50	U	N/A	Yes
SCSB-048D-0001-SO	cis-1,3-Dichloropropene	11	53	ug/kg	U	8260	SCSB-084D-0001-SO	10	50	U	N/A	Yes
SCSB-048D-0001-SO	Dibromochloromethane	8.5	53	ug/kg	UJ	8260	SCSB-084D-0001-SO	8	50	U	N/A	Yes
SCSB-048D-0001-SO	Ethylbenzene	150	53	ug/kg		8260	SCSB-084D-0001-SO	21	50	J	N/A	No
SCSB-048D-0001-SO	m,p-Xylenes	360	110	ug/kg		8260	SCSB-084D-0001-SO	63	100	J	N/A	No
SCSB-048D-0001-SO	Methylene chloride	42	110	ug/kg	U	8260	SCSB-084D-0001-SO	40	100	U	N/A	Yes
SCSB-048D-0001-SO	o-Xylene	350	53	ug/kg		8260	SCSB-084D-0001-SO	55	50		N/A	No
SCSB-048D-0001-SO	Styrene	6.3	53	ug/kg	U	8260	SCSB-084D-0001-SO	6	50	U	N/A	Yes
SCSB-048D-0001-SO	Tetrachloroethene	8.5	53	ug/kg	U	8260	SCSB-084D-0001-SO	8	50	U	N/A	Yes
SCSB-048D-0001-SO	Toluene	310	53	ug/kg		8260	SCSB-084D-0001-SO	37	50	J	N/A	No
SCSB-048D-0001-SO	trans-1,2-Dichloroethene	12	53	ug/kg	U	8260	SCSB-084D-0001-SO	11	50	U	N/A	Yes
SCSB-048D-0001-SO	trans-1,3-Dichloropropene	7.4	110	ug/kg	UJ	8260	SCSB-084D-0001-SO	7	100	U	N/A	Yes

Sand Creek Field Duplicate Comparisons

Sample	Analyte	Result	LOQ	Units	Qualifier	Method	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
SCSB-048D-0001-SO	Trichloroethene	11	53	ug/kg	U	8260	SCSB-084D-0001-SO	10	50	U	N/A	Yes
SCSB-048D-0001-SO	Vinyl chloride	15	53	ug/kg	U	8260	SCSB-084D-0001-SO	14	50	U	N/A	Yes
SCSS-058M-0001-SO	Aluminum	10400	0.24	mg/kg	J-	6010	SCSS-085M-0001-SO	9250	0.25		12	N/A
SCSS-058M-0001-SO	Antimony	3.1	0.55	mg/kg	J-	6010	SCSS-085M-0001-SO	3.3	0.55		6	N/A
SCSS-058M-0001-SO	Arsenic	4.5	0.92	mg/kg	J	6010	SCSS-085M-0001-SO	5.3	0.92		N/A	Yes
SCSS-058M-0001-SO	Barium	127	0.055	mg/kg	J-	6010	SCSS-085M-0001-SO	83.3	0.055		42	N/A
SCSS-058M-0001-SO	Beryllium	0.66	0.024	mg/kg		6010	SCSS-085M-0001-SO	0.51	0.025		26	N/A
SCSS-058M-0001-SO	Cadmium	1.9	0.043	mg/kg	J-	6010	SCSS-085M-0001-SO	1.7	0.043		11	N/A
SCSS-058M-0001-SO	Calcium	21500	1	mg/kg	J-	6010	SCSS-085M-0001-SO	10400	1		70	N/A
SCSS-058M-0001-SO	Chromium	143	0.13	mg/kg	J-	6010	SCSS-085M-0001-SO	152	0.13		6	N/A
SCSS-058M-0001-SO	Cobalt	6.7	0.1	mg/kg	J-	6010	SCSS-085M-0001-SO	6.9	0.1		3	N/A
SCSS-058M-0001-SO	Copper	33.7	0.41	mg/kg	J-	6010	SCSS-085M-0001-SO	32.3	0.41		4	N/A
SCSS-058M-0001-SO	Iron	27100	2	mg/kg		6010	SCSS-085M-0001-SO	26400	2		3	N/A
SCSS-058M-0001-SO	Lead	139	0.29	mg/kg	J+	6010	SCSS-085M-0001-SO	120	0.29		15	N/A
SCSS-058M-0001-SO	Magnesium	3930	0.82	mg/kg	J-	6010	SCSS-085M-0001-SO	2870	0.82		31	N/A
SCSS-058M-0001-SO	Manganese	729	0.1	mg/kg	J-	6010	SCSS-085M-0001-SO	516	0.1		34	N/A
SCSS-058M-0001-SO	Nickel	21.7	0.12	mg/kg	J-	6010	SCSS-085M-0001-SO	22.9	0.12		5	N/A
SCSS-058M-0001-SO	Potassium	1180	37	mg/kg	J-	6010	SCSS-085M-0001-SO	1120	37		5	N/A
SCSS-058M-0001-SO	Selenium	0.83	0.86	mg/kg	J	6010	SCSS-085M-0001-SO	0.8	0.86	J	N/A	Yes
SCSS-058M-0001-SO	Silver	3.8	0.11	mg/kg		6010	SCSS-085M-0001-SO	4.4	0.11		15	N/A
SCSS-058M-0001-SO	Sodium	99.6	13	mg/kg	J-	6010	SCSS-085M-0001-SO	64.7	13		N/A	No
SCSS-058M-0001-SO	Thallium	1.7	0.29	mg/kg	J-	6010	SCSS-085M-0001-SO	1.7	0.29		0	N/A
SCSS-058M-0001-SO	Vanadium	14.8	0.069	mg/kg		6010	SCSS-085M-0001-SO	15.4	0.07		4	N/A
SCSS-058M-0001-SO	Zinc	269	0.24	mg/kg	J-	6010	SCSS-085M-0001-SO	252	0.25		7	N/A
SCSS-058M-0001-SO	Mercury	11.1	0.81	mg/kg		7471	SCSS-085M-0001-SO	11.1	0.81		0	N/A
SCSS-058M-0001-SO	1,2,4-Trichlorobenzene	21	410	ug/kg	UJ	8270	SCSS-085M-0001-SO	21	410	U	N/A	Yes
SCSS-058M-0001-SO	1,2-Dichlorobenzene	24	410	ug/kg	UJ	8270	SCSS-085M-0001-SO	24	410	U	N/A	Yes
SCSS-058M-0001-SO	1,3-Dichlorobenzene	20	410	ug/kg	UJ	8270	SCSS-085M-0001-SO	20	410	U	N/A	Yes
SCSS-058M-0001-SO	1,4-Dichlorobenzene	22	410	ug/kg	J-	8270	SCSS-085M-0001-SO	19	410	J	N/A	Yes
SCSS-058M-0001-SO	2,4,5-Trichlorophenol	130	510	ug/kg	UJ	8270	SCSS-085M-0001-SO	130	510	U	N/A	Yes
SCSS-058M-0001-SO	2,4,6-Trichlorophenol	130	510	ug/kg	UJ	8270	SCSS-085M-0001-SO	130	510	U	N/A	Yes
SCSS-058M-0001-SO	2,4-Dichlorophenol	120	510	ug/kg	UJ	8270	SCSS-085M-0001-SO	120	510	U	N/A	Yes
SCSS-058M-0001-SO	2,4-Dimethylphenol	100	410	ug/kg	UJ	8270	SCSS-085M-0001-SO	100	410	U	N/A	Yes
SCSS-058M-0001-SO	2,4-Dinitrophenol	700	2000	ug/kg	UJ	8270	SCSS-085M-0001-SO	700	2000	U	N/A	Yes
SCSS-058M-0001-SO	2,4-Dinitrotoluene	24	410	ug/kg	UJ	8270	SCSS-085M-0001-SO	24	410	U	N/A	Yes
SCSS-058M-0001-SO	2,6-Dinitrotoluene	24	410	ug/kg	UJ	8270	SCSS-085M-0001-SO	24	410	U	N/A	Yes
SCSS-058M-0001-SO	2-Chloronaphthalene	23	410	ug/kg	UJ	8270	SCSS-085M-0001-SO	23	410	U	N/A	Yes
SCSS-058M-0001-SO	2-Chlorophenol	350	510	ug/kg	UJ	8270	SCSS-085M-0001-SO	350	510	U	N/A	Yes

Sand Creek Field Duplicate Comparisons

Sample	Analyte	Result	LOQ	Units	Qualifier	Method	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
SCSS-058M-0001-SO	2-Methyl-4,6-dinitrophenol	270	1000	ug/kg	UJ	8270	SCSS-085M-0001-SO	280	1000	U	N/A	Yes
SCSS-058M-0001-SO	2-Methylnaphthalene	370	410	ug/kg	J-	8270	SCSS-085M-0001-SO	320	410	J	N/A	Yes
SCSS-058M-0001-SO	2-Methylphenol	430	1000	ug/kg	UJ	8270	SCSS-085M-0001-SO	430	1000	U	N/A	Yes
SCSS-058M-0001-SO	2-Nitroaniline	23	410	ug/kg	UJ	8270	SCSS-085M-0001-SO	23	410	U	N/A	Yes
SCSS-058M-0001-SO	2-Nitrophenol	280	510	ug/kg	UJ	8270	SCSS-085M-0001-SO	290	510	U	N/A	Yes
SCSS-058M-0001-SO	3,3'-Dichlorobenzidine	150	510	ug/kg	UJ	8270	SCSS-085M-0001-SO	150	510	U	N/A	Yes
SCSS-058M-0001-SO	3-Nitroaniline	22	1000	ug/kg	UJ	8270	SCSS-085M-0001-SO	22	1000	U	N/A	Yes
SCSS-058M-0001-SO	4-Bromophenyl phenyl ether	25	410	ug/kg	UJ	8270	SCSS-085M-0001-SO	25	410	U	N/A	Yes
SCSS-058M-0001-SO	4-Chloro-3-methylphenol	390	510	ug/kg	UJ	8270	SCSS-085M-0001-SO	390	510	U	N/A	Yes
SCSS-058M-0001-SO	4-Chloroaniline	40	410	ug/kg	UJ	8270	SCSS-085M-0001-SO	40	410	U	N/A	Yes
SCSS-058M-0001-SO	4-Chlorophenyl phenyl ether	26	410	ug/kg	UJ	8270	SCSS-085M-0001-SO	27	410	U	N/A	Yes
SCSS-058M-0001-SO	4-Methylphenol	660	2000	ug/kg	UJ	8270	SCSS-085M-0001-SO	660	2000	U	N/A	Yes
SCSS-058M-0001-SO	4-Nitroaniline	31	1000	ug/kg	UJ	8270	SCSS-085M-0001-SO	31	1000	U	N/A	Yes
SCSS-058M-0001-SO	4-Nitrophenol	410	1000	ug/kg	UJ	8270	SCSS-085M-0001-SO	410	1000	U	N/A	Yes
SCSS-058M-0001-SO	Acenaphthene	43	410	ug/kg	J-	8270	SCSS-085M-0001-SO	34	410	J	N/A	Yes
SCSS-058M-0001-SO	Acenaphthylene	160	410	ug/kg	J-	8270	SCSS-085M-0001-SO	43	410	J	N/A	Yes
SCSS-058M-0001-SO	Anthracene	300	410	ug/kg	J-	8270	SCSS-085M-0001-SO	120	410	J	N/A	Yes
SCSS-058M-0001-SO	Benzo(a)anthracene	740	410	ug/kg	J-	8270	SCSS-085M-0001-SO	380	410	J	N/A	Yes
SCSS-058M-0001-SO	Benzo(a)pyrene	590	410	ug/kg	J-	8270	SCSS-085M-0001-SO	330	410	J	N/A	Yes
SCSS-058M-0001-SO	Benzo(b)fluoranthene	1000	410	ug/kg	J-	8270	SCSS-085M-0001-SO	580	410		N/A	No
SCSS-058M-0001-SO	Benzo(g,h,i)perylene	170	410	ug/kg	J-	8270	SCSS-085M-0001-SO	120	410	J	N/A	Yes
SCSS-058M-0001-SO	Benzo(k)fluoranthene	330	410	ug/kg	J-	8270	SCSS-085M-0001-SO	180	410	J	N/A	Yes
SCSS-058M-0001-SO	Benzoic acid	300	1000	ug/kg	UJ	8270	SCSS-085M-0001-SO	300	1000	U	N/A	Yes
SCSS-058M-0001-SO	Benzyl alcohol	84	1000	ug/kg	R	8270	SCSS-085M-0001-SO	85	1000	U	N/A	N/A
SCSS-058M-0001-SO	Bis(2-chloroethoxy)methane	23	410	ug/kg	UJ	8270	SCSS-085M-0001-SO	23	410	U	N/A	Yes
SCSS-058M-0001-SO	Bis(2-chloroethyl) ether	25	410	ug/kg	UJ	8270	SCSS-085M-0001-SO	25	410	U	N/A	Yes
SCSS-058M-0001-SO	Bis(2-chloroisopropyl) ether	31	410	ug/kg	UJ	8270	SCSS-085M-0001-SO	31	410	U	N/A	Yes
SCSS-058M-0001-SO	Bis(2-ethylhexyl) phthalate	89	1000	ug/kg	UJ	8270	SCSS-085M-0001-SO	89	1000	U	N/A	Yes
SCSS-058M-0001-SO	Butylbenzyl phthalate	74	410	ug/kg	UJ	8270	SCSS-085M-0001-SO	74	410	U	N/A	Yes
SCSS-058M-0001-SO	Carbazole	78	410	ug/kg	J-	8270	SCSS-085M-0001-SO	69	410	J	N/A	Yes
SCSS-058M-0001-SO	Chrysene	700	410	ug/kg	J-	8270	SCSS-085M-0001-SO	360	410	J	N/A	Yes
SCSS-058M-0001-SO	Dibenzo(a,h)anthracene	75	410	ug/kg	J-	8270	SCSS-085M-0001-SO	50	410	J	N/A	Yes
SCSS-058M-0001-SO	Dibenzofuran	140	410	ug/kg	J-	8270	SCSS-085M-0001-SO	86	410	J	N/A	Yes
SCSS-058M-0001-SO	Diethyl phthalate	65	410	ug/kg	UJ	8270	SCSS-085M-0001-SO	65	410	U	N/A	Yes
SCSS-058M-0001-SO	Dimethyl phthalate	64	410	ug/kg	UJ	8270	SCSS-085M-0001-SO	64	410	U	N/A	Yes
SCSS-058M-0001-SO	Di-n-butyl phthalate	120	410	ug/kg	J-	8270	SCSS-085M-0001-SO	130	410	J	N/A	Yes
SCSS-058M-0001-SO	Di-n-octyl phthalate	60	410	ug/kg	UJ	8270	SCSS-085M-0001-SO	60	410	U	N/A	Yes
SCSS-058M-0001-SO	Fluoranthene	1800	410	ug/kg	J-	8270	SCSS-085M-0001-SO	800	410		N/A	No

Sand Creek Field Duplicate Comparisons

Sample	Analyte	Result	LOQ	Units	Qualifier	Method	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
SCSS-058M-0001-SO	Fluorene	190	410	ug/kg	J-	8270	SCSS-085M-0001-SO	46	410	J	N/A	Yes
SCSS-058M-0001-SO	Hexachlorobenzene	28	410	ug/kg	UJ	8270	SCSS-085M-0001-SO	29	410	U	N/A	Yes
SCSS-058M-0001-SO	Hexachlorobutadiene	63	410	ug/kg	UJ	8270	SCSS-085M-0001-SO	63	410	U	N/A	Yes
SCSS-058M-0001-SO	Hexachlorocyclopentadiene	53	410	ug/kg	R	8270	SCSS-085M-0001-SO	53	410	U	N/A	N/A
SCSS-058M-0001-SO	Hexachloroethane	34	410	ug/kg	UJ	8270	SCSS-085M-0001-SO	34	410	U	N/A	Yes
SCSS-058M-0001-SO	Indeno(1,2,3-cd)pyrene	180	410	ug/kg	J-	8270	SCSS-085M-0001-SO	100	410	J	N/A	Yes
SCSS-058M-0001-SO	Isophorone	110	410	ug/kg	J-	8270	SCSS-085M-0001-SO	79	410	J	N/A	Yes
SCSS-058M-0001-SO	Naphthalene	240	410	ug/kg	J-	8270	SCSS-085M-0001-SO	200	410	J	N/A	Yes
SCSS-058M-0001-SO	Nitrobenzene	60	410	ug/kg	R	8270	SCSS-085M-0001-SO	60	410	U	N/A	N/A
SCSS-058M-0001-SO	N-Nitroso-di-n-propylamine	71	410	ug/kg	UJ	8270	SCSS-085M-0001-SO	71	410	U	N/A	Yes
SCSS-058M-0001-SO	N-Nitrosodiphenylamine	51	810	ug/kg	UJ	8270	SCSS-085M-0001-SO	51	820	U	N/A	Yes
SCSS-058M-0001-SO	Pentachlorophenol	240	1000	ug/kg	UJ	8270	SCSS-085M-0001-SO	240	1000	U	N/A	Yes
SCSS-058M-0001-SO	Phenanthrene	1200	410	ug/kg	J-	8270	SCSS-085M-0001-SO	520	410		N/A	No
SCSS-058M-0001-SO	Phenol	160	510	ug/kg	UJ	8270	SCSS-085M-0001-SO	160	510	U	N/A	Yes
SCSS-058M-0001-SO	Pyrene	1300	410	ug/kg	J-	8270	SCSS-085M-0001-SO	680	410		N/A	No
SCSS-058M-0001-SO	1,3,5-Trinitrobenzene	0.13	0.44	mg/kg	UJ	8330B	SCSS-085M-0001-SO	0.13	0.44	U	N/A	Yes
SCSS-058M-0001-SO	1,3-Dinitrobenzene	0.08	0.44	mg/kg	UJ	8330B	SCSS-085M-0001-SO	0.08	0.44	U	N/A	Yes
SCSS-058M-0001-SO	2,4,6-Trinitrotoluene	0.26	0.44	mg/kg	J-	8330B	SCSS-085M-0001-SO	0.21	0.44	J	N/A	Yes
SCSS-058M-0001-SO	2,4-Dinitrotoluene	0.2	0.44	mg/kg	R	8330B	SCSS-085M-0001-SO	0.2	0.44	U	N/A	N/A
SCSS-058M-0001-SO	2,6-Dinitrotoluene	0.07	0.5	mg/kg	R	8330B	SCSS-085M-0001-SO	0.07	0.5	U	N/A	N/A
SCSS-058M-0001-SO	2-Amino-4,6-dinitrotoluene	0.05	0.44	mg/kg	UJ	8330B	SCSS-085M-0001-SO	0.05	0.44	U	N/A	Yes
SCSS-058M-0001-SO	2-Nitrotoluene	0.09	0.44	mg/kg	UJ	8330B	SCSS-085M-0001-SO	0.09	0.44	U	N/A	Yes
SCSS-058M-0001-SO	3,5-Dinitroaniline	0.09	0.44	mg/kg	UJ	8330B	SCSS-085M-0001-SO	0.09	0.44	U	N/A	Yes
SCSS-058M-0001-SO	3-Nitrotoluene	0.07	0.44	mg/kg	UJ	8330B	SCSS-085M-0001-SO	0.07	0.44	U	N/A	Yes
SCSS-058M-0001-SO	4-Amino-2,6-dinitrotoluene	0.07	0.44	mg/kg	UJ	8330B	SCSS-085M-0001-SO	0.07	0.44	U	N/A	Yes
SCSS-058M-0001-SO	4-Nitrotoluene	0.07	0.5	mg/kg	UJ	8330B	SCSS-085M-0001-SO	0.07	0.5	U	N/A	Yes
SCSS-058M-0001-SO	HMX	0.12	0.44	mg/kg	UJ	8330B	SCSS-085M-0001-SO	0.12	0.44	U	N/A	Yes
SCSS-058M-0001-SO	Nitrobenzene	0.04	0.44	mg/kg	UJ	8330B	SCSS-085M-0001-SO	0.04	0.44	U	N/A	Yes
SCSS-058M-0001-SO	Nitroglycerin	0.5	1.5	mg/kg	UJ	8330B	SCSS-085M-0001-SO	0.5	1.5	U	N/A	Yes
SCSS-058M-0001-SO	PETN	0.5	1.5	mg/kg	UJ	8330B	SCSS-085M-0001-SO	0.5	1.5	U	N/A	Yes
SCSS-058M-0001-SO	RDX	0.16	0.44	mg/kg	UJ	8330B	SCSS-085M-0001-SO	0.16	0.44	U	N/A	Yes
SCSS-058M-0001-SO	Tetryl	0.09	0.44	mg/kg	UJ	8330B	SCSS-085M-0001-SO	0.09	0.44	U	N/A	Yes
SCSS-068D-0001-SO	1,1,1-Trichloroethane	11	55	ug/kg	U	8260	SCSS-086D-0001-SO	12	61	U	N/A	Yes
SCSS-068D-0001-SO	1,1,2,2-Tetrachloroethane	6.6	55	ug/kg	U	8260	SCSS-086D-0001-SO	7.3	61	U	N/A	Yes
SCSS-068D-0001-SO	1,1,2-Trichloroethane	8.8	55	ug/kg	U	8260	SCSS-086D-0001-SO	9.7	61	U	N/A	Yes
SCSS-068D-0001-SO	1,1-Dichloroethane	12	55	ug/kg	U	8260	SCSS-086D-0001-SO	13	61	U	N/A	Yes
SCSS-068D-0001-SO	1,1-Dichloroethene	18	55	ug/kg	U	8260	SCSS-086D-0001-SO	19	61	U	N/A	Yes
SCSS-068D-0001-SO	1,2-Dibromoethane	11	55	ug/kg	U	8260	SCSS-086D-0001-SO	12	61	U	N/A	Yes

Sand Creek Field Duplicate Comparisons

Sample	Analyte	Result	LOQ	Units	Qualifier	Method	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
SCSS-068D-0001-SO	1,2-Dichloroethane	13	55	ug/kg	U	8260	SCSS-086D-0001-SO	15	61	U	N/A	Yes
SCSS-068D-0001-SO	1,2-Dichloropropane	7.7	55	ug/kg	U	8260	SCSS-086D-0001-SO	8.5	61	U	N/A	Yes
SCSS-068D-0001-SO	2-Butanone	110	550	ug/kg	U	8260	SCSS-086D-0001-SO	120	610	U	N/A	Yes
SCSS-068D-0001-SO	2-Hexanone	75	550	ug/kg	U	8260	SCSS-086D-0001-SO	82	610	U	N/A	Yes
SCSS-068D-0001-SO	4-Methyl-2-pentanone	90	550	ug/kg	U	8260	SCSS-086D-0001-SO	99	610	U	N/A	Yes
SCSS-068D-0001-SO	Acetone	69	1100	ug/kg	U	8260	SCSS-086D-0001-SO	76	1200	U	N/A	Yes
SCSS-068D-0001-SO	Benzene	5.5	55	ug/kg	U	8260	SCSS-086D-0001-SO	6.1	61	U	N/A	Yes
SCSS-068D-0001-SO	Bromochloromethane	8.8	55	ug/kg	U	8260	SCSS-086D-0001-SO	9.7	61	U	N/A	Yes
SCSS-068D-0001-SO	Bromodichloromethane	9.9	55	ug/kg	U	8260	SCSS-086D-0001-SO	11	61	U	N/A	Yes
SCSS-068D-0001-SO	Bromoform	6.6	55	ug/kg	U	8260	SCSS-086D-0001-SO	7.3	61	U	N/A	Yes
SCSS-068D-0001-SO	Bromomethane	33	110	ug/kg	U	8260	SCSS-086D-0001-SO	36	120	U	N/A	Yes
SCSS-068D-0001-SO	Carbon disulfide	16	110	ug/kg	U	8260	SCSS-086D-0001-SO	18	120	U	N/A	Yes
SCSS-068D-0001-SO	Carbon tetrachloride	12	55	ug/kg	U	8260	SCSS-086D-0001-SO	13	61	U	N/A	Yes
SCSS-068D-0001-SO	Chlorobenzene	8.8	55	ug/kg	U	8260	SCSS-086D-0001-SO	9.7	61	U	N/A	Yes
SCSS-068D-0001-SO	Chloroethane	21	110	ug/kg	U	8260	SCSS-086D-0001-SO	23	120	U	N/A	Yes
SCSS-068D-0001-SO	Chloroform	9.9	55	ug/kg	U	8260	SCSS-086D-0001-SO	11	61	U	N/A	Yes
SCSS-068D-0001-SO	Chloromethane	27	110	ug/kg	U	8260	SCSS-086D-0001-SO	30	120	U	N/A	Yes
SCSS-068D-0001-SO	cis-1,2-Dichloroethene	11	55	ug/kg	U	8260	SCSS-086D-0001-SO	12	61	U	N/A	Yes
SCSS-068D-0001-SO	cis-1,3-Dichloropropene	11	55	ug/kg	U	8260	SCSS-086D-0001-SO	12	61	U	N/A	Yes
SCSS-068D-0001-SO	Dibromochloromethane	8.8	55	ug/kg	U	8260	SCSS-086D-0001-SO	9.7	61	U	N/A	Yes
SCSS-068D-0001-SO	Ethylbenzene	8.8	55	ug/kg	U	8260	SCSS-086D-0001-SO	9.7	61	U	N/A	Yes
SCSS-068D-0001-SO	m,p-Xylenes	20	110	ug/kg	U	8260	SCSS-086D-0001-SO	22	120	U	N/A	Yes
SCSS-068D-0001-SO	Methylene chloride	44	110	ug/kg	U	8260	SCSS-086D-0001-SO	49	120	U	N/A	Yes
SCSS-068D-0001-SO	o-Xylene	8.8	55	ug/kg	U	8260	SCSS-086D-0001-SO	9.7	61	U	N/A	Yes
SCSS-068D-0001-SO	Styrene	6.6	55	ug/kg	U	8260	SCSS-086D-0001-SO	7.3	61	U	N/A	Yes
SCSS-068D-0001-SO	Tetrachloroethene	8.8	55	ug/kg	U	8260	SCSS-086D-0001-SO	9.7	61	U	N/A	Yes
SCSS-068D-0001-SO	Toluene	7.7	55	ug/kg	U	8260	SCSS-086D-0001-SO	8.5	61	U	N/A	Yes
SCSS-068D-0001-SO	trans-1,2-Dichloroethene	12	55	ug/kg	U	8260	SCSS-086D-0001-SO	13	61	U	N/A	Yes
SCSS-068D-0001-SO	trans-1,3-Dichloropropene	7.7	110	ug/kg	U	8260	SCSS-086D-0001-SO	8.5	120	U	N/A	Yes
SCSS-068D-0001-SO	Trichloroethene	11	55	ug/kg	U	8260	SCSS-086D-0001-SO	12	61	U	N/A	Yes
SCSS-068D-0001-SO	Vinyl chloride	15	55	ug/kg	U	8260	SCSS-086D-0001-SO	17	61	U	N/A	Yes
SCSS-068M-0001-SO	Aluminum	9150	0.12	mg/kg	J-	6010	SCSS-086M-0001-SO	8350	0.12		9	N/A
SCSS-068M-0001-SO	Antimony	0.082	0.28	mg/kg	R	6010	SCSS-086M-0001-SO	0.76	0.27		N/A	N/A
SCSS-068M-0001-SO	Arsenic	11.2	0.46	mg/kg	J-	6010	SCSS-086M-0001-SO	8.6	0.46		26	N/A
SCSS-068M-0001-SO	Barium	49.7	0.028	mg/kg	J-	6010	SCSS-086M-0001-SO	47	0.027		6	N/A
SCSS-068M-0001-SO	Beryllium	0.41	0.024	mg/kg	J-	6010	SCSS-086M-0001-SO	0.4	0.024		2	N/A
SCSS-068M-0001-SO	Cadmium	0.057	0.021	mg/kg	J-	6010	SCSS-086M-0001-SO	0.039	0.021		N/A	Yes
SCSS-068M-0001-SO	Calcium	1650	0.51	mg/kg	J-	6010	SCSS-086M-0001-SO	1210	0.51		31	N/A

Sand Creek Field Duplicate Comparisons

Sample	Analyte	Result	LOQ	Units	Qualifier	Method	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
SCSS-068M-0001-SO	Chromium	24.2	0.064	mg/kg	J-	6010	SCSS-086M-0001-SO	116	0.064		131	N/A
SCSS-068M-0001-SO	Cobalt	7.6	0.05	mg/kg	J-	6010	SCSS-086M-0001-SO	6.8	0.05		11	N/A
SCSS-068M-0001-SO	Copper	11	0.2	mg/kg	J-	6010	SCSS-086M-0001-SO	10.4	0.2		6	N/A
SCSS-068M-0001-SO	Iron	22500	1	mg/kg	J-	6010	SCSS-086M-0001-SO	20500	1		9	N/A
SCSS-068M-0001-SO	Lead	29.8	0.14	mg/kg	J-	6010	SCSS-086M-0001-SO	29.2	0.14		2	N/A
SCSS-068M-0001-SO	Magnesium	2320	0.41	mg/kg	J-	6010	SCSS-086M-0001-SO	1980	0.41		16	N/A
SCSS-068M-0001-SO	Manganese	395	0.051	mg/kg	J-	6010	SCSS-086M-0001-SO	350	0.051		12	N/A
SCSS-068M-0001-SO	Nickel	20.9	0.062	mg/kg	J-	6010	SCSS-086M-0001-SO	28.7	0.062		31	N/A
SCSS-068M-0001-SO	Potassium	693	37	mg/kg	J-	6010	SCSS-086M-0001-SO	850	37		20	N/A
SCSS-068M-0001-SO	Selenium	0.24	0.43	mg/kg	J-	6010	SCSS-086M-0001-SO	0.22	0.43	J	N/A	Yes
SCSS-068M-0001-SO	Silver	0.017	0.057	mg/kg	U	6010	SCSS-086M-0001-SO	0.035	0.11	U	N/A	Yes
SCSS-068M-0001-SO	Sodium	20.5	13	mg/kg	J-	6010	SCSS-086M-0001-SO	36.8	13		N/A	No
SCSS-068M-0001-SO	Thallium	0.62	0.29	mg/kg	J-	6010	SCSS-086M-0001-SO	0.62	0.28		N/A	Yes
SCSS-068M-0001-SO	Vanadium	14.8	0.035	mg/kg	J-	6010	SCSS-086M-0001-SO	13.8	0.035		7	N/A
SCSS-068M-0001-SO	Zinc	48.2	0.12	mg/kg	J-	6010	SCSS-086M-0001-SO	43.4	0.12		10	N/A
SCSS-068M-0001-SO	Mercury	0.031	0.008	mg/kg	J-	7471	SCSS-086M-0001-SO	0.032	0.008		N/A	Yes
SCSS-068M-0001-SO	1,2,4-Trichlorobenzene	21	410	ug/kg	U	8270	SCSS-086M-0001-SO	21	410	U	N/A	Yes
SCSS-068M-0001-SO	1,2-Dichlorobenzene	24	410	ug/kg	U	8270	SCSS-086M-0001-SO	24	410	U	N/A	Yes
SCSS-068M-0001-SO	1,3-Dichlorobenzene	20	410	ug/kg	U	8270	SCSS-086M-0001-SO	20	410	U	N/A	Yes
SCSS-068M-0001-SO	1,4-Dichlorobenzene	19	410	ug/kg	U	8270	SCSS-086M-0001-SO	19	410	U	N/A	Yes
SCSS-068M-0001-SO	2,4,5-Trichlorophenol	130	510	ug/kg	U	8270	SCSS-086M-0001-SO	130	510	U	N/A	Yes
SCSS-068M-0001-SO	2,4,6-Trichlorophenol	130	510	ug/kg	U	8270	SCSS-086M-0001-SO	130	510	U	N/A	Yes
SCSS-068M-0001-SO	2,4-Dichlorophenol	120	510	ug/kg	U	8270	SCSS-086M-0001-SO	120	510	U	N/A	Yes
SCSS-068M-0001-SO	2,4-Dimethylphenol	100	410	ug/kg	U	8270	SCSS-086M-0001-SO	100	410	U	N/A	Yes
SCSS-068M-0001-SO	2,4-Dinitrophenol	700	2000	ug/kg	U	8270	SCSS-086M-0001-SO	700	2000	U	N/A	Yes
SCSS-068M-0001-SO	2,4-Dinitrotoluene	24	410	ug/kg	U	8270	SCSS-086M-0001-SO	24	410	U	N/A	Yes
SCSS-068M-0001-SO	2,6-Dinitrotoluene	24	410	ug/kg	U	8270	SCSS-086M-0001-SO	24	410	U	N/A	Yes
SCSS-068M-0001-SO	2-Chloronaphthalene	23	410	ug/kg	U	8270	SCSS-086M-0001-SO	23	410	U	N/A	Yes
SCSS-068M-0001-SO	2-Chlorophenol	340	510	ug/kg	U	8270	SCSS-086M-0001-SO	350	510	U	N/A	Yes
SCSS-068M-0001-SO	2-Methyl-4,6-dinitrophenol	270	1000	ug/kg	U	8270	SCSS-086M-0001-SO	280	1000	U	N/A	Yes
SCSS-068M-0001-SO	2-Methylnaphthalene	25	410	ug/kg	U	8270	SCSS-086M-0001-SO	26	410	U	N/A	Yes
SCSS-068M-0001-SO	2-Methylphenol	430	1000	ug/kg	U	8270	SCSS-086M-0001-SO	430	1000	U	N/A	Yes
SCSS-068M-0001-SO	2-Nitroaniline	23	410	ug/kg	U	8270	SCSS-086M-0001-SO	23	410	U	N/A	Yes
SCSS-068M-0001-SO	2-Nitrophenol	280	510	ug/kg	U	8270	SCSS-086M-0001-SO	290	510	U	N/A	Yes
SCSS-068M-0001-SO	3,3'-Dichlorobenzidine	150	510	ug/kg	U	8270	SCSS-086M-0001-SO	150	510	U	N/A	Yes
SCSS-068M-0001-SO	3-Nitroaniline	22	1000	ug/kg	UJ	8270	SCSS-086M-0001-SO	22	1000	U	N/A	Yes
SCSS-068M-0001-SO	4-Bromophenyl phenyl ether	25	410	ug/kg	U	8270	SCSS-086M-0001-SO	26	410	U	N/A	Yes
SCSS-068M-0001-SO	4-Chloro-3-methylphenol	390	510	ug/kg	U	8270	SCSS-086M-0001-SO	390	510	U	N/A	Yes

Sand Creek Field Duplicate Comparisons

Sample	Analyte	Result	LOQ	Units	Qualifier	Method	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
SCSS-068M-0001-SO	4-Chloroaniline	40	410	ug/kg	UJ	8270	SCSS-086M-0001-SO	40	410	U	N/A	Yes
SCSS-068M-0001-SO	4-Chlorophenyl phenyl ether	26	410	ug/kg	U	8270	SCSS-086M-0001-SO	27	410	U	N/A	Yes
SCSS-068M-0001-SO	4-Methylphenol	660	2000	ug/kg	U	8270	SCSS-086M-0001-SO	660	2000	U	N/A	Yes
SCSS-068M-0001-SO	4-Nitroaniline	30	1000	ug/kg	U	8270	SCSS-086M-0001-SO	31	1000	U	N/A	Yes
SCSS-068M-0001-SO	4-Nitrophenol	410	1000	ug/kg	U	8270	SCSS-086M-0001-SO	410	1000	U	N/A	Yes
SCSS-068M-0001-SO	Acenaphthene	24	410	ug/kg	U	8270	SCSS-086M-0001-SO	24	410	U	N/A	Yes
SCSS-068M-0001-SO	Acenaphthylene	24	410	ug/kg	U	8270	SCSS-086M-0001-SO	24	410	U	N/A	Yes
SCSS-068M-0001-SO	Anthracene	24	410	ug/kg	U	8270	SCSS-086M-0001-SO	24	410	U	N/A	Yes
SCSS-068M-0001-SO	Benzo(a)anthracene	25	410	ug/kg	U	8270	SCSS-086M-0001-SO	26	410	U	N/A	Yes
SCSS-068M-0001-SO	Benzo(a)pyrene	23	410	ug/kg	U	8270	SCSS-086M-0001-SO	23	410	U	N/A	Yes
SCSS-068M-0001-SO	Benzo(b)fluoranthene	25	410	ug/kg	U	8270	SCSS-086M-0001-SO	26	410	U	N/A	Yes
SCSS-068M-0001-SO	Benzo(g,h,i)perylene	22	410	ug/kg	U	8270	SCSS-086M-0001-SO	22	410	U	N/A	Yes
SCSS-068M-0001-SO	Benzo(k)fluoranthene	25	410	ug/kg	U	8270	SCSS-086M-0001-SO	26	410	U	N/A	Yes
SCSS-068M-0001-SO	Benzoic acid	290	990	ug/kg	U	8270	SCSS-086M-0001-SO	300	1000	U	N/A	Yes
SCSS-068M-0001-SO	Benzyl alcohol	84	1000	ug/kg	U	8270	SCSS-086M-0001-SO	85	1000	U	N/A	Yes
SCSS-068M-0001-SO	Bis(2-chloroethoxy)methane	23	410	ug/kg	U	8270	SCSS-086M-0001-SO	23	410	U	N/A	Yes
SCSS-068M-0001-SO	Bis(2-chloroethyl) ether	25	410	ug/kg	U	8270	SCSS-086M-0001-SO	26	410	U	N/A	Yes
SCSS-068M-0001-SO	Bis(2-chloroisopropyl) ether	30	410	ug/kg	U	8270	SCSS-086M-0001-SO	31	410	U	N/A	Yes
SCSS-068M-0001-SO	Bis(2-ethylhexyl) phthalate	100	1000	ug/kg	U	8270	SCSS-086M-0001-SO	130	1000	J	N/A	Yes
SCSS-068M-0001-SO	Butylbenzyl phthalate	74	410	ug/kg	U	8270	SCSS-086M-0001-SO	74	410	U	N/A	Yes
SCSS-068M-0001-SO	Carbazole	28	410	ug/kg	U	8270	SCSS-086M-0001-SO	29	410	U	N/A	Yes
SCSS-068M-0001-SO	Chrysene	25	410	ug/kg	U	8270	SCSS-086M-0001-SO	26	410	U	N/A	Yes
SCSS-068M-0001-SO	Dibenzo(a,h)anthracene	22	410	ug/kg	U	8270	SCSS-086M-0001-SO	22	410	U	N/A	Yes
SCSS-068M-0001-SO	Dibenzofuran	24	410	ug/kg	U	8270	SCSS-086M-0001-SO	24	410	U	N/A	Yes
SCSS-068M-0001-SO	Diethyl phthalate	65	410	ug/kg	U	8270	SCSS-086M-0001-SO	65	410	U	N/A	Yes
SCSS-068M-0001-SO	Dimethyl phthalate	64	410	ug/kg	U	8270	SCSS-086M-0001-SO	64	410	U	N/A	Yes
SCSS-068M-0001-SO	Di-n-butyl phthalate	88	410	ug/kg	J	8270	SCSS-086M-0001-SO	81	410	U	N/A	Yes
SCSS-068M-0001-SO	Di-n-octyl phthalate	60	410	ug/kg	U	8270	SCSS-086M-0001-SO	60	410	U	N/A	Yes
SCSS-068M-0001-SO	Fluoranthene	26	410	ug/kg	U	8270	SCSS-086M-0001-SO	27	410	U	N/A	Yes
SCSS-068M-0001-SO	Fluorene	25	410	ug/kg	U	8270	SCSS-086M-0001-SO	26	410	U	N/A	Yes
SCSS-068M-0001-SO	Hexachlorobenzene	28	410	ug/kg	U	8270	SCSS-086M-0001-SO	29	410	U	N/A	Yes
SCSS-068M-0001-SO	Hexachlorobutadiene	63	410	ug/kg	U	8270	SCSS-086M-0001-SO	63	410	U	N/A	Yes
SCSS-068M-0001-SO	Hexachlorocyclopentadiene	53	410	ug/kg	UJ	8270	SCSS-086M-0001-SO	53	410	U	N/A	Yes
SCSS-068M-0001-SO	Hexachloroethane	33	410	ug/kg	U	8270	SCSS-086M-0001-SO	34	410	U	N/A	Yes
SCSS-068M-0001-SO	Indeno(1,2,3-cd)pyrene	23	410	ug/kg	U	8270	SCSS-086M-0001-SO	23	410	U	N/A	Yes
SCSS-068M-0001-SO	Isophorone	51	410	ug/kg	J	8270	SCSS-086M-0001-SO	140	410	J	N/A	Yes
SCSS-068M-0001-SO	Naphthalene	21	410	ug/kg	U	8270	SCSS-086M-0001-SO	21	410	U	N/A	Yes
SCSS-068M-0001-SO	Nitrobenzene	60	410	ug/kg	R	8270	SCSS-086M-0001-SO	60	410	U	N/A	N/A

Sand Creek Field Duplicate Comparisons

Sample	Analyte	Result	LOQ	Units	Qualifier	Method	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
SCSS-068M-0001-SO	N-Nitroso-di-n-propylamine	71	410	ug/kg	U	8270	SCSS-086M-0001-SO	71	410	U	N/A	Yes
SCSS-068M-0001-SO	N-Nitrosodiphenylamine	51	810	ug/kg	U	8270	SCSS-086M-0001-SO	51	820	U	N/A	Yes
SCSS-068M-0001-SO	Pentachlorophenol	240	1000	ug/kg	U	8270	SCSS-086M-0001-SO	240	1000	U	N/A	Yes
SCSS-068M-0001-SO	Phenanthrene	26	410	ug/kg	U	8270	SCSS-086M-0001-SO	27	410	U	N/A	Yes
SCSS-068M-0001-SO	Phenol	160	510	ug/kg	U	8270	SCSS-086M-0001-SO	160	510	U	N/A	Yes
SCSS-068M-0001-SO	Pyrene	26	410	ug/kg	U	8270	SCSS-086M-0001-SO	27	410	U	N/A	Yes
SCSS-068M-0001-SO	1,3,5-Trinitrobenzene	0.13	0.44	mg/kg	U	8330B	SCSS-086M-0001-SO	0.13	0.44	U	N/A	Yes
SCSS-068M-0001-SO	1,3-Dinitrobenzene	0.08	0.44	mg/kg	U	8330B	SCSS-086M-0001-SO	0.08	0.44	U	N/A	Yes
SCSS-068M-0001-SO	2,4,6-Trinitrotoluene	0.09	0.44	mg/kg	U	8330B	SCSS-086M-0001-SO	0.09	0.44	U	N/A	Yes
SCSS-068M-0001-SO	2,4-Dinitrotoluene	0.2	0.44	mg/kg	R	8330B	SCSS-086M-0001-SO	0.2	0.44	U	N/A	N/A
SCSS-068M-0001-SO	2,6-Dinitrotoluene	0.07	0.5	mg/kg	R	8330B	SCSS-086M-0001-SO	0.07	0.5	U	N/A	N/A
SCSS-068M-0001-SO	2-Amino-4,6-dinitrotoluene	0.05	0.44	mg/kg	U	8330B	SCSS-086M-0001-SO	0.05	0.44	U	N/A	Yes
SCSS-068M-0001-SO	2-Nitrotoluene	0.09	0.44	mg/kg	U	8330B	SCSS-086M-0001-SO	0.09	0.44	U	N/A	Yes
SCSS-068M-0001-SO	3,5-Dinitroaniline	0.09	0.44	mg/kg	U	8330B	SCSS-086M-0001-SO	0.09	0.44	U	N/A	Yes
SCSS-068M-0001-SO	3-Nitrotoluene	0.07	0.44	mg/kg	U	8330B	SCSS-086M-0001-SO	0.07	0.44	U	N/A	Yes
SCSS-068M-0001-SO	4-Amino-2,6-dinitrotoluene	0.07	0.44	mg/kg	U	8330B	SCSS-086M-0001-SO	0.07	0.44	U	N/A	Yes
SCSS-068M-0001-SO	4-Nitrotoluene	0.07	0.5	mg/kg	U	8330B	SCSS-086M-0001-SO	0.07	0.5	U	N/A	Yes
SCSS-068M-0001-SO	HMX	0.12	0.44	mg/kg	U	8330B	SCSS-086M-0001-SO	0.12	0.44	U	N/A	Yes
SCSS-068M-0001-SO	Nitrobenzene	0.04	0.44	mg/kg	U	8330B	SCSS-086M-0001-SO	0.04	0.44	U	N/A	Yes
SCSS-068M-0001-SO	Nitroglycerin	0.5	1.5	mg/kg	U	8330B	SCSS-086M-0001-SO	0.5	1.5	U	N/A	Yes
SCSS-068M-0001-SO	PETN	0.5	1.5	mg/kg	U	8330B	SCSS-086M-0001-SO	0.5	1.5	U	N/A	Yes
SCSS-068M-0001-SO	RDX	0.16	0.44	mg/kg	U	8330B	SCSS-086M-0001-SO	0.16	0.44	U	N/A	Yes
SCSS-068M-0001-SO	Tetryl	0.09	0.44	mg/kg	U	8330B	SCSS-086M-0001-SO	0.09	0.44	U	N/A	Yes
SCSS-073M-0001-SO	Aluminum	9480	0.24	mg/kg		6010	SCSS-087M-0001-SO	8210	0.24		14	N/A
SCSS-073M-0001-SO	Antimony	2.9	0.55	mg/kg	J+	6010	SCSS-087M-0001-SO	2.2	0.55		N/A	No
SCSS-073M-0001-SO	Arsenic	21.8	0.92	mg/kg		6010	SCSS-087M-0001-SO	23	0.92		5	N/A
SCSS-073M-0001-SO	Barium	94.3	0.055	mg/kg		6010	SCSS-087M-0001-SO	91.7	0.055		3	N/A
SCSS-073M-0001-SO	Beryllium	0.77	0.024	mg/kg		6010	SCSS-087M-0001-SO	0.72	0.024		7	N/A
SCSS-073M-0001-SO	Cadmium	0.63	0.043	mg/kg		6010	SCSS-087M-0001-SO	0.58	0.043		8	N/A
SCSS-073M-0001-SO	Calcium	10300	1	mg/kg		6010	SCSS-087M-0001-SO	7340	1		34	N/A
SCSS-073M-0001-SO	Chromium	130	0.13	mg/kg		6010	SCSS-087M-0001-SO	86.1	0.13		41	N/A
SCSS-073M-0001-SO	Cobalt	10.8	0.1	mg/kg		6010	SCSS-087M-0001-SO	11.3	0.1		5	N/A
SCSS-073M-0001-SO	Copper	24.3	0.41	mg/kg		6010	SCSS-087M-0001-SO	26.2	0.41		8	N/A
SCSS-073M-0001-SO	Iron	24800	2	mg/kg		6010	SCSS-087M-0001-SO	23300	2		6	N/A
SCSS-073M-0001-SO	Lead	50.3	0.29	mg/kg		6010	SCSS-087M-0001-SO	61.2	0.29		20	N/A
SCSS-073M-0001-SO	Magnesium	3040	0.82	mg/kg		6010	SCSS-087M-0001-SO	2710	0.82		11	N/A
SCSS-073M-0001-SO	Manganese	576	0.1	mg/kg		6010	SCSS-087M-0001-SO	520	0.1		10	N/A
SCSS-073M-0001-SO	Nickel	32.7	0.12	mg/kg		6010	SCSS-087M-0001-SO	26.9	0.12		19	N/A

Sand Creek Field Duplicate Comparisons

Sample	Analyte	Result	LOQ	Units	Qualifier	Method	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
SCSS-073M-0001-SO	Potassium	1350	37	mg/kg		6010	SCSS-087M-0001-SO	1080	37		22	N/A
SCSS-073M-0001-SO	Selenium	2.4	0.86	mg/kg	J+	6010	SCSS-087M-0001-SO	2.2	0.86		N/A	Yes
SCSS-073M-0001-SO	Silver	2	0.11	mg/kg		6010	SCSS-087M-0001-SO	3	0.11		40	N/A
SCSS-073M-0001-SO	Sodium	101	13	mg/kg		6010	SCSS-087M-0001-SO	79.8	13		23	N/A
SCSS-073M-0001-SO	Thallium	0.082	0.29	mg/kg	UJ	6010	SCSS-087M-0001-SO	0.47	0.29		N/A	No
SCSS-073M-0001-SO	Vanadium	19.8	0.069	mg/kg		6010	SCSS-087M-0001-SO	20.3	0.069		2	N/A
SCSS-073M-0001-SO	Zinc	86.1	0.24	mg/kg		6010	SCSS-087M-0001-SO	86.1	0.24		0	N/A
SCSS-073M-0001-SO	Mercury	0.27	0.008	mg/kg		7471	SCSS-087M-0001-SO	0.21	0.008		25	N/A
SCSS-073M-0001-SO	1,2,4-Trichlorobenzene	21	410	ug/kg	U	8270	SCSS-087M-0001-SO	21	410	U	N/A	Yes
SCSS-073M-0001-SO	1,2-Dichlorobenzene	39	410	ug/kg	J	8270	SCSS-087M-0001-SO	100	410	J	N/A	Yes
SCSS-073M-0001-SO	1,3-Dichlorobenzene	20	410	ug/kg	U	8270	SCSS-087M-0001-SO	26	410	J	N/A	Yes
SCSS-073M-0001-SO	1,4-Dichlorobenzene	19	410	ug/kg	U	8270	SCSS-087M-0001-SO	48	410	J	N/A	Yes
SCSS-073M-0001-SO	2,4,5-Trichlorophenol	130	510	ug/kg	U	8270	SCSS-087M-0001-SO	130	510	U	N/A	Yes
SCSS-073M-0001-SO	2,4,6-Trichlorophenol	130	510	ug/kg	U	8270	SCSS-087M-0001-SO	130	510	U	N/A	Yes
SCSS-073M-0001-SO	2,4-Dichlorophenol	120	510	ug/kg	U	8270	SCSS-087M-0001-SO	120	510	U	N/A	Yes
SCSS-073M-0001-SO	2,4-Dimethylphenol	100	410	ug/kg	U	8270	SCSS-087M-0001-SO	100	410	U	N/A	Yes
SCSS-073M-0001-SO	2,4-Dinitrophenol	700	2000	ug/kg	U	8270	SCSS-087M-0001-SO	710	2000	U	N/A	Yes
SCSS-073M-0001-SO	2,4-Dinitrotoluene	24	410	ug/kg	U	8270	SCSS-087M-0001-SO	92	410	J	N/A	Yes
SCSS-073M-0001-SO	2,6-Dinitrotoluene	24	410	ug/kg	U	8270	SCSS-087M-0001-SO	25	410	U	N/A	Yes
SCSS-073M-0001-SO	2-Chloronaphthalene	23	410	ug/kg	U	8270	SCSS-087M-0001-SO	24	410	U	N/A	Yes
SCSS-073M-0001-SO	2-Chlorophenol	350	510	ug/kg	U	8270	SCSS-087M-0001-SO	350	510	U	N/A	Yes
SCSS-073M-0001-SO	2-Methyl-4,6-dinitrophenol	270	1000	ug/kg	U	8270	SCSS-087M-0001-SO	280	1000	U	N/A	Yes
SCSS-073M-0001-SO	2-Methylnaphthalene	240	410	ug/kg	J	8270	SCSS-087M-0001-SO	330	410	J	N/A	Yes
SCSS-073M-0001-SO	2-Methylphenol	430	1000	ug/kg	U	8270	SCSS-087M-0001-SO	430	1000	U	N/A	Yes
SCSS-073M-0001-SO	2-Nitroaniline	23	410	ug/kg	U	8270	SCSS-087M-0001-SO	24	410	U	N/A	Yes
SCSS-073M-0001-SO	2-Nitrophenol	290	510	ug/kg	U	8270	SCSS-087M-0001-SO	290	510	U	N/A	Yes
SCSS-073M-0001-SO	3,3'-Dichlorobenzidine	150	510	ug/kg	U	8270	SCSS-087M-0001-SO	150	510	U	N/A	Yes
SCSS-073M-0001-SO	3-Nitroaniline	22	1000	ug/kg	U	8270	SCSS-087M-0001-SO	22	1000	U	N/A	Yes
SCSS-073M-0001-SO	4-Bromophenyl phenyl ether	25	410	ug/kg	U	8270	SCSS-087M-0001-SO	26	410	U	N/A	Yes
SCSS-073M-0001-SO	4-Chloro-3-methylphenol	390	510	ug/kg	U	8270	SCSS-087M-0001-SO	390	510	U	N/A	Yes
SCSS-073M-0001-SO	4-Chloroaniline	40	410	ug/kg	U	8270	SCSS-087M-0001-SO	40	410	U	N/A	Yes
SCSS-073M-0001-SO	4-Chlorophenyl phenyl ether	26	410	ug/kg	U	8270	SCSS-087M-0001-SO	27	410	U	N/A	Yes
SCSS-073M-0001-SO	4-Methylphenol	660	2000	ug/kg	U	8270	SCSS-087M-0001-SO	660	2000	U	N/A	Yes
SCSS-073M-0001-SO	4-Nitroaniline	31	1000	ug/kg	U	8270	SCSS-087M-0001-SO	31	1000	U	N/A	Yes
SCSS-073M-0001-SO	4-Nitrophenol	410	1000	ug/kg	UJ	8270	SCSS-087M-0001-SO	410	1000	U	N/A	Yes
SCSS-073M-0001-SO	Acenaphthene	35	410	ug/kg	J	8270	SCSS-087M-0001-SO	64	410	J	N/A	Yes
SCSS-073M-0001-SO	Acenaphthylene	29	410	ug/kg	J	8270	SCSS-087M-0001-SO	25	410	U	N/A	Yes
SCSS-073M-0001-SO	Anthracene	93	410	ug/kg	J	8270	SCSS-087M-0001-SO	150	410	J	N/A	Yes

Sand Creek Field Duplicate Comparisons

Sample	Analyte	Result	LOQ	Units	Qualifier	Method	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
SCSS-073M-0001-SO	Benzo(a)anthracene	370	410	ug/kg	J	8270	SCSS-087M-0001-SO	390	410	J	N/A	Yes
SCSS-073M-0001-SO	Benzo(a)pyrene	350	410	ug/kg	J	8270	SCSS-087M-0001-SO	350	410	J	N/A	Yes
SCSS-073M-0001-SO	Benzo(b)fluoranthene	580	410	ug/kg		8270	SCSS-087M-0001-SO	520	410		N/A	Yes
SCSS-073M-0001-SO	Benzo(g,h,i)perylene	190	410	ug/kg	J	8270	SCSS-087M-0001-SO	210	410	J	N/A	Yes
SCSS-073M-0001-SO	Benzo(k)fluoranthene	200	410	ug/kg	J	8270	SCSS-087M-0001-SO	170	410	J	N/A	Yes
SCSS-073M-0001-SO	Benzoic acid	300	2000	ug/kg	U	8270	SCSS-087M-0001-SO	300	2000	U	N/A	Yes
SCSS-073M-0001-SO	Benzyl alcohol	85	1000	ug/kg	U	8270	SCSS-087M-0001-SO	85	1000	U	N/A	Yes
SCSS-073M-0001-SO	Bis(2-chloroethoxy)methane	23	410	ug/kg	U	8270	SCSS-087M-0001-SO	24	410	U	N/A	Yes
SCSS-073M-0001-SO	Bis(2-chloroethyl) ether	25	410	ug/kg	U	8270	SCSS-087M-0001-SO	26	410	U	N/A	Yes
SCSS-073M-0001-SO	Bis(2-chloroisopropyl) ether	31	410	ug/kg	U	8270	SCSS-087M-0001-SO	31	410	U	N/A	Yes
SCSS-073M-0001-SO	Bis(2-ethylhexyl) phthalate	190	1000	ug/kg	J	8270	SCSS-087M-0001-SO	950	1000	J	N/A	Yes
SCSS-073M-0001-SO	Butylbenzyl phthalate	74	410	ug/kg	U	8270	SCSS-087M-0001-SO	75	410	U	N/A	Yes
SCSS-073M-0001-SO	Carbazole	58	410	ug/kg	J	8270	SCSS-087M-0001-SO	99	410	J	N/A	Yes
SCSS-073M-0001-SO	Chrysene	400	410	ug/kg	J	8270	SCSS-087M-0001-SO	390	410	J	N/A	Yes
SCSS-073M-0001-SO	Dibenzo(a,h)anthracene	69	410	ug/kg	J	8270	SCSS-087M-0001-SO	92	410	J	N/A	Yes
SCSS-073M-0001-SO	Dibenzofuran	72	410	ug/kg	J	8270	SCSS-087M-0001-SO	100	410	J	N/A	Yes
SCSS-073M-0001-SO	Diethyl phthalate	65	410	ug/kg	U	8270	SCSS-087M-0001-SO	65	410	U	N/A	Yes
SCSS-073M-0001-SO	Dimethyl phthalate	64	410	ug/kg	U	8270	SCSS-087M-0001-SO	64	410	U	N/A	Yes
SCSS-073M-0001-SO	Di-n-butyl phthalate	140	410	ug/kg	J	8270	SCSS-087M-0001-SO	130	410	J	N/A	Yes
SCSS-073M-0001-SO	Di-n-octyl phthalate	60	410	ug/kg	U	8270	SCSS-087M-0001-SO	60	410	U	N/A	Yes
SCSS-073M-0001-SO	Fluoranthene	760	410	ug/kg		8270	SCSS-087M-0001-SO	890	410		N/A	Yes
SCSS-073M-0001-SO	Fluorene	33	410	ug/kg	J	8270	SCSS-087M-0001-SO	55	410	J	N/A	Yes
SCSS-073M-0001-SO	Hexachlorobenzene	29	410	ug/kg	U	8270	SCSS-087M-0001-SO	29	410	U	N/A	Yes
SCSS-073M-0001-SO	Hexachlorobutadiene	63	410	ug/kg	U	8270	SCSS-087M-0001-SO	63	410	U	N/A	Yes
SCSS-073M-0001-SO	Hexachlorocyclopentadiene	53	410	ug/kg	U	8270	SCSS-087M-0001-SO	53	410	U	N/A	Yes
SCSS-073M-0001-SO	Hexachloroethane	34	410	ug/kg	U	8270	SCSS-087M-0001-SO	34	410	U	N/A	Yes
SCSS-073M-0001-SO	Indeno(1,2,3-cd)pyrene	170	410	ug/kg	J	8270	SCSS-087M-0001-SO	210	410	J	N/A	Yes
SCSS-073M-0001-SO	Isophorone	51	410	ug/kg	U	8270	SCSS-087M-0001-SO	51	410	U	N/A	Yes
SCSS-073M-0001-SO	Naphthalene	170	410	ug/kg	J	8270	SCSS-087M-0001-SO	240	410	J	N/A	Yes
SCSS-073M-0001-SO	Nitrobenzene	60	410	ug/kg	R	8270	SCSS-087M-0001-SO	60	410	U	N/A	N/A
SCSS-073M-0001-SO	N-Nitroso-di-n-propylamine	71	410	ug/kg	U	8270	SCSS-087M-0001-SO	72	410	U	N/A	Yes
SCSS-073M-0001-SO	N-Nitrosodiphenylamine	51	810	ug/kg	U	8270	SCSS-087M-0001-SO	51	820	U	N/A	Yes
SCSS-073M-0001-SO	Pentachlorophenol	240	1000	ug/kg	U	8270	SCSS-087M-0001-SO	250	1000	U	N/A	Yes
SCSS-073M-0001-SO	Phenanthrene	450	410	ug/kg		8270	SCSS-087M-0001-SO	700	410		N/A	Yes
SCSS-073M-0001-SO	Phenol	160	510	ug/kg	U	8270	SCSS-087M-0001-SO	160	510	U	N/A	Yes
SCSS-073M-0001-SO	Pyrene	620	410	ug/kg		8270	SCSS-087M-0001-SO	630	410		N/A	Yes
SCSS-073M-0001-SO	1,3,5-Trinitrobenzene	0.13	0.44	mg/kg	U	8330B	SCSS-087M-0001-SO	0.13	0.43	U	N/A	Yes
SCSS-073M-0001-SO	1,3-Dinitrobenzene	0.081	0.44	mg/kg	U	8330B	SCSS-087M-0001-SO	0.079	0.43	U	N/A	Yes

Sand Creek Field Duplicate Comparisons

Sample	Analyte	Result	LOQ	Units	Qualifier	Method	Sample	Result	LOQ	Qualifier	RPD	W/In LOQ
SCSS-073M-0001-SO	2,4,6-Trinitrotoluene	0.091	0.44	mg/kg	U	8330B	SCSS-087M-0001-SO	0.089	0.43	U	N/A	Yes
SCSS-073M-0001-SO	2,4-Dinitrotoluene	0.2	0.44	mg/kg	R	8330B	SCSS-087M-0001-SO	0.2	0.43	U	N/A	N/A
SCSS-073M-0001-SO	2,6-Dinitrotoluene	0.07	0.5	mg/kg	R	8330B	SCSS-087M-0001-SO	0.069	0.49	U	N/A	N/A
SCSS-073M-0001-SO	2-Amino-4,6-dinitrotoluene	0.05	0.44	mg/kg	U	8330B	SCSS-087M-0001-SO	0.049	0.43	U	N/A	Yes
SCSS-073M-0001-SO	2-Nitrotoluene	0.091	0.44	mg/kg	U	8330B	SCSS-087M-0001-SO	0.089	0.43	U	N/A	Yes
SCSS-073M-0001-SO	3,5-Dinitroaniline	0.091	0.44	mg/kg	U	8330B	SCSS-087M-0001-SO	0.089	0.43	U	N/A	Yes
SCSS-073M-0001-SO	3-Nitrotoluene	0.07	0.44	mg/kg	U	8330B	SCSS-087M-0001-SO	0.069	0.43	U	N/A	Yes
SCSS-073M-0001-SO	4-Amino-2,6-dinitrotoluene	0.07	0.44	mg/kg	U	8330B	SCSS-087M-0001-SO	0.069	0.43	U	N/A	Yes
SCSS-073M-0001-SO	4-Nitrotoluene	0.07	0.5	mg/kg	U	8330B	SCSS-087M-0001-SO	0.069	0.49	U	N/A	Yes
SCSS-073M-0001-SO	HMX	0.12	0.44	mg/kg	U	8330B	SCSS-087M-0001-SO	0.12	0.43	U	N/A	Yes
SCSS-073M-0001-SO	Nitrobenzene	0.04	0.44	mg/kg	U	8330B	SCSS-087M-0001-SO	0.04	0.43	U	N/A	Yes
SCSS-073M-0001-SO	Nitroglycerin	0.5	1.5	mg/kg	U	8330B	SCSS-087M-0001-SO	0.49	1.5	U	N/A	Yes
SCSS-073M-0001-SO	PETN	0.5	1.5	mg/kg	U	8330B	SCSS-087M-0001-SO	0.49	1.5	U	N/A	Yes
SCSS-073M-0001-SO	RDX	0.16	0.44	mg/kg	U	8330B	SCSS-087M-0001-SO	0.16	0.43	U	N/A	Yes
SCSS-073M-0001-SO	Tetryl	0.091	0.44	mg/kg	U	8330B	SCSS-087M-0001-SO	0.089	0.43	U	N/A	Yes

APPENDIX D

Validator Checklists

POLY CHLORINATED BIPHENYLS (PCB/AROCLORS) CHECKLIST

Project Name: Ravenna ODA1 / Sand Creek

Laboratory: CT Laboratories

Batch Number(s): 34836, 34839

Sample Delivery Group: 81575, 81670

	Yes	No
1. Holding Time:		
(a) Were samples extracted within holding time?	[✓]	[ ]
(b) Were samples analyzed within holding time?	[✓]	[ ]
2. Initial Calibration:		
• Did the initial calibration consist of five standards?	[✓]	[ ]
• Did Aroclors 1016 and 1260 meet the RSD ≤ 20% or the r ≥ 0.99?	[✓]	[ ]
• Was manual integration "M" performed? If the answer is "Yes", check for supporting documents.	[ ]	[✓]
• Was the manual integration necessary? N/A	[ ]	[ ]
If the answer is "no", contact the laboratory inquiring about the reasons behind the manual integration, and **inform the District Chemist immediately if there were no valid reasons.**		
3. QCMDL:		
• Was MDL Check performed?	[✓]	[ ]
4. QCMRL:		
• Were QC/MRL run at the beginning and end of every daily sequence or every 12 hours??	[✓]	[ ]
• Was the QC/MRL between 70-130% R avg.	[✓]	[ ]
5. Initial Calibration Verification (ICV):		
Is the mid level (2nd source) recovery within ~~85 - 115%~~ QSM ±20%?	[✓]	[ ]

	Yes	No
6. Continuing Calibration Verification (CCV):		
• Was CCV conducted every 12 hours?	[✓]	[ ]
≤20% QSM		
• Was Drift or D ~~≤15%~~ from the initial calibration with a maximum %D < 20% for a specific compound?	[✓]	[ ]
7. Sample Analysis:		
• Was the RRT of an identified component within the retention time window created as SW-846 requires?	[✓]	[ ]
• Were samples with levels higher than the calibration range (E), diluted and re-analyzed? N/A	[ ]	[ ]
• Were identified Aroclors confirmed on a second GC column? QC - N/A for samples	[✓]	[ ]
• Were individual Aroclor standards used to determine the pattern of the peaks? (Individual Aroclors are 1221, 1232, 1242, 1248, and 1254. Both Aroclor 1016, and 1260 can be used from the mixed calibration standards.)	[✓]	[ ]
• Was RPD of target analyte conformation ≤ 40? (N/A for samples)	[✓]	[ ]
8. Sample Quality Control:		
• Method Blanks: Were target analytes ≤ 1/2 MRL? ND	[✓]	[ ]
• LCS: Were the percent recoveries for LCS within the limits?	[✓]	[ ]
• MS/MSD: Were the percent recoveries within limits?	[✓]	[ ]
Were the RPDs within control limits?	[✓]	[ ]
• System Monitoring Compounds (Surrogates): are surrogate recoveries within QC limits?	[✓]	[ ]

9. Comments (attach additional sheets if necessary):

No dilutions.

Validated/Reviewed by:

Signature: L S Calvin

Date: 03-12-2013

Name: L.S. Calvin

ORGANOCHLORINE PESTICIDES ANALYSIS CHECKLIST

Project Name: Ravenna ODA1 / Sand Creek

Laboratory: CT Laboratories

Batch Number(s): 34839, 34954

Sample Delivery Group: 81575, 81670

	Yes	No
1. Holding Time:		
(a) Were samples extracted within holding time?	[✓]	[ ]
(b) Were samples analyzed within holding time?	[✓]	[ ]
2. DDT/Endrin Breakdown:		
• Was breakdown ≤ 15%?	[✓]	[ ]
3. Initial Calibration:		
• Did the initial calibration consist of five standards?	[✓]	[ ]
• Did all compounds meet the RSD ≤ 20% or r ≥ 0.99?	[✓]	[ ]
• Was manual integration "M" performed? If the answer is "Yes", check for supporting documents.	[ ]	[✓]
• Was the manual integration necessary? N/A	[ ]	[ ]
If the answer is "no", contact the laboratory inquiring about the reasons behind the manual integration, and **inform the District Chemist immediately if there were no valid reasons.**		
4. QCMDL:		
• Was MDL Check performed?	[✓]	[ ]
5. QCMRL:		
• Were QC/MRL run at the beginning and end of every daily sequence or every 12 hours??	[✓]	[ ]
• Was the QC/MRL between 70-130% R	[ ]	[✓]

endrin 60.8%, 59.5%[182] on 2° col both MRLs for sample 48M-0001 (Sand Creek) UJ/C

	Yes	No
6. Initial Calibration Verification (ICV): QSM 40-120% • Is the mid level (2nd source) recovery within ~~85 - 115%~~?	[✓]	[ ]
7. Continuing Calibration Verification (CCV):		
• Was CCV conducted every 12 hours?	[✓]	[ ]
• Was Drift or D ~~≤ 15%~~ ≤20% QSM from the initial calibration with a maximum D ≤ 20% for a specific compound?	[✓]	[ ]
8. Sample Analysis:		
• Was the RRT of an identified component within the retention time window created as SW-846 requires?	[✓]	[ ]
• Were samples with levels higher than the calibration range (E), diluted and re-analyzed? N/A	[ ]	[ ]
• Were identified compounds confirmed on a second GC column?	[✓]	[ ]
• Was RPD of target analyte confirmation ≤ 40?	[✓]	[ ]
9. Sample Quality Control:		
• Method Blanks: Were target analytes ≤ 1/2 MRL? ND	[✓]	[ ]
• LCS: Were the percent recoveries for LCS within the limits? endrin aldehyde 18%, 16% (35-145)	[✓]	[ ]
• MS/MSD: Were the percent recoveries within limits? MS/SD 59M-0201 ODA1	[ ]	[✓]
Were the RPD within control limits?	[✓]	[ ]
• System Monitoring Compounds (Surrogates): are surrogate recoveries within QC limits? MC	[✓]	[ ]

10. Comments (attach additional sheets if necessary):

SCSB-048M-0001 Sand Creek analyzed @ 5X due to sample matrix

Validated/Reviewed by:

Signature: L.S. Calvin

Date: 03.12.2013

Name: L.S. Calvin

VOLATILE ORGANIC ANALYSIS CHECKLIST

Project Name: Ravenna ODA1/Sand Creek

Laboratory: CT Laboratories

Batch Number(s): 34800, 34868, 34867

Sample Delivery Group (SDG): 81575, 81623, 81670

	Yes	No
1. Holding Time:		
(a) Were samples preserved?	[✓]	[ ]
(b) Were samples analyzed within holding time?	[✓]	[ ]
2. Was the BFB tune performed at the beginning of each 12-hour period during which samples were analyzed?	[✓]	[ ]
3. Was mass assignment based on m/z 95?	[✓]	[ ]
4. Indicate if BFB ions abundance relative to m/z 95 base peak met the ions abundance criteria:		

m/z	Acceptance Criteria		
50	15.0 - 40.0 %	[✓]	[ ]
75	30.0 - 66.0 %	[✓]	[ ]
95	**100%, Base Peak**	[✓]	[ ]
96	5.0 - 9.0%	[✓]	[ ]
173	<2.0% of m/z 174	[✓]	[ ]
174	>50%	[✓]	[ ]
175	5.0 - 9.0% of mass 174	[✓]	[ ]
176	95.0 - 101.0% of m/z 174	[✓]	[ ]
177	5.0 - 9.0% of m/z 176	[✓]	[ ]

The relative ion abundance of m/z 95/96, m/z 174/176, and 176/177 are of critical importance.

The relative ion abundance of m/z 50 and 75 are of lower importance.

	Yes	No
5. Initial Calibration:		
• Did the initial calibration consist of five standards?	[✓]	[ ]
• Did the System Performance Check Compounds (SPCC) meet the minimum mean response factor (RF)?		
RF		
Chloromethane 0.1	[✓]	[ ]
1,1-Dichloroethane 0.1	[✓]	[ ]
Bromoform 0.1	[✓]	[ ]
Chlorobenzene 0.3	[✓]	[ ]
1,1,2,2-Tetrachloroethane 0.3	[✓]	[ ]
• Did the RSD meet the criteria ≤ 30% for each individual Calibration Check Compound (CCC)?		
1,1-Dichloroethene	[✓]	[ ]
Chloroform	[✓]	[ ]
1,2-Dichloropropane	[✓]	[ ]
Toluene	[✓]	[ ]
Ethylbenzene	[✓]	[ ]
Vinyl chloride	[✓]	[ ]
• Are the RSDs for the remaining target analytes ≤ 15% or r ≥ 0.99 with a mean RSD ≤ 15% with a maximum RSD ≤ 20%?	[✓]	[ ]
If the answer is "No", are the mean RSDs ≤ 15%? NA	[ ]	[ ]
• Was manual integration "M" performed?	[ ]	[✓]
If the answer is "Yes", check for supporting documents. N/A	[ ]	[ ]
• Was the manual integration necessary?	[ ]	[ ]
If the answer is "No", contact the laboratory inquiring about the reasons behind the manual integration, and **inform the District Chemist immediately if there were no valid reasons**.		
6. QCMDL:	[✓]	[ ]
• Was MDL Check performed?		
7. QCMRL:	[✓]	[ ]

	Yes	No
• Were QC/MRL run at the beginning and end of every daily sequence or every 12 hours?	[✓]	[ ]
• Was the QC/MRL between 70-130% R see comments	[ ]	[✓]
• For the non-contaminants of concern was the QC/MRL between 60-140% (Sporadic Marginal Failure) N/A	[ ]	[ ]
8. Initial Calibration Verification (ICV):	[✓]	[ ]
• Is the mid level (2nd source) recovery within 80 - 120% for contaminants of concern ?		
• Is the mid level (2nd source) recovery within 60-140% for non-contaminants of concern (Sporadic Marginal Failure)?		
9. Continuing Calibration Verification (CCV):		
• Was CCV conducted every 12 hours?	[✓]	[ ]
• Did SPCC meet the RF values?	[✓]	[ ]
RF		
Chloromethane 0.1	[✓]	[ ]
1,1-Dichloroethane 0.1	[✓]	[ ]
Bromoform 0.1	[✓]	[ ]
Chlorobenzene 0.3	[✓]	[ ]
1,1,2,2-Tetrachloroethane 0.3	[ ]	[ ]
• Did the CCC meet the minimum requirements (D ≤ 20%)?	[✓]	[ ]
1,1-Dichloroethene	[✓]	[ ]
Chloroform	[✓]	[ ]
1,2-Dichloropropane	[✓]	[ ]
Toluene	[✓]	[ ]
Ethylbenzene	[✓]	[ ]
Vinyl chloride	[ ]	[ ]
• Primary Evaluation: Was the mean, Drift or D ≤ 20% from the initial calibration?	[✓]	[ ]
• Alternative Evaluation: Maximum allowable Drift/D for		

	Yes	No
each target analyte is ≤ 30% when mean D ≤ 20%? N/A	[ ]	[ ]

10. Sample Analysis:

	Yes	No
• Was the RRT of an identified component within ± 0.06 RRT units of the RRT of the standard component?	[✓]	[ ]
• Did the abundance of ions in the sample spectra agree within 30% of the major ions (> 10% of the base ion) in the standard spectra?	[✓]	[ ]
• Were the internal standard areas within the QC limits (from -50% to +200%)?	[✓]	[ ]

11. Sample Quality Control:

	Yes	No
• Method Blanks: Were target analytes ≤ 1/2 MRL? ND	[✓]	[ ]
• LCS: Were the percent recoveries for LCS within the limits?	[✓]	[ ]
• MS/MSD: Were the percent recoveries within limits?	[✓]	[ ]
Were the RPD within control limits?	[ ]	[✓]
70D-0201 (ODA1) 2but, 2hex 36%, acet 37% ud/@ System Monitoring Compounds (Surrogates): are surrogate recoveries within QC limits (50-150%)?	[✓]	[ ]

12. Comments (attach additional sheets if necessary):
see attached for MRL outliers and quals

Validated/Reviewed by:
Signature: L.S. Calvin

Date: 03.12.2013

Name: L.S. Calvin

Samples qualified for MRL recovery outliers		
Analyte	**MRL %Rs Begin / End**	**Qualified Samples**
2-hexanone	37% / 62%	DA1SB-059D-0201-SO
chloroethane	**5% / 4%**	
chloromethane	**0% / 0%**	
2-hexanone	**38% / 3%**	DA1SB-068D-0201-SO
chloroethane	**0% / 17%**	
chloromethane	**0% / 0%**	
4-methyl-2-pentanone	--- / 69%	
acetone	--- / 67%	
m,p-xylenes	--- / 11%	

Samples qualified for MRL recovery outliers		
Analyte	***MRL %Rs Begin / End***	***Qualified Samples***
carbon disulfide	*--- / 68%*	*SCSB-048D-0001-SO*
dibromochloromethane	--- / 63%	
trans-1,3-dichloropropene	--- / 69%	

NITROAROMATICS & NITRAMINE DATA ANALYSIS (EXPLOSIVE RESIDUES) CHECKLIST

triplicate
9/22 DA1SB-055M-0001-SO (851518)
+ 9/23 DA1SB-059M-0201-SO (851582)
9/23 + DA1SB-063M-0202-SO (851881)
triplicate

Project Name: ODA1 / Sand Creek

Laboratory: CT

Batch Number(s): 63 35052, 59,55 35050

Sample Delivery Group: 81575

	Yes	No	
1. Holding Time: Were samples analyzed within holding time?	[ ]	[X]	5 055M - 8d past 059M - 4d 063M - 8d 9 NG + Ex
2. Initial Calibration:			
• Did the initial calibration consist of five standards?	[X]	[ ]	
• Did the RSD meet the criteria ≤ 20% for each individual Calibration Compound or r ≥ 0.99?	[X]	[ ]	
• Was manual integration "M" performed? If the answer is "Yes", check for supporting documents.	[ ]	[X]	
• Was the manual integration necessary?	[ ]	[ ]	
If the answer is "no", contact the laboratory inquiring about the reasons behind the manual integration, and **inform the District Chemist immediately if there were no valid reasons.**			
3. QCMDL:			
• Was MDL Check performed?	[X]	[ ]	
4. QCMRL:			
• Were QC/MRL run at the beginning and end of every daily sequence or every 12 hours??	[X]	[ ]	
• Was the percentage "D" for QC/MRL ≤ 30%?	[X]	[ ]	
5. Initial Calibration Verification (ICV):	[X]	[ ]	

	Yes	No
• Was the ICV made of a 2nd source?	[N]	[ ]
• Was the mid level (2nd source) recovery within 85 - 115%?		
6. Continuing Calibration Verification (CCV): {Daily calibration}		
• Was midpoint calibration standard conducted at the beginning of the day?	[N]	[ ]
• Was midpoint calibration standard conducted every ten samples or every twelve hours?	[N]	[ ]
• Was midpoint calibration standard conducted after the last sample of the day?	[N]	[ ]
• Did the CCV meet the minimum requirements (D ≤ 15% with a maximum D ≤ 20% for a specific compound if the mean D ≤ 15%)?	[N]	[ ]
7. Sample Analysis:		
• Was the RRT of an identified component within the retention time window created as SW-846 requires?	N/A [ ]	[ ]
• Were all identified hits, above the initial calibration curve, diluted and reanalyzed?	[ ]	[ ]
• Were all identified hits confirmed on a second column?	[ ]	[ ]
• Was RPD of target analyte confirmation ≤ 40?	[ ]	[ ]
• Was there a shoulder on the 2,4,6-TNT peak?	[ ]	[ ]
If the answer is "Yes", then tetryl decomposition is suspected. Peak height rather than peak area should be used for calculating TNT concentration. If teryl was identified in aqueous samples, was pH adjusted to <3? If the answer is "No", then check for tetryl decomposition, and qualify hits with **"J"** accordingly.	[ ]	[ ]
8. Sample Quality Control:		
• Method Blanks: Were target analytes ≤ 1/2 MRL?	[N]	[ ]
• LCS: Were the percent recoveries for LCS within the limits?	[N]	[ ]

	Yes	No
• MS/MSD: Were the percent recoveries within limits?	[ ]	[ ]
Were the RPDs within control limits?		
• System Monitoring Compounds (Surrogates): Were surrogate recoveries within QC limits?	[ ]	[ ]

9. Comments (attach additional sheets if necessary):

MS/D 055M 4A (79, –) RPD 4A = 22 24DNT = 22%

~~063M NG + EX 4A (76~~

NG MRLs poorly integrated – includes more than peak; may be ↓ based on re-int

NC ~~MS/D 063M~~ 0201 56%/50%

Validated/Reviewed by:

Signature: P. Meeks Date: 3/6/13

Name: P. Meeks

NITROAROMATICS & NITRAMINE DATA ANALYSIS (EXPLOSIVE RESIDUES) CHECKLIST

9/21 SCSB-037M-0001-SO (851488)
9/22 SCSB-038M-0005-SO (851510)
9/21 SCSB-042M-0003-SO (851552)
9/21 SCSS-068M-0001-SO (850426)

Project Name: ODA1/Sand Creek

Laboratory: CT

Batch Number(s): 35049, 34934, 34878
(57/38 68 42)

Sample Delivery Group: _____

	Yes	No	
1. Holding Time: Were samples analyzed within holding time?	[N]	[N]	042M 8d; 037m 8d; 038m 7d
2. Initial Calibration:			
• Did the initial calibration consist of five standards?	[N]	[ ]	
• Did the RSD meet the criteria ≤ 20% for each individual Calibration Compound or r ≥ 0.99?	[N]	[ ]	
• Was manual integration "M" performed? If the answer is "Yes", check for supporting documents.	[ ]	[N]	
• Was the manual integration necessary?	[ ]	[ ]	
If the answer is "no", contact the laboratory inquiring about the reasons behind the manual integration, and **inform the District Chemist immediately if there were no valid reasons.**			
3. QCMDL:			
• Was MDL Check performed?	[N]	[ ]	
4. QCMRL:			
• Were QC/MRL run at the beginning and end of every daily sequence or every 12 hours??	[N]	[ ]	
• Was the percentage "D" for QC/MRL ≤ 30%?	[ ]	[ ]	
5. Initial Calibration Verification (ICV):	[N]	[ ]	

	Yes	No
• Was the ICV made of a 2nd source?	[N]	[ ]
• Was the mid level (2nd source) recovery within 85 - 115%?		
6. Continuing Calibration Verification (CCV): {Daily calibration}		
• Was midpoint calibration standard conducted at the beginning of the day?	[N]	[ ]
• Was midpoint calibration standard conducted every ten samples or every twelve hours?	[N]	[ ]
• Was midpoint calibration standard conducted after the last sample of the day?	[N]	[ ]
• Did the CCV meet the minimum requirements (D ≤ 15% with a maximum D ≤ 20% for a specific compound if the mean D ≤ 15%)?	[ ]	[ ]
7. Sample Analysis:		
• Was the RRT of an identified component within the retention time window created as SW-846 requires? N/A	[ ]	[ ]
• Were all identified hits, above the initial calibration curve, diluted and reanalyzed?	[ ]	[ ]
• Were all identified hits confirmed on a second column?	[ ]	[ ]
• Was RPD of target analyte confirmation ≤ 40?	[ ]	[ ]
• Was there a shoulder on the 2,4,6-TNT peak?	[ ]	[ ]
If the answer is "Yes", then tetryl decomposition is suspected. Peak height rather than peak area should be used for calculating TNT concentration. If teryl was identified in aqueous samples, was pH adjusted to <3? If the answer is "No", then check for tetryl decomposition, and qualify hits with **"J"** accordingly.	[ ]	[ ]
8. Sample Quality Control:	[N]	[ ]
• Method Blanks: Were target analytes ≤ 1/2 MRL?	[N]	[ ]
• LCS: Were the percent recoveries for LCS within the limits?		

	Yes	No
• MS/MSD: Were the percent recoveries within limits? N/A	[ ]	[ ]
Were the RPDs within control limits?		
• System Monitoring Compounds (Surrogates): Were surrogate recoveries within QC limits?	[N]	[ ]

9. Comments (attach additional sheets if necessary):

~~LCS 4A = 74% w/ 038M/038M~~
CCV 4A = 18%D UJ 042M

Validated/Reviewed by:

Signature: P. Meeks Date: 3/6/13

Name: P. Meeks

NITROAROMATICS & NITRAMINE DATA ANALYSIS (EXPLOSIVE RESIDUES) CHECKLIST

NG 10/18
+ DA1SB-068M-0201 (852373) 9/24
DA1SB-070M-0204 (852383) 9/24
DA1SB-072M-0204 (852390) 9/24
DA1SS-050M-0201 (852568) 9/27
triplicate

Project Name: ODA1 / Sand Creek

Laboratory: CT

050M 070M 072M 068M
Batch Number(s): 35123, 35122, 35121

Sample Delivery Group: 81623

	Yes	No	
1. Holding Time: Were samples analyzed within holding time?	[ ]	[N]	068M NG 10d EX 9d 070M 9d 072M 9d 050M 6d
2. Initial Calibration:			
• Did the initial calibration consist of five standards?	[N]	[ ]	
• Did the RSD meet the criteria ≤ 20% for each individual Calibration Compound or r ≥ 0.99?	[ ]	[ ]	
• Was manual integration "M" performed? If the answer is "Yes", check for supporting documents.	[ ]	[N]	
• Was the manual integration necessary?	[ ]	[ ]	
If the answer is "no", contact the laboratory inquiring about the reasons behind the manual integration, and **inform the District Chemist immediately if there were no valid reasons.**			
3. QCMDL:			
• Was MDL Check performed?	[N]	[ ]	
4. QCMRL:			
• Were QC/MRL run at the beginning and end of every daily sequence or every 12 hours??	[N]	[ ]	
• Was the percentage "D" for QC/MRL ≤ 30%?	[N]	[ ]	
5. Initial Calibration Verification (ICV):	[ ]	[ ]	

	Yes	No
• Was the ICV made of a 2nd source?	[N]	[ ]
• Was the mid level (2nd source) recovery within 85 - 115%?		
6. Continuing Calibration Verification (CCV): {Daily calibration}		
• Was midpoint calibration standard conducted at the beginning of the day?	[N]	[ ]
• Was midpoint calibration standard conducted every ten samples or every twelve hours?	[N]	[ ]
• Was midpoint calibration standard conducted after the last sample of the day?	[N]	[ ]
• Did the CCV meet the minimum requirements (D ≤ 15% with a maximum D ≤ 20% for a specific compound if the mean D ≤ 15%)?	[N]	[ ]
7. Sample Analysis:		
• Was the RRT of an identified component within the retention time window created as SW-846 requires? N/A	[ ]	[ ]
• Were all identified hits, above the initial calibration curve, diluted and reanalyzed?	[ ]	[ ]
• Were all identified hits confirmed on a second column?	[ ]	[ ]
• Was RPD of target analyte confirmation ≤ 40?	[ ]	[ ]
• Was there a shoulder on the 2,4,6-TNT peak?	[ ]	[ ]
If the answer is "Yes", then tetryl decomposition is suspected. Peak height rather than peak area should be used for calculating TNT concentration. If teryl was identified in aqueous samples, was pH adjusted to <3? If the answer is "No", then check for tetryl decomposition, and qualify hits with **"J"** accordingly.	[ ]	[ ]
8. Sample Quality Control:	[N]	[ ]
• Method Blanks: Were target analytes ≤ 1/2 MRL?	[ ]	[N]
• LCS: Were the percent recoveries for LCS within the limits?		

	Yes	No
• MS/MSD: Were the percent recoveries within limits?	~~[ ]~~ [N]	[ ]
Were the RPDs within control limits?		
• System Monitoring Compounds (Surrogates): Were surrogate recoveries within QC limits?	[ ]	~~[ ]~~ [N]

9. Comments (attach additional sheets if necessary):

MS/D DA155-050M-0201-50 RPD 24DNT=24%
LCS 4A=77% w/ 070M + 072M

CCV 24DNT =18.8 UJ / 068M

Validated/Reviewed by:

Signature: P. Meeks Date: 3/6/13

Name: P. Meeks

~~Need raw EX data~~

NITROAROMATICS & NITRAMINE DATA ANALYSIS (EXPLOSIVE RESIDUES) CHECKLIST

+SCSB-048M-0001 (854011) 9/29
SCSD-070M-0001 (854000) 9/28
SCSS-058M-0001 (852322) 9/23

Project Name: ODA1 / Sand Creek

Laboratory: CT

Batch Number(s): 35121 (058M), 35123 (070M, 048M), 35126 (NG)

Sample Delivery Group: 81670

	Yes	No	
1. Holding Time: Were samples analyzed within holding time?	[ ]	[N]	058M 10d 070M 5d 048M NG 4d Ex 3d
2. Initial Calibration:			
• Did the initial calibration consist of five standards?	[N]	[ ]	
• Did the RSD meet the criteria ≤ 20% for each individual Calibration Compound or r ≥ 0.99?	[N]	[ ]	
• Was manual integration "M" performed? If the answer is "Yes", check for supporting documents.	[ ]	[N]	
• Was the manual integration necessary?	[ ]	[ ]	
If the answer is "no", contact the laboratory inquiring about the reasons behind the manual integration, and **inform the District Chemist immediately if there were no valid reasons.**			
3. QCMDL:			
• Was MDL Check performed?	[N]	[ ]	
4. QCMRL:			
• Were QC/MRL run at the beginning and end of every daily sequence or every 12 hours??	[N]	[ ]	
• Was the percentage "D" for QC/MRL ≤ 30%?	[N]	[ ]	
5. Initial Calibration Verification (ICV):	[N]	[ ]	

	Yes	No
• Was the ICV made of a 2nd source?	[N]	[ ]
• Was the mid level (2nd source) recovery within 85 - 115%?		
6. Continuing Calibration Verification (CCV): {Daily calibration}		
• Was midpoint calibration standard conducted at the beginning of the day?	[N]	[ ]
• Was midpoint calibration standard conducted every ten samples or every twelve hours?	[N]	[ ]
• Was midpoint calibration standard conducted after the last sample of the day?	[N]	[ ]
• Did the CCV meet the minimum requirements (D ≤ 15% with a maximum D ≤ 20% for a specific compound if the mean D ≤ 15%)?	[N]	[ ]
7. Sample Analysis:		
• Was the RRT of an identified component within the retention time window created as SW-846 requires?	[N]	[ ]
• Were all identified hits, above the initial calibration curve, diluted and reanalyzed? N/A	[ ]	[ ]
• Were all identified hits confirmed on a second column?	[N]	[ ]
• Was RPD of target analyte confirmation ≤ 40?	[ ]	[N]
• Was there a shoulder on the 2,4,6-TNT peak?	[ ]	[N]
If the answer is "Yes", then tetryl decomposition is suspected. Peak height rather than peak area should be used for calculating TNT concentration. If teryl was identified in aqueous samples, was pH adjusted to <3? If the answer is "No", then check for tetryl decomposition, and qualify hits with **"J"** accordingly.	[ ]	[ ]
8. Sample Quality Control:	[N]	[ ]
• Method Blanks: Were target analytes ≤ 1/2 MRL?		
• LCS: Were the percent recoveries for LCS within the limits?	[N]	[ ]

	Yes	No
• MS/MSD: Were the percent recoveries within limits? N/A	[ ]	[ ]
Were the RPDs within control limits?		
• System Monitoring Compounds (Surrogates): Were surrogate recoveries within QC limits?	[N]	[ ]

9. Comments (attach additional sheets if necessary): 3
Intercolumn %RPD 246 in 058M = 75%

Validated/Reviewed by:

Signature: P. Meeks Date: 3/7/13

Name: P. Meeks

NITROAROMATICS & NITRAMINE DATA ANALYSIS (EXPLOSIVE RESIDUES) CHECKLIST

869558
SCSS-073M-0001 11/9
SCSS-076M-0001 11/9
869562

Project Name: ODA1 / Sand Creek

Laboratory: CT

Batch Number(s): 35490

Sample Delivery Group: 82400

	Yes	No
1. Holding Time: Were samples analyzed within holding time?	[N]	[ ]
2. Initial Calibration:		
• Did the initial calibration consist of five standards?	[ ]	[ ]
• Did the RSD meet the criteria ≤ 20% for each individual Calibration Compound or r ≥ 0.99?	[N]	[ ]
• Was manual integration "M" performed? If the answer is "Yes", check for supporting documents.	[ ]	[N]
• Was the manual integration necessary?	[ ]	[ ]
If the answer is "no", contact the laboratory inquiring about the reasons behind the manual integration, and **inform the District Chemist immediately if there were no valid reasons.**		
3. QCMDL:		
• Was MDL Check performed?	[N]	[ ]
4. QCMRL:		
• Were QC/MRL run at the beginning and end of every daily sequence or every 12 hours??	[N]	[ ]
• Was the percentage "D" for QC/MRL ≤ 30%?	[ ]	[N]
5. Initial Calibration Verification (ICV):	[N]	[ ]

	Yes	No
• Was the ICV made of a 2nd source?	[ ]	[ ]
• Was the mid level (2nd source) recovery within 85 - 115%?		
6. Continuing Calibration Verification (CCV): {Daily calibration}		
• Was midpoint calibration standard conducted at the beginning of the day?	[ ]	[ ]
• Was midpoint calibration standard conducted every ten samples or every twelve hours?	[ ]	[ ]
• Was midpoint calibration standard conducted after the last sample of the day?	[ ]	[ ]
• Did the CCV meet the minimum requirements (D ≤ 15% with a maximum D ≤ 20% for a specific compound if the mean D ≤ 15%)?	[ ]	[ ]
7. Sample Analysis:		
• Was the RRT of an identified component within the retention time window created as SW-846 requires? N/A	[ ]	[ ]
• Were all identified hits, above the initial calibration curve, diluted and reanalyzed?	[ ]	[ ]
• Were all identified hits confirmed on a second column?	[ ]	[ ]
• Was RPD of target analyte confirmation ≤ 40?	[ ]	[ ]
• Was there a shoulder on the 2,4,6-TNT peak?	[ ]	[ ]
If the answer is "Yes", then tetryl decomposition is suspected. Peak height rather than peak area should be used for calculating TNT concentration. If teryl was identified in aqueous samples, was pH adjusted to <3? If the answer is "No", then check for tetryl decomposition, and qualify hits with **"J"** accordingly.	[ ]	[ ]
8. Sample Quality Control:	[ ]	[ ]
• Method Blanks: Were target analytes ≤ 1/2 MRL?	[ ]	[ ]
• LCS: Were the percent recoveries for LCS within the limits?		

	Yes	No
• MS/MSD: Were the percent recoveries within limits? N/A	[ ]	[ ]
Were the RPDs within control limits?		
• System Monitoring Compounds (Surrogates): Were surrogate recoveries within QC limits?	[N]	[ ]

9. Comments (attach additional sheets if necessary):

MRL 2,6-DNT 60% UJ 076M

Validated/Reviewed by:

Signature: P. Meeks Date: 3/7/13

Name: P. Meeks

NITROAROMATICS & NITRAMINE DATA ANALYSIS (EXPLOSIVE RESIDUES) CHECKLIST

DA15B-074M-0202 (871039) 11/10
DA15S-054M-0201 (871020) 11/10

Project Name: ODA1 / Sand Creek

Laboratory: CT

Batch Number(s): 35490

Sample Delivery Group: 82452

	Yes	No	
1. Holding Time: Were samples analyzed within holding time?	[ ]	N	074M Id
2. Initial Calibration:			
• Did the initial calibration consist of five standards?	N	[ ]	
• Did the RSD meet the criteria ≤ 20% for each individual Calibration Compound or r ≥ 0.99?	N	[ ]	
• Was manual integration "M" performed? If the answer is "Yes", check for supporting documents.	[ ]	N	
• Was the manual integration necessary?	[ ]	[ ]	
If the answer is "no", contact the laboratory inquiring about the reasons behind the manual integration, and **inform the District Chemist immediately if there were no valid reasons.**			
3. QCMDL:			
• Was MDL Check performed?	N	[ ]	
4. QCMRL:			
• Were QC/MRL run at the beginning and end of every daily sequence or every 12 hours??	N	[ ]	
• Was the percentage "D" for QC/MRL ≤ 30%?	[ ]	N	
5. Initial Calibration Verification (ICV):	N	[ ]	

	Yes	No
• Was the ICV made of a 2nd source?	[ ]	[ ]
• Was the mid level (2nd source) recovery within 85 - 115%?		
6. Continuing Calibration Verification (CCV): {Daily calibration}		
• Was midpoint calibration standard conducted at the beginning of the day?	[ ]	[ ]
• Was midpoint calibration standard conducted every ten samples or every twelve hours?	[ ]	[ ]
• Was midpoint calibration standard conducted after the last sample of the day?	[ ]	[ ]
• Did the CCV meet the minimum requirements (D ≤ 15% with a maximum D ≤ 20% for a specific compound if the mean D ≤ 15%)?	[ ]	[ ]
7. Sample Analysis:		
• Was the RRT of an identified component within the retention time window created as SW-846 requires? N/A	[ ]	[ ]
• Were all identified hits, above the initial calibration curve, diluted and reanalyzed?	[ ]	[ ]
• Were all identified hits confirmed on a second column?	[ ]	[ ]
• Was RPD of target analyte confirmation ≤ 40?	[ ]	[ ]
• Was there a shoulder on the 2,4,6-TNT peak?	[ ]	[ ]
If the answer is "Yes", then tetryl decomposition is suspected. Peak height rather than peak area should be used for calculating TNT concentration. If teryl was identified in aqueous samples, was pH adjusted to <3? If the answer is "No", then check for tetryl decomposition, and qualify hits with **"J"** accordingly.	[ ]	[ ]
8. Sample Quality Control:		
• Method Blanks: Were target analytes ≤ 1/2 MRL?	[ ]	[ ]
• LCS: Were the percent recoveries for LCS within the limits?	[ ]	[ ]

	Yes	No
• MS/MSD: Were the percent recoveries within limits? N/A	[ ]	[ ]
Were the RPDs within control limits?		
• System Monitoring Compounds (Surrogates): Were surrogate recoveries within QC limits?	[ ]	[ ]

9. Comments (attach additional sheets if necessary):

MRL 2,6 DNT ~~35~~ 60% UJ both
24 64% } UJ 074
NG 58%

Validated/Reviewed by:

Signature: _____ Date: _____

Name: _____

ICP METALS ANALYSIS (6010) CHECKLIST

SCSB-048M-0001-SO (852322) 4011
SCSD-070M-0001-SD (854000)
SCSS-058M-0001-SO (852322)

Project Name: ODAI/Sand Creek

Laboratory: CT

Batch Number(s): _____

Sample Delivery Group: 81670

	Yes	No
1. Holding Time:		
• Were samples analyzed within holding time (6-Months)?	[N]	[ ]
2. Initial Calibration:		
• Did the initial calibration consist of		
One calibration standard and a blank?	[N]	[ ]
three calibration standards and a blank?	[ ]	[ ]
• Was R ≥ 0.995	[ ]	[ ]
3. QCMDL:		
• Was MDL Check performed?	[ ]	[N]
QCMRL:		
• Were QC/MRL run at the beginning and end of every daily sequence or every 12 hours??	[ ]	[ ]
• Was the QC/MRL between 70-130% R? Common Elements can be between the MRL and 2X MRL level (Fe, Al, Mg and Ca)	[ ]	[ ]
4. Initial Calibration Verification (ICV):		
• Is the mid level (2nd source) recovery within 90 - 110%?		
5. Initial Calibration Blank (ICP):		

	Yes	No
• Were analytes in the blank ≤ 1/2 MRL?	[ ]	[N]
6. Interelement Check Standard:		
• Was ICS-A (interferents only) conducted at the beginning of analytical sequence?	[N]	[ ]
• Was ICS-AB results within QC limits (80-120)?	[N]	[ ]
7. Continuing calibration Blank (CCB):		
• Was CCB conducted every 10 samples?	[N]	[ ]
• Was CCB conducted at end of the analytical sequence?	[N]	[ ]
• Were analytes ≤ 1/2 MRL?	[ ]	[N]
8. Continuing Calibration Verification (CCV):		
• Was CCV conducted every 10 samples?	[N]	[ ]
• Was CCV conducted at end of the analytical sequence?	[N]	[ ]
• Was the %R between 90-110?	[N]	[ ]
9. Sample Analysis:		
• Were samples with levels higher than the calibration range (E), diluted and re-analyzed?	[N]	[ ]
10. Sample Quality Control:		
• Method Blanks: Were target analytes ≤ 1/2 MRL?	[ ]	[N]
• LCS: Were the percent recoveries for LCS within the limits?	[N]	[ ]
• MS: Were the percent recoveries within limits?	[ ]	[N]
• MD: Were the RPDs within control limits?	[ ]	[N]
11. Serial Dilution:		
• Was serial dilution (1:4) conducted when needed?	[N]	[ ]

	Yes	No
• Was there an agreement between diluted and undiluted results (<10%)?	[ ]	[ ]

12. Method of Standard Addition (MSA):

• Was MSA performed on samples suspected of matrix effect (R ≥ 0.995)? N/A	[ ]	[ ]

13. Comments (attach additional sheets if necessary):
MRL Na = 73% 048m ~~+ 070m~~ detects too ↑

MS/D SCSS-057M-0001-SO Sb (26, 29), K (67, 59), Na (72, 72)

SCSB-051M-0001-SO Al (28, 23), Sb (24, 18), Pb (179, —)
Tl (69, 63), Cd (—, 69), Co (—, 75), Cu (—, 55), Ni (—, 75)
Zn (—, 55)

Dup SCSS-057M As (32), Tl (LOQ)

MS/D RPDs SCSB-051M Sb (27), Cd (30), Pb (57)

SDs: SCSS-057M Al (16), ~~Ba (18?)~~, Ca (16), Cr (15), Mg (16), Mn (15),
Ni (11) Zn (17)

SCSB-051M Zn (16)

Validated/Reviewed by:

Signature: P. Meeks Date: 3/5/13

Name: P. Meeks

ICP METALS ANALYSIS (6010) CHECKLIST

SCSS-073M-0001-SO (869558)
SCSS-076M-0001-SO (869562)

Project Name: ODA1 / Sand Creeks

Laboratory: CT

Batch Number(s): _____

Sample Delivery Group: 82400

	Yes	No
1. Holding Time:		
• Were samples analyzed within holding time (6-Months)?	[ ]	[ ]
2. Initial Calibration:		
• Did the initial calibration consist of		
One calibration standard and a blank?	[ ]	[ ]
three calibration standards and a blank?	[ ]	[ ]
• Was R ≥ 0.995	[ ]	[ ]
3. QCMDL:		
• Was MDL Check performed?	[ ]	[ ]
QCMRL:		
• Were QC/MRL run at the beginning and end of every daily sequence or every 12 hours??	[ ]	[ ]
	[ ]	[ ]
• Was the QC/MRL between 70-130% R? Common Elements can be between the MRL and 2X MRL level (Fe, Al, Mg and Ca)	[ ]	[ ]
4. Initial Calibration Verification (ICV):		
• Is the mid level (2nd source) recovery within 90 - 110%?		
5. Initial Calibration Blank (ICP):		

	Yes	No
• Were analytes in the blank ≤ 1/2 MRL?	[ ]	[ ]

6. Interelement Check Standard:

• Was ICS-A (interferents only) conducted at the beginning of analytical sequence?	[ ]	[ ]
• Was ICS-AB results within QC limits (80-120)?	[ ]	[ ]

7. Continuing calibration Blank (CCB):

• Was CCB conducted every 10 samples?	[ ]	[ ]
• Was CCB conducted at end of the analytical sequence?	[ ]	[ ]
• Were analytes ≤ 1/2 MRL?	[N]	[ ]

8. Continuing Calibration Verification (CCV):

• Was CCV conducted every 10 samples?	[ ]	[ ]
• Was CCV conducted at end of the analytical sequence?	[ ]	[ ]
• Was the %R between 90-110?	[N]	[ ]

9. Sample Analysis:

• Were samples with levels higher than the calibration range (E), diluted and re-analyzed?	[N]	[ ]

10. Sample Quality Control:

• Method Blanks: Were target analytes ≤ 1/2 MRL?	[ ]	[N]
• LCS: Were the percent recoveries for LCS within the limits?	[N]	[ ]
• MS: Were the percent recoveries within limits?	[ ]	[ ] N/A
• MD: Were the RPDs within control limits?	[ ]	[ ] ↓

11. Serial Dilution:

• Was serial dilution (1:4) conducted when needed?	[ ]	[N] N/A

	Yes	No
• Was there an agreement between diluted and undiluted results (<10%)?	~~[N]~~	[ ]

12. Method of Standard Addition (MSA):

• Was MSA performed on samples suspected of matrix effect ($R \geq 0.995$)? N/A	[ ]	[ ]

13. Comments (attach additional sheets if necessary):

MRL 073M Sb = 121, Se = 129, ~~Zn = 60~~ detect too large
076M Se = 78
~~Hg both~~ 076M Hg = 75

CCB TI = -4.91 UJ 073M
-8.33 J 076M

Validated/Reviewed by:

Signature: [signature] Date: 3/5/13

Name: P. Meeks

ICP METALS ANALYSIS (6010) CHECKLIST

Project Name: OPAI / Sand Creek

Laboratory: CT

Batch Number(s): SCSB-037M-0001-SO (851488)
SCSB-038M-0005-SO (851510)
SCSB-042M-0003-SO (851552)
SCSS-068M-0001-SO (850426)

Sample Delivery Group: 81578

	Yes	No
1. Holding Time:		
• Were samples analyzed within holding time (6-Months)?	[X]	[ ]
2. Initial Calibration:		
• Did the initial calibration consist of		
One calibration standard and a blank?	[X]	[ ]
three calibration standards and a blank?	[X]	[ ]
• Was R ≥ 0.995	[ ]	[ ]
3. QCMDL:		
• Was MDL Check performed?	[ ]	[X]
QCMRL:		
• Were QC/MRL run at the beginning and end of every daily sequence or every 12 hours??	[X]	[ ]
	[ ]	[X]
• Was the QC/MRL between 70-130% R? Common Elements can be between the MRL and 2X MRL level (Fe, Al, Mg and Ca)	[X]	[ ]
4. Initial Calibration Verification (ICV):		
• Is the mid level (2nd source) recovery within 90 - 110%?		
5. Initial Calibration Blank (ICP):		

	Yes	No
• Were analytes in the blank ≤ 1/2 MRL?	[N]	[ ]

6. Interelement Check Standard:

• Was ICS-A (interferents only) conducted at the beginning of analytical sequence?	[ ]	[ ]
• Was ICS-AB results within QC limits (80-120)?	[N]	[ ]

7. Continuing calibration Blank (CCB):

• Was CCB conducted every 10 samples?	[N]	[ ]
• Was CCB conducted at end of the analytical sequence?	[N]	[ ]
• Were analytes ≤ 1/2 MRL?	[ ]	[ ]

8. Continuing Calibration Verification (CCV):

• Was CCV conducted every 10 samples?	[N]	[ ]
• Was CCV conducted at end of the analytical sequence?	[N]	[ ]
• Was the %R between 90-110?	[ ]	[ ]

9. Sample Analysis:

• Were samples with levels higher than the calibration range (E), diluted and re-analyzed?	[N]	[ ]

10. Sample Quality Control:

• Method Blanks: Were target analytes ≤ 1/2 MRL?	[ ]	[N]
• LCS: Were the percent recoveries for LCS within the limits?	[N]	[ ]
• MS: Were the percent recoveries within limits?	[ ]	[N]
• MD: Were the RPDs within control limits?	[ ]	[N]

11. Serial Dilution:

• Was serial dilution (1:4) conducted when needed?	[ ]	[ ]

	Yes	No
• Was there an agreement between diluted and undiluted results (<10%)?	[ ]	[N]

12. Method of Standard Addition (MSA):

• Was MSA performed on samples suspected of matrix effect (R ≥ 0.995)? N/A	[ ]	[ ]

13. Comments (attach additional sheets if necessary):

MRL Th = 78% 042M
CCB Tl

SCSB-041M-0002-SO Sb (24, 23), Co (12, 10), Cu (69, 63), Ni (72, 67), V (79, 74)
Zn (74, 68), Mn (14, 10), Tl (74, 73), Al (52, 37), K (76, 72), Cd (-, 76)
Pb (-, 72), Mg (-, 75), ~~Ni (-, 67)~~ Se (-, 78)

SCSB-039M-0002-SO Sb (0, 0), Cd (78, 78), Co (50, 50), Cu (71, 70), Se (71, 70)
V (68, 66), Zn (71, 67), Tl (70, 75), K (78, -), Ni (-, 78)

SCSB-038M-0001-SO Sb (0, 0), Cd (56, 0), Cr (0, 0), Co (63, 0), Cu (46, 0)
Ni (74, 0), Se (71, 4), Tl (56, 2), V (75, -), Zn (74, 0), As (-, 7), Pb (-, 0)
RPDs As (200), Cd (200), Co (199), Cu (200), Pb (200), Ni (200), Tl (174), Zn (200)

SCSS-057M-0001-SO Sb (26, 29), K (67, 59), Na (72, 72)
Sb PDS = 71%

Dups 038M As (38), Cu (22), Pb (28), Ni (21), Tl (22), V (24), Zn (22)
057M As (±LOQ), Tl (±LOQ)

Validated/Reviewed by:

Signature: P. Meeks Date: 3/1/13

Name: P. Meeks

SD: 039~~041~~M Al (11), Ba (11), Be (12), Ca (13), Cr (16), Co (27), Cu (29), Pb (73), Mg (12)
Mn (16), Ni (18), V (18), Zn (28), Al (18)

041M Sb (21), As (11), Co (20), Cu (19), Pb (79), Mg (11), Ni (17), V (24)
Zn (21), Fe (18), Al (13)

038M ~~As~~Cr (112), Co (23), Cu (26), Pb (31), Mg (13), Ni (25), ~~K~~ (17), Zn (19)
Hg (42)

057M Al (16), Ba (18), Ca (16), Cr (15), Mg (16), Mn (15), Ni (11), Zn (17)

ICP METALS ANALYSIS (6010) CHECKLIST

DA15B-074M-0202-SO (871039)
DA155-054M-0201-SO (871020)

Project Name: ODA1/Sand Creek

Laboratory: CT

Batch Number(s): _____

Sample Delivery Group: 82452

	Yes	No
1. Holding Time:		
• Were samples analyzed within holding time (6-Months)?	[X]	[ ]
2. Initial Calibration:		
• Did the initial calibration consist of		
One calibration standard and a blank?	[ ]	[ ]
three calibration standards and a blank?	[X]	[ ]
• Was $R \geq 0.995$	[X]	[ ]
3. QCMDL:		
• Was MDL Check performed?	[ ]	[X]
QCMRL:		
• Were QC/MRL run at the beginning and end of every daily sequence or every 12 hours??	[X]	[ ]
	[X]	[ ]
• Was the QC/MRL between 70-130% R? Common Elements can be between the MRL and 2X MRL level (Fe, Al, Mg and Ca)	[X]	[ ]
4. Initial Calibration Verification (ICV):		
• Is the mid level (2nd source) recovery within 90 - 110%?		
5. Initial Calibration Blank (ICP):		

	Yes	No
• Were analytes in the blank ≤ 1/2 MRL?	[X]	[ ]
6. Interelement Check Standard:		
• Was ICS-A (interferents only) conducted at the beginning of analytical sequence?	[ ]	[ ]
• Was ICS-AB results within QC limits (80-120)?	[X]	[ ]
7. Continuing calibration Blank (CCB):		
• Was CCB conducted every 10 samples?	[X]	[ ]
• Was CCB conducted at end of the analytical sequence?	[X]	[ ]
• Were analytes ≤ 1/2 MRL?	[ ]	[X]
8. Continuing Calibration Verification (CCV):		
• Was CCV conducted every 10 samples?	[X]	[ ]
• Was CCV conducted at end of the analytical sequence?	[X]	[ ]
• Was the %R between 90-110?	[X]	[ ]
9. Sample Analysis:		
• Were samples with levels higher than the calibration range (E), diluted and re-analyzed?	[ ]	[ ]
10. Sample Quality Control:		
• Method Blanks: Were target analytes ≤ 1/2 MRL?	[ ]	[X]
• LCS: Were the percent recoveries for LCS within the limits?	[X]	[ ]
• MS: Were the percent recoveries within limits?	[ ]	[X]
• MD: Were the RPDs within control limits?	[ ]	[X]
11. Serial Dilution:		
• Was serial dilution (1:4) conducted when needed?	[X]	[ ]

	Yes	No
• Was there an agreement between diluted and undiluted results (<10%)?	[ ]	N

12. Method of Standard Addition (MSA):

• Was MSA performed on samples suspected of matrix effect (R ≥ 0.995)? N/A	[ ]	[ ]

13. Comments (attach additional sheets if necessary):

MRL Sb = 74% 074M
Hg = 75% 074M
Sb (121), Se (129), Zn (60) 054M
Hg = 78% 054M

CCB Tl = -4.91 B 020M
= -3.03 B 074M

MS/D DA15B-073M-0201-SO Al (77, 46), Sb (24, 24), Fe (53, 21), Mg (11, -) Zn (128, -), Pb (-, 75), Se (7, 79), Tl (-, 75)

DA15S-053M-0201-SO Sb (4, 21), As (78, -), Cd (72, -), Co (24, -) Pb (69, -), Ni (64, -), Se (75, -), Ag (60, 64), Tl (65, 70)
RPDs: Sb (77), Co (38), Pb (29)

Dup 073M Sb (38), Cd (28), Cu (22), Hg (27)
053M Na (36)

SD 053M Al (20), Ba (12), Cd (29), Cr (17), Co (23), Cu (23), Fe (17) Mg (23), Mn (17), Ni (22), V (18), Zn (21), Hg (33)
073M Al (12), Cd (36), Cr (12), Co (16), Cu (17), Fe (12), Pb (12), Ni (16) Zn (12)

CCB Tl = -3.03 J 074M Hg = -0.08 J/074
-4.91 J 054M
Se = -2.68 UJ 074M

Validated/Reviewed by:

Signature: P. Meeks Date: 3/1/13

Name: P. Meeks

ICP METALS ANALYSIS (6010) CHECKLIST

DA1SB-068M-0201 (852373)
DA1SB-070M-0204 (852388)
DA1SB-072M-0204 (852390)
DA1SS-050M-0201 (852568)

Project Name: ODA1/Sand Creek

Laboratory: CT

Batch Number(s): _____

Sample Delivery Group: 81623

	Yes	No
1. Holding Time:		
• Were samples analyzed within holding time (6-Months)? 28d	N	[ ]
2. Initial Calibration:		
• Did the initial calibration consist of		
One calibration standard and a blank?	N	[ ]
three calibration standards and a blank?	N	[ ]
• Was R ≥ 0.995	N	[ ]
3. QCMDL:		
• Was MDL Check performed?	[ ]	N
QCMRL:		
• Were QC/MRL run at the beginning and end of every daily sequence or every 12 hours??	N	[ ]
	[ ]	[ ]
• Was the QC/MRL between 70-130% R? Common Elements can be between the MRL and 2X MRL level (Fe, Al, Mg and Ca)	[ ]	N
4. Initial Calibration Verification (ICV):		
• Is the mid level (2nd source) recovery within 90 - 110%?	/	
5. Initial Calibration Blank (ICP):		

	Yes	No
• Were analytes in the blank ≤ 1/2 MRL?	[N]	[ ]

6. Interelement Check Standard:

• Was ICS-A (interferents only) conducted at the beginning of analytical sequence?	[ ]	[ ]
• Was ICS-AB results within QC limits (80-120)?	[ ]	[ ]

7. Continuing calibration Blank (CCB):

• Was CCB conducted every 10 samples?	[ ]	[ ]
• Was CCB conducted at end of the analytical sequence?	[ ]	[ ]
• Were analytes ≤ 1/2 MRL?	[ ]	[ ]

8. Continuing Calibration Verification (CCV):

• Was CCV conducted every 10 samples?	[ ]	[ ]
• Was CCV conducted at end of the analytical sequence?	[ ]	[ ]
• Was the %R between 90-110?	[ ]	[ ]

9. Sample Analysis:

• Were samples with levels higher than the calibration range (E), diluted and re-analyzed? N/A	[ ]	[ ]

10. Sample Quality Control:

• Method Blanks: Were target analytes ≤ 1/2 MRL?	[ ]	[ ]
• LCS: Were the percent recoveries for LCS within the limits?	[ ]	[ ]
• MS: Were the percent recoveries within limits?	[ ]	[ ]
• MD: Were the RPDs within control limits?	[ ]	[ ]

11. Serial Dilution:

• Was serial dilution (1:4) conducted when needed?	[ ]	[ ]

	Yes	No
• Was there an agreement between diluted and undiluted results (<10%)?	[ ]	[N]

12. Method of Standard Addition (MSA):

• Was MSA performed on samples suspected of matrix effect (R ≥ 0.995)? N/A	[ ]	[ ]

13. Comments (attach additional sheets if necessary):

Dup : SBSS-057m-0001-SO As (BOQ), Tl (LOQ), Cd (58)
~~Cd (LOQ)~~

MS/D RPDs : SCSB-051M-0001-SO Sb (27), Cd (30), Pb (57)

SD : SCSS:057m Al (16), Ba (18), Ca (16), Cr (15), Mg (16), Mn (15)
Ni (11), Zn (17)
DA1SB-070m As (20), Be (16), Ca (19), Cr (16), Co (19), Cu (23)
Pb (22), Mg (13), Ni (21), V (13), Zn (20), Hg (24)
SCSB-051M Zn (16)

CCB Cd = -0.939 UJ/B 070M, 072M

Validated/Reviewed by:

Signature: P. Meeks Date: 2/28/13

Name: Pete

MRL Na = 70% 10/21 08:53 — 070M, 072M, 050M
75% 10/21 14:49

MS/D SCSS-057m-001-SO Sb (26, 29), K (67, 59), Na (72, 72) & Cr (-, 39)
PDS (71)

DA1SB-070M-0201-SO Al (13, 36), Sb (19, 23), As (79, -), Cd (73, 77), Cr (69, -), Co (70, 79)
Mn (0, 2), Ni (69, -), Se (77, -), Ag (73, -), Tl (60, 65), V (73, -), Zn (68, -), K (78, -)
Na (73, 78) PDS Tl (60)

SCSB-051M-0001-SO Al (28, 23), Sb (24, 18), Pb (179,), Tl (69,), Cd (-, 69), Co (-, 75) J
PDS Tl (58) Cu (55,), Ni (70,), Tl (63,), Zn (55,)

ICP METALS ANALYSIS (6010) CHECKLIST

DA1SB-055M-0001 (851518)
059M-0201 (851528)
063M-0202 (851882)

Project Name: ODA1/Sand Creek

Laboratory: CT

SESB-037M-0001
038M-0005
042M-0003
SCSS-068M-0001

Batch Number(s):

Sample Delivery Group: ~~81543~~ 81575 & 81578

	Yes	No
1. Holding Time:		
• Were samples analyzed within holding time (6-Months)? 4 28d	[N]	[ ]
2. Initial Calibration:		
• Did the initial calibration consist of		
One calibration standard and a blank?	[N]	[ ]
three calibration standards and a blank?	[N]	[ ]
• Was $R \geq 0.995$	[N]	[ ]
3. QCMDL:		
• Was MDL Check performed?	[ ]	[N]
QCMRL:		
• Were QC/MRL run at the beginning and end of every daily sequence or every 12 hours??	[N]	[ ]
• Was the QC/MRL between 70-130% R? Common Elements can be between the MRL and 2X MRL level (Fe, Al, Mg and Ca)	[ ]	[N]
4. Initial Calibration Verification (ICV):	[N]	[ ]
• Is the mid level (2nd source) recovery within 90 - 110%?		
5. Initial Calibration Blank (ICP):		

	Yes	No
• Were analytes in the blank ≤ 1/2 MRL?	[ ]	[N]

6. Interelement Check Standard:

• Was ICS-A (interferents only) conducted at the beginning of analytical sequence?	[N]	[ ]
• Was ICS-AB results within QC limits (80-120)?	[N]	[ ]

7. Continuing calibration Blank (CCB):

• Was CCB conducted every 10 samples?	[N]	[ ]
• Was CCB conducted at end of the analytical sequence?	[N]	[ ]
• Were analytes ≤ 1/2 MRL?	[ ]	[N]

8. Continuing Calibration Verification (CCV):

• Was CCV conducted every 10 samples?	[N]	[ ]
• Was CCV conducted at end of the analytical sequence?	[N]	[ ]
• Was the %R between 90-110?	[N]	[ ]

9. Sample Analysis:

• Were samples with levels higher than the calibration range (E), diluted and re-analyzed? N/A	[ ]	[ ]

10. Sample Quality Control:

• Method Blanks: Were target analytes ≤ 1/2 MRL?	[ ]	[N]
• LCS: Were the percent recoveries for LCS within the limits?	[ ]	[ ]
• MS: Were the percent recoveries within limits?	[ ]	[ ]
• MD: Were the RPDs within control limits?	[ ]	[ ]

11. Serial Dilution:

• Was serial dilution (1:4) conducted when needed?	[ ]	[ ]

	Yes	No
• Was there an agreement between diluted and undiluted results (<10%)?	[ ]	[ ]

12. Method of Standard Addition (MSA):

• Was MSA performed on samples suspected of matrix effect (R ≥ 0.995)?	[ ]	[ ]

13. Comments (attach additional sheets if necessary):

MS/D SCSB-041M-0002-SO Sb (24,23), Co (12,10), Cu (69,63)
Ni (72,67), V (79,74), Zn (74,68), Mn (14,10)
Tl (74,73), Al (52,37), K (76,76), Cd (-,76), Cr (57)
Pb (-,72), Mg (-,75), ~~Ni (-,67)~~, Se (-,78)
SCSB-039M-002-SO Sb (0,0), Cd (78,78), Co (50,50)
Cu (71,70), Se (71,70), V (68,66), Zn (71,67), Tl (70,75)
K (78,-), Ni (-,78)

SCSB-038M-0001-SO Al (125,-), Sb (0,0), Cd (56,0)
Cr (0,0), Co (63,0), Cu (46,0), Ni (74,0), Se (71,4)
Tl (56,0), V (75,-), Zn (74,0), As (-,0), Pb (-,0)

DA1SB-055M-0001-SO ~~Al (0,0)~~, Sb (19,19), Cd (64,72)
Cr (0,0), Co (76,76), Cu (66,66), Mn (0,0), ~~Se~~ (78,-)
Tl (54,55), Zn (64,66), Mg (-,78)

DA1SB-063M-0201 Al (14,-), Sb (21,19), Cd (72,68), Cr (0,0) Ca 79
Se (-,77) Mg (-,76) Co (79,73), Cu (76,64), Mn (1,0), Tl (55,52) Zn (78,62)
SCSS-057M-0001-SO Sb (26,29), ~~Cr (59,-)~~, K (67,59), Na (72,72)
Ag (124,)

Validated/Reviewed by:

Signature: P. Meeks Date: 2/27/13

Name: P. Meeks

MRL Tl = 78% 059M-0201

MB Se = 0.1 mg/kg U/B 55M + 63M 10/12 17:16

Dups: SCSB-038M As (34), Cu (22), Pb (28), Ni (21), Tl (22), V (24), Zn (22)
SCSS-057M-0001 As (32), Tl (98)

MS/D RPDs SCSB-038M Tl (174), Zn (200,)

SD: SCSB-039M Al (11) Ba (11) Be (12) 193, Ca (13), Cr (16), Co (27), Cu (29), Pb (73)
Mg (12), Mn (16), Ni (18), V (18), Zn (28), Fe (18)
SCSB-041M As (11), Co (20), Pb (79), Mg (11), Ni (17), V (24), Zn (21), Fe (18), Al (13) →

055m → 10/12 @ 17:51 most
→ 10/11 16:02 Na+K
10/3 13:20 Hg 0.56g/25ml
→ 10/19 13:54 most - Ag

059m
10/20 16:17 Ag
→ 10/11 16:37 Na+K
10/13 13:50 Hg 0.56g/25mL

063m → 10/12 23:19 most
→ 10/11 19:46 Na+K
10/13 15:03 Hg 0.58g/25mL

SD ~~B~~AISB-063m Al(19), Ba(30), Be(29), Ca(25), Cr(39), Co(42), Cu(45), Mg(34), (Mn(20), Ni(44) V(33), Zn(41)

DAISB-055m Ba(14), Be(11), Ca(11), Cr(22), Co(22) Cu(25), Pb(54), Ni(23), V(18), Zn(22)

SCSB-038m As(41), Cr(112), Co(23), Cu(26), Pb(31) Mg(13), Ni(25), V(17), Zn(19)

SCSS-057m Al(16), Ba(18), Cd(29), Ca(16), Cr(15) Cr(15), ~~Co(19~~ Mg(16), Mn(15) Ni(11), Zn(17)

~~10/11 run starts p 6247~~ N/K OK

055m on p 6569 10/12 run
Ag = -1.60
Cd = -5.25

063m on p 6605 10/12 run
Ag = -1.94
Cd = -4.15

059m on p 6705 10/19 run
OK

MDL

Al, Sb, As	-4
Ba	-0.26
Be	-0.13
Cd	-0.11
Ca	15
Cr	0.7
Co	1.3
Cu	1.2
Fe	9
Pb	1.5
Mg	3
Mn	0.7
Ni	0.6
K	280
Se	2.3
Ag	0.7
Na	100
Tl	1.6
V	0.5
Zn	1.8
Hg	0.04

Appendix F
Fate and Transport Tables

Table F-3
Site-Specific Dilution Attenuation (DAF) Calculation
Open Demolition Area #1
RVAAP, Ravenna, Ohio

Analyte	CAS Number	Maximum Detection (mg/kg)	GSSL (DAF=1) (mg/kg)	RSL (mg/kg)	MCL based SSL (mg/kg)	Initial CMCOPC ?
Explosives and Propellants						
2,4,6-Trinitrotoluene	118-96-7	7.1	NF	0.013		Yes
2-Amino-4,6-Dinitrotoluene	35572-78-2	0.25	NF	0.056		Yes
Nitroguanidine	556-88-7	0.59	NF	0.88		No
Inorganics						
Antimony	7440-36-0	2.7	0.3			Yes
Barium	7440-39-3	252	82			Yes
Cadmium	7440-43-9	2.6	0.4			Yes
Chromium	7440-47-3	110	2			Yes
Cobalt	7440-48-4	20.60	NF	0.49		Yes
Copper	7440-50-8	188	NF	51	46	Yes
Cyanide	57-12-5	0.16	2			No
Mercury	7439-97-6	0.0079	NF	0.03	0.1	No
Selenium	7782-49-2	2.40	0.3			Yes
Thallium	7440-28-0	0.48	0.04			Yes
Zinc	7440-66-6	317	620			No
Semivolatile Organic Compounds						
Di-n-Butyl Phthalate	84-74-2	0.21	270			No
Pesticides						
4,4'-DDT	50-29-3	0.00072	NF	0.067		No
4,4'-DDE	72-55-9	0.00082	NF	NF	0.047	No
gamma-Chlordane	5103-74-2	0.0052	NF	NF	NF	No
Heptachlor	76-44-8	0.0019	NF	0.0012	0.033	No

SRCs that exceed the GSSL screen are in shaded grey.
CMCOPC denotes Contaminant Migration Contaminant of Potential Concern.
DAF denotes dilution attenuation factor.
DDE denotes dichlorodiethyldichloroethylene.
DDT denotes dichlorodiphenyltrichloroethane.
GSSL denotes generic soil screening level.
MCL denotes maximum contaminant level.
mg/kg denotes milligrams per kilogram.
NF denotes not found.
SRC denotes site-related contaminant.
SSL denotes soil screening level.
RSL denotes Risk-Based Screening Level (EPA, 2010).

Table F-3
Site-Specific Dilution Attenuation (DAF) Calculation
Open Demolition Area #1
RVAAP, Ravenna, Ohio

Analyte	CAS Number	Maximum Detection (mg/kg)	GSSL (DAF=1) (mg/kg)	Risk Based SSL (mg/kg)	MCL based SSL (mg/kg)	Initial CMCOPC ?
Explosives and Propellants						
2,4,6-Trinitrotoluene	118-96-7	64	NF	0.013		Yes
2-Amino-4,6-Dinitrotoluene	35572-78-2	0.31	NF	0.056		Yes
Inorganics						
Aluminum	7429-90-5	28,600	NF	55,000		No
Antimony	7440-36-0	20.5	0.3			Yes
Arsenic	7440-38-2	33	1			Yes
Barium	7440-39-3	869	82			Yes
Beryllium	7440-41-7	0.95	3			No
Cadmium	7440-43-9	18.4	0.4			Yes
Chromium	7440-47-3	589	2			Yes
Copper	7440-50-8	1,290	NF	51	46	Yes
Cyanide	57-12-5	0.4	2			No
Lead	7439-92-1	416	400			Yes
Mercury	7439-97-6	0.25	NF	0.03	0.1	Yes
Selenium	7782-49-2	2.4	0.3			Yes
Silver	7440-22-4	115	2			Yes
Thallium	7440-28-0	3.2	0.04			Yes
Vanadium	7440-62-2	39.9	300			No
Zinc	7440-66-6	475	620			No
Semivolatile Organic Compounds						
Bis(2-Ethylhexyl)phthalate	117-81-7	2.7	180			No
Isophorone	78-59-1	0.054	0.03			Yes
Di-n-Butyl Phthalate	84-74-2	0.11	270			No
2-Methylnaphthalene	91-57-6	0.053	NF	0.75		No
Pesticides						
4,4'-DDT	50-29-3	0.0003	NF	0.067		No
4,4'-DDE	72-55-9	0.00061	NF	0.047		No
Aldrin	309-00-2	0.00071	0.02			No
delta-BHC	608-73-1	0.0027	NF	0.27		No
Heptachlor Epoxide	1024-57-3	0.00061	0.03			No
Endosulfan II	115-29-7	0.00091	0.9			No
gamma-Chlordane	5103-74-2	0.0058	NF	NF	NF	No
Heptachlor	76-44-8	0.0073	NF	0.0012	0.033	No

SRCs that exceed the GSSL screen are shaded grey.

Table F-3
Site-Specific Dilution Attenuation (DAF) Calculation
Open Demolition Area #1
RVAAP, Ravenna, Ohio

Analyte	CAS Number	Maximum Detection (mg/kg)	GSSL (DAF=1) (mg/kg)	Risk Based SSL (mg/kg)	MCL based SSL (mg/kg)	Initial CMCOPC ?
Explosives and Propellants						
2,4,6-Trinitrotoluene	118-96-7	64	NF	0.013		Yes

BHC denotes benzene hexachloride.
CMCOPC denotes Contaminant Migration Contaminant of Potential Concern.
DAF denotes dilution attenuation factor.
DDE denotes dichlorodiethyldichloroethylene.
DDT denotes dichlorodiphenyltrichloroethane.
GSSL denotes generic soil screening level.
mg/kg denotes milligrams per kilogram.
MCL denotes maximum contaminant level.
NF denotes not found.
SRC denotes site-related contaminant.
SSL denotes soil screening level.
RSL denotes Risk-Based Screening Level (EPA, 2010).

Table F-3
Site-Specific Dilution Attenuation (DAF) Calculation
Open Demolition Area #1
RVAAP, Ravenna, Ohio

$$DAF = 1 + \{ (Kid))/IL \}$$

$$d = \sqrt{(0.012\ L^2)} + d_a \{1 - \exp [(-LI)/(Kid_a)] \}$$

Parameter	Symbol	Value	Units	Data Source
Dilution attenuation factor	DAF	1.03	unit less	Calculated using the DAF equation shown above
Aquifer Hydraulic conductivity	K	3.16	m/yr	Literature value based on lithology type (silts, sands and clayey sands), from Fetter C. W., 1992.
Horizontal hydraulic gradient	i	0.022	m/m	Estimated based on RVAAP unconsolidated potentiometric surface map, Portage Environmental, 07-08-04
Infiltration rate	I	0.09	m/yr	10% of annual precipitation from Youngstown WSO AP, Ohio weather station
Source length parallel to groundwater flow	L	152.4	m	Based on surface area of area with soil impacts
Mixing zone depth	d	5	m	determine from the lower value between d calculated by equation above and aquifer thickness
Aquifer thickness	da	5	m	Assumed value

m denotes meters.

m/m denotes meters per meter.

m/yr denotes meters per year.

Youngstown WSO AP denotes Youngstown Weather Service Office - Airport Station.

Table F-3
Site-Specific Dilution Attenuation (DAF) Calculation
Open Demolition Area #1
RVAAP, Ravenna, Ohio

Analyte	CAS Number	Maximum Detection (mg/kg)	SSL (mg/kg)	SSSL (DAF=1.03) (mg/kg)	Refined CMCOPC ?
Explosives and Propellants					
2,4,6-Trinitrotoluene	118-96-7	7.1	0.013	0.0134	Yes
2-Amino-4,6-Dinitrotoluene	35572-78-2	0.25	0.056	0.058	Yes
Inorganics					
Antimony	7440-36-0	2.7	0.3	0.31	Yes
Barium	7440-39-3	252	82	84.46	Yes
Cadmium	7440-43-9	2.6	0.4	0.41	Yes
Chromium	7440-47-3	110	2	2.1	Yes
Cobalt	7440-48-4	20.60	0.49	0.50	Yes
Copper	7440-50-8	188	51	52.5	Yes
Selenium	7782-49-2	2.40	0.3	0.31	Yes
Thallium	7440-28-0	0.48	0.04	0.041	Yes

SRCs that were retained after screening against SSSLs are shaded grey.

CMCOPC denotes Contaminant Migration Contaminant of Potential Concern.

DAF denotes dilution attenuation factor.

mg/kg denotes milligrams per kilogram.

SRC denotes site-related contaminant.

SSL denotes soil screening level.

SSSL denotes site-specific soil screening level.

Table F-3
Site-Specific Dilution Attenuation (DAF) Calculation
Open Demolition Area #1
RVAAP, Ravenna, Ohio

Analyte	CAS Number	Maximum Detection (mg/kg)	SSL (mg/kg)	SSSL (DAF=1.03) (mg/kg)	Refined CMCOPC ?
Explosives and Propellants					
2,4,6-Trinitrotoluene	118-96-7	64	0.013	0.0134	Yes
2-Amino-4,6-Dinitrotoluene	35572-78-2	0.31	0.056	0.058	Yes
Inorganics					
Antimony	7440-36-0	20.5	0.3	0.31	Yes
Arsenic	7440-38-2	33	1	1.03	Yes
Barium	7440-39-3	869	82	84.46	Yes
Cadmium	7440-43-9	18.4	0.4	0.41	Yes
Chromium	7440-47-3	589	2	2.06	Yes
Copper	7440-50-8	1,290	51	52.53	Yes
Lead	7439-92-1	416	400	412	Yes
Mercury	7439-97-6	0.25	0.1	0.103	Yes
Selenium	7782-49-2	2.4	0.3	0.309	Yes
Silver	7440-22-4	115	2	2.06	Yes
Thallium	7440-28-0	3.2	0.04	0.041	Yes
Semivolatile Organic Compounds					
Isophorone	78-59-1	0.054	0.03	0.031	Yes

SRCs that were retained after screening against SSSLs are shaded grey.

CMCOPC denotes Contaminant Migration Contaminant of Potential Concern.

DAF denotes dilution attenuation factor.

mg/kg denotes milligrams per kilogram.

SRC denotes site-related contaminant.

SSL denotes soil screening level.

SSSL denotes site-specific soil screening level.

Table F-3
Site-Specific Dilution Attenuation (DAF) Calculation
Open Demolition Area #1
RVAAP, Ravenna, Ohio

Analyte	CAS Number	Maximum Detection (mg/kg)	Koc L/Kg	Kd L/Kg	R	T year	CMCOPC (T<1000)
Explosives and Propellants							
2,4,6-Trinitrotoluene	118-96-7	7.1	2810 [a]	7.31E+00	44.8	217	Yes
2-Amino-4,6-Dinitrotoluene	35572-78-2	0.25	283 [c]	7.36E-01	5.4	26	Yes
Inorganics							
Antimony	7440-36-0	2.7	NA	4.50E+01 [a]	271	1,311	No
Barium	7440-39-3	252	NA	6.00E+01 [a]	361	1,747	No
Cadmium	7440-43-9	2.6	NA	6.40E+00 [a]	39	191	Yes
Chromium	7440-47-3	110	NA	8.50E+02 [a]	5,101	24,682	No
Cobalt	7440-48-4	20.60	NA	4.50E+01 [b]	271	1,311	No
Copper	7440-50-8	188	NA	3.50E+01 [b]	211	1,021	No
Selenium	7782-49-2	2.40	NA	3.00E+02 [a]	1,801	8,715	No
Thallium	7440-28-0	0.48	NA	1.50E+03 [a]	9,001	43,553	No

CMCOPCs that are retained for further analysis are shaded grey.

[a] *EPA, 1996, Soil Screening Guidance: Technical Background Document, EPA Document Number: EPA/540/R-95/128, July.*

[b] *Baes, C. F., and R. D. Sharp, 1983, A Proposal for Estimation of Soil Leaching Constants for Use in Assessment Models, Journal of Environmental Quality, 12:17-28.*

[c] *EPA, 2010, Regional Screening Level (RSL) Chemical -Specific Parameters Supporting Table, EPA Region 9, November.*

L/Kg denotes liters per kilogram.
Kd denotes soil-water distribution coefficient.
Koc denotes organic carbon distribution coefficient.
mg/kg denotes milligrams per kilogram.
R denotes retardation factor.
T denotes contaminant arrival time.

Table F-3
Site-Specific Dilution Attenuation (DAF) Calculation
Open Demolition Area #1
RVAAP, Ravenna, Ohio

Analyte	CAS Number	Maximum Detection (mg/kg)	Sample ID	Sample Top Depth ft bgs	Sample Bottom Depth ft bgs	Depth to water ft bgs	Leaching Zone Thickness ft	Koc L/kg	Kd L/kg	R	T year	CMCOPC (T<1000)
Explosives and Propellants												
2,4,6-Trinitrotoluene	118-96-7	64	DA1SB-070	1	4	5	1	2810 [a]	3.37E+00	16	19	Yes
2-Amino-4,6-Dinitrotoluene	35572-78-2	0.31	DA1SB-070	1	4	5	1	283 [d]	3.40E-01	3	3	Yes
Inorganics												
Antimony	7440-36-0	20.5	DA1SB-059	4	8	5	IN GROUNWATER					
Arsenic	7440-38-2	33	DA1SB-059	4	8	5	IN GROUNWATER					
Barium	7440-39-3	869	DA1SB-059	4	8	5	IN GROUNWATER					
Cadmium	7440-43-9	18.4	DA1SB-059	4	8	5	IN GROUNWATER					
Chromium	7440-47-3	589	DA1SB-072	12	16	6	IN GROUNWATER					
Copper	7440-50-8	1,290	DA1SB-072	2	4	6	2	NA	3.50E+01 [b]	156	370	Yes
Lead	7439-92-1	416	DA1SB-059	4	8	5	IN GROUNWATER					
Mercury	7439-97-6	0.25	DA1SB-064	8	12	6	IN GROUNWATER					
Selenium	7782-49-2	2.4	DA1SB-073	8	12		IN GROUNWATER					
Silver	7440-22-4	115	DA1SB-059	4	8	5	IN GROUNWATER					
Thallium	7440-28-0	3.2	DA1SB-056	1	4	6	2	NA	1.50E+03 [a]	6,663	15,777	No
Semivolatile Organic Compounds												
Isophorone	78-59-1	0.054	DA1SB-071	4	8	5	IN GROUNWATER					

CMCOPCs that are retained for further analysis are shaded grey.

[a] *EPA, 1996, Soil Screening Guidance: Technical Background Document, EPA Document Number: EPA/540/R-95/128, July.*

[b] *Baes, C. F., and R. D. Sharp, 1983, A Proposal for Estimation of Soil Leaching Constants for Use in Assessment Models, Journal of Environmental Quality, 12:17-28.*

[c] *EPA, 2010, Regional Screening Level (RSL) Chemical -Specific Parameters Supporting Table, EPA Region 9, November.*

DA1SB denotes soil boring from Open Demolition Area #1.
ft denotes feet.
ft bgs denotes feet below ground surface.
L/kg denotes liters per kilogram.
Kd denotes soil-water distribution coefficient.
Koc denotes organic carbon distribution coefficient.
mg/kg denotes milligrams per kilogram.
R denotes retardation factor.
T denotes contaminant arrival time.

Table F-3
Site-Specific Dilution Attenuation (DAF) Calculation
Open Demolition Area #1
RVAAP, Ravenna, Ohio

Analyte	Water Solubility (mg/L)	Diffusion Coefficient in Air (cm^2/sec)	Henry's Law Constants (atm-m3/mole)	K_{oc} (L/Kg)	K_d (L/Kg)	Molecular Weight (g/mole)	Half Life (hour)	Degradation Rate (per hour)
Explosives and Propellants								
2,4,6-Trinitrotoluene	1.15E+02	NF	2.08E-08	2810	NA	227.13	8,640	3.3E-06
2-Amino-4,6-Dinitrotoluene	3.19E+02	NF	1.62E-10	283	NA	197.15	NF	NF
Inorganics								
Copper	0.00E+00	NF	NF	NA	3.50E+01	63.55	NA	0.0E+00

Highest half life (lowest degradation rate) obtained from: Handbook of Environmental Degradation Rates, Lewis Publishers. Howard, P.H., Boethling, R.S., Jarvis, W.F., Meylan, W.M., and Michalenko, E.M., 1991.

Parameters except half life obtained from the following sources:
EPA, 1996, Soil Screening Guidance: Technical Background Document, EPA Document Number: EPA/540/R-95/128, July.
Baes, C. F., and R. D. Sharp, 1983, A Proposal for Estimation of Soil Leaching Constants for Use in Assessment Models, Journal of Environmental Quality, 12:17-
EPA, 2010, Regional Screening Level (RSL) Chemical -Specific Parameters Supporting Table, EPA Region 9, November.

cm^2/sec denotes square centimeter per second.

g/mole denotes grams per mole.

Kd denotes soil-water distribution coefficient.

Koc denotes organic carbon distribution coefficient.

L/kg denotes liters per kilogram.

m^3/mole denotes cubic meter per mole.

mg/L denotes milligrams per liter.

NF denotes not found.

NA denotes not applicable.

Table F-3
Site-Specific Dilution Attenuation (DAF) Calculation
Open Demolition Area #1
RVAAP, Ravenna, Ohio

Month	Air Temp (^{o}C)	Cloud Cover	Humidity	Albedo	Evapotranspiration (cm/d)	Precipitation (cm)	Duration (days)	Storms per Month	Model Days in Month
October	12	0.6	0.7	0.17	0	6.46	0.42	5.33	30.4
November	5.22	0.7	0.75	0.24	0	7.4	0.53	6.67	30.4
December	-1.06	0.8	0.75	0.31	0	7.06	0.57	6.14	30.4
January	-2.94	0.8	0.8	0.3	0	7.06	0.61	5.69	30.4
February	-2.33	0.7	0.75	0.32	0	5.76	0.53	5.09	30.4
March	2.33	0.7	0.7	0.29	0	8.26	0.55	7.14	30.4
April	9.11	0.7	0.7	0.19	0	8.83	0.48	7.4	30.4
May	14.61	0.6	0.7	0.16	0	8.46	0.45	7.15	30.4
June	19.89	0.6	0.7	0.16	0	9.07	0.36	6.57	30.4
July	21.89	0.5	0.7	0.16	0	9.8	0.3	6.06	30.4
August	21.11	0.55	0.7	0.16	0	8.14	0.3	6.06	30.4
September	17.67	0.55	0.7	0.16	0	7.85	0.4	5.44	30.4

Data is from 1996, from Youngstown, Ohio Weather Service Office - Airport Station.
^{o}C denotes degrees Celsius.
cm denotes centimeters.
cm/d denotes centimeters per day.

Table F-3
Site-Specific Dilution Attenuation (DAF) Calculation
Open Demolition Area #1
RVAAP, Ravenna, Ohio

Analyte	No. of Layers	Layer No.	Layer Thickness (feet)	No. of Sub layers	Sub layer No.	Maximum Soil Concentration (mg/kg)
2,4,6-Trinitrotoluene	3	1	1	1	1	7.1
		2	3	3	1	64
					2	64
					3	64
		3	1	1	1	0.0
2-Amino-4,6-Dinitrotoluene	3	1	1	1	1	0.25
		2	3	3	1	0.31
					2	0.31
					3	0.31
		3	1	1	1	0.00
Copper	3	1	1	1	1	188
		2	3	3	1	1290
					2	1290
					3	1290
		3	2	2	1	0
					2	0

mg/kg denotes milligrams per kilogram.

Table
Maximum Predicted Groundwater Concentration

CMCOPC based on travel time < 1000 years	Maximum Leachate Concentration mg/L	Time days	Maximum Groundwater Concentration mg/L	Time years	MCL/RBC mg/L	Final CMCOPC
Explosives and Propellants						
2,4,6-Trinitrotoluene	1.54	7,305	1.50	20	0.018	Yes
2-Amino-4,6-Dinitrotoluene	0.59	1,461	0.57	4	0.073	Yes
Inorganics						
Copper	0.00	NA	0.00	NA	1,300	No

Use MCL, if not available then use RBC ttp://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/xls/restap_sl_table_run_NOVEMBER2010.xls

DAF =1.08

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Do not print for Appendix

Appendix G
Human Health Risk Assessment Tables

General UCL Statistics for Data Sets with Non-Detects - ODA-1 Residential Farmer Deep Soil (Discrete)

User Selected Options

From File	N:\Shared\Employees Work Folder\Perwak,Jody\Ravenna\ODA1\UCLs\RF 1_13 for UCLsrev.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum

General Statistics

Number of Valid Observations	125	Number of Distinct Observations	89

Raw Statistics		Log-transformed Statistics	
Minimum	1990	Minimum of Log Data	7.596
Maximum	28600	Maximum of Log Data	10.26
Mean	11650	Mean of log Data	9.299
Median	11800	SD of log Data	0.388
SD	3863		
Coefficient of Variation	0.332		
Skewness	0.538		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.0794	Lilliefors Test Statistic	0.137
Lilliefors Critical Value	0.0792	Lilliefors Critical Value	0.0792
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	12223	95% H-UCL	12530
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	13618
95% Adjusted-CLT UCL	12236	97.5% Chebyshev (MVUE) UCL	14416
95% Modified-t UCL	12225	99% Chebyshev (MVUE) UCL	15984

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	7.766	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	1500		
MLE of Mean	11650		
MLE of Standard Deviation	4180		
nu star	1942		
Approximate Chi Square Value (.05)	1840	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0481	95% CLT UCL	12218
Adjusted Chi Square Value	1839	95% Jackknife UCL	12223
		95% Standard Bootstrap UCL	12209
Anderson-Darling Test Statistic	2.127	95% Bootstrap-t UCL	12250
Anderson-Darling 5% Critical Value	0.753	95% Hall's Bootstrap UCL	12271
Kolmogorov-Smirnov Test Statistic	0.111	95% Percentile Bootstrap UCL	12226
Kolmogorov-Smirnov 5% Critical Value	0.083	95% BCA Bootstrap UCL	12259
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	13156
		97.5% Chebyshev(Mean, Sd) UCL	13808
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	15088
95% Approximate Gamma UCL	12292		
95% Adjusted Gamma UCL	12299		

Potential UCL to Use	
Use 95% Student's-t UCL	12223
or 95% Modified-t UCL	12225

Antimony

General Statistics

Number of Valid Data	112	Number of Detected Data	43
Number of Distinct Detected Data	37	Number of Non-Detect Data	69
		Percent Non-Detects	61.61%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.22	Minimum Detected	-1.514
Maximum Detected	20.5	Maximum Detected	3.02
Mean of Detected	1.95	Mean of Detected	0.101
SD of Detected	3.24	SD of Detected	0.982
Minimum Non-Detect	0.54	Minimum Non-Detect	-0.616
Maximum Non-Detect	1.4	Maximum Non-Detect	0.336

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	96
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	16
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	85.71%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.484	Shapiro Wilk Test Statistic	0.966
5% Shapiro Wilk Critical Value	0.943	5% Shapiro Wilk Critical Value	0.943
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.018	Mean	-0.521
SD	2.13	SD	0.842
95% DL/2 (t) UCL	1.352	95% H-Stat (DL/2) UCL	1.036
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-0.642
		SD in Log Scale	0.997
		Mean in Original Scale	0.999
		SD in Original Scale	2.14
		95% Percentile Bootstrap UCL	1.386
		95% BCA Bootstrap UCL	1.583

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.961	**Data appear Lognormal at 5% Significance Level**	
Theta Star	2.029		
nu star	82.65		
A-D Test Statistic	1.548	**Nonparametric Statistics**	
5% A-D Critical Value	0.777	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.777	Mean	0.994
5% K-S Critical Value	0.139	SD	2.127
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.205
		95% KM (t) UCL	1.334
Assuming Gamma Distribution		95% KM (z) UCL	1.331
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.332
Minimum	1E-09	95% KM (bootstrap t) UCL	1.732
Maximum	20.5	95% KM (BCA) UCL	1.392

Mean	2.37	95% KM (Percentile Bootstrap) UCL	1.353
Median	1.76	95% KM (Chebyshev) UCL	1.886
SD	2.507	97.5% KM (Chebyshev) UCL	2.272
k star	0.421	99% KM (Chebyshev) UCL	3.03
Theta star	5.625		
Nu star	94.38	**Potential UCLs to Use**	
AppChi2	72.97	95% KM (t) UCL	1.334
95% Gamma Approximate UCL	3.065	95% KM (% Bootstrap) UCL	1.353
95% Adjusted Gamma UCL	3.076		

Note: DL/2 is not a recommended method.

Arsenic

General Statistics

Number of Valid Observations	124	Number of Distinct Observations	88

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.4	Minimum of Log Data	-0.916
Maximum	33	Maximum of Log Data	3.497
Mean	10.27	Mean of log Data	2.142
Median	10.65	SD of log Data	0.705
SD	5.403		
Coefficient of Variation	0.526		
Skewness	0.526		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Lilliefors Test Statistic	0.121	Lilliefors Test Statistic	0.149
Lilliefors Critical Value	0.0796	Lilliefors Critical Value	0.0796
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	11.08	95% H-UCL	12.37
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	14.23
95% Adjusted-CLT UCL	11.1	97.5% Chebyshev (MVUE) UCL	15.67
95% Modified-t UCL	11.08	99% Chebyshev (MVUE) UCL	18.51

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	2.764	**Data do not follow a Discernable Distribution (0.05)**
Theta Star	3.717	
MLE of Mean	10.27	
MLE of Standard Deviation	6.179	
nu star	685.6	
Approximate Chi Square Value (.05)	625.8	**Nonparametric Statistics**
Adjusted Level of Significance	0.0481	95% CLT UCL 11.07
Adjusted Chi Square Value	625.1	95% Jackknife UCL 11.08
		95% Standard Bootstrap UCL 11.06
Anderson-Darling Test Statistic	2.326	95% Bootstrap-t UCL 11.11
Anderson-Darling 5% Critical Value	0.76	95% Hall's Bootstrap UCL 11.08
Kolmogorov-Smirnov Test Statistic	0.123	95% Percentile Bootstrap UCL 11.09
Kolmogorov-Smirnov 5% Critical Value	0.0839	95% BCA Bootstrap UCL 11.05
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 12.39
		97.5% Chebyshev(Mean, Sd) UCL 13.3
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 15.1
95% Approximate Gamma UCL	11.25	
95% Adjusted Gamma UCL	11.27	

Potential UCL to Use	
Use 95% Chebyshev (Mean, Sd) UCL	12.39

Cadmium

General Statistics

Number of Valid Data	125	Number of Detected Data	25
Number of Distinct Detected Data	25	Number of Non-Detect Data	100
		Percent Non-Detects	80.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.026	Minimum Detected	-3.65
Maximum Detected	18.4	Maximum Detected	2.912
Mean of Detected	1.392	Mean of Detected	-0.921
SD of Detected	3.69	SD of Detected	1.412
Minimum Non-Detect	0.042	Minimum Non-Detect	-3.17
Maximum Non-Detect	0.64	Maximum Non-Detect	-0.446

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	116
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	9
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	92.80%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.369	Shapiro Wilk Test Statistic	0.953
5% Shapiro Wilk Critical Value	0.918	5% Shapiro Wilk Critical Value	0.918
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.391	Mean	-2.294
SD	1.704	SD	1.445
95% DL/2 (t) UCL	0.643	95% H-Stat (DL/2) UCL	0.437
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-3.754
		SD in Log Scale	2.045
		Mean in Original Scale	0.301
		SD in Original Scale	1.714
		95% Percentile Bootstrap UCL	0.6
		95% BCA Bootstrap UCL	0.775

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.472	**Data appear Lognormal at 5% Significance Level**	
Theta Star	2.948		
nu star	23.61		
A-D Test Statistic	2.182	**Nonparametric Statistics**	
5% A-D Critical Value	0.806	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.806	Mean	0.314
5% K-S Critical Value	0.184	SD	1.705
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.156
		95% KM (t) UCL	0.572
Assuming Gamma Distribution		95% KM (z) UCL	0.57
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.54
Minimum	1E-09	95% KM (bootstrap t) UCL	1.338
Maximum	18.4	95% KM (BCA) UCL	0.691
Mean	1.22	95% KM (Percentile Bootstrap) UCL	0.603
Median	1.102	95% KM (Chebyshev) UCL	0.993
SD	1.757	97.5% KM (Chebyshev) UCL	1.287
k star	0.245	99% KM (Chebyshev) UCL	1.864

Theta star	4.988
Nu star	61.13
AppChi2	44.15
95% Gamma Approximate UCL	1.689
95% Adjusted Gamma UCL	1.695

Potential UCLs to Use

95% KM (BCA) UCL	0.691

Note: DL/2 is not a recommended method.

Copper

General Statistics

Number of Valid Observations	125	Number of Distinct Observations	89

Raw Statistics		**Log-transformed Statistics**	
Minimum	9	Minimum of Log Data	2.197
Maximum	1290	Maximum of Log Data	7.162
Mean	34.95	Mean of log Data	3.002
Median	18.8	SD of log Data	0.596
SD	122.2		
Coefficient of Variation	3.496		
Skewness	9.33		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Lilliefors Test Statistic	0.466	Lilliefors Test Statistic	0.27
Lilliefors Critical Value	0.0792	Lilliefors Critical Value	0.0792
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	53.06	95% H-UCL	26.58
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	30.01
95% Adjusted-CLT UCL	62.67	97.5% Chebyshev (MVUE) UCL	32.61
95% Modified-t UCL	54.58	99% Chebyshev (MVUE) UCL	37.73

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.022	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	34.19		
MLE of Mean	34.95		
MLE of Standard Deviation	34.57		
nu star	255.5		
Approximate Chi Square Value (.05)	219.5	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0481	95% CLT UCL	52.93
Adjusted Chi Square Value	219.1	95% Jackknife UCL	53.06
		95% Standard Bootstrap UCL	53.18
Anderson-Darling Test Statistic	8E+28	95% Bootstrap-t UCL	129.3
Anderson-Darling 5% Critical Value	0.782	95% Hall's Bootstrap UCL	135.3
Kolmogorov-Smirnov Test Statistic	0.406	95% Percentile Bootstrap UCL	55.24
Kolmogorov-Smirnov 5% Critical Value	0.0854	95% BCA Bootstrap UCL	73.33
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	82.59
		97.5% Chebyshev(Mean, Sd) UCL	103.2
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	143.7
95% Approximate Gamma UCL	40.68		
95% Adjusted Gamma UCL	40.75		

Potential UCL to Use	
Use 95% Chebyshev (Mean, Sd) UCL	82.59

Lead

General Statistics

Number of Valid Observations	125	Number of Distinct Observations	92

Raw Statistics		**Log-transformed Statistics**	
Minimum	3.6	Minimum of Log Data	1.281
Maximum	416	Maximum of Log Data	6.031
Mean	16.62	Mean of log Data	2.464
Median	11.6	SD of log Data	0.639
SD	37.06		
Coefficient of Variation	2.23		
Skewness	10.28		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Lilliefors Test Statistic	0.363	Lilliefors Test Statistic	0.124
Lilliefors Critical Value	0.0792	Lilliefors Critical Value	0.0792
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	22.11	95% H-UCL	16.07
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	18.28
95% Adjusted-CLT UCL	25.32	97.5% Chebyshev (MVUE) UCL	19.97
95% Modified-t UCL	22.62	99% Chebyshev (MVUE) UCL	23.29

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.556	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	10.68		
MLE of Mean	16.62		
MLE of Standard Deviation	13.32		
nu star	389.1		
Approximate Chi Square Value (.05)	344.3	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0481	95% CLT UCL	22.07
Adjusted Chi Square Value	343.9	95% Jackknife UCL	22.11
		95% Standard Bootstrap UCL	22.09
Anderson-Darling Test Statistic	8E+28	95% Bootstrap-t UCL	37.03
Anderson-Darling 5% Critical Value	0.769	95% Hall's Bootstrap UCL	43.76
Kolmogorov-Smirnov Test Statistic	0.215	95% Percentile Bootstrap UCL	23.08
Kolmogorov-Smirnov 5% Critical Value	0.0845	95% BCA Bootstrap UCL	28.24
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	31.06
		97.5% Chebyshev(Mean, Sd) UCL	37.31
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	49.6
95% Approximate Gamma UCL	18.77		
95% Adjusted Gamma UCL	18.8		

Potential UCL to Use	
Use 95% Chebyshev (Mean, Sd) UCL	31.06

Thallium

General Statistics

Number of Valid Data	125	Number of Detected Data	107
Number of Distinct Detected Data	37	Number of Non-Detect Data	18
		Percent Non-Detects	14.40%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.14	Minimum Detected	-1.966
Maximum Detected	3.2	Maximum Detected	1.163
Mean of Detected	1.227	Mean of Detected	-0.0805

SD of Detected	0.777	SD of Detected	0.83
Minimum Non-Detect	0.14	Minimum Non-Detect	-1.966
Maximum Non-Detect	0.7	Maximum Non-Detect	-0.357
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	61
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	64
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	48.80%

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Lilliefors Test Statistic	0.224	Lilliefors Test Statistic	0.244
5% Lilliefors Critical Value	0.0857	5% Lilliefors Critical Value	0.0857
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.071	Mean	-0.369
SD	0.814	SD	1.061
95% DL/2 (t) UCL	1.191	95% H-Stat (DL/2) UCL	1.222
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.872	Mean in Log Scale	-0.296
SD	1.092	SD in Log Scale	0.946
95% MLE (t) UCL	1.034	Mean in Original Scale	1.083
95% MLE (Tiku) UCL	1.069	SD in Original Scale	0.801
		95% Percentile Bootstrap UCL	1.202
		95% BCA Bootstrap UCL	1.201

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	1.858	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	0.66		
nu star	397.7		
A-D Test Statistic	7.497	**Nonparametric Statistics**	
5% A-D Critical Value	0.766	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.766	Mean	1.078
5% K-S Critical Value	0.0889	SD	0.803
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0722
		95% KM (t) UCL	1.198
Assuming Gamma Distribution		95% KM (z) UCL	1.197
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.195
Minimum	1E-09	95% KM (bootstrap t) UCL	1.199
Maximum	3.2	95% KM (BCA) UCL	1.207
Mean	1.089	95% KM (Percentile Bootstrap) UCL	1.205
Median	1.1	95% KM (Chebyshev) UCL	1.393
SD	0.802	97.5% KM (Chebyshev) UCL	1.529
k star	0.45	99% KM (Chebyshev) UCL	1.796
Theta star	2.418		
Nu star	112.6	**Potential UCLs to Use**	
AppChi2	89.07	95% KM (BCA) UCL	1.207
95% Gamma Approximate UCL	1.376		
95% Adjusted Gamma UCL	1.379		

Note: DL/2 is not a recommended method.

Appendix H
Screening-Level Ecological Risk Assessment Tables

Table H-1
Soil Ecological Screening Values
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPEC	Log Kow	CAS Number	Ecological Screening Values for Soil						
			USEPA Eco SSL 2010 [a] (mg/kg)	ORNL PRGs 1997 [b] (mg/kg)	Region 5 ESLs 2003 [c] (mg/kg)	LANL ESLs 2010 [d] (mg/kg)	Talmage et al. 1999 [e] (mg/kg)	Persistent, Bioaccumulative, and Toxic Pollutant [f]	Recommended Soil Ecological Screening Value [g] (mg/kg)
Explosives									
1,3,5-Trinitrobenzene	1.45	99-35-4	NA	NA	0.376	6.6	9.7	No (Log Kow < 3.0)	0.376
1,3-Dinitrobenzene	1.63	99-65-0	NA	NA	0.655	0.073	0.41	No (Log Kow < 3.0)	0.655
2,4,6-Trinitrotoluene	1.99	118-96-7	NA	NA	NA	6.4	5.6	No (Log Kow < 3.0)	6.4
2,4-Dinitrotoluene	2.18	121-14-2	NA	NA	1.28	0.52	NA	No (Log Kow < 3.0)	1.28
2,6-Dinitrotoluene	2.18	606-20-2	NA	NA	0.0328	0.37	NA	No (Log Kow < 3.0)	0.0328
Dinitrotoluene (2,4/2,6-) Mixture (ca)	2.18	25321-14-6	NA	NA	NA	NA	NA	No (Log Kow < 3.0)	NA
2-Amino-4,6-dinitrotoluene	1.84	35572-78-2	NA	NA	NA	2.1	80	No (Log Kow < 3.0)	2.1
2-Nitrotoluene	2.36	88-72-2	NA	NA	NA	2	NA	No (Log Kow < 3.0)	2
3-Nitrotoluene	2.36	99-08-1	NA	NA	NA	2.4	NA	No (Log Kow < 3.0)	2.4
3,5-Dinitroaniline	1.29	618-87-1	NA	NA	NA	NA	NA	No (Log Kow < 3.0)	NA
4-Amino-2,6-dinitrotoluene	1.84	19406-51-0	NA	NA	NA	0.73	NA	No (Log Kow < 3.0)	0.73
4-Nitrotoluene	2.36	99-99-0	NA	NA	NA	4.4	NA	No (Log Kow < 3.0)	4.4
HMX	0.82	2691-41-0	NA	NA	NA	27	5.6	No (Log Kow < 3.0)	27
Nitrobenzene	1.81	98-95-3	NA	NA	1.31	2.2	NA	No (Log Kow < 3.0)	1.31
Nitroglycerin	1.51	55-63-0	NA	NA	NA	71	NA	No (Log Kow < 3.0)	71
Nitroguanidine	-1.72	556-88-7	NA	NA	NA	NA	NA	No (Log Kow < 3.0)	NA
PETN	2.38	78-11-5	NA	NA	NA	8600	NA	No (Log Kow < 3.0)	8600
RDX	0.68	121-82-4	NA	NA	NA	7.5	15	No (Log Kow < 3.0)	7.5
Tetryl	1.64	479-45-8	NA	NA	NA	0.99	4.4	No (Log Kow < 3.0)	0.99
Metals									
Aluminum	NA	7429-90-5	Narrative	NA	NA	Narrative	NA	No (not USEPA IBC)	NA
Antimony	NA	7440-36-0	0.27	5	0.142	0.05	NA	No (not USEPA IBC)	0.27
Arsenic	NA	7440-38-2	18	9.9	5.7	6.8		**Yes (USEPA IBC)**	18
Barium	NA	7440-39-3	330	283	1.04	110	NA	No (not USEPA IBC)	330
Beryllium	NA	7440-41-7	21	10	1.06	2.5		No (not USEPA IBC)	21
Cadmium	NA	7440-43-9	0.36	4	0.00222	0.27	NA	**Yes (USEPA IBC)**	0.36
Calcium	NA	7440-70-2	NA	NA	NA	NA	NA	No (not USEPA IBC)	NA
Cobalt	NA	7440-48-4	13	20	0.14	13		No (not USEPA IBC)	13
Copper	NA	7440-50-8	28	60	5.4	15	NA	**Yes (USEPA IBC)**	28
Chromium (as Cr^{3+})	NA	7440-47-3	26	0.4	0.4	2.3	NA	No (not USEPA IBC)	26
Chromium (as Cr^{6+})	NA	18540-29-9	130	NA	NA	0.34	NA	**Yes (USEPA IBC)**	130
Iron	NA	4739-89-6	Narrative	NA	NA	NA	NA	No (not USEPA IBC)	NA
Lead	NA	7439-92-1	11	40.5	0.0537	14	NA	**Yes (USEPA IBC)**	11
Magnesium	NA	7439-95-4	NA	NA	NA	NA	NA	No (not USEPA IBC)	NA
Manganese	NA	7439-96-5	220	NA	NA	220	NA	No (not USEPA IBC)	220
Mercury	NA	7439-97-6	NA	0.00051	0.1	0.013	NA	**Yes (OEPA PBT)**	0.00051
Nickel	NA	7440-02-0	38	30	13.6	9.7	NA	**Yes (USEPA IBC)**	38

Table H-1 (continued)
Soil Ecological Screening Values
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPEC	Log Kow	CAS Number	Ecological Screening Values for Soil						
			USEPA Eco SSL 2010 [a] (mg/kg)	ORNL PRGs 1997 [b] (mg/kg)	Region 5 ESLs 2003 [c] (mg/kg)	LANL ESLs 2010 [d] (mg/kg)	Talmage et al. 1999 [e] (mg/kg)	Persistent, Bioaccumulative, and Toxic Pollutant [f]	Recommended Soil Ecological Screening Value [g] (mg/kg)
Explosives									
Potassium									
Selenium	NA	7782-49-2	0.52	0.21	0.0276	0.52	NA	**Yes (USEPA IBC)**	0.52
Silver	NA	7440-22-4	4.2	2	4.04	2.6	NA	**Yes (USEPA IBC)**	4.2
Sodium	NA		NA	NA	NA	NA	NA	No (not USEPA IBC)	Nutrient
Strontium	NA	7440-24-6	NA	NA	NA	96	NA	No (not USEPA IBC)	NA
Thallium	NA	7440-28-0	NA	1	0.0569	0.032	NA	No (not USEPA IBC)	1
Vanadium	NA	7440-62-2	7.8	2	1.59	0.025	NA	No (not USEPA IBC)	7.8
Zinc	NA	7440-66-0	46	8.5	6.62	48	NA	**Yes (USEPA IBC)**	46
Volatile Organic Compounds									
Chloroethane	1.58	75-00-3	NA	NA	NA	NA	NA	No (Log Kow < 3.0)	NA
Semivolatile Organic Compounds									
1,2,4-Trichlorobenzene	3.93	120-82-1	NA	20	11.1	0.27	NA	**Yes (Log Kow ≥ 3.0)**	20
1,2-Dichlorobenzene	3.28	95-50-1	NA	NA	2.96	0.92	NA	**Yes (Log Kow ≥ 3.0)**	2.96
1,3-Dichlorobenzene	3.28	541-73-1	NA	NA	37.7	0.73	NA	**Yes (Log Kow ≥ 3.0)**	37.7
1,4-Dichlorobenzene	3.28	106-46-7	NA	20	0.546	0.88	NA	**Yes (Log Kow ≥ 3.0)**	20
2,4,5-Trichlorophenol	3.45	95-95-4	NA	9	14.1	NA	NA	**Yes (Log Kow ≥ 3.0)**	9
2,4,6-Trichlorophenol	3.45	88-06-2	NA	4	9.94	NA	NA	**Yes (Log Kow ≥ 3.0)**	4
2,4-Dichlorophenol	2.8	120-83-2	NA	NA	87.5	NA	NA	No (Log Kow < 3.0)	87.5
2,4-Dimethylphenol	2.61	105-67-9	NA	NA	0.01	NA	NA	No (Log Kow < 3.0)	0.01
2,4-Dinitrophenol	1.73	51-28-5	NA	20	0.0609	NA	NA	No (Log Kow < 3.0)	20
2,4-Dinitrotoluene	2.18	121-14-2	NA	NA	1.28	0.52	NA	No (Log Kow < 3.0)	1.28
2,6-Dinitrotoluene	2.18	606-20-2	NA	NA	0.0328	0.37	NA	No (Log Kow < 3.0)	0.0328
2-Chloronaphthalene	3.81	91-58-7	NA	NA	0.0122	NA	NA	**Yes (Log Kow ≥ 3.0)**	0.0122
2-Chlorophenol	2.16	95-57-8	NA	NA	0.243	0.39	NA	No (Log Kow < 3.0)	0.243
2-Methylnaphthalene	3.72	91-57-6	NA	NA	3.24	2.5	NA	**Yes (Log Kow ≥ 3.0)**	3.24
2-Methylphenol	2.06	95-48-7	NA	NA	40.4	0.67	NA	No (Log Kow < 3.0)	40.4
2-Nitroaniline	2.02	88-74-4	NA	NA	74.1	5.4	NA	No (Log Kow < 3.0)	74.1
2-Nitrophenol	1.91	88-75-5	NA	NA	1.6	NA	NA	No (Log Kow < 3.0)	1.6
3 & 4-Methylphenol	2.06	CASID30030	NA	NA	3.49	0.69	NA	No (Log Kow < 3.0)	3.49
3,3'-Dichlorobenzidine	3.21	91-94-1	NA	NA	0.646	NA	NA	**Yes (Log Kow ≥ 3.0)**	0.646
3-Nitroaniline	1.47	99-09-2	NA	NA	3.16	NA	NA	No (Log Kow < 3.0)	3.16
4,6-Dinitro-2-methylphenol	2.27	534-52-1	NA	NA	0.144	NA	NA	No (Log Kow < 3.0)	0.144
4-Bromophenyl-phenyl ether	4.94	101-55-3	NA	NA	NA	NA	NA	**Yes (Log Kow ≥ 3.0)**	NA
4-Chloro-3-methylphenol	2.7	59-50-7	NA	NA	7.95	NA	NA	No (Log Kow < 3.0)	7.95
4-Chloroaniline	1.72	106-47-8	NA	NA	1.1	1	NA	No (Log Kow < 3.0)	1.1
4-Chlorophenyl-phenyl ether	4.69	7005-72-3	NA	NA	NA	NA	NA	**Yes (Log Kow ≥ 3.0)**	NA
4-Nitroaniline	1.47	100-01-6	NA	NA	21.9	NA	NA	No (Log Kow < 3.0)	21.9

Table H-1 (continued)
Soil Ecological Screening Values
Ravenna Army Ammunition Plant, Ravenna, Obio

COPEC	Log Kow	CAS Number	Ecological Screening Values for Soil						
			USEPA Eco SSL 2010 [a] (mg/kg)	ORNL PRGs 1997 [b] (mg/kg)	Region 5 ESLs 2003 [c] (mg/kg)	LANL ESLs 2010 [d] (mg/kg)	Talmage et al. 1999 [e] (mg/kg)	Persistent, Bioaccumulative, and Toxic Pollutant [f]	Recommended Soil Ecological Screening Value [g] (mg/kg)
Explosives									
4-Nitrophenol	1.91	100-02-7	NA	7	5.12	NA	NA	No (Log Kow < 3.0)	7
Acenaphthene	4.15	83-32-9	29	20	682	0.25	NA	**Yes (Log Kow ≥ 3.0)**	29
Acenaphthylene	3.94	208-96-8	29	NA	682	120	NA	**Yes (Log Kow ≥ 3.0)**	29
Anthracene	4.35	120-12-7	29	NA	1480	6.8	NA	**Yes (Log Kow ≥ 3.0)**	29
Benzo(a)anthracene	5.52	56-55-3	1.1	NA	5.21	3	NA	**Yes (Log Kow ≥ 3.0)**	1.1
Benzo(a)pyrene	6.11	50-32-8	1.1	NA	1.52	53	NA	**Yes (Log Kow ≥ 3.0)**	1.1
Benzo(b)fluoranthene	6.11	205-99-2	1.1	NA	59.8	18	NA	**Yes (Log Kow ≥ 3.0)**	1.1
Benzo(g,h,i)perylene	6.7	191-24-2	1.1	NA	119	24	NA	**Yes (Log Kow ≥ 3.0)**	1.1
Benzo(k)fluoranthene	6.11	207-08-9	1.1	NA	148	62	NA	**Yes (Log Kow ≥ 3.0)**	1.1
Benzoic acid	1.87	65-85-0	NA	NA	NA	1	NA	No (Log Kow < 3.0)	1
Benzyl alcohol	1.08	100-51-6	NA	NA	65.8	120	NA	No (Log Kow < 3.0)	65.8
Bis(2-chloroethoxy)methane	1.3	111-91-1	NA	NA	0.302	NA	NA	No (Log Kow < 3.0)	0.302
Bis(2-chloroethyl)ether	1.56	111-44-4	NA	NA	23.7	NA	NA	No (Log Kow < 3.0)	23.7
Bis(2-chloroisopropyl)ether	2.39	108-60-1	NA	NA	19.9	NA	NA	No (Log Kow < 3.0)	19.9
Bis(2-ethylhexyl)phthalate	8.39	117-81-7	NA	NA	0.925	0.02	NA	**Yes (Log Kow ≥ 3.0)**	0.925
Butylbenzylphthalate	4.84	85-68-7	NA	NA	0.239	90	NA	**Yes (Log Kow ≥ 3.0)**	0.239
Carbazole	3.23	86-74-8	NA	NA	NA	0.00008	NA	**Yes (Log Kow ≥ 3.0)**	0.00008
Chrysene	5.52	218-01-9	1.1	NA	4.73	2.4	NA	**Yes (Log Kow ≥ 3.0)**	1.1
Di-n-butylphthalate	4.61	84-74-2	NA	200	0.15	0.011	NA	**Yes (Log Kow ≥ 3.0)**	200
Di-n-octylphthalate	8.54	117-84-0	NA	NA	709	1.1	NA	**Yes (Log Kow ≥ 3.0)**	709
Dibenzo(a,h)anthracene	6.7	53-70-3	1.1	NA	18.4	12	NA	**Yes (Log Kow ≥ 3.0)**	1.1
Dibenzofuran	3.71	132-64-9	NA	NA	NA	6.1	NA	**Yes (Log Kow ≥ 3.0)**	6.1
Diethylphthalate	2.65	84-66-2	NA	100	24.8	100	NA	No (Log Kow < 3.0)	100
Dimethylphthalate	1.66	131-11-3	NA	NA	734	10	NA	No (Log Kow < 3.0)	734
Fluoranthene	4.93	206-44-0	29	NA	122	10	NA	**Yes (Log Kow ≥ 3.0)**	29
Fluorene	4.02	86-73-7	29	NA	122	3.7	NA	**Yes (Log Kow ≥ 3.0)**	29
Hexachlorobenzene	5.86	118-74-1	NA	NA	0.199	0.079	NA	**Yes (Log Kow ≥ 3.0)**	0.199
Hexachlorobutadiene	4.72	87-68-3	NA	NA	0.0398	NA	NA	**Yes (Log Kow ≥ 3.0)**	0.0398
Hexachlorocyclopentadiene	4.63	77-47-4	NA	10	0.755	NA	NA	**Yes (Log Kow ≥ 3.0)**	10
Hexachloroethane	4.03	67-72-1	NA	NA	0.596	NA	NA	**Yes (Log Kow ≥ 3.0)**	0.596
Indeno(1,2,3-cd)pyrene	6.7	193-39-5	1.1	NA	109	62	NA	**Yes (Log Kow ≥ 3.0)**	1.1
Isophorone	2.62	78-59-1	NA	NA	139	NA	NA	No (Log Kow < 3.0)	139
N-Nitroso-di-n-propylamine	1.33	621-64-7	NA	NA	0.544	NA	NA	No (Log Kow < 3.0)	0.544
N-Nitrosodiphenylamine & Diphn	3.16	86-30-6	NA	NA	0.545	NA	NA	**Yes (Log Kow ≥ 3.0)**	0.545
Naphthalene	3.17	91-20-3	29	NA	0.0994	1	NA	**Yes (Log Kow ≥ 3.0)**	29
Nitrobenzene	1.81	98-95-3	NA	NA	1.31	2.2	NA	No (Log Kow < 3.0)	1.31
Pentachlorophenol	4.74	87-86-5	2.1	3	0.119	0.36	NA	**Yes (Log Kow ≥ 3.0)**	2.1

Table H-1 (continued)
Soil Ecological Screening Values
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPEC	Log Kow	CAS Number	Ecological Screening Values for Soil						
			USEPA Eco SSL 2010 [a] (mg/kg)	ORNL PRGs 1997 [b] (mg/kg)	Region 5 ESLs 2003 [c] (mg/kg)	LANL ESLs 2010 [d] (mg/kg)	Talmage et al. 1999 [e] (mg/kg)	Persistent, Bioaccumulative, and Toxic Pollutant [f]	Recommended Soil Ecological Screening Value [g] (mg/kg)
Explosives									
Phenanthrene	4.35	85-01-8	29	NA	45.7	5.5	NA	Yes (Log Kow ≥ 3.0)	29
Phenol	1.51	108-95-2	NA	30	120	0.79	NA	No (Log Kow < 3.0)	30
Pyrene	4.93	129-00-0	1.1	NA	78.5	10	NA	Yes (Log Kow ≥ 3.0)	1.1
Pesticides									
4,4'-DDD	5.87	72-54-8	0.021	NA	0.758	0.0063	NA	Yes (Log Kow ≥ 3.0)	0.021
4,4'-DDE	6	72-55-9	0.021	NA	0.596	0.11	NA	Yes (Log Kow ≥ 3.0)	0.021
4,4'-DDT	6.79	50-29-3	0.021	NA	0.0035	0.044	NA	Yes (Log Kow ≥ 3.0)	0.021
gamma Chlordane	6.26	5103-74-2	NA	NA	0.224	2.2	NA	Yes (Log Kow ≥ 3.0)	0.224
Heptachlor	5.86	76-44-8	NA	NA	0.00598	0.059	NA	Yes (Log Kow ≥ 3.0)	0.00598
Lindane	4.26	58-89-9	NA	NA	0.005	0.0094	NA	Yes (Log Kow ≥ 3.0)	0.005
Methoxychlor	5.67	72-43-5	NA	NA	0.0199	5	NA	Yes (Log Kow ≥ 3.0)	0.0199
PCBs									
Aroclor 1016	5.69	12674-11-2	NA	0.371	0.000332	1	NA	Yes (Log Kow ≥ 3.0)	0.371
Aroclor 1221	4.4	11104-28-2	NA	0.371	0.000332	NA	NA	Yes (Log Kow ≥ 3.0)	0.371
Aroclor 1232	4.4	11141-16-5	NA	0.371	0.000332	NA	NA	Yes (Log Kow ≥ 3.0)	0.371
Aroclor 1242	6.34	53469-21-9	NA	0.371	0.000332	0.041	NA	Yes (Log Kow ≥ 3.0)	0.371
Aroclor 1248	6.34	12672-29-6	NA	0.371	0.000332	0.0072	NA	Yes (Log Kow ≥ 3.0)	0.371
Aroclor 1254	6.98	11097-69-1	NA	0.371	0.000332	0.041	NA	Yes (Log Kow ≥ 3.0)	0.371
Aroclor 1260	8.27	11096-82-5	NA	0.371	0.000332	0.14	NA	Yes (Log Kow ≥ 3.0)	0.371
General Chemistry									
Cyanide, Total	57-12-5	57-12-5	NA	NA	1.33	0.1	NA	NA	1.33
Nitrocellulose									
Nitrocellulose	-4.56	9004-70-0	NA	NA	NA	NA	NA	No (Log Kow < 3.0)	NA
Total Organic Carbon									
Total Organic Carbon	NA	TOC (mg/kg)	NA	NA	NA	NA	NA	NA	NA
pH	NA	pH (Units)	NA	NA	NA	NA	NA	NA	NA

Notes:

[a] *Ecological Soil Screening Levels (EcoSSLs), (EPA, 2008) online updates from http: www.epa.gov ecotox ecossl .*

[b] *ORNL: Efroymson, R.A., Suter II, G.W., Sample, B.E. and Jones, D.S., 1997. Preliminary Remediation Goals for Ecological Endpoints, ES ER TM-162 R2.*

[c] *Ecological Screening Levels (ESLs), US EPA Region V, August 2003.*

[d] *Los Alamos National Laboratory (LANL), Eco Risk Database, Release 2.5, October 2010.*

[e] *From Nitroaromatic Munition Compaunds: Environmental Effects and Screening Values, Talmage et al., 1999, Rev. Environ. Contamin. Toxicol., 161: 1-156.*

[f] *Analyte identified as a persistent, bioaccumulative, and toxic (PBT) compound (OEPA DERR ERA Guidance, April 2008).*

[g] *The following hierarchy (based on OEPA DERR ERA Guidance, April 2008) was used to select the soil screening values:*

1. *USEPA EcoSSL (plants, invertebrates, wildlife)*
2. *ORNL (1997) [plants, invertebrates, wildlife]*
3. *USEPA Region 5 ESLs (2003)*
4. *LANL (2010) [various endpoints]*
5. *Talmage et al. (1999)*

Table H-1 (continued)
Soil Ecological Screening Values
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPEC	Log Kow	CAS Number	Ecological Screening Values for Soil						
			USEPA Eco SSL 2010 [a] (mg/kg)	ORNL PRGs 1997 [b] (mg/kg)	Region 5 ESLs 2003 [c] (mg/kg)	LANL ESLs 2010 [d] (mg/kg)	Talmage et al. 1999 [e] (mg/kg)	Persistent, Bioaccumulative, and Toxic Pollutant [f]	Recommended Soil Ecological Screening Value [g] (mg/kg)
Explosives									

CAS Chemical Abstract Service.
mg kg milligrams per kilogram.
NA = RVAAP-specific screening level not available.
RVAAP Ravenna Army Ammunition Plant.

Appendix I
Investigation-Derived Waste Report

Note: In the Original Submittal this was Appendix K. Only the Appendix Section was changed and not the page numbers or the content.

Note: Data submitted on compact disc.

Table I-1
Ravenna Facility-Wide CUGs for National Guard Dust/Fire Control Worker COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}	
Surface Soil								
Inorganics								
Aluminum	mg/kg	1.0E+06	1.0E+06	1.0E+06	--	--	--	17,700
Antimony	mg/kg	1030	10,297	30,892	--	--	--	0.96
Arsenic	mg/kg	573	5735	17,204	35.7	357	3565	15.4
Barium	mg/kg	810,909	1.0E+06	1.0E+06	--	--	--	88.4
Cadmium	mg/kg	1473	14,726	44,179	94,527	945,273	1.0E+06	0
Chromium (as Cr-3)	mg/kg	1.0E+06	1.0E+06	1.0E+06	--	--	--	17.4
Chromium, hexavalent	mg/kg	6666	66,659	199,978	14,179	141,791	1.0E+06	NA
Cobalt	mg/kg	74,531	745,311	1.0E+06	60,768	607,676	1.0E+06	10.4
Copper	mg/kg	341,235	1.0E+06	1.0E+06	--	--	--	17.7
Iron	mg/kg	1.0E+06	1.0E+06	1.0E+06	--	--	--	23,100
Manganese	mg/kg	116,634	1.0E+06	1.0E+06	--	--	--	1450
Mercury	mg/kg	1659	16,586	49,757	--	--	--	0.036
Nickel	mg/kg	167,541	1.0E+06	1.0E+06	--	--	--	21.1
Nitrate	mg/kg	1.0E+06	1.0E+06	1.0E+06	--	--	--	NA
Silver	mg/kg	38,421	384,211	1.0E+06	--	--	--	0
Thallium	mg/kg	513	5129	15,388	--	--	--	0
Vanadium	mg/kg	10,308	103,084	309,251	--	--	--	31.1
Zinc	mg/kg	1.0E+06	1.0E+06	1.0E+06	--	--	--	61.8
Organics								
1,3,5-Trinitrobenzene	mg/kg	144,038	1.0E+06	1.0E+06	--	--	--	NA
1,3-Dinitrobenzene	mg/kg	641	6412	19,235	--	--	--	NA
2,4,6-Trinitrotoluene	mg/kg	1762	17,616	52,847	3288	32,883	328,829	NA
2,4-Dinitrotoluene	mg/kg	2896	28,957	86,870	59.6	596	5962	NA
2,6-Dinitrotoluene	mg/kg	1485	14,853	44,560	61.2	612	6116	NA
2-Amino-4,6-dinitrotoluene	mg/kg	1507	15,069	45,208	--	--	--	NA
2-Methylnaphthalene	mg/kg	25,646	256,462	769,385	--	--	--	NA
2-Nitrotoluene	mg/kg	64,115	641,154	1.0E+06	781	7805	78,054	NA
4,4'-DDE	mg/kg	--	--	--	528	5280	52,801	NA
4-Amino-2,6-dinitrotoluene	mg/kg	1507	15,069	45,208	--	--	--	NA

Table I-1 (continued)
Ravenna Facility-Wide CUGs for National Guard Dust/Fire Control Worker COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}	
4-Chloro-3-methylphenol	mg/kg	--	--	--	--	--	--	NA
4-Nitrophenol	mg/kg	51,292	512,923	1.0E+06	--	--	--	NA
4-Nitrotoluene	mg/kg	64,115	641,154	1.0E+06	10,560	105,602	1.0E+06	NA
Aldrin	mg/kg	192	1923	5770	10.6	106	1056	NA
Benz(a)anthracene	mg/kg	--	--	--	15.1	151	1513	NA
Benzo(a)pyrene	mg/kg	--	--	--	1.51	15.1	151	NA
Benzo(b)fluoranthene	mg/kg	--	--	--	15.1	151	1513	NA
Benzo(k)fluoranthene	mg/kg	--	--	--	151	1513	15,129	NA
Bis(2-chloroethoxy)methane	mg/kg	19,235	192,346	577,039	--	--	--	NA
Carbazole	mg/kg	--	--	--	8976	89,762	897,616	NA
Chrysene	mg/kg	--	--	--	1513	15,129	151,294	NA
Dibenz(a,h)anthracene	mg/kg	--	--	--	1.51	15.1	151	NA
Dibenzofuran	mg/kg	12,823	128,231	384,693	--	--	--	NA
Dieldrin	mg/kg	321	3206	9617	11.2	112	1122	NA
Endrin	mg/kg	100	999	2996	--	--	--	NA
Endrin aldehyde	mg/kg	--	--	--	--	--	--	NA
Fluoranthene	mg/kg	15,778	157,779	473,337	--	--	--	NA
Fluorene	mg/kg	46,870	468,700	1.0E+06	--	--	--	NA
HMX	mg/kg	151,363	1.0E+06	1.0E+06	--	--	--	NA
Heptachlor	mg/kg	3206	32,058	96,173	39.9	399	3988	NA
Heptachlor epoxide	mg/kg	83.4	834	2501	19.7	197	1972	NA
Indeno(1,2,3-cd)pyrene	mg/kg	--	--	--	15.1	151	1513	NA
N-Nitroso-di-n-propylamine	mg/kg	--	--	--	12.1	121	1211	NA
Naphthalene	mg/kg	23,405	234,049	702,147	--	--	--	NA
Nitroglycerin	mg/kg	--	--	--	10,560	105,602	1.0E+06	NA
PCB-1016	mg/kg	76.8	768	2304	15.4	154	1536	NA
PCB-1248	mg/kg	--	--	--	15.4	154	1536	NA
PCB-1254	mg/kg	21.9	219	658	15.4	154	1536	NA
PCB-1260	mg/kg	--	--	--	15.4	154	1536	NA
Pentachlorophenol	mg/kg	19,344	193,438	580,315	150	1505	15,045	NA
Pyrene	mg/kg	11,833	118,334	355,002	--	--	--	NA
RDX	mg/kg	16,214	162,136	486,409	1376	13,757	137,570	NA

Table I-1 (continued)
Ravenna Facility-Wide CUGs for National Guard Dust/Fire Control Worker COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}	
alpha-Chlordane	mg/kg	--	--	--	--	--	--	NA
beta-BHC	mg/kg	--	--	--	100	997	9970	NA
gamma-Chlordane	mg/kg	--	--	--	--	--	--	NA
Surface Water								
Inorganics								
Aluminum	µg/L	734,195	7.3E+06	2.2E+07	--	--	--	3370
Antimony	µg/L	89.6	896	2689	--	--	--	0
Arsenic	µg/L	387	3865	11,596	24.1	241	2405	3.2
Barium	µg/L	118,053	1.2E+06	3.5E+06	--	--	--	47.5
Cadmium	µg/L	60.0	600	1799	--	--	--	0
Chromium (as Cr-3)	µg/L	93,248	932,482	2.8E+06	--	--	--	0
Chromium, hexavalent	µg/L	360	3599	10,796	--	--	--	NA
Copper	µg/L	47,315	473,148	1.4E+06	--	--	--	7.9
Iron	µg/L	271,809	2.7E+06	8.2E+06	--	--	--	2560
Manganese	µg/L	18,222	182,217	546,651	--	--	--	391
Mercury	µg/L	177	1771	5312	--	--	--	0
Nickel	µg/L	31,032	310,324	930,972	--	--	--	0
Nitrate	µg/L	2.4E+06	2.4E+07	7.2E+07	--	--	--	NA
Silver	µg/L	5914	59,144	177,431	--	--	--	0
Thallium	µg/L	120	1204	3611	--	--	--	0
Vanadium	µg/L	840	8397	25,190	--	--	--	0
Zinc	µg/L	366,046	3.7E+06	1.1E+07	--	--	--	42
Organics								
1,1,2,2-Tetrachloroethane	µg/L	43,781	437,814	1.3E+06	5.98	59.8	598	NA
1,2-Dichloroethene	µg/L	6954	69,542	208,625	--	--	--	NA
1,4-Dichlorobenzene	µg/L	--	--	--	249	2493	24,931	NA
2,4,6-Trinitrotoluene	µg/L	852	8517	25,550	1590	15,898	158,978	NA
2,4-Dimethylphenol	µg/L	12,040	120,397	361,192	--	--	--	NA
2,4-Dinitrotoluene	µg/L	2079	20,793	62,380	42.8	428	4281	NA
2,6-Dinitrotoluene	µg/L	1189	11,891	35,674	49.0	490	4896	NA
2-Amino-4,6-dinitrotoluene	µg/L	341	3407	10,220	--	--	--	NA
2-Nitrotoluene	µg/L	17,033	170,333	511,000	207	2074	20,736	NA
4,4'-DDT	µg/L	7.57	75.7	227	1.25	12.5	125	NA
4-Amino-2,6-dinitrotoluene	µg/L	341	3407	10,220	--	--	--	NA
4-Methylphenol	µg/L	3811	38,107	114,321	--	--	--	NA

Table I-1 (continued)
Ravenna Facility-Wide CUGs for National Guard Dust/Fire Control Worker COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}	
4-Nitrotoluene	µg/L	17,033	170,333	511,000	2805	28,055	280,549	NA
Aldrin	µg/L	27.2	272	815	1.49	14.9	149	NA
Benz(a)anthracene	µg/L	--	--	--	0.165	1.65	16.5	NA
Benzo(a)pyrene	µg/L	--	--	--	0.01	0.097	0.966	NA
Benzo(b)fluoranthene	µg/L	--	--	--	0.095	0.952	9.52	NA
Benzo(k)fluoranthene	µg/L	--	--	--	653	6533	65,333	NA
Bis(2-ethylhexyl)phthalate	µg/L	429	4294	12,883	42.9	429	4294	NA
Chloroform	µg/L	2577	25,769	77,307	15.8	158	1580	NA
Chrysene	µg/L	--	--	--	16.5	165	1654	NA
Dibenz(a,h)anthracene	µg/L	--	--	--	0.006	0.063	0.626	NA
HMX	µg/L	85,167	851,667	2.6E+06	--	--	--	NA
Heptachlor epoxide	µg/L	22.1	221	664.3	5.24	52.4	524	NA
Indeno(1,2,3-cd)pyrene	µg/L	--	--	--	0.095	0.95	9.5	NA
Methylene chloride	µg/L	24,768	247,676	743,029	657	6572	65,721	NA
PCB-1254	µg/L	34.1	341	1022	119	1192	11,923	NA
Pentachlorophenol	µg/L	434	4336	13,009	3.37	33.7	337	NA
Pyrene	µg/L	51,100	511,000	1.5E+06	--	--	--	NA
RDX	µg/L	5110	51,100	153,300	434	4336	43,358	NA
Tetrachloroethene	µg/L	1859	18,593	55,779	10.5	105	1049	NA
Trichloroethene	µg/L	34.2	342	1026	2.34	23.4	234	NA
beta-BHC	µg/L	--	--	--	26.5	265	2650	NA
cis-1,2-Dichloroethene	µg/L	17,033	170,333	511,000	--	--	--	NA
Sediment								
Inorganics								
Aluminum	mg/kg	1.0E+06	1.0E+06	1.0E+06	--	--	--	13,900
Antimony	mg/kg	1030	10,297	30,892	--	--	--	0
Arsenic	mg/kg	573	5735	17,204	35.7	357	3565	19.5
Barium	mg/kg	810,909	1.0E+06	1.0E+06	--	--	--	123
Cadmium	mg/kg	1473	14,726	44,179	94,527	945,273	1.0E+06	0
Chromium (as Cr-3)	mg/kg	1.0E+06	1.0E+06	1.0E+06	--	--	--	18.1
Chromium, hexavalent	mg/kg	6666	66,659	199,978	14,179	141,791	1.0E+06	NA
Copper	mg/kg	341,235	1.0E+06	1.0E+06	--	--	--	27.6
Iron	mg/kg	1.0E+06	1.0E+06	1.0E+06	--	--	--	28,200
Manganese	mg/kg	116,634	1.0E+06	1.0E+06	--	--	--	1950
Mercury	mg/kg	1659	16,586	49,757	--	--	--	0.059

Table I-1 (continued)
Ravenna Facility-Wide CUGs for National Guard Dust/Fire Control Worker COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}	
Nickel	mg/kg	167,541	1.0E+06	1.0E+06	--	--	--	17.7
Silver	mg/kg	38,421	384,211	1.0E+06	--	--	--	0
Thallium	mg/kg	513	5129	15,388	--	--	--	0.89
Vanadium	mg/kg	10,308	103,084	309,251	--	--	--	26.1
Zinc	mg/kg	1.0E+06	1.0E+06	1.0E+06	--	--	--	532
Organics								
2,4,6-Trinitrotoluene	mg/kg	1762	17,616	52,847	3288	32,883	328,829	NA
2,4-Dinitrotoluene	mg/kg	2896	28,957	86,870	59.6	596	5962	NA
2-Amino-4,6-dinitrotoluene	mg/kg	1507	15,069	45,208	--	--	--	NA
4-Amino-2,6-dinitrotoluene	mg/kg	1507	15,069	45,208	--	--	--	NA
Benz(a)anthracene	mg/kg	--	--	--	15.1	151	1513	NA
Benzo(a)pyrene	mg/kg	--	--	--	1.51	15.1	151	NA
Benzo(b)fluoranthene	mg/kg	--	--	--	15.1	151	1513	NA
Benzo(k)fluoranthene	mg/kg	--	--	--	151	1513	15,129	NA
Dibenz(a,h)anthracene	mg/kg	--	--	--	1.51	15.1	151	NA
Dieldrin	mg/kg	321	3206	9617	11.2	112	1122	NA
HMX	mg/kg	151,363	1.0E+06	1.0E+06	--	--	--	NA
Indeno(1,2,3-cd)pyrene	mg/kg	--	--	--	15.1	151	1513	NA
Nitroglycerin	mg/kg	--	--	--	10,560	105,602	1.0E+06	NA
PCB-1016	mg/kg	76.8	768	2304	15.4	154	1536	NA
PCB-1254	mg/kg	21.9	219	658	15.4	154	1536	NA
PCB-1260	mg/kg	--	--	--	15.4	154	1536	NA
RDX	mg/kg	16,214	162,136	486,409	1376	13,757	137,570	NA
alpha-Chlordane	mg/kg	--	--	--	--	--	--	NA
gamma-Chlordane	mg/kg	--	--	--	--	--	--	NA

Table I-1 (continued)
Ravenna Facility-Wide CUGs for National Guard Dust/Fire Control Worker COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

BHC denotes benzene hexachloride
COPC denotes chemical(s) of potential concern
CUG denotes Cleanup Goal across all pathways (ingestion, dermal, and inhalation)
DDE denotes dichlorodiphenyldichloroethylene
DDT denotes dichlorodiphenyltrichloroethane
HI denotes hazard index
HMX denotes octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
NA denotes not available
PCB denotes polychlorinated biphenyl
RDX denotes hexahydro-1,3,5-trinitro-1,3,5-triazine
µg/L denotes micrograms per liter
-- denotes no CUG could be quantified based on lack of approved toxicity value

Table I-2
Ravenna Facility-Wide CUGs for National Guard Range Maintenance Soldier COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}	
Surface Soil								
Inorganics								
Aluminum	mg/kg	775,289	1.0E+06	1.0E+06	--	--	--	17,700
Antimony	mg/kg	161	1614	4842	--	--	--	0.96
Arsenic	mg/kg	92.5	925	2776	5.76	57.6	576	15.4
Barium	mg/kg	128,223	1.0E+06	1.0E+06	--	--	--	88.4
Cadmium	mg/kg	242	2424	7272	24,133	241,332	1.0E+06	0
Chromium (as Cr-3)	mg/kg	202,189	1.0E+06	1.0E+06	--	--	--	17.4
Chromium, hexavalent	mg/kg	1103	11,030	33,091	3620	36,200	361,999	NA
Cobalt	mg/kg	13,248	132,477	397,432	15,514	155,142	1.0E+06	10.4
Copper	mg/kg	42,486	424,860	1.0E+06	--	--	--	17.7
Iron	mg/kg	285,369	1.0E+06	1.0E+06	--	--	--	23,100
Manganese	mg/kg	20,467	204,672	614,016	--	--	--	1450
Mercury	mg/kg	230	2304	6911	--	--	--	0.036
Nickel	mg/kg	20,971	209,713	629,138	--	--	--	21.1
Nitrate	mg/kg	1.0E+06	1.0E+06	1.0E+06	--	--	--	NA
Silver	mg/kg	4928	49,277	147,830	--	--	--	0
Thallium	mg/kg	68.9	689	2067	--	--	--	0
Vanadium	mg/kg	1697	16,969	50,906	--	--	--	31.1
Zinc	mg/kg	301,090	1.0E+06	1.0E+06	--	--	--	61.8
Organics								
1,3,5-Trinitrobenzene	mg/kg	20,584	205,835	617,506	--	--	--	NA
1,3-Dinitrobenzene	mg/kg	86.1	861	2584	--	--	--	NA
2,4,6-Trinitrotoluene	mg/kg	265	2652	7955	495	4950	49,497	NA
2,4-Dinitrotoluene	mg/kg	477	4772	14,316	9.82	98.2	982	NA
2,6-Dinitrotoluene	mg/kg	244	2444	7331	10.1	101	1006	NA
2-Amino-4,6-dinitrotoluene	mg/kg	194	1943	5829	--	--	--	NA
2-Methylnaphthalene	mg/kg	3445	34,451	103,354	--	--	--	NA
2-Nitrotoluene	mg/kg	8613	86,128	258,385	105	1049	10,485	NA
4,4'-DDE	mg/kg	--	--	--	70.9	709	7093	NA

Table I-2 (continued)
Ravenna Facility-Wide CUGs for National Guard Range Maintenance Soldier COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}	
4-Amino-2,6-dinitrotoluene	mg/kg	194	1943	5829	--	--	--	NA
4-Chloro-3-methylphenol	mg/kg	--	--	--	--	--	--	NA
4-Nitrophenol	mg/kg	6890	68,903	206,708	--	--	--	NA
4-Nitrotoluene	mg/kg	8613	86,128	258,385	1419	14,186	141,859	NA
Aldrin	mg/kg	25.8	258	775	1.42	14.2	142	NA
Benz(a)anthracene	mg/kg	--	--	--	2.62	26.2	262	NA
Benzo(a)pyrene	mg/kg	--	--	--	0.262	2.62	26.2	NA
Benzo(b)fluoranthene	mg/kg	--	--	--	2.62	26.2	262	NA
Benzo(k)fluoranthene	mg/kg	--	--	--	26.2	262	2619	NA
Bis(2-chloroethoxy)methane	mg/kg	2584	25,839	77,516	--	--	--	NA
Carbazole	mg/kg	--	--	--	1206	12,058	120,580	NA
Chrysene	mg/kg	--	--	--	262	2619	26,193	NA
Dibenz(a,h)anthracene	mg/kg	--	--	--	0.262	2.62	26.2	NA
Dibenzofuran	mg/kg	1723	17,226	51,677	--	--	--	NA
Dieldrin	mg/kg	43.1	431	1292	1.51	15.1	151	NA
Endrin	mg/kg	17.3	173	520	--	--	--	NA
Endrin aldehyde	mg/kg	--	--	--	--	--	--	NA
Fluoranthene	mg/kg	2732	27,316	81,949	--	--	--	NA
Fluorene	mg/kg	7823	78,227	234,682	--	--	--	NA
HMX	mg/kg	23,265	232,653	697,960	--	--	--	NA
Heptachlor	mg/kg	431	4306	12,919	5.36	53.6	536	NA
Heptachlor epoxide	mg/kg	11.2	112	336	2.65	26.5	265	NA
Indeno(1,2,3-cd)pyrene	mg/kg	--	--	--	2.62	26.2	262	NA
N-Nitroso-di-n-propylamine	mg/kg	--	--	--	1.86	18.6	186	NA
Naphthalene	mg/kg	3908	39,081	117,242	--	--	--	NA
Nitroglycerin	mg/kg	--	--	--	1419	14,186	141,859	NA
PCB-1016	mg/kg	12.9	129	386	2.57	25.7	257	NA
PCB-1248	mg/kg	--	--	--	2.57	25.7	257	NA
PCB-1254	mg/kg	3.67	36.7	110	2.57	25.7	257	NA
PCB-1260	mg/kg	--	--	--	2.57	25.7	257	NA

Table I-2 (continued)
Ravenna Facility-Wide CUGs for National Guard Range Maintenance Soldier COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}	
Pentachlorophenol	mg/kg	3309	33,092	99,277	25.7	257	2574	NA
Pyrene	mg/kg	2049	20,487	61,461	--	--	--	NA
RDX	mg/kg	2263	22,629	67,887	192	1920	19,200	NA
alpha-Chlordane	mg/kg	--	--	--	--	--	--	NA
beta-BHC	mg/kg	--	--	--	13.4	134	1340	NA
gamma-Chlordane	mg/kg	--	--	--	--	--	--	NA

BHC denotes benzene hexachloride.
COPC denotes chemical(s) of potential concern.
CUG denotes Cleanup Goal across all pathways (ingestion, dermal, and inhalation).
DDE denotes dichlorodiphenyldichloroethylene.
HI denotes hazard index.
HMX denotes octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
mg/kg denotes milligrams per kilogram.
NA denotes not available.
PCB denotes polychlorinated biphenyl.
RDX denotes hexahydro-1,3,5-trinitro-1,3,5-triazine.
-- denotes no CUG could be quantified based on lack of approved toxicity value.

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Table I-3
Ravenna Facility-Wide CUGs for National Guard Trainee COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
Surface Soil										
Inorganics										
Aluminum	mg/kg	3496	34,960	104,881	--	--	--	17,700	NA	NA
Antimony	mg/kg	175	1753	5259	--	--	--	0.96	NA	NA
Arsenic	mg/kg	114	1140	3419	2.78	27.8	278	15.4	NA	NA
Barium	mg/kg	351	3506	10,518	--	--	--	88.4	NA	NA
Cadmium	mg/kg	329	3292	9876	10.9	109	1093	0	NA	NA
Chromium (as Cr-3)	mg/kg	329,763	1.0E+06	1.0E+06	--	--	--	17.4	NA	NA
Chromium, hexavalent	mg/kg	5.61	56.1	168	1.64	16.4	164	NA	NA	NA
Cobalt	mg/kg	14.0	140	421	7.03	70.3	703	10.4	NA	NA
Copper	mg/kg	25,368	253,680	761,040	--	--	--	17.7	NA	NA
Iron	mg/kg	184,370	1.0E+06	1.0E+06	--	--	--	23,100	NA	NA
Manganese	mg/kg	35.1	351	1053	--	--	--	1450	NA	NA
Mercury	mg/kg	172	1722	5166	--	--	--	0.036	NA	NA
Nickel	mg/kg	12,639	126,391	379,174	--	--	--	21.1	NA	NA
Nitrate	mg/kg	1.0E+06	1.0E+06	1.0E+06	--	--	--	NA	NA	NA
Silver	mg/kg	3105	31,049	93,146	--	--	--	0	NA	NA
Thallium	mg/kg	47.7	477	1431	--	--	--	0	NA	NA
Vanadium	mg/kg	2304	23,045	69,134	--	--	--	31.1	NA	NA
Zinc	mg/kg	187,269	1.0E+06	1.0E+06	--	--	--	61.8	NA	NA
Organics										
1,3,5-Trinitrobenzene	mg/kg	16,542	165,422	496,267	--	--	--	NA	NA	NA
1,3-Dinitrobenzene	mg/kg	59.6	596	1788	--	--	--	NA	NA	NA
2,4,6-Trinitrotoluene	mg/kg	249	2488	7463	464	4643	46,435	NA	NA	NA
2,4-Dinitrotoluene	mg/kg	652	6519	19,558	13.4	134	1342	NA	NA	NA
2,6-Dinitrotoluene	mg/kg	331	3309	9926	13.6	136	1362	NA	NA	NA
2-Amino-4,6-dinitrotoluene	mg/kg	124	1237	3710	--	--	--	NA	NA	NA
2-Methylnaphthalene	mg/kg	2384	23,845	71,534	--	--	--	NA	NA	NA
2-Nitrotoluene	mg/kg	5961	59,611	178,834	72.6	726	7257	NA	NA	NA

Table I-3 (continued)
Ravenna Facility-Wide CUGs for National Guard Trainee COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
4,4'-DDE	mg/kg	--	--	--	49.1	491	4909	NA	NA	NA
4-Amino-2,6-dinitrotoluene	mg/kg	124	1237	3710	--	--	--	NA	NA	NA
4-Chloro-3-methylphenol	mg/kg	--	--	--	--	--	--	NA	NA	NA
4-Nitrophenol	mg/kg	4769	47,689	143,067	--	--	--	NA	NA	NA
4-Nitrotoluene	mg/kg	5961	59,611	178,834	982	9818	98,183	NA	NA	NA
Aldrin	mg/kg	17.9	179	537	0.788	7.88	78.8	NA	NA	NA
Benz(a)anthracene	mg/kg	--	--	--	4.77	47.7	477	NA	NA	NA
Benzo(a)pyrene	mg/kg	--	--	--	0.477	4.77	47.7	NA	NA	NA
Benzo(b)fluoranthene	mg/kg	--	--	--	4.77	47.7	477	NA	NA	NA
Benzo(k)fluoranthene	mg/kg	--	--	--	47.7	477	4774	NA	NA	NA
Bis(2-chloroethoxy)methane	mg/kg	1788	17,883	53,650	--	--	--	NA	NA	NA
Carbazole	mg/kg	--	--	--	835	8346	83,456	NA	NA	NA
Chrysene	mg/kg	--	--	--	477	4774	47,736	NA	NA	NA
Dibenz(a,h)anthracene	mg/kg	--	--	--	0.477	4.77	47.7	NA	NA	NA
Dibenzofuran	mg/kg	1192	11,922	35,767	--	--	--	NA	NA	NA
Dieldrin	mg/kg	29.8	298	894	0.839	8.39	83.9	NA	NA	NA
Endrin	mg/kg	33.0	330	991	--	--	--	NA	NA	NA
Endrin aldehyde	mg/kg	--	--	--	--	--	--	NA	NA	NA
Fluoranthene	mg/kg	5087	50,868	152,603	--	--	--	NA	NA	NA
Fluorene	mg/kg	11,458	114,583	343,749	--	--	--	NA	NA	NA
HMX	mg/kg	23,464	234,645	703,934	--	--	--	NA	NA	NA
Heptachlor	mg/kg	298	2981	8942	2.98	29.8	298	NA	NA	NA
Heptachlor epoxide	mg/kg	7.75	77.5	232	1.48	14.8	148	NA	NA	NA
Indeno(1,2,3-cd)pyrene	mg/kg	--	--	--	4.77	47.7	477	NA	NA	NA
N-Nitroso-di-n-propylamine	mg/kg	--	--	--	1.88	18.8	188	NA	NA	NA
Naphthalene	mg/kg	1541	15,407	46,222	--	--	--	NA	NA	NA
Nitroglycerin	mg/kg	--	--	--	982	9818	98,183	NA	NA	NA
PCB-1016	mg/kg	19.2	192	577	3.46	34.6	346	NA	NA	NA
PCB-1248	mg/kg	--	--	--	3.46	34.6	346	NA	NA	NA
PCB-1254	mg/kg	5.49	54.9	165	3.46	34.6	346	NA	NA	NA
PCB-1260	mg/kg	--	--	--	3.46	34.6	346	NA	NA	NA

Table I-3 (continued)
Ravenna Facility-Wide CUGs for National Guard Trainee COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
Pentachlorophenol	mg/kg	5656	56,558	169,673	44.0	440	4399	NA	NA	NA
Pyrene	mg/kg	3815	38,151	114,453	--	--	--	NA	NA	NA
RDX	mg/kg	1711	17,113	51,338	145	1452	14,520	NA	NA	NA
alpha-Chlordane	mg/kg	--	--	--	--	--	--	NA	NA	NA
beta-BHC	mg/kg	--	--	--	7.42	74.2	742	NA	NA	NA
gamma-Chlordane	mg/kg	--	--	--	--	--	--	NA	NA	NA
Subsurface Soil										
Inorganics										
Aluminum	mg/kg	3496	34,960	104,881	--	--	--	19,500	NA	NA
Antimony	mg/kg	175	1753	5259	--	--	--	0.96	NA	NA
Arsenic	mg/kg	114	1140	3419	2.78	27.8	278	19.8	NA	NA
Barium	mg/kg	351	3506	10,518	--	--	--	124	NA	NA
Cadmium	mg/kg	329	3292	9876	10.9	109	1093	0	NA	NA
Chromium (as Cr-3)	mg/kg	329,763	1.0E+06	1.0E+06	--	--	--	27.2	NA	NA
Chromium, hexavalent	mg/kg	5.61	56.1	168	1.64	16.4	164	NA	NA	NA
Cobalt	mg/kg	14.0	140	421	7.03	70.3	703	23.2	NA	NA
Copper	mg/kg	25,368	253,680	761,040	--	--	--	32.3	NA	NA
Iron	mg/kg	184,370	1.0E+06	1.0E+06	--	--	--	35,200	NA	NA
Manganese	mg/kg	35.1	351	1053	--	--	--	3030	NA	NA
Mercury	mg/kg	172	1722	5166	--	--	--	0.044	NA	NA
Nickel	mg/kg	12,639	126,391	379,174	--	--	--	60.7	NA	NA
Nitrate	mg/kg	1.0E+06	1.0E+06	1.0E+06	--	--	--	NA	NA	NA
Silver	mg/kg	3105	31,049	93,146	--	--	--	0	NA	NA
Thallium	mg/kg	47.7	477	1431	--	--	--	0.91	NA	NA
Vanadium	mg/kg	2304	23,045	69,134	--	--	--	37.6	NA	NA
Zinc	mg/kg	187,269	1.0E+06	1.0E+06	--	--	--	93.3	NA	NA
Organics										
1,3,5-Trinitrobenzene	mg/kg	16,542	165,422	496,267	--	--	--	NA	NA	NA
1,3-Dinitrobenzene	mg/kg	59.6	596	1788	--	--	--	NA	NA	NA
2,4,6-Trinitrotoluene	mg/kg	249	2488	7463	464	4643	46,435	NA	NA	NA
2,4-Dinitrotoluene	mg/kg	652	6519	19,558	13.4	134	1342	NA	NA	NA

Table I-3 (continued)
Ravenna Facility-Wide CUGs for National Guard Trainee COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
2,6-Dinitrotoluene	mg/kg	331	3309	9926	13.6	136	1362	NA	NA	NA
2-Amino-4,6-dinitrotoluene	mg/kg	124	1237	3710	--	--	--	NA	NA	NA
2-Methylnaphthalene	mg/kg	2384	23,845	71,534	--	--	--	NA	NA	NA
2-Nitrotoluene	mg/kg	5961	59,611	178,834	72.6	726	7257	NA	NA	NA
4,4'-DDE	mg/kg	--	--	--	49.1	491	4909	NA	NA	NA
4-Amino-2,6-dinitrotoluene	mg/kg	124	1237	3710	--	--	--	NA	NA	NA
4-Chloro-3-methylphenol	mg/kg	--	--	--	--	--	--	NA	NA	NA
4-Nitrophenol	mg/kg	4769	47,689	143,067	--	--	--	NA	NA	NA
4-Nitrotoluene	mg/kg	5961	59,611	178,834	982	9818	98,183	NA	NA	NA
Aldrin	mg/kg	17.9	179	537	0.788	7.88	78.8	NA	NA	NA
Benz(a)anthracene	mg/kg	--	--	--	4.77	47.7	477	NA	NA	NA
Benzo(a)pyrene	mg/kg	--	--	--	0.477	4.77	47.7	NA	NA	NA
Benzo(b)fluoranthene	mg/kg	--	--	--	4.77	47.7	477	NA	NA	NA
Benzo(k)fluoranthene	mg/kg	--	--	--	47.7	477	4774	NA	NA	NA
Bis(2-chloroethoxy)methane	mg/kg	1788	17,883	53,650	--	--	--	NA	NA	NA
Carbazole	mg/kg	--	--	--	835	8346	83,456	NA	NA	NA
Chrysene	mg/kg	--	--	--	477	4774	47,736	NA	NA	NA
Dibenz(a,h)anthracene	mg/kg	--	--	--	0.477	4.77	47.7	NA	NA	NA
Dibenzofuran	mg/kg	1192	11,922	35,767	--	--	--	NA	NA	NA
Dieldrin	mg/kg	29.8	298	894	0.839	8.39	83.9	NA	NA	NA
Endrin	mg/kg	33.0	330	991	--	--	--	NA	NA	NA
Endrin aldehyde	mg/kg	--	--	--	--	--	--	NA	NA	NA
Fluoranthene	mg/kg	5087	50,868	152,603	--	--	--	NA	NA	NA
Fluorene	mg/kg	11,458	114,583	343,749	--	--	--	NA	NA	NA
HMX	mg/kg	23,464	234,645	703,934	--	--	--	NA	NA	NA
Heptachlor	mg/kg	298	2981	8942	2.98	29.8	298	NA	NA	NA
Heptachlor epoxide	mg/kg	7.75	77.5	232	1.48	14.8	148	NA	NA	NA
Indeno(1,2,3-cd)pyrene	mg/kg	--	--	--	4.77	47.7	477	NA	NA	NA
N-Nitroso-di-n-propylamine	mg/kg	--	--	--	1.88	18.8	188	NA	NA	NA
Naphthalene	mg/kg	1541	15,407	46,222	--	--	--	NA	NA	NA
Nitroglycerin	mg/kg	--	--	--	982	9818	98,183	NA	NA	NA

Table I-3 (continued)
Ravenna Facility-Wide CUGs for National Guard Trainee COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
PCB-1016	mg/kg	19.2	192	577	3.46	34.6	346	NA	NA	NA
PCB-1248	mg/kg	--	--	--	3.46	34.6	346	NA	NA	NA
PCB-1254	mg/kg	5.49	54.9	165	3.46	34.6	346	NA	NA	NA
PCB-1260	mg/kg	--	--	--	3.46	34.6	346	NA	NA	NA
Pentachlorophenol	mg/kg	5656	56,558	169,673	44.0	440	4399	NA	NA	NA
Pyrene	mg/kg	3815	38,151	114,453	--	--	--	NA	NA	NA
RDX	mg/kg	1711	17,113	51,338	145	1452	14,520	NA	NA	NA
alpha-Chlordane	mg/kg	--	--	--	--	--	--	NA	NA	NA
beta-BHC	mg/kg	--	--	--	7.42	74.2	742	NA	NA	NA
gamma-Chlordane	mg/kg	--	--	--	--	--	--	NA	NA	NA
Groundwater										
Inorganics										
Aluminum	µg/L	31,981	319,809	959,426	--	--	--	NA	48,000	9410
Antimony	µg/L	11.7	117	351	--	--	--	NA	4.3	0
Arsenic	µg/L	9.77	97.7	293	0.608	6.08	60.8	NA	215	19.1
Barium	µg/L	6332	63,319	189,958	--	--	--	NA	327	241
Cadmium	µg/L	13.2	132	395	--	--	--	NA	0	0
Chromium (as Cr-3)	µg/L	33,087	330,873	992,618	--	--	--	NA	85.2	19.5
Cobalt	µg/L	654	6545	19,635	--	--	--	NA	46.3	0
Iron	µg/L	9671	96,706	290,117	--	--	--	NA	195,000	21,500
Manganese	µg/L	1421	14,207	42,620	--	--	--	NA	2860	1260
Nickel	µg/L	654	6540	19,619	--	--	--	NA	117	85.3
Nitrate	µg/L	52,283	522,835	1.6E+06	--	--	--	NA	NA	NA
Thallium	µg/L	2.61	26.1	78.4	--	--	--	NA	2.4	0
Vanadium	µg/L	185	1845	5536	--	--	--	NA	98.1	15.5
Zinc	µg/L	9756	97,559	292,678	--	--	--	NA	888	193
Organics										
1,1,2,2-Tetrachloroethane	µg/L	1804	18,044	54,133	0.744	7.44	74.4	NA	NA	NA
1,2-Dichloroethane	µg/L	633	6332	18,995	1.67	16.7	167	NA	NA	NA
1,3-Dinitrobenzene	µg/L	3.28	32.8	98.3	--	--	--	NA	NA	NA
2,4,6-Trinitrotoluene	µg/L	16.4	164	491	30.6	306	3057	NA	NA	NA

Table I-3 (continued)
Ravenna Facility-Wide CUGs for National Guard Trainee COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
2,4-Dinitrotoluene	µg/L	62.8	628	1883	1.29	12.9	129	NA	NA	NA
2,6-Dinitrotoluene	µg/L	31.8	318	954	1.31	13.1	131	NA	NA	NA
2-Amino-4,6-dinitrotoluene	µg/L	6.55	65.5	197	--	--	--	NA	NA	NA
2-Nitrotoluene	µg/L	328	3276	9827	3.99	39.9	399	NA	NA	NA
4,4'-DDD	µg/L	11.0	110	329	0.639	6.39	63.9	NA	NA	NA
4,4'-DDE	µg/L	--	--	--	0.503	5.03	50.3	NA	NA	NA
4,4'-DDT	µg/L	1.78	17.8	53.5	0.294	2.94	29.4	NA	NA	NA
4-Amino-2,6-dinitrotoluene	µg/L	6.55	65.5	197	--	--	--	NA	NA	NA
4-Nitrobenzenamine	µg/L	98.3	983	2948	43.7	437	4368	NA	NA	NA
4-Nitrotoluene	µg/L	328	3276	9827	54.0	540	5395	NA	NA	NA
Aldrin	µg/L	0.923	9.23	27.7	0.051	0.507	5.07	NA	NA	NA
Benz(a)anthracene	µg/L	--	--	--	0.042	0.419	4.19	NA	NA	NA
Benzene	µg/L	38.1	381	1142	4.64	46.4	464	NA	NA	NA
Benzo(a)pyrene	µg/L	--	--	--	0.002	0.025	0.248	NA	NA	NA
Benzo(b)fluoranthene	µg/L	--	--	--	0.024	0.245	2.45	NA	NA	NA
Bis(2-ethylhexyl)phthalate	µg/L	97.0	970	2909	9.7	97.0	970	NA	NA	NA
Carbon tetrachloride	µg/L	19.3	193	578	2.2	22.0	220	NA	NA	NA
Chloroform	µg/L	248	2477	7432	2.23	22.3	223	NA	NA	NA
Dibenz(a,h)anthracene	µg/L	--	--	--	0.002	0.016	0.162	NA	NA	NA
Dieldrin	µg/L	1.1	11.0	32.9	0.038	0.384	3.84	NA	NA	NA
Heptachlor	µg/L	12.3	123	368	0.153	1.53	15.3	NA	NA	NA
Heptachlor epoxide	µg/L	0.426	4.26	12.8	0.101	1.01	10.1	NA	NA	NA
Indeno(1,2,3-cd)pyrene	µg/L	--	--	--	0.024	0.244	2.44	NA	NA	NA
Lindane	µg/L	7.66	76.6	230	0.55	5.5	55.0	NA	NA	NA
Methylene chloride	µg/L	1428	14,277	42,831	57.5	575	5751	NA	NA	NA
Nitrobenzene	µg/L	16.4	164	491	--	--	--	NA	NA	NA
Nitroglycerin	µg/L	--	--	--	54.0	540	5395	NA	NA	NA
PCB-1242	µg/L	--	--	--	2.29	22.9	229	NA	NA	NA
PCB-1254	µg/L	0.655	6.55	19.7	2.29	22.9	229	NA	NA	NA
PCB-1260	µg/L	--	--	--	2.29	22.9	229	NA	NA	NA
Pentachlorophenol	µg/L	103	1025	3075	0.797	7.97	79.7	NA	NA	NA

Table I-3 (continued)
Ravenna Facility-Wide CUGs for National Guard Trainee COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
RDX	µg/L	98.3	983	2948	8.34	83.4	834	NA	NA	NA
Tetrachloroethene	µg/L	191	1911	5732	1.05	10.5	105	NA	NA	NA
Toxaphene	µg/L	--	--	--	0.518	5.18	51.8	NA	NA	NA
Trichloroethene	µg/L	5.04	50.4	151	0.336	3.36	33.6	NA	NA	NA
alpha-BHC	µg/L	--	--	--	0.146	1.46	14.6	NA	NA	NA
beta-BHC	µg/L	--	--	--	0.51	5.1	51.0	NA	NA	NA
Surface Water										
Inorganics										
Aluminum	µg/L	73,445	734,449	2.2E+06	--	--	--	3370	NA	NA
Antimony	µg/L	6.45	64.5	194	--	--	--	0	NA	NA
Arsenic	µg/L	67.0	670	2011	4.17	41.7	417	3.2	NA	NA
Barium	µg/L	10,640	106,401	319,204	--	--	--	47.5	NA	NA
Cadmium	µg/L	4.08	40.8	123	--	--	--	0	NA	NA
Chromium (as Cr-3)	µg/L	6165	61,649	184,948	--	--	--	0	NA	NA
Chromium, hexavalent	µg/L	24.5	245	735	--	--	--	NA	NA	NA
Copper	µg/L	7199	71,992	215,976	--	--	--	7.9	NA	NA
Iron	µg/L	31,296	312,959	938,878	--	--	--	2560	NA	NA
Manganese	µg/L	1449	14,488	43,465	--	--	--	391	NA	NA
Mercury	µg/L	16.0	160	479	--	--	--	0	NA	NA
Nickel	µg/L	8258	82,579	247,738	--	--	--	0	NA	NA
Nitrate	µg/L	584,936	5.8E+06	1.8E+07	--	--	--	NA	NA	NA
Silver	µg/L	900	8999	26,997	--	--	--	0	NA	NA
Thallium	µg/L	29.2	292	877	--	--	--	0	NA	NA
Vanadium	µg/L	57.2	572	1715	--	--	--	0	NA	NA
Zinc	µg/L	58,216	582,164	1.7E+06	--	--	--	42	NA	NA
Organics										
1,1,2,2-Tetrachloroethane	µg/L	5706	57,064	171,193	0.395	3.95	39.5	NA	NA	NA
1,2-Dichloroethene	µg/L	809	8092	24,276	--	--	--	NA	NA	NA
1,4-Dichlorobenzene	µg/L	--	--	--	24.6	246	2460	NA	NA	NA
2,4,6-Trinitrotoluene	µg/L	328	3276	9827	611	6115	61,145	NA	NA	NA
2,4-Dimethylphenol	µg/L	1299	12,986	38,959	--	--	--	NA	NA	NA

Table I-3 (continued)
Ravenna Facility-Wide CUGs for National Guard Trainee COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
2,4-Dinitrotoluene	µg/L	356	3556	10,669	7.32	73.2	732	NA	NA	NA
2,6-Dinitrotoluene	µg/L	232	2324	6973	9.57	95.7	957	NA	NA	NA
2-Amino-4,6-dinitrotoluene	µg/L	131	1310	3931	--	--	--	NA	NA	NA
2-Nitrotoluene	µg/L	6551	65,513	196,538	79.8	798	7975	NA	NA	NA
4,4'-DDT	µg/L	1.2	12.0	35.9	0.197	1.97	19.7	NA	NA	NA
4-Amino-2,6-dinitrotoluene	µg/L	131	1310	3931	--	--	--	NA	NA	NA
4-Methylphenol	µg/L	448	4477	13,430	--	--	--	NA	NA	NA
4-Nitrotoluene	µg/L	6551	65,513	196,538	1079	10,790	107,903	NA	NA	NA
Aldrin	µg/L	6.23	62.3	187	0.342	3.42	34.2	NA	NA	NA
Benz(a)anthracene	µg/L	--	--	--	0.032	0.322	3.22	NA	NA	NA
Benzo(a)pyrene	µg/L	--	--	--	0.002	0.019	0.189	NA	NA	NA
Benzo(b)fluoranthene	µg/L	--	--	--	0.019	0.185	1.85	NA	NA	NA
Benzo(k)fluoranthene	µg/L	--	--	--	251	2513	25,128	NA	NA	NA
Bis(2-ethylhexyl)phthalate	µg/L	67.9	679	2038	6.79	67.9	679	NA	NA	NA
Chloroform	µg/L	226	2255	6766	1.02	10.2	102	NA	NA	NA
Chrysene	µg/L	--	--	--	3.22	32.2	322	NA	NA	NA
Dibenz(a,h)anthracene	µg/L	--	--	--	0.001	0.011	0.112	NA	NA	NA
HMX	µg/L	32,756	327,564	982,692	--	--	--	NA	NA	NA
Heptachlor epoxide	µg/L	8.52	85.2	256	2.02	20.2	202	NA	NA	NA
Indeno(1,2,3-cd)pyrene	µg/L	--	--	--	0.017	0.171	1.71	NA	NA	NA
Methylene chloride	µg/L	2027	20,274	60,821	46.4	464	4642	NA	NA	NA
PCB-1254	µg/L	13.1	131	393	45.9	459	4586	NA	NA	NA
Pentachlorophenol	µg/L	78.0	780	2339	0.607	6.07	60.7	NA	NA	NA
Pyrene	µg/L	19,654	196,538	589,615	--	--	--	NA	NA	NA
RDX	µg/L	1965	19,654	58,962	167	1668	16,676	NA	NA	NA
Tetrachloroethene	µg/L	172	1718	5154	1.01	10.1	101	NA	NA	NA
Trichloroethene	µg/L	2.9	29.0	87.0	0.161	1.61	16.1	NA	NA	NA
beta-BHC	µg/L	--	--	--	10.2	102	1019	NA	NA	NA
cis-1,2-Dichloroethene	µg/L	6551	65,513	196,538	--	--	--	NA	NA	NA

Table I-3 (continued)
Ravenna Facility-Wide CUGs for National Guard Trainee COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
Sediment										
Inorganics										
Aluminum	mg/kg	3496	34,960	104,881	--	--	--	13,900	NA	NA
Antimony	mg/kg	175	1753	5259	--	--	--	0	NA	NA
Arsenic	mg/kg	114	1140	3419	2.78	27.8	278	19.5	NA	NA
Barium	mg/kg	351	3506	10,518	--	--	--	123	NA	NA
Cadmium	mg/kg	329	3292	9876	10.9	109	1093	0	NA	NA
Chromium (as Cr-3)	mg/kg	329,763	1.0E+06	1.0E+06	--	--	--	18.1	NA	NA
Chromium, hexavalent	mg/kg	5.61	56.1	168	1.64	16.4	164	NA	NA	NA
Copper	mg/kg	25,368	253,680	761,040	--	--	--	27.6	NA	NA
Iron	mg/kg	184,370	1.0E+06	1.0E+06	--	--	--	28,200	NA	NA
Manganese	mg/kg	35.1	351	1053	--	--	--	1950	NA	NA
Mercury	mg/kg	172	1722	5166	--	--	--	0.059	NA	NA
Nickel	mg/kg	12,639	126,391	379,174	--	--	--	17.7	NA	NA
Silver	mg/kg	3105	31,049	93,146	--	--	--	0	NA	NA
Thallium	mg/kg	47.7	477	1431	--	--	--	0.89	NA	NA
Vanadium	mg/kg	2304	23,045	69,134	--	--	--	26.1	NA	NA
Zinc	mg/kg	187,269	1.0E+06	1.0E+06	--	--	--	532	NA	NA
Organics										
2,4,6-Trinitrotoluene	mg/kg	249	2488	7463	464	4643	46,435	NA	NA	NA
2,4-Dinitrotoluene	mg/kg	652	6519	19,558	13.4	134	1342	NA	NA	NA
2-Amino-4,6-dinitrotoluene	mg/kg	124	1237	3710	--	--	--	NA	NA	NA
4-Amino-2,6-dinitrotoluene	mg/kg	124	1237	3710	--	--	--	NA	NA	NA
Benz(a)anthracene	mg/kg	--	--	--	4.77	47.7	477	NA	NA	NA
Benzo(a)pyrene	mg/kg	--	--	--	0.477	4.77	47.7	NA	NA	NA
Benzo(b)fluoranthene	mg/kg	--	--	--	4.77	47.7	477	NA	NA	NA
Benzo(k)fluoranthene	mg/kg	--	--	--	47.7	477	4774	NA	NA	NA
Dibenz(a,h)anthracene	mg/kg	--	--	--	0.477	4.77	47.7	NA	NA	NA
Dieldrin	mg/kg	29.8	298	894	0.839	8.39	83.9	NA	NA	NA
HMX	mg/kg	23,464	234,645	703,934	--	--	--	NA	NA	NA
Indeno(1,2,3-cd)pyrene	mg/kg	--	--	--	4.77	47.7	477	NA	NA	NA

Table I-3 (continued)
Ravenna Facility-Wide CUGs for National Guard Trainee COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
Nitroglycerin	mg/kg	--	--	--	982	9818	98,183	NA	NA	NA
PCB-1016	mg/kg	19.2	192	577	3.46	34.6	346	NA	NA	NA
PCB-1254	mg/kg	5.49	54.9	165	3.46	34.6	346	NA	NA	NA
PCB-1260	mg/kg	--	--	--	3.46	34.6	346	NA	NA	NA
RDX	mg/kg	1711	17,113	51,338	145	1452	14,520	NA	NA	NA
alpha-Chlordane	mg/kg	--	--	--	--	--	--	NA	NA	NA
gamma-Chlordane	mg/kg	--	--	--	--	--	--	NA	NA	NA

BHC denotes benzene hexachloride.
COPC denotes chemical(s) of potential concern.
CUG denotes Cleanup Goal across all pathways (ingestion, dermal, and inhalation).
DDD denotes dichlorodiphenyldichloroethane.
DDE denotes dichlorodiphenyldichloroethylene.
DDT denotes dichlorodiphenyltrichloroethane.
GW denotes groundwater.
HI denotes hazard index.
HMX denotes octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
mg/kg denotes milligrams per kilogram.
NA denotes not available.
PCB denotes polychlorinated biphenyl.
RDX denotes hexahydro-1,3,5-trinitro-1,3,5-triazine.
Uncon. denotes unconfined.
µg/L denotes micrograms per liter.
-- denotes no CUG could be quantified based on lack of approved toxicity value.

Table I-4
Ravenna Facility-Wide CUGs for Resident Farmer Adult COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
Surface Soil										
Inorganics										
Aluminum	mg/kg	52,923	529,229	1.0E+06	--	--	--	17,700	NA	NA
Antimony	mg/kg	13.6	136	409	--	--	--	0.96	NA	NA
Arsenic	mg/kg	8.21	82.1	246	0.425	4.25	42.5	15.4	NA	NA
Barium	mg/kg	8966	89,656	268,969	--	--	--	88.4	NA	NA
Cadmium	mg/kg	22.3	223	668	1249	12,491	124,911	0	NA	NA
Chromium (as Cr-3)	mg/kg	19,694	196,942	590,827	--	--	--	17.4	NA	NA
Chromium, hexavalent	mg/kg	90.4	904	2711	187	1874	18,737	NA	NA	NA
Cobalt	mg/kg	820	8198	24,594	803	8030	80,300	10.4	NA	NA
Copper	mg/kg	2714	27,138	81,413	--	--	--	17.7	NA	NA
Iron	mg/kg	19,010	190,104	570,313	--	--	--	23,100	NA	NA
Manganese	mg/kg	1482	14,817	44,452	--	--	--	1450	NA	NA
Mercury	mg/kg	16.5	165	496	--	--	--	0.036	NA	NA
Nickel	mg/kg	1346	13,463	40,389	--	--	--	21.1	NA	NA
Nitrate	mg/kg	114,196	1.0E+06	1.0E+06	--	--	--	NA	NA	NA
Silver	mg/kg	324	3240	9719	--	--	--	0	NA	NA
Thallium	mg/kg	4.76	47.6	143	--	--	--	0	NA	NA
Vanadium	mg/kg	156	1558	4674	--	--	--	31.1	NA	NA
Zinc	mg/kg	19,659	196,589	589,767	--	--	--	61.8	NA	NA
Organics										
1,3,5-Trinitrobenzene	mg/kg	1528	15,280	45,841	--	--	--	NA	NA	NA
1,3-Dinitrobenzene	mg/kg	5.94	59.4	178	--	--	--	NA	NA	NA
2,4,6-Trinitrotoluene	mg/kg	21.1	211	633	32.8	328	3283	NA	NA	NA
2,4-Dinitrotoluene	mg/kg	43.9	439	1317	0.753	7.53	75.3	NA	NA	NA
2,6-Dinitrotoluene	mg/kg	22.4	224	672	0.769	7.69	76.9	NA	NA	NA
2-Amino-4,6-dinitrotoluene	mg/kg	12.8	128	385	--	--	--	NA	NA	NA
2-Methylnaphthalene	mg/kg	238	2378	7134	--	--	--	NA	NA	NA
2-Nitrotoluene	mg/kg	594	5945	17,834	6.03	60.3	603	NA	NA	NA

Table I-4 (continued)
Ravenna Facility-Wide CUGs for Resident Farmer Adult COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
4,4'-DDE	mg/kg	--	--	--	4.08	40.8	408	NA	NA	NA
4-Amino-2,6-dinitrotoluene	mg/kg	12.8	128	385	--	--	--	NA	NA	NA
4-Chloro-3-methylphenol	mg/kg	--	--	--	--	--	--	NA	NA	NA
4-Nitrophenol	mg/kg	476	4756	14,267	--	--	--	NA	NA	NA
4-Nitrotoluene	mg/kg	594	5945	17,834	81.6	816	8159	NA	NA	NA
Aldrin	mg/kg	1.78	17.8	53.5	0.082	0.816	8.16	NA	NA	NA
Benz(a)anthracene	mg/kg	--	--	--	0.221	2.21	22.1	NA	NA	NA
Benzo(a)pyrene	mg/kg	--	--	--	0.022	0.221	2.21	NA	NA	NA
Benzo(b)fluoranthene	mg/kg	--	--	--	0.221	2.21	22.1	NA	NA	NA
Benzo(k)fluoranthene	mg/kg	--	--	--	2.21	22.1	221	NA	NA	NA
Bis(2-chloroethoxy)methane	mg/kg	178	1783	5350	--	--	--	NA	NA	NA
Carbazole	mg/kg	--	--	--	69.4	694	6935	NA	NA	NA
Chrysene	mg/kg	--	--	--	22.1	221	2209	NA	NA	NA
Dibenz(a,h)anthracene	mg/kg	--	--	--	0.022	0.221	2.21	NA	NA	NA
Dibenzofuran	mg/kg	119	1189	3567	--	--	--	NA	NA	NA
Dieldrin	mg/kg	2.97	29.7	89.2	0.087	0.867	8.67	NA	NA	NA
Endrin	mg/kg	1.77	17.7	53.0	--	--	--	NA	NA	NA
Endrin aldehyde	mg/kg	--	--	--	--	--	--	NA	NA	NA
Fluoranthene	mg/kg	276	2765	8294	--	--	--	NA	NA	NA
Fluorene	mg/kg	737	7366	22,099	--	--	--	NA	NA	NA
HMX	mg/kg	1909	19,090	57,270	--	--	--	NA	NA	NA
Heptachlor	mg/kg	29.7	297	892	0.308	3.08	30.8	NA	NA	NA
Heptachlor epoxide	mg/kg	0.773	7.73	23.2	0.152	1.52	15.2	NA	NA	NA
Indeno(1,2,3-cd)pyrene	mg/kg	--	--	--	0.221	2.21	22.1	NA	NA	NA
N-Nitroso-di-n-propylamine	mg/kg	--	--	--	0.127	1.27	12.7	NA	NA	NA
Naphthalene	mg/kg	368	3678	11,035	--	--	--	NA	NA	NA
Nitroglycerin	mg/kg	--	--	--	81.6	816	8159	NA	NA	NA
PCB-1016	mg/kg	1.22	12.2	36.6	0.203	2.03	20.3	NA	NA	NA
PCB-1248	mg/kg	--	--	--	0.203	2.03	20.3	NA	NA	NA
PCB-1254	mg/kg	0.348	3.48	10.4	0.203	2.03	20.3	NA	NA	NA
PCB-1260	mg/kg	--	--	--	0.203	2.03	20.3	NA	NA	NA

Table I-4 (continued)
Ravenna Facility-Wide CUGs for Resident Farmer Adult COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
Pentachlorophenol	mg/kg	327	3269	9806	2.12	21.2	212	NA	NA	NA
Pyrene	mg/kg	207	2074	6221	--	--	--	NA	NA	NA
RDX	mg/kg	163	1632	4896	11.5	115	1154	NA	NA	NA
alpha-Chlordane	mg/kg	--	--	--	--	--	--	NA	NA	NA
beta-BHC	mg/kg	--	--	--	0.77	7.7	77.0	NA	NA	NA
gamma-Chlordane	mg/kg	--	--	--	--	--	--	NA	NA	NA
Ingestion of Foodstuffs from Surface Soil										
Inorganics										
Aluminum	mg/kg	329	3292	9875	--	--	--	NA	NA	NA
Antimony	mg/kg	0.129	1.29	3.88	--	--	--	NA	NA	NA
Arsenic	mg/kg	0.096	0.958	2.87	0.005	0.05	0.497	NA	NA	NA
Barium	mg/kg	64.5	645	1935	--	--	--	NA	NA	NA
Cadmium	mg/kg	0.201	2.01	6.04	--	--	--	NA	NA	NA
Chromium (as Cr-3)	mg/kg	478	4779	14,337	--	--	--	NA	NA	NA
Chromium, hexavalent	mg/kg	0.956	9.56	28.7	--	--	--	NA	NA	NA
Cobalt	mg/kg	6.16	61.6	185	--	--	--	NA	NA	NA
Copper	mg/kg	7.86	78.6	236	--	--	--	NA	NA	NA
Iron	mg/kg	90.4	904	2712	--	--	--	NA	NA	NA
Manganese	mg/kg	12.1	121	363	--	--	--	NA	NA	NA
Mercury	mg/kg	--	--	--	--	--	--	NA	NA	NA
Nickel	mg/kg	2.76	27.6	82.7	--	--	--	NA	NA	NA
Nitrate	mg/kg	--	--	--	--	--	--	NA	NA	NA
Silver	mg/kg	1.57	15.7	47.1	--	--	--	NA	NA	NA
Thallium	mg/kg	--	--	--	--	--	--	NA	NA	NA
Vanadium	mg/kg	2.31	23.1	69.3	--	--	--	NA	NA	NA
Zinc	mg/kg	16.9	169	507	--	--	--	NA	NA	NA
Organics										
1,3,5-Trinitrobenzene	mg/kg	1.41	14.1	42.3	--	--	--	NA	NA	NA
1,3-Dinitrobenzene	mg/kg	0.007	0.075	0.224	--	--	--	NA	NA	NA
2,4,6-Trinitrotoluene	mg/kg	0.071	0.705	2.12	0.11	1.1	11.0	NA	NA	NA
2,4-Dinitrotoluene	mg/kg	0.221	2.21	6.64	0.004	0.038	0.38	NA	NA	NA

Table I-4 (continued)
Ravenna Facility-Wide CUGs for Resident Farmer Adult COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
2,6-Dinitrotoluene	mg/kg	0.083	0.825	2.48	0.003	0.028	0.283	NA	NA	NA
2-Amino-4,6-dinitrotoluene	mg/kg	--	--	--	--	--	--	NA	NA	NA
2-Methylnaphthalene	mg/kg	1.15	11.5	34.6	--	--	--	NA	NA	NA
2-Nitrotoluene	mg/kg	1.41	14.1	42.3	0.014	0.143	1.43	NA	NA	NA
4,4'-DDE	mg/kg	--	--	--	0.018	0.177	1.77	NA	NA	NA
4-Amino-2,6-dinitrotoluene	mg/kg	--	--	--	--	--	--	NA	NA	NA
4-Chloro-3-methylphenol	mg/kg	--	--	--	--	--	--	NA	NA	NA
4-Nitrophenol	mg/kg	0.805	8.05	24.1	--	--	--	NA	NA	NA
4-Nitrotoluene	mg/kg	1.53	15.3	46.0	0.211	2.11	21.1	NA	NA	NA
Aldrin	mg/kg	0.007	0.066	0.197	3.0E-04	0.003	0.03	NA	NA	NA
Benz(a)anthracene	mg/kg	--	--	--	0.008	0.083	0.827	NA	NA	NA
Benzo(a)pyrene	mg/kg	--	--	--	6.3E-04	0.006	0.063	NA	NA	NA
Benzo(b)fluoranthene	mg/kg	--	--	--	0.006	0.063	0.634	NA	NA	NA
Benzo(k)fluoranthene	mg/kg	--	--	--	0.024	0.243	2.43	NA	NA	NA
Bis(2-chloroethoxy)methane	mg/kg	0.158	1.58	4.74	--	--	--	NA	NA	NA
Carbazole	mg/kg	--	--	--	0.33	3.3	33.0	NA	NA	NA
Chrysene	mg/kg	--	--	--	0.827	8.27	82.7	NA	NA	NA
Dibenz(a,h)anthracene	mg/kg	--	--	--	2.4E-04	0.002	0.024	NA	NA	NA
Dibenzofuran	mg/kg	0.596	5.96	17.9	--	--	--	NA	NA	NA
Dieldrin	mg/kg	0.015	0.154	0.463	4.5E-04	0.004	0.045	NA	NA	NA
Endrin	mg/kg	0.093	0.925	2.78	--	--	--	NA	NA	NA
Endrin aldehyde	mg/kg	--	--	--	--	--	--	NA	NA	NA
Fluoranthene	mg/kg	12.3	123	370	--	--	--	NA	NA	NA
Fluorene	mg/kg	12.2	122	366	--	--	--	NA	NA	NA
HMX	mg/kg	1.16	11.6	34.9	--	--	--	NA	NA	NA
Heptachlor	mg/kg	0.152	1.52	4.55	0.002	0.016	0.157	NA	NA	NA
Heptachlor epoxide	mg/kg	0.004	0.037	0.112	7.4E-04	0.007	0.074	NA	NA	NA
Indeno(1,2,3-cd)pyrene	mg/kg	--	--	--	0.003	0.034	0.342	NA	NA	NA
N-Nitroso-di-n-propylamine	mg/kg	--	--	--	2.0E-04	0.002	0.02	NA	NA	NA
Naphthalene	mg/kg	4.93	49.3	148	--	--	--	NA	NA	NA
Nitroglycerin	mg/kg	--	--	--	--	--	--	NA	NA	NA

Table I-4 (continued)
Ravenna Facility-Wide CUGs for Resident Farmer Adult COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
PCB-1016	mg/kg	0.016	0.162	0.486	0.003	0.027	0.27	NA	NA	NA
PCB-1248	mg/kg	--	--	--	0.003	0.029	0.287	NA	NA	NA
PCB-1254	mg/kg	0.004	0.043	0.129	0.003	0.025	0.251	NA	NA	NA
PCB-1260	mg/kg	--	--	--	5.1E-04	0.005	0.051	NA	NA	NA
Pentachlorophenol	mg/kg	6.94	69.4	208	0.045	0.45	4.5	NA	NA	NA
Pyrene	mg/kg	9.25	92.5	278	--	--	--	NA	NA	NA
RDX	mg/kg	0.74	7.4	22.2	0.052	0.523	5.23	NA	NA	NA
alpha-Chlordane	mg/kg	--	--	--	--	--	--	NA	NA	NA
beta-BHC	mg/kg	--	--	--	0.004	0.038	0.379	NA	NA	NA
gamma-Chlordane	mg/kg	--	--	--	--	--	--	NA	NA	NA
Subsurface Soil										
Inorganics										
Aluminum	mg/kg	52,923	529,229	1.0E+06	--	--	--	19,500	NA	NA
Antimony	mg/kg	13.6	136	409	--	--	--	0.96	NA	NA
Arsenic	mg/kg	8.21	82.1	246	0.425	4.25	42.5	19.8	NA	NA
Barium	mg/kg	8966	89,656	268,969	--	--	--	124	NA	NA
Cadmium	mg/kg	22.3	223	668	1249	12,491	124,911	0	NA	NA
Chromium (as Cr-3)	mg/kg	19,694	196,942	590,827	--	--	--	27.2	NA	NA
Chromium, hexavalent	mg/kg	90.4	904	2711	187	1874	18,737	NA	NA	NA
Cobalt	mg/kg	820	8198	24,594	803	8030	80,300	23.2	NA	NA
Copper	mg/kg	2714	27,138	81,413	--	--	--	32.3	NA	NA
Iron	mg/kg	19,010	190,104	570,313	--	--	--	35,200	NA	NA
Manganese	mg/kg	1482	14,817	44,452	--	--	--	3030	NA	NA
Mercury	mg/kg	16.5	165	496	--	--	--	0.044	NA	NA
Nickel	mg/kg	1346	13,463	40,389	--	--	--	60.7	NA	NA
Nitrate	mg/kg	114,196	1.0E+06	1.0E+06	--	--	--	NA	NA	NA
Silver	mg/kg	324	3240	9719	--	--	--	0	NA	NA
Thallium	mg/kg	4.76	47.6	143	--	--	--	0.91	NA	NA
Vanadium	mg/kg	156	1558	4674	--	--	--	37.6	NA	NA
Zinc	mg/kg	19,659	196,589	589,767	--	--	--	93.3	NA	NA

Table I-4 (continued)
Ravenna Facility-Wide CUGs for Resident Farmer Adult COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
Organics										
1,3,5-Trinitrobenzene	mg/kg	1528	15,280	45,841	--	--	--	NA	NA	NA
1,3-Dinitrobenzene	mg/kg	5.94	59.4	178	--	--	--	NA	NA	NA
2,4,6-Trinitrotoluene	mg/kg	21.1	211	633	32.8	328	3283	NA	NA	NA
2,4-Dinitrotoluene	mg/kg	43.9	439	1317	0.753	7.53	75.3	NA	NA	NA
2,6-Dinitrotoluene	mg/kg	22.4	224	672	0.769	7.69	76.9	NA	NA	NA
2-Amino-4,6-dinitrotoluene	mg/kg	12.8	128	385	--	--	--	NA	NA	NA
2-Methylnaphthalene	mg/kg	238	2378	7134	--	--	--	NA	NA	NA
2-Nitrotoluene	mg/kg	594	5945	17,834	6.03	60.3	603	NA	NA	NA
4,4'-DDE	mg/kg	--	--	--	4.08	40.8	408	NA	NA	NA
4-Amino-2,6-dinitrotoluene	mg/kg	12.8	128	385	--	--	--	NA	NA	NA
4-Chloro-3-methylphenol	mg/kg	--	--	--	--	--	--	NA	NA	NA
4-Nitrophenol	mg/kg	476	4756	14,267	--	--	--	NA	NA	NA
4-Nitrotoluene	mg/kg	594	5945	17,834	81.6	816	8159	NA	NA	NA
Aldrin	mg/kg	1.78	17.8	53.5	0.082	0.816	8.16	NA	NA	NA
Benz(a)anthracene	mg/kg	--	--	--	0.221	2.21	22.1	NA	NA	NA
Benzo(a)pyrene	mg/kg	--	--	--	0.022	0.221	2.21	NA	NA	NA
Benzo(b)fluoranthene	mg/kg	--	--	--	0.221	2.21	22.1	NA	NA	NA
Benzo(k)fluoranthene	mg/kg	--	--	--	2.21	22.1	221	NA	NA	NA
Bis(2-chloroethoxy)methane	mg/kg	178	1783	5350	--	--	--	NA	NA	NA
Carbazole	mg/kg	--	--	--	69.4	694	6935	NA	NA	NA
Chrysene	mg/kg	--	--	--	22.1	221	2209	NA	NA	NA
Dibenz(a,h)anthracene	mg/kg	--	--	--	0.022	0.221	2.21	NA	NA	NA
Dibenzofuran	mg/kg	119	1189	3567	--	--	--	NA	NA	NA
Dieldrin	mg/kg	2.97	29.7	89.2	0.087	0.867	8.67	NA	NA	NA
Endrin	mg/kg	1.77	17.7	53.0	--	--	--	NA	NA	NA
Endrin aldehyde	mg/kg	--	--	--	--	--	--	NA	NA	NA
Fluoranthene	mg/kg	276	2765	8294	--	--	--	NA	NA	NA
Fluorene	mg/kg	737	7366	22,099	--	--	--	NA	NA	NA
HMX	mg/kg	1909	19,090	57,270	--	--	--	NA	NA	NA
Heptachlor	mg/kg	29.7	297	892	0.308	3.08	30.8	NA	NA	NA

Table I-4 (continued)
Ravenna Facility-Wide CUGs for Resident Farmer Adult COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
Heptachlor epoxide	mg/kg	0.773	7.73	23.2	0.152	1.52	15.2	NA	NA	NA
Indeno(1,2,3-cd)pyrene	mg/kg	--	--	--	0.221	2.21	22.1	NA	NA	NA
N-Nitroso-di-n-propylamine	mg/kg	--	--	--	0.127	1.27	12.7	NA	NA	NA
Naphthalene	mg/kg	368	3678	11,035	--	--	--	NA	NA	NA
Nitroglycerin	mg/kg	--	--	--	81.6	816	8159	NA	NA	NA
PCB-1016	mg/kg	1.22	12.2	36.6	0.203	2.03	20.3	NA	NA	NA
PCB-1248	mg/kg	--	--	--	0.203	2.03	20.3	NA	NA	NA
PCB-1254	mg/kg	0.348	3.48	10.4	0.203	2.03	20.3	NA	NA	NA
PCB-1260	mg/kg	--	--	--	0.203	2.03	20.3	NA	NA	NA
Pentachlorophenol	mg/kg	327	3269	9806	2.12	21.2	212	NA	NA	NA
Pyrene	mg/kg	207	2074	6221	--	--	--	NA	NA	NA
RDX	mg/kg	163	1632	4896	11.5	115	1154	NA	NA	NA
alpha-Chlordane	mg/kg	--	--	--	--	--	--	NA	NA	NA
beta-BHC	mg/kg	--	--	--	0.77	7.7	77.0	NA	NA	NA
gamma-Chlordane	mg/kg	--	--	--	--	--	--	NA	NA	NA
Groundwater										
Inorganics										
Aluminum	µg/L	3564	35,636	106,907	--	--	--	NA	48,000	9410
Antimony	µg/L	1.3	13.0	39.1	--	--	--	NA	4.3	0
Arsenic	µg/L	1.09	10.9	32.7	0.056	0.564	5.64	NA	215	19.1
Barium	µg/L	706	7056	21,167	--	--	--	NA	327	241
Cadmium	µg/L	1.47	14.7	44.1	--	--	--	NA	0	0
Chromium (as Cr-3)	µg/L	3687	36,869	110,606	--	--	--	NA	85.2	19.5
Cobalt	µg/L	72.9	729	2188	--	--	--	NA	46.3	0
Iron	µg/L	1078	10,776	32,327	--	--	--	NA	195,000	21,500
Manganese	µg/L	158	1583	4749	--	--	--	NA	2860	1260
Nickel	µg/L	72.9	729	2186	--	--	--	NA	117	85.3
Nitrate	µg/L	5826	58,259	174,776	--	--	--	NA	NA	NA
Thallium	µg/L	0.291	2.91	8.74	--	--	--	NA	2.4	0
Vanadium	µg/L	20.6	206	617	--	--	--	NA	98.1	15.5
Zinc	µg/L	1087	10,871	32,613	--	--	--	NA	888	193

Table I-4 (continued)
Ravenna Facility-Wide CUGs for Resident Farmer Adult COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
Organics										
1,1,2,2-Tetrachloroethane	µg/L	201	2011	6032	0.069	0.691	6.91	NA	NA	NA
1,2-Dichloroethane	µg/L	70.6	706	2117	0.155	1.55	15.5	NA	NA	NA
1,3-Dinitrobenzene	µg/L	0.365	3.65	11.0	--	--	--	NA	NA	NA
2,4,6-Trinitrotoluene	µg/L	1.83	18.3	54.8	2.84	28.4	284	NA	NA	NA
2,4-Dinitrotoluene	µg/L	6.99	69.9	210	0.12	1.2	12.0	NA	NA	NA
2,6-Dinitrotoluene	µg/L	3.54	35.4	106	0.122	1.22	12.2	NA	NA	NA
2-Amino-4,6-dinitrotoluene	µg/L	0.73	7.3	21.9	--	--	--	NA	NA	NA
2-Nitrotoluene	µg/L	36.5	365	1095	0.37	3.7	37.0	NA	NA	NA
4,4'-DDD	µg/L	1.22	12.2	36.6	0.059	0.594	5.94	NA	NA	NA
4,4'-DDE	µg/L	--	--	--	0.047	0.467	4.67	NA	NA	NA
4,4'-DDT	µg/L	0.199	1.99	5.96	0.027	0.273	2.73	NA	NA	NA
4-Amino-2,6-dinitrotoluene	µg/L	0.73	7.3	21.9	--	--	--	NA	NA	NA
4-Nitrobenzenamine	µg/L	11.0	109.5	328.5	4.06	40.6	406	NA	NA	NA
4-Nitrotoluene	µg/L	36.5	365	1095	5.01	50.1	501	NA	NA	NA
Aldrin	µg/L	0.103	1.03	3.09	0.005	0.047	0.471	NA	NA	NA
Benz(a)anthracene	µg/L	--	--	--	0.004	0.039	0.389	NA	NA	NA
Benzene	µg/L	4.24	42.4	127	0.431	4.31	43.1	NA	NA	NA
Benzo(a)pyrene	µg/L	--	--	--	2.3E-04	0.002	0.023	NA	NA	NA
Benzo(b)fluoranthene	µg/L	--	--	--	0.002	0.023	0.227	NA	NA	NA
Bis(2-ethylhexyl)phthalate	µg/L	10.8	108	324	0.9	9.0	90.0	NA	NA	NA
Carbon tetrachloride	µg/L	2.15	21.5	64.4	0.204	2.04	20.4	NA	NA	NA
Chloroform	µg/L	27.6	276	828	0.207	2.07	20.7	NA	NA	NA
Dibenz(a,h)anthracene	µg/L	--	--	--	1.5E-04	0.002	0.015	NA	NA	NA
Dieldrin	µg/L	0.122	1.22	3.67	0.004	0.036	0.357	NA	NA	NA
Heptachlor	µg/L	1.37	13.7	41.0	0.014	0.142	1.42	NA	NA	NA
Heptachlor epoxide	µg/L	0.047	0.475	1.42	0.009	0.094	0.936	NA	NA	NA
Indeno(1,2,3-cd)pyrene	µg/L	--	--	--	0.002	0.023	0.227	NA	NA	NA
Lindane	µg/L	0.853	8.53	25.6	0.051	0.51	5.1	NA	NA	NA
Methylene chloride	µg/L	159	1591	4773	5.34	53.4	534	NA	NA	NA
Nitrobenzene	µg/L	1.83	18.3	54.8	--	--	--	NA	NA	NA

Table I-4 (continued)
Ravenna Facility-Wide CUGs for Resident Farmer Adult COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
Nitroglycerin	µg/L	--	--	--	5.01	50.1	501	NA	NA	NA
PCB-1242	µg/L	--	--	--	0.213	2.13	21.3	NA	NA	NA
PCB-1254	µg/L	0.073	0.73	2.19	0.213	2.13	21.3	NA	NA	NA
PCB-1260	µg/L	--	--	--	0.213	2.13	21.3	NA	NA	NA
Pentachlorophenol	µg/L	11.4	114	343	0.074	0.74	7.4	NA	NA	NA
RDX	µg/L	11.0	110	329	0.774	7.74	77.4	NA	NA	NA
Tetrachloroethene	µg/L	21.3	213	639	0.098	0.977	9.77	NA	NA	NA
Toxaphene	µg/L	--	--	--	0.048	0.481	4.81	NA	NA	NA
Trichloroethene	µg/L	0.562	5.62	16.9	0.031	0.312	3.12	NA	NA	NA
alpha-BHC	µg/L	--	--	--	0.014	0.135	1.35	NA	NA	NA
beta-BHC	µg/L	--	--	--	0.047	0.473	4.73	NA	NA	NA
Surface Water										
Inorganics										
Aluminum	µg/L	63,895	638,950	1.9E+06	--	--	--	3370	NA	NA
Antimony	µg/L	17.1	171	512	--	--	--	0	NA	NA
Arsenic	µg/L	21.2	212	635	1.1	11.0	110	3.2	NA	NA
Barium	µg/L	12,131	121,306	363,917	--	--	--	47.5	NA	NA
Cadmium	µg/L	15.1	151	452	--	--	--	0	NA	NA
Chromium (as Cr-3)	µg/L	28,442	284,416	853,247	--	--	--	0	NA	NA
Chromium, hexavalent	µg/L	90.3	903	2709	--	--	--	NA	NA	NA
Copper	µg/L	2788	27,876	83,628	--	--	--	7.9	NA	NA
Iron	µg/L	20,000	200,000	600,000	--	--	--	2560	NA	NA
Manganese	µg/L	2476	24,759	74,278	--	--	--	391	NA	NA
Mercury	µg/L	18.2	182	546	--	--	--	0	NA	NA
Nickel	µg/L	1445	14,447	43,342	--	--	--	0	NA	NA
Nitrate	µg/L	115,159	1.2E+06	3.5E+06	--	--	--	NA	NA	NA
Silver	µg/L	348	3484	10,453	--	--	--	0	NA	NA
Thallium	µg/L	5.76	57.6	173	--	--	--	0	NA	NA
Vanadium	µg/L	211	2107	6322	--	--	--	0	NA	NA
Zinc	µg/L	21,002	210,022	630,065	--	--	--	42	NA	NA

Table I-4 (continued)
Ravenna Facility-Wide CUGs for Resident Farmer Adult COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
Organics										
1,1,2,2-Tetrachloroethane	µg/L	2874	28,737	86,211	0.853	8.53	85.3	NA	NA	NA
1,2-Dichloroethene	µg/L	480	4799	14,398	--	--	--	NA	NA	NA
1,4-Dichlorobenzene	µg/L	--	--	--	18.7	187	1874	NA	NA	NA
2,4,6-Trinitrotoluene	µg/L	36.5	365	1095	56.8	568	5678	NA	NA	NA
2,4-Dimethylphenol	µg/L	899	8985	26,956	--	--	--	NA	NA	NA
2,4-Dinitrotoluene	µg/L	116	1160	3481	1.99	19.9	199	NA	NA	NA
2,6-Dinitrotoluene	µg/L	62.1	621	1864	2.13	21.3	213	NA	NA	NA
2-Amino-4,6-dinitrotoluene	µg/L	14.6	146	438	--	--	--	NA	NA	NA
2-Nitrotoluene	µg/L	730	7300	21,900	7.41	74.1	741	NA	NA	NA
4,4'-DDT	µg/L	0.743	7.43	22.3	0.102	1.02	10.2	NA	NA	NA
4-Amino-2,6-dinitrotoluene	µg/L	14.6	146	438	--	--	--	NA	NA	NA
4-Methylphenol	µg/L	261	2611	7834	--	--	--	NA	NA	NA
4-Nitrotoluene	µg/L	730	7300	21,900	100	1002	10,020	NA	NA	NA
Aldrin	µg/L	1.59	15.9	47.6	0.073	0.726	7.26	NA	NA	NA
Benz(a)anthracene	µg/L	--	--	--	0.014	0.136	1.36	NA	NA	NA
Benzo(a)pyrene	µg/L	--	--	--	8.0E-04	0.008	0.08	NA	NA	NA
Benzo(b)fluoranthene	µg/L	--	--	--	0.008	0.079	0.786	NA	NA	NA
Benzo(k)fluoranthene	µg/L	--	--	--	23.3	233	2333	NA	NA	NA
Bis(2-ethylhexyl)phthalate	µg/L	41.9	419	1258	3.49	34.9	349	NA	NA	NA
Chloroform	µg/L	252	2523	7568	2.47	24.7	247	NA	NA	NA
Chrysene	µg/L	--	--	--	1.36	13.6	136	NA	NA	NA
Dibenz(a,h)anthracene	µg/L	--	--	--	5.2E-04	0.005	0.052	NA	NA	NA
HMX	µg/L	3650	36,500	109,500	--	--	--	NA	NA	NA
Heptachlor epoxide	µg/L	0.949	9.49	28.5	0.187	1.87	18.7	NA	NA	NA
Indeno(1,2,3-cd)pyrene	µg/L	--	--	--	0.008	0.078	0.785	NA	NA	NA
Methylene chloride	µg/L	2518	25,181	75,544	76.0	760	7597	NA	NA	NA
PCB-1254	µg/L	1.46	14.6	43.8	4.26	42.6	426	NA	NA	NA
Pentachlorophenol	µg/L	42.6	426	1277	0.276	2.76	27.6	NA	NA	NA
Pyrene	µg/L	2190	21,900	65,700	--	--	--	NA	NA	NA
RDX	µg/L	219	2190	6570	15.5	155	1548	NA	NA	NA

Table I-4 (continued)
Ravenna Facility-Wide CUGs for Resident Farmer Adult COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
Tetrachloroethene	µg/L	184	1840	5520	0.83	8.3	83.0	NA	NA	NA
Trichloroethene	µg/L	3.64	36.4	109	0.301	3.01	30.1	NA	NA	NA
beta-BHC	µg/L	--	--	--	0.946	9.46	94.6	NA	NA	NA
cis-1,2-Dichloroethene	µg/L	730	7300	21,900	--	--	--	NA	NA	NA
Sediment										
Inorganics										
Aluminum	mg/kg	52,923	529,229	1.0E+06	--	--	--	13,900	NA	NA
Antimony	mg/kg	13.6	136	409	--	--	--	0	NA	NA
Arsenic	mg/kg	8.21	82.1	246	0.425	4.25	42.5	19.5	NA	NA
Barium	mg/kg	8966	89,656	268,969	--	--	--	123	NA	NA
Cadmium	mg/kg	22.3	223	668	1249	12,491	124,911	0	NA	NA
Chromium (as Cr-3)	mg/kg	19,694	196,942	590,827	--	--	--	18.1	NA	NA
Chromium, hexavalent	mg/kg	90.4	904	2711	187	1874	18,737	NA	NA	NA
Copper	mg/kg	2714	27,138	81,413	--	--	--	27.6	NA	NA
Iron	mg/kg	19,010	190,104	570,313	--	--	--	28,200	NA	NA
Manganese	mg/kg	1482	14,817	44,452	--	--	--	1950	NA	NA
Mercury	mg/kg	16.5	165	496	--	--	--	0.059	NA	NA
Nickel	mg/kg	1346	13,463	40,389	--	--	--	17.7	NA	NA
Silver	mg/kg	324	3240	9719	--	--	--	0	NA	NA
Thallium	mg/kg	4.76	47.6	143	--	--	--	0.89	NA	NA
Vanadium	mg/kg	156	1558	4674	--	--	--	26.1	NA	NA
Zinc	mg/kg	19,659	196,589	589,767	--	--	--	532	NA	NA
Organics										
2,4,6-Trinitrotoluene	mg/kg	21.1	211	633	32.8	328	3283	NA	NA	NA
2,4-Dinitrotoluene	mg/kg	43.9	439	1317	0.753	7.53	75.3	NA	NA	NA
2-Amino-4,6-dinitrotoluene	mg/kg	12.8	128	385	--	--	--	NA	NA	NA
4-Amino-2,6-dinitrotoluene	mg/kg	12.8	128	385	--	--	--	NA	NA	NA
Benz(a)anthracene	mg/kg	--	--	--	0.221	2.21	22.1	NA	NA	NA
Benzo(a)pyrene	mg/kg	--	--	--	0.022	0.221	2.21	NA	NA	NA
Benzo(b)fluoranthene	mg/kg	--	--	--	0.221	2.21	22.1	NA	NA	NA
Benzo(k)fluoranthene	mg/kg	--	--	--	2.21	22.1	221	NA	NA	NA

Table I-4 (continued)
Ravenna Facility-Wide CUGs for Resident Farmer Adult COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
Dibenz(a,h)anthracene	mg/kg	--	--	--	0.022	0.221	2.21	NA	NA	NA
Dieldrin	mg/kg	2.97	29.7	89.2	0.087	0.867	8.67	NA	NA	NA
HMX	mg/kg	1909	19,090	57,270	--	--	--	NA	NA	NA
Indeno(1,2,3-cd)pyrene	mg/kg	--	--	--	0.221	2.21	22.1	NA	NA	NA
Nitroglycerin	mg/kg	--	--	--	81.6	816	8159	NA	NA	NA
PCB-1016	mg/kg	1.22	12.2	36.6	0.203	2.03	20.3	NA	NA	NA
PCB-1254	mg/kg	0.348	3.48	10.4	0.203	2.03	20.3	NA	NA	NA
PCB-1260	mg/kg	--	--	--	0.203	2.03	20.3	NA	NA	NA
RDX	mg/kg	163	1632	4896	11.5	115	1154	NA	NA	NA
alpha-Chlordane	mg/kg	--	--	--	--	--	--	NA	NA	NA
gamma-Chlordane	mg/kg	--	--	--	--	--	--	NA	NA	NA

BHC denotes benzene hexachloride.
COPC denotes chemical(s) of potential concern.
CUG denotes Cleanup Goal across all pathways (ingestion, dermal, and inhalation).
DDD denotes dichlorodiphenyldichloroethane.
DDE denotes dichlorodiphenyldichloroethylene.
DDT denotes dichlorodiphenyltrichloroethane.
GW denotes groundwater.
HI denotes hazard index.
HMX denotes octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
mg/kg denotes milligrams per kilogram.
NA denotes not available.
PCB denotes polychlorinated biphenyl.
RDX denotes hexahydro-1,3,5-trinitro-1,3,5-triazine.
Uncon. denotes unconfined.
µg/L denotes micrograms per liter.
-- denotes no CUG could be quantified based on lack of approved toxicity value.

Table I-5
Ravenna Facility-Wide CUGs for Resident Farmer Child COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
Surface Soil										
Inorganics										
Aluminum	mg/kg	7380	73,798	221,394	--	--	--	17,700	NA	NA
Antimony	mg/kg	2.82	28.2	84.6	--	--	--	0.96	NA	NA
Arsenic	mg/kg	2.02	20.2	60.6	0.524	5.24	52.4	15.4	NA	NA
Barium	mg/kg	1413	14,129	42,388	--	--	--	88.4	NA	NA
Cadmium	mg/kg	6.41	64.1	192	2677	26,767	267,667	0	NA	NA
Chromium (as Cr-3)	mg/kg	8147	81,473	244,420	--	--	--	17.4	NA	NA
Chromium, hexavalent	mg/kg	19.9	199	596	401.5	4015	40,150	NA	NA	NA
Cobalt	mg/kg	131	1313	3938	1721	17,207	172,071	10.4	NA	NA
Copper	mg/kg	311	3106	9317	--	--	--	17.7	NA	NA
Iron	mg/kg	2313	23,125	69,375	--	--	--	23,100	NA	NA
Manganese	mg/kg	293	2927	8782	--	--	--	1450	NA	NA
Mercury	mg/kg	2.27	22.7	68.2	--	--	--	0.036	NA	NA
Nickel	mg/kg	155	1552	4655	--	--	--	21.1	NA	NA
Nitrate	mg/kg	12,487	124,868	374,604	--	--	--	NA	NA	NA
Silver	mg/kg	38.6	386	1159	--	--	--	0	NA	NA
Thallium	mg/kg	0.612	6.12	18.4	--	--	--	0	NA	NA
Vanadium	mg/kg	44.9	449	1346	--	--	--	31.1	NA	NA
Zinc	mg/kg	2321	23,209	69,627	--	--	--	61.8	NA	NA
Organics										
1,3,5-Trinitrobenzene	mg/kg	225	2252	6757	--	--	--	NA	NA	NA
1,3-Dinitrobenzene	mg/kg	0.765	7.65	23.0	--	--	--	NA	NA	NA
2,4,6-Trinitrotoluene	mg/kg	3.65	36.5	110	28.4	284	2842	NA	NA	NA
2,4-Dinitrotoluene	mg/kg	12.8	128	383	1.1	11.0	110	NA	NA	NA
2,6-Dinitrotoluene	mg/kg	6.42	64.2	193	1.1	11.0	110	NA	NA	NA
2-Amino-4,6-dinitrotoluene	mg/kg	1.54	15.4	46.3	--	--	--	NA	NA	NA
2-Methylnaphthalene	mg/kg	30.6	306	918	--	--	--	NA	NA	NA
2-Nitrotoluene	mg/kg	76.5	765	2296	3.88	38.8	388	NA	NA	NA

Table I-5 (continued)
Ravenna Facility-Wide CUGs for Resident Farmer Child COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
4,4'-DDE	mg/kg	--	--	--	2.63	26.3	263	NA	NA	NA
4-Amino-2,6-dinitrotoluene	mg/kg	1.54	15.4	46.3	--	--	--	NA	NA	NA
4-Chloro-3-methylphenol	mg/kg	--	--	--	--	--	--	NA	NA	NA
4-Nitrophenol	mg/kg	61.2	612	1837	--	--	--	NA	NA	NA
4-Nitrotoluene	mg/kg	76.5	765	2296	52.5	525	5252	NA	NA	NA
Aldrin	mg/kg	0.23	2.3	6.89	0.053	0.525	5.25	NA	NA	NA
Benz(a)anthracene	mg/kg	--	--	--	0.65	6.5	65.0	NA	NA	NA
Benzo(a)pyrene	mg/kg	--	--	--	0.065	0.65	6.5	NA	NA	NA
Benzo(b)fluoranthene	mg/kg	--	--	--	0.65	6.5	65.0	NA	NA	NA
Benzo(k)fluoranthene	mg/kg	--	--	--	6.5	65.0	650	NA	NA	NA
Bis(2-chloroethoxy)methane	mg/kg	23.0	230	689	--	--	--	NA	NA	NA
Carbazole	mg/kg	--	--	--	44.6	446	4464	NA	NA	NA
Chrysene	mg/kg	--	--	--	65.0	650	6502	NA	NA	NA
Dibenz(a,h)anthracene	mg/kg	--	--	--	0.065	0.65	6.5	NA	NA	NA
Dibenzofuran	mg/kg	15.3	153	459	--	--	--	NA	NA	NA
Dieldrin	mg/kg	0.383	3.83	11.5	0.056	0.558	5.58	NA	NA	NA
Endrin	mg/kg	1.12	11.2	33.5	--	--	--	NA	NA	NA
Endrin aldehyde	mg/kg	--	--	--	--	--	--	NA	NA	NA
Fluoranthene	mg/kg	163	1627	4882	--	--	--	NA	NA	NA
Fluorene	mg/kg	243	2433	7298	--	--	--	NA	NA	NA
HMX	mg/kg	359	3594	10,783	--	--	--	NA	NA	NA
Heptachlor	mg/kg	3.83	38.3	115	0.198	1.98	19.8	NA	NA	NA
Heptachlor epoxide	mg/kg	0.099	0.995	2.98	0.098	0.981	9.81	NA	NA	NA
Indeno(1,2,3-cd)pyrene	mg/kg	--	--	--	0.65	6.5	65.0	NA	NA	NA
N-Nitroso-di-n-propylamine	mg/kg	--	--	--	0.12	1.2	12.0	NA	NA	NA
Naphthalene	mg/kg	122	1215	3646	--	--	--	NA	NA	NA
Nitroglycerin	mg/kg	--	--	--	52.5	525	5252	NA	NA	NA
PCB-1016	mg/kg	0.419	4.19	12.6	0.349	3.49	34.9	NA	NA	NA
PCB-1248	mg/kg	--	--	--	0.349	3.49	34.9	NA	NA	NA
PCB-1254	mg/kg	0.12	1.2	3.59	0.349	3.49	34.9	NA	NA	NA
PCB-1260	mg/kg	--	--	--	0.349	3.49	34.9	NA	NA	NA

Table I-5 (continued)
Ravenna Facility-Wide CUGs for Resident Farmer Child COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
Pentachlorophenol	mg/kg	151	1514	4541	4.91	49.1	491	NA	NA	NA
Pyrene	mg/kg	122	1220	3661	--	--	--	NA	NA	NA
RDX	mg/kg	22.7	227	681	8.03	80.3	803	NA	NA	NA
alpha-Chlordane	mg/kg	--	--	--	--	--	--	NA	NA	NA
beta-BHC	mg/kg	--	--	--	0.496	4.96	49.6	NA	NA	NA
gamma-Chlordane	mg/kg	--	--	--	--	--	--	NA	NA	NA
Ingestion of Foodstuffs from Surface Soil										
Inorganics										
Aluminum	mg/kg	70.1	701	2102	--	--	--	NA	NA	NA
Antimony	mg/kg	0.028	0.277	0.831	--	--	--	NA	NA	NA
Arsenic	mg/kg	0.02	0.205	0.614	0.005	0.053	0.531	NA	NA	NA
Barium	mg/kg	13.6	136	407	--	--	--	NA	NA	NA
Cadmium	mg/kg	0.041	0.41	1.23	--	--	--	NA	NA	NA
Chromium (as Cr-3)	mg/kg	102	1024	3071	--	--	--	NA	NA	NA
Chromium, hexavalent	mg/kg	0.205	2.05	6.14	--	--	--	NA	NA	NA
Cobalt	mg/kg	1.32	13.2	39.5	--	--	--	NA	NA	NA
Copper	mg/kg	1.54	15.4	46.1	--	--	--	NA	NA	NA
Iron	mg/kg	19.4	194	581	--	--	--	NA	NA	NA
Manganese	mg/kg	2.59	25.9	77.7	--	--	--	NA	NA	NA
Mercury	mg/kg	--	--	--	--	--	--	NA	NA	NA
Nickel	mg/kg	0.444	4.44	13.3	--	--	--	NA	NA	NA
Nitrate	mg/kg	--	--	--	--	--	--	NA	NA	NA
Silver	mg/kg	0.334	3.34	10.0	--	--	--	NA	NA	NA
Thallium	mg/kg	--	--	--	--	--	--	NA	NA	NA
Vanadium	mg/kg	0.494	4.94	14.8	--	--	--	NA	NA	NA
Zinc	mg/kg	2.99	29.9	89.6	--	--	--	NA	NA	NA
Organics										
1,3,5-Trinitrobenzene	mg/kg	0.302	3.02	9.07	--	--	--	NA	NA	NA
1,3-Dinitrobenzene	mg/kg	0.002	0.016	0.048	--	--	--	NA	NA	NA
2,4,6-Trinitrotoluene	mg/kg	0.015	0.151	0.453	0.118	1.18	11.8	NA	NA	NA
2,4-Dinitrotoluene	mg/kg	0.047	0.475	1.42	0.004	0.041	0.407	NA	NA	NA

Table I-5 (continued)
Ravenna Facility-Wide CUGs for Resident Farmer Child COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
2,6-Dinitrotoluene	mg/kg	0.018	0.177	0.531	0.003	0.03	0.303	NA	NA	NA
2-Amino-4,6-dinitrotoluene	mg/kg	--	--	--	--	--	--	NA	NA	NA
2-Methylnaphthalene	mg/kg	0.246	2.46	7.39	--	--	--	NA	NA	NA
2-Nitrotoluene	mg/kg	0.302	3.02	9.07	0.015	0.153	1.53	NA	NA	NA
4,4'-DDE	mg/kg	--	--	--	0.017	0.172	1.72	NA	NA	NA
4-Amino-2,6-dinitrotoluene	mg/kg	--	--	--	--	--	--	NA	NA	NA
4-Chloro-3-methylphenol	mg/kg	--	--	--	--	--	--	NA	NA	NA
4-Nitrophenol	mg/kg	0.172	1.72	5.17	--	--	--	NA	NA	NA
4-Nitrotoluene	mg/kg	0.329	3.29	9.86	0.226	2.26	22.6	NA	NA	NA
Aldrin	mg/kg	0.001	0.014	0.042	3.2E-04	0.003	0.032	NA	NA	NA
Benz(a)anthracene	mg/kg	--	--	--	0.008	0.08	0.799	NA	NA	NA
Benzo(a)pyrene	mg/kg	--	--	--	5.7E-04	0.006	0.057	NA	NA	NA
Benzo(b)fluoranthene	mg/kg	--	--	--	0.006	0.057	0.565	NA	NA	NA
Benzo(k)fluoranthene	mg/kg	--	--	--	0.019	0.188	1.88	NA	NA	NA
Bis(2-chloroethoxy)methane	mg/kg	0.034	0.339	1.02	--	--	--	NA	NA	NA
Carbazole	mg/kg	--	--	--	0.353	3.53	35.3	NA	NA	NA
Chrysene	mg/kg	--	--	--	0.799	7.99	79.9	NA	NA	NA
Dibenz(a,h)anthracene	mg/kg	--	--	--	1.9E-04	0.002	0.019	NA	NA	NA
Dibenzofuran	mg/kg	0.127	1.27	3.82	--	--	--	NA	NA	NA
Dieldrin	mg/kg	0.003	0.033	0.098	4.8E-04	0.005	0.048	NA	NA	NA
Endrin	mg/kg	0.02	0.196	0.588	--	--	--	NA	NA	NA
Endrin aldehyde	mg/kg	--	--	--	--	--	--	NA	NA	NA
Fluoranthene	mg/kg	2.59	25.9	77.6	--	--	--	NA	NA	NA
Fluorene	mg/kg	2.6	26.0	77.9	--	--	--	NA	NA	NA
HMX	mg/kg	0.249	2.49	7.48	--	--	--	NA	NA	NA
Heptachlor	mg/kg	0.032	0.323	0.968	0.002	0.017	0.167	NA	NA	NA
Heptachlor epoxide	mg/kg	7.6E-04	0.008	0.023	7.5E-04	0.007	0.075	NA	NA	NA
Indeno(1,2,3-cd)pyrene	mg/kg	--	--	--	0.003	0.027	0.275	NA	NA	NA
N-Nitroso-di-n-propylamine	mg/kg	--	--	--	2.1E-04	0.002	0.021	NA	NA	NA
Naphthalene	mg/kg	1.06	10.6	31.7	--	--	--	NA	NA	NA
Nitroglycerin	mg/kg	--	--	--	--	--	--	NA	NA	NA

Table I-5 (continued)
Ravenna Facility-Wide CUGs for Resident Farmer Child COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
PCB-1016	mg/kg	0.003	0.03	0.091	0.003	0.025	0.251	NA	NA	NA
PCB-1248	mg/kg	--	--	--	0.003	0.027	0.273	NA	NA	NA
PCB-1254	mg/kg	7.9E-04	0.008	0.024	0.002	0.023	0.229	NA	NA	NA
PCB-1260	mg/kg	--	--	--	3.8E-04	0.004	0.038	NA	NA	NA
Pentachlorophenol	mg/kg	1.29	12.9	38.8	0.042	0.419	4.19	NA	NA	NA
Pyrene	mg/kg	1.94	19.4	58.2	--	--	--	NA	NA	NA
RDX	mg/kg	0.158	1.58	4.75	0.056	0.56	5.6	NA	NA	NA
alpha-Chlordane	mg/kg	--	--	--	--	--	--	NA	NA	NA
beta-BHC	mg/kg	--	--	--	0.004	0.04	0.405	NA	NA	NA
gamma-Chlordane	mg/kg	--	--	--	--	--	--	NA	NA	NA
Subsurface Soil										
Inorganics										
Aluminum	mg/kg	7380	73,798	221,394	--	--	--	19,500	NA	NA
Antimony	mg/kg	2.82	28.2	84.6	--	--	--	0.96	NA	NA
Arsenic	mg/kg	2.02	20.2	60.6	0.524	5.24	52.4	19.8	NA	NA
Barium	mg/kg	1413	14,129	42,388	--	--	--	124	NA	NA
Cadmium	mg/kg	6.41	64.1	192	2677	26,767	267,667	0	NA	NA
Chromium (as Cr-3)	mg/kg	8147	81,473	244,420	--	--	--	27.2	NA	NA
Chromium, hexavalent	mg/kg	19.9	199	596	401.5	4015	40,150	NA	NA	NA
Cobalt	mg/kg	131	1313	3938	1721	17,207	172,071	23.2	NA	NA
Copper	mg/kg	311	3106	9317	--	--	--	32.3	NA	NA
Iron	mg/kg	2313	23,125	69,375	--	--	--	35,200	NA	NA
Manganese	mg/kg	293	2927	8782	--	--	--	3030	NA	NA
Mercury	mg/kg	2.27	22.7	68.2	--	--	--	0.044	NA	NA
Nickel	mg/kg	155	1552	4655	--	--	--	60.7	NA	NA
Nitrate	mg/kg	12,487	124,868	374,604	--	--	--	NA	NA	NA
Silver	mg/kg	38.6	386	1159	--	--	--	0	NA	NA
Thallium	mg/kg	0.612	6.12	18.4	--	--	--	0.91	NA	NA
Vanadium	mg/kg	44.9	449	1346	--	--	--	37.6	NA	NA
Zinc	mg/kg	2321	23,209	69,627	--	--	--	93.3	NA	NA

Table I-5 (continued)
Ravenna Facility-Wide CUGs for Resident Farmer Child COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
Organics										
1,3,5-Trinitrobenzene	mg/kg	225	2252	6757	--	--	--	NA	NA	NA
1,3-Dinitrobenzene	mg/kg	0.765	7.65	23.0	--	--	--	NA	NA	NA
2,4,6-Trinitrotoluene	mg/kg	3.65	36.5	110	28.4	284	2842	NA	NA	NA
2,4-Dinitrotoluene	mg/kg	12.8	128	383	1.1	11.0	110	NA	NA	NA
2,6-Dinitrotoluene	mg/kg	6.42	64.2	193	1.1	11.0	110	NA	NA	NA
2-Amino-4,6-dinitrotoluene	mg/kg	1.54	15.4	46.3	--	--	--	NA	NA	NA
2-Methylnaphthalene	mg/kg	30.6	306	918	--	--	--	NA	NA	NA
2-Nitrotoluene	mg/kg	76.5	765	2296	3.88	38.8	388	NA	NA	NA
4,4'-DDE	mg/kg	--	--	--	2.63	26.3	263	NA	NA	NA
4-Amino-2,6-dinitrotoluene	mg/kg	1.54	15.4	46.3	--	--	--	NA	NA	NA
4-Chloro-3-methylphenol	mg/kg	--	--	--	--	--	--	NA	NA	NA
4-Nitrophenol	mg/kg	61.2	612	1837	--	--	--	NA	NA	NA
4-Nitrotoluene	mg/kg	76.5	765	2296	52.5	525	5252	NA	NA	NA
Aldrin	mg/kg	0.23	2.3	6.89	0.053	0.525	5.25	NA	NA	NA
Benz(a)anthracene	mg/kg	--	--	--	0.65	6.5	65.0	NA	NA	NA
Benzo(a)pyrene	mg/kg	--	--	--	0.065	0.65	6.5	NA	NA	NA
Benzo(b)fluoranthene	mg/kg	--	--	--	0.65	6.5	65.0	NA	NA	NA
Benzo(k)fluoranthene	mg/kg	--	--	--	6.5	65.0	650	NA	NA	NA
Bis(2-chloroethoxy)methane	mg/kg	23.0	230	689	--	--	--	NA	NA	NA
Carbazole	mg/kg	--	--	--	44.6	446	4464	NA	NA	NA
Chrysene	mg/kg	--	--	--	65.0	650	6502	NA	NA	NA
Dibenz(a,h)anthracene	mg/kg	--	--	--	0.065	0.65	6.5	NA	NA	NA
Dibenzofuran	mg/kg	15.3	153	459	--	--	--	NA	NA	NA
Dieldrin	mg/kg	0.383	3.83	11.5	0.056	0.558	5.58	NA	NA	NA
Endrin	mg/kg	1.12	11.2	33.5	--	--	--	NA	NA	NA
Endrin aldehyde	mg/kg	--	--	--	--	--	--	NA	NA	NA
Fluoranthene	mg/kg	163	1627	4882	--	--	--	NA	NA	NA
Fluorene	mg/kg	243	2433	7298	--	--	--	NA	NA	NA
HMX	mg/kg	359	3594	10,783	--	--	--	NA	NA	NA
Heptachlor	mg/kg	3.83	38.3	115	0.198	1.98	19.8	NA	NA	NA

Table I-5 (continued)
Ravenna Facility-Wide CUGs for Resident Farmer Child COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
Heptachlor epoxide	mg/kg	0.099	0.995	2.98	0.098	0.981	9.81	NA	NA	NA
Indeno(1,2,3-cd)pyrene	mg/kg	--	--	--	0.65	6.5	65.0	NA	NA	NA
N-Nitroso-di-n-propylamine	mg/kg	--	--	--	0.12	1.2	12.0	NA	NA	NA
Naphthalene	mg/kg	122	1215	3646	--	--	--	NA	NA	NA
Nitroglycerin	mg/kg	--	--	--	52.5	525	5252	NA	NA	NA
PCB-1016	mg/kg	0.419	4.19	12.6	0.349	3.49	34.9	NA	NA	NA
PCB-1248	mg/kg	--	--	--	0.349	3.49	34.9	NA	NA	NA
PCB-1254	mg/kg	0.12	1.2	3.59	0.349	3.49	34.9	NA	NA	NA
PCB-1260	mg/kg	--	--	--	0.349	3.49	34.9	NA	NA	NA
Pentachlorophenol	mg/kg	151	1514	4541	4.91	49.1	491	NA	NA	NA
Pyrene	mg/kg	122	1220	3661	--	--	--	NA	NA	NA
RDX	mg/kg	22.7	227	681	8.03	80.3	803	NA	NA	NA
alpha-Chlordane	mg/kg	--	--	--	--	--	--	NA	NA	NA
beta-BHC	mg/kg	--	--	--	0.496	4.96	49.6	NA	NA	NA
gamma-Chlordane	mg/kg	--	--	--	--	--	--	NA	NA	NA
Groundwater										
Inorganics										
Aluminum	µg/L	1028	10,280	30,841	--	--	--	NA	48,000	9410
Antimony	µg/L	0.389	3.89	11.7	--	--	--	NA	4.3	0
Arsenic	µg/L	0.312	3.12	9.35	0.081	0.808	8.08	NA	215	19.1
Barium	µg/L	204	2044	6131	--	--	--	NA	327	241
Cadmium	µg/L	0.456	4.56	13.7	--	--	--	NA	0	0
Chromium (as Cr-3)	µg/L	1214	12,139	36,416	--	--	--	NA	85.2	19.5
Cobalt	µg/L	20.8	208	625	--	--	--	NA	46.3	0
Iron	µg/L	310	3099	9296	--	--	--	NA	195,000	21,500
Manganese	µg/L	46.3	463	1389	--	--	--	NA	2860	1260
Nickel	µg/L	20.8	208	625	--	--	--	NA	117	85.3
Nitrate	µg/L	1666	16,662	49,985	--	--	--	NA	NA	NA
Thallium	µg/L	0.083	0.833	2.5	--	--	--	NA	2.4	0
Vanadium	µg/L	6.38	63.8	191	--	--	--	NA	98.1	15.5
Zinc	µg/L	312	3115	9345	--	--	--	NA	888	193

Table I-5 (continued)
Ravenna Facility-Wide CUGs for Resident Farmer Child COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
Organics										
1,1,2,2-Tetrachloroethane	µg/L	59.4	594	1783	0.137	1.37	13.7	NA	NA	NA
1,2-Dichloroethane	µg/L	20.4	204	613	0.307	3.07	30.7	NA	NA	NA
1,3-Dinitrobenzene	µg/L	0.104	1.04	3.13	--	--	--	NA	NA	NA
2,4,6-Trinitrotoluene	µg/L	0.521	5.21	15.6	4.06	40.6	406	NA	NA	NA
2,4-Dinitrotoluene	µg/L	2.03	20.3	61.0	0.174	1.74	17.4	NA	NA	NA
2,6-Dinitrotoluene	µg/L	1.02	10.2	30.7	0.176	1.76	17.6	NA	NA	NA
2-Amino-4,6-dinitrotoluene	µg/L	0.209	2.09	6.26	--	--	--	NA	NA	NA
2-Nitrotoluene	µg/L	10.4	104	313	0.529	5.29	52.9	NA	NA	NA
4,4'-DDD	µg/L	0.526	5.26	15.8	0.128	1.28	12.8	NA	NA	NA
4,4'-DDE	µg/L	--	--	--	0.099	0.994	9.94	NA	NA	NA
4,4'-DDT	µg/L	0.089	0.888	2.66	0.061	0.609	6.09	NA	NA	NA
4-Amino-2,6-dinitrotoluene	µg/L	0.209	2.09	6.26	--	--	--	NA	NA	NA
4-Nitrobenzenamine	µg/L	3.13	31.3	93.9	5.79	57.9	579	NA	NA	NA
4-Nitrotoluene	µg/L	10.4	104	313	7.16	71.6	716	NA	NA	NA
Aldrin	µg/L	0.03	0.301	0.904	0.007	0.069	0.689	NA	NA	NA
Benz(a)anthracene	µg/L	--	--	--	0.009	0.091	0.914	NA	NA	NA
Benzene	µg/L	1.59	15.9	47.8	0.814	8.14	81.4	NA	NA	NA
Benzo(a)pyrene	µg/L	--	--	--	5.5E-04	0.005	0.055	NA	NA	NA
Benzo(b)fluoranthene	µg/L	--	--	--	0.005	0.054	0.538	NA	NA	NA
Bis(2-ethylhexyl)phthalate	µg/L	4.71	47.1	141	1.96	19.6	196	NA	NA	NA
Carbon tetrachloride	µg/L	0.656	6.56	19.7	0.381	3.81	38.1	NA	NA	NA
Chloroform	µg/L	8.75	87.5	263	0.441	4.41	44.1	NA	NA	NA
Dibenz(a,h)anthracene	µg/L	--	--	--	3.6E-04	0.004	0.036	NA	NA	NA
Dieldrin	µg/L	0.04	0.403	1.21	0.006	0.059	0.588	NA	NA	NA
Heptachlor	µg/L	0.435	4.35	13.0	0.023	0.225	2.25	NA	NA	NA
Heptachlor epoxide	µg/L	0.014	0.136	0.407	0.013	0.134	1.34	NA	NA	NA
Indeno(1,2,3-cd)pyrene	µg/L	--	--	--	0.005	0.054	0.537	NA	NA	NA
Lindane	µg/L	0.268	2.68	8.03	0.08	0.801	8.01	NA	NA	NA
Methylene chloride	µg/L	50.1	501	1503	9.27	92.7	927	NA	NA	NA
Nitrobenzene	µg/L	0.521	5.21	15.6	--	--	--	NA	NA	NA

Table I-5 (continued)
Ravenna Facility-Wide CUGs for Resident Farmer Child COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
Nitroglycerin	µg/L	--	--	--	7.16	71.6	716	NA	NA	NA
PCB-1242	µg/L	--	--	--	0.304	3.04	30.4	NA	NA	NA
PCB-1254	µg/L	0.021	0.209	0.626	0.304	3.04	30.4	NA	NA	NA
PCB-1260	µg/L	--	--	--	0.304	3.04	30.4	NA	NA	NA
Pentachlorophenol	µg/L	5.12	51.2	154	0.166	1.66	16.6	NA	NA	NA
RDX	µg/L	3.13	31.3	93.9	1.11	11.1	111	NA	NA	NA
Tetrachloroethene	µg/L	7.21	72.1	216	0.163	1.63	16.3	NA	NA	NA
Toxaphene	µg/L	--	--	--	0.081	0.812	8.12	NA	NA	NA
Trichloroethene	µg/L	0.199	1.99	5.96	0.063	0.631	6.31	NA	NA	NA
alpha-BHC	µg/L	--	--	--	0.019	0.193	1.93	NA	NA	NA
beta-BHC	µg/L	--	--	--	0.068	0.676	6.76	NA	NA	NA
Surface Water										
Inorganics										
Aluminum	µg/L	14,827	148,274	444,821	--	--	--	3370	NA	NA
Antimony	µg/L	4.91	49.1	147	--	--	--	0	NA	NA
Arsenic	µg/L	4.63	46.3	139	1.2	12.0	120	3.2	NA	NA
Barium	µg/L	2901	29,007	87,020	--	--	--	47.5	NA	NA
Cadmium	µg/L	5.05	50.5	151	--	--	--	0	NA	NA
Chromium (as Cr-3)	µg/L	11,173	111,735	335,204	--	--	--	0	NA	NA
Chromium, hexavalent	µg/L	30.3	303	908	--	--	--	NA	NA	NA
Copper	µg/L	614	6144	18,433	--	--	--	7.9	NA	NA
Iron	µg/L	4527	45,269	135,806	--	--	--	2560	NA	NA
Manganese	µg/L	633	6326	18,978	--	--	--	391	NA	NA
Mercury	µg/L	4.35	43.5	131	--	--	--	0	NA	NA
Nickel	µg/L	312	3116	9348	--	--	--	0	NA	NA
Nitrate	µg/L	24,892	248,917	746,750	--	--	--	NA	NA	NA
Silver	µg/L	76.8	768	2304	--	--	--	0	NA	NA
Thallium	µg/L	1.24	12.4	37.3	--	--	--	0	NA	NA
Vanadium	µg/L	70.6	706	2119	--	--	--	0	NA	NA
Zinc	µg/L	4617	46,167	138,500	--	--	--	42	NA	NA

Table I-5 (continued)
Ravenna Facility-Wide CUGs for Resident Farmer Child COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
Organics										
1,1,2,2-Tetrachloroethane	µg/L	781	7806	23,419	0.945	9.45	94.5	NA	NA	NA
1,2-Dichloroethene	µg/L	123	1232	3697	--	--	--	NA	NA	NA
1,4-Dichlorobenzene	µg/L	--	--	--	36.6	366	3663	NA	NA	NA
2,4,6-Trinitrotoluene	µg/L	7.82	78.2	235	60.8	608	6083	NA	NA	NA
2,4-Dimethylphenol	µg/L	252	2521	7562	--	--	--	NA	NA	NA
2,4-Dinitrotoluene	µg/L	28.4	284	853	2.44	24.4	244	NA	NA	NA
2,6-Dinitrotoluene	µg/L	14.7	147	440	2.51	25.1	251	NA	NA	NA
2-Amino-4,6-dinitrotoluene	µg/L	3.13	31.3	93.9	--	--	--	NA	NA	NA
2-Nitrotoluene	µg/L	156	1564	4693	7.93	79.3	793	NA	NA	NA
4,4'-DDT	µg/L	0.4	4.0	12.0	0.274	2.74	27.4	NA	NA	NA
4-Amino-2,6-dinitrotoluene	µg/L	3.13	31.3	93.9	--	--	--	NA	NA	NA
4-Methylphenol	µg/L	67.8	678	2034	--	--	--	NA	NA	NA
4-Nitrotoluene	µg/L	156	1564	4693	107	1074	10,735	NA	NA	NA
Aldrin	µg/L	0.409	4.09	12.3	0.094	0.936	9.36	NA	NA	NA
Benz(a)anthracene	µg/L	--	--	--	0.037	0.375	3.75	NA	NA	NA
Benzo(a)pyrene	µg/L	--	--	--	0.002	0.022	0.22	NA	NA	NA
Benzo(b)fluoranthene	µg/L	--	--	--	0.022	0.217	2.17	NA	NA	NA
Benzo(k)fluoranthene	µg/L	--	--	--	25	250	2500	NA	NA	NA
Bis(2-ethylhexyl)phthalate	µg/L	22.3	223	668	9.27	92.7	927	NA	NA	NA
Chloroform	µg/L	90.4	904	2711	2.68	26.8	268	NA	NA	NA
Chrysene	µg/L	--	--	--	3.75	37.5	375	NA	NA	NA
Dibenz(a,h)anthracene	µg/L	--	--	--	0.001	0.014	0.143	NA	NA	NA
HMX	µg/L	782	7821	23,464	--	--	--	NA	NA	NA
Heptachlor epoxide	µg/L	0.203	2.03	6.1	0.201	2.01	20.1	NA	NA	NA
Indeno(1,2,3-cd)pyrene	µg/L	--	--	--	0.022	0.217	2.17	NA	NA	NA
Methylene chloride	µg/L	571	5710	17,131	84.1	841	8410	NA	NA	NA
PCB-1254	µg/L	0.313	3.13	9.39	4.56	45.6	456	NA	NA	NA
Pentachlorophenol	□g/L	22.9	229	688	0.743	7.43	74.3	NA	NA	NA
Pyrene	µg/L	469	4693	14,079	--	--	--	NA	NA	NA
RDX	µg/L	46.9	469	1408	16.6	166	1659	NA	NA	NA

Table I-5 (continued)
Ravenna Facility-Wide CUGs for Resident Farmer Child COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
Tetrachloroethene	µg/L	64.0	640	1920	1.48	14.8	148	NA	NA	NA
Trichloroethene	µg/L	1.53	15.3	45.8	0.408	4.08	40.8	NA	NA	NA
beta-BHC	µg/L	--	--	--	1.01	10.1	101	NA	NA	NA
cis-1,2-Dichloroethene	µg/L	156	1564	4693	--	--	--	NA	NA	NA
Sediment										
Inorganics										
Aluminum	mg/kg	7380	73,798	221,394	--	--	--	13,900	NA	NA
Antimony	mg/kg	2.82	28.2	84.6	--	--	--	0	NA	NA
Arsenic	mg/kg	2.02	20.2	60.6	0.524	5.24	52.4	19.5	NA	NA
Barium	mg/kg	1413	14,129	42,388	--	--	--	123	NA	NA
Cadmium	mg/kg	6.41	64.1	192	2677	26,767	267,667	0	NA	NA
Chromium (as Cr-3)	mg/kg	8147	81,473	244,420	--	--	--	18.1	NA	NA
Chromium, hexavalent	mg/kg	19.9	199	596	402	4015	40,150	NA	NA	NA
Copper	mg/kg	311	3106	9317	--	--	--	27.6	NA	NA
Iron	mg/kg	2313	23,125	69,375	--	--	--	28,200	NA	NA
Manganese	mg/kg	293	2927	8782	--	--	--	1950	NA	NA
Mercury	mg/kg	2.27	22.7	68.2	--	--	--	0.059	NA	NA
Nickel	mg/kg	155	1552	4655	--	--	--	17.7	NA	NA
Silver	mg/kg	38.6	386	1159	--	--	--	0	NA	NA
Thallium	mg/kg	0.612	6.12	18.4	--	--	--	0.89	NA	NA
Vanadium	mg/kg	44.9	449	1346	--	--	--	26.1	NA	NA
Zinc	mg/kg	2321	23,209	69,627	--	--	--	532	NA	NA
Organics										
2,4,6-Trinitrotoluene	mg/kg	3.65	36.5	110	28.4	284	2842	NA	NA	NA
2,4-Dinitrotoluene	mg/kg	12.8	128	383	1.1	11.0	110	NA	NA	NA
2-Amino-4,6-dinitrotoluene	mg/kg	1.54	15.4	46.3	--	--	--	NA	NA	NA
4-Amino-2,6-dinitrotoluene	mg/kg	1.54	15.4	46.3	--	--	--	NA	NA	NA
Benz(a)anthracene	mg/kg	--	--	--	0.65	6.5	65.0	NA	NA	NA
Benzo(a)pyrene	mg/kg	--	--	--	0.065	0.65	6.5	NA	NA	NA
Benzo(b)fluoranthene	mg/kg	--	--	--	0.65	6.5	65.0	NA	NA	NA
Benzo(k)fluoranthene	mg/kg	--	--	--	6.5	65.0	650	NA	NA	NA

Table I-5 (continued)
Ravenna Facility-Wide CUGs for Resident Farmer Child COPCs
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

COPC	Units	Non-carcinogenic CUG			Carcinogenic CUG			Background	GW Background	
		HI = 0.1	HI = 1	HI = 3	Risk = 10^{-6}	Risk = 10^{-5}	Risk = 10^{-4}		Uncon.	Bedrock
Dibenz(a,h)anthracene	mg/kg	--	--	--	0.065	0.65	6.5	NA	NA	NA
Dieldrin	mg/kg	0.383	3.83	11.5	0.056	0.558	5.58	NA	NA	NA
HMX	mg/kg	359	3594	10,783	--	--	--	NA	NA	NA
Indeno(1,2,3-cd)pyrene	mg/kg	--	--	--	0.65	6.5	65.0	NA	NA	NA
Nitroglycerin	mg/kg	--	--	--	52.5	525	5252	NA	NA	NA
PCB-1016	mg/kg	0.419	4.19	12.6	0.349	3.49	34.9	NA	NA	NA
PCB-1254	mg/kg	0.12	1.2	3.59	0.349	3.49	34.9	NA	NA	NA
PCB-1260	mg/kg	--	--	--	0.349	3.49	34.9	NA	NA	NA
RDX	mg/kg	22.7	227	681	8.03	80.3	803	NA	NA	NA
alpha-Chlordane	mg/kg	--	--	--	--	--	--	NA	NA	NA
gamma-Chlordane	mg/kg	--	--	--	--	--	--	NA	NA	NA

BHC denotes benzene hexachloride.
COPC denotes chemical(s) of potential concern.
CUG denotes Cleanup Goal across all pathways (ingestion, dermal, and inhalation).
DDD denotes dichlorodiphenyldichloroethane.
DDE denotes dichlorodiphenyldichloroethylene.
DDT denotes dichlorodiphenyltrichloroethane.
GW denotes groundwater.
HI denotes hazard index.
HMX denotes octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
mg/kg denotes milligrams per kilogram.
NA denotes not available.
PCB denotes polychlorinated biphenyl.
RDX denotes hexahydro-1,3,5-trinitro-1,3,5-triazine.
Uncon. denotes unconfined.
µg/L denotes micrograms per liter.
-- denotes no CUG could be quantified based on lack of approved toxicity value.

Table I-6
Potential Action-Specific ARARs and TBC Guidance for Remediation of Soils at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Action	Requirements	Prerequisite	Citation(s)
General Construction Standards—Site Preparation and Excavation			
Activities resulting in the emission of particulate matter, dusts, fumes, gas, mists, smoke, etc. from a hazardous waste facility	No owner/operator of a hazardous waste facility shall cause or allow the emission of any particulate matter, dusts, gas, fumes, mists, smoke, vapor, or odorous substances that interferes with the enjoyment of life or property by persons living or working in the vicinity of the facility. Any such action is considered a public nuisance.	Applicable to soil excavation at ODA1	ORC 3734.02(I) OAC 3745-15-07(A)
Activities Causing Fugitive Dust Emissions	Persons engaged in construction activities shall take reasonable precautions to prevent particulate matter from becoming airborne; reasonable precautions include, but are not limited to, the following: • the use of water or chemicals for control of dust during construction operations or clearing of land; and • the application of asphalt, oil, water, or suitable chemicals on dirt roads, materials stockpiles, and other surfaces, which can create airborne dusts. No person shall cause, or allow, fugitive dust to be emitted in such a manner that visible emissions are produced beyond the property line.	Applicable to fugitive emissions from demolition of existing structures, construction operations, grading of roads, or the clearing of land. Applicable to pre-construction clearing activities and excavation activities.	OAC 3745-17-08(B)

Table I-6 (continued)
Potential Action-Specific ARARs and TBC Guidance for Remediation of Soils at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Action	Requirements	Prerequisite	Citation(s)
Construction Activities Causing Storm Water Runoff (e.g., clearing, grading, and excavation)	Construction activities disturbing more than 1 acre must develop and implement a storm water pollution prevention plan incorporating best management practices (including sediment and erosion controls, vegetative controls, and structural controls) in accordance with the requirements of the Ohio EPA General Permit for Construction Activities (Permit ORC 000002). An NOI shall be submitted 21 days prior to initiation of the construction activity.	Applicable to stormwater discharges from land disturbances from a construction activity involving more than 1 acre. NOI must be submitted pursuant to DERR-OO-RR-034, which indicates that no permit exemption equivalent to CERCLA Section 121(e) is available for non-NPL sites.	40 CFR 122.26 OAC 3745-38-06
Removal of Contaminated Soils			
Removal or Remediation of Hazardous-contaminated Soils	The GDCS may apply to any property except for certain circumstances specified in OAC 3745-30008(B)(1). Property-specific risk-based standards must be determined in place of or in addition to the GDCS if: (l) the exposure pathways or exposure factors for the intended land use are not included in the development of the GDCS for residential, commercial, or industrial scenarios; (2) the chemicals of concern at the property are not included in the GDCS; (3) radioactive materials are identified on the property; (4) PCBs subject to TSCA are identified on the property; or (5) important ecological resources are identified on the property.	The GDCS are not applicable to soil at ODA1 because the action is not under the VAP. The GDCS are not re1evant and appropriate because the exposure scenarios for the intended land use are not considered in the development of the GDCS and certain chemicals of concern are not included in OAC 3745-30008(B)(3). Property-specific risk-based clean-up standards will be developed in accordance with CERCLA methodology.	OAC 3745-300-08(B)(1) OAC 3745-300-09(B)(2)

Table I-6 (continued)
Potential Action-Specific ARARs and TBC Guidance for Remediation of Soils at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Action	Requirements	Prerequisite	Citation(s)
	No person shall engage in filling, grading, excavating, drilling, or mining on land where a hazardous waste or solid waste facility was operated without prior authorization from the director of the Ohio EPA.	Not applicable to HTRW excavation activities at ODA1. MEC activities are covered under the Administrative Orders and are therefore exempt from OAC 3745-27-13. See OAC 3745-27.13(C).	ORC 3734.02(H) OAC 3745-27-13(C)
Waste Generation, Characterization, Segregation, and Storage-Excavated Soils and Buried Wastes, Sludge, Surface Features, Debris, and Secondary Wastes			
Generation and Characterization of Solid Waste (all primary and secondary wastes)	The generator must determine if the material is a solid waste, as defined in 40 CFR 261.2 and 40 CFR 261.4(a). if the material is a solid waste, the generator must determine if the solid waste is a hazardous waste by:	Applicable to generation of a solid waste as defined in 40 CFR 261.2 and that is not excluded under 40 CFR 261.4(a).	40 CFR 262.11(a)(b)(c) OAC 3745-52-11(A)(B)(C)(D)
	• determining if the waste is listed under 40 CFR Part 261; or • determining if the waste exhibits characteristics by using prescribed testing methods or applying generator knowledge based on information regarding material or processes used; and • determining if the waste is excluded under 40 CFR Parts 261, 262, 266, 268, and 273	Applicable to the generation and characterization of hazardous-contaminated soil and hazardous debris resulting from excavation. Process history indicates that soils were contaminated with metals and explosives from OB/OD operations. Applicable to the generation and characterization of hazardous-contaminated soil and hazardous debris resulting from excavation. Applicable to generation of decontamination wastewater.	40 CFR 262.11(a)(b)(c) OAC 3745-52-11(A)(B)(C)(D) 40 CFR 262.II(a)(b)(c) OAC 3745-52-11(A)(B)(C)(D)

Table I-6 (continued)
Potential Action-Specific ARARs and TBC Guidance for Remediation of Soils at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Action	Requirements	Prerequisite	Citation(s)
	The generator must determine if the waste is restricted from land disposal under 40 CFR 268 et seq. by testing in accordance with prescribed methods or use of generator knowledge of waste.	Applicable to the generation and characterization of hazardous-contaminated soil and hazardous debris resulting from excavation. Applicable to generation of decontamination wastewater.	40 CFR 268.7 OAC 3745-270-07
	The generator must determine each EPA Hazardous Waste Number (Waste Code) to determine the applicable treatment standards under 40 CFR 268.40, Subpart D.	Applicable to the generation and characterization of hazardous-contaminated soil and hazardous debris resulting from excavation. Applicable to generation of decontamination wastewater.	40 CFR 268.9(a) OAC 3745-270-07 OAC 3745-270-09
	The generator must determine the underlying hazardous constituents [as defined in 40 CFR 268.2(i)] in the waste.	Applicable to the generation and characterization of RCRA characteristic hazardous waste (except D00I non-wastewaters treated by combustion, recovery of organics, or polymerization. See 268.42, Table I) and to hazardous-contaminated soils for their subsequent storage, treatment, or disposal.	40 CFR 268.9(a) OAC 3745-270-09

Table I-6 (continued)
Potential Action-Specific ARARs and TBC Guidance for Remediation of Soils at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Action	Requirements	Prerequisite	Citation(s)
Accumulation of Hazardous Debris from Excavation and Screening. It is Assumed that any Debris Resulting from Excavation and Screening will be Accumulated for < 90 Days	A generator may accumulate for up to 90 days or conduct treatment of hazardous wastes in containers without an Ohio EPA permit. Generators that accumulate for 90 days or conduct on-site treatment of hazardous waste in containers must comply with the personnel training, preparedness and prevention requirements, and contingency plan requirements of 40 CFR 265.16; 40 CFR 265, Subpart C; and 40 CFR 265, Subpart D, respectively.	Applicable to 90-day accumulation of debris from excavation and screening if such debris contains listed wastes or exhibits a characteristic.	40 CFR 262.34(a)(4) OAC 3745-52-34(A)(4)
	Containers must be marked with the date upon which period of accumulation began and with the words "Hazardous Waste."	Applicable to 90-day accumulation of debris from excavation and screening if such debris contains listed wastes or exhibits a characteristic.	40 CFR 262.34 (a)(2)(3) OAC 3745-52-34 (A)(2)(3)
	Containers holding hazardous wastes must be kept closed except to add or remove wastes and must not be managed in a manner that would cause them to leak.	Applicable to 90-day accumulation of debris from excavation and screening if such debris contains listed wastes or exhibits a characteristic.	40 CFR 264.171 40 CFR 264.172 40 CFR 264.173 40 CFR 264.176 40 CFR 264.17 OAC 3745-52-34(A)(1)
	Containers of hazardous waste must be maintained in good condition and comparable with the waste stored therein. Containers holding ignitable or reactive wastes must be separated from potential ignition sources and located 50 ft from the property boundary.		

Table I-6 (continued)
Potential Action-Specific ARARs and TBC Guidance for Remediation of Soils at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Action	Requirements	Prerequisite	Citation(s)
Storage of Hazardous-contaminated Soil in a Waste Pile	Submission of Parts A and B of the RCRA Permit Application is required for owners/operators of any Hazardous Waste Management Unit. Specific submission requirements are provided at 40 CFR 270.13 and 270.14.	Applicable to storage of soils from excavation if the soils are hazardous per the toxicity characteristic. Not ARAR if the soils do not contain a hazardous waste. There is no state equivalent to the permit exemption provided by CERCLA Section 121(e). It is the DERR's policy to require responsible parties to acquire and comply with all permits required by the action (unless permit exception is provided for by the orders).	40 CFR 270.13 40 CFR 270.14 40 CFR 270.18 OAC 3745-50-44 OAC 3745-50-44(C)(4)
	Owners/operators of hazardous waste management facilities must comply with the General Facility Standards of 40 CFR 264, Subpart B concerning waste analysis, site security, inspection/maintenance, personnel training, special precautions for management of ignitable or reactive wastes, and locations standards.	Applicable to storage of soils from excavation if the soils are hazardous per the toxicity characteristic. Not ARAR if the soils do not contain a hazardous waste. There is no state equivalent to the permit exemption provided by CERCLA Section 121(e). It is the DERR's policy to require responsible parties to acquire and comply with all permits required by the action (unless permit exception is provided for by the orders).	40 CFR 264.13 to 40 CFR 264.18 OAC 3745-54-13 to OAC 3745-54-18

Table I-6 (continued)
Potential Action-Specific ARARs and TBC Guidance for Remediation of Soils at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Action	Requirements	Prerequisite	Citation(s)
	Owners/operators of hazardous waste management facilities must comply with the Preparedness Standards of 40 CFR 264, Subpart C concerning alarms, communication systems, notification of local authorities, testing and maintenance of spill control and emergency response equipment, and aisle space.	Applicable to storage of soils from excavation if the soils are hazardous per the toxicity characteristic. Not ARAR if the soils do not contain a hazardous waste. There is no state equivalent to the permit exemption provided by CERCLA Section 121 (e). It is the DERR's policy to require responsible parties to acquire and comply with all permits required by the action (unless permit exception is provided for by the orders).	40 CFR 264.31 to 40 CFR 264.38 OAC 3745-54-31 to OAC 3745-54-37
	Owners/operators of hazardous waste management facilities must comply with the Preparedness Standards of 40 CFR 264, Subpart D concerning development of a written contingency plan that designates the emergency coordinator, describes emergency and evacuation procedures, and identifies the emergency equipment to be maintained. Copies of the plan must be submitted to local authorities that would respond in the event of an emergency.	Applicable to storage of soils from excavation if the soils contain listed wastes K044 through K047 or exhibit the TC. Not ARAR if the soils do not contain a hazardous waste. There is no state equivalent to the permit exemption provided by CERCLA Section 121(e). It is the DERR's policy to require responsible parties to acquire and comply with all permits required by the action (unless permit exception is provided for by the orders).	40 CFR 264.50 to 40 CFR 264.56 OAC 3745-54-52 to OAC 3745-54-56

Table I-6 (continued)
Potential Action-Specific ARARs and TBC Guidance for Remediation of Soils at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Action	Requirements	Prerequisite	Citation(s)
	Owners/operators of hazardous waste management facilities must comply with the Recordkeeping Standards of 40 CFR 264, Subpart E concerning maintenance of the operating record, manifest files, contingency plan, and closure plan.	Applicable to storage of soils from excavation if the soils are hazardous per the toxicity characteristic. Not ARAR if the soils do not contain a hazardous waste. There is no state equivalent to the permit exemption provided by CERCLA Section 121(e). It is the DERR's policy to require responsible parties to acquire and comply with all permits required by the action (unless permit exception is provided for by the orders).	40 CFR 264.70 to 40 CFR 264.77 OAC 3745-54- 73 to OAC 3745-54-77
	Owners/Operators of waste piles must implement a groundwater monitoring program in accordance with 40 CFR 264, Subpart F unless the unit is an engineered structure that does not receive liquid wastes or wastes containing free liquids and is designed to exclude precipitation and run-on/runoff. The unit must also have inner and outer layers of containment. Waste piles that are inside or under a structure that prevents wind dispersal and protects the pile from contact with precipitation or run-on are exempt from groundwater monitoring. Owners/Operators of waste piles must implement a groundwater monitoring program in accordance	Applicable to storage of soils from excavation if the soils are hazardous per the toxicity characteristic. Provisions for groundwater monitoring are not considered relevant and appropriate to the operation of the waste piles if the soils do not contain hazardous wastes due to the limited nature of the action. There is no state equivalent to the permit exemption provided by CERCLA Section 121(e). It is the DERR's policy to require responsible parties to acquire and comply with all permits required by the action (unless permit exception is provided for by the orders).	40 CFR 264.90 to 40 CFR 264.100 OAC 3745-54-90 to OAC 3745-54-99 OAC 3745-55-01

Table I-6 (continued)
Potential Action-Specific ARARs and TBC Guidance for Remediation of Soils at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Action	Requirements	Prerequisite	Citation(s)
	Upon closure of a hazardous waste management unit the owner/operator must comply with the general closure performance standard.	Closure must be conducted in a manner that minimizes the need for further maintenance and controls, minimizes, or eliminates, to the extent necessary to protect human health and the environment post-closure escape of hazardous wastes, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products to the ground, to surface waters, or to the atmosphere. Applicable to waste piles used to store soils that contain hazardous wastes. Relevant and appropriate to waste piles that manage soils not containing hazardous wastes.	40 CFR 264.111 OAC 3745-55-11
Storage of Hazardous-contaminated soil in a Waste Pile	Waste piles must have a liner that is designed, constructed, and installed to prevent any migration of wastes out of the pile into the adjacent subsurface soils or groundwater.	Applicable to storage of hazardous-contaminated soils in waste piles, if the wastes contain free liquid or generate leachate and are not protected from wind disposal and surface water run-on. Potentially relevant and appropriate if excavated soils are determined to not contain listed wastes or exhibit the TC soils.	40 CFR 264.251 OAC 3745-56-51

Table I-6 (continued)
Potential Action-Specific ARARs and TBC Guidance for Remediation of Soils at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Action	Requirements	Prerequisite	Citation(s)
	Waste piles must have a liner constructed of materials that have appropriate chemical properties and sufficient strength to prevent failures due to pressure gradients, contact with the waste, climatic conditions, and the stress of daily operation.	Applicable to storage of hazardous-contaminated soils in waste piles, if the wastes contain free liquid or generate leachate and are not protected from wind disposal and surface water run-on. Potentially relevant and appropriate if excavated soils are determined to not contain listed wastes or exhibit the TC soils.	40 CFR 264.251 OAC 3745-56-51
	Waste piles must be placed upon a base or foundation capable of supporting the liner and preventing failure of the liner due to settlement, compression, or uplift. Liners must be installed to cover all surrounding earth likely to contact the waste or leachate.	Applicable to storage of hazardous-contaminated soils in waste piles, if the wastes contain free liquid or generate leachate and are not protected from wind disposal and surface water run-on. Potentially relevant and appropriate if excavated soils are determined to not contain listed wastes or exhibit the TC soils.	40 CFR 264.251 OAC 3745-56-51
	Waste piles must be designed, constructed, and installed with a top liner (such as a geomembrane) that prevents migration of hazardous constituents into the liner and a bottom composite liner with a lower component constructed of at least 3 ft of compacted soil with a hydraulic conductivity of <10-7 cm/sec.	Applicable to storage of hazardous-contaminated soils in waste piles, if the wastes contain free liquid or generate leachate and are not protected from wind disposal and surface water run-on. Potentially relevant and appropriate if excavated soils are determined to not contain listed wastes or exhibit the TC soils.	40 CFR 264.251 OAC 3745-56-51

Table I-6 (continued)
Potential Action-Specific ARARs and TBC Guidance for Remediation of Soils at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Action	Requirements	Prerequisite	Citation(s)
	Waste piles must be designed, constructed, and installed with a leachate collection and removal system between the liners that has a bottom slope of 1 % and is constructed of granular drainage material with a thickness of > 12 in. and a hydraulic conductivity > 10-2 cm/sec. The leachate-collection system shall be chemically compatible with the wastes and leachate. The leachate-collection system shall be designed to minimize clogging. The leachate-collection system shall be constructed with sumps and liquid removal systems that ensure that the leachate depth over the liner does not exceed 12 in.	Applicable to storage of hazardous-contaminated soils in waste piles, if the wastes contain free liquid or generate leachate and are not protected from wind disposal and surface water run-on. Potentially relevant and appropriate if excavated soils are determined to not contain listed wastes or exhibit the TC soils.	40 CFR 264.251 OAC 3745-56-51
	Waste piles must be designed, constructed, and operated with a run-on control system with a capacity to control the water volume from a 24-hr, 25-year storm event.	Applicable to storage of hazardous-contaminated soils in waste piles, if the wastes contain free liquid or generate leachate and are not protected from wind disposal and surface water run-on. Potentially relevant and appropriate if excavated soils are determined to not contain listed wastes or exhibit the TC soils.	40 CFR 264.251 OAC 3745-56-51
	Waste piles that are inside or under a structure that provides protection from precipitation, run-on, and wind dispersal, and that holds wastes that do not contain free liquids or generate leachate, are not required to meet the liner and leachate collection system requirements or the groundwater monitoring provisions of 40 CFR 264, Subpart F.	Applicable to waste piles that are engineered to be protected from precipitation, run-on, and wind dispersal where the wastes do not contain any free liquids and that store soils from excavation or construction and development of injection/monitoring wells.	40 CFR 264.250 40 CFR 264.90(b)(5)

Table I-6 (continued)
Potential Action-Specific ARARs and TBC Guidance for Remediation of Soils at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Action	Requirements	Prerequisite	Citation(s)
	During construction, liners and cover system components must be inspected for uniformity, damage, or imperfections. During operation, a waste pile must be inspected weekly and after storms to detect signs of deterioration or improper operation of the run-on/run-off control systems, wind dispersal control systems, and leachate collection system. The volume of liquids collected from the leak detection system must be recorded weekly.	Applicable to waste piles used to store soils that contain hazardous wastes. Relevant and appropriate to waste piles that manage soils not containing hazardous wastes.	40 CFR 264.254 OAC 3745-56-54
Placement of Hazardous-contaminated Soil in a Waste Pile	A prohibited waste may be land-disposed only if it meets the treatment standards of 40 CFR 268, Subpart D.	Applicable to land disposal of hazardous wastes and hazardous debris by placement in a waste pile constituting land disposal by 40 CFR 268.2.	40 CFR 268.7 OAC 3745-270-40
	Hazardous-contaminated soils must be treated according to the alternative treatment standards of 40 CFR 268.49(c) or according to the UTSs specified in 40 CFR 268.48 applicable to the listed and/or characteristic waste contaminating the soil prior to land disposal.	Applicable to placement of soils that contain listed wastes or exhibit the TC in a waste pile.	40 CFR 268.49 (b) OAC 3745-270-49
	Unless the wastes will be placed in a CAMU for storage and/or treatment only, CAMU-eligible wastes that have been determined to contain principal hazardous constituents must be treated to the following standards: • for non-metals, 90% reduction in total principal hazardous constituent; and • for metals, 90% reduction in principal hazardous constituent concentration as measured in the leachate by TCLP analysis.	Applicable to hazardous-contaminated soils replaced within the excavation with the excavation designated as a CAMU for purposes other than storage or treatment. Note that Ohio EPA has proposed to adopt these conforming changes to the CAMU rules but that the rule changes are not finalized.	40 CFR 264.552(e)(4)

Table I-6 (continued)
Potential Action-Specific ARARs and TBC Guidance for Remediation of Soils at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Action	Requirements	Prerequisite	Citation(s)
	Groundwater monitoring that is sufficient to continue to detect and characterize the nature, direction, and movement of existing releases of hazardous constituents in groundwater must be conducted during operation. In addition, the groundwater monitoring must be able to detect and subsequently characterize releases of hazardous constituents to groundwater that may occur from areas of the CAMU in which wastes will remain in place after closure of the CAMU.	Not applicable to replacement of excavated soils because such soils will be returned to the excavation only if RGOs are met.	40 CFR 264.552(e)(5) 40 CFR 264.552(g)
	The owner/operator must conduct daily inspections of the aboveground portions of the tank system, monitoring and leak detection system data, and the secondary containment.	Potentially relevant and appropriate to wastewater that is determined to contain listed wastes or exhibits the TC and that is returned to the ground. Wastewater from RI activities has not exhibited the TC. It is expected that wastewater would be determined to not contain listed wastes. Therefore, these requirements are likely not applicable or relevant and appropriate.	40 CFR 264.195 OAC 3745.55.95

Table I-6 (continued)
Potential Action-Specific ARARs and TBC Guidance for Remediation of Soils at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Action	Requirements	Prerequisite	Citation(s)
	Temporary tanks used to store hazardous remediation wastes may be designated as temporary units. The temporary unit must be located within the contiguous property under the control of the owner/operator where the waste was generated. For temporary units, the Ohio EPA Administrator may replace the design, operating, and closure standards of 40 CFR 264 with alternative requirements that are protective of human health and the environment. Temporary units are authorized to operate for up to 1 year.	Potentially applicable to storage of hazardous wastewaters prior to application to the soils returned to CFR 264.553(d) the excavation. Allows temporary storage without berms to meet all technical standards for permitted units. Designation of the tank as a temporary unit is achieved by permit or within the provision of the orders.	40 CFR 264.553(a) 40 CFR 264.553(d) OAC 3745.57-73
	The requirements for hazardous waste tank systems of 40 CFR 264, Subpart J do not apply to tanks that store or treat hazardous wastewaters that are part of a wastewater treatment facility subject to Section 402 or 307(b) of the CWA.	Applicable to tank systems that store or treat hazardous wastewaters prior to discharge to a POTW or surface water under Sections 307 or 402 of the CWA.	40 CFR 264.1(g)(c)
Off-site Disposal of Waste-Excavated Soils, Debris, and Secondary Wastes			
Disposal of RCRA-Hazardous Waste in a Land- based Unit (i.e., lead, other debris, and soils exhibiting the TC or that contain listed waste)	RCRA-restricted waste may be land-disposed if it meets the requirements in the table "Treatment Standards for Hazardous Waste" at 40 CFR 268.40 before land disposal.	Applicable to land disposal, as defined in 40 CFR 268.2, of restricted RCRA waste. Applicable to disposal of exhumed hazardous wastes (i.e., soils and water from excavation and injection/monitoring well installation that exhibit a hazardous waste characteristic).	40 CFR 268.40(a)

Table I-6 (continued)
Potential Action-Specific ARARs and TBC Guidance for Remediation of Soils at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Action	Requirements	Prerequisite	Citation(s)
	Hazardous debris may be land-disposed if it meets the requirements in the table "Alternative Treatment Standards for Hazardous Debris" at 40 CFR 268.45 before land disposal or the debris is treated to the waste-specific treatment standard provided in 40 CFR 268.40 for the waste contaminating the debris.	Applicable to land disposal, as defined in 40 CFR 268.2, of restricted RCRA-hazardous Debris.	40 CFR 268.45(a)
	Hazardous-contaminated soils must be treated according to the alternative treatment standards of 40 CFR 268.49 (c) or according to the UTSs specified in 40 CFR 268.48 applicable to the listed and/or characteristic waste contaminating the soil prior to land disposal.	Applicable to land disposal, as defined in 40 CFR 268.2, of restricted hazardous soils.	40 CFR 268.49(b) OAC 3745-270-49
Off-site Shipment of Hazardous Wastes, Debris, or Hazardous-contaminated Soils	A generator who transports or offers hazardous wastes for off-site transport must prepare a Uniform Hazardous Waste Manifest.	Applicable to the offsite shipment of soils or wastewater that contain listed wastes or that exhibit the TC.	40 CFR 262.20 OAC 3745-52-20
	Before transporting or offering a hazardous waste for transport, the generator must package the waste, label the package, and placard the carrier in accordance with DOT requirements.	Applicable to the off-site shipment of soils or wastewater that contain listed wastes or that exhibit the TC.	40 CFR 262.30 to 40 CFR 262.33 OAC 3745-52-30 to OAC 3745-52-33
	Prior to sale, lease, or transfer of the property from DOD control, a notation to the deed must be recorded that indicates that the property has been used as a disposal facility and that its use is restricted in accordance with the approved closure/post-closure plan.	Applicable to transfer of a solid waste disposal facility. CFR 264.119	40OAC 3745-55-19

Table I-6 (continued)
Potential Action-Specific ARARs and TBC Guidance for Remediation of Soils at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Action	Requirements	Prerequisite	Citation(s)
Hazardous Waste, On-Site Capping of Soils, Landfill Disposal			
On-site Hazardous Waste Land Disposal Facilities.	Establishes the substantive hazardous waste land disposal permit requirements necessary for Ohio EPA to determine adequate protection of the groundwater. Includes information such as groundwater monitoring data, information on interconnected aquifers, plume(s) of contamination, plans and reports on groundwater monitoring program.	Pertains to any facility/site which will have hazardous waste disposed of on-site or has existing areas of hazardous waste contamination on-site that will be capped in-place. This, along with other paragraphs of this rule, establishes the minimum information required during the remedial design stage.	OAC 3745-50-44 (8)
Construction of On-site Sanitary Landfills	Specifies the minimum technical information required of a solid waste permit to install included are a hydrogeologic investigation report, leachate production and migration information, surface water discharge information, design calculations, plan drawings.	Pertains to any new solid waste disposal facility created on-site and expansions of existing solid waste landfills. Also pertains to existing areas of contamination that are capped per solid waste rules. This rule establishes the minimum information required during the remedial design stage.	OAC 3745-27-06 (b,c)
	Specifies the minimum requirements for the soil/clay layers, granular drainage layer, geosynthetics, leachate management system, gas monitoring system, etc. Also establishes construction requirements for facilities to be located in geologically unfavorable areas.	Pertains to any new solid waste disposal facility created on-site and any expansions to existing solid waste landfills. Portions also pertain to areas of contamination that are capped per solid waste rules. May serve as siting criteria	OAC 3745-27-08 (c,d-h)

Table I-6 (continued)
Potential Action-Specific ARARs and TBC Guidance for Remediation of Soils at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Action	Requirements	Prerequisite	Citation(s)
Sanitary Landfill- GW Monitoring and Correction	Groundwater monitoring program must be established for all sanitary landfill facilities. The system must consist of a sufficient number of wells that are located so that samples indicate both upgradient (i.e., background) and downgradient water samples. The system must be designed per the minimum requirements specified in this rule. The sampling and analysis procedures used must comply with this rule. Specifies procedures for assessment and correction of contamination.	Pertains to any new solid waste facility and any expansions of existing solid waste landfills on-site. Also may pertain to existing areas of contamination that are capped in-place per the solid waste rules.	OAC 3745-27-10 (b,c,d,e,f)
Final Closure of Sanitary Landfill Facilities	Requires closure of a landfill in a manner which minimized the need for post-closure maintenance and minimizes post-closure formation and release of leachate and explosive gases to air, soil, groundwater, or surface water. Specifies acceptable cap design; soil barrier layer, granular drainage layer, soil and vegetative layer. Provides for use of comparable materials to those specified with approval of director.	Pertain to any new solid waste landfills created on-site, any expansions of existing solid waste landfills on-site, and any existing areas of contamination that are capped in-place per the solid waste rules	OAC 3745-27-11 (b,g)

Table I-6 (continued)
Potential Action-Specific ARARs and TBC Guidance for Remediation of Soils at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

ARAR denotes Applicable or Relevant and Appropriate Requirements.
CAMU denotes Corrective Action Management Units.
CERCLA denotes Comprehensive Environmental Response, Compensation, and Liability Act.
CFR denotes Code of Federal Regulations.
CWA denotes Clean Water Act.
DERR denotes Division of Emergency and Remedial Response.
DOD denotes U.S. Department of Defense.
DOT denotes U.S. Department of Transportation.
EPA denotes U.S. Environmental Protection Agency.
GDCS denotes General Direct Contact Soil Standards.
HTRW denotes Hazardous, Toxic, and Radiological Waste.
MEC denotes munitions and explosives of concern.
NOI denotes Notice of Intent.
NPL denotes National Priorities List.
OAC denotes Ohio Administrative Code.
OB/OD denotes open burn/open detonation.
ODA1 denotes Open Demolition Area #1 area of concern.
Ohio EPA denotes Ohio Environmental Protection Agency.
ORC denotes Ohio Revised Code.
PCB denotes polychlorinated biphenyls.
POTW denotes publicly owned treatment works.
RCRA denotes Resource Conservation and Recovery Act.
RGO denotes Remedial Goal Options.
RI denotes remedial investigation.
TBC denotes to be considered.
TC denotes toxicity characteristic.
TCLP denotes toxicity characteristic leaching procedure.
TSCA denotes Toxic Substances Cleanup Act.
UTS denotes Universal Treatment Standards.

Table I-7
Potential Location-Specific ARARs and TBC Guidance for Remediation of Soils at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Action	Requirements	Prerequisite	Citation(s)
Wetlands			
Waters of the State, as Defined in ORC 6111.01	Except as provided under section 404(b)(2), no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences.	Not Applicable: No active remediation will occur in wetlands; no wetlands occur at the site	40 CFR 230.10(a)
	No discharge of dredged or fill material shall be permitted if it: (1) Causes or contributes, after consideration of disposal site dilution and dispersion, to violations of any applicable State water quality standard; (2) Violates any applicable toxic effluent standard or prohibition under section 307 of the Act.	Not Applicable: No active remediation will occur in wetlands; no wetlands occur at the site.	40 CFR 230.10(b)
	Pollution of waters of the state is prohibited. Duty to comply.	Not Applicable: No active remediation will occur in wetlands; no wetlands occur at the site. No discharge to surface water.	ORC 6111.04 and ORC 6111.07

Table I-7 (continued)
Potential Location-Specific ARARs and TBC Guidance for Remediation of Soils at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Action	Requirements	Prerequisite	Citation(s)
T&E Species			
Threatened and Endangered Species	Federal agencies may not jeopardize the continued existence of any listed species or cause the destruction or adverse modification of critical habitat. The Endangered Species Committee may grant an exemption for agency action if reasonable mitigation and enhancement measures such as propagation, transplantation, and habitat acquisition and improvement are implemented.	Not Applicable: There are currently no federally listed species or critical habitat on the facility. There are a few species currently under federal observation for listing, but none listed. State-listed species have been confirmed to be present on RVAAP/Camp Ravenna property through biological and confirmed sightings (AMEC, 2008). The site has not been previously surveyed for rare species. There are no known documented sightings of rare or threatened and endangered species at the site.	Endangered Species Act of 1973 (16 U.S.C, §§ 1531-1543)
	Protects almost all species of native migratory birds in the U.S. from unregulated "take," which can include poisoning at hazardous waste sites.	Not Applicable: There are currently no federally listed species or critical habitat on the facility. There are a few species currently under federal observation for listing, but none listed. State-listed species have been confirmed to be present on RVAAP/Camp Ravenna property through biological and confirmed sightings (AMEC, 2008). The site has not been previously surveyed for rare species. There are no known documented sightings of rare or threatened and endangered species at the site.	Migratory Bird Treaty Act of 1972 (16 U.S.C. §§ 703–712)

Table I-7 (continued)
Potential Location-Specific ARARs and TBC Guidance for Remediation of Soils at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

Action	Requirements	Prerequisite	Citation(s)
	Accords protection to species of wildlife within the state which may be found to be in jeopardy. Prohibits the taking, possession, transportation or sale of endangered species.	Relevant and Appropriate: Several state-listed species have been observed at RVAAP. There are no known documented sightings of rare or threatened and endangered species at the site.	Endangered Species Conservation Act RSA 212-A
	Prohibits removal or destruction of endangered animal species.	Relevant and Appropriate: There are no known documented sightings of rare or threatened and endangered species at the site.	ORC 1531.25 and OAC 1501-31-23
	Accords protection to plant species in the State which are threatened by the loss, drastic modification or severe curtailment of their habitants.	Relevant and Appropriate: Several state-listed species have been observed at RVAAP. There are no known documented sightings of rare or threatened and endangered species at the site.	Native Plant Protection RSA 217-A
	Prohibits removal or destruction of endangered plant species.	Relevant and Appropriate: No endangered plant species have been documented at ODA1.	ORC 1518.02 and OAC 1501-18-1

Table I-7 (continued)
Potential Location-Specific ARARs and TBC Guidance for Remediation of Soils at ODA1
Open Demolition Area #1
Ravenna Army Ammunition Plant, Ravenna, Ohio

ARAR denotes Applicable or Relevant and Appropriate Requirements.
CFR denotes Code of Federal Regulations.
TBC denotes to be considered.
OAC denotes Ohio Administrative Code.
ODA1 denotes Open Demolition Area #1 area of concern.
ORC denotes Ohio Revised Code.
RSA denotes Revised Statutes Annotated.
RVAAP denotes Ravenna Army Ammunition Plant.
U.S.C. denotes United States Code.

Appendix J
Photograph Log

Note: In Original Submittal this was Appendix L. Only the Appendix Section Letter was changed and not the page numbers or the content of this Appendix.

Soil from sample location DA1sb-055

Soil cores from sample location DA1sb-055

Soil core from sample location DA1sb-055

Soil core from sample location DA1sb-056

Soil core from sample location DA1sb-056

Soil cores from sample location DA1sb-056

Soil cores at sample location DA1sb-056

Soil core at sample location DA1sb-057

Soil cores from sample location DA1sb-057

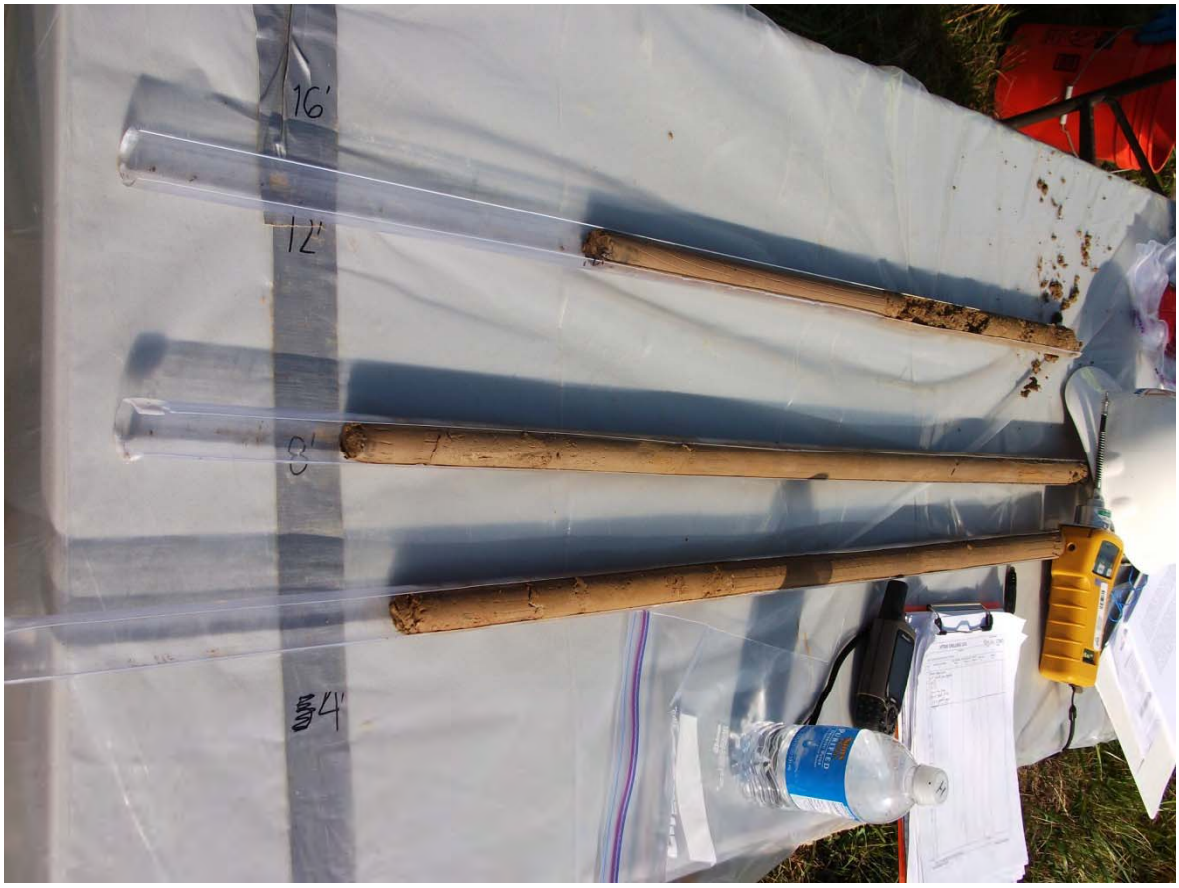
Drill Rig at sample location DA1sb-057

Soil cores from sample location DA1sb-057

Soil from sample location DA1sb-058

Soil cores from sample location DA1sb-058

Soil from sample location DA1sb-059

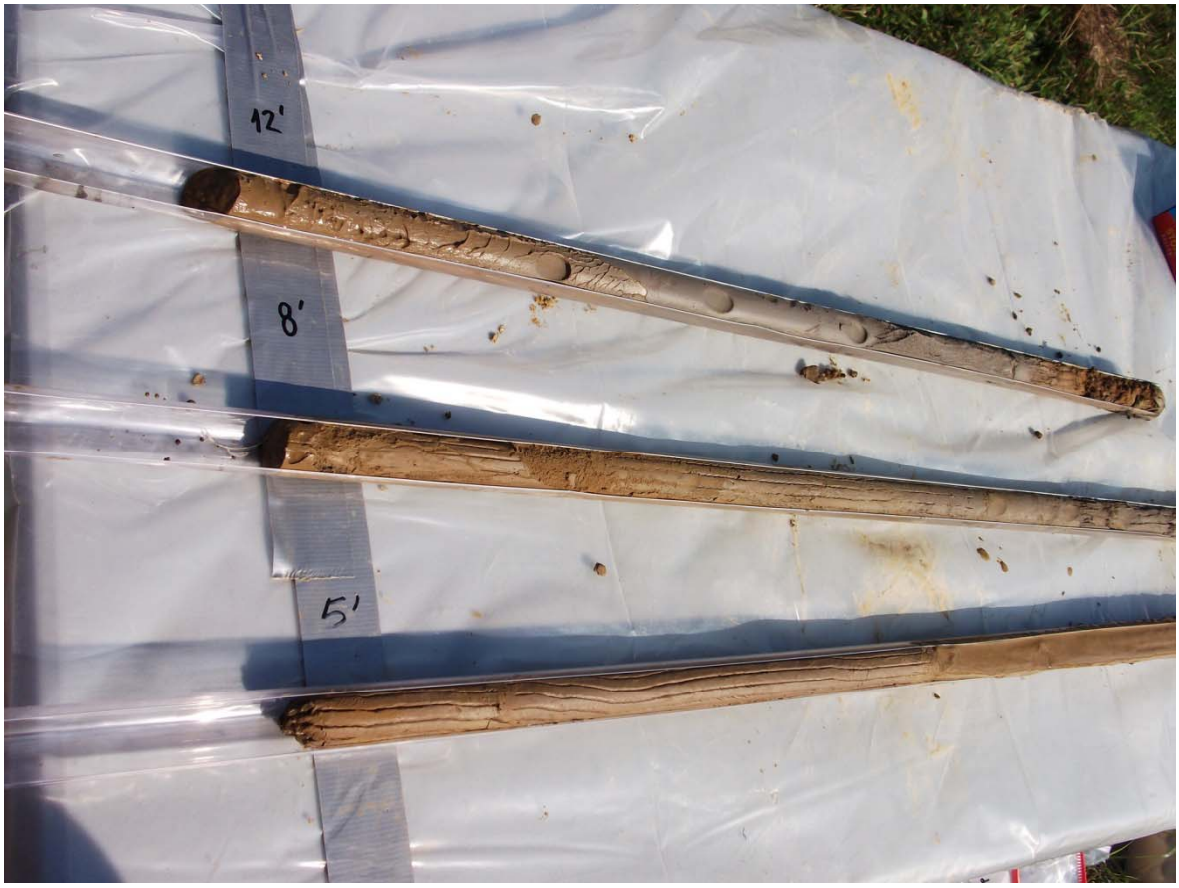


Soil cores from sample location DA1sb-060

Soil core from sample location DA1sb-061

Soil core at sample location DA1sb-067

Soil core at sample location DA1sb-068



Soil cores at sample location DA1sb-069

Soil cores at sample location DA1sb-070

Soil core at sample location DA1sb-071

Soil cores at sample location DA1sb-071

Soil cores at sample location DA1sb-071

Soil cores at sample location DA1sb-071

Geoprobe Rig

Geoprobe Rig