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REVISED FINAL ENGINEERING EVALUATION/COST ANALYSIS (EE/CA) FIVE SMALL  
ARMS/SKEET RANGES AT STUMP NECK ANNEX NSWC INDIAN HEAD MD  
11/1/2012  
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**Engineering Evaluation/  
Cost Analysis (EE/CA)  
for  
Five Small Arms/Skeet Ranges  
at Stump Neck Annex**

**Naval Support Facility Indian Head  
Indian Head, Maryland**



**Naval Facilities Engineering Command  
Washington**

**Contract Number N62467-04-D-0055  
Contract Task Order 423**

**November 2012**



**ENGINEERING EVALUATION/  
COST ANALYSIS (EE/CA)  
FOR  
FIVE SMALL ARMS/SKEET RANGES  
AT STUMP NECK ANNEX**

**NAVAL SUPPORT FACILITY INDIAN HEAD  
INDIAN HEAD, MARYLAND**

**COMPREHENSIVE LONG-TERM  
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT**

**Submitted to:  
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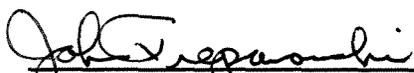
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## LIST OF ACRONYMS

|          |   |
|----------|---|
| AOC      | Area of Contamination   |
| ARAR     | Applicable or Relevant and Appropriate Requirement                    |
| B(a)P    | benzo(a)pyrene  |
| bgs      | below ground surface  |
| CERCLA   | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR      | Code of Federal Regulations   |
| CG       | Cleanup Goal  |
| CLEAN    | Comprehensive Long-Term Environmental Action Navy                     |
| COC      | Chemical of Concern   |
| COPC     | Contaminant of Potential Concern                                      |
| COMAR    | Code of Maryland Regulations  |
| CSM      | Conceptual Site Model   |
| CTO      | Contract Task Order   |
| CWAP     | Comprehensive Work Approval Process                                   |
| DPT      | Direct Push Technology  |
| EE/CA    | Engineering Evaluation/Cost Analysis                                  |
| EEQ      | Ecological Effects Quotient   |
| EOD      | Explosive Ordnance Disposal   |
| EPA      | U.S. Environmental Protection Agency                                  |
| ERA      | ecological risk assessment  |
| ESCP     | Erosion and Sedimentation Control Plan                                |
| FBL      | fixed-base laboratory   |
| FS       | Feasibility Study   |
| HASP     | Health and Safety Plan  |
| HAZWOPER | Hazardous Waste Operations and Emergency Response                     |
| HI       | Hazard Index  |
| ILCR     | incremental lifetime cancer risk                                      |
| LOAEL    | Lowest Observed Adverse Effects Level                                 |
| MC       | Munitions Constituents  |
| MCL      | Maximum Contaminant Level   |
| MDE      | Maryland Department of the Environment                                |
| MEC      | Munitions and Explosives of Concern                                   |
| mg/kg    | milligrams per kilogram   |
| mg/L     | milligrams per liter  |
| MRR      | Marine Rifle Range  |
| MRP      | Munitions Response Program  |

## LIST OF ACRONYMS (Continued)

|            |  |
|------------|--|
| msl        | mean sea level   |
| NAVFAC     | Naval Facilities Engineering Command                             |
| NCP        | National Oil and Hazardous Substances Pollution Contingency Plan |
| NOAEL      | No Observed Adverse Effects Level                                |
| NOSSA      | Naval Ordnance Safety and Security Activity                      |
| NPDES      | National Pollutant Discharge Elimination System                  |
| NSF-IH     | Naval Support Facility – Indian Head                             |
| NTCRA      | Non-Time-Critical Removal Action                                 |
| ORNL       | Oak Ridge National Laboratory                                    |
| OSHA       | Occupational Safety and Health Administration                    |
| OSTR       | Old Skeet and Trap Range   |
| OSWER      | Office of Solid Waste and Emergency Response                     |
| PA         | Preliminary Assessment   |
| PAH        | polycyclic aromatic hydrocarbon                                  |
| PAL        | Project Action Limit   |
| PRG        | Preliminary Remediation Goal                                     |
| RAO        | Removal Action Objective   |
| RAWP       | Removal Action Work Plan   |
| RCRA       | Resource Conservation and Recovery Act                           |
| RFI        | RCRA Facility Investigation                                      |
| RI         | Remedial Investigation   |
| RPSR       | Rum Point Skeet Range  |
| RRRR       | Roach Road Rifle Range   |
| RSL        | Regional Screening Level   |
| SAP        | Sampling and Analysis Plan                                       |
| SAPR       | Small Arms Pistol Range  |
| SARA       | Superfund Amendments and Reauthorization Act                     |
| SASR       | Small Arms/Skeet Range   |
| SDWA       | Safe Drinking Water Act  |
| SHPO       | State Historic Preservation Office                               |
| SI         | Site Inspection  |
| TBC        | To Be Considered   |
| TCLP       | Toxicity Characteristic Leaching Procedure                       |
| Tetra Tech | Tetra Tech, Inc.   |
| THQ        | Target Hazard Quotient   |
| TR         | Target Risk  |

## LIST OF ACRONYMS (Continued)

|       |                                       |
|-------|---------------------------------------|
| UFP   | Uniform Federal Policy                |
| USACE | United States Army Corps of Engineers |
| USDA  | U.S. Department of Agriculture        |
| UXO   | Unexploded Ordnance                   |
| WMA   | Wildlife Management Area              |
| XRF   | X-ray fluorescence                    |

## EXECUTIVE SUMMARY

This Engineering Evaluation/Cost Analysis (EE/CA) presents the evaluation of alternatives for a removal action at five former Small Arms/Skeet Ranges (SASRs) located at Naval Support Facility Indian Head (NSF-IH) in Indian Head, Maryland. In coordination with the NSF-IH Partnering Team, the Navy is pursuing a non-time-critical removal action (NTCRA) at the five SASRs, which are located in the Stump Neck Annex portion of NSF-IH. The five sites, designated as Unexploded Ordnance (UXO) sites, include the Marine Rifle Range (UXO 14), Old Skeet and Trap Range (UXO 15), Rum Point Skeet Range (UXO 16), Small Arms (Pistol) Range (UXO 17), and Roach Road Rifle Range (UXO 25). This EE/CA has been prepared under the Navy's Munitions Response Program (MRP) for Naval Facilities Engineering Command (NAVFAC) Washington as part of Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract Number N62467-04-D-0055, Contract Task Order (CTO) 423.

This EE/CA addresses contaminated soil resulting from historical range operations at the five SASRs. Discrete areas of contamination are present at each of the five sites, which pose a potential risk to site receptors and must be managed appropriately. The evaluation of removal alternatives to address soil contaminated with lead, polycyclic aromatic hydrocarbons (PAHs), and nitroglycerin at the sites is necessary to mitigate risk and eliminate the potential for future contaminant migration.

The following Removal Action Objectives (RAOs) have been identified for this removal action:

- Mitigate potential human health risks due to direct exposure to lead, PAHs, and nitroglycerin contamination in soils;
- Mitigate the potential for erosion of contaminated soil, transport of contaminants, and subsequent exposure; and
- Ensure that post-removal action conditions provide an acceptable level of protection for ecological receptors against direct exposure and exposure via the food chain to lead, collocated metals, nitroglycerin, and PAHs in soil.

The three removal action alternatives developed and evaluated in this EE/CA are the following:

- Alternative 1 – No Action
- Alternative 2 – Excavation and Off-Site Disposal
- Alternative 3 – In-Situ Treatment, Excavation, and Off-Site Disposal

This EE/CA compares the three removal action alternatives on the basis of their effectiveness, implementability, and cost. Based on the results of this comparison, Alternative 3 is recommended for implementation at the five SASRs. This alternative involves the in-situ chemical treatment of lead-

contaminated soils to stabilize the leachable lead, excavation of contaminated soils to achieve the cleanup goals for individual contaminants of concern, and off-site disposal of the excavated waste. A total of 8,809 cubic yards of contaminated soils are designated for removal. It is estimated that, of that, approximately 3,048 tons of lead-contaminated soils will exceed the U.S. Environmental Protection Agency (EPA) threshold for lead toxicity and require lead stabilization prior to excavation and disposal. A total of 3,810 tons of lead-contaminated soil (treated and untreated) will be shipped off-site for disposal as non-hazardous waste at a Subtitle D landfill, along with approximately 8,673 tons of PAH-contaminated soil and 598 tons of nitroglycerin-contaminated soil. After the contaminated soils have been removed, verification sampling of residual soils will be conducted to ensure that the removal action objectives have been met.

Alternative 3 is recommended because it is the most cost-effective alternative that would meet the stated RAOs. Implementation of this alternative would be effective in permanently reducing lead, PAH, and nitroglycerin concentrations at the five SASRs and eliminating the potential for unacceptable risks to human health and ecological receptors. Alternative 3 is technically and administratively feasible, and it constitutes a permanent remedy to existing contamination at these sites. This alternative is estimated to cost \$3,156,800 and will require approximately 5 months to complete.

## **1.0 INTRODUCTION**

Tetra Tech, Inc. (Tetra Tech) has prepared this Engineering Evaluation/Cost Analysis (EE/CA) to document the need for a removal action at five former Small Arms/Skeet Ranges (SASRs) located in the Stump Neck Annex portion of Naval Support Facility Indian Head (NSF-IH), Indian Head, Maryland. In coordination with the NSF-IH Partnering Team, the Navy is pursuing a non-time-critical removal action (NTCRA) under the guidance provided by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA). This removal action is necessary to prevent, minimize, or mitigate damage to public health or welfare based on the potential for environmental contamination from lead, polycyclic aromatic hydrocarbons (PAHs), and nitroglycerin in soil at the five SASRs.

The five sites addressed in this EE/CA are designated as Unexploded Ordnance (UXO) sites, and include: the Marine Rifle Range (UXO 14), Old Skeet and Trap Range (UXO 15), Rum Point Skeet Range (UXO 16), Small Arms (Pistol) Range (UXO 17), and Roach Road Rifle Range (UXO 25). This EE/CA has been prepared under the Navy's Munitions Response Program (MRP) for Naval Facilities Engineering Command (NAVFAC) Washington as part of Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract Number N62467-04-D-0055, Contract Task Order (CTO) 423.

### **1.1 PURPOSE AND ORGANIZATION**

This EE/CA provides the CERCLA documentation necessary to support a NTCRA for the five SASRs. This document is organized in six sections. Section 1.0 provides introductory information, including the purpose, organization, and regulatory framework for this EE/CA. Section 2.0 presents descriptive information and contaminant characterizations for each site. Section 3.0 identifies the removal action objectives (RAOs). Section 4.0 discusses potential removal technologies and describes the removal action alternatives evaluated. Section 5.0 provides a comparative analysis of the removal action alternatives, and Section 6.0 presents the recommended alternative. References and appendices are also included.

### **1.2 REGULATORY FRAMEWORK**

This document is being issued by the U.S. Navy, who is the lead agency responsible for implementing the NTCRA at the five former SASRs, in partnership with U.S. Environmental Protection Agency (EPA) Region 3 and Maryland Department of the Environment (MDE). This EE/CA meets the requirements of Section 104 of CERCLA, as amended by SARA, and the National Oil and Hazardous Substance Pollution Contingency Plan (NCP) presented in Title 40 of the Code of Federal Regulations (40 CFR) Part 300.

This EE/CA has been developed according to EPA's "Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA" (EPA, 1993).

A NTCRA is being pursued under 40 CFR Part 300.415(b)(2), which defines the right and responsibility of the lead agency to instigate an appropriate removal action to mitigate or eliminate the threat posed to the public or the environment from a release. NTCRAs may constitute interim or final actions. In the case of the five SASRs, the NTCRA is planned as a final action to mitigate potential unacceptable risks to both human and ecological receptors based on exposure to munitions constituents (MC) in site soils.

Community involvement requirements for NTCRAs include making the EE/CA available for public review and comment for a period of 30 days. An announcement of the public comment period for this EE/CA will be placed in a local newspaper once the EE/CA has been reviewed and approved by the Partnering Team (i.e., Navy, EPA, MDE, NSF-IH, and interested stakeholders). Written responses to significant comments will be provided in a responsiveness summary to be attached to the Navy's Action Memorandum, and will be included in the Administrative Record for NSF-IH. Information in the Administrative Record can be accessed at the following repositories:

|  |   |  |
|--|---|--|
| Indian Head Town Hall<br>4195 Indian Head Highway<br>Indian Head, Maryland<br>(301) 743-5511 | Charles County Public Library<br>2 Garrett Avenue<br>La Plata, Maryland<br>(301) 934-9001 | NSF-IH General Library<br>Building 620 (The Crossroads)<br>4163 N. Jackson Road<br>Indian Head, Maryland<br>(301) 744-4747 |
|--|---|--|

## 2.0 SITE CHARACTERIZATION

This section presents information about the five SASRs including site descriptions and background; summaries of previous investigations; characterization of the source, nature, and extent of contamination; human health and ecological risk evaluations; and conceptual site models.

### 2.1 SITE DESCRIPTION AND BACKGROUND

NSF-IH is located in northwestern Charles County, Maryland. It consists of the Main Installation and Stump Neck Annex (Figure 2-1). Stump Neck Annex covers approximately 1,100 acres on the Stump Neck peninsula at the confluence of the Potomac River and Chicamuxen Creek in Charles County, Maryland. Much of the Stump Neck peninsula lies within the Valley Firing Fan (Figure 2-2), which received fire from the Valley Gun Proving Site at the Main Installation from 1891 through 1921. General Smallwood State Park and private property parcels lie east and southeast, respectively, of Stump Neck Annex, and the Chicamuxen Wildlife Management Area (WMA) lies to the south, across Chicamuxen Creek.

Five former SASRs have been identified at NSF-IH Stump Neck Annex as “other than operational ranges” and are being addressed under the Navy’s MRP. These SASRs consist of the following sites: Marine Rifle Range (UXO 14), Old Skeet and Trap Range (UXO 15), Rum Point Skeet Range (UXO 16), Small Arms (Pistol) Range (UXO 17), and Roach Road Rifle Range (UXO 25) (Figure 2-3).

Under the MRP, military ranges that are considered to be “other than operational” are investigated and remediated, if necessary, for munitions and explosives of concern (MEC) and MC. MEC are generally not of concern at small arms ranges. However, there is a possibility that MEC could be encountered at the SASRs located within the Valley Firing Fan (i.e., the Marine Rifle Range and Old Skeet and Trap Range) as a result of errant projectiles fired from the Valley Gun Proving Site.

#### 2.1.1 Site Location and History

##### **Marine Rifle Range - UXO 14**

The former Marine Rifle Range (MRR) is located south of Archer Avenue, within the Valley Firing Fan, and includes multiple Firing Lines, two Target Berms, and a Hillside Impact Area (Figures 2-4 to 2-6). The total area of the site is 30.4 acres. During its estimated period of use, 1911 to 1918, the range was used for small arms (.30-caliber) rifle training. Two sets of Firing Lines, one for each Target Berm, were located at 100-meter intervals over a 1,000-meter span. Targets were mounted on each berm and held in place by a series of chains and mechanical supports. Bullets that were fired low and missed the targets tended to accumulate in the Target Berm soil at the base of the targets. Bullets that were fired high and

missed the targets, or hit the targets and passed through, continued down range and accumulated in the Hillside Impact Area.

#### **Old Skeet and Trap Range - UXO 15**

The former Old Skeet and Trap Range (OSTR) is located north of Archer Avenue, between the MRR and Potomac River (Figures 2-7 and 2-8). Like the MRR, this site lies within the Valley Firing Fan. The total area of the OSTR is 29.3 acres. The site was reportedly used for small arms recreational activities from sometime after 1967 until 1991. Shotguns were used to fire on clay targets launched from two separate firing points. Impacted targets would shatter and fall to the ground surface, and the shot pellets, because of their ballistic momentum, greater density, and spherical shape, would travel further down range before falling to the ground. Missed targets would fall to the ground intact, and the expended shot would continue along an undisturbed trajectory toward the river.

#### **Rum Point Skeet Range - UXO 16**

The former Rum Point Skeet Range (RPSR) is a 900-foot wide fan-shaped area that covers 33.5 acres in the northeastern section of Stump Neck Annex (Figures 2-9 and 2-10). There is no available information regarding land use at the RPSR prior to 1991, although records show that the site was used for small arms (shotgun) recreational activities from 1991 until 2001. The range was primarily used and maintained by the Potomac River Gun Club. Shotguns were used to fire on clay targets launched from two concrete firing pads. Impacted targets would shatter and fall to the ground surface, and the shot pellets, because of their ballistic momentum, greater density, and spherical shape, would travel further down range before falling to the ground. Missed targets would fall to the ground intact, and the expended shot would continue along an undisturbed standard trajectory.

#### **Small Arms (Pistol) Range - UXO 17**

The former Small Arms (Pistol) Range (SAPR) was also previously known as the Old Pistol Range. It covers approximately 2 acres near the eastern perimeter of the Stump Neck peninsula, along the east side of Rum Point Road (Figures 2-11 and 2-12). The SAPR was used for small arms training from the mid-1980s to 1991. The range contained three Firing Lines with north-south orientation, a Target Area, and a Hillside Impact Area on the eastern edge of the range. Bullets fired from the Firing Lines would have passed through or around the targets and accumulated in the Hillside Impact Area behind the targets. Currently, the SAPR is an open field bounded on the east by a steep upward slope that borders General Smallwood State Park.

#### **Roach Road Rifle Range - UXO 25**

The former Roach Road Rifle Range (RRRR) is located in the central portion of Stump Neck Annex, directly west of Roach Road (Figures 2-13 and 2-14). The site is a 0.3-acre site that was used for small

arms (rifle and pistol) training from 1967 to 1986. The site contained eight firing stands, six targets, and a Hillside Impact Area on the western side of the range. Bullets fired from the firing stands would have passed through or around the targets and accumulated in the Hillside Impact Area behind the targets.

### **2.1.2 Topography and Vegetation**

The Stump Neck Annex has a relatively low topographic profile. The highest point is the northeastern portion of the peninsula, which has an elevation of approximately 140 feet above mean sea level (msl). The lowest points lie along the shorelines of the Stump Neck Annex adjacent to Mattawoman Creek and Chicamuxen Creek. These areas are mostly flat, tidal marsh areas, although several 50- to 60-foot bluffs exist along Mattawoman Creek.

The land around the Stump Neck Annex is heavily vegetated. There are five basic vegetation types present including pine, hardwood, pine-hardwood mix, tidal and non-tidal wetlands, and urban landscape. Most of the forested land is either second or third growth; little, if any, virgin forest remains. The most abundant trees are Virginia pine, sweet gum, red oak, and yellow poplar. In addition, the following grasses are present: gama grass, panic grass, bermuda grass, and finger grass.

#### **MRR - UXO 14**

Surface elevations at the MRR vary from 5 to 60 feet above msl. The western portion of the range slopes slightly from 10 to 30 feet above msl, and the central and eastern portions of the range are relatively flat, with a general elevation of approximately 10 feet above msl. The Hillside Impact Area that borders the eastern side of the range slopes steeply from 5 to 60 feet above msl. Vegetation at the MRR is a mixture of mowed grass, grassy fields, hardwood forest, and wetland.

#### **OSTR - UXO 15**

Topographic relief at the OSTR is relatively flat; the elevation of the entire range is approximately 16 feet above msl. The site consists primarily of an open field with maintained grass.

#### **RPSR - UXO 16**

The general topography of the RPSR slopes gently downward from southeast to northwest. More than 90 percent of the range is located in upland terrain, at or above an elevation of 30 feet above msl. The cleared area of the range is fairly flat; however, west of the cleared area, the land slopes downward toward a wetlands area and beyond.

Vegetation is characterized by open fields with maintained grass surrounded by hardwood forests and wetlands. High grasses of the family Gramineae and genus *Festuca* were planted by the Potomac River Gun Club within specific zones to dissuade birds and waterfowl from grazing or nesting on the range.

There is a 100-yard transition zone between the grasses and the tree line containing a mix of high scrubs, bushes, and tall grasses. The trees are approximately 50 to 75 feet tall.

### **SAPR - UXO 17**

The topography of the SAPR can be described as relatively flat with a steeply sloping hill on the eastern side, bordering General Smallwood State Park. The range floor has an elevation of approximately 100 feet above msl, and the Hillside Impact Area along the eastern boundary rises to approximately 130 feet above msl.

The SAPR is located adjacent to a hardwood forest area. The range is covered with high grass and surrounded by trees on the northern edge. Open fields, trees, grass, and an access road surround the range.

### **RRRR - UXO 25**

The terrain at the RRRR is relatively flat, and has an elevation of approximately 50 feet above msl. There is a small downward slope toward the north. Vegetation at the RRRR is a mixture of shrubs and forest.

#### **2.1.3 Hydrology**

The Potomac River, Mattawoman Creek, and Chicamuxen Creek border the Stump Neck Annex. The Potomac River is a continuous, slow-moving, slightly brackish, tidal tributary to the Chesapeake Bay. Mattawoman Creek and Chicamuxen Creek are tributaries to the Potomac River, which are also tidally influenced. Both have large floodplains and contain large expanses of tidal wetlands and swamps. Many small streams cross the area, most of which drain directly into one of the three major waterways.

### **MRR - UXO 14**

Wetlands are present in the eastern portion of the range, and also surround an unnamed tributary in the central portion of the range. Surface water runoff drains to these wetlands, unnamed tributaries, and drainage swales, ultimately flowing to the Potomac River. A portion of MRR along the wetlands is located within the 100-year floodplain.

### **OSTR - UXO 15**

Surface runoff is to the north, toward the Potomac River, either directly or via a drainage ditch located along Archer Avenue. Although erosion on the range is considered to be minimal, surface soil contaminants may become mobile, particularly during extended periods of surface runoff.

## **RPSR - UXO 16**

The RPSR has two small unnamed tributaries, and a wetlands area in the western portion of the range. Surface water runoff flows toward the wetlands and tributaries, which eventually drain into Mattawoman Creek. The tall fescue grass planted in the shot fall zone impedes surface runoff and minimizes erosion. The site was also graded during range operations so that surface runoff would be directed away from the shot fall zone toward the western edge of the range.

## **SAPR - UXO 17**

The closest water body to the SAPR is an unnamed tributary along the western boundary of the range. Surface water runoff follows the topography at the range, flowing generally towards the unnamed tributary. There are no known wetlands in the vicinity of this site.

## **RRRR - UXO 25**

There are no surface water bodies present at the RRRR. Based on topography, surface water flows to the north toward Chicamuxen Creek, which drains to the Potomac River.

### **2.1.4 Geology and Hydrogeology**

#### **MRR - UXO 14**

According to the Soil Survey of Charles County (USDA, 1974), soils in the general vicinity of this site consist of silty sand with gravel at the ground surface underlain by silty sand with clay. Specifically, Keyport silt, Elkton silt loam, and Mattapex silt loam are present at this site. These soil types generally have low permeability, thus impeding the downward movement of rainwater through the vadose zone.

Based on Phase 2 SI groundwater sampling and a review of available information (e.g., Background Report [Tetra Tech, 2002], RCRA Facility Investigation (RFI) Verification Report [Brown and Root, 1998]), shallow groundwater flow beneath the MRR follows the general topography and is connected to the area's dominant surface water bodies (i.e., Mattawoman Creek, Chicamuxen Creek, and Potomac River). The depth to groundwater is about 5 to 10 feet below ground surface (bgs). Due to the proximity of the site to the river, it is possible that groundwater at the MRR experiences tidally induced fluctuations in elevation and quality.

#### **OSTR - UXO 15**

According to the Soil Survey of Charles County (USDA, 1974), the soils at the OSTR consist of Mattapex fine sandy loam with 0 to 2 percent slopes. Soils in this area generally have a surface layer of sandy silt and are moderately well-drained. Available moisture capacity is high, and permeability is moderately low.

Based on Phase 2 SI groundwater sampling and a review of available information (e.g., Background Report [Tetra Tech, 2002], RFI Report [Brown and Root, 1998]), shallow groundwater flow beneath the OSTR follows the general topography and is connected to the area's dominant surface water bodies (i.e., Mattawoman Creek and Potomac River). The depth to groundwater is about 5 to 10 feet bgs. Due to the proximity of the site to the river, groundwater at the OSTR experiences tidally induced fluctuations in elevation and quality.

#### **RPSR - UXO 16**

According to the Soil Survey of Charles County (USDA, 1974), the surface soil at the RPSR consists of a thick series of silty clays. The subsurface soil is a combination of Sassafras sandy loams with 0 to 5 percent slopes and moderate erodability. These soils form on upland terrains that are nearly level to moderately sloping. They are well-drained soils with moderate permeability.

Based on Phase 2 SI groundwater sampling and a review of available information (e.g., Background Report [Tetra Tech, 2002], RFI Report [Brown and Root, 1998]), shallow groundwater flow beneath the RPSR follows the general topography and is connected to the area's dominant surface water bodies (i.e., Mattawoman Creek and Potomac River). The depth to groundwater is about 5 to 10 feet bgs. Due to the distance between the site and the river, neither groundwater elevation nor quality is expected to fluctuate in response to tides.

#### **SAPR - UXO 17**

According to the Soil Survey of Charles County (USDA, 1974), the predominant soil types at the SAPR are silty loams and gravelly sandy loam. Specifically, the soils consist of moderately eroded, Beltsville silt loam with 2 to 5 percent slopes and a moderately eroded Aura gravelly loam with a 10 to 15 percent slope, both of which are moderate to well-drained soils that allow for downward movement of rainwater through the vadose zone.

During the 2009 SI, it was evident that soils from the western face of the Target/Impact Area berm had slumped to the bottom of the slope, likely consolidating much of the contaminated soil from the impact area at this location. This material appears to be in the process of being eroded by overland flow processes.

Based on Phase 2 SI groundwater sampling and a review of available information (e.g., Background Report [Tetra Tech, 2002], RFI Report [Brown and Root, 1998]), shallow groundwater flow beneath the SAPR follows the topography toward the unnamed tributary and is connected to the area's dominant surface water bodies (i.e., Mattawoman Creek and Potomac River). The depth to groundwater is about

5 to 10 feet bgs, with an inferred north-by-northwest flow direction. Due to the distance between the site and the river, neither groundwater elevation nor quality is expected to fluctuate in response to tides.

#### **RRRR - UXO 25**

According to the Soil Survey of Charles County (USDA, 1974), soils in the area consist of silty sand with gravel at the ground surface underlain by silty sand with clay. Specifically, Aura gravelly sandy loam is present at the range. This soil type is generally a well-draining gravelly soil that allow for the downward movement of rainwater through the vadose zone. Soil boring data from the 2009 SI at Area 8 (Tetra Tech, 2010), located approximately 400 feet northeast of the RRRR boundary, indicate that surficial deposits consist of gravel, sand, silt, clay, and peat mixtures with irregular bedding and an aggregate thickness of 0 to approximately 40 feet bgs.

In the absence of site-specific data, it is assumed that shallow groundwater flow beneath the RRRR follows the general topography and is connected to the area's dominant surface water bodies (i.e., Mattawoman Creek and Potomac River). Based on a review of available information, depth to water is estimated at 25 to 30 feet bgs, with an inferred northeast-by-north flow direction. Due to the distance between the site and the river, neither groundwater elevation nor quality is expected to fluctuate in response to tides.

#### **2.1.5 Current and Potential Future Land Use**

No public access is authorized at NSF-IH. Signs, partial fencing, locked/secured gates, login book/office check-in, and vehicle security patrols are used to control the entire facility.

#### **MRR - UXO 14**

The western portion of the MRR is partially developed, with a number of parking lots and warehouse-type structures, such as Building 2195, which is used by the Joint Services Explosive Ordnance Disposal (EOD) Equipment Support Facility. The central and eastern portions of the range are mostly wooded and undeveloped, with sparsely distributed structures (e.g., Buildings 2156 and 2075). There is a fenced maintenance yard in the central portion of the range that is used to store equipment (e.g., dump trucks, backhoes, etc.). Buildings located within the MRR are used primarily as offices and for storage. The wooded areas surrounding the existing buildings and the wetland area in the eastern portion of the range are currently unused. According to the installation personnel, there are no changes planned for future land use at this site.

## **OSTR - UXO 15**

The OSTR is currently a routinely manicured grass field, which is used primarily for recreation. The site is also used as a helicopter pad and, approximately once a year, for amphibious training exercises. According to the NSF IH Master Plan, there are no anticipated changes in future land use at this site.

## **RPSR - UXO 16**

From 1991 until 2001, the RPSR was maintained by the Potomac River Gun Club and used as a recreational skeet and trap range. Currently, the site is unused.

## **SAPR - UXO 17**

The SAPR is currently an unused open field. Areas directly adjacent to the eastern and southern boundaries of the SAPR are part of General Smallwood State Park. Rum Point Road runs along the western border of the range.

## **RRRR - UXO 25**

There is no available information on land use at the RRRR prior to 1963. From 1967 until 1986, the site was maintained as a rifle range. The site is currently undeveloped and is adjacent to an area used for staging dirt, gravel, telephone poles, and other road construction supplies. According to installation personnel, there are no changes planned for land use at this site. According to the 2003-2004 Stump Neck Annex Hunting Map, the RRRR is located within an upland hunting area.

### **2.1.6 Wetlands**

The Stump Neck Annex is bordered by and contains large tracts of both tidal and non-tidal wetlands. Wetlands are valuable habitats for wildlife, and important groundwater recharge areas.

## **MRR - UXO 14**

There are wetlands located in the central portion of the MRR surrounding an unnamed tributary, and in the eastern portion of the site. The wetlands located on the eastern edge of the range are protected under United States Executive Order 11990, which prohibits construction in a wetland area unless there is no practicable alternative and all possible measures are taken to minimize the environmental impacts. Wetlands are also protected under Section 404 of the Clean Water Act, and CERCLA activities that may impact wetlands must meet the substantive requirements of this Act.

The wetlands found at the MRR are categorized as Palustrine forested broad-leaved deciduous wetlands. A portion of the MRR is located in the 100-year floodplain surrounding the wetlands. Executive Order 11988 restricts development within the 100-year floodplain to water-dependent activities. Any

construction within the floodplain must be in accordance with regulations promulgated by the Federal Insurance Administration pursuant to the National Flood Insurance Act of 1968. Permits for construction within the 100-year floodplain are also required and are administered by the Waterway Permits Division of the Maryland Department of Natural Resources.

#### **OSTR - UXO 15**

No wetlands are known to exist at the OSTR. A portion of the OSTR is located within the 100-year floodplain.

#### **RPSR - UXO 16**

The RPSR has two small unnamed tributaries, and a wetlands area on the western portion of the range.

#### **SAPR - UXO 17**

No wetlands are known to exist at the SAR.

#### **RRRR - UXO 25**

No wetlands are known to exist at the RRRR.

### **2.1.7 Endangered and Special Status Species**

According to the 1997 Wildlife Management Plan published by Naval District of Washington Indian Head, three endangered species are reported to be located within the Stump Neck Annex. Two of these three species, the rainbow snake and joint-vetch (flowering plant of the pea family), are federally endangered. The third species, the scaly blazing-star (perennial herb), is a species of special concern in the State of Maryland. As of the July 2001 Threatened and Endangered Plant/Animal Species of Charles County, Maryland report, the Maryland Department of Natural Resources Wildlife and Heritage Service still listed these three species as federally and state endangered for Charles County. These species potentially inhabit the MRR (UXO 14).

### **2.1.8 Cultural and Archaeological Resources**

A Phase I Cultural Resources Survey and Supplemental Architectural Investigations were conducted at Stump Neck in 1996. As a result, 33 sites were identified and investigated. Only 17 of 33 were recommended for Phase II evaluations to determine their eligibility for listing on the National Register of Historic Places. Five of these 17 sites are considered to potentially overlap with the former ranges discussed in this report:

- Site 18CH388 – overlaps with the OSTR (UXO 15) and the MRR (UXO 14)
- Sites 18CH391, 18CH628, and 18CH630 – overlap with the RPSR (UXO 16)
- Site 18CH644 – overlaps with the SAR (UXO 17)

The architectural evaluation verified three National Register-eligible historic districts and identified one additional district: the Indian Head Residential Historic District containing 64 contributing resources; the Naval Powder Factory District containing 124 contributing resources; the Naval Proving Ground Historic District containing no contributing resources; and the Extrusion Plant Historic District containing 63 contributing resources. An additional area of the base, the Polaris facility, was recommended for further research, as it was considered potentially eligible for the National Register as an exceptionally significant area. The exact locations of the contributing resources within these districts were not available.

#### **MRR - UXO 14**

The Phase I Cultural Resources Survey of Stump Neck Annex and Supplemental Architectural Investigations (Goodwin, 1996) identified one site within the MRR. Site 18CH388 contained a mix of prehistoric and historic artifacts, and may correspond to Indian Head Quad File #4, a Late Woodland Indian village. A total of 645 artifacts were recovered at this site, which also overlaps UXO 15. In addition, a reinforced concrete retaining wall approximately 130 feet long and 33 feet high was identified in the area bordering the marsh on the eastern edge of the MRR. No sites were identified within the range Maryland Register of Historic Places (State Register) or the National Register of Historic Places.

According to the 2003-2004 Stump Neck Annex Hunting Map, hunting is permitted in the undeveloped portions of the MRR. The Chicamuxen WMA is located approximately 75 feet south of the MRR.

#### **OSTR - UXO 15**

According to the Phase I Cultural Resources Survey (Goodwin, 1996), there is one archaeological site located within the OSTR. Site 18CH388 contained a mix of prehistoric and historic artifacts, and may correspond to Indian Head Quad File #4, a Late Woodland Indian village. A total of 645 artifacts were recovered at this site, which also overlaps the MRR.

#### **RPSR - UXO 16**

The Phase I Cultural Resources Survey (Goodwin, 1996) identified three archaeological sites that partially overlap the RPSR;

- Site 18CH391: This site was previously identified in a 1966 historic survey. Artifacts recovered from this site were from the Late Archaic through Late Woodland periods. The size and nature of the site suggest that it was once a base camp or village. Many of the prehistoric materials were from the Ap horizon. The site overlaps the northeastern portion of the RPSR.
- Site 18CH628: This small Late Woodland site contained a wide variety of artifact classes including debitage, flake tools, ceramics, and fire-cracked rock. The artifacts provide evidence that the site was a resource procurement site or a briefly occupied camp. Cores and primary debitage were located in the southeastern portion of the site. Ceramic artifacts were located in the northwestern portion of the site. Recovered historic artifacts were most likely from field scatter. This site overlaps the eastern side of the RPSR.
- Site 18CH630: A diverse collection of prehistoric artifacts including debitage, a flake tool, a core, ceramics, and fire-cracked rock fragments were recovered at this small Late Woodland site. The artifacts were uncovered in unplowed Sassafras Silt Loam soils. The entire site is overlain by the northwestern section of the RPSR.

The RPSR is located in a species-protected area where hunting is not permitted.

#### **SAPR - UXO 17**

According to the Phase I Cultural Resources Survey (Goodwin, 1996), Cultural Site 18CH644 overlaps the SAPR. However, several shovel test pits were dug on the site, and all were negative for artifacts.

#### **RRRR - UXO 25**

The Phase I Cultural Resources Survey (Goodwin, 1996) did not identify any archeological sites within the RRRR. Historic and prehistoric artifacts were recovered but not in sufficient concentrations to warrant a site designation. No sites listed in the Maryland Register of Historic Places (State Register) or the National Register of Historic Places were identified at the RRRR.

According to the 2003-2004 Stump Neck Annex Hunting Map, hunting is permitted in the undeveloped portions of the RRRR. The Chicamuxen WMA is located approximately 500 feet north of the range and contains an eagle protection area.

#### **2.1.9 Coastal Zones**

The Coastal Zone of Maryland includes all land and water lying within coastal counties, one of which is Charles County. Within the Coastal Zone, Maryland has defined an area within which strict land use

management is needed to protect the Chesapeake Bay. The critical area is defined as a 1,000-foot-wide strip of land surrounding the bay and its tidal tributaries. Most construction within 100 feet of the Mean High Water Line (buffer) is prohibited. Most of the OSTR falls within the 100-foot buffer of the Mean High Water Line (buffer).

## **2.2 PREVIOUS REMOVAL ACTIONS**

No previous CERCLA removal actions have occurred at these sites.

## **2.3 PREVIOUS INVESTIGATIONS**

The five SASRs are being investigated under the Navy MRP, in accordance with the CERCLA process. Previous CERCLA investigations at these sites have included a Preliminary Assessment (PA) and Site Inspection (SI).

### **2.3.1 Preliminary Assessment**

The initial stage of the CERCLA process, the PA, was completed in September 2005 (Malcolm Pirnie, 2005). It recommended further investigation of the five SASRs at Stump Neck Annex that were classified as “other than operational,” and identified them as Munitions Response Areas or Munitions Response Sites under the MRP. The PA used five primary sources of information to support the data collection effort, including historical archives, personal interviews, installation data repositories (including the Administrative Record), visual surveys, and off-facility data sources and repositories such as local libraries and museums.

### **2.3.2 Phase 1 Site Inspection**

The next stage of the CERCLA process, the SI, was initiated in 2009, as documented in the SI Report (Tetra Tech, 2010). The first phase of the SI focused on the collection and analysis of surface soil, subsurface soil, and sediment samples to support screening-level risk evaluations and the identification of contaminants of potential concern (COPCs) at each of the five sites. The SI considered the background information provided in the PA to refine the conceptual site models and determine what data were necessary to evaluate the potential presence of contamination related to historical site use.

The initial SI field work was conducted from May through June 2009. It consisted of the collection of more than 450 soil and sediment samples, along with associated quality control samples (e.g., duplicates and blanks), in areas most likely to have been contaminated by former range operations. All soil and sediment samples were screened on-site for lead using X-ray fluorescence (XRF), and a subset of those samples was shipped off-site to a fixed-base laboratory (FBL) for analysis of select munitions-related metals, PAHs, and explosives (i.e., nitroglycerin).

Using the lead data generated for samples that were analyzed both in the field using XRF and also at the FBL, regression analyses were conducted to evaluate the strength of the correlation between the FBL analytical data and the XRF screening data. Results of the regression analyses indicated that the correlation between the on-site XRF and off-site FBL lead data was statistically acceptable at UXOs 14, 15, and 25, but not at UXOs 16 and 17. Thus, regression equations were derived for UXOs 14, 15, and 25 that allowed for the calculation of predicted FBL concentrations at sample locations where only XRF analyses were performed.

Analytical results were compared to the Project Action Limits (PALs) specified in the project Uniform Federal Policy (UFP) Sampling and Analysis Plan (SAP) (Tetra Tech, 2009). The PALs corresponded to the minimum screening values established for direct-contact residential exposure for human health or ecological receptors. Statistical comparisons between the site-specific data and installation-wide background data (Tetra Tech, 2002) were performed whenever the maximum reported concentration of a constituent exceeded its respective PAL.

Soil contaminants with maximum concentrations that exceeded both their respective PALs and background at each site were retained as COPCs and subjected to human health and ecological risk screening evaluations. Based on these evaluations, the SI resulted in the following recommendations:

- Proceed to a Remedial Investigation (RI) and Feasibility Study (FS) or conduct interim measures to address soil containing elevated concentrations of COPCs.
- Determine impacts to groundwater at each site.
- No further action with respect to sediment.

### **2.3.3 Phase 2 Site Inspection**

In response to the Phase 1 SI recommendations, the Navy conducted a Phase 2 SI to determine the impacts of range operations on groundwater quality at the five SASRs. Fieldwork for the Phase 2 SI was conducted in September 2011, as documented in the Phase 2 SI Report (Tetra Tech, 2012). The objective of the Phase 2 SI was to collect groundwater data at each site to evaluate whether site-specific contaminants have migrated from soil to the underlying groundwater. Sampling locations were biased toward areas where contaminant concentrations in soil were among the highest for individual subareas of each site. The data collected were used to conduct a human health risk screening evaluation to determine whether actual contaminant concentrations measured in groundwater could pose an unacceptable risk to potential future human receptors.

As described in the Phase 2 SI Report, a total of ten temporary wells were installed at four of the five sites using Direct Push Technology (DPT). Wells were installed at UXO 14, UXO 15, UXO 16, and UXO 17;

however, the well planned for UXO 25 was not able to be installed due to unexpected site conditions that prevented access to the planned location. Prior to sampling, the wells were developed by means of low-flow purging until the water became visibly clear or until the well went dry. Nine of the ten wells were successfully developed. Groundwater samples were collected from the nine viable wells for analysis of location-specific contaminants (i.e., PAHs, nitroglycerin, and/or select total and dissolved metals). All of the analytical results for the samples collected were validated, in accordance with the Phase 2 UFP-SAP (Tetra Tech, 2011).

A human health risk screening evaluation was conducted to conservatively estimate potential risks posed to human receptors from contaminants present in the groundwater. Analytical results were compared to EPA Regional Screening Levels (RSLs), Safe Drinking Water Act (SDWA) Maximum Contaminant Levels (MCLs), and background concentrations. No potential human health risks associated with direct exposure to groundwater were identified at UXO 14, UXO 16, or UXO 17. However, potentially unacceptable human health risks were identified at UXO 15 based on exposure to measured concentrations of lead and six carcinogenic PAHs. A significant source of uncertainty in the evaluation was the high turbidity in samples collected from this site, which limited the ability to draw reliable conclusions regarding actual concentrations of groundwater contaminants in unfiltered samples. No risk evaluation was performed for UXO 25 because no groundwater sample was collected at that site.

The Phase 2 SI report recommended that further investigation of groundwater be conducted to complete the data collection and risk evaluation at UXO 25, and to evaluate the possible impacts of turbidity on the analytical results at UXO 15. The Partnering Team agreed to defer this evaluation until after the soil removal action is complete.

## **2.4 SOURCE, NATURE, AND EXTENT OF CONTAMINATION**

The source, nature, and extent of soil contamination at the five SASRs, as indicated by PAL exceedances observed during the SI, are described below for each site. The complete analytical data sets for soil sampling conducted during the SI are provided in Appendix A. The data tables present the analytical results by location, and highlight all exceedances of the PALs specified in the SI UFP-SAP (Tetra Tech, 2009). Exceedances of the arsenic PAL (0.39 milligrams per kilogram [mg/kg]) shown in the data tables are not discussed below because all reported data were determined to be less than the adjusted screening level (9.7 mg/kg) derived through statistical data evaluations and comparisons to background.

### **2.4.1 Marine Rifle Range - UXO 14**

Potential sources of contamination evaluated at UXO 14 included select metals (antimony, arsenic, copper, lead, tin, and zinc) resulting from bullet accumulations in soil at the Firing Line Area and on the tops and uprange (western) slopes of the Target Berms and Hillside Impact Area. Surface soil in the

Firing Line Area is also a potential source of nitroglycerin contamination as a result of incomplete consumption of propellant during firing activities.

Summary tables of analytical data collected during the SI are presented for each subarea of UXO 14 in Appendix A.1. For the discrete samples, the correlation between the on-site XRF and off-site FBL lead data was determined to be statistically acceptable. Consequently, an appropriate regression equation was derived, and the values predicted by this equation were used to supplement the analytical lead data for this site. The lead results, including both the reported FBL data and the predicted concentrations based on XRF results, are depicted on Figure 2-4. Analytical data that exceeded PALs for metals are depicted on Figure 2-5 for the Firing Line Area and Figure 2-6 for the Target Berms and Hillside Impact Area. Statistical summaries of all detected contaminants are provided in Appendix B.1.

### **Firing Line Area**

In the Firing Line Area, results of the composite surface soil sampling indicated exceedances of the PALs for antimony (up to 1.4 mg/kg), zinc (up to 66.5 mg/kg), and lead (up to 52.5 mg/kg). The antimony PAL was exceeded at two locations, and the zinc PAL was exceeded at three locations. At all locations, lead detections were greater than the PAL but less than the human health criterion for residential exposure. The average lead concentration for this area was 24.5 mg/kg.

### **Target Berm 1**

At Target Berm 1, results of the discrete surface soil sampling indicated exceedances of the PALs for copper (up to 107 mg/kg), tin (up to 9.1 mg/kg), and lead (up to 543 mg/kg). The copper PAL was exceeded at one location, and the tin PAL was exceeded at two locations. The lead PAL was exceeded at most locations, but the human health criterion for residential exposure was exceeded at only two locations. The average lead concentration for this area was 222 mg/kg.

### **Target Berm 2**

At Target Berm 2, results of the discrete surface soil sampling indicated exceedances of the PALs for tin (up to 10.1 mg/kg) and lead (up to 606 mg/kg). The tin PAL was exceeded at one location. The lead PAL was exceeded at all locations, and the human health criterion for residential exposure was exceeded at twelve of those locations. The average lead concentration for this area was 288 mg/kg.

### **Hillside Impact Area**

At the Hillside Impact Area, results of the discrete surface soil sampling indicated exceedances of the PALs for antimony (up to 0.32 mg/kg), copper (up to 276 mg/kg), tin (up to 81.8 mg/kg), zinc (up to 60.3 mg/kg), and lead (up to 904 mg/kg for the FBL data and 2,363 mg/kg for the XRF predicted value). The antimony PAL was exceeded at one location, but results were determined to be consistent with

background. The copper PAL was exceeded at four locations, the tin PAL was exceeded at twelve locations, and the zinc PAL was exceeded at three locations. The lead PAL was exceeded at all locations except one, and the human health criterion for residential exposure was exceeded at 43 of those locations. The average lead concentration for surface soil in this area was 316 mg/kg.

Discrete subsurface soil sampling results indicated exceedances of PALs for copper (up to 849 mg/kg), tin (up to 139 mg/kg), zinc (up to 53.9 mg/kg), and lead (up to 6,620 mg/kg). The copper PAL was exceeded at two locations at 1 to 2 feet bgs, and one location at 2 to 3 feet bgs. The tin PAL was exceeded at two locations at 1 to 2 feet bgs, and one location at 2 to 3 feet bgs. The zinc PAL was exceeded at one location at 1 to 2 feet bgs. The lead PAL was exceeded at three locations at 1 to 2 feet bgs, and one location at 2 to 3 feet bgs. The average lead concentration for subsurface soil in this area was 2,990 mg/kg.

#### **2.4.2 Old Skeet and Trap Range - UXO 15**

Potential sources of contamination evaluated at UXO 15 included select metals (antimony, arsenic, copper, lead, tin, and zinc) resulting from bullet accumulations in soil throughout the range, and PAHs resulting from clay target accumulations in soil near the Firing Points and in the Shot Fall/Target Area. Surface soil near the Firing Points is also a potential source of nitroglycerin contamination as a result of incomplete consumption of propellant during firing activities.

Summary tables of analytical data collected during the SI are presented in Appendix A.2. For the discrete soil samples, the correlation between the on-site XRF and off-site FBL lead data was determined to be statistically acceptable. Consequently, an appropriate regression equation was derived, and the values predicted by this equation were used to supplement the analytical lead data for this site. The lead results, including both the reported FBL data and the predicted concentrations based on XRF results, are depicted on Figure 2-7. Analytical results that exceeded PALs for metals and/or PAHs are depicted on Figure 2-8. Statistical summaries of all detected contaminants are provided in Appendix B.2.

#### **Firing Points**

Results of the composite surface soil sampling conducted near the firing points indicated two exceedances of the PALs for antimony (up to 0.68 mg/kg), zinc (up to 54.4 mg/kg), and lead (up to 77.2 mg/kg). Lead concentrations were less than the human health criterion for residential exposure at both sampling locations. The average lead concentration for this area was 72 mg/kg.

#### **Shot Fall/Target Area**

Results of the discrete surface soil sampling conducted in the Shot Fall/Target Area indicated exceedances of the PALs for antimony (up to 4.8 mg/kg), zinc (up to 53.3 mg/kg), and lead (up to

940 mg/kg). The antimony PAL was exceeded at ten locations, and the zinc PAL was exceeded at one location. The lead PAL was exceeded at all locations, and the human health criterion for residential exposure was exceeded at ten of those locations. The average lead concentration for this area was 320 mg/kg.

Results of the discrete subsurface soil sampling conducted in this area indicated PAL exceedances only for lead, with all samples exceeding the PAL but no samples exceeding the human health criterion for residential exposure.

Results of the discrete surface soil sampling for seven carcinogenic PAHs were used to calculate benzo(a)pyrene (BaP) equivalent concentrations for comparison to EPA's RSLs for residential exposure. A threshold value of 150 µg/kg, which corresponds to a cancer risk management benchmark of  $10^{-5}$ , was used to evaluate direct exposure to the calculated BaP equivalent concentrations in soil. Fourteen samples exceeded this threshold, with calculated BaP equivalent concentrations of up to 59,903 µg/kg.

#### **2.4.3 Rum Point Skeet Range - UXO 16**

Potential sources of contamination evaluated at UXO 16 included select metals (antimony, arsenic, copper, lead, tin, and zinc) resulting from bullet accumulations in surface soil at the Range Area and PAHs resulting from clay target accumulations in soil near the Firing Points and in the Shot Fall/Target Area. Surface soil near the Firing Points is also a potential source of nitroglycerin contamination as a result of incomplete consumption of propellant during firing activities.

Summary tables of analytical data collected during the SI are presented in Appendix A.3. For the discrete surface soil samples, the correlation between the on-site XRF and off-site FBL lead data was not statistically acceptable. Consequently, predicted laboratory values for lead were not computed, and the XRF data were considered usable for screening purposes only. The lead results (FBL data only) are depicted on Figure 2-9. Analytical results that exceeded PALs for metals and/or PAHs are depicted on Figure 2-10. Statistical summaries of all detected contaminants are provided in Appendix B.3.

#### **Firing Points**

Results of the composite surface soil sampling conducted near the firing points indicated one exceedance of the PAL for antimony (up to 0.42 mg/kg) and one for lead (up to 48.7 mg/kg). Lead concentrations were less than the human health criterion for residential exposure at both sampling locations. The average lead concentration for this area was 28.9 mg/kg.

## **Shot Fall/Target Area**

Results of the discrete surface soil sampling conducted in the Shot Fall/Target Area indicated exceedances of the PALs for antimony (up to 1.6 mg/kg) and lead (up to 616 mg/kg). The antimony PAL was exceeded at several locations, but concentrations were determined to be consistent with background. The lead PAL was exceeded at all but one location, but the human health criterion for residential exposure was exceeded at only one location. The average lead concentration for this area was 90.9 mg/kg.

Results of the discrete surface soil sampling for seven carcinogenic PAHs were used to calculate BaP equivalent concentrations for comparison to EPA's Regional Screening Levels for residential exposure. Thirteen samples exceeded the threshold value of 150 µg/kg used to evaluate direct exposure, based on a cancer risk management benchmark of  $10^{-5}$ . BaP equivalent concentrations of up to 4,111 µg/kg were calculated for samples in this area.

### **2.4.4 Small Arms (Pistol) Range - UXO 17**

Potential sources of contamination evaluated at UXO 17 include select metals (antimony, arsenic, copper, lead, tin, and zinc) resulting from bullet accumulations in soil at the Firing Line Area and Target Area. Surface soil in the Firing Line Area is also a potential source of nitroglycerin contamination as a result of incomplete consumption of propellant during firing activities.

Summary tables of analytical data collected during the SI are presented in Appendix A.4. For the discrete surface soil samples, the correlation between the on-site XRF and off-site FBL lead data was not statistically acceptable. Consequently, predicted laboratory values for lead were not computed, and the XRF data were considered usable for screening purposes only. The lead results (FBL data only) are depicted on Figure 2-11. Analytical results that exceeded PALs for metals and/or nitroglycerin are depicted on Figure 2-12. Statistical summaries of all detected contaminants are provided in Appendix B.4.

## **Firing Line Area**

In the Firing Line Area, results of the composite surface soil sampling indicated exceedances of the PALs for antimony (up to 1.3 mg/kg), nitroglycerin (up to 20.4 mg/kg), and lead (up to 200 mg/kg). The antimony PAL was exceeded at three locations, but concentrations were determined to be consistent with background. The nitroglycerin PAL was exceeded at three locations. Lead detections at all three locations were greater than the PAL but less than the human health criterion for residential exposure. The average lead concentration for this area was 86.6 mg/kg.

## **Target Area**

In the Target Area, results of the discrete surface soil sampling indicated exceedances of the PALs for antimony (up to 6.0 mg/kg) and lead (up to 706 mg/kg). The antimony PAL was exceeded at five locations. The lead PAL was exceeded at eight locations, and the human health criterion for residential exposure was exceeded at five of those locations. The average lead concentration for surface soil in this area was 314 mg/kg.

Results of the discrete subsurface soil sampling indicated exceedances of the PALs for antimony (up to 1.0 mg/kg), tin (up to 1.5 mg/kg), and lead (up to 132 mg/kg). The antimony PAL was exceeded at five locations: two locations at 1 to 2 feet bgs, one location at 4 to 6 feet bgs, one location at 6 to 8 feet bgs, and one location at 8 to 10 ft bgs. However, the antimony results were determined to be consistent with background. The tin PAL was exceeded at one location at 1 to 2 feet bgs. The lead PAL was exceeded at seven locations, but the human health criterion for residential exposure was not exceeded at any location. The average lead concentration for subsurface soil in this area was 59.6 mg/kg.

### **2.4.5 Roach Road Rifle Range - UXO 25**

Potential sources of contamination evaluated at UXO 25 include select metals (antimony, arsenic, copper, lead, tin, and zinc) resulting from bullet accumulations in soil at the Firing Line Area and Target Area. Surface soil in the Firing Line Area is also a potential source of nitroglycerin contamination as a result of incomplete consumption of propellant during firing activities.

Summary tables of analytical data collected during the SI are presented in Appendix A.5. For the discrete soil samples, the correlation between the on-site XRF and off-site FBL lead data was determined to be statistically acceptable. Consequently, an appropriate regression equation was derived, and the values predicted by this equation were used to supplement the analytical lead data for this site. The lead results, including both the reported FBL data and the predicted concentrations based on XRF results, are depicted on Figure 2-13. Analytical results that exceeded PALs for metals are depicted on Figure 2-14. Statistical summaries of all detected contaminants are provided in Appendix B.5.

## **Firing Line Area**

In the Firing Line Area, results of the composite surface soil sampling indicated no exceedances of any PALs. The average lead concentration for this area was 9.4 mg/kg.

## **Target Area**

In the Target Area, results of the discrete surface soil sampling indicated exceedances of the PALs for antimony (up to 12.2 mg/kg), copper (up to 370 mg/kg), zinc (up to 63.9 mg/kg), and lead (up to

3,450 mg/kg). The antimony PAL was exceeded at nine locations, the copper PAL was exceeded at two locations, and the zinc PAL was exceeded at one location. The lead PAL was exceeded at all locations, and the human health criterion for residential exposure was exceeded at six of those locations. The average lead concentration for surface soil in this area was 349 mg/kg.

## **2.5 STREAMLINED RISK EVALUATION**

This section presents an overview of the human health and ecological risk screening evaluations conducted for the five SASRs.

### **2.5.1 Human Health Risk Screening Evaluation**

A human health risk screening evaluation was conducted as part of the SI (Tetra Tech, 2010). This evaluation provided conservative estimates of potential risk posed to human receptors based on direct contact exposures to measured concentrations of MC in soil at the five SASRs. The tables presented in Appendix B document the selection of soil COPCs for individual subareas at the five SASRs and present the associated calculations of incremental lifetime cancer risks (ILCRs) for carcinogenic COPCs, calculations of non-cancer hazard indices (HIs) for non-carcinogenic COPCs, and comparisons of lead concentrations to EPA risk-based screening levels.

Results of the human health risk screening evaluation were used to identify contaminants of concern (COCs) for the five SASRs. A COPC was reclassified as a human health COC if it contributed to the exceedance of one or more of the following risk management benchmarks:

- ILCR for carcinogenic contaminants:  $10^{-5}$  (equivalent to one excess cancer death in 100,000).
- HI for non-carcinogenic contaminants: 1 (unity).
- Average lead concentration: 400 mg/kg (corresponds to EPA's RSL for residential exposure).

In the evaluation of direct contact exposures to lead, hot spot areas were also considered in the identification of COCs. In subareas where the average lead concentration was less than 400 mg/kg, but one or more discrete locations exhibited evidence of a hot spot (i.e., lead concentration was greater than the non-residential screening level of 800 mg/kg), lead was identified as a COC.

### **MRR - UXO 14**

Human health risk screening results are discussed below for direct exposure to COPCs in site soils based on the results of the Phase 1 SI at UXO 14. Tables documenting the risk screening calculations for this site are provided in Appendix B.1.

### Firing Line Area

For the composite surface soil samples collected from the Firing Line Area, antimony, copper, and nitroglycerin were selected as COPCs for the human health risk screening evaluation. Using the maximum detected concentrations of COPCs in soil, the calculated risks for direct contact exposures for both residential and nonresidential land uses were less than the EPA target level of  $10^{-5}$ , and the calculated HIs for residential and nonresidential land uses were less than the EPA target level of 1. Lead concentrations were less than both the residential and non-residential screening levels. Based on the results of the human health risk screening evaluation, no COCs are identified for this subarea.

### Target Berm 1

For the discrete surface soil samples collected from Target Berm 1, copper and lead were selected as COPCs for the human health risk screening evaluation. These contaminants are not carcinogenic; thus, no cancer risk was calculated. Using the maximum detected concentration of copper in soil, the calculated HIs for direct contact exposures for both residential and nonresidential land uses were less than the EPA target level of 1. The maximum FBL lead concentration (543 mg/kg) was greater than the residential direct contact screening level but less than the non-residential screening level. The average FBL lead concentration for this subarea (222 mg/kg) was less than both screening levels, indicating that lead does not pose a potential human health risk. Based on the results of the human health risk screening evaluation, no COCs are identified for this subarea.

### Target Berm 2

For the discrete surface soil samples collected from Target Berm 2, copper and lead were selected as COPCs for the human health risk screening evaluation. These contaminants are not carcinogenic; thus, no cancer risk was calculated. Using the maximum detected concentration of copper in soil, the calculated HIs for direct contact exposures for both residential and nonresidential land uses were less than the EPA target level of 1. The maximum FBL lead concentration (606 mg/kg) was greater than the residential screening level but less than the non-residential screening level. The average FBL lead concentration for this subarea (288 mg/kg) was less than both screening levels, indicating that lead does not pose a potential human health risk. Based on the results of the human health risk screening evaluation, no COCs are identified for this subarea.

### Hillside Impact Area

For the discrete surface soil samples collected from the Hillside Impact Area, copper and lead were selected as COPCs for the human health risk screening evaluation. These contaminants are not

carcinogenic; thus, no cancer risk was calculated. Using the maximum detected concentration of copper in soil, the calculated HIs for direct contact exposures for both residential and nonresidential land uses were less than the EPA target level of 1. The maximum FBL lead concentration (904 mg/kg) was greater than both the residential and non-residential screening levels. The average FBL lead concentration for this subarea (316 mg/kg) was less than both screening levels; however, XRF data from numerous locations exceeded one or both screening levels, confirming the presence of hot spots. Thus, lead is considered a COC in the surface soil.

For the discrete subsurface soil samples collected from the Hillside Impact Area, copper and lead were selected as COPCs for the human health risk screening evaluation. These contaminants are not carcinogenic; thus, no cancer risk was calculated. Using the maximum detected concentration of copper in soil, the calculated HIs for direct contact exposures for both residential and nonresidential land uses were less than the EPA target level of 1. The maximum FBL lead concentration (6,620 mg/kg) was greater than both the residential and non-residential screening levels. The average FBL lead concentration for this subarea (2,990 mg/kg) was also greater than both screening levels, confirming that lead poses a potential human health risk and, thus, should be considered a COC in the subsurface soil.

#### **OSTR - UXO 15**

Human health risk screening results are discussed below for direct exposure to COPCs in site soil based on results of the Phase 1 SI at UXO 15. Tables documenting the risk screening calculations for this site are provided in Appendix B.2.

#### Firing Points

For the composite surface soil samples collected from the Firing Points, antimony and nitroglycerin were selected as COPCs for the human health risk screening evaluation. Using the maximum detected concentrations in soil, the calculated risks for direct contact exposures for both residential and nonresidential land uses were less than the EPA target level of  $10^{-5}$ , and the calculated HIs for residential and nonresidential land uses were less than the EPA target level of 1. Lead concentrations were less than both the residential and non-residential screening levels. Based on the results of the human health risk screening evaluation, no COCs are identified for this subarea.

#### Shot Fall/Target Area

For the discrete surface soil samples collected from the Shot Fall/Target area, antimony, lead, and a number of PAHs were selected as COPCs for the human health risk screening evaluation. Using the maximum detected concentrations of carcinogenic PAHs in soil, the calculated risks for direct contact

exposures for both residential and nonresidential land uses exceeded the EPA target level of  $10^{-5}$ . Using the maximum detected concentration of antimony in soil, the calculated HIs for residential and nonresidential land uses were less than the EPA target level of 1. The maximum FBL lead concentration (940 mg/kg) was greater than both the residential and non-residential screening levels. The average FBL lead concentration for this subarea (320 mg/kg) was less than both screening levels; however, XRF data from three distinct areas exceeded one or both screening levels, confirming the presence of hot spots. Based on the results of the human health risk screening evaluation, six carcinogenic PAHs and lead are identified as COCs in the surface soil.

For the discrete subsurface soil samples collected from the Shot Fall/Target area, no contaminants met the COPC selection criteria. Consequently, no human health risk screening evaluation was conducted and, thus, no COCs are identified for the subsurface soil.

### **RPSR - UXO 16**

Human health risk screening results are discussed below for direct exposure to COPCs in site soil based on results of the Phase 1 SI at UXO 16. Tables documenting the risk screening calculations for this site are provided in Appendix B.3.

#### Firing Points

For the composite surface soil samples collected from the Firing Points, antimony was the only COPC selected for the human health risk screening evaluation. Using the maximum detected concentration of antimony in soil, the calculated HIs for residential and nonresidential land uses were less than the EPA target level of 1. Lead concentrations were less than both the residential and non-residential screening levels. Based on the results of the human health risk screening evaluation, no COCs are identified for this subarea.

#### Shot Fall/Target Area

For the discrete surface soil samples collected from the Shot Fall/Target Area, lead and a number of PAHs were selected as COPCs for the human health risk screening evaluation. Using the maximum detected concentrations of carcinogenic PAHs in soil, the calculated risks for direct contact exposures for both residential and non-residential land uses exceeded the EPA target level of  $10^{-5}$ . Using the maximum detected concentration of non-carcinogenic PAHs in soil, the calculated HIs for residential and nonresidential land uses were less than the EPA target level of 1. Based on the results of the human health risk screening evaluation, three carcinogenic PAHs are identified as COCs for this subarea.

One FBL lead concentration (616 mg/kg) was greater than the residential screening level but less than the non-residential screening level. The average FBL lead concentration for this subarea (90.9 mg/kg) was less than both screening levels. XRF data from two locations slightly exceeded the residential screening level but did not suggest the presence of hot spots. Due to the lack of statistically acceptable correlation between the XRF and FBL results for this site, conclusions based on XRF data are uncertain. However, based on the single FBL exceedance of the residential screening level and the apparent lack of hot spots, lead is not identified as a COC for this subarea.

### **SAPR - UXO 17**

Human health risk screening results are discussed below for direct exposure to COPCs in site soils based on the results of the Phase 1 SI at UXO 17. Tables documenting the risk screening calculations for this site are provided in Appendix B.4. (Note: Due to the visible sloughing of soil from the face of the backstop berm in the Target Area, soil from 0 to 4 feet bgs was considered to be "surface soil" along the base of the berm.)

#### Firing Line Area

For the composite surface soil samples collected from the Firing Line Area, nitroglycerin was the only COPC selected for the human health risk screening evaluation. Using the maximum detected concentrations of nitroglycerin in soil, the calculated risks for direct contact exposures for both residential and nonresidential land uses were less than the EPA target level of  $10^{-5}$ . The calculated HI exceeded the EPA target level of 1 for residential land use but not for non-residential land use. Lead concentrations were less than both the residential and non-residential screening levels. Based on the results of the human health risk screening evaluation, only nitroglycerin is identified as a COC for this subarea.

#### Target Area

For the discrete surface soil samples collected from the Target Area, antimony and lead were selected as COPCs for the human health risk screening evaluation. These contaminants are not carcinogenic; thus, no cancer risk was calculated. Using the maximum detected concentration of antimony in soil, the calculated HIs for residential and nonresidential land uses were less than the EPA target level of 1. The maximum FBL lead concentration (706 mg/kg) was greater than the residential screening level but not the non-residential screening level. The average FBL lead concentration for this subarea (314 mg/kg) was less than both screening levels. XRF data from several locations exceeded one or both screening levels, suggesting the possible presence of hot spots. However, due to the lack of statistically acceptable correlation between the XRF and FBL results for this site, conclusions based on XRF data are uncertain.

Based on the results of the human health risk screening evaluation, and considering the uncertainty associated with XRF results, lead is identified as a COC in the surface soil.

For the discrete subsurface soil samples collected from the Target Area, no contaminants met the COPC selection criteria. Consequently, no human health risk screening evaluation was conducted and, thus, no COCs are identified for the subsurface soil.

### **RRRR - UXO 25**

Human health risk screening results are discussed below for direct exposure to COPCs in site soils based on the results of the Phase 1 SI at UXO 25. Tables documenting the risk screening calculations for this site are provided in Appendix B.5.

#### Firing Line Area

For the composite subsurface soil samples collected from the Firing Line Area, no contaminants met the COPC selection criteria. Consequently, no human health risk screening evaluation was conducted and, thus, no COCs are identified for this subarea.

#### Target Area

For the discrete surface soil samples collected from the Target Area, antimony, copper, and lead were selected as COPCs for the human health risk screening evaluation. These contaminants are not carcinogenic; thus, no cancer risk was calculated. Using the maximum detected concentrations of antimony and copper in soil, the calculated HIs for direct contact exposures for both residential and nonresidential land uses were less than the EPA target level of 1. The maximum FBL lead concentration (3,450 mg/kg) was greater than both the residential and non-residential screening levels. The average FBL lead concentration for this subarea (349 mg/kg) was less than both screening levels; however, XRF data from numerous locations exceeded one or both screening levels, confirming the presence of hot spots. Thus, lead is considered a COC in the surface soil.

### **2.5.2 Ecological Risk Screening Evaluation**

An ecological risk assessment (ERA) screening was conducted as part of the SI (Tetra Tech, 2010). This evaluation provided conservative estimates of potential risk posed to ecological receptors based on direct contact and food chain exposures to measured concentrations of MC in soil at the five SASRs. The evaluation included a comparison of maximum measured concentrations to screening level and threshold toxicity values, as well as the calculation of ecological effects quotients (EEQs) for contaminants with concentrations that exceeded those values. For chemicals retained as COPCs based on maximum

exposure assumptions, the model input parameters were refined to reflect more realistic assumptions that focused the evaluation only on chemicals posing the greatest risk. Tables documenting the ERA screening for each site are included in Appendix C.

Results of the ERA screening were used to identify COPCs for each site and determine whether further information was necessary to fully evaluate ecological risk to site receptors. For soil contaminants, the assessment endpoints (i.e., site receptors) included terrestrial plants and invertebrates, as well as wildlife (e.g., mammals and birds). The conclusions of the ERA screening at each site are discussed below for each of these receptor groups.

### **MRR - UXO 14**

Results of the ERA screening for UXO 14 indicate that potentially unacceptable risks may exist due to exposure of terrestrial plants, invertebrates, and/or wildlife to copper, lead, and tin in soil.

#### Terrestrial Plants and Invertebrates

Maximum concentrations exceeded the copper screening level for risk to invertebrates in surface soil from Target Berm 1, Target Berm 2, and the Hillside Impact Area samples; therefore, copper was retained as a soil COPC. Maximum XRF concentrations exceeded the lead screening level for risk to invertebrates in surface soil from the Hillside Impact Area samples; therefore, lead was retained as a soil COPC. Maximum copper and lead concentrations exceeded their respective screening levels for risk to plants in surface soil from Target Berm 1, Target Berm 2, and the Hillside Impact Area samples; therefore, copper and lead were retained as soil COPCs. Tin was retained as a COPC for plants from the Hillside Impact Area because maximum concentrations of tin exceeded the screening level in the discrete soil samples. Nitroglycerin was eliminated as a soil COPC for invertebrates and plants because it was infrequently detected.

#### Mammals and Birds

Copper and lead were retained as soil COPCs for terrestrial wildlife because these contaminants are related to site activities, and observed concentrations resulted in ecological effects quotients (EEQs) greater than 1.0 in the food chain model.

### **OSTR - UXO 15**

Results of the ERA screening for UXO 15 indicate that potentially unacceptable risks may exist due to exposure of terrestrial plants, invertebrates, and/or wildlife to PAHs, nitroglycerin, antimony, and lead in soil.

### Terrestrial Plants and Invertebrates

Several PAHs were detected at concentrations in soil that exceeded invertebrate and plant screening levels. Because of the high concentrations of the PAHs and their high frequency of detection, PAHs were retained as soil COPCs. Lead concentrations exceeded the screening level for risk to plants; therefore, lead was retained as a soil COPC. Nitroglycerin was not eliminated as a COPC for risks to plants and invertebrates because although toxicity data are not available, it was detected in the two composite soil samples.

### Mammals and Birds

PAHs, antimony, and lead were retained as soil COPCs for terrestrial wildlife because these contaminants are related to site activities, and observed concentrations resulted in EEQs greater than 1.0 in the food chain model.

### **RPSR - UXO 16**

Results of the ERA screening for UXO 16 indicate that potentially unacceptable risks may exist due to exposure of terrestrial plants and wildlife to lead in soil. Potential risks were acceptable for terrestrial invertebrates.

### Terrestrial Plants and Invertebrates

Lead was retained as a soil COPC for terrestrial plants because it was detected at concentrations that exceeded the screening level.

### Mammals and Birds

Lead was retained as a soil COPC for terrestrial wildlife because it is related to site activities, and observed concentrations resulted in EEQs greater than 1.0 in the food chain model.

### **SAPR - UXO 17**

Results of the ERA screening for UXO 17 indicate that potentially unacceptable risks may exist due to exposure of terrestrial plants, invertebrates, and/or wildlife to nitroglycerin, antimony, and lead in soil.

### Terrestrial Plants and Invertebrates

Nitroglycerin was retained as a soil COPC for terrestrial invertebrates and plants because it was detected in three samples and no screening levels were available. Lead was retained as a soil COPC for terrestrial plants because it was detected at concentrations that exceeded screening levels.

### Mammals and Birds

Antimony and lead were retained as soil COPCs for terrestrial wildlife because these contaminants are related to site activities, and observed concentrations resulted in EEQs greater than 1.0 in the food chain model.

### **RRRR - UXO 25**

Results of the ERA screening for UXO 25 indicate that potentially unacceptable risks may exist due to exposure of terrestrial plants, invertebrates, and/or wildlife to copper, antimony and lead in soil.

### Terrestrial Plants and Invertebrates

Copper and lead were retained as soil COPCs for terrestrial invertebrates because they were detected at concentrations that exceeded screening levels. Antimony, copper, and lead were retained as soil COPCs for terrestrial plants because they were detected at concentrations that exceeded screening levels.

### Mammals and Birds

Antimony and lead were retained as soil COPCs for terrestrial wildlife because these contaminants are related to site activities, and observed concentrations resulted in EEQs greater than 1.0 in the food chain model.

### **2.5.3 Conceptual Site Models**

Based on results of the site characterizations and risk screening evaluations, the conceptual site models (CSMs) for the five SASRs were updated, as shown on Figures 2-15 to 2-19. The updated CSM figures illustrate the potential exposure sources, pathways, human and ecological receptors under both current and hypothetical future land uses for each site. Potential human and ecological risks are characterized for receptors exposed to the potentially contaminated environmental media where unacceptable human and/or ecological risks may exist.

## 2.6 CONCLUSIONS

Site-specific COCs have been identified for individual subareas of each site, as shown in Table 2-1, based on results of the risk evaluations presented in this EE/CA.

**Table 2-1 Contaminants of Concern**

| Site          | Subarea                   | COC <sup>1</sup>  |                 |
|---------------|---------------------------|-------------------|-----------------|
|               |                           | Surface Soil      | Subsurface Soil |
| MRR - UXO 14  | Hillside Impact Area      | Lead              | Lead            |
| OSTR - UXO 15 | Firing Points/Target Area | PAHs              | --              |
|               | NW Shot Fall Area         | Lead              | --              |
|               | NE Shot Fall Area         | Lead              | --              |
| RPSR - UXO 16 | Firing Points/Target Area | PAHs              | --              |
| SAPR - UXO 17 | Firing Line Area          | Nitroglycerin     | --              |
|               | Target Area               | Lead <sup>2</sup> | --              |
| RRRR - UXO 25 | Target Area               | Lead              | --              |

<sup>1</sup> COCs include contaminants that are present at concentrations that pose unacceptable risks to potential human health and ecological receptors. Contaminants discussed in the text as COCs based on results of the ecological risk evaluation only are not included on this list of COCs, but are addressed in Section 3.4 and Appendix E.

<sup>2</sup> Due to the visible evidence of soil sloughing from the face of the backstop berm in the UXO 17 Target Area, "surface soil" was considered to be soil from 0 to 4 feet bgs along the base of the berm.

The COCs shown in Table 2-1, which are associated with historical site operations at the five SASRs, are present at concentrations that pose unacceptable risks to potential human health and ecological receptors. These risks must be mitigated to ensure long-term protectiveness and prevent potential migration of contaminants to adjacent properties.

### 3.0 IDENTIFICATION OF REMOVAL ACTION OBJECTIVES

Removal action objectives are developed to guide the removal action and ensure that it complies with regulatory requirements. This section identifies the statutory limits, applicable or relevant and appropriate requirements (ARARs), RAOs, removal action scope, and proposed schedule that pertain to this removal action.

#### 3.1 STATUTORY LIMITS ON REMOVAL ACTION

The Navy, as the lead agency for cleanup of the five SASRs, has determined that a NTCRA is the appropriate response to contaminated soils at these sites. This determination was based on the relatively stable condition of the sites and the available planning period prior to implementation of the response. The NCP (40 CFR 300.415) dictates statutory limits of \$2 million and 12 months for EPA fund-financed removal actions, with statutory exemptions for emergencies and actions consistent with the removal action to be taken. However, the removal action evaluated in this EE/CA will not be EPA fund-financed, and the Navy MRP does not impose prescribed limits on cost or duration of removal actions. Thus, no statutory limits apply.

#### 3.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

ARARs are used to develop criteria by which removal action objectives and removal action technologies can be established. The definition of ARARs, as presented in the NCP, is as follows:

- **Applicable** requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal environmental or state environmental laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be considered as applicable requirements.
- **Relevant and appropriate** requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal environmental or state environmental laws that, although not applicable to a hazardous substance, a pollutant, a contaminant, a remedial action, or other circumstances at a CERCLA site, address problems or situations sufficiently similar to those encountered at a CERCLA site so that their use is well suited to the particular site.

ARARs can include any promulgated standard, requirement, criterion, or limitation under a state environmental or facility-siting law that is more stringent than the associated federal standard, requirement, criterion, or limitation.

ARARs are classified into three broad categories, based on the manner in which they are applied during a removal action. These categories are as follows:

- Chemical-Specific: Chemical-specific ARARs are health or risk management-based numbers or methodologies that result in the establishment of numerical values for a given media that would meet the NCP “threshold criterion” of overall protection of human health and the environment. These requirements generally set protective cleanup concentrations for the chemicals of concern in the designated media, or set safe concentrations of discharge for remedial activity. Chemical-specific ARARs may be concentration-based cleanup goals (CGs) or may provide the basis for calculating such levels. In cases where no chemical-specific ARAR exists, chemical advisories may be used to develop removal objectives.
- Location-Specific: Location-specific ARARs are considered in view of natural or manmade site features. These ARARs are intended to limit activities within designated areas.
- Action-Specific: Action-specific ARARs pertain to the implementation of a given remedy. These ARARs control or restrict hazardous substance-related or pollutant-related activities. These controls are considered when specific removal activities are planned for a site.

In addition to ARARs, other regulations and guidance may be classified as "To Be Considered" (TBC). TBCs are non-promulgated, non-enforceable guidelines or criteria that may aid in the development and evaluation of removal action alternatives and in the establishment of CGs.

Presumptive remedies have been developed on the federal level as preferred technologies for common categories of sites. EPA's Office of Solid Waste and Emergency Response (OSWER) has developed a series of directives describing these remedies and anticipates their use at all appropriate sites except under unusual site-specific circumstances. While the OSWER directives are national in scope and do not take into account all possible regulatory requirements, presumptive remedies are expected to be carried out in accordance with federal and state ARARs.

Chemical-, location-, and action- specific ARARs for the five SASRs are discussed in the subsections that follow.

### 3.2.1 Chemical-Specific ARARs

This section presents the federal and state chemical-specific TBC criteria that pertain to the removal action at the five SASRs. There are no chemical-specific ARARs associated with the COCs identified in this EE/CA. The TBC criteria, which are summarized on Table 3-1, provide medium-specific guidance on "acceptable" or "permissible" concentrations of contaminants.

Regional Screening Levels (RSLs) for the protection of human health and impacts to groundwater from soil contaminants were developed by Oak Ridge National Laboratory (ORNL) under an Interagency Agreement with EPA. These concentrations are calculated for a Target Hazard Quotient (THQ) of 1.0 for non-carcinogenic effects and a Target Risk (TR) of  $10^{-6}$  for carcinogenic effects. The primary use of RSLs is for chemical screening during baseline risk assessments. The RSL table should be used in the selection of COPCs for the purposes of quantitative risk assessment. The levels are not enforceable, nor do they have official status as guidance. EPA Region 3 stresses that these levels should generally not be used to: "(1) set cleanup or no-action levels at CERCLA sites or Resource Conservation and Recovery Act (RCRA) Corrective Action sites, (2) substitute for EPA guidance for preparing baseline risk assessments, or (3) determine if a waste is hazardous under RCRA." The RSL values are not typically used as cleanup levels. Rather, cleanup levels are determined on a case-by-case basis, in accordance with the criteria listed in the NCP.

According to EPA Region 3, RSLs would likely be protective as "no-action" levels or CGs if the following criteria are met on a site-specific basis:

- A single medium is contaminated
- A single contaminant contributes nearly all of the health risk
- Volatilization or leaching of that contaminant from soil is expected not to be significant
- The exposure scenarios used in the RSLs table are appropriate for the site
- The fixed risk levels used in the RSLs table are appropriate for the soil
- Risk to ecological receptors is expected not to be significant

Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (August 1994) recommends screening levels for lead in soil for residential land use (400 parts per million [ppm]), describes how to develop site-specific preliminary remediation goals (PRGs) at CERCLA sites and media cleanup standards at RCRA Corrective Action facilities for residential land use, and describes a plan for soil lead cleanup at CERCLA sites and RCRA Corrective Action Facilities that have multiple sources of lead. The guidance presumes that risks due to lead will be addressed through remediation using excavation to meet the CG.

### 3.2.2 Location-Specific ARARs

Location-specific ARARs and TBC criteria may result in restrictions on removal action activities depending on the characteristics of a site or its immediate surroundings. The location-specific ARARs discussed in this section are summarized in Table 3-2.

The Bald and Golden Eagle Protection Act (USC 668) requires project activities to protect and preserve eagle habitat. Per the USFWS Biological Opinion (August 2007), construction activities at NSF-IH will be limited to a time of year that will not impact Bald Eagle nesting. UXO 16 is within the 750-foot arc surrounding a designated potential Bald Eagle nest. UXO 17 is on the edge of an arc potentially within line of site. Site survey (and work approval) will be conducted at UXO16 and UXO17 by the NSF-IH Environmental Department to determine whether any Bald Eagles or potential nesting areas are present prior to beginning removal activities.

The Endangered Species Act (50 CFR 17.21(c), 17.31(a)). This Act is intended to protect and, if possible, restore species of animals and plants that are endangered or threatened with extinction. The corresponding federal code requires construction project consultation with the U.S. Department of Interior, the U.S. Fish and Wildlife Service, and/or the National Marine Fisheries Service to determine whether the action could jeopardize the continued existence of any threatened or endangered species or result in the destruction of critical habitat for such species. To ensure that no endangered species or threatened species inhabit the five SASRs, state natural resources officials should be consulted prior to performing the removal action.

Protection of Wetlands. Executive Order 11990 Section 7 provides for consideration of wetlands during remedial actions. Under this Order, federal agencies are required to minimize the destruction, loss, or degradation of wetlands and enhance the natural and beneficial values of wetlands. If no practicable alternative exists to a removal action that may adversely affect a wetland, impacts from implementation of the remedy must be mitigated. Wetlands could be affected by activities at UXO 14 and UXO 16.

Floodplain Management. Executive Order 11988 Section 2(a)(2) requires federal agencies to develop procedures that consider potential flood hazards and floodplain management criteria when undertaking a project in a floodplain area, and to avoid floodplain impacts to the fullest extent possible. Some areas of UXO 14 and UXO 15 are located within a 100-year floodplain.

National Historic Preservation Act (36 CFR 800.3 – 800.6). This Act is intended to preserve sites (or portions thereof) with archaeological and historic significance. The corresponding federal code requires consultation with appropriate agencies to identify historic properties potentially affected by the site activities, assess the effects, and seek ways to avoid, minimize, or mitigate adverse effects on historic

properties. Some areas of UXO 14, UXO 15, UXO 16, and UXO 17 overlap with archaeologically significant areas.

Migratory Bird Treaty Act (16 USC 703(a)). This Act is intended to protect birds that have common migration patterns among the United States, Canada, Mexico, Japan, and the former Soviet Union. The Act makes it illegal to "kill...any migratory bird," or disturb nests or eggs, except as stated otherwise by the Act. The corresponding federal code controls the harvest of such birds by establishing hunting seasons, bag limits, and methods of harvest. To determine whether any birds and nesting areas are present, site surveys should be conducted prior to commencing removal activities.

MDE Nontidal Wetlands Protection Act (COMAR 26.23.02.01, 26.23.02.04, 26.23.03.01-02, 26.23.04.02, and 26.23.04.03). This Act requires that nontidal wetlands disturbance due to regulated activities (such as excavation or dredging of soil, changing drainage characteristic or water levels, filling, grading, or destruction of plant life) must be mitigated. However, certain activities defined in the regulations, depending on location, extent, and type of activity are exempt. Adverse impacts and losses of nontidal wetlands during removal activities will be avoided.

MDE Tidal Wetlands Protection Act (COMAR 26.24.01.02, 26.24.02.01B, 26.24.03.02, 26.24.03.05, 26.24.03.06, and 26.24.05.01). This act requires that tidal wetlands disturbance due to filling, draining, excavating, dredging, constructing structures within, or destroying the vegetation, tidal flow patterns or altering the natural and beneficial character of the wetlands must be mitigated. Adverse impacts and losses of tidal wetlands during removal activities will be avoided.

MDE Endangered Species Act (COMAR 08.03.08.01, 08.03.08.03, 08.03.08.04, 08.03.08.05, 08.03.08.06, 08.03.08.07, and 08.03.08.08). This Act requires that threatened and endangered species of plants and animals (as defined by Maryland) and their critical habitats must be conserved. An action may not reduce the likelihood of either survival or recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of a listed species or otherwise adversely affect a listed species.

### **3.2.3 Action-Specific ARARs**

Action-specific ARARs and TBC criteria may set controls or restrictions on particular types of activities considered as part of the removal action. The action-specific ARARs discussed in this section are summarized in Table 3-3.

Management of Remediation Waste Under RCRA - Area of Contamination Policy (EPA 530-F-98-026). This Policy allows wastes to be consolidated and treated in-situ within an Area of Contamination (AOC) without triggering RCRA waste management, land disposal restrictions, or minimum technology

requirements. An AOC would be defined for each site so that contaminated material can be consolidated within the site boundaries prior to characterization, then treated in-situ (if necessary) prior to off-site disposal.

National Pollutant Discharge Elimination System (NPDES) permit requirements (40 CFR 122.26(b) and (c)). The corresponding federal code regulates the discharge of pollutants from any point source into U.S. waters. It may be necessary for removal actions to control and manage storm water during construction activities (including clearing, grading, and excavating) that result in land disturbance of equal to or greater than 1 acre.

MDE Hazardous Waste Management System (COMAR 26.13.03.02, 26.13.03.03, 26.13.03.04, and 26.13.03.05). These state regulations include requirements for generators of hazardous waste. COMAR 26.13.02 identifies those solid wastes that are subject to regulation as hazardous wastes. COMAR 26.13.03 provides standards for generators of hazardous waste who treat, store, or dispose of hazardous wastes on-site.

MDE Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities - Military Munitions (COMAR 26.13.10.27). These state regulations identify when military munitions become solid waste and, if hazardous, how they are managed. Munitions found on a range may be consolidated within the range boundaries prior to characterization and off-site disposal.

MDE Water Pollution Control permit requirements (COMAR 26.08.04.09). These state regulations govern the discharge of pollutants in storm water from construction activities (including clearing, grading, and excavating) that result from land disturbance of equal to or greater than 1 acre.

MDE Water Pollution Control permit requirements (COMAR 26.08.02.02-1, 26.08.02.03, 26.08.02.03-1, 26.08.02.03-2, 26.08.02.03-3, 26.08.02.03-4, 26.08.02.04-1, 26.08.02.05, 26.08.02.09, and 26.08.03). These state regulations govern discharge requirements from contaminated construction sites equal to or greater than 1 acre where the requirements of a general permit for discharge of storm water from construction activity is not sufficient. In addition to meeting requirements for suspended solids, discharges of contaminants not typically found at construction sites must be controlled.

MDE Storm Water Management and Erosion and Sediment Control (COMAR 26.17.01.05, 26.17.01.07B, 26.17.01.07C, 26.17.01.11, 26.17.02.06, 26.17.02.08, and 26.17.02.09). Regulations in COMAR 26.17.01 describe erosion and sediment controls requirements for all grading and earth disturbances, except for areas less than 5,000 square feet or soil volumes less than 100 cubic yards. Regulations in

COMAR 26.17.02 describe storm water management requirements for development of land that alters the run-off characteristics of the land, except for areas less than 5,000 square feet.

MDE Erosion and Sedimentation Control (COMAR 26.17.01.11). These state regulations provide minimum standards for reducing losses from erosion and sedimentation during earth-moving activities. Basic controls and site stabilization measures must be taken when a project involves filling, displacing, or exposing earthen material. These regulations are applicable to all earth-moving activities (e.g., excavation, stockpiling, backfilling with clean borrow soils, etc.) that may be part of the removal action.

MDE General Emission Standards, Prohibitions, and Restrictions (COMAR 26.11.06.03D). These state regulations provide standards for emission of particulate matter. Fugitive emissions of particulate matter from excavation, loading, stockpiling, and backfilling must be controlled.

### **3.3 REMOVAL ACTION OBJECTIVES**

The RAOs for the removal action at the five SASRs are as follows:

- Mitigate potential human health risks due to direct exposure to lead, PAHs, and nitroglycerin contamination in soil;
- Mitigate the potential erosion of contaminated soil, transport of contaminants, and subsequent exposure; and
- Ensure that post-removal action conditions provide an acceptable level of protection for ecological receptors against direct exposure and exposure via the food chain to lead, collocated metals, nitroglycerin, and PAHs in soil.

The objectives can be met by removal of the contaminated soils from each site.

### **3.4 REMOVAL ACTION SCOPE**

The Navy's objective is unrestricted land use at the five SASRs. Cleanup goals were developed for the soil COCs based on chemical-specific ARARs (see Table 3-1) with a consideration of background concentrations derived for the NSF-IH installation in 2002 (Tetra Tech, 2002). In addition, the Partnering Team agreed that the CGs for carcinogenic COCs should reflect a cancer risk threshold of  $10^{-5}$ , which is the midpoint of the EPA acceptability range of  $10^{-4}$  to  $10^{-6}$ . Table 3-4 presents the resulting contaminant-specific soil CGs for the five SASRs.

The scope of this removal action is to remove the lead-, PAH-, and nitroglycerin-contaminated soils that exceed CGs at each subarea of the five SASRs. For PAHs and nitroglycerin, the removal scope includes

all areas where soil concentrations measured during the SI were greater than the CGs. This is consistent with the methodology used to evaluate human health risks for these contaminants, and ensures that all soils posing unacceptable risk due to exposure to PAHs and nitroglycerin are removed.

To determine the necessary removal action scope for lead-contaminated soils, however, arithmetic mean lead concentrations were used. This is consistent with the methodology used to evaluate both human health and ecological risks due to exposure to lead (and collocated metals). Of the individual subareas at each of the five sites, only the Hillside Impact Area at UXO 14 exhibited an average lead concentration in surface soils that exceeded the EPA threshold for residential land use (i.e., 400 mg/kg), indicating that soil from this subarea must be remediated for lead. In addition, the non-homogeneous distribution of lead associated with bullet accumulations and the observed presence of lead hot-spots within the Target Areas of UXO 15, UXO 17, and UXO 25 (i.e., discrete locations where lead concentrations exceeded 800 mg/kg), indicate that these subareas must also be remediated for lead.

The CGs for lead, PAHs, and nitroglycerin were used to define the initial limits of excavation at the five SASRs based on the soil data collected during the SI. Figures 2-4, 2-5, and 2-6 show the initial limits of excavation at UXO 14 (Marine Rifle Range); Figures 2-7 and 2-8 show the initial limits of excavation at UXO 15 (Old Skeet and Trap Range); Figures 2-9 and 2-10 show the initial limits of excavation at UXO 16 (Rum Point Skeet Range); Figures 2-11 and 2-12 show the initial limits of excavation at UXO 17 (Small Arms [Pistol] Range); and Figures 2-13 and 2-14 show the initial limits of excavation at UXO 25 (Roach Road Rifle Range). Actual limits of excavation may be revised during the removal action, as necessary to ensure that confirmation sampling results demonstrate attainment of the CGs.

The initial limits of excavation were used to estimate the quantities of soil that must be removed at each site to meet the specified CGs. Estimated soil quantities designated for removal are summarized in Table 3-5. The assumptions and calculations that provide the basis for these quantities are presented in Appendix D. It is estimated that a total of 8,809 cubic yards (cy) (equivalent to 13,081 tons) of contaminated soil will be excavated during the removal action.

The RAOs described in Section 3.3 will be achieved through removal of contaminated soil from within the initial limits of excavation and replacement with clean backfill that contains background concentrations of contaminants. By removing soil that exceeds the CGs, potential human health risks will be mitigated; and by removing contaminated soil permanently from the sites, the potential for future migration of contaminants and subsequent exposure will be mitigated. By replacing contaminated soil with clean backfill, site conditions following the completion of the removal action will provide an acceptable level of protection for ecological receptors, as described in the Post-Removal Action Ecological Risk Evaluation presented in Appendix E.

### **3.5 REMOVAL ACTION SCHEDULE**

This EE/CA will be placed in the Administrative Record, and notice of its availability for public review will be published in local newspapers along with a brief summary of its contents. The EE/CA will then be subjected to a 30-day public comment period. A public information session will be held during or immediately following the public comment period, if requested. If significant comments are received, a Responsiveness Summary will be prepared and attached to the Action Memorandum, which will be included in the NSF-IH Administrative Record. Following the finalization of the EE/CA and Action Memorandum, the Remedial Action Work Plan (RAWP) will be prepared.

Since this removal action has been designated non-time-critical, the start date is dependent on factors other than the urgency of the threat, including the time necessary to receive regulatory approval and public review of the EE/CA, the availability of adequate funding and contracting capacity, and the time required to develop and receive approval of the RAWP. Once the planning process is complete, the removal action can be implemented. Section 4 of this EE/CA identifies two alternatives that can be implemented to achieve the removal action objectives. The preferred alternative (Alternative 3) will require approximately 5 months to complete at all five sites. Because this alternative permanently removes all soil that poses an unacceptable risk, no follow-on actions such as long-term administrative controls or operation and maintenance activities are necessary.

A formal project schedule will be developed as part of the removal action decision document (i.e., Action Memorandum) and RAWP.

## **4.0 IDENTIFICATION AND ANALYSIS OF REMOVAL ACTION ALTERNATIVES**

This section identifies general response actions applicable to the five SASRs and describes the development and evaluation of specific alternatives based on these actions that could be implemented to achieve the removal action objectives presented in Section 3.

### **4.1 GENERAL RESPONSE ACTIONS**

General response actions are broad classes of responses or remedies that can be applied to meet the stated RAOs. Each action is intended to address specific constituents and possible migration pathways. Although an individual action may be capable of meeting a particular objective, combinations of actions may be more cost-effective in meeting all of the objectives.

The general response actions listed below were identified as being potentially applicable for the lead-, PAH-, and nitroglycerin-contaminated soils at the five SASRs:

- Excavation of contaminated soil
- Disposal of excavated waste
- Treatment of characteristic waste

As shown in Table 4-1, other response actions were considered for applicability to these sites. However, only technologies that contribute toward the Navy's objective of unrestricted land use were retained for evaluation in the EE/CA. General response actions that could be used to address the COCs identified for these sites but that would not achieve the goal of unrestricted release (e.g., institutional controls, source containment, on-site disposal) were rejected during the screening process and are not components of the removal action alternatives evaluated.

### **4.2 DEVELOPMENT OF ALTERNATIVES**

Based on the general response actions retained during the screening process (see Table 4-1), the following three removal action alternatives have been developed for the five SASRs:

- Alternative 1: No Action
- Alternative 2: Excavation and Off-Site Disposal
- Alternative 3: In-Situ Treatment, Excavation, and Off-Site Disposal

These alternatives are described below.

#### **4.2.1 Alternative 1 - No Action**

Alternative 1 consists of no action. As outlined in CERCLA guidance (EPA, 1988), when developing removal alternatives, the “no action” response is evaluated to provide a comparative baseline against which other alternatives can be assessed. Under this alternative, the contaminated media would be left in place, without the application of land use controls (e.g., deed restrictions), construction of access controls (e.g., physical barriers), or implementation of containment, removal, treatment, or other mitigation measures to reduce the potential for future exposure to site contaminants. Because no removal action would be implemented, site conditions would be unchanged and long-term risks due to exposure to site contamination would remain the same as described in Section 2.5.

#### **4.2.2 Alternative 2 - Excavation and Off-Site Disposal**

Alternative 2 would involve the excavation of lead-, PAH-, and nitroglycerin-contaminated soils from the five SASRs followed by the off-site disposal of excavated wastes at appropriate disposal facilities. This alternative consists of the following major components: site preparation, UXO escort, cultural resources escort, waste characterization, soil excavation, confirmation sampling, off-site waste disposal, and site restoration. Prior to the commencement of work, a RAWP would be developed that would include details of the removal action design along with a Health and Safety Plan (HASP), Sampling and Analysis Plan (SAP), and Erosion and Sediment Control Plan (ESCP). In addition, the Comprehensive Work Approval Process (CWAP) would be completed to ensure that potential interactions with installation resources are considered and that work activities are coordinated with and approved by the appropriate installation contacts.

##### **Site Preparation**

Site preparation includes mobilization and setup of support facilities, utility clearance surveys, vegetation removal, temporary road construction, and establishment of soil erosion and sediment controls. Equipment and support facilities (e.g., excavators, loaders, office trailer, storage containers, sanitary facilities, etc.) would be mobilized to the site and set up or staged at approved locations. Utility clearance surveys, vegetation removal, and temporary road construction would be conducted where necessary to expose or provide access to the areas marked for excavation (see Figures 2-4 to 2-14). At UXO 14 and UXO 25, which are densely forested, trees 4 inches in diameter or greater (at 4.5 feet above the ground surface) would be left in place to maintain the structural stability of the sloped areas and to preserve significant ecological habitat. Grubbing of root systems associated with the smaller vegetation would be performed incidental to the excavation of contaminated soil from the indicated areas.

Erosion and sediment control measures would be established to ensure that soil disturbance activities do not adversely impact downgradient surface water bodies, floodplains, tidal marshes, or wetlands. During

vegetation clearance, road construction, soil excavation and stockpiling, waste loading, backfilling, and re-grading operations, erosion and sediment controls would be regularly inspected and maintained until excavation and backfilling is complete and the site vegetation is re-established. An ESCP would be prepared as part of the RAWP, in accordance with the substantive requirements of Maryland Standards and Specifications for Soil Erosion and Sediment Control (MDE, 2011).

### **UXO Avoidance Escort and Construction Support**

At UXO 14 and UXO 15, UXO avoidance and construction support procedures are required during intrusive activities because these sites are located within the estimated firing fan of the Valley Impact Area and, thus, may contain MEC in the surface or subsurface soils. A qualified UXO technician must be present during all intrusive activities to conduct avoidance surveys and ensure that any MEC encountered are managed safely and appropriately. Based on past observations at these sites, it is anticipated that there is a low likelihood of encountering MEC during work activities and, thus, that Naval Ordnance Safety and Security Activity (NOSSA) would approve of the work being conducted using UXO avoidance and construction support only, under an approved Explosives Safety Submission Determination Request.

### **Cultural Resources Escort**

Portions of UXO 14, UXO 15, UXO 16, and UXO 17 have been identified as Cultural Resources Protection Areas, where items of archaeological or cultural significance have been identified previously in subsurface materials. Thus, the State Historic Preservation Office (SHPO) must be consulted prior to the commencement of work, and the NSF-IH Cultural Resources Program Manager or qualified archeologist meeting the Secretary of the Interior standards must be present to observe excavation activities at these sites to ensure that any archeological artifacts encountered are properly documented and managed.

### **Waste Characterization**

Soils designated for removal would be characterized prior to excavation to facilitate planning for the appropriate disposition of excavated waste. Approximately 10 samples (at least one per 1,500 tons) would be collected and analyzed for the full toxicity characteristic leaching procedure (TCLP) waste characterization suite. Approximately 20 samples (at least one per 200 tons) would be collected from areas designated for removal due to lead contamination and analyzed for TCLP lead only. Details of the waste characterization sampling program would be described in the SAP prepared as part of the RAWP.

Based on the SI results, it is anticipated that the PAH- and nitroglycerin-contaminated soil would be classified as non-hazardous waste. In the absence of site-specific TCLP data, it is estimated that 80 percent of the lead-contaminated soil would be classified as hazardous waste due to lead toxicity and that the remainder would be classified as non-hazardous waste.

## Soil Excavation

Contaminated soil would be excavated from within the removal area boundaries shown on Figures 2-4 through 2-14. The corresponding removal depths and soil quantity estimates for each site are presented in Appendix D and summarized below.

Lead-Contaminated Soil: The total in-situ volume of lead-contaminated soil designated for removal would be approximately 2,565 cy. Lead-contaminated soil would be excavated from each site as follows:

MRR - UXO 14: Approximately 1,817 cy of soil would be excavated to a depth of 1 to 2 feet bgs at the Hillside Impact Area. The initial excavation limits are shown on Figures 2-4, 2-5, and 2-6.

OSTR - UXO 15: Approximately 526 cy of soil would be excavated to a depth of 1 foot bgs in discrete regions of the Shot Fall Area represented by SI Sample Locations X15SB064, X15SB013, and X15SB074. The initial excavation limits are shown on Figures 2-7 and 2-8.

SAPR - UXO 17: Approximately 178 cy of soil would be excavated to a depth of 1 foot bgs in regions of the Target Area represented by SI Sample Locations X17SB013 and X17SB014, and to a depth of 4 feet bgs in a region of the Target Area represented by SI Sample Locations X17SB004 and X17SB0005. The initial excavation limits are shown on Figures 2-11 and 2-12.

RRRR - UXO 25: Approximately 44 cy of soil would be excavated to a depth of 1 to 2 feet bgs at a region of the Target Area represented by SI Sample Locations X25SB019 and X25SB020. The initial excavation limits are shown on Figures 2-13 and 2-14.

PAH-Contaminated Soil: The total in-situ volume of PAH-contaminated soil designated for removal would be approximately 5,841 cy. PAH-contaminated soil would be excavated from each site as follows:

OSTR - UXO 15: Approximately 2,551 cy of soil would be excavated to a depth of 2 feet bgs in a region of the Shot Fall/Target Area represented by SI Sample Locations X15SB038 and X15SB053. The initial excavation limits are shown on Figures 2-7 and 2-8.

RPSR - UXO 16: Approximately 3,290 cy of soil would be excavated to a depth of 1 to 2 feet bgs in a region of the Target Area represented by SI Sample Locations X16SB056 and X16SB076. The initial excavation limits are shown on Figures 2-9 and 2-10.

Nitroglycerin-Contaminated Soil: The total in-situ volume of PAH-contaminated soil designated for removal would be approximately 403 cy. Nitroglycerin-contaminated soil would be excavated as follows:

SAPR - UXO 17: Approximately 403 cy of soil would be excavated to a depth of 1 foot bgs at the Firing Line Area. The initial excavation limits are shown on Figures 2-11 and 2-12.

Excavation operations would be performed by qualified excavation personnel with current Hazardous Waste Operations and Emergency Response (HAZWOPER) training, as required by the Occupational Health and Safety Administration (OSHA). Standard dust control techniques would be used during removal activities to mitigate fugitive dust emissions. The HASP submitted as part of the RAWP would specify the dust suppression techniques, air monitoring requirements, and action levels necessary to ensure worker safety, as well as the site access controls necessary to prevent members of the public from being exposed to contamination during removal operations.

### **Confirmation Sampling**

Confirmation samples would be collected from the bottoms and sidewalls of each excavation area and analyzed for COCs to verify that relevant CGs have been met. Based on the confirmation sampling results, additional excavation would be conducted, as necessary, to remove residual soil that exceeds CGs. The confirmation sampling program would be described in the SAP prepared as part of the RAWP.

To expedite decision-making in the field, the lead confirmation sampling program may include the use of field screening using portable XRF instrumentation. This technology can provide nearly real-time field measurements of lead for use in determining whether additional excavation is necessary. The use of XRF can provide significant savings of time and cost relative to laboratory analyses because decisions regarding the need for additional excavation can be made within a few hours rather than a few days following removal of soil from within the initial excavation boundaries. To provide defensible documentation of removal action completeness, confirmation samples collected from the final excavation boundaries would be sent to the FBL for analytical testing upon meeting the lead CG through field screening.

### **Waste Disposal**

Excavated waste would be containerized and transported off-site to an appropriate waste disposal facility. Hazardous waste would be transported to a RCRA Subtitle C (i.e., permitted) facility, and non-hazardous waste would be transported to a Subtitle D landfill.

Based on results of the SI, it is estimated that the following quantities of waste would require disposal:

Lead-Contaminated Soil: The total weight of lead-contaminated soil to be disposed off-site would be approximately 3,810 tons. Soil with TCLP lead concentrations greater than 5.0 milligrams per liter (mg/L)

(based on waste characterization sampling results) would be classified as hazardous waste based on lead toxicity and, thus, would be subject to special transportation and disposal requirements. In the absence of site-specific TCLP data, it is estimated that 80 percent (3,048 tons) would be classified as hazardous waste and need to be disposed at a Subtitle C facility, and that 20 percent (762 tons) would be classified as non-hazardous waste suitable for disposal at a Subtitle D landfill.

PAH-Contaminated Soil: The total weight of PAH-contaminated soil to be disposed off-site would be approximately 8,673 tons. It is estimated that the entire amount would be classified as non-hazardous waste suitable for disposal at a Subtitle D landfill.

Nitroglycerin-Contaminated Soil: The total weight of nitroglycerin-contaminated soil to be disposed off-site would be approximately 598 tons. It is estimated that the entire amount would be classified as non-hazardous waste suitable for disposal at a Subtitle D landfill.

### **Site Restoration**

After confirming that the project CGs have been achieved, the excavated areas would be backfilled with clean material derived from an off-site borrow source. The backfill material would meet prescribed specifications for chemical constituents (e.g., NSF-IH background concentrations) and structural stability, as certified through laboratory analysis. The excavated areas would be backfilled and re-graded to the approximate original contours, ensuring appropriate site drainage. The backfilled areas would be compacted, as necessary, to ensure slope stability and covered with 6 inches of clean topsoil. All disturbed areas would be re-vegetated and covered with straw to minimize erosion until vegetation is sufficiently re-established.

### **4.2.3 Alternative 3 - In-Situ Treatment, Excavation, and Off-Site Disposal**

Alternative 3 incorporates all components of Alternative 2 except for the off-site disposal of hazardous waste. Under Alternative 3, lead-contaminated soils that exceed EPA's TCLP criterion for lead toxicity would be chemically treated in-situ to stabilize the leachable lead, and all lead-, PAH-, and nitroglycerin-contaminated soils would be excavated and disposed off-site as non-hazardous waste. Contaminated soil would be excavated from within the removal area boundaries shown on Figures 2-4 through 2-14. The corresponding removal depths and soil quantity estimates for each site, which are the same as those estimated for Alternative 2, are presented in Appendix D.

The following major components of Alternative 2, as described in Section 4.2.2, would also apply to Alternative 3: site preparation, UXO escort, cultural resources escort, waste characterization, soil excavation, confirmation sampling, and site restoration. Under Alternative 3, however, a waste treatment component would be added to the process, and the waste disposal component would be revised, as

described below. As with Alternative 2, the planning and design process for Alternative 3 would consist of the preparation of a RAWP (including a HASP, SAP, and ESCP), as well as completion of the CWAP.

### **Waste Treatment**

Lead-contaminated soils with TCLP lead concentrations greater than 5.0 mg/L (based on waste characterization sampling results) would be treated prior to removal to stabilize the leachable lead and render it non-hazardous. Under EPA's Area of Contamination (AOC) Policy (EPA, 1998), remediation wastes may be consolidated and treated within an AOC without triggering land disposal restrictions or minimum technology requirements normally associated with RCRA waste management. To maximize cost-effectiveness, Alternative 3 would be designed in a manner consistent with the AOC Policy, specifying consolidation (if necessary) and in-situ treatment of lead-contaminated soils within each AOC rather than excavation and ex-situ treatment at a centralized RCRA-compliant treatment area.

In the absence of site-specific TCLP data, it is estimated that 80 percent (3,048 tons) of the lead-contaminated soil would be classified as hazardous waste and, thus, would require treatment prior to removal from the AOC. The most commonly used in-situ treatment technology for lead-contaminated soils is chemical stabilization. This technology has been widely tested and successfully implemented at numerous remediation sites and is considered a reliable treatment technology for rendering lead-contaminated soils non-hazardous. Chemical stabilization converts leachable lead into insoluble minerals and mixed mineral forms, thereby minimizing the ability of lead to mobilize in the environment.

For the purposes of developing a cost estimate for this alternative, the treatment process is assumed to be chemical stabilization through the application of Maectite<sup>®</sup>, a phosphate-based liquid reagent that binds leachable lead in soil within 3 to 5 hours (Sevenson, 1999 and 2012). This reagent can be applied in-situ and mechanically blended, as necessary, using traditional earth-moving equipment (e.g., excavator) to ensure complete contact with the contaminated soil. Once the chemical reaction is complete, the resulting mixture can be managed as non-hazardous waste and stockpiled or loaded directly into containers for transport to a Subtitle D landfill.

The waste treatment process requires that a treatability study be conducted prior to implementation to determine the optimal ratio of reagent-to-soil necessary to meet the treatment goal of 5.0 mg/L. The treatability study would be conducted using representative site soils and various proportions of reagent to ensure that the treatment design can consistently render the waste non-hazardous. Once the proper proportions are determined and treatment process is underway, waste composite samples would be collected from a representative portion of the treated soils to verify compliance with the waste facility acceptance criteria. The waste verification sampling program would be described in the SAP prepared as part of the RAWP.

## **Waste Disposal**

Excavated waste would be containerized and transported off-site to an appropriate waste disposal facility. Since all lead-contaminated soils that exceed EPA's TCLP criterion for lead toxicity would be chemically treated in-situ to stabilize the leachable lead prior to removal, no hazardous waste would be generated or require transport and disposal at a RCRA Subtitle C (i.e., permitted) facility. All waste generated during the removal action would be classified as non-hazardous waste suitable for disposal at a Subtitle D landfill.

Based on results of the SI, it is estimated that a total of 13,081 tons of lead-, PAH-, and nitroglycerin-contaminated waste would require disposal, as follows:

Lead-Contaminated Soil: The total weight of lead-contaminated soil to be disposed off-site would be approximately 3,810 tons. Soil with TCLP lead concentrations greater than 5.0 mg/L would be treated on-site prior to loading. It is anticipated that the entire combined weight of lead-contaminated soil (3,048 tons treated and 762 tons untreated) would be classified as non-hazardous waste suitable for disposal at a Subtitle D landfill.

PAH-Contaminated Soil: The total weight of PAH-contaminated soil to be disposed off-site would be approximately 8,673 tons. It is anticipated that the entire amount would be classified as non-hazardous waste suitable for disposal at a Subtitle D landfill.

Nitroglycerin-Contaminated Soil: The total weight of nitroglycerin-contaminated soil to be disposed off-site would be approximately 598 tons. It is anticipated that the entire amount would be classified as non-hazardous waste suitable for disposal at a Subtitle D landfill.

### **4.3 EVALUATION CRITERIA**

As specified in EPA guidance (EPA, 1993), the following evaluation criteria were used in evaluating the removal action alternatives for the five SASRs:

- Effectiveness: Short-term and long-term protection of human health and the environment, compliance with ARARs, the degree of protection achieved, the degree of contaminant destruction or immobility achieved, and the reliability and performance of the chosen alternative.
- Implementability: The degree of difficulty of implementation, associated risks and limitations, feasibility, and the limitations of the technology process. Implementability includes technical feasibility, administrative feasibility, and availability of services.

- Cost: Removal action costs including capital, operations and maintenance, and monitoring costs, if required.

#### **4.4 DETAILED EVALUATION OF ALTERNATIVES**

The three removal action alternatives were evaluated for the five SASRs on the basis of effectiveness, implementability, and cost, as described below.

##### **4.4.1 Alternative 1 - No Action**

###### **Effectiveness**

The “No Action” response would not achieve the long-term removal action objectives necessary for the protection of human health and the environment at the five SASRs. If contaminated soils are not removed, contaminants may migrate to surrounding sediments and surface soils, or to underlying groundwater and subsurface soils, thereby increasing risk to potential human and ecological receptors. This alternative would not comply with ARARs and would not reduce either the volume or mobility of contamination. Taking no action would not meet the specified RAOs for the five SASRs.

###### **Implementability**

The “No Action” alternative is immediately and easily implementable. No implementability concerns exist.

###### **Cost**

No costs are associated with this alternative.

##### **4.4.2 Alternative 2 - Excavation and Off-Site Disposal**

###### **Effectiveness**

The effectiveness of Alternative 2 is moderately high. This alternative provides long-term protection to human health and the environment by achieving the stated RAOs, although it does not fully satisfy the regulatory preference for treatment to permanently and significantly reduce toxicity, mobility, or volume of contaminated materials. All lead-, PAH-, and nitroglycerin-contaminated soils with concentrations greater than their respective CGs would be excavated and containerized for transportation and off-site disposal. This alternative would be designed and implemented in a manner that complies with the chemical-specific, location-specific and action-specific ARARs. Contaminated soil would be permanently removed, thereby eliminating unacceptable risks and minimizing the potential for future contaminant migration at the five SASRs. Unrestricted land use would be achieved following implementation of this alternative.

The high long-term effectiveness of this alternative is partially offset by the introduction of short-term risks to site workers, waste transporters, and members of the public located near waste transportation routes. Due to the generation, handling, and transportation of hazardous waste, there would be short-term occupational risks to workers involved in the excavation, loading, and transportation of contaminated waste. However, risks to site workers could be mitigated through the use of standard personal protective equipment, conventional dust suppression techniques, and site health and safety monitoring. Risks to waste transporters and members of the public could be mitigated through compliance with U.S. Department of Transportation (DOT), state, and local requirements for shipment of hazardous materials, including proper containerization, placarding, and manifesting procedures.

### **Implementability**

Alternative 2 is easy to implement. No significant engineering, administrative, or construction difficulties are anticipated, although coordination with appropriate federal, state, and local agencies would be required. The labor, equipment, and materials necessary to implement this alternative are conventional and readily available. Multiple general and specialized contractors have the capability to perform the activities specified for this alternative, and disposal facilities permitted to accept contaminated soils classified as either hazardous or non-hazardous are available. The most significant challenge to implementability for this alternative is the need to remove vegetation and soil from the steep slopes at UXO 14 and UXO 25 without jeopardizing slope stability or causing undue erosion. However, this can be accomplished through careful application of field techniques and adequate erosion controls.

### **Cost**

To develop a detailed cost analysis for Alternative 2, the required expenditures were estimated in terms of capital costs to complete the construction activities. There are no recurring costs (i.e., for institutional controls or operation and maintenance) associated with the removal alternative. Cost estimates for individual line items are based on quotations from potential vendors and subcontractors, engineering estimates, recent project experience on similar Navy projects, and values published by R.S. Means (R.S. Means, 2012). If implemented, the actual cost of Alternative 2 would depend on the final scope and design parameters presented in the RAWP, the schedule for implementation, competitive market conditions, actual scale weights of waste disposed, and other variables.

The cost of Alternative 2 (Excavation and Off-Site Disposal) is estimated to be approximately \$4,210,900. A detailed breakdown of costs for this alternative is presented in Appendix F.

#### **4.4.3 Alternative 3 - In-Situ Treatment, Excavation, and Off-Site Disposal**

##### **Effectiveness**

The effectiveness of Alternative 3 is high. This alternative provides long-term protection to human health and the environment by achieving the stated RAOs, and it satisfies the regulatory preference for treatment to permanently and significantly reduce toxicity, mobility, or volume of contaminated materials. All lead-, PAH-, and nitroglycerin-contaminated soils with concentrations greater than their respective CGs would be treated (as necessary), excavated, and containerized for transportation and off-site disposal. This alternative would be designed and implemented in a manner that complies with the chemical-specific, location-specific and action-specific ARARs. Contaminated soil would be permanently removed, thereby eliminating unacceptable risks and minimizing the potential for future contaminant migration at the five SASRs. Unrestricted land use would be achieved following implementation of this alternative.

Short-term risks to site workers, waste transporters, and members of the public located near waste transportation routes would exist to some extent, although no hazardous waste would be generated or transported. Due to the treatment of lead-contaminated soils in-situ and the handling and transportation of contaminated waste, there would be short-term occupational risks to workers involved in the treatment, excavation, loading, and transportation of contaminated (non-hazardous) waste. However, risks to site workers could be mitigated through the use of standard personal protective equipment, conventional dust suppression techniques, and site health and safety monitoring. Risks to waste transporters and members of the public would be minimal, as no hazardous materials would be transported over public roads.

##### **Implementability**

Alternative 3 is moderately easy to implement. No significant engineering, administrative, or construction difficulties are anticipated, although coordination with appropriate federal, state, and local agencies would be required. The labor, equipment, and materials necessary to implement this alternative are conventional and readily available. Multiple general and specialized contractors have the capability to perform the activities specified for this alternative, and disposal facilities that accept contaminated soils classified as non-hazardous are available. Chemical stabilization has been widely tested and implemented at various remediation sites and is considered a reliable treatment technology for reducing the leachability of lead-contaminated soils. The most significant challenge to implementability for this alternative is the need to remove vegetation and soil from the steep slopes at UXO 14 and UXO 25 without jeopardizing slope stability or causing undue erosion. However, this can be accomplished through careful application of field techniques and adequate erosion controls.

## **Cost**

To develop a detailed cost analysis for Alternative 3, the required expenditures were estimated in terms of capital costs to complete the construction activities. There are no recurring costs (i.e., for institutional controls or operation and maintenance) associated with the removal alternative. Cost estimates for individual line items are based on quotations from potential vendors and subcontractors, engineering estimates, recent project experience on similar Navy projects, and values published by R.S. Means (R.S. Means, 2012). If implemented, the actual cost of Alternative 3 would depend on the final scope and design parameters presented in the RAWP, the schedule for implementation, competitive market conditions, actual scale weights of waste disposed, and other variables.

The cost of Alternative 3 (In-Situ Treatment, Excavation, and Off-Site Disposal) is estimated to be approximately \$3,156,800. A detailed breakdown of costs for this alternative is presented in Appendix F.

## 5.0 COMPARATIVE ANALYSIS OF REMOVAL ACTION ALTERNATIVES

This section provides a comparative analysis of the removal action alternatives. In accordance with EPA's "Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA" (EPA, 1993), the three removal action alternatives are compared on the basis of effectiveness, implementability, and cost.

### 5.1 EFFECTIVENESS

Levels of effectiveness were assessed based on the number of "effectiveness criteria" that would be satisfied by each alternative. The "effectiveness criteria," as listed in the EPA guidance (EPA, 1993), are identified as:

1. Protection of public health
2. Protection of workers during implementation
3. Protection of environment
4. Compliance with ARARs
5. Level of treatment and containment expected
6. Residual effect concerns

Alternative 1 would not achieve the RAOs or provide protection of human health and the environment because no action would be taken. Alternatives 2 and 3 would be able to achieve all of the identified RAOs discussed in Section 3. Alternatives 2 and 3 provide the highest level of protection for human health and the environment with regard to the removal and off-site disposal of contaminated soils with concentrations greater than the specified CGs. However, Alternatives 2 and 3 add potential short-term safety risks to site workers due to increased truck traffic within and around the five SASRs, and to members of the public due to increased truck traffic along the waste transportation routes.

The short-term effectiveness of both Alternatives 2 and 3 would be impacted by increased risks to site workers due to potential exposure to contaminated materials and general construction hazards, as well as to members of the public located along waste transportation routes due to increased truck traffic. Alternative 2 would pose additional short-term risks to site workers due to potential exposure to waste that is classified as hazardous based on lead toxicity. However, short-term risks to site workers could be mitigated using personal protective equipment, conventional dust suppression techniques, and site health and safety monitoring; and short-term risks to members of the public could be mitigated through compliance with regulatory requirements.

Alternative 1 would not comply with chemical-specific ARARs; and no location- or action-specific ARARs would apply if no action were taken. Alternatives 2 and 3 would comply with the chemical-specific and could be implemented in a manner that complies with location- and action-specific ARARs, as well.

Alternative 1 would not satisfy the statutory preference for treatment since no action would be performed. Under Alternative 2, all contaminated soils with concentrations greater than CGs would be permanently removed. However, this alternative does not include treatment; therefore, the regulatory preference for the reduction of toxicity, mobility, or volume of the contaminated waste through treatment would not be satisfied. Under Alternative 3, lead-contaminated soils that exhibit the lead toxicity characteristic would be treated through chemical stabilization prior to removal, which would significantly reduce the toxicity and mobility of lead in contaminated soils. In addition, all contaminated soils with concentrations greater than CGs would be permanently removed. The level of treatment for lead-contaminated soil is highest for Alternative 3.

Alternative 1 would not provide long-term effectiveness or permanence because no action would be taken. Alternatives 2 and 3 would provide the greatest long-term effectiveness and permanence because the contaminated soils would be permanently removed from the five SASR, resulting in mitigation of the existing human health and ecological risks. Alternatives 2 and 3 would not require future actions to remain protective.

## **5.2 IMPLEMENTABILITY**

Levels of implementability were assessed based on the number of “implementability criteria” satisfied by each alternative. The “implementability criteria,” from the EPA Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA (EPA, 1993), are as follows:

1. Construction and operational considerations.
2. Demonstrated performance/useful life.
3. Adaptable to environmental conditions.
4. Contributes to remedial performance.
5. Can be completed in an acceptable timeframe.
6. Availability of equipment, personnel, and services, outside laboratory testing capacity, and offsite treatment and disposal capacity.
7. Permits required.
8. Easements or rights-of-way required.
9. Impact on adjoining property.
10. Ability to impose institutional controls.

The evaluation of implementability involves the evaluation of both technical and administrative feasibility. In general, technical feasibility is addressed by Items 1 through 6 above, and administrative feasibility is addressed by Items 7 through 10.

Alternative 1 is easily implementable because it involves no action. However, the lead-, PAH-, and nitroglycerin-contaminated soils would remain on-site; thus, risks to human health and ecological receptors would continue unabated. This alternative would not contribute to long-term remedial performance and could adversely impact adjoining property by allowing the potential for contaminants to migrate from their current locations to surrounding media.

Alternative 2 is easily implementable and involves standard construction techniques and equipment for excavating, loading, and transporting contaminated soils. There are several off-site landfills located within a reasonable distance from NSF-IH that accept contaminated (non-hazardous) waste. Hazardous lead-contaminated soils would need to be containerized and transported to a RCRA-permitted Subtitle C landfill, which are located much further away (e.g., Ohio, Michigan, New York, etc.) but are also available for use. Experienced HAZWOPER-certified workers and contracting companies are capable and readily available to excavate and transport the lead-, PAH-, and nitroglycerin-contaminated soils to the appropriate disposal facility.

Alternative 3 is moderately easy to implement. In general, Alternative 3 involves standard construction techniques and equipment for excavating and transporting lead-, PAH-, and nitroglycerin-contaminated soils. There are several off-site landfills located within a reasonable distance from NSF-IH that accept contaminated (non-hazardous) waste. Experienced HAZWOPER-certified workers and contracting companies are capable and readily available to excavate and transport the lead-, PAH-, and nitroglycerin-contaminated soils to the disposal facility. However, although chemical stabilization for hazardous lead-contaminated soils has been widely tested and implemented at various remediation sites, the reagents are typically proprietary and must be applied by one of only a few specialty subcontractors.

Since this removal action is being carried out under CERCLA (121(e)(1), 42 USC § 9621(e)(1)), the Navy is not required to pay fees associated with permitting, or to obtain the actual permits required by ARARs. However, the Navy will comply with the substantive requirements of the permitting process, and implementation of the removal action will proceed upon approval through a federal consistency determination from the state.

### **5.3 COST**

There is no cost associated with Alternative 1. Alternative 2 is the most expensive alternative at approximately \$4,210,900. The next most expensive alternative is Alternative 3, which is estimated to

cost approximately \$3,156,800. Details of the cost analysis conducted for Alternatives 2 and 3 are presented in Appendix F.

The estimated costs for Alternatives 2 and 3 consist of capital costs only. There are no recurring or future costs associated with these removal alternatives because contaminated soils with concentrations greater than the CGs would be permanently removed from the site. Thus, no follow-on actions such as long-term administrative controls or operation and maintenance activities are necessary. Potential risks to human health and ecological receptors would be permanently mitigated, resulting in unrestricted land use and a No Further Action determination for soils at each site.

## 6.0 RECOMMENDED REMOVAL ACTION ALTERNATIVE

This EE/CA was performed in accordance with current EPA and Navy guidance for conducting non-time-critical removal actions under CERCLA. The purpose of this EE/CA was to develop and evaluate removal action alternatives to address the lead-, PAH-, and nitroglycerin-contaminated soils that pose unacceptable risks at the five SASRs.

Upon screening the available technologies, three alternatives were developed, evaluated, and compared on the basis of effectiveness, implementability, and cost. The effectiveness evaluation included reviewing the protectiveness of each alternative; compliance with ARARs to the extent practicable; long-term effectiveness and permanence; reduction in toxicity, mobility, or volume through treatment; short-term effectiveness; and its ability to meet the RAOs. The implementability evaluation included a review of the technical feasibility, availability, and administrative feasibility of each alternative. The evaluation of cost included calculations of capital costs and potential future costs.

Considering the results of the evaluation and comparison of removal action alternatives, Alternative 3 (In-Situ Treatment, Excavation, and Off-Site Disposal) is recommended for implementation at the five SASRs. Under this alternative, lead-contaminated soils that exceed EPA's TCLP criterion for lead toxicity would be chemically treated in-situ to stabilize the leachable lead, and all lead-, PAH-, and nitroglycerin-contaminated soils would be excavated and disposed off-site as non-hazardous waste. The total excavation area would be approximately 154,487 ft<sup>2</sup>; and the total volume of contaminated soils to be excavated would be approximately 8,809 cubic yards. It is estimated that approximately 3,048 tons of hazardous lead-contaminated soils would be consolidated within the AOCs and treated in-situ prior to excavation and disposal using chemical stabilization technology. A total of approximately 13,081 tons of contaminated soil (3,810 tons of lead-contaminated soil, 8,673 tons of PAH-contaminated soil, and 598 tons of nitroglycerin-contaminated soil) would be shipped off-site for disposal as non-hazardous waste. After contaminated soils are excavated, but before the sites are backfilled, verification sampling would be conducted to ensure that CGs have been achieved.

Alternative 3 is recommended because it is the most cost-effective alternative that would meet the stated RAOs. Implementation of this alternative would be effective in permanently reducing lead, PAH, and nitroglycerin concentrations at the five SASRs and eliminating the potential for unacceptable risks to human health and ecological receptors. Alternative 3 is technically and administratively feasible, and it constitutes a permanent remedy to existing contamination at these sites. This alternative is estimated to cost \$3,156,800 and require approximately 5 months to complete.

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## TABLES

**TABLE 3-1**

**CHEMICAL-SPECIFIC ARARs AND TBCs  
FIVE SMALL ARMS/SKEET RANGES  
NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND**

| <b>Location</b> | <b>Requirement</b>  | <b>Prerequisite</b>                          | <b>Citation</b>   | <b>ARAR Determination</b> | <b>Comments</b>  |
|-----------------|---|--|---|---------------------------|--|
| <b>Federal</b>  |   |  |   |                           |  |
| Soil            | Risk to contaminants in soil must be eliminated through removal of contaminants or removal of exposure pathway.   | Potential exposure to contaminated soil      | EPA Regional Screening Levels (RSLs) (April 2012)   | TBC                       | These values are used in the risk screening evaluation and may aid in the selection of clean-up goals. (Pertinent to all sites.) |
| Soil            | Risk to lead in soil must be eliminated through removal of contaminants or removal of exposure pathway.<br>The guidance recommends screening levels for lead in soil for residential land use at 400 ppm. | Potential exposure to lead-contaminated soil | Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (August, 1994), EPA OSWER Directive 9355.4-12 | TBC                       | Risks from lead will be addressed through remediation using excavation to meet the cleanup goal. (Pertinent to all sites.)       |

- ARAR     Applicable or Relevant and Appropriate Requirement
- CERCLA    Comprehensive Environmental Response, Compensation, and Liability Act
- EPA        Environmental Protection Agency
- OSWER    Office of Solid Waste and Emergency Response
- ppm        parts per million
- RCRA      Resource Conservation and Recovery Act
- TBC        To Be Considered criterion

TABLE 3-2

LOCATION-SPECIFIC ARARs AND TBCs  
 FIVE SMALL ARMS/SKEET RANGES  
 NSF INDIAN HEAD STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND  
 PAGE 1 OF 8

| Location   | Requirement  | Prerequisite  | Citation   | ARAR Determination | Comments  |
|--|--|---|--|--------------------|---|
| <b>Federal</b>   |  |   |  |                    |   |
| <b>USFWS Biological Opinion Letter / Agreement with Navy</b> |  |   |  |                    |   |
| Bald Eagle nesting areas and activities                      | The Navy will take the appropriate measures to minimize disturbance to Bald Eagle nesting activities. Designated potential nests at NSF-IH Main Area and Stump Neck Annex are monitored annually from December 15 through June 15. | Any field activities that will or potentially could disturb nesting Bald Eagle(s) | USFWS Biological Opinion, letter to Mr. Jeffrey Bossart (August 2007) (i.e., agreement between USFWS and NSF-IH) | TBC                | Construction activities will be limited to a time of year that will not impact Bald Eagle nesting. UXO 16 is within the 750-foot arc surrounding a designated potential Bald Eagle nest. UXO 17 is on the edge of an arc potentially within line of site. Site survey (and work approval) will be conducted at UXO 16 and UXO 17 by NSF-IH Environmental Department to determine if any Bald Eagles or potential nesting areas are present prior to beginning removal activities. |

TABLE 3-2

LOCATION-SPECIFIC ARARs AND TBCs  
 FIVE SMALL ARMS/SKEET RANGES  
 NSF INDIAN HEAD STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND  
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| Location                          | Requirement   | Prerequisite  | Citation                            | ARAR Determination       | Comments   |
|-----------------------------------|---|---|-------------------------------------|--------------------------|--|
| Threatened and endangered species | Navy shall ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species. It is unlawful to take threatened or endangered wildlife in the United States. | Removal activities that may impact threatened or endangered species and their habitat | 50 CFR 17.21(c),<br>50 CFR 17.31(a) | Relevant and Appropriate | <p>Endangered/threatened species may be near all sites. If ESA species are present and Navy actions will have an effect on the listed species, then Navy will consult with USFWS and/or NSF-IH Environmental Department (MD Habitat Protection Area is near UXO 16 and UXO 17. MD Natural Heritage Area is near UXO 14, UXO 15, and UXO 25.)</p> <p>Note: Under 50 CFR 10.12 Definitions, the term "Take" means to "pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect."</p> |

TABLE 3-2

LOCATION-SPECIFIC ARARs AND TBCs  
 FIVE SMALL ARMS/SKEET RANGES  
 NSF INDIAN HEAD STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND  
 PAGE 3 OF 8

| Location   | Requirement  | Prerequisite  | Citation  | ARAR Determination | Comments  |
|--|--|---|---|--------------------|---|
| <b>Procedures for Implementing the Requirements of the Council on Environmental Quality on the National Environmental Policy Act and Executive Order 11990, Protection of Wetlands</b> |  |   |   |                    |   |
| Wetlands   | Removal actions must minimize the destruction, loss, or degradation of wetlands. Wetlands of primary ecological significance must not be altered such that ecological systems in the wetlands are unreasonably disturbed.                    | Wetlands, as defined by Executive Order 11990 Section 7                                 | Executive Order 11990 Section 7                               | TBC                | This executive order will be considered for activities occurring in areas that meet the definition of a wetland. Due to the proximity of the streams and the presence of plant life associated with wetlands, removal activities will minimize the destruction, loss, or degradation of the wetlands. (UXO 14 and UXO 16 contain wetlands, and activities will be designed and performed to avoid wetland impacts.) |
| <b>Floodplain Management</b>   |  |   |   |                    |   |
| Presence of floodplain designated as such on a map   | Removal actions shall consider alternatives that avoid, to the extent possible adverse effects and incompatible development in the floodplain. Activities in the floodplain must be designed and operated to minimize impacts due to floods. | Removal activities that involve potential impacts to, or take place within, floodplains | Executive Order 11988 - Floodplain Management Section 2(a)(2) | TBC                | Defines federal executive branch and military requirements to reduce the risk of flood loss, minimize impact of floods, and restore and preserve the natural and beneficial value of floodplains. (Some activities at UXO 14 and UXO 15 are located within a 100-year floodplain.)  |

TABLE 3-2

LOCATION-SPECIFIC ARARs AND TBCs  
 FIVE SMALL ARMS/SKEET RANGES  
 NSF INDIAN HEAD STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND  
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| Location                            | Requirement  | Prerequisite                   | Citation  | ARAR Determination | Comments  |
|-------------------------------------|--|--------------------------------|---|--------------------|---|
| <b>Clean Water Act, Section 404</b> |  |                                |   |                    |   |
| Wetlands                            | <p>Degradation or destruction of wetlands and other aquatic sites shall be avoided to the extent possible.</p> <p>Dredged or fill material must not be discharged to navigable waters if the activity: contributes to the violation of Maryland water quality standards; contributes to exceedances of applicable toxic effluent standards or prohibitions; or jeopardizes endangered or threatened species.</p> | Removal activities in wetlands | 40 CFR 230.10(a)(1) – (a)(3); (b)(1); (b)(2); (c); (d); 230.74(d) | Applicable         | No activity that adversely affects a wetland shall be permitted if a practicable alternative with lesser effects is available. (UXO 14 and UXO 16 contain wetlands, and activities should be designed to avoid wetland impacts.) If activity takes place, impacts must be minimized and discharges of dredged or fill material must be controlled to protect aquatic ecosystems. Filling or discharge of dredged material may only occur where there is no other practicable alternative, and any adverse impacts to aquatic ecosystems will be mitigated. Removal activities that include filling in wetlands will be implemented to meet these requirements, including mitigation of altered wetland/aquatic resource, as required. |

TABLE 3-2

LOCATION-SPECIFIC ARARs AND TBCs  
 FIVE SMALL ARMS/SKEET RANGES  
 NSF INDIAN HEAD STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND  
 PAGE 5 OF 8

| Location  | Requirement   | Prerequisite  | Citation                              | ARAR Determination | Comments   |
|---|---|---|---------------------------------------|--------------------|--|
| <b>National Historic Preservation Act</b>         |   |   |                                       |                    |  |
| Historic or archaeologically significant property | Section 106 of the Act requires consultation with appropriate agencies to identify historic properties potentially affected by the site activities, assess the effects, and seek ways to avoid, minimize, or mitigate adverse effects on historic properties. If artifacts are found, the State Historic Preservation Office will be consulted. | Removal activities that impact historic or archeologically significant properties | 36 CFR 800.3, 800.4, 800.5, and 800.6 | Applicable         | Preserves sites with archaeological and historic significance. A Phase I Cultural Resources Survey and Supplemental Architectural Investigations were conducted at Stump Neck in 1996. Five sites containing prehistoric and/or historic artifacts are considered to potentially overlap UXO 14, UXO 15, UXO 16, and UXO 17. No archaeological sites were identified near UXO 25. If artifacts are found during removal activities, the State Historic Preservation Office will be consulted per Section 106 of the Act. |

TABLE 3-2

LOCATION-SPECIFIC ARARs AND TBCs  
 FIVE SMALL ARMS/SKEET RANGES  
 NSF INDIAN HEAD STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND  
 PAGE 6 OF 8

| Location                                     | Requirement   | Prerequisite   | Citation      | ARAR Determination | Comments   |
|--|---|--|---------------|--------------------|--|
| <b>Migratory Bird Treaty Act</b>             |   |  |               |                    |  |
| Presence of migratory birds or nesting areas | Provides protection for migrating birds, nests, and eggs and makes it illegal for people to “take” migratory birds, their eggs, feathers, or nests. To meet this requirement, USFWS and MDE will be consulted regarding actions that could impact migratory birds or nesting areas. | Presence of migratory birds, or their nests and eggs | 16 USC 703(a) | Applicable         | The substantive requirements of the Act will be followed, and appropriate actions will be taken during the removal action to ensure that no migratory birds or nests are affected. Site surveys will be conducted prior to beginning removal activities to determine if any birds and nesting areas are present. (MD Waterfowl Staging Area is near UXO 15 and UXO 14. Large tract of trees may be affected at UXO 14. Fewer trees may be affected at UXO 16, UXO 17, and UXO 25.) |

TABLE 3-2

LOCATION-SPECIFIC ARARs AND TBCs  
 FIVE SMALL ARMS/SKEET RANGES  
 NSF INDIAN HEAD STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND  
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| Location                                | Requirement   | Prerequisite   | Citation  | ARAR Determination | Comments   |
|---|---|--|---|--------------------|--|
| <b>State</b>                            |   |  |   |                    |  |
| <b>Nontidal Wetlands Protection Act</b> |   |  |   |                    |  |
| Activity affecting nontidal wetlands    | Nontidal wetlands disturbance due to regulated activities such as excavation, or dredging of soil, changing drainage characteristic or water levels, filling, grading, or destruction of plant life must be mitigated. However, certain activities, depending on location, extent, and type of activity are exempt. | Activities that will occur in nontidal wetlands or the buffer of a wetland (i.e., area within 25 feet of the wetland edge) | COMAR, 26.23.02.04D, 26.23.02.05, 26.23.04.02, 26.23.04.03            | Applicable         | Adverse impacts to and losses of nontidal wetlands during removal activities will be avoided. (Wetlands could be affected by activities at UXO 14 and UXO 16.) |
| <b>Tidal Wetlands Protection Act</b>    |   |  |   |                    |  |
| Activity affecting tidal wetlands       | Tidal wetlands disturbance due to filling, draining, excavating, dredging, constructing structures within, or destroying the vegetation, tidal flow patterns or altering the natural and beneficial character of the wetlands must be mitigated.  | Activities that will occur on or near tidal wetlands   | COMAR 26.24.01.02, 26.24.03.02, 26.24.03.05, 26.24.03.06, 26.24.05.01 | Applicable         | Adverse impacts to and losses of tidal wetlands during removal activities will be avoided. (Wetlands could be affected by activities at UXO 14 and UXO 16.)    |

TABLE 3-2

LOCATION-SPECIFIC ARARs AND TBCs  
 FIVE SMALL ARMS/SKEET RANGES  
 NSF INDIAN HEAD STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND  
 PAGE 8 OF 8

| Location   | Requirement  | Prerequisite  | Citation  | ARAR Determination       | Comments  |
|--|--|---|---|--------------------------|---|
| <b>Threatened and Endangered Species</b>   |  |   |   |                          |   |
| Critical habitats of threatened or endangered species, and threatened and endangered species | Requires action to conserve threatened and endangered species and their critical habitat. Removal activities may not reduce the likelihood of either survival or recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of a listed species or otherwise adversely affect a listed species. | Removal activities that may impact threatened or endangered species and their habitat | COMAR<br>08.03.08.01,<br>08.03.08.04C,<br>08.03.08.05C,<br>08.03.08.06C,<br>08.03.08.07C,<br>08.03.08.08C | Relevant and Appropriate | Threatened and endangered species of plants and animals and their critical habitats must be conserved. (MD Habitat Protection Area near UXO 16 and UXO 17. MD Natural Heritage Area near UXO 14, UXO 15, and UXO 25.) |

ARAR           Applicable or Relevant and Appropriate Requirement  
 CFR           Code of Federal Regulations  
 COMAR       Code of Maryland Regulations  
 CWA           Clean Water Act  
 MD            Maryland  
 MDE          Maryland Department of the Environment  
 TBC           To Be Considered criterion  
 USC           U.S. Code  
 USFWS       U.S. Fish and Wildlife Service

TABLE 3-3

**ACTION-SPECIFIC ARARS AND TBCS  
FIVE SMALL ARMS/SKEET RANGES  
NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
PAGE 1 OF 5**

| Action   | Requirement   | Prerequisite   | Citation  | ARAR Determination                         | Comments   |
|--|---|--|---|--|--|
| <b>Federal</b>   |   |  |   |  |  |
| <b>Hazardous Waste Management</b>                                    |   |  |   |  |  |
| Staging of hazardous waste within an AOC prior to off-site disposal  | The Area of Contamination (AOC) policy allows wastes to be consolidated or treated in-situ within an AOC without triggering land disposal restrictions or minimum technology requirements. An AOC would be defined for each site so that contaminated material can be stockpiled prior to characterization and off-site disposal. | Excavated material classified as hazardous waste that will be consolidated on-site prior to off-site disposal      | Management of Remediation Waste Under RCRA - Area of Contamination Policy, EPA 530-F-98-026, October 1998 | TBC  | Pertinent only for waste that is classified as hazardous waste. (Pertinent to all sites.)  |
| <b>Clean Water Act</b>   |   |  |   |  |  |
| Discharge of storm water to surface water from construction activity | Must meet NPDES discharge requirements for suspended solids in storm water.   | Discharge of storm water to surface water from construction activity with an area of disturbance of 1 acre or more | 40 CFR 122.26(b) and (c)  | Applicable (Substantive requirements only) | Only the construction activities (clearing, grading, and excavating) at UXO 14 are anticipated to be greater than 1 acre. Appropriate erosion and sediment and storm water controls will be implemented (see state land-disturbing activities and land development ARARs below). |

TABLE 3-3

**ACTION-SPECIFIC ARARS AND TBCS  
FIVE SMALL ARMS/SKEET RANGES  
NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
PAGE 2 OF 5**

| Action                            | Requirement   | Prerequisite  | Citation  | ARAR Determination | Comments  |
|-----------------------------------|---|---|---|--------------------|---|
| <b>State</b>                      |   |   |   |                    |   |
| <b>Hazardous Waste Management</b> |   |   |   |                    |   |
| On-site waste generation          | Waste generator to determine whether solid waste is hazardous waste.  | Generation (e.g., excavation) of solid waste  | COMAR 26.13.03.02                               | Applicable         | Prior to excavation and management of solid waste, material to be transported off-site will be tested to determine whether it is a hazardous waste. (Pertinent to all sites.) |
| Generation of hazardous waste     | Manifest requirements and pre-transport requirements (i.e., packaging, labeling, and placarding).   | Temporary storage and off-site transport of hazardous waste   | COMAR 26.13.03.03<br>26.13.03.04<br>26.13.03.05 | Applicable         | Applicable only for off-site shipment of hazardous waste. (Pertinent to all sites.)   |
| Management of military munitions  | Military munitions that are determined to be hazardous waste will be managed within the range and then transported and disposed off-site according to hazardous waste regulations. Munitions found on a range can be consolidated within the range prior to characterization and off-site disposal. | Presence of military munitions classified as characteristic hazardous wastes that require off-site disposal | COMAR 26.13.10.27                               | Applicable         | Military munitions are only likely to be found at UXO 14 and UXO 15.  |

TABLE 3-3

**ACTION-SPECIFIC ARARS AND TBCS  
FIVE SMALL ARMS/SKEET RANGES  
NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
PAGE 3 OF 5**

| Action   | Requirement   | Prerequisite   | Citation          | ARAR Determination | Comments  |
|--|---|--|-------------------|--------------------|---|
| <b>Storm Water Management</b>  |   |  |                   |                    |   |
| Discharge of storm water to surface water from construction activity | Must meet NPDES discharge requirements for suspended solids in storm water. | Discharge of storm water to surface water from construction activity with an area of disturbance of 1 acre or more | COMAR 26.08.04.09 | Applicable         | Activities must meet the substantive requirements of a General Permit for Construction Activity. Only the construction activities (clearing, grading, and excavating) at UXO 14 are anticipated to be greater than 1 acre. Appropriate erosion and sediment and storm water controls will be implemented (see state land-disturbing activities and land development ARARs below). |

**TABLE 3-3**

**ACTION-SPECIFIC ARARS AND TBCS  
FIVE SMALL ARMS/SKEET RANGES  
NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
PAGE 4 OF 5**

| <b>Action</b>              | <b>Requirement</b>  | <b>Prerequisite</b>  | <b>Citation</b>   | <b>ARAR Determination</b> | <b>Comments</b>  |
|----------------------------|---|--|---|---------------------------|--|
| Discharge to surface water | Must meet NPDES discharge requirements where the requirements of a general permit for discharge of storm water from construction activity is not sufficient. In addition to meeting requirements for suspended solids, discharges of contaminants not typically found at construction sites must be controlled. | Discharge of storm water from construction activity in contaminated area with an area of disturbance of 1 acre or more | COMAR<br>26.08.02.02-1<br>26.08.02.03<br>26.08.02.03-1<br>26.08.02.03-2<br>26.08.02.03-3<br>26.08.02.03-4<br>26.08.02.04-1<br>26.08.02.05<br>26.08.02.09<br>26.08.03.01 | Applicable                | Only the construction activities (clearing, grading, and excavating) at UXO 14 are anticipated to be greater than 1 acre. Appropriate erosion and sediment and storm water controls will be implemented (see state land-disturbing activities and land development ARARs below). |
| Land-disturbing activities | Erosion and sediment controls are required for all grading and earth disturbances, except for areas less than 5,000 square feet or soil volumes less than 100 cubic yards.  | Land clearing, grading, and other earth disturbance.   | COMAR<br>26.17.01.11  | Applicable                | Compliant erosion and sediment and storm water controls will be designed/planned and implemented. (Pertinent to all sites.)  |
| Land development           | Storm water management is required for development of land that alters the run-off characteristics of the land, except for areas less than 5,000 square feet.   | Construction activities that alter run-off characteristics of land   | COMAR<br>26.17.02.06<br>26.17.02.08   | Applicable                | Compliant erosion and sediment and storm water controls will be designed/planned and implemented. (Pertinent to all sites.)  |

TABLE 3-3

**ACTION-SPECIFIC ARARS AND TBCS  
FIVE SMALL ARMS/SKEET RANGES  
NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
PAGE 5 OF 5**

| Action  | Requirement  | Prerequisite                                      | Citation           | ARAR Determination | Comments   |
|---|--|---|--------------------|--------------------|--|
| <b>Air Quality</b>                                  |  |   |                    |                    |  |
| Construction activities that generate fugitive dust | Precautions will be taken to prevent fugitive particulate emissions during construction activities. Actions include application of water or appropriate chemicals to roadways and stockpiles, covering material that has been loaded on to trucks, and housekeeping of roadways to remove material that could become airborne. | Soil excavation and handling of soil and backfill | COMAR 26.11.06.03D | Applicable         | Applicable for alternatives where there may be fugitive dust emissions from material handling. (Pertinent to all sites.) |

ARAR           Applicable or Relevant and Appropriate Requirement  
 CFR            Code of Federal Regulations  
 COMAR       Code of Maryland Regulations  
 NPDES        National Pollutant Discharge Elimination System  
 RCRA         Resource Conservation and Recovery Act  
 TBC          To Be Considered criterion

**TABLE 3-4**  
**CLEANUP GOALS FOR FIVE SMALL ARMS/SKEET RANGES**  
**NSF INDIAN HEAD STUMP NECK ANNEX**  
**INDIAN HEAD, MARYLAND**

| <b>Chemical</b>             | <b>Residential Soil<sup>1</sup> (mg/kg)</b> |
|-----------------------------|---|
| Lead                        | 400   |
| BaP Equivalent <sup>2</sup> | 0.15  |
| Nitroglycerin               | 6.1   |

**Note:**

1. The references for soil cleanup goals are: EPA Regional Screening Levels for Soil (November 2011); Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (EPA OSWER 9355.4-12, August 1994).
2. The BaP equivalent is based on the EPA 1993 toxicity equivalency factors and the concentrations of the seven individual carcinogenic PAHs. BaP equivalents = (0.1) benzo(a)anthracene + (1.0)BaP + (0.1)benzo(b)flouranthene + (0.01) benzo(k)flouranthene +(0.001)chrysene + (1.0) dibenz(a,h)anthracene + (0.1) ideno(1,2,3cd)pyrene.

**TABLE 3-5**  
**SUMMARY OF PROPOSED SOIL REMOVAL QUANTITIES**  
**FIVE SMALL ARMS/ SKEET RANGES**  
**NSF INDIAN HEAD - STUMP NECK ANNEX**  
**INDIAN HEAD, MARYLAND**

| Site Name                              | Area of Concern  | COC           | Excavation Area<br>(square feet) | Volume<br>(cubic yards) | Weight<br>(tons) |
|--|--|---------------|----------------------------------|-------------------------|------------------|
| Marine Rifle Range (UXO 14)            | Hillside Impact Area   | Lead          | 54,518                           | 1,817                   | 2,699            |
| Old Skeet and Trap Range (UXO 15)      | Firing Points/Target Area (Sample Locations X15SB038 and X15SB053)         | PAHs          | 34,433                           | 2,551                   | 3,788            |
|  | Shot Fall Areas (Sample Locations X15SB064, X15SB013, and X15SB074)        | Lead          | 14,199                           | 526                     | 781              |
| Rum Point Skeet Range (UXO 16)         | Target Area (Sample Locations X16SB056 and X16SB076)                       | PAHs          | 59,215                           | 3,290                   | 4,885            |
| Small Arms (Pistol) Range (UXO 17)     | Firing Line Area (Sample Locations X17SB008 and X17SB009)                  | Nitroglycerin | 10,880                           | 403                     | 598              |
|  | Target Area (Sample Locations X17SB013, X17SB014, X17SB004, and X17SB0005) | Lead          | 2,259                            | 178                     | 265              |
| Roach Road Rifle Range (UXO 25)        | Target Area (Sample Locations X25SB019 and X25SB020)                       | Lead          | 985                              | 44                      | 65               |
| Total Lead-Contaminated Soil:          |  |               |                                  | 2,565                   | 3,810            |
| Total PAH-Contaminated Soil:           |  |               |                                  | 5,841                   | 8,673            |
| Total Nitroglycerin-Contaminated Soil: |  |               |                                  | 403                     | 598              |
| <b>TOTAL CONTAMINATED SOIL:</b>        |  |               |                                  | <b>8,809</b>            | <b>13,081</b>    |

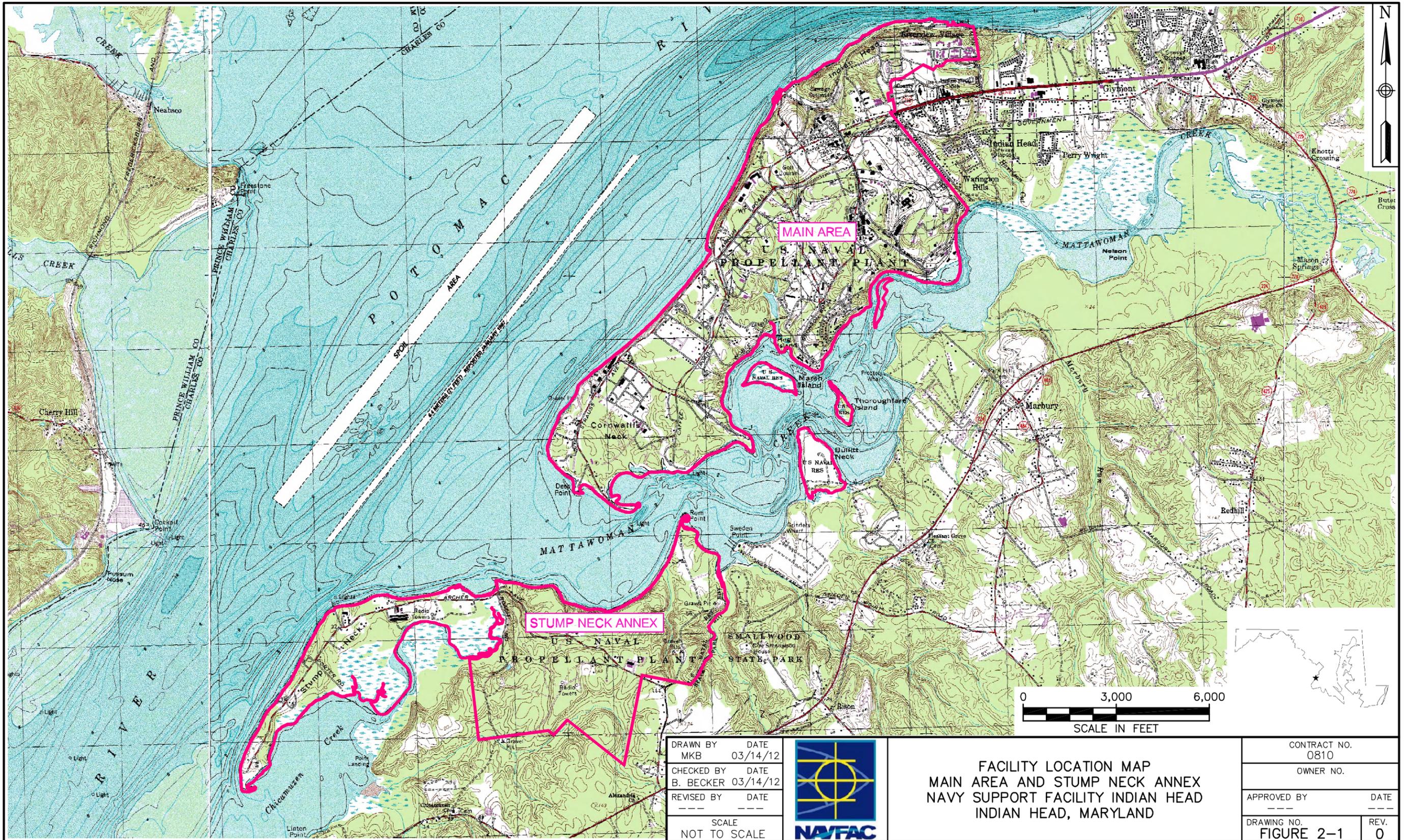
**TABLE 4-1**  
**SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS FOR**  
**CONTAMINATED SOIL AT FIVE SMALL ARMS/SKEET RANGES**  
**NSF INDIAN HEAD STUMP NECK ANNEX, MARYLAND**  
**PAGE 1 OF 2**

| GENERAL RESPONSE ACTION | TECHNOLOGY            | PROCESS OPTION             | DESCRIPTION   | SCREENING ACTION |        | SCREENING COMMENTS  |
|-------------------------|-----------------------|----------------------------|---|------------------|--------|---|
|                         |                       |                            |   | RETAIN           | REJECT |   |
| No Action               | No Action             | No Action                  | No remedial actions taken.  | √                |        | Retained as baseline for comparison, as required by NCP.  |
| Institutional controls  | Land Use Restrictions | Land Use Restrictions      | Land use restrictions incorporated into the Navy planning documents.  |                  | √      | Potentially applicable, though this constitutes a land use restriction and is therefore unacceptable.             |
|                         | Access Restrictions   | Fencing                    | Security fence is installed around contaminated areas to restrict access.   |                  | √      | Potentially applicable, though this constitutes a land use restriction and is therefore unacceptable.             |
|                         | Monitoring            | Long-term Monitoring       | Monitoring to assess the temporal variation in the levels of contamination at the site.   |                  | √      | Potentially applicable, but will not achieve a reduction in risk to future residents and/or construction workers. |
| Containment             | Capping               | Soil Cover                 | A layer of native soil placed over the site with a vegetative cover to prevent direct contact and minimize erosion and surface migration of contaminated soils.   |                  | √      | Technically feasible. However, prohibitive to unrestricted future land use.                                       |
|                         |                       | Single Barrier             | Cap constructed with one low-permeability layer (clay or synthetic membrane) over the site to prevent direct contact and to minimize surface migration of contaminated soil.                                  |                  | √      | Technically feasible. However, prohibitive to unrestricted future land use.                                       |
|                         |                       | Composite (Double) Barrier | Multi-media cap with two low-permeability layers (clay and/or synthetic membranes) constructed over the site to prevent direct contact. Provides better protection against failure than a single-barrier cap. |                  | √      | Technically feasible. However, prohibitive to unrestricted future land use.                                       |

**TABLE 4-1**  
**SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS FOR**  
**CONTAMINATED SOIL AT FIVE SMALL ARMS/SKEET RANGES**  
**NSF INDIAN HEAD STUMP NECK ANNEX, MARYLAND**  
**PAGE 2 OF 2**

| GENERAL RESPONSE ACTION | TECHNOLOGY            | PROCESS OPTION  | DESCRIPTION   | SCREENING ACTION |        | SCREENING COMMENTS  |
|-------------------------|-----------------------|---|---|------------------|--------|---|
|                         |                       |   |   | RETAIN           | REJECT |   |
| Removal                 | Bulk Excavation       | Mechanical Excavation                                     | Mechanical removal of solid materials using conventional earth-moving equipment such as bulldozers, excavators, and front-end loaders.  | √                |        | Excavation is an accepted method of removing soil contamination.                                      |
|                         | Confirmatory Sampling | Confirmatory Sampling                                     | Sampling and testing of soil at the base and the sides of the excavation to ensure that all targeted soil has been removed.   | √                |        | Required to ensure the effectiveness of the excavation.   |
| Disposal                | On Site               | Consolidation/ Engineered Disposal Cell                   | Excavation and deposition of all contaminated soils in an engineered disposal cell to minimize space and closure requirements, reduce infiltration, and minimize direct contact with contaminants.        |                  | √      | Not implementable due to landfill siting regulations and significant restrictions on future land use. |
|                         | Off Site              | Permitted Treatment, Storage, and Disposal Facility (TSD) | Excavated soil is classified as hazardous waste or banned from land disposal. Disposal of contaminated soils at a permitted commercial TSD facility (i.e., hazardous waste landfill).                     |                  | √      | Potentially applicable if the lead –contaminated soil fail the TCLP test. However, the cost is high.  |
|                         |                       | RCRA Subtitle D Solid Waste Disposal Facility             | Excavated soil is classified as non-hazardous waste. Disposal of contaminated soils at an off-site permitted solid waste facility (e.g., intermediate or residual waste landfill) or industrial landfill. | √                |        | Applicable. Technically feasible.   |
| Treatment               | Stabilization         | Chemical Treatment  | Chemical Treatment converts leachable lead into insoluble minerals and mixed mineral forms within the material or waste matrix as non-hazardous waste.  | √                |        | Hazardous waste can be treated through chemical treatment to render it non-hazardous.                 |

## FIGURES

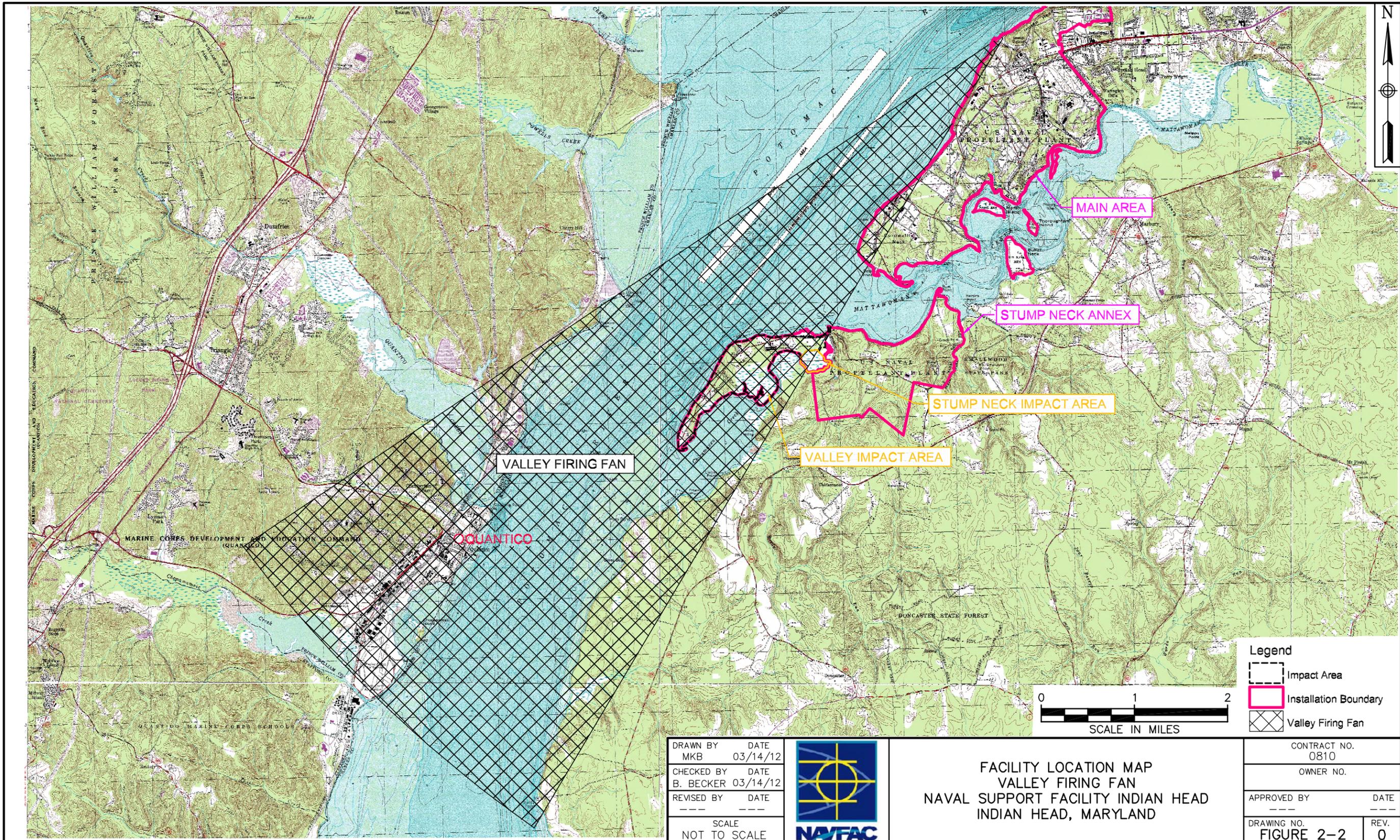


|              |          |
|--------------|----------|
| DRAWN BY     | DATE     |
| MKB          | 03/14/12 |
| CHECKED BY   | DATE     |
| B. BECKER    | 03/14/12 |
| REVISED BY   | DATE     |
| ---          | ---      |
| SCALE        |          |
| NOT TO SCALE |          |



FACILITY LOCATION MAP  
 MAIN AREA AND STUMP NECK ANNEX  
 NAVY SUPPORT FACILITY INDIAN HEAD  
 INDIAN HEAD, MARYLAND

|                           |           |
|---------------------------|-----------|
| CONTRACT NO.<br>0810      |           |
| OWNER NO.                 |           |
| APPROVED BY               | DATE      |
| ---                       | ---       |
| DRAWING NO.<br>FIGURE 2-1 | REV.<br>0 |



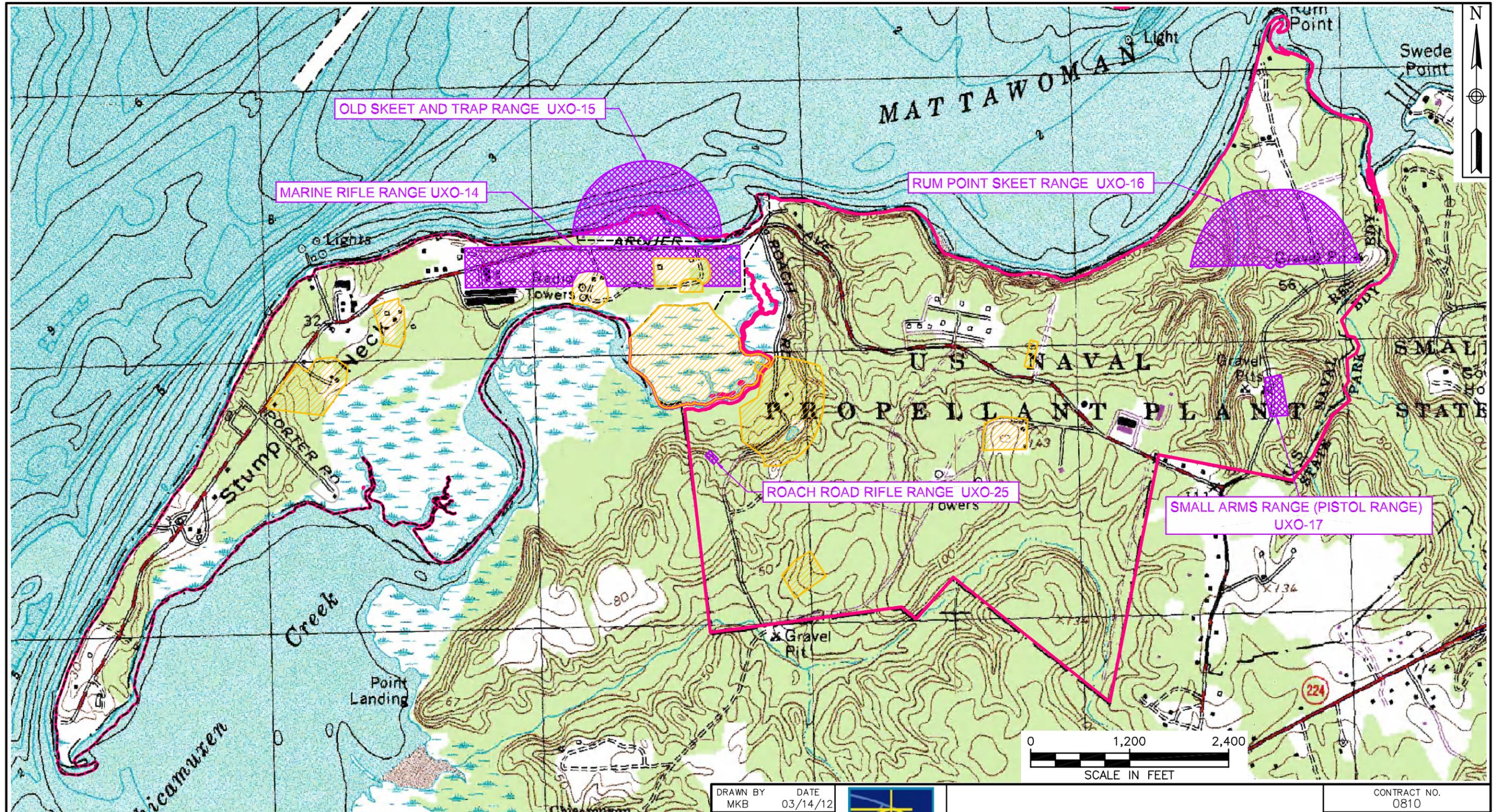
| Legend |                       |
|--------|-----------------------|
|        | Impact Area           |
|        | Installation Boundary |
|        | Valley Firing Fan     |

|              |          |
|--------------|----------|
| DRAWN BY     | DATE     |
| MKB          | 03/14/12 |
| CHECKED BY   | DATE     |
| B. BECKER    | 03/14/12 |
| REVISED BY   | DATE     |
| ---          | ---      |
| SCALE        |          |
| NOT TO SCALE |          |



FACILITY LOCATION MAP  
 VALLEY FIRING FAN  
 NAVAL SUPPORT FACILITY INDIAN HEAD  
 INDIAN HEAD, MARYLAND

|              |      |
|--------------|------|
| CONTRACT NO. |      |
| 0810         |      |
| OWNER NO.    |      |
| APPROVED BY  | DATE |
| ---          | ---  |
| DRAWING NO.  | REV. |
| FIGURE 2-2   | 0    |



| Legend |   |
|--------|---|
|        | MRP Site Boundary - Small Arms/Skeet Range                      |
|        | MRP Site Boundary - MEC Site Not Included In This Investigation |
|        | Boundary Of Site Within Valley Firing Fan                       |
|        | Installation Boundary   |

|                         |                  |
|-------------------------|------------------|
| DRAWN BY<br>MKB         | DATE<br>03/14/12 |
| CHECKED BY<br>B. BECKER | DATE<br>03/14/12 |
| REVISED BY<br>---       | DATE<br>---      |
| SCALE<br>NOT TO SCALE   |                  |



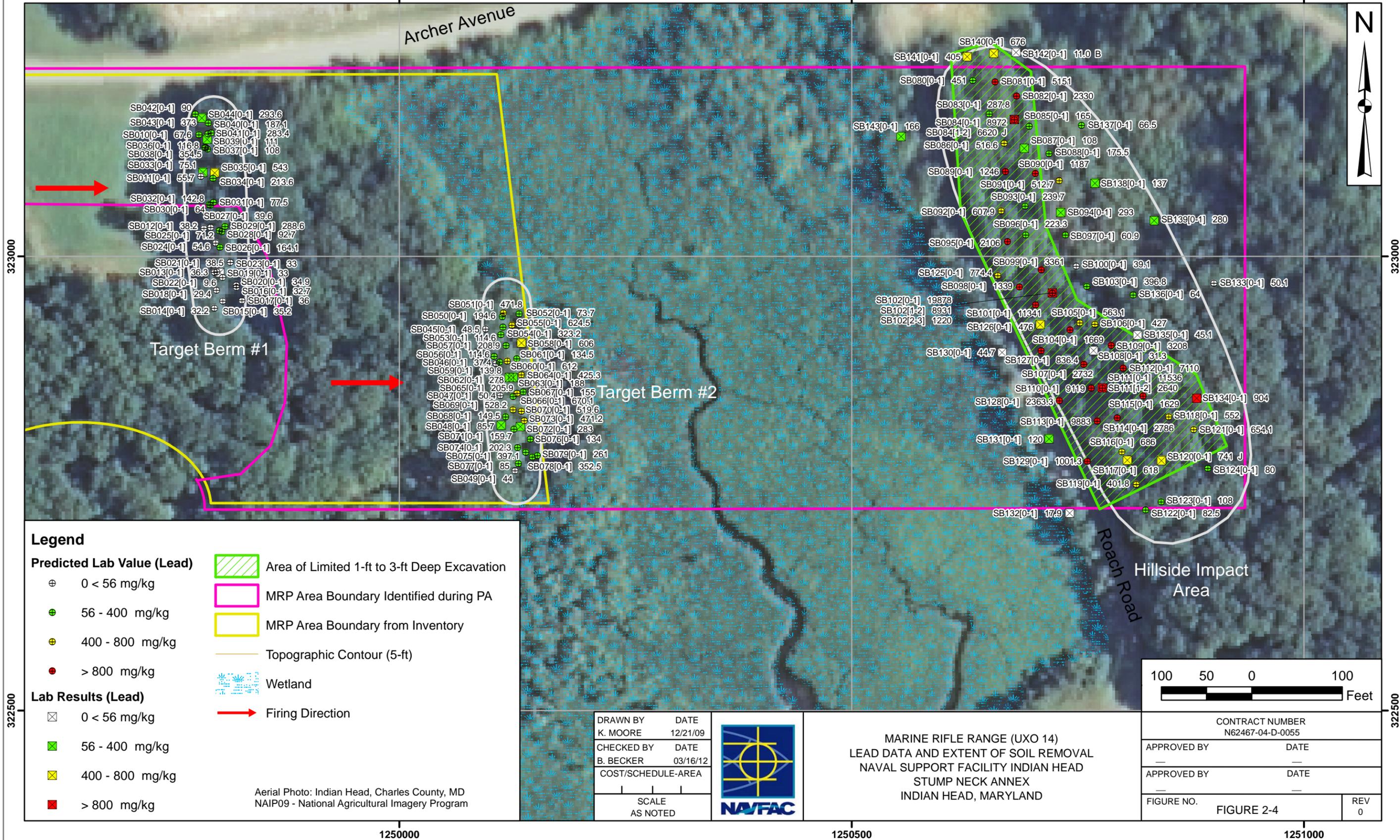
SMALL ARMS/SKEET RANGE LOCATION MAP  
 NAVAL SUPPORT FACILITY INDIAN HEAD  
 INDIAN HEAD, MARYLAND

|                           |             |
|---------------------------|-------------|
| CONTRACT NO.<br>0810      |             |
| OWNER NO.                 |             |
| APPROVED BY<br>---        | DATE<br>--- |
| DRAWING NO.<br>FIGURE 2-3 | REV.<br>0   |

1250000

1250500

1251000



323000

323000

322500

322500

**Legend**

- Predicted Lab Value (Lead)**
- ⊕ 0 < 56 mg/kg
  - ⊕ 56 - 400 mg/kg
  - ⊕ 400 - 800 mg/kg
  - > 800 mg/kg
- Lab Results (Lead)**
- ⊠ 0 < 56 mg/kg
  - ⊠ 56 - 400 mg/kg
  - ⊠ 400 - 800 mg/kg
  - ⊠ > 800 mg/kg
- ▨ Area of Limited 1-ft to 3-ft Deep Excavation
  - ▭ MRP Area Boundary Identified during PA
  - ▭ MRP Area Boundary from Inventory
  - Topographic Contour (5-ft)
  - Wetland
  - Firing Direction

Aerial Photo: Indian Head, Charles County, MD  
NAIP09 - National Agricultural Imagery Program

|                         |                  |
|-------------------------|------------------|
| DRAWN BY<br>K. MOORE    | DATE<br>12/21/09 |
| CHECKED BY<br>B. BECKER | DATE<br>03/16/12 |
| COST/SCHEDULE-AREA      |                  |
| SCALE<br>AS NOTED       |                  |



MARINE RIFLE RANGE (UXO 14)  
LEAD DATA AND EXTENT OF SOIL REMOVAL  
NAVAL SUPPORT FACILITY INDIAN HEAD  
STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND

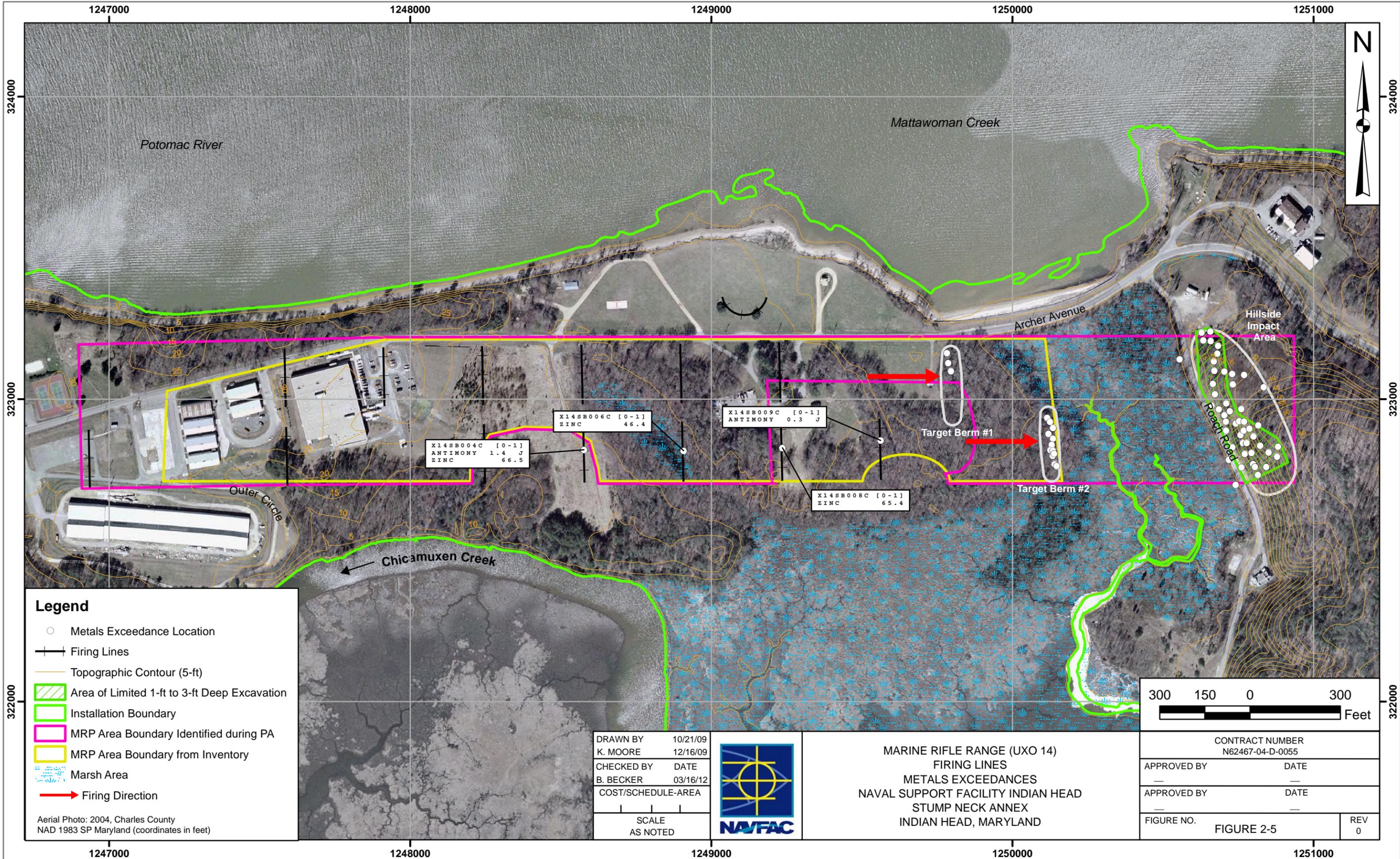


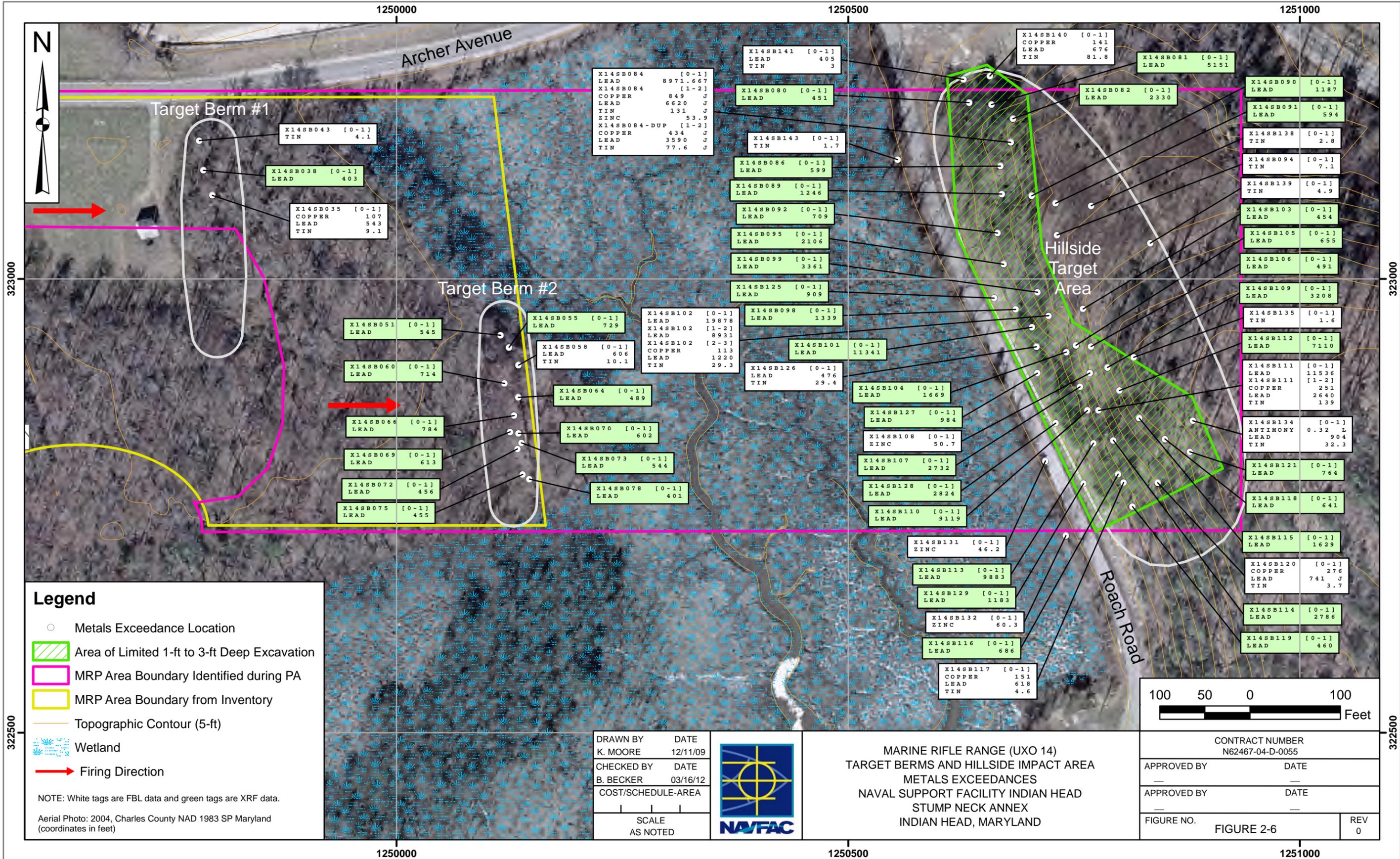
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| CONTRACT NUMBER<br>N62467-04-D-0055 |      |
| APPROVED BY                         | DATE |
| APPROVED BY                         | DATE |
| FIGURE NO.                          | REV  |
| FIGURE 2-4                          | 0    |

1250000

1250500

1251000





**Legend**

- Metals Exceedance Location
- ▨ Area of Limited 1-ft to 3-ft Deep Excavation
- ▭ MRP Area Boundary Identified during PA
- ▭ MRP Area Boundary from Inventory
- Topographic Contour (5-ft)
- Wetland
- Firing Direction

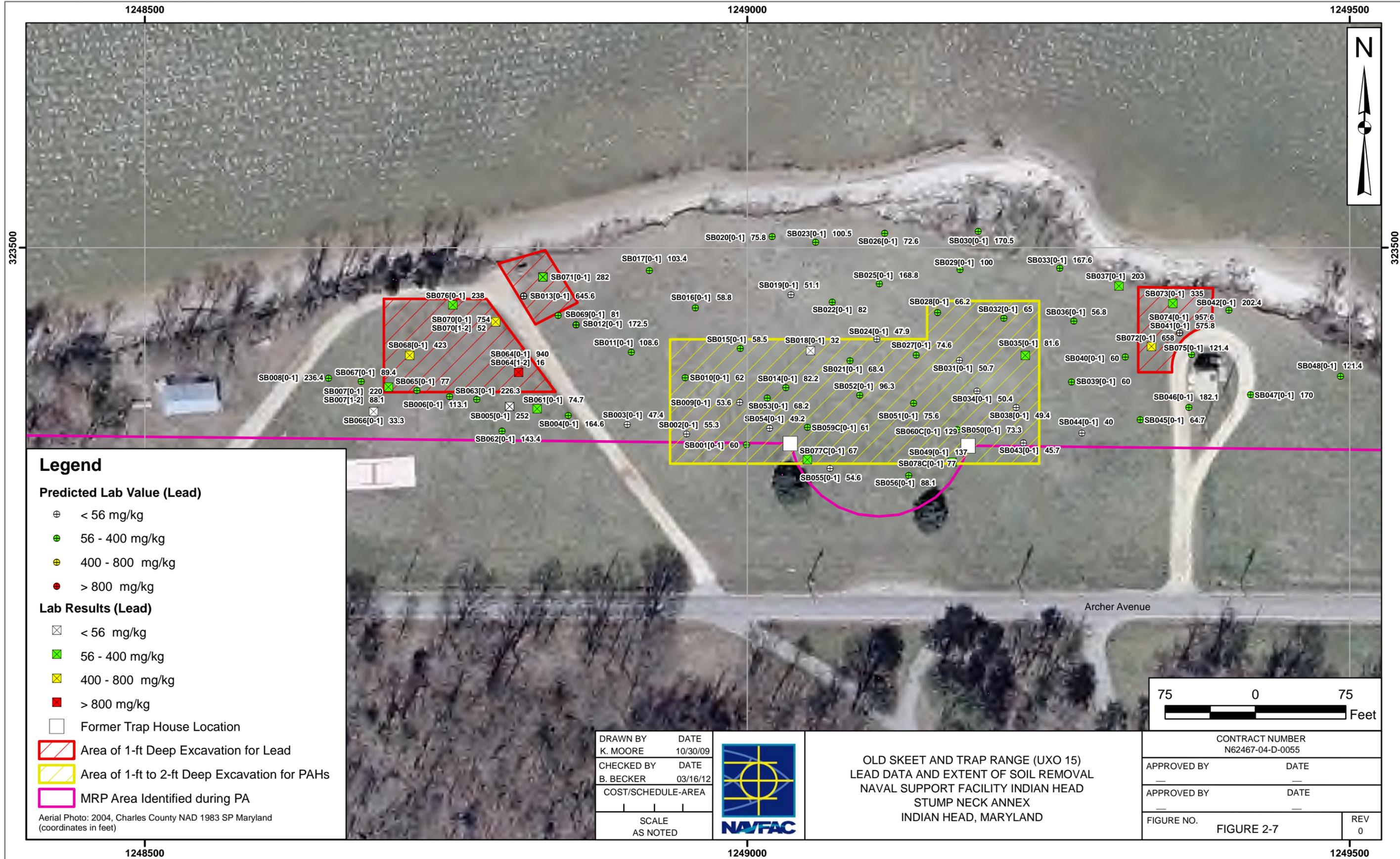
NOTE: White tags are FBL data and green tags are XRF data.  
 Aerial Photo: 2004, Charles County NAD 1983 SP Maryland (coordinates in feet)

|                    |          |
|--------------------|----------|
| DRAWN BY           | DATE     |
| K. MOORE           | 12/11/09 |
| CHECKED BY         | DATE     |
| B. BECKER          | 03/16/12 |
| COST/SCHEDULE-AREA |          |
| SCALE AS NOTED     |          |



MARINE RIFLE RANGE (UXO 14)  
 TARGET BERMS AND HILLSIDE IMPACT AREA  
 METALS EXCEEDANCES  
 NAVAL SUPPORT FACILITY INDIAN HEAD  
 STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND

|                 |            |                  |      |
|-----------------|------------|------------------|------|
| CONTRACT NUMBER |            | N62467-04-D-0055 |      |
| APPROVED BY     | DATE       | APPROVED BY      | DATE |
| —               | —          | —                | —    |
| APPROVED BY     | DATE       | APPROVED BY      | DATE |
| —               | —          | —                | —    |
| FIGURE NO.      | FIGURE 2-6 | REV              | 0    |



**Legend**

**Predicted Lab Value (Lead)**

- ⊕ < 56 mg/kg
- ⊕ 56 - 400 mg/kg
- ⊕ 400 - 800 mg/kg
- > 800 mg/kg

**Lab Results (Lead)**

- ⊗ < 56 mg/kg
- ⊗ 56 - 400 mg/kg
- ⊗ 400 - 800 mg/kg
- ⊗ > 800 mg/kg

□ Former Trap House Location

▨ Area of 1-ft Deep Excavation for Lead

▨ Area of 1-ft to 2-ft Deep Excavation for PAHs

▭ MRP Area Identified during PA

Aerial Photo: 2004, Charles County NAD 1983 SP Maryland (coordinates in feet)

|                         |                  |
|-------------------------|------------------|
| DRAWN BY<br>K. MOORE    | DATE<br>10/30/09 |
| CHECKED BY<br>B. BECKER | DATE<br>03/16/12 |
| COST/SCHEDULE-AREA      |                  |

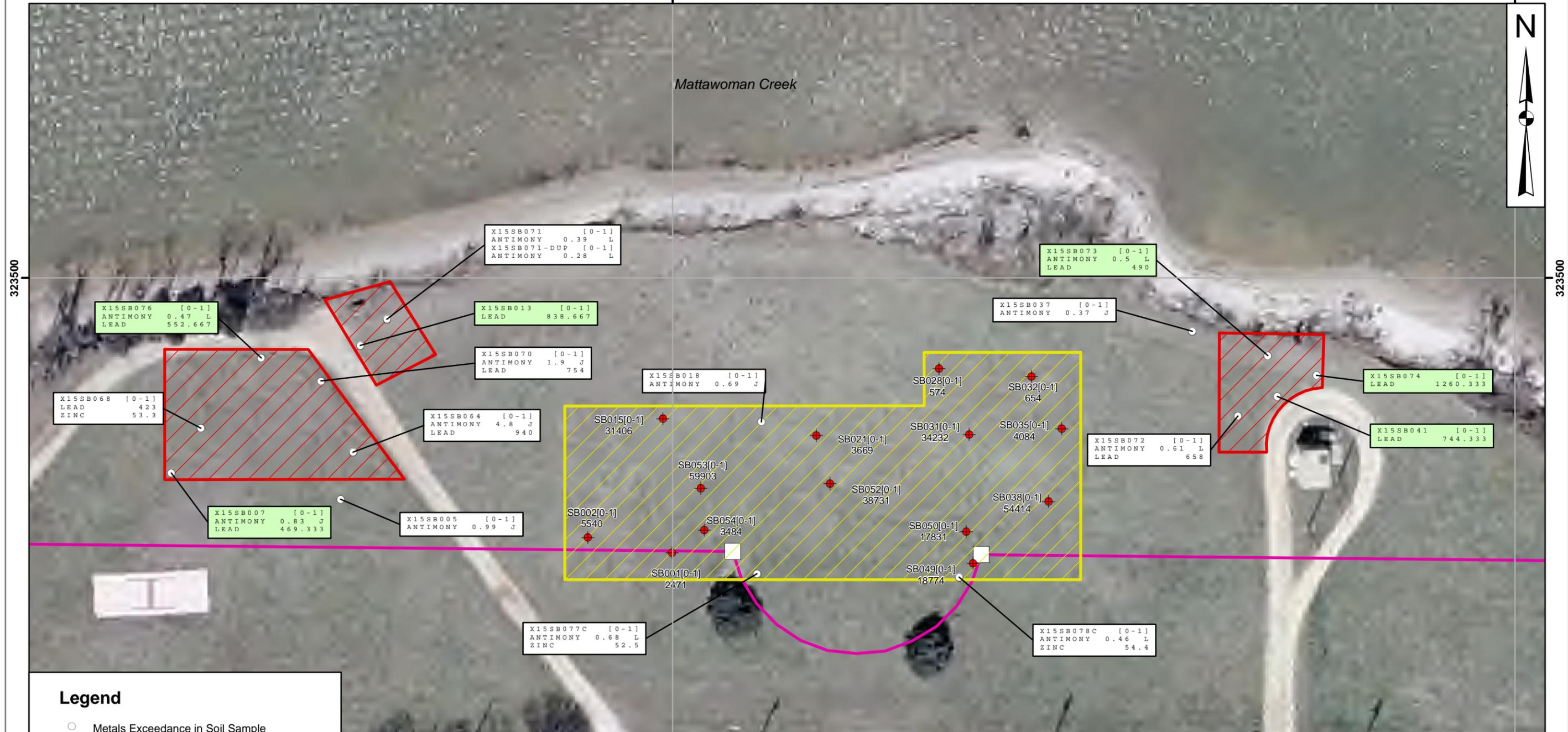
SCALE  
AS NOTED



OLD SKEET AND TRAP RANGE (UXO 15)  
LEAD DATA AND EXTENT OF SOIL REMOVAL  
NAVAL SUPPORT FACILITY INDIAN HEAD  
STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND



|                                     |      |
|-------------------------------------|------|
| CONTRACT NUMBER<br>N62467-04-D-0055 |      |
| APPROVED BY                         | DATE |
| APPROVED BY                         | DATE |
| FIGURE NO.                          | REV  |
| FIGURE 2-7                          | 0    |



Mattawoman Creek

Archer Avenue

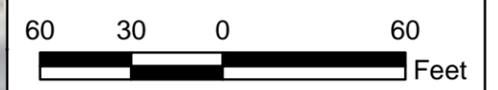


**Legend**

- Metals Exceedance in Soil Sample
- ◆ Clay Target Remains, BaP >150 µg/kg
- ▨ Area of 1-ft Deep Excavation for Lead
- ▨ Area of 1-ft to 2-ft Deep Excavation for PAHs
- Former Trap House Location
- ▭ MRP Area Boundary Identified During PA

NOTE: White tags are FBL data and the green tags are XRF data.

Aerial Photo: 2004, Charles County  
NAD 1983 SP Maryland (coordinates in feet)



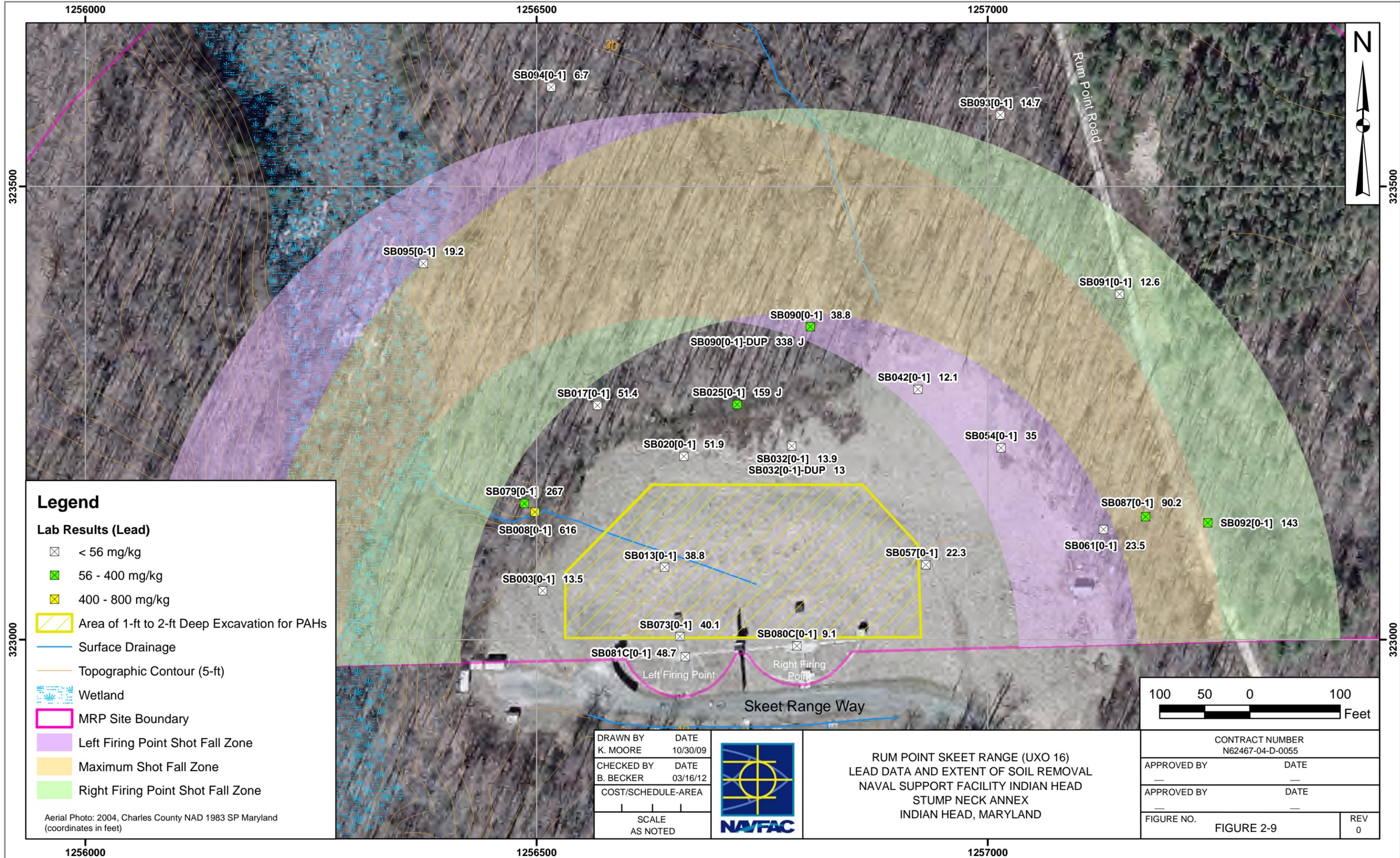
|                    |          |
|--------------------|----------|
| DRAWN BY           | DATE     |
| K. MOORE           | 12/21/09 |
| CHECKED BY         | DATE     |
| B. BECKER          | 03/14/12 |
| COST/SCHEDULE-AREA |          |
|                    |          |

SCALE  
AS NOTED



OLD SKEET AND TRAP RANGE (UXO 15)  
METALS/PAH EXCEEDANCES AND  
EXTENT OF SOIL REMOVAL  
NAVAL SUPPORT FACILITY INDIAN HEAD  
STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND

|                                     |      |
|-------------------------------------|------|
| CONTRACT NUMBER<br>N62467-04-D-0055 |      |
| APPROVED BY                         | DATE |
| —                                   | —    |
| APPROVED BY                         | DATE |
| —                                   | —    |
| FIGURE NO.                          | REV  |
| FIGURE 2-8                          | 0    |



**Legend**

**Lab Results (Lead)**

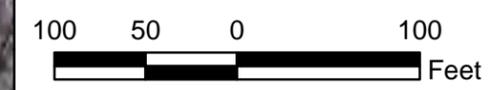
- ☒ < 56 mg/kg
- 56 - 400 mg/kg
- 400 - 800 mg/kg
- ▨ Area of 1-ft to 2-ft Deep Excavation for PAHs
- Surface Drainage
- Topographic Contour (5-ft)
- Wetland
- MRP Site Boundary
- Left Firing Point Shot Fall Zone
- Maximum Shot Fall Zone
- Right Firing Point Shot Fall Zone

Aerial Photo: 2004, Charles County NAD 1983 SP Maryland (coordinates in feet)

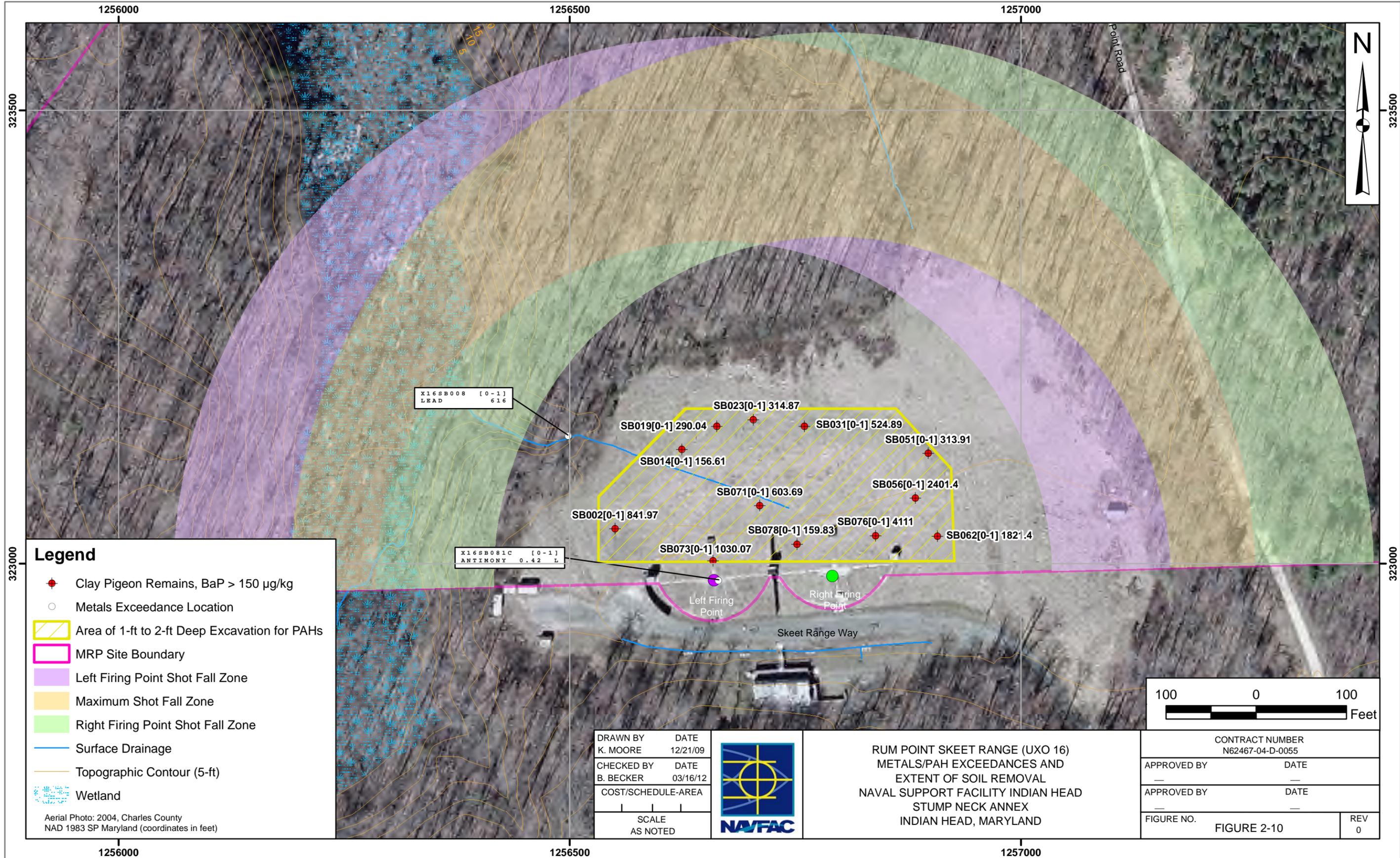
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|-------------------------|------------------|
| DRAWN BY<br>K. MOORE    | DATE<br>10/30/09 |
| CHECKED BY<br>B. BECKER | DATE<br>03/16/12 |
| COST/SCHEDULE-AREA      |                  |
| SCALE<br>AS NOTED       |                  |



RUM POINT SKEET RANGE (UXO 16)  
LEAD DATA AND EXTENT OF SOIL REMOVAL  
NAVAL SUPPORT FACILITY INDIAN HEAD  
STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND



|                                     |      |
|-------------------------------------|------|
| CONTRACT NUMBER<br>N62467-04-D-0055 |      |
| APPROVED BY                         | DATE |
| APPROVED BY                         | DATE |
| FIGURE NO.                          | REV  |
| FIGURE 2-9                          | 0    |



**Legend**

- ◆ Clay Pigeon Remains, BaP > 150 µg/kg
- Metals Exceedance Location
- Area of 1-ft to 2-ft Deep Excavation for PAHs
- MRP Site Boundary
- Left Firing Point Shot Fall Zone
- Maximum Shot Fall Zone
- Right Firing Point Shot Fall Zone
- Surface Drainage
- Topographic Contour (5-ft)
- Wetland

Aerial Photo: 2004, Charles County  
NAD 1983 SP Maryland (coordinates in feet)

X16SB008 [0-1]  
LEAD 616

X16SB081C [0-1]  
ANTIMONY 0.42 L

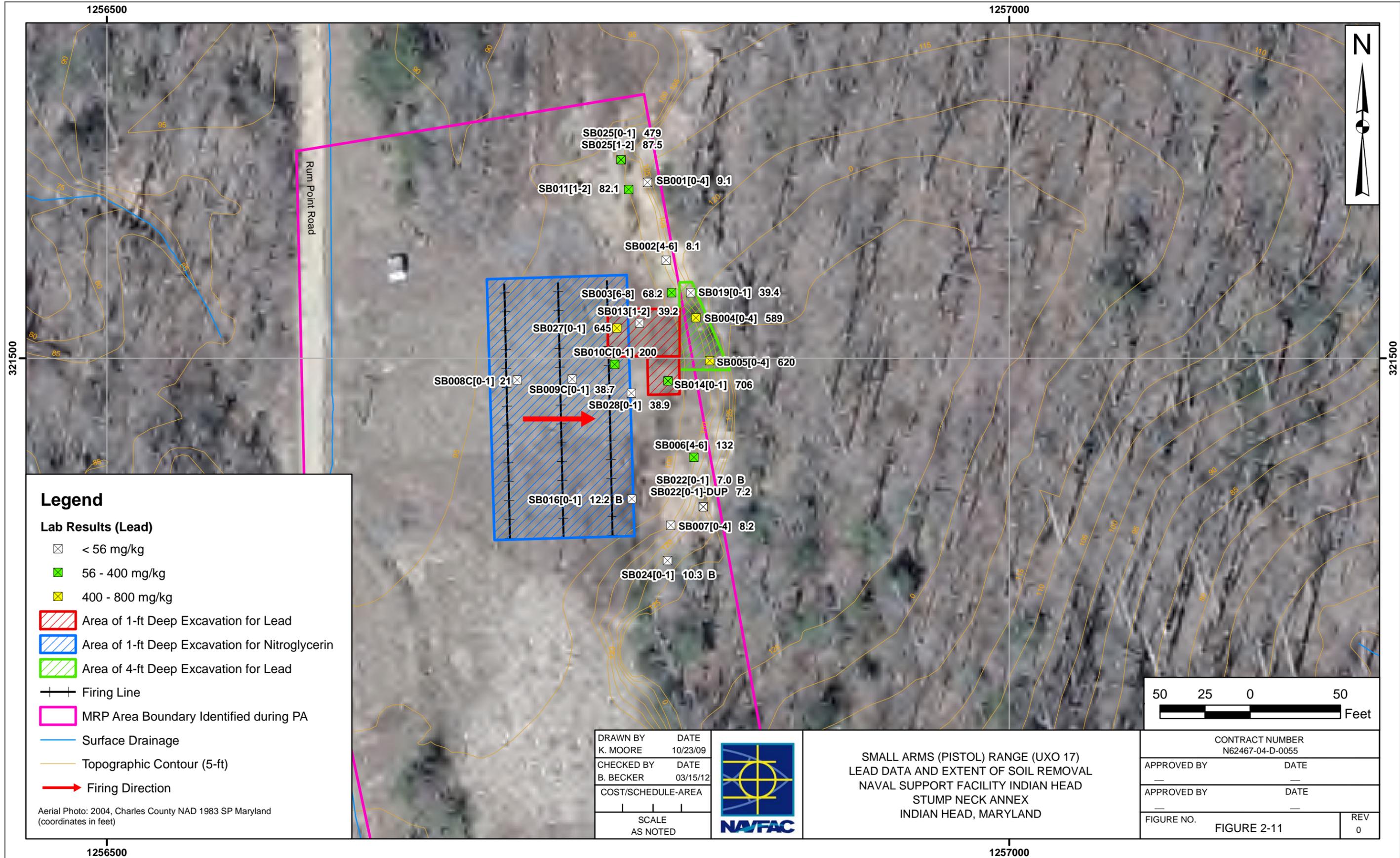
- SB019[0-1] 290.04
- SB014[0-1] 156.61
- SB002[0-1] 841.97
- SB073[0-1] 1030.07
- SB071[0-1] 603.69
- SB078[0-1] 159.83
- SB023[0-1] 314.87
- SB031[0-1] 524.89
- SB051[0-1] 313.91
- SB056[0-1] 2401.4
- SB076[0-1] 4111
- SB062[0-1] 1821.4

|                         |                  |
|-------------------------|------------------|
| DRAWN BY<br>K. MOORE    | DATE<br>12/21/09 |
| CHECKED BY<br>B. BECKER | DATE<br>03/16/12 |
| COST/SCHEDULE-AREA      |                  |
| SCALE<br>AS NOTED       |                  |



RUM POINT SKEET RANGE (UXO 16)  
METALS/PAH EXCEEDANCES AND  
EXTENT OF SOIL REMOVAL  
NAVAL SUPPORT FACILITY INDIAN HEAD  
STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND

|                                     |      |
|-------------------------------------|------|
| 100 0 100<br>Feet                   |      |
| CONTRACT NUMBER<br>N62467-04-D-0055 |      |
| APPROVED BY                         | DATE |
| —                                   | —    |
| APPROVED BY                         | DATE |
| —                                   | —    |
| FIGURE NO.                          | REV  |
| FIGURE 2-10                         | 0    |



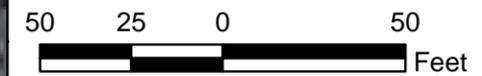
**Legend**

**Lab Results (Lead)**

- ☒ < 56 mg/kg
- ☒ 56 - 400 mg/kg
- ☒ 400 - 800 mg/kg

- ▨ Area of 1-ft Deep Excavation for Lead
- ▨ Area of 1-ft Deep Excavation for Nitroglycerin
- ▨ Area of 4-ft Deep Excavation for Lead
- +— Firing Line
- ▭ MRP Area Boundary Identified during PA
- Surface Drainage
- Topographic Contour (5-ft)
- Firing Direction

Aerial Photo: 2004, Charles County NAD 1983 SP Maryland (coordinates in feet)

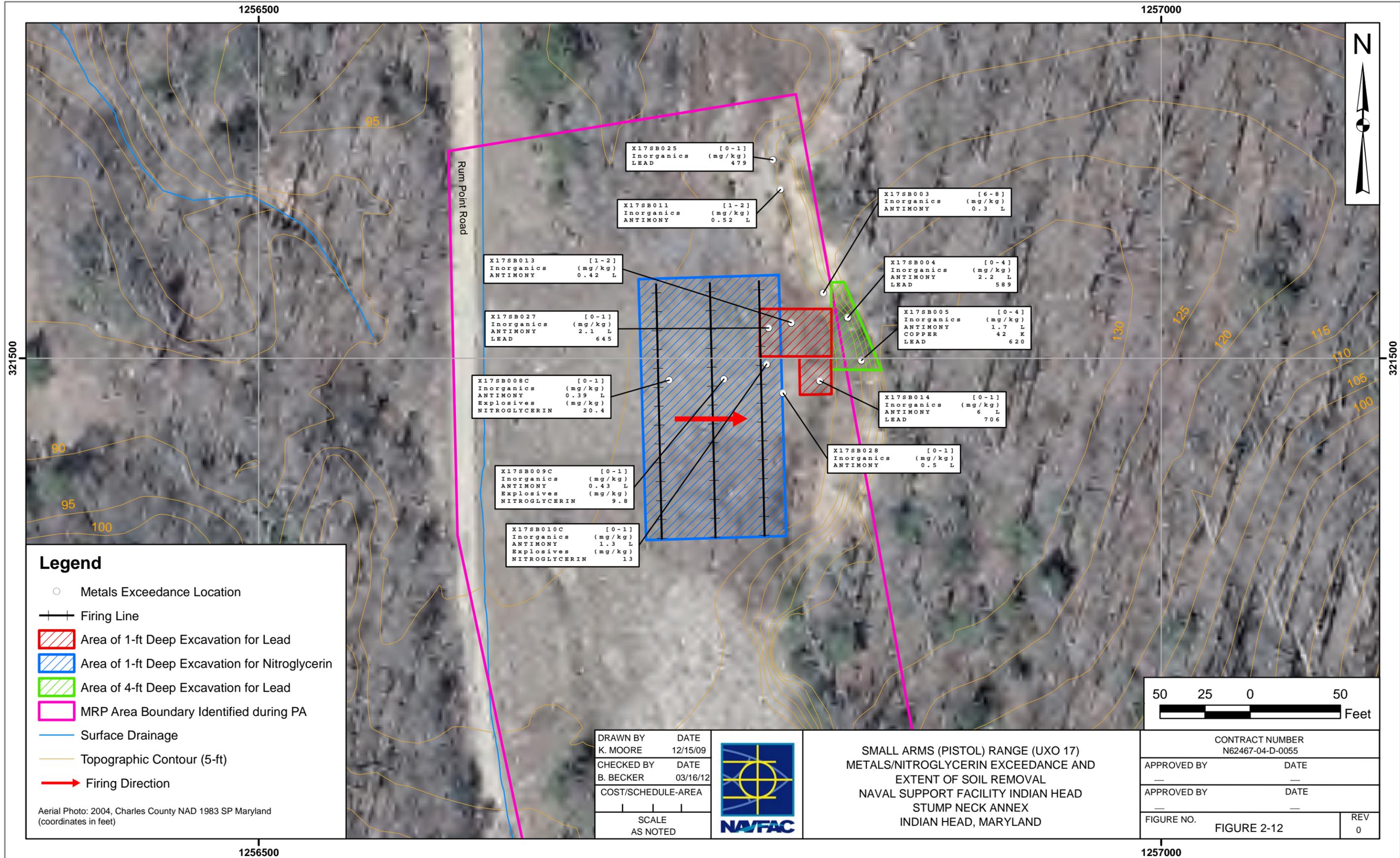


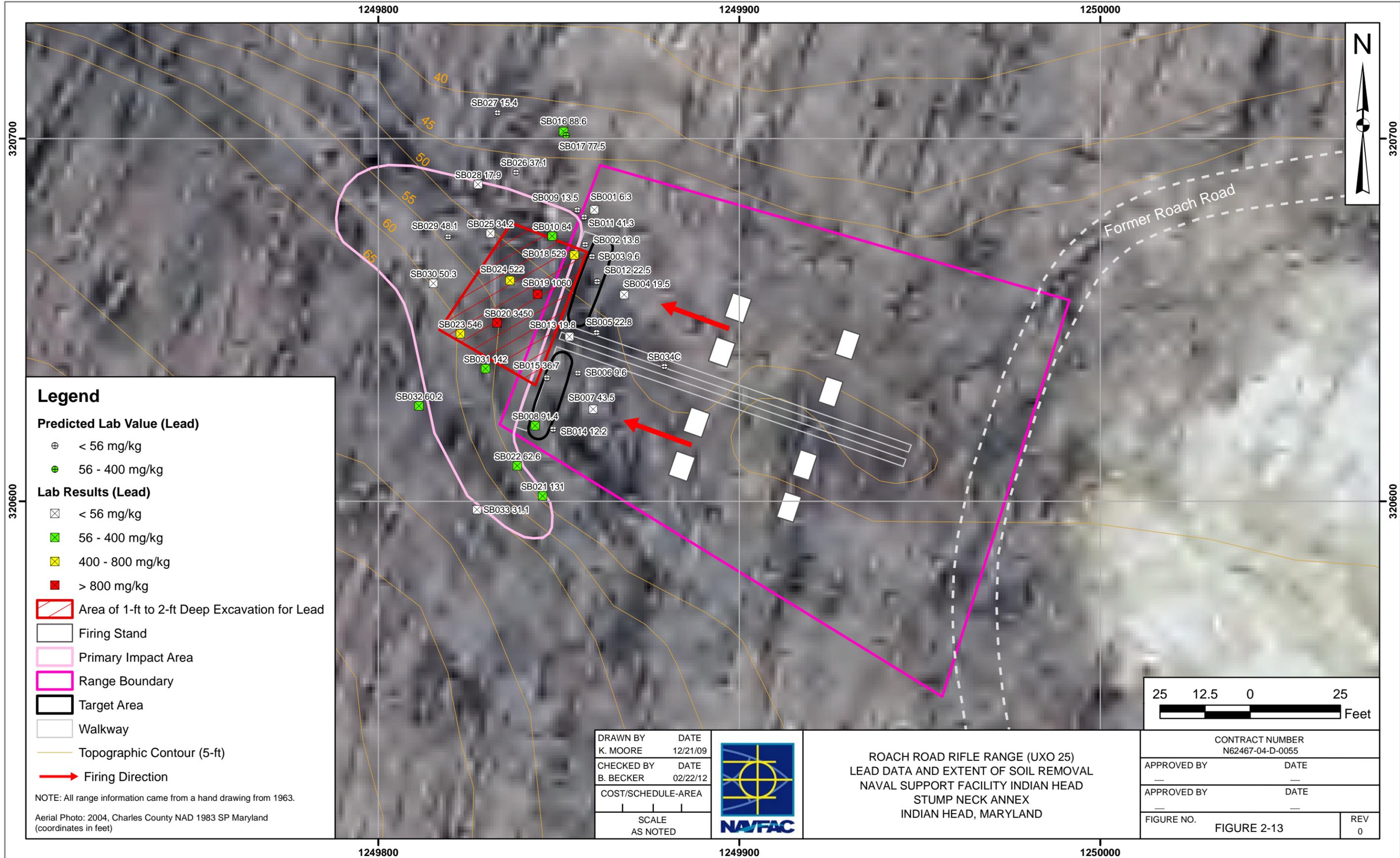
|                         |                  |
|-------------------------|------------------|
| DRAWN BY<br>K. MOORE    | DATE<br>10/23/09 |
| CHECKED BY<br>B. BECKER | DATE<br>03/15/12 |
| COST/SCHEDULE-AREA      |                  |
| SCALE<br>AS NOTED       |                  |



SMALL ARMS (PISTOL) RANGE (UXO 17)  
LEAD DATA AND EXTENT OF SOIL REMOVAL  
NAVAL SUPPORT FACILITY INDIAN HEAD  
STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND

|                                     |      |
|-------------------------------------|------|
| CONTRACT NUMBER<br>N62467-04-D-0055 |      |
| APPROVED BY                         | DATE |
| APPROVED BY                         | DATE |
| FIGURE NO.                          | REV  |
| FIGURE 2-11                         | 0    |





**Legend**

**Predicted Lab Value (Lead)**

- ⊕ < 56 mg/kg
- 56 - 400 mg/kg

**Lab Results (Lead)**

- ⊗ < 56 mg/kg
- ⊗ 56 - 400 mg/kg
- ⊗ 400 - 800 mg/kg
- ⊗ > 800 mg/kg

▨ Area of 1-ft to 2-ft Deep Excavation for Lead

□ Firing Stand

□ Primary Impact Area

□ Range Boundary

□ Target Area

□ Walkway

— Topographic Contour (5-ft)

→ Firing Direction

NOTE: All range information came from a hand drawing from 1963.

Aerial Photo: 2004, Charles County NAD 1983 SP Maryland (coordinates in feet)

DRAWN BY K. MOORE DATE 12/21/09

CHECKED BY B. BECKER DATE 02/22/12

COST/SCHEDULE-AREA

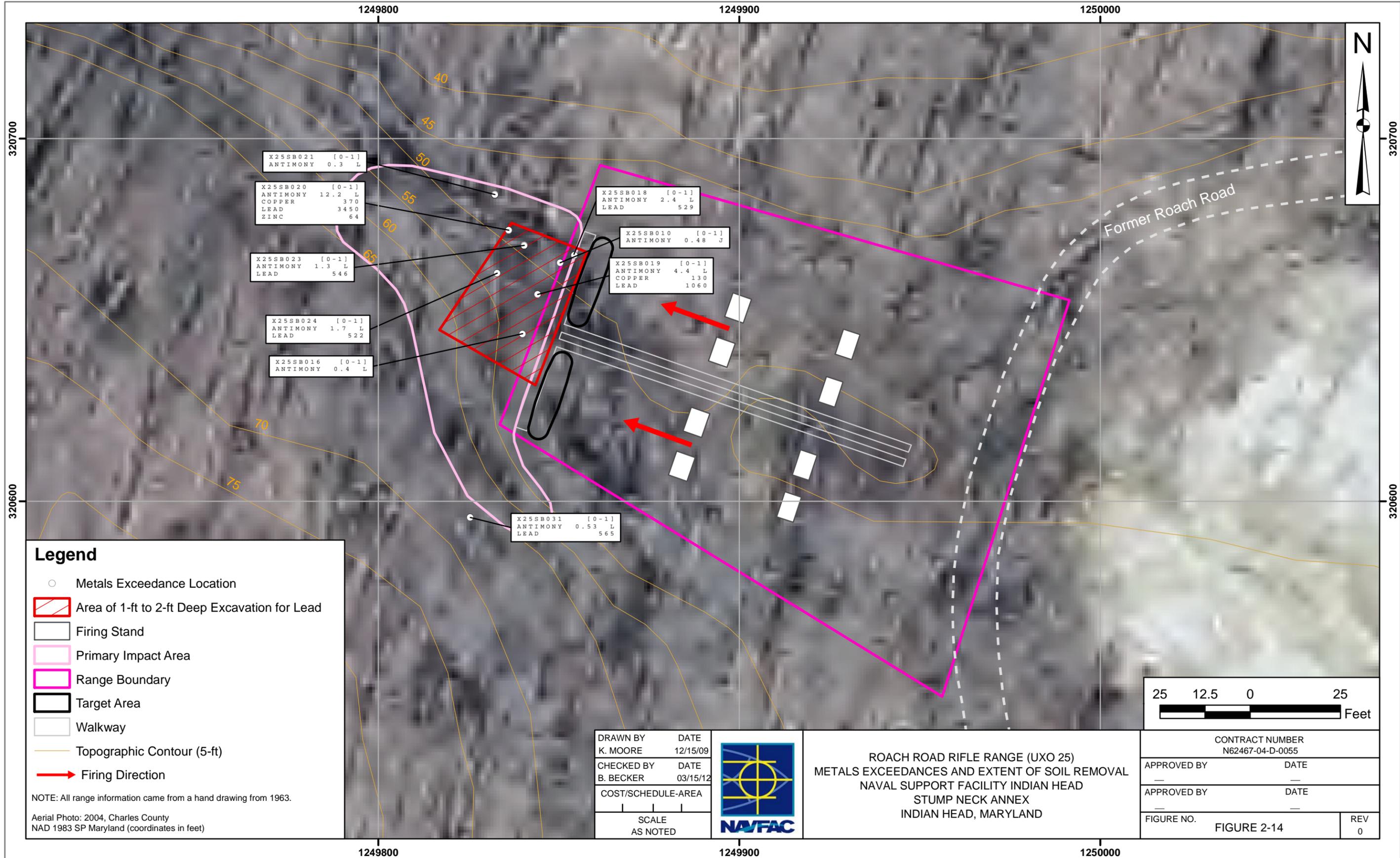
SCALE AS NOTED



ROACH ROAD RIFLE RANGE (UXO 25)  
LEAD DATA AND EXTENT OF SOIL REMOVAL  
NAVAL SUPPORT FACILITY INDIAN HEAD  
STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND



|                                     |      |
|-------------------------------------|------|
| CONTRACT NUMBER<br>N62467-04-D-0055 |      |
| APPROVED BY                         | DATE |
| APPROVED BY                         | DATE |
| FIGURE NO.                          | REV  |
| FIGURE 2-13                         | 0    |



X25SB021 [0-1]  
ANTIMONY 0.3 L

X25SB020 [0-1]  
ANTIMONY 12.2 L  
COPPER 370  
LEAD 3450  
ZINC 64

X25SB023 [0-1]  
ANTIMONY 1.3 L  
LEAD 546

X25SB024 [0-1]  
ANTIMONY 1.7 L  
LEAD 522

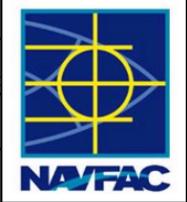
X25SB016 [0-1]  
ANTIMONY 0.4 L

X25SB031 [0-1]  
ANTIMONY 0.53 L  
LEAD 565

X25SB018 [0-1]  
ANTIMONY 2.4 L  
LEAD 529

X25SB010 [0-1]  
ANTIMONY 0.48 L

X25SB019 [0-1]  
ANTIMONY 4.4 L  
COPPER 130  
LEAD 1060

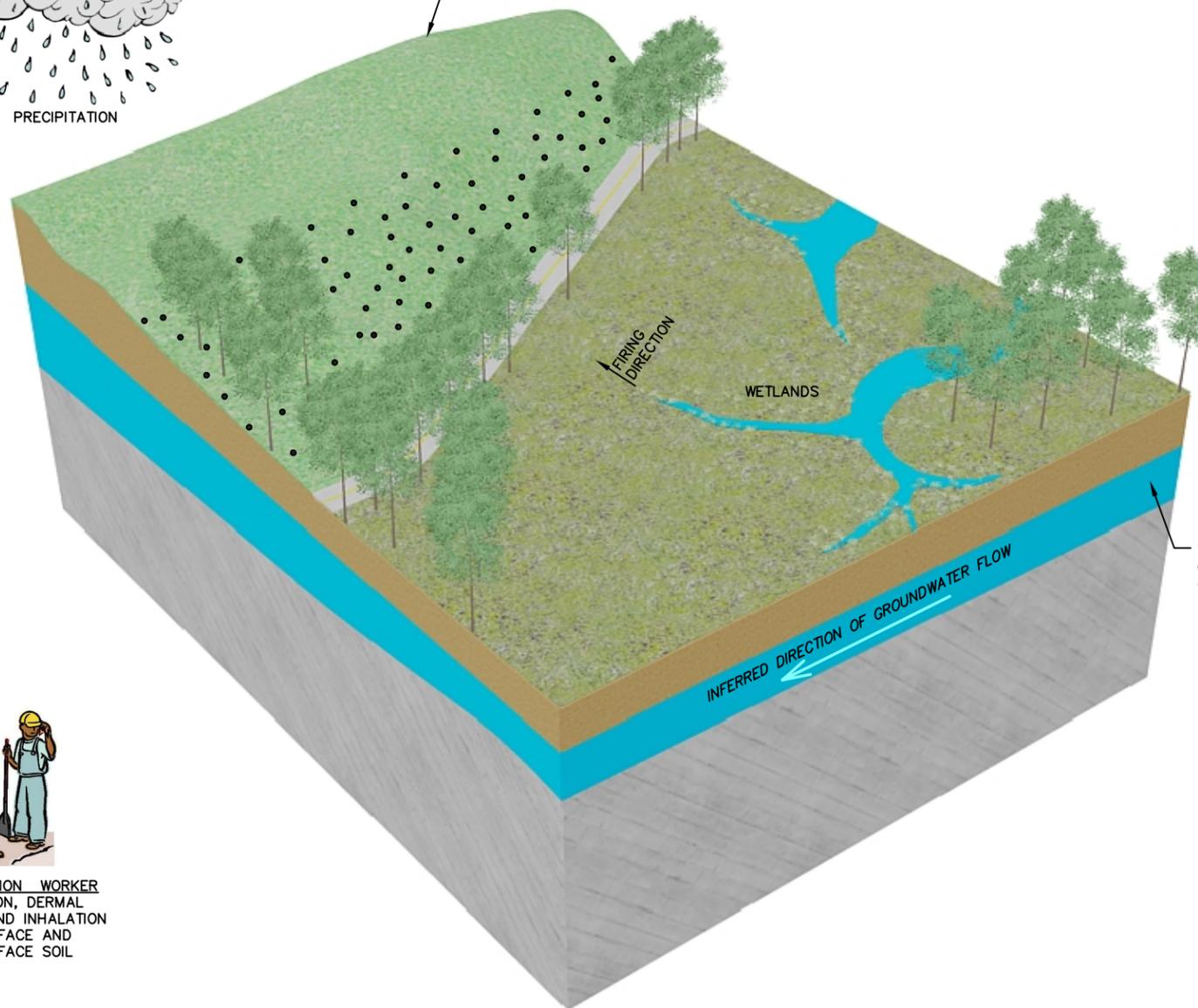


ROACH ROAD RIFLE RANGE (UXO 25)  
METALS EXCEEDANCES AND EXTENT OF SOIL REMOVAL  
NAVAL SUPPORT FACILITY INDIAN HEAD  
STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND





HILLSIDE (IMPACT BERM)



WATER TABLE  
(DEPTH TO GROUNDWATER  
~5-10 FT BGS)



SITE WORKER/TRESSPASSER/  
RECREATIONAL USER  
-INGESTION, DERMAL  
CONTACT, AND INHALATION  
OF SURFACE SOIL



FUTURE RESIDENT  
-INGESTION, DERMAL  
CONTACT, AND INHALATION  
OF SURFACE AND  
SUBSURFACE SOIL



CONSTRUCTION WORKER  
-INGESTION, DERMAL  
CONTACT, AND INHALATION  
OF SURFACE AND  
SUBSURFACE SOIL



ECOLOGICAL RECEPTOR  
-INGESTION, DERMAL CONTACT,  
AND INHALATION OF SURFACE SOIL  
-INGESTION, DERMAL CONTACT  
OF SURFACE WATER/SEDIMENT

LEGEND

••• AREA OF BULLET ACCUMULATION

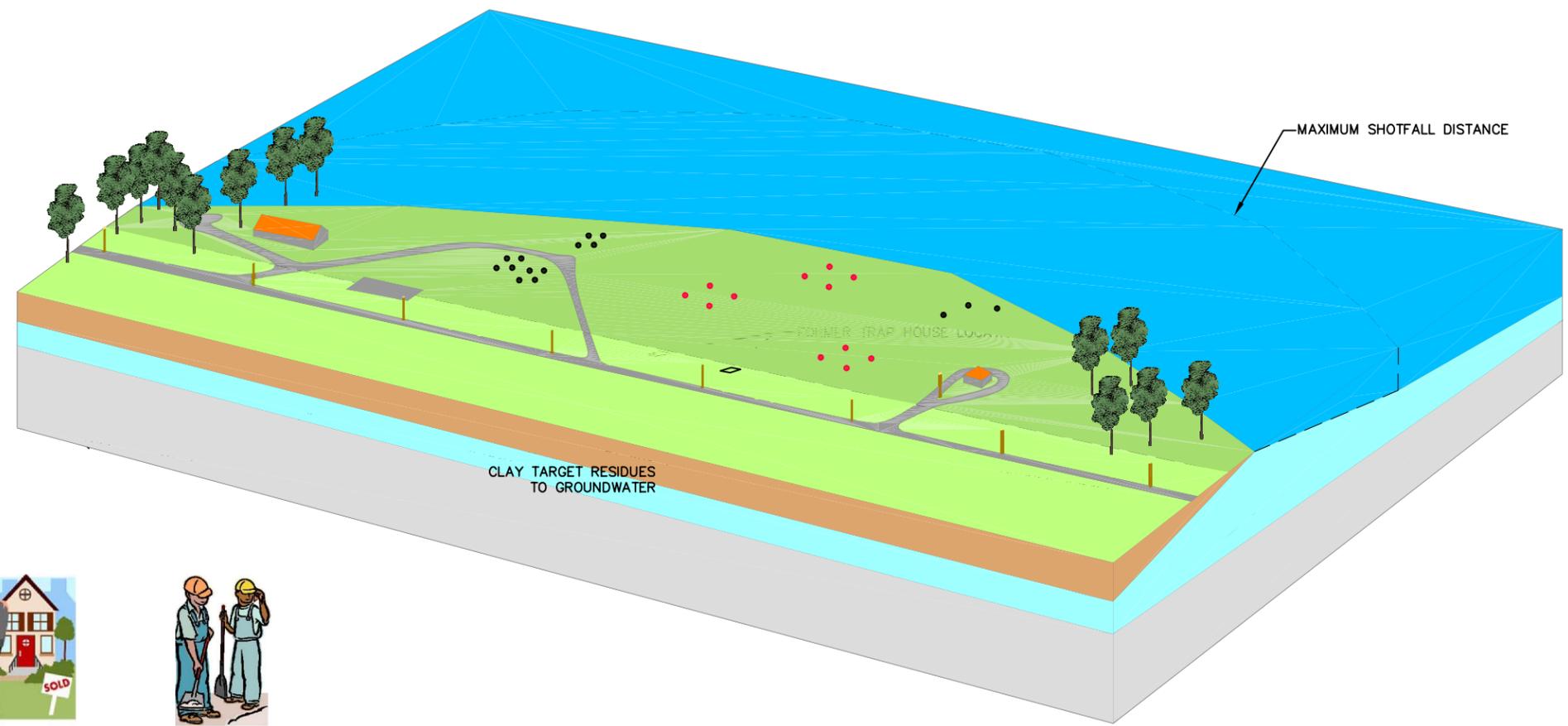
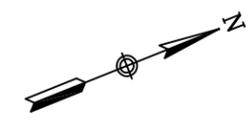
|                         |                  |
|-------------------------|------------------|
| DRAWN BY<br>MKB         | DATE<br>03/14/12 |
| CHECKED BY<br>B. BECKER | DATE<br>03/14/12 |
| REVISED BY<br>---       | DATE<br>---      |

SCALE  
NOT TO SCALE



MARINE RIFLE RANGE (UXO 14)  
HILLSIDE IMPACT AREA  
CONCEPTUAL SITE MODEL  
NAVAL SUPPORT FACILITY  
STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND

|                            |             |
|----------------------------|-------------|
| CONTRACT NO.<br>0810       |             |
| OWNER NO.                  |             |
| APPROVED BY<br>---         | DATE<br>--- |
| DRAWING NO.<br>FIGURE 2-15 | REV.<br>0   |



**SITE WORKER/TRESPASSER/  
RECREATIONAL USER**  
-INGESTION, DERMAL  
CONTACT, AND INHALATION  
OF SURFACE SOIL  
-INGESTION AND DERMAL  
CONTACT WITH SEDIMENT



**FUTURE RESIDENT**  
-INGESTION, DERMAL  
CONTACT, AND INHALATION  
OF SURFACE AND  
SUBSURFACE SOIL  
-INGESTION OF AND  
DERMAL CONTACT WITH  
GROUNDWATER  
-INGESTION AND DERMAL  
CONTACT WITH SEDIMENT



**CONSTRUCTION WORKER**  
-INGESTION, DERMAL  
CONTACT, AND INHALATION  
OF SURFACE AND  
SUBSURFACE SOIL  
-INGESTION OF AND  
DERMAL CONTACT WITH  
GROUNDWATER  
-INGESTION AND DERMAL  
CONTACT WITH SEDIMENT



**ECOLOGICAL RECEPTOR**  
-INGESTION, DERMAL CONTACT,  
AND INHALATION OF SURFACE SOIL  
-INGESTION, DERMAL CONTACT  
OF SURFACE WATER/SEDIMENT

**LEGEND**

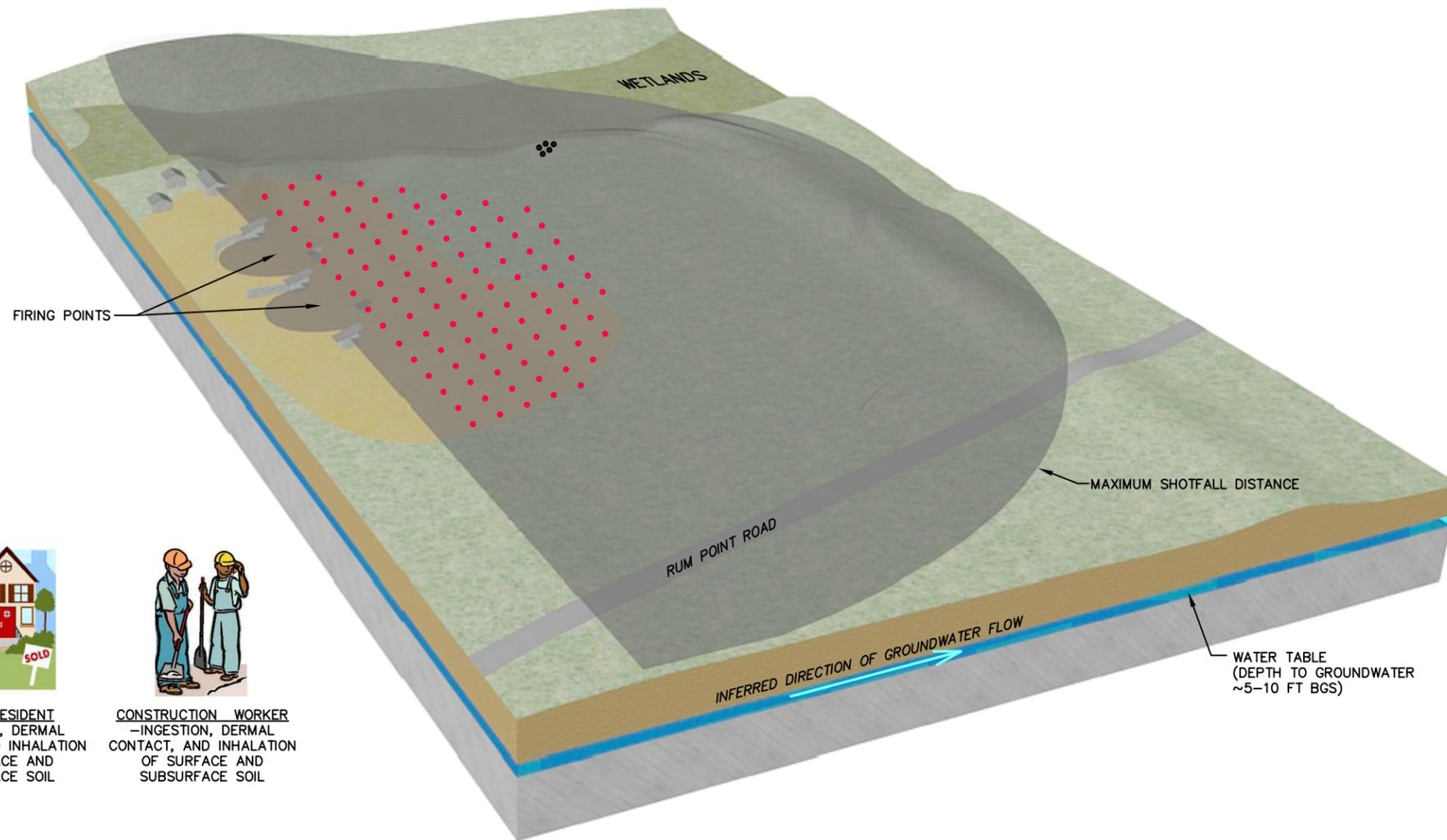
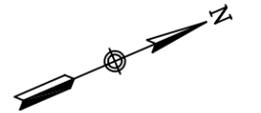
- AREA OF LEAD SHOT ACCUMULATION
- CLAY TARGET ACCUMULATIONS

|                         |                  |
|-------------------------|------------------|
| DRAWN BY<br>MKB         | DATE<br>03/14/12 |
| CHECKED BY<br>B. BECKER | DATE<br>03/14/12 |
| REVISED BY<br>---       | DATE<br>---      |
| SCALE<br>NOT TO SCALE   |                  |



**OLD SKEET AND TRAP RANGE (UXO 15)  
CONCEPTUAL SITE MODEL  
NAVAL SUPPORT FACILITY  
STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND**

|                                   |                  |
|-----------------------------------|------------------|
| CONTRACT NO.<br>0810              |                  |
| OWNER NO.                         |                  |
| APPROVED BY<br>---                | DATE<br>---      |
| DRAWING NO.<br><b>FIGURE 2-16</b> | REV.<br><b>0</b> |



**SITE WORKER/TRESSPASSER/  
RECREATIONAL USER**  
-INGESTION, DERMAL  
CONTACT, AND INHALATION  
OF SURFACE SOIL



**FUTURE RESIDENT**  
-INGESTION, DERMAL  
CONTACT, AND INHALATION  
OF SURFACE AND  
SUBSURFACE SOIL



**CONSTRUCTION WORKER**  
-INGESTION, DERMAL  
CONTACT, AND INHALATION  
OF SURFACE AND  
SUBSURFACE SOIL



**ECOLOGICAL RECEPTOR**  
-INGESTION, DERMAL CONTACT,  
AND INHALATION OF SURFACE SOIL  
-INGESTION, DERMAL CONTACT  
OF SURFACE WATER/SEDIMENT

**LEGEND**

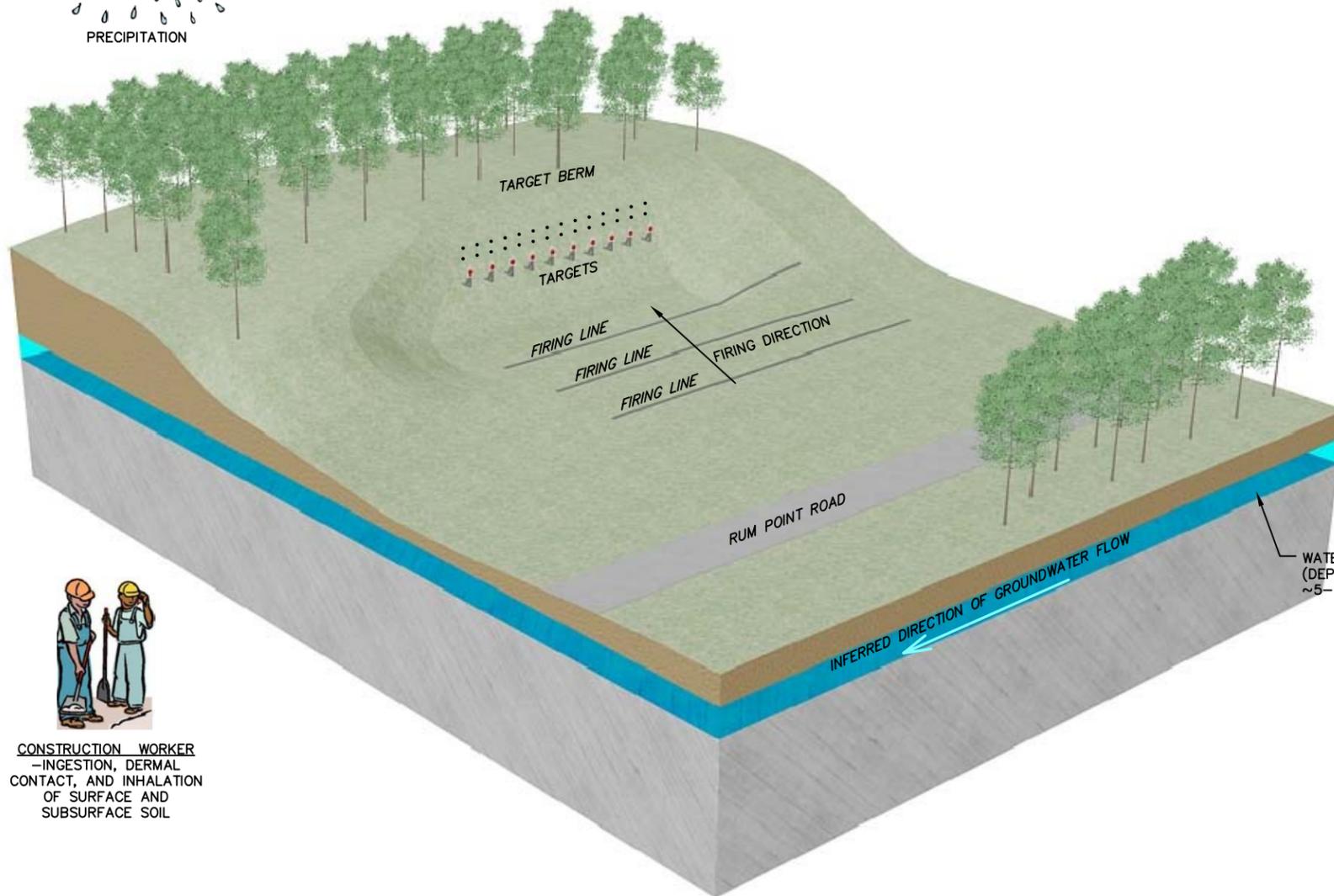
- AREA OF LEAD SHOT ACCUMULATION
- CLAY TARGET ACCUMULATIONS

|                         |                  |
|-------------------------|------------------|
| DRAWN BY<br>MKB         | DATE<br>03/14/12 |
| CHECKED BY<br>B. BECKER | DATE<br>03/14/12 |
| REVISED BY<br>---       | DATE<br>---      |
| SCALE<br>NOT TO SCALE   |                  |



**RUM POINT SKEET RANGE (UXO 16)  
CONCEPTUAL SITE MODEL FOR GROUNDWATER  
NAVAL SUPPORT FACILITY  
STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND**

|                            |             |
|----------------------------|-------------|
| CONTRACT NO.<br>0810       |             |
| OWNER NO.                  |             |
| APPROVED BY<br>---         | DATE<br>--- |
| DRAWING NO.<br>FIGURE 2-17 | REV.<br>0   |



**SITE WORKER/TRESSPASSER/  
RECREATIONAL USER**  
-INGESTION, DERMAL  
CONTACT, AND INHALATION  
OF SURFACE SOIL



**FUTURE RESIDENT**  
-INGESTION, DERMAL  
CONTACT, AND INHALATION  
OF SURFACE AND  
SUBSURFACE SOIL



**CONSTRUCTION WORKER**  
-INGESTION, DERMAL  
CONTACT, AND INHALATION  
OF SURFACE AND  
SUBSURFACE SOIL



**ECOLOGICAL RECEPTOR**  
-INGESTION, DERMAL CONTACT,  
AND INHALATION OF SURFACE SOIL  
-INGESTION, DERMAL CONTACT  
OF SURFACE WATER/SEDIMENT

LEGEND

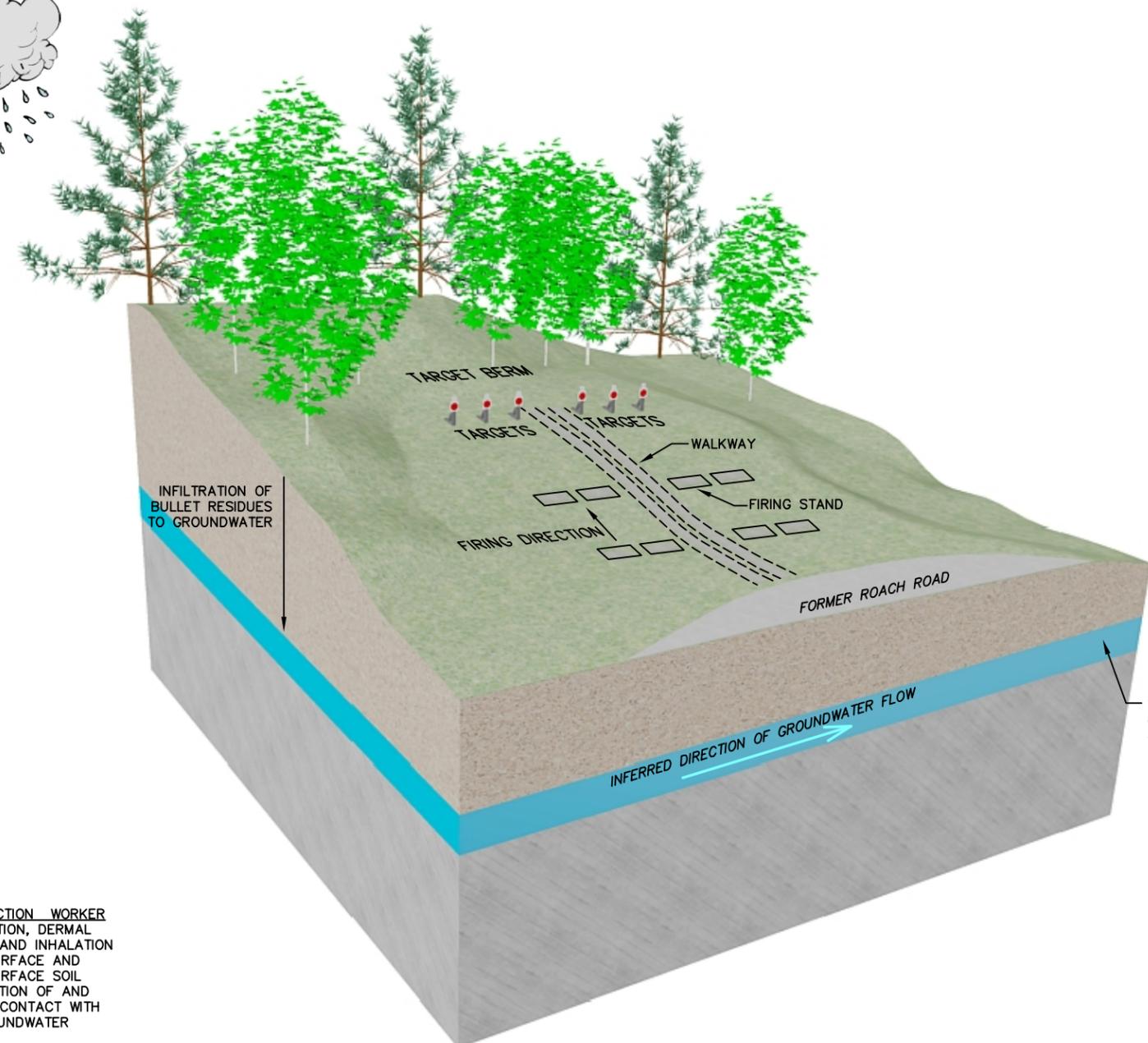
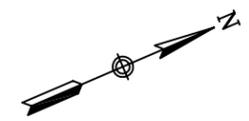
••• AREA OF BULLET ACCUMULATION

|                         |                  |
|-------------------------|------------------|
| DRAWN BY<br>MKB         | DATE<br>03/15/12 |
| CHECKED BY<br>B. BECKER | DATE<br>03/15/12 |
| REVISED BY<br>---       | DATE<br>---      |
| SCALE<br>NOT TO SCALE   |                  |



SMALL ARMS (PISTOL) RANGE (UXO 17)  
CONCEPTUAL SITE MODEL  
NAVAL SUPPORT FACILITY  
STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND

|                            |             |
|----------------------------|-------------|
| CONTRACT NO.<br>0810       |             |
| OWNER NO.                  |             |
| APPROVED BY<br>---         | DATE<br>--- |
| DRAWING NO.<br>FIGURE 2-18 | REV.<br>0   |



**SITE WORKER/TRESSPASSER/  
RECREATIONAL USER**  
-INGESTION, DERMAL  
CONTACT, AND INHALATION  
OF SURFACE SOIL



**FUTURE RESIDENT**  
-INGESTION, DERMAL  
CONTACT, AND INHALATION  
OF SURFACE AND  
SUBSURFACE SOIL  
-INGESTION OF AND  
DERMAL CONTACT WITH  
GROUNDWATER

**CONSTRUCTION WORKER**  
-INGESTION, DERMAL  
CONTACT, AND INHALATION  
OF SURFACE AND  
SUBSURFACE SOIL  
-INGESTION OF AND  
DERMAL CONTACT WITH  
GROUNDWATER



**ECOLOGICAL RECEPTOR**  
-INGESTION, DERMAL CONTACT,  
AND INHALATION OF SURFACE SOIL  
-INGESTION, DERMAL CONTACT  
OF SURFACE WATER/SEDIMENT

LEGEND  
••• AREA OF BULLET ACCUMULATION

|                         |                  |
|-------------------------|------------------|
| DRAWN BY<br>MKB         | DATE<br>03/14/12 |
| CHECKED BY<br>B. BECKER | DATE<br>03/14/12 |
| REVISED BY<br>---       | DATE<br>---      |
| SCALE<br>NOT TO SCALE   |                  |



**ROACH ROAD RIFLE RANGE (UXO 25)**  
CONCEPTUAL SITE MODEL  
NAVAL SUPPORT FACILITY  
STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND

|                            |             |
|----------------------------|-------------|
| CONTRACT NO.<br>0810       |             |
| OWNER NO.                  |             |
| APPROVED BY<br>---         | DATE<br>--- |
| DRAWING NO.<br>FIGURE 2-19 | REV.<br>0   |

**APPENDIX A**

**SUMMARY OF FIELD SCREENING AND ANALYTICAL RESULTS**

**Table A.1-1**  
**Summary of Chemicals Detected in Composite Surface Soil Samples**  
**Firing Line Area**  
**Marine Rifle Range - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
**Page 1 of 2**

| location                                 |      | X14SB001C     | X14SB002C     | X14SB003C     | X14SB004C     | X14SB004C         | X14SB004C       | X14SB005C     | X14SB006C     |        |    |     |    |        |    |        |    |
|--|------|---------------|---------------|---------------|---------------|-------------------|-----------------|---------------|---------------|--------|----|-----|----|--------|----|--------|----|
| nsample                                  |      | X14SS001C0001 | X14SS002C0001 | X14SS003C0001 | X14SS004C0001 | X14SS004C0001-AVG | X14SS004C0001-D | X14SS005C0001 | X14SS006C0001 |        |    |     |    |        |    |        |    |
| sample_dat                               |      | 20090529      | 20090529      | 20090529      | 20090529      | 20090529          | 20090529        | 20090529      | 20090529      |        |    |     |    |        |    |        |    |
| qc_type                                  |      | NM            | NM            | NM            | NM            | NM                | FD              | NM            | NM            |        |    |     |    |        |    |        |    |
| sacode                                   |      | NORMAL        | NORMAL        | NORMAL        | ORIG          | AVG               | DUP             | NORMAL        | NORMAL        |        |    |     |    |        |    |        |    |
| matrix                                   | PALs | SO            | SO            | SO            | SO            | SO                | SO              | SO            | SO            |        |    |     |    |        |    |        |    |
| top_depth                                |      | 0             | 0             | 0             | 0             | 0                 | 0               | 0             | 0             |        |    |     |    |        |    |        |    |
| bottom_dep                               |      | 1             | 1             | 1             | 1             | 1                 | 1               | 1             | 1             |        |    |     |    |        |    |        |    |
| depth_unit                               |      | FT            | FT            | FT            | FT            | FT                | FT              | FT            | FT            |        |    |     |    |        |    |        |    |
| submatrix                                |      | SS            | SS            | SS            | SS            | SS                | SS              | SS            | SS            |        |    |     |    |        |    |        |    |
| composite                                |      | Y             | Y             | Y             | Y             | Y                 | Y               | Y             | Y             |        |    |     |    |        |    |        |    |
| <b>Inorganics (mg/kg)</b>                |      |               |               |               |               |                   |                 |               |               |        |    |     |    |        |    |        |    |
| ANTIMONY                                 | 0.27 | 0.15          | J             | 0.19          | J             | 0.18              | J               | 1.4           | J             | 1.4    | J  |     |    | 0.13   | J  | 0.19   | J  |
| ARSENIC                                  | 0.39 | 3.2           |               | 2.8           |               | 3                 |                 | 3.3           |               | 3.3    |    |     |    | 1.6    |    | 2      |    |
| COPPER                                   | 100  | 9.5           | L             | 9.3           | L             | 11.9              | L               | 25.5          | L             | 25.5   | L  |     |    | 12.7   | L  | 8      | L  |
| LEAD                                     | 11   | 18.4          |               | 17.6          |               | 19.6              |                 | 52.5          |               | 52.5   |    |     |    | 12     |    | 36.7   |    |
| TIN                                      | 0.89 | 1.2           | B             | 1.2           | B             | 1.3               | B               | 3.2           | B             | 3.2    | B  |     |    | 1.2    | B  | 1      | B  |
| ZINC                                     | 46   | 29.6          |               | 26.7          |               | 36                |                 | 66.5          |               | 66.5   |    |     |    | 25.1   |    | 46.4   |    |
| <b>Explosives (mg/kg)</b>                |      |               |               |               |               |                   |                 |               |               |        |    |     |    |        |    |        |    |
| NITROGLYCERIN                            | 6.1  | 1.2           | UJ            | 1.2           | UJ            | 1.2               | UJ              | 1.2           | UJ            | 1.2    | UJ | 1.2 | UJ | 1.2    | UJ | 1.2    | UJ |
| <b>XRF Field Parameters (mg/kg)</b>      |      |               |               |               |               |                   |                 |               |               |        |    |     |    |        |    |        |    |
| LEAD                                     | 11   | 19.667        |               | 18.333        |               | 15.667            |                 | 82.333        |               | 82.333 |    |     |    | 16.667 |    | 19.667 |    |
| <b>Miscellaneous Parameters (mg/100)</b> |      |               |               |               |               |                   |                 |               |               |        |    |     |    |        |    |        |    |
| CATION EXCHANGE CAPACITY                 | NA   |               |               |               |               |                   |                 |               |               |        |    |     |    |        |    |        |    |
| <b>Miscellaneous Parameters (s.u.)</b>   |      |               |               |               |               |                   |                 |               |               |        |    |     |    |        |    |        |    |
| PH                                       | NA   |               |               |               |               |                   |                 |               |               |        |    |     |    |        |    |        |    |
| <b>Miscellaneous Parameters (mg/kg)</b>  |      |               |               |               |               |                   |                 |               |               |        |    |     |    |        |    |        |    |
| TOTAL ORGANIC CARBON                     | NA   |               |               |               |               |                   |                 |               |               |        |    |     |    |        |    |        |    |
| <b>Miscellaneous Parameters (%)</b>      |      |               |               |               |               |                   |                 |               |               |        |    |     |    |        |    |        |    |
| TOTAL SOLIDS                             | NA   | 83            |               | 79            |               | 76                |                 | 84            |               | 84     |    |     |    | 86     |    | 79     |    |

**Table A.1-1**  
**Summary of Chemicals Detected in Composite Surface Soil Samples**  
**Firing Line Area**  
**Marine Rifle Range - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                  |             | X14SB007C            | X14SB008C            | X14SB009C            |   |      |   |
|---|-------------|----------------------|----------------------|----------------------|---|------|---|
| <b>nsample</b>                            |             | <b>X14SS007C0001</b> | <b>X14SS008C0001</b> | <b>X14SS009C0001</b> |   |      |   |
| sample_dat                                |             | 20090529             | 20090601             | 20090601             |   |      |   |
| qc_type                                   |             | NM                   | NM                   | NM                   |   |      |   |
| sacode                                    |             | NORMAL               | NORMAL               | NORMAL               |   |      |   |
| matrix                                    | <b>PALs</b> | SO                   | SO                   | SO                   |   |      |   |
| top_depth                                 |             | 0                    | 0                    | 0                    |   |      |   |
| bottom_dep                                |             | 1                    | 1                    | 1                    |   |      |   |
| depth_unit                                |             | FT                   | FT                   | FT                   |   |      |   |
| submatrix                                 |             | SS                   | SS                   | SS                   |   |      |   |
| composite                                 |             | Y                    | Y                    | Y                    |   |      |   |
| <b>Inorganics (mg/kg)</b>                 |             |                      |                      |                      |   |      |   |
| ANTIMONY                                  | 0.27        | 0.16                 | J                    | 0.19                 | J | 0.3  | J |
| ARSENIC                                   | 0.39        | 3                    |                      | 2.6                  |   | 2.5  |   |
| COPPER                                    | 100         | 8.7                  | L                    | 52.4                 | L | 12.8 | L |
| LEAD                                      | 11          | 21.2                 |                      | 22.3                 |   | 20.1 |   |
| TIN                                       | 0.89        | 1.7                  | B                    | 1.2                  | B | 1.5  | B |
| ZINC                                      | 46          | 31.9                 |                      | 65.4                 |   | 34.5 |   |
| <b>Explosives (mg/kg)</b>                 |             |                      |                      |                      |   |      |   |
| NITROGLYCERIN                             | 6.1         | 1.2                  | UJ                   | 1.2                  | U | 0.8  | J |
| <b>XRF Field Parameters (mg/kg)</b>       |             |                      |                      |                      |   |      |   |
| LEAD                                      | 11          | 19                   |                      | 30                   |   | 22   |   |
| <b>Miscellaneous Parameters (meq/100)</b> |             |                      |                      |                      |   |      |   |
| CATION EXCHANGE CAPACITY                  | NA          |                      |                      |                      |   |      |   |
| <b>Miscellaneous Parameters (s.u.)</b>    |             |                      |                      |                      |   |      |   |
| PH  | NA          |                      |                      |                      |   |      |   |
| <b>Miscellaneous Parameters (mg/kg)</b>   |             |                      |                      |                      |   |      |   |
| TOTAL ORGANIC CARBON                      | NA          |                      |                      |                      |   |      |   |
| <b>Miscellaneous Parameters (%)</b>       |             |                      |                      |                      |   |      |   |
| TOTAL SOLIDS                              | NA          | 84                   |                      | 80                   |   | 73   |   |



**Table A.1-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Target Berm 1**  
**Marine Rifle Range - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                  |             | X14SB018            | X14SB019            | X14SB020            | X14SB021            | X14SB022            | X14SB023            | X14SB024            | X14SB025            |
|---|-------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| <b>nsample</b>                            |             | <b>X14SS0180001</b> | <b>X14SS0190001</b> | <b>X14SS0200001</b> | <b>X14SS0210001</b> | <b>X14SS0220001</b> | <b>X14SS0230001</b> | <b>X14SS0240001</b> | <b>X14SS0250001</b> |
| sample_dat                                |             | 20090602            | 20090602            | 20090602            | 20090602            | 20090602            | 20090602            | 20090602            | 20090602            |
| qc_type                                   |             | NM                  |
| sacode                                    |             | NORMAL              |
| matrix                                    | <b>PALs</b> | SO                  |
| top_depth                                 |             | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   |
| bottom_dep                                |             | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   |
| depth_unit                                |             | FT                  |
| submatrix                                 |             | SS                  |
| composite                                 |             | N                   | N                   | N                   | N                   | N                   | N                   | N                   | N                   |
| <b>Inorganics (mg/kg)</b>                 |             |                     |                     |                     |                     |                     |                     |                     |                     |
| ANTIMONY                                  | 0.27        |                     |                     |                     |                     | 0.12                | L                   |                     |                     |
| ARSENIC                                   | 0.39        |                     |                     |                     |                     | 4.2                 |                     |                     |                     |
| COPPER                                    | 100         |                     |                     |                     |                     | 9.2                 |                     |                     |                     |
| LEAD                                      | 11          |                     |                     |                     |                     | 9.6                 |                     |                     |                     |
| TIN                                       | 0.89        |                     |                     |                     |                     | 1.8                 | B                   |                     |                     |
| ZINC                                      | 46          |                     |                     |                     |                     | 29.8                |                     |                     |                     |
| <b>Explosives (mg/kg)</b>                 |             |                     |                     |                     |                     |                     |                     |                     |                     |
| NITROGLYCERIN                             | 6.1         |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>XRF Field Parameters (mg/kg)</b>       |             |                     |                     |                     |                     |                     |                     |                     |                     |
| LEAD                                      | 11          | 11.667              | 16                  | 18.333              | 22.667              | 28.667              | 16                  | 42                  | 62                  |
| <b>Miscellaneous Parameters (meq/100)</b> |             |                     |                     |                     |                     |                     |                     |                     |                     |
| CATION EXCHANGE CAPACITY                  | NA          |                     |                     |                     |                     | 20                  | K                   |                     |                     |
| <b>Miscellaneous Parameters (s.u.)</b>    |             |                     |                     |                     |                     |                     |                     |                     |                     |
| PH  | NA          |                     |                     |                     |                     | 4.8                 |                     |                     |                     |
| <b>Miscellaneous Parameters (mg/kg)</b>   |             |                     |                     |                     |                     |                     |                     |                     |                     |
| TOTAL ORGANIC CARBON                      | NA          |                     |                     |                     |                     | 15000               |                     |                     |                     |
| <b>Miscellaneous Parameters (%)</b>       |             |                     |                     |                     |                     |                     |                     |                     |                     |
| TOTAL SOLIDS                              | NA          |                     |                     |                     |                     | 84                  |                     |                     |                     |



**Table A.1-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Target Berm 1**  
**Marine Rifle Range - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                  |             | X14SB034            | X14SB035            | X14SB036            | X14SB037            | X14SB038            | X14SB039            | X14SB040            | X14SB041            |
|---|-------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| <b>nsample</b>                            |             | <b>X14SS0340001</b> | <b>X14SS0350001</b> | <b>X14SS0360001</b> | <b>X14SS0370001</b> | <b>X14SS0380001</b> | <b>X14SS0390001</b> | <b>X14SS0400001</b> | <b>X14SS0410001</b> |
| sample_dat                                |             | 20090602            | 20090602            | 20090602            | 20090602            | 20090602            | 20090602            | 20090602            | 20090602            |
| qc_type                                   |             | NM                  |
| sacode                                    |             | NORMAL              |
| matrix                                    | <b>PALs</b> | SO                  |
| top_depth                                 |             | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   |
| bottom_dep                                |             | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   |
| depth_unit                                |             | FT                  |
| submatrix                                 |             | SS                  |
| composite                                 |             | N                   | N                   | N                   | N                   | N                   | N                   | N                   | N                   |
| <b>Inorganics (mg/kg)</b>                 |             |                     |                     |                     |                     |                     |                     |                     |                     |
| ANTIMONY                                  | 0.27        |                     | 0.14                | L                   |                     |                     | 0.16                | L                   |                     |
| ARSENIC                                   | 0.39        |                     | 2.9                 |                     |                     |                     | 1.8                 |                     |                     |
| COPPER                                    | 100         |                     | 107                 |                     |                     |                     | 41                  |                     |                     |
| LEAD                                      | 11          |                     | 543                 |                     |                     |                     | 111                 |                     |                     |
| TIN                                       | 0.89        |                     | 9.1                 |                     |                     |                     | 2.9                 | B                   |                     |
| ZINC                                      | 46          |                     | 33.3                |                     |                     |                     | 23.3                |                     |                     |
| <b>Explosives (mg/kg)</b>                 |             |                     |                     |                     |                     |                     |                     |                     |                     |
| NITROGLYCERIN                             | 6.1         |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>XRF Field Parameters (mg/kg)</b>       |             |                     |                     |                     |                     |                     |                     |                     |                     |
| LEAD                                      | 11          | 233.667             | 540.333             | 117                 | 106.333             | 403.333             | 128.333             | 201.667             | 317.667             |
| <b>Miscellaneous Parameters (meq/100)</b> |             |                     |                     |                     |                     |                     |                     |                     |                     |
| CATION EXCHANGE CAPACITY                  | NA          |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (s.u.)</b>    |             |                     |                     |                     |                     |                     |                     |                     |                     |
| PH  | NA          |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (mg/kg)</b>   |             |                     |                     |                     |                     |                     |                     |                     |                     |
| TOTAL ORGANIC CARBON                      | NA          |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (%)</b>       |             |                     |                     |                     |                     |                     |                     |                     |                     |
| TOTAL SOLIDS                              | NA          |                     | 85                  |                     |                     |                     | 84                  |                     |                     |

**Table A.1-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Target Berm 1**  
**Marine Rifle Range - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                  |             | X14SB042            | X14SB043            | X14SB044            | X14SB045            |
|---|-------------|---------------------|---------------------|---------------------|---------------------|
| <b>nsample</b>                            |             | <b>X14SS0420001</b> | <b>X14SS0430001</b> | <b>X14SS0440001</b> | <b>X14SS0450001</b> |
| sample_dat                                |             | 20090602            | 20090602            | 20090602            | 20090603            |
| qc_type                                   |             | NM                  | NM                  | NM                  | NM                  |
| sacode                                    |             | NORMAL              | NORMAL              | NORMAL              | NORMAL              |
| matrix                                    | <b>PALs</b> | SO                  | SO                  | SO                  | SO                  |
| top_depth                                 |             | 0                   | 0                   | 0                   | 0                   |
| bottom_dep                                |             | 1                   | 1                   | 1                   | 1                   |
| depth_unit                                |             | FT                  | FT                  | FT                  | FT                  |
| submatrix                                 |             | SS                  | SS                  | SS                  | SS                  |
| composite                                 |             | N                   | N                   | N                   | N                   |
| <b>Inorganics (mg/kg)</b>                 |             |                     |                     |                     |                     |
| ANTIMONY                                  | 0.27        |                     | 0.13                | L                   |                     |
| ARSENIC                                   | 0.39        |                     | 1.3                 |                     |                     |
| COPPER                                    | 100         |                     | 76.5                |                     |                     |
| LEAD                                      | 11          |                     | 373                 |                     |                     |
| TIN                                       | 0.89        |                     | 4.1                 |                     |                     |
| ZINC                                      | 46          |                     | 18.6                |                     |                     |
| <b>Explosives (mg/kg)</b>                 |             |                     |                     |                     |                     |
| NITROGLYCERIN                             | 6.1         |                     |                     |                     |                     |
| <b>XRF Field Parameters (mg/kg)</b>       |             |                     |                     |                     |                     |
| LEAD                                      | 11          | 84.667              | 389                 | 330                 | 34.667              |
| <b>Miscellaneous Parameters (meg/100)</b> |             |                     |                     |                     |                     |
| CATION EXCHANGE CAPACITY                  | NA          |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (s.u.)</b>    |             |                     |                     |                     |                     |
| PH  | NA          |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (mg/kg)</b>   |             |                     |                     |                     |                     |
| TOTAL ORGANIC CARBON                      | NA          |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (%)</b>       |             |                     |                     |                     |                     |
| TOTAL SOLIDS                              | NA          |                     | 86                  |                     |                     |

**Table A.1-3**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Target Berm 2**  
**Marine Rifle Range - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                 |             | X14SB046            | X14SB047            | X14SB048            | X14SB049            | X14SB050            | X14SB051            | X14SB052            | X14SB053            |
|--|-------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| <b>nsample</b>                           |             | <b>X14SS0460001</b> | <b>X14SS0470001</b> | <b>X14SS0480001</b> | <b>X14SS0490001</b> | <b>X14SS0500001</b> | <b>X14SS0510001</b> | <b>X14SS0520001</b> | <b>X14SS0530001</b> |
| sample_dat                               |             | 20090603            | 20090603            | 20090603            | 20090603            | 20090603            | 20090603            | 20090603            | 20090603            |
| qc_type                                  |             | NM                  |
| sacode                                   |             | NORMAL              |
| matrix                                   | <b>PALs</b> | SO                  |
| top_depth                                |             | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   |
| bottom_dep                               |             | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   |
| depth_unit                               |             | FT                  |
| submatrix                                |             | SS                  |
| composite                                |             | N                   | N                   | N                   | N                   | N                   | N                   | N                   | N                   |
| <b>Inorganics (mg/kg)</b>                |             |                     |                     |                     |                     |                     |                     |                     |                     |
| ANTIMONY                                 | 0.27        |                     |                     | 0.14                | L                   |                     |                     |                     |                     |
| ARSENIC                                  | 0.39        |                     |                     | 2.7                 |                     |                     |                     |                     |                     |
| COPPER                                   | 100         |                     |                     | 14.6                |                     |                     |                     |                     |                     |
| LEAD                                     | 11          |                     |                     | 85.7                |                     |                     |                     |                     |                     |
| TIN                                      | 0.89        |                     |                     | 2                   | B                   |                     |                     |                     |                     |
| ZINC                                     | 46          |                     |                     | 33.1                |                     |                     |                     |                     |                     |
| <b>Explosives (mg/kg)</b>                |             |                     |                     |                     |                     |                     |                     |                     |                     |
| NITROGLYCERIN                            | 6.1         |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>XRF Field Parameters (mg/kg)</b>      |             |                     |                     |                     |                     |                     |                     |                     |                     |
| LEAD                                     | 11          | 21.333              | 37                  | 50.333              | 29.333              | 210.667             | 544.667             | 65                  | 114.333             |
| <b>Miscellaneous Parameters (mg/100)</b> |             |                     |                     |                     |                     |                     |                     |                     |                     |
| CATION EXCHANGE CAPACITY                 | NA          |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (s.u.)</b>   |             |                     |                     |                     |                     |                     |                     |                     |                     |
| PH                                       | NA          |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (mg/kg)</b>  |             |                     |                     |                     |                     |                     |                     |                     |                     |
| TOTAL ORGANIC CARBON                     | NA          |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (%)</b>      |             |                     |                     |                     |                     |                     |                     |                     |                     |
| TOTAL SOLIDS                             | NA          |                     |                     | 71                  |                     |                     |                     |                     |                     |

**Table A.1-3**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Target Berm 2**  
**Marine Rifle Range - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                  |             | X14SB054            | X14SB055            | X14SB056            | X14SB057            | X14SB058            | X14SB059            | X14SB060            | X14SB061            |
|---|-------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| <b>nsample</b>                            |             | <b>X14SS0540001</b> | <b>X14SS0550001</b> | <b>X14SS0560001</b> | <b>X14SS0570001</b> | <b>X14SS0580001</b> | <b>X14SS0590001</b> | <b>X14SS0600001</b> | <b>X14SS0610001</b> |
| sample_dat                                |             | 20090603            | 20090603            | 20090603            | 20090603            | 20090603            | 20090603            | 20090603            | 20090603            |
| qc_type                                   |             | NM                  |
| sacode                                    |             | NORMAL              |
| matrix                                    | <b>PALs</b> | SO                  |
| top_depth                                 |             | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   |
| bottom_dep                                |             | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   |
| depth_unit                                |             | FT                  |
| submatrix                                 |             | SS                  |
| composite                                 |             | N                   | N                   | N                   | N                   | N                   | N                   | N                   | N                   |
| <b>Inorganics (mg/kg)</b>                 |             |                     |                     |                     |                     |                     |                     |                     |                     |
| ANTIMONY                                  | 0.27        |                     |                     |                     |                     | 0.15                | L                   |                     |                     |
| ARSENIC                                   | 0.39        |                     |                     |                     |                     | 1.6                 |                     |                     |                     |
| COPPER                                    | 100         |                     |                     |                     |                     | 88.6                |                     |                     |                     |
| LEAD                                      | 11          |                     |                     |                     |                     | 606                 |                     |                     |                     |
| TIN                                       | 0.89        |                     |                     |                     |                     | 10.1                |                     |                     |                     |
| ZINC                                      | 46          |                     |                     |                     |                     | 18.2                |                     |                     |                     |
| <b>Explosives (mg/kg)</b>                 |             |                     |                     |                     |                     |                     |                     |                     |                     |
| NITROGLYCERIN                             | 6.1         |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>XRF Field Parameters (mg/kg)</b>       |             |                     |                     |                     |                     |                     |                     |                     |                     |
| LEAD                                      | 11          | 365.667             | 728.667             | 114.333             | 228                 | 661                 | 144.667             | 713.667             | 138.333             |
| <b>Miscellaneous Parameters (meq/100)</b> |             |                     |                     |                     |                     |                     |                     |                     |                     |
| CATION EXCHANGE CAPACITY                  | NA          |                     |                     |                     |                     | 13                  | K                   |                     |                     |
| <b>Miscellaneous Parameters (s.u.)</b>    |             |                     |                     |                     |                     |                     |                     |                     |                     |
| PH  | NA          |                     |                     |                     |                     | 4.6                 |                     |                     |                     |
| <b>Miscellaneous Parameters (mg/kg)</b>   |             |                     |                     |                     |                     |                     |                     |                     |                     |
| TOTAL ORGANIC CARBON                      | NA          |                     |                     |                     |                     | 10000               |                     |                     |                     |
| <b>Miscellaneous Parameters (%)</b>       |             |                     |                     |                     |                     |                     |                     |                     |                     |
| TOTAL SOLIDS                              | NA          |                     |                     |                     |                     | 84                  |                     |                     |                     |

**Table A.1-3**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Target Berm 2**  
**Marine Rifle Range - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                 |             | X14SB062            | X14SB063            | X14SB064            | X14SB065            | X14SB066            | X14SB067            | X14SB068            | X14SB069            |
|--|-------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| <b>nsample</b>                           |             | <b>X14SS0620001</b> | <b>X14SS0630001</b> | <b>X14SS0640001</b> | <b>X14SS0650001</b> | <b>X14SS0660001</b> | <b>X14SS0670001</b> | <b>X14SS0680001</b> | <b>X14SS0690001</b> |
| sample_dat                               |             | 20090603            | 20090603            | 20090603            | 20090603            | 20090603            | 20090603            | 20090603            | 20090603            |
| qc_type                                  |             | NM                  |
| sacode                                   |             | NORMAL              |
| matrix                                   | <b>PALs</b> | SO                  |
| top_depth                                |             | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   |
| bottom_dep                               |             | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   |
| depth_unit                               |             | FT                  |
| submatrix                                |             | SS                  |
| composite                                |             | N                   | N                   | N                   | N                   | N                   | N                   | N                   | N                   |
| <b>Inorganics (mg/kg)</b>                |             |                     |                     |                     |                     |                     |                     |                     |                     |
| ANTIMONY                                 | 0.27        | 0.17                | L                   | 0.11                | B                   |                     |                     |                     |                     |
| ARSENIC                                  | 0.39        | 3.1                 |                     | 2.1                 |                     |                     |                     |                     |                     |
| COPPER                                   | 100         | 29.7                |                     | 40.8                |                     |                     |                     |                     |                     |
| LEAD                                     | 11          | 278                 |                     | 188                 |                     |                     |                     |                     |                     |
| TIN                                      | 0.89        | 2                   | B                   | 3                   | B                   |                     |                     |                     |                     |
| ZINC                                     | 46          | 35.2                |                     | 21.8                |                     |                     |                     |                     |                     |
| <b>Explosives (mg/kg)</b>                |             |                     |                     |                     |                     |                     |                     |                     |                     |
| NITROGLYCERIN                            | 6.1         |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>XRF Field Parameters (mg/kg)</b>      |             |                     |                     |                     |                     |                     |                     |                     |                     |
| LEAD                                     | 11          | 286.333             | 172.667             | 488.667             | 224.333             | 783.667             | 163                 | 156.333             | 612.667             |
| <b>Miscellaneous Parameters (mg/100)</b> |             |                     |                     |                     |                     |                     |                     |                     |                     |
| CATION EXCHANGE CAPACITY                 | NA          |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (s.u.)</b>   |             |                     |                     |                     |                     |                     |                     |                     |                     |
| PH                                       | NA          |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (mg/kg)</b>  |             |                     |                     |                     |                     |                     |                     |                     |                     |
| TOTAL ORGANIC CARBON                     | NA          |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (%)</b>      |             |                     |                     |                     |                     |                     |                     |                     |                     |
| TOTAL SOLIDS                             | NA          | 80                  | 83                  |                     |                     |                     |                     |                     |                     |

**Table A.1-3**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Target Berm 2**  
**Marine Rifle Range - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                  |             | X14SB070            | X14SB071            | X14SB072            |
|---|-------------|---------------------|---------------------|---------------------|
| <b>nsample</b>                            |             | <b>X14SS0700001</b> | <b>X14SS0710001</b> | <b>X14SS0720001</b> |
| sample_dat                                |             | 20090603            | 20090603            | 20090603            |
| qc_type                                   |             | NM                  | NM                  | NM                  |
| sacode                                    |             | NORMAL              | NORMAL              | NORMAL              |
| matrix                                    | <b>PALs</b> | SO                  | SO                  | SO                  |
| top_depth                                 |             | 0                   | 0                   | 0                   |
| bottom_dep                                |             | 1                   | 1                   | 1                   |
| depth_unit                                |             | FT                  | FT                  | FT                  |
| submatrix                                 |             | SS                  | SS                  | SS                  |
| composite                                 |             | N                   | N                   | N                   |
| <b>Inorganics (mg/kg)</b>                 |             |                     |                     |                     |
| ANTIMONY                                  | 0.27        |                     |                     | 0.13 L              |
| ARSENIC                                   | 0.39        |                     |                     | 3.3                 |
| COPPER                                    | 100         |                     |                     | 85                  |
| LEAD                                      | 11          |                     |                     | 283                 |
| TIN                                       | 0.89        |                     |                     | 2.5 B               |
| ZINC                                      | 46          |                     |                     | 34.5                |
| <b>Explosives (mg/kg)</b>                 |             |                     |                     |                     |
| NITROGLYCERIN                             | 6.1         |                     |                     |                     |
| <b>XRF Field Parameters (mg/kg)</b>       |             |                     |                     |                     |
| LEAD                                      | 11          | 602.333             | 168.667             | 456.333             |
| <b>Miscellaneous Parameters (meq/100)</b> |             |                     |                     |                     |
| CATION EXCHANGE CAPACITY                  | NA          |                     |                     |                     |
| <b>Miscellaneous Parameters (s.u.)</b>    |             |                     |                     |                     |
| PH  | NA          |                     |                     |                     |
| <b>Miscellaneous Parameters (mg/kg)</b>   |             |                     |                     |                     |
| TOTAL ORGANIC CARBON                      | NA          |                     |                     |                     |
| <b>Miscellaneous Parameters (%)</b>       |             |                     |                     |                     |
| TOTAL SOLIDS                              | NA          |                     |                     | 81                  |

**Table A.1-4**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Hillside Impact Area**  
**Marine Rifle Range - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                  |      | X14SB080     | X14SB081     | X14SB082     | X14SB083     | X14SB084     | X14SB084     | X14SB084         | X14SB084       | X14SB084 |      |   |
|---|------|--------------|--------------|--------------|--------------|--------------|--------------|------------------|----------------|----------|------|---|
| nsample                                   |      | X14SS0800001 | X14SS0810001 | X14SS0820001 | X14SS0830001 | X14SS0840001 | X14SB0840102 | X14SB0840102-AVG | X14SB0840102-D |          |      |   |
| sample_dat                                |      | 20090604     | 20090604     | 20090604     | 20090604     | 20090604     | 20090616     | 20090616         | 20090616       |          |      |   |
| qc_type                                   |      | NM               | FD             |          |      |   |
| sacode                                    |      | NORMAL       | NORMAL       | NORMAL       | NORMAL       | NORMAL       | ORIG         | AVG              | DUP            |          |      |   |
| matrix                                    | PALs | SO               | SO             |          |      |   |
| top_depth                                 |      | 0            | 0            | 0            | 0            | 0            | 1            | 1                | 1              |          |      |   |
| bottom_dep                                |      | 1            | 1            | 1            | 1            | 1            | 2            | 2                | 2              |          |      |   |
| depth_unit                                |      | FT               | FT             |          |      |   |
| submatrix                                 |      | SS           | SS           | SS           | SS           | SS           | SB           | SB               | SB             |          |      |   |
| composite                                 |      | N            | N            | N            | N            | N            | N            | N                | N              |          |      |   |
| <b>Inorganics (mg/kg)</b>                 |      |              |              |              |              |              |              |                  |                |          |      |   |
| ANTIMONY                                  | 0.27 |              |              |              |              |              | 0.88         | B                | 0.67           | B        | 0.46 | B |
| ARSENIC                                   | 0.39 |              |              |              |              |              | 7.8          | J                | 5.9            | J        | 4    | J |
| COPPER                                    | 100  |              |              |              |              |              | 849          | J                | 641.5          | J        | 434  | J |
| LEAD                                      | 11   |              |              |              |              |              | 6620         | J                | 5105           | J        | 3590 | J |
| TIN                                       | 0.89 |              |              |              |              |              | 131          | J                | 104.3          | J        | 77.6 | J |
| ZINC                                      | 46   |              |              |              |              |              | 53.9         |                  | 46.65          |          | 39.4 |   |
| <b>Explosives (mg/kg)</b>                 |      |              |              |              |              |              |              |                  |                |          |      |   |
| NITROGLYCERIN                             |      |              |              |              |              |              |              |                  |                |          |      |   |
| <b>XRF Field Parameters (mg/kg)</b>       |      |              |              |              |              |              |              |                  |                |          |      |   |
| LEAD                                      | 11   | 450.667      | 5150.667     | 2329.667     | 323          | 8971.667     | 357.667      | 357.667          |                |          |      |   |
| <b>Miscellaneous Parameters (meq/100)</b> |      |              |              |              |              |              |              |                  |                |          |      |   |
| CATION EXCHANGE CAPACITY                  | NA   |              |              |              |              |              |              |                  |                |          |      |   |
| <b>Miscellaneous Parameters (s.u.)</b>    |      |              |              |              |              |              |              |                  |                |          |      |   |
| PH  | NA   |              |              |              |              |              |              |                  |                |          |      |   |
| <b>Miscellaneous Parameters (mg/kg)</b>   |      |              |              |              |              |              |              |                  |                |          |      |   |
| TOTAL ORGANIC CARBON                      | NA   |              |              |              |              |              |              |                  |                |          |      |   |
| <b>Miscellaneous Parameters (%)</b>       |      |              |              |              |              |              |              |                  |                |          |      |   |
| TOTAL SOLIDS                              | NA   |              |              |              |              |              | 79           | 78.5             | 78             |          |      |   |

**Table A.1-4**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Hillside Impact Area**  
**Marine Rifle Range - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                  |             | X14SB085            | X14SB086            | X14SB087            | X14SB088            | X14SB089            | X14SB090            | X14SB091            | X14SB092            |
|---|-------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| <b>nsample</b>                            |             | <b>X14SS0850001</b> | <b>X14SS0860001</b> | <b>X14SS0870001</b> | <b>X14SS0880001</b> | <b>X14SS0890001</b> | <b>X14SS0900001</b> | <b>X14SS0910001</b> | <b>X14SS0920001</b> |
| sample_dat                                |             | 20090604            | 20090604            | 20090604            | 20090604            | 20090604            | 20090604            | 20090604            | 20090604            |
| qc_type                                   |             | NM                  |
| sacode                                    |             | NORMAL              |
| matrix                                    | <b>PALs</b> | SO                  |
| top_depth                                 |             | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   |
| bottom_dep                                |             | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   |
| depth_unit                                |             | FT                  |
| submatrix                                 |             | SS                  |
| composite                                 |             | N                   | N                   | N                   | N                   | N                   | N                   | N                   | N                   |
| <b>Inorganics (mg/kg)</b>                 |             |                     |                     |                     |                     |                     |                     |                     |                     |
| ANTIMONY                                  | 0.27        |                     |                     | 0.12                | L                   |                     |                     |                     |                     |
| ARSENIC                                   | 0.39        |                     |                     | 3.2                 |                     |                     |                     |                     |                     |
| COPPER                                    | 100         |                     |                     | 32.6                |                     |                     |                     |                     |                     |
| LEAD                                      | 11          |                     |                     | 108                 |                     |                     |                     |                     |                     |
| TIN                                       | 0.89        |                     |                     | 1.7                 | B                   |                     |                     |                     |                     |
| ZINC                                      | 46          |                     |                     | 32.9                |                     |                     |                     |                     |                     |
| <b>Explosives (mg/kg)</b>                 |             |                     |                     |                     |                     |                     |                     |                     |                     |
| NITROGLYCERIN                             |             |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>XRF Field Parameters (mg/kg)</b>       |             |                     |                     |                     |                     |                     |                     |                     |                     |
| LEAD                                      | 11          | 175                 | 598.667             | 279                 | 187.667             | 1245.667            | 1186.667            | 594                 | 708.667             |
| <b>Miscellaneous Parameters (meq/100)</b> |             |                     |                     |                     |                     |                     |                     |                     |                     |
| CATION EXCHANGE CAPACITY                  | NA          |                     |                     | 23                  | K                   |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (s.u.)</b>    |             |                     |                     |                     |                     |                     |                     |                     |                     |
| PH  | NA          |                     |                     | 4.9                 |                     |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (mg/kg)</b>   |             |                     |                     |                     |                     |                     |                     |                     |                     |
| TOTAL ORGANIC CARBON                      | NA          |                     |                     | 15000               |                     |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (%)</b>       |             |                     |                     |                     |                     |                     |                     |                     |                     |
| TOTAL SOLIDS                              | NA          |                     |                     | 85                  |                     |                     |                     |                     |                     |

**Table A.1-4**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Hillside Impact Area**  
**Marine Rifle Range - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                  |             | X14SB093            | X14SB094            | X14SB095            | X14SB096            | X14SB097            | X14SB098            | X14SB099            | X14SB100            |
|---|-------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| <b>nsample</b>                            |             | <b>X14SS0930001</b> | <b>X14SS0940001</b> | <b>X14SS0950001</b> | <b>X14SS0960001</b> | <b>X14SS0970001</b> | <b>X14SS0980001</b> | <b>X14SS0990001</b> | <b>X14SS1000001</b> |
| sample_dat                                |             | 20090604            | 20090604            | 20090604            | 20090604            | 20090604            | 20090604            | 20090604            | 20090604            |
| qc_type                                   |             | NM                  |
| sacode                                    |             | NORMAL              |
| matrix                                    | <b>PALs</b> | SO                  |
| top_depth                                 |             | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   |
| bottom_dep                                |             | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   |
| depth_unit                                |             | FT                  |
| submatrix                                 |             | SS                  |
| composite                                 |             | N                   | N                   | N                   | N                   | N                   | N                   | N                   | N                   |
| <b>Inorganics (mg/kg)</b>                 |             |                     |                     |                     |                     |                     |                     |                     |                     |
| ANTIMONY                                  | 0.27        |                     | 0.14                | L                   |                     |                     |                     |                     |                     |
| ARSENIC                                   | 0.39        |                     | 2.4                 |                     |                     |                     |                     |                     |                     |
| COPPER                                    | 100         |                     | 39.5                |                     |                     |                     |                     |                     |                     |
| LEAD                                      | 11          |                     | 293                 |                     |                     |                     |                     |                     |                     |
| TIN                                       | 0.89        |                     | 7.1                 |                     |                     |                     |                     |                     |                     |
| ZINC                                      | 46          |                     | 24.8                |                     |                     |                     |                     |                     |                     |
| <b>Explosives (mg/kg)</b>                 |             |                     |                     |                     |                     |                     |                     |                     |                     |
| NITROGLYCERIN                             |             |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>XRF Field Parameters (mg/kg)</b>       |             |                     |                     |                     |                     |                     |                     |                     |                     |
| LEAD                                      | 11          | 265                 | 337                 | 2105.667            | 245.333             | 49.667              | 1339                | 3361.333            | 23.333              |
| <b>Miscellaneous Parameters (meq/100)</b> |             |                     |                     |                     |                     |                     |                     |                     |                     |
| CATION EXCHANGE CAPACITY                  | NA          |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (s.u.)</b>    |             |                     |                     |                     |                     |                     |                     |                     |                     |
| PH  | NA          |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (mg/kg)</b>   |             |                     |                     |                     |                     |                     |                     |                     |                     |
| TOTAL ORGANIC CARBON                      | NA          |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (%)</b>       |             |                     |                     |                     |                     |                     |                     |                     |                     |
| TOTAL SOLIDS                              | NA          |                     | 83                  |                     |                     |                     |                     |                     |                     |

**Table A.1-4**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Hillside Impact Area**  
**Marine Rifle Range - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                  |      | X14SB101     | X14SB102     | X14SB102     | X14SB102     | X14SB103     | X14SB104     | X14SB105     | X14SB106     |
|---|------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| nsample                                   |      | X14SS1010001 | X14SS1020001 | X14SB1020102 | X14SB1020203 | X14SS1030001 | X14SS1040001 | X14SS1050001 | X14SS1060001 |
| sample_dat                                |      | 20090604     | 20090604     | 20090616     | 20090617     | 20090604     | 20090604     | 20090604     | 20090604     |
| qc_type                                   |      | NM           |
| sacode                                    |      | NORMAL       |
| matrix                                    | PALs | SO           |
| top_depth                                 |      | 0            | 0            | 1            | 2            | 0            | 0            | 0            | 0            |
| bottom_dep                                |      | 1            | 1            | 2            | 3            | 1            | 1            | 1            | 1            |
| depth_unit                                |      | FT           |
| submatrix                                 |      | SS           | SS           | SB           | SB           | SS           | SS           | SS           | SS           |
| composite                                 |      | N            | N            | N            | N            | N            | N            | N            | N            |
| <b>Inorganics (mg/kg)</b>                 |      |              |              |              |              |              |              |              |              |
| ANTIMONY                                  | 0.27 |              |              |              |              | 0.18         | B            |              |              |
| ARSENIC                                   | 0.39 |              |              |              |              | 3.9          |              |              |              |
| COPPER                                    | 100  |              |              |              |              | 113          |              |              |              |
| LEAD                                      | 11   |              |              |              |              | 1220         |              |              |              |
| TIN                                       | 0.89 |              |              |              |              | 29.3         |              |              |              |
| ZINC                                      | 46   |              |              |              |              | 25.8         |              |              |              |
| <b>Explosives (mg/kg)</b>                 |      |              |              |              |              |              |              |              |              |
| NITROGLYCERIN                             |      |              |              |              |              |              |              |              |              |
| <b>XRF Field Parameters (mg/kg)</b>       |      |              |              |              |              |              |              |              |              |
| LEAD                                      | 11   | 11340.67     | 19878        | 8931         | 2401.667     | 454.333      | 1668.667     | 654.667      | 490.667      |
| <b>Miscellaneous Parameters (meq/100)</b> |      |              |              |              |              |              |              |              |              |
| CATION EXCHANGE CAPACITY                  | NA   |              |              |              |              |              |              |              |              |
| <b>Miscellaneous Parameters (s.u.)</b>    |      |              |              |              |              |              |              |              |              |
| PH  | NA   |              |              |              |              |              |              |              |              |
| <b>Miscellaneous Parameters (mg/kg)</b>   |      |              |              |              |              |              |              |              |              |
| TOTAL ORGANIC CARBON                      | NA   |              |              |              |              |              |              |              |              |
| <b>Miscellaneous Parameters (%)</b>       |      |              |              |              |              |              |              |              |              |
| TOTAL SOLIDS                              | NA   |              |              |              |              | 86           |              |              |              |

**Table A.1-4**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Hillside Impact Area**  
**Marine Rifle Range - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                  |             | X14SB107            | X14SB108            | X14SB109            | X14SB110            | X14SB111            | X14SB111            | X14SB112            | X14SB113            |
|---|-------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| <b>nsample</b>                            |             | <b>X14SS1070001</b> | <b>X14SS1080001</b> | <b>X14SS1090001</b> | <b>X14SS1100001</b> | <b>X14SS1110001</b> | <b>X14SB1110102</b> | <b>X14SS1120001</b> | <b>X14SS1130001</b> |
| sample_dat                                |             | 20090604            | 20090604            | 20090604            | 20090604            | 20090604            | 20090616            | 20090604            | 20090604            |
| qc_type                                   |             | NM                  |
| sacode                                    |             | NORMAL              |
| matrix                                    | <b>PALs</b> | SO                  |
| top_depth                                 |             | 0                   | 0                   | 0                   | 0                   | 0                   | 1                   | 0                   | 0                   |
| bottom_dep                                |             | 1                   | 1                   | 1                   | 1                   | 1                   | 2                   | 1                   | 1                   |
| depth_unit                                |             | FT                  |
| submatrix                                 |             | SS                  | SS                  | SS                  | SS                  | SS                  | SB                  | SS                  | SS                  |
| composite                                 |             | N                   | N                   | N                   | N                   | N                   | N                   | N                   | N                   |
| <b>Inorganics (mg/kg)</b>                 |             |                     |                     |                     |                     |                     |                     |                     |                     |
| ANTIMONY                                  | 0.27        |                     | 0.14                | L                   |                     |                     | 0.6                 | B                   |                     |
| ARSENIC                                   | 0.39        |                     | 6.9                 |                     |                     |                     | 2.2                 |                     |                     |
| COPPER                                    | 100         |                     | 21.9                |                     |                     |                     | 251                 |                     |                     |
| LEAD                                      | 11          |                     | 31.3                |                     |                     |                     | 2640                |                     |                     |
| TIN                                       | 0.89        |                     | 1.6                 | B                   |                     |                     | 139                 |                     |                     |
| ZINC                                      | 46          |                     | 50.7                |                     |                     |                     | 9.8                 |                     |                     |
| <b>Explosives (mg/kg)</b>                 |             |                     |                     |                     |                     |                     |                     |                     |                     |
| NITROGLYCERIN                             |             |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>XRF Field Parameters (mg/kg)</b>       |             |                     |                     |                     |                     |                     |                     |                     |                     |
| LEAD                                      | 11          | 2731.667            | 54.333              | 3208.333            | 9119.333            | 11536               | 1842.667            | 7109.667            | 9883                |
| <b>Miscellaneous Parameters (meq/100)</b> |             |                     |                     |                     |                     |                     |                     |                     |                     |
| CATION EXCHANGE CAPACITY                  | NA          |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (s.u.)</b>    |             |                     |                     |                     |                     |                     |                     |                     |                     |
| PH  | NA          |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (mg/kg)</b>   |             |                     |                     |                     |                     |                     |                     |                     |                     |
| TOTAL ORGANIC CARBON                      | NA          |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (%)</b>       |             |                     |                     |                     |                     |                     |                     |                     |                     |
| TOTAL SOLIDS                              | NA          |                     | 81                  |                     |                     |                     | 84                  |                     |                     |

**Table A.1-4**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Hillside Impact Area**  
**Marine Rifle Range - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                  |             | X14SB114            | X14SB115            | X14SB116            | X14SB117            | X14SB118            | X14SB119            | X14SB120            | X14SB121            |
|---|-------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| <b>nsample</b>                            |             | <b>X14SS1140001</b> | <b>X14SS1150001</b> | <b>X14SS1160001</b> | <b>X14SS1170001</b> | <b>X14SS1180001</b> | <b>X14SS1190001</b> | <b>X14SS1200001</b> | <b>X14SS1210001</b> |
| sample_dat                                |             | 20090604            | 20090604            | 20090604            | 20090604            | 20090604            | 20090604            | 20090604            | 20090604            |
| qc_type                                   |             | NM                  |
| sacode                                    |             | NORMAL              |
| matrix                                    | <b>PALs</b> | SO                  |
| top_depth                                 |             | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   |
| bottom_dep                                |             | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   |
| depth_unit                                |             | FT                  |
| submatrix                                 |             | SS                  |
| composite                                 |             | N                   | N                   | N                   | N                   | N                   | N                   | N                   | N                   |
| <b>Inorganics (mg/kg)</b>                 |             |                     |                     |                     |                     |                     |                     |                     |                     |
| ANTIMONY                                  | 0.27        |                     |                     |                     | 0.07                | B                   |                     | 0.14                | B                   |
| ARSENIC                                   | 0.39        |                     |                     |                     | 1.1                 |                     |                     | 1.6                 | B                   |
| COPPER                                    | 100         |                     |                     |                     | 151                 |                     |                     | 276                 | J                   |
| LEAD                                      | 11          |                     |                     |                     | 618                 |                     |                     | 741                 | J                   |
| TIN                                       | 0.89        |                     |                     |                     | 4.6                 |                     |                     | 3.7                 |                     |
| ZINC                                      | 46          |                     |                     |                     | 7.2                 |                     |                     | 9.3                 |                     |
| <b>Explosives (mg/kg)</b>                 |             |                     |                     |                     |                     |                     |                     |                     |                     |
| NITROGLYCERIN                             |             |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>XRF Field Parameters (mg/kg)</b>       |             |                     |                     |                     |                     |                     |                     |                     |                     |
| LEAD                                      | 11          | 2786                | 1628.667            | 685.667             | 848.667             | 641.333             | 460.333             | 287.667             | 764.333             |
| <b>Miscellaneous Parameters (meq/100)</b> |             |                     |                     |                     |                     |                     |                     |                     |                     |
| CATION EXCHANGE CAPACITY                  | NA          |                     |                     |                     | 15                  | K                   |                     |                     |                     |
| <b>Miscellaneous Parameters (s.u.)</b>    |             |                     |                     |                     |                     |                     |                     |                     |                     |
| PH  | NA          |                     |                     |                     | 4.6                 |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (mg/kg)</b>   |             |                     |                     |                     |                     |                     |                     |                     |                     |
| TOTAL ORGANIC CARBON                      | NA          |                     |                     |                     | 28000               |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (%)</b>       |             |                     |                     |                     |                     |                     |                     |                     |                     |
| TOTAL SOLIDS                              | NA          |                     |                     |                     | 86                  |                     |                     | 79                  |                     |

**Table A.1-4**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Hillside Impact Area**  
**Marine Rifle Range - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                  |             | X14SB122            | X14SB123            | X14SB124            | X14SB125            | X14SB126            | X14SB127            | X14SB128            | X14SB129            |
|---|-------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| <b>nsample</b>                            |             | <b>X14SS1220001</b> | <b>X14SS1230001</b> | <b>X14SS1240001</b> | <b>X14SS1250001</b> | <b>X14SS1260001</b> | <b>X14SS1270001</b> | <b>X14SS1280001</b> | <b>X14SS1290001</b> |
| sample_dat                                |             | 20090604            | 20090604            | 20090604            | 20090609            | 20090609            | 20090609            | 20090609            | 20090609            |
| qc_type                                   |             | NM                  |
| sacode                                    |             | NORMAL              |
| matrix                                    | <b>PALs</b> | SO                  |
| top_depth                                 |             | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   |
| bottom_dep                                |             | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   |
| depth_unit                                |             | FT                  |
| submatrix                                 |             | SS                  |
| composite                                 |             | N                   | N                   | N                   | N                   | N                   | N                   | N                   | N                   |
| <b>Inorganics (mg/kg)</b>                 |             |                     |                     |                     |                     |                     |                     |                     |                     |
| ANTIMONY                                  | 0.27        |                     |                     |                     |                     | 0.07                | B                   |                     |                     |
| ARSENIC                                   | 0.39        |                     |                     |                     |                     | 1.2                 |                     |                     |                     |
| COPPER                                    | 100         |                     |                     |                     |                     | 53.3                |                     |                     |                     |
| LEAD                                      | 11          |                     |                     |                     |                     | 476                 |                     |                     |                     |
| TIN                                       | 0.89        |                     |                     |                     |                     | 29.4                |                     |                     |                     |
| ZINC                                      | 46          |                     |                     |                     |                     | 15.3                |                     |                     |                     |
| <b>Explosives (mg/kg)</b>                 |             |                     |                     |                     |                     |                     |                     |                     |                     |
| NITROGLYCERIN                             |             |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>XRF Field Parameters (mg/kg)</b>       |             |                     |                     |                     |                     |                     |                     |                     |                     |
| LEAD                                      | 11          | 75.667              | 106.333             | 72.667              | 909.333             | 512.333             | 984                 | 2823.667            | 1182.667            |
| <b>Miscellaneous Parameters (meq/100)</b> |             |                     |                     |                     |                     |                     |                     |                     |                     |
| CATION EXCHANGE CAPACITY                  | NA          |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (s.u.)</b>    |             |                     |                     |                     |                     |                     |                     |                     |                     |
| PH  | NA          |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (mg/kg)</b>   |             |                     |                     |                     |                     |                     |                     |                     |                     |
| TOTAL ORGANIC CARBON                      | NA          |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (%)</b>       |             |                     |                     |                     |                     |                     |                     |                     |                     |
| TOTAL SOLIDS                              | NA          |                     |                     |                     |                     | 68                  |                     |                     |                     |

**Table A.1-4**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Hillside Impact Area**  
**Marine Rifle Range - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                  |             | X14SB130            | X14SB131            | X14SB132            | X14SB133            | X14SB134            | X14SB135            | X14SB136            | X14SB137            |          |   |
|---|-------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|----------|---|
| <b>nsample</b>                            |             | <b>X14SS1300001</b> | <b>X14SS1310001</b> | <b>X14SS1320001</b> | <b>X14SS1330001</b> | <b>X14SS1340001</b> | <b>X14SS1350001</b> | <b>X14SS1360001</b> | <b>X14SS1370001</b> |          |   |
| sample_dat                                |             | 20090616            | 20090616            | 20090616            | 20090616            | 20090616            | 20090616            | 20090616            | 20090616            |          |   |
| qc_type                                   |             | NM                  |          |   |
| sacode                                    |             | NORMAL              |          |   |
| matrix                                    | <b>PALs</b> | SO                  |          |   |
| top_depth                                 |             | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   |          |   |
| bottom_dep                                |             | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   |          |   |
| depth_unit                                |             | FT                  |          |   |
| submatrix                                 |             | SS                  |          |   |
| composite                                 |             | N                   | N                   | N                   | N                   | N                   | N                   | N                   | N                   |          |   |
| <b>Inorganics (mg/kg)</b>                 |             |                     |                     |                     |                     |                     |                     |                     |                     |          |   |
| ANTIMONY                                  | 0.27        | 0.02                | B                   | 0.02                | B                   | 0.22                | L                   | 0.32                | L                   | 0.28     | B |
| ARSENIC                                   | 0.39        | 2.2                 |                     | 3.1                 |                     | 3.2                 |                     | 7.3                 |                     | 4.5      |   |
| COPPER                                    | 100         | 18.8                |                     | 36.4                |                     | 8.6                 |                     | 77.9                |                     | 9.4      |   |
| LEAD                                      | 11          | 44.7                |                     | 120                 |                     | 17.9                |                     | 904                 |                     | 45.1     |   |
| TIN                                       | 0.89        | 0.49                | B                   | 0.58                | B                   | 0.54                | B                   | 32.3                |                     | 1.6      |   |
| ZINC                                      | 46          | 41.1                |                     | 46.2                |                     | 60.3                |                     | 28.2                |                     | 30.5     |   |
| <b>Explosives (mg/kg)</b>                 |             |                     |                     |                     |                     |                     |                     |                     |                     |          |   |
| NITROGLYCERIN                             |             |                     |                     |                     |                     |                     |                     |                     |                     |          |   |
| <b>XRF Field Parameters (mg/kg)</b>       |             |                     |                     |                     |                     |                     |                     |                     |                     |          |   |
| LEAD                                      | 11          | 28.667              |                     | 122                 |                     | 109.667             |                     | 36.667              |                     | 1097.333 |   |
| <b>Miscellaneous Parameters (meq/100)</b> |             |                     |                     |                     |                     |                     |                     |                     |                     |          |   |
| CATION EXCHANGE CAPACITY                  | NA          |                     |                     |                     |                     |                     |                     |                     |                     |          |   |
| <b>Miscellaneous Parameters (s.u.)</b>    |             |                     |                     |                     |                     |                     |                     |                     |                     |          |   |
| PH  | NA          |                     |                     |                     |                     |                     |                     |                     |                     |          |   |
| <b>Miscellaneous Parameters (mg/kg)</b>   |             |                     |                     |                     |                     |                     |                     |                     |                     |          |   |
| TOTAL ORGANIC CARBON                      | NA          |                     |                     |                     |                     |                     |                     |                     |                     |          |   |
| <b>Miscellaneous Parameters (%)</b>       |             |                     |                     |                     |                     |                     |                     |                     |                     |          |   |
| TOTAL SOLIDS                              | NA          | 86                  |                     | 81                  |                     | 87                  |                     | 88                  |                     | 86       |   |

**Table A.1-4**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Hillside Impact Area**  
**Marine Rifle Range - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                  |             | X14SB138            | X14SB139            | X14SB140            | X14SB141            | X14SB142            | X14SB143            |         |   |        |   |         |   |    |  |    |  |    |  |    |  |
|---|-------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------|---|--------|---|---------|---|----|--|----|--|----|--|----|--|
| <b>nsample</b>                            |             | <b>X14SS1380001</b> | <b>X14SS1390001</b> | <b>X14SS1400001</b> | <b>X14SS1410001</b> | <b>X14SS1420001</b> | <b>X14SS1430001</b> |         |   |        |   |         |   |    |  |    |  |    |  |    |  |
| sample_dat                                |             | 20090616            | 20090616            | 20090616            | 20090616            | 20090617            | 20090617            |         |   |        |   |         |   |    |  |    |  |    |  |    |  |
| qc_type                                   |             | NM                  | NM                  | NM                  | NM                  | NM                  | NM                  |         |   |        |   |         |   |    |  |    |  |    |  |    |  |
| sacode                                    |             | NORMAL              | NORMAL              | NORMAL              | NORMAL              | NORMAL              | NORMAL              |         |   |        |   |         |   |    |  |    |  |    |  |    |  |
| matrix                                    | <b>PALs</b> | SO                  | SO                  | SO                  | SO                  | SO                  | SO                  |         |   |        |   |         |   |    |  |    |  |    |  |    |  |
| top_depth                                 |             | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   |         |   |        |   |         |   |    |  |    |  |    |  |    |  |
| bottom_dep                                |             | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   |         |   |        |   |         |   |    |  |    |  |    |  |    |  |
| depth_unit                                |             | FT                  | FT                  | FT                  | FT                  | FT                  | FT                  |         |   |        |   |         |   |    |  |    |  |    |  |    |  |
| submatrix                                 |             | SS                  | SS                  | SS                  | SS                  | SS                  | SS                  |         |   |        |   |         |   |    |  |    |  |    |  |    |  |
| composite                                 |             | N                   | N                   | N                   | N                   | N                   | N                   |         |   |        |   |         |   |    |  |    |  |    |  |    |  |
| <b>Inorganics (mg/kg)</b>                 |             |                     |                     |                     |                     |                     |                     |         |   |        |   |         |   |    |  |    |  |    |  |    |  |
| ANTIMONY                                  | 0.27        | 0.14                | B                   | 0.14                | B                   | 0.32                | B                   | 0.1     | B | 0.14   | B | 0.14    | B |    |  |    |  |    |  |    |  |
| ARSENIC                                   | 0.39        | 2.2                 |                     | 2.3                 |                     | 3                   |                     | 1.2     |   | 4.8    |   | 3.8     |   |    |  |    |  |    |  |    |  |
| COPPER                                    | 100         | 28.2                |                     | 63.4                |                     | 141                 |                     | 13.6    |   | 9.8    |   | 20.3    |   |    |  |    |  |    |  |    |  |
| LEAD                                      | 11          | 137                 |                     | 280                 |                     | 676                 |                     | 405     |   | 11     | B | 166     |   |    |  |    |  |    |  |    |  |
| TIN                                       | 0.89        | 2.8                 |                     | 4.9                 |                     | 81.8                |                     | 3       |   | 1.3    | B | 1.7     |   |    |  |    |  |    |  |    |  |
| ZINC                                      | 46          | 33.8                |                     | 25.4                |                     | 20                  |                     | 7       |   | 29.2   |   | 19.7    |   |    |  |    |  |    |  |    |  |
| <b>Explosives (mg/kg)</b>                 |             |                     |                     |                     |                     |                     |                     |         |   |        |   |         |   |    |  |    |  |    |  |    |  |
| NITROGLYCERIN                             |             |                     |                     |                     |                     |                     |                     |         |   |        |   |         |   |    |  |    |  |    |  |    |  |
| <b>XRF Field Parameters (mg/kg)</b>       |             |                     |                     |                     |                     |                     |                     |         |   |        |   |         |   |    |  |    |  |    |  |    |  |
| LEAD                                      | 11          | 160.667             |                     | 328.333             |                     | 1031                |                     | 351.333 |   | 19.333 |   | 289.667 |   |    |  |    |  |    |  |    |  |
| <b>Miscellaneous Parameters (meq/100)</b> |             |                     |                     |                     |                     |                     |                     |         |   |        |   |         |   |    |  |    |  |    |  |    |  |
| CATION EXCHANGE CAPACITY                  |             |                     |                     |                     |                     |                     |                     | NA      |   |        |   |         |   |    |  |    |  |    |  |    |  |
| <b>Miscellaneous Parameters (s.u.)</b>    |             |                     |                     |                     |                     |                     |                     |         |   |        |   |         |   |    |  |    |  |    |  |    |  |
| PH  |             |                     |                     |                     |                     |                     |                     | NA      |   |        |   |         |   |    |  |    |  |    |  |    |  |
| <b>Miscellaneous Parameters (mg/kg)</b>   |             |                     |                     |                     |                     |                     |                     |         |   |        |   |         |   |    |  |    |  |    |  |    |  |
| TOTAL ORGANIC CARBON                      |             |                     |                     |                     |                     |                     |                     | NA      |   |        |   |         |   |    |  |    |  |    |  |    |  |
| <b>Miscellaneous Parameters (%)</b>       |             |                     |                     |                     |                     |                     |                     |         |   |        |   |         |   |    |  |    |  |    |  |    |  |
| TOTAL SOLIDS                              |             |                     |                     |                     |                     |                     |                     | NA      |   | 85     |   | 84      |   | 81 |  | 85 |  | 86 |  | 84 |  |

**Table A.2-1**  
**Summary of Chemicals Detected in Composite Soil Samples**  
**Firing Points**  
**Old Skeet and Trap Range - UXO 15**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                    |       | X15SB077C     |   | X15SB078C     |   |
|---|-------|---------------|---|---------------|---|
| nsample                                     |       | X15SS077C0001 |   | X15SS078C0001 |   |
| sample_dat                                  |       | 20090610      |   | 20090610      |   |
| qc_type                                     |       | NM            |   | NM            |   |
| sacode                                      |       | NORMAL        |   | NORMAL        |   |
| matrix                                      | PALs  | SO            |   | SO            |   |
| top_depth                                   |       | 0             |   | 0             |   |
| bottom_dep                                  |       | 1             |   | 1             |   |
| depth_unit                                  |       | FT            |   | FT            |   |
| submatrix                                   |       | SS            |   | SS            |   |
| composite                                   |       | Y             |   | Y             |   |
| <b>Inorganics (mg/kg)</b>                   |       |               |   |               |   |
| ANTIMONY                                    | 0.27  | 0.68          | L | 0.46          | L |
| ARSENIC                                     | 0.39  | 2.6           |   | 2.7           |   |
| COPPER                                      | 100   | 23.3          |   | 14.8          |   |
| LEAD  | 11    | 66.7          |   | 77.2          |   |
| TIN   | 0.89  | 1.8           | B | 1.7           | B |
| ZINC  | 46    | 52.5          |   | 54.4          |   |
| <b>PAHs (ug/kg)</b>                         |       |               |   |               |   |
| 1-METHYLNAPHTHALENE                         | 22000 |               |   |               |   |
| 2-METHYLNAPHTHALENE                         | 31000 |               |   |               |   |
| ACENAPHTHENE                                | 29000 |               |   |               |   |
| ACENAPHTHYLENE                              | 29000 |               |   |               |   |
| ANTHRACENE                                  | 29000 |               |   |               |   |
| BENZO(A)ANTHRACENE                          | 150   |               |   |               |   |
| BENZO(A)PYRENE                              | 15    |               |   |               |   |
| BENZO(B)FLUORANTHENE                        | 150   |               |   |               |   |
| BENZO(G,H,I)PERYLENE                        | 1100  |               |   |               |   |
| BENZO(K)FLUORANTHENE                        | 1100  |               |   |               |   |
| CHRYSENE                                    | 1100  |               |   |               |   |
| DIBENZO(A,H)ANTHRACENE                      | 15    |               |   |               |   |
| FLUORANTHENE                                | 29000 |               |   |               |   |
| FLUORENE                                    | 29000 |               |   |               |   |
| INDENO(1,2,3-CD)PYRENE                      | 150   |               |   |               |   |
| NAPHTHALENE                                 | 330   |               |   |               |   |
| PHENANTHRENE                                | 29000 |               |   |               |   |
| PYRENE                                      | 1100  |               |   |               |   |
| <b>Explosives (mg/kg)</b>                   |       |               |   |               |   |
| NITROGLYCERIN                               | 6.1   | 3.7           | J | 0.49          | J |
| <b>XRF Field Parameters (mg/kg)</b>         |       |               |   |               |   |
| LEAD  | 11    | 67.667        |   | 81.333        |   |
| <b>Miscellaneous Parameters (meq/100)</b>   |       |               |   |               |   |
| CATION EXCHANGE CAPACITY                    | NA    |               |   |               |   |
| <b>Miscellaneous Parameters (s.u.)</b>      |       |               |   |               |   |
| PH  | NA    |               |   |               |   |
| <b>Miscellaneous Parameters (mg/kg)</b>     |       |               |   |               |   |
| TOTAL ORGANIC CARBON                        | NA    |               |   |               |   |
| <b>Miscellaneous Parameters (%)</b>         |       |               |   |               |   |
| TOTAL SOLIDS                                | NA    | 81            |   | 82            |   |
| <b>Miscellaneous Organic Parameters (%)</b> |       |               |   |               |   |
| TOTAL SOLIDS                                | NA    |               |   |               |   |



**Table A.2-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Old Skeet and Trap Range - UXO 15**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                    |       | X15SB007     | X15SB008     | X15SB009     | X15SB010     | X15SB011     | X15SB012     | X15SB012       | X15SB013     |
|---|-------|--------------|--------------|--------------|--------------|--------------|--------------|----------------|--------------|
| nsample                                     |       | X15SB0070102 | X15SS0080001 | X15SS0090001 | X15SS0100001 | X15SS0110001 | X15SS0120001 | X15SS0120001RE | X15SS0130001 |
| sample_dat                                  |       | 20090602     | 20090527     | 20090527     | 20090527     | 20090527     | 20090527     | 20090527       | 20090527     |
| qc_type                                     |       | NM             | NM           |
| sacode                                      |       | NORMAL         | NORMAL       |
| matrix                                      | PALs  | SO             | SO           |
| top_depth                                   |       | 1            | 0            | 0            | 0            | 0            | 0            | 0              | 0            |
| bottom_dep                                  |       | 2            | 1            | 1            | 1            | 1            | 1            | 1              | 1            |
| depth_unit                                  |       | FT             | FT           |
| submatrix                                   |       | SB           | SS           | SS           | SS           | SS           | SS           | SS             | SS           |
| composite                                   |       | N            | N            | N            | N            | N            | N            | N              | N            |
| <b>Inorganics (mg/kg)</b>                   |       |              |              |              |              |              |              |                |              |
| ANTIMONY                                    | 0.27  |              |              |              |              |              |              |                |              |
| ARSENIC                                     | 0.39  |              |              |              |              |              |              |                |              |
| COPPER                                      | 100   |              |              |              |              |              |              |                |              |
| LEAD  | 11    |              |              |              |              |              |              |                |              |
| TIN   | 0.89  |              |              |              |              |              |              |                |              |
| ZINC  | 46    |              |              |              |              |              |              |                |              |
| <b>PAHs (ug/kg)</b>                         |       |              |              |              |              |              |              |                |              |
| 1-METHYLNAPHTHALENE                         | 22000 |              |              |              |              | 25           | UJ           |                |              |
| 2-METHYLNAPHTHALENE                         | 31000 |              |              |              |              | 25           | UJ           |                |              |
| ACENAPHTHENE                                | 29000 |              |              |              |              | 25           | U            |                |              |
| ACENAPHTHYLENE                              | 29000 |              |              |              |              | 25           | U            |                |              |
| ANTHRACENE                                  | 29000 |              |              |              |              | 25           | U            |                |              |
| BENZO(A)ANTHRACENE                          | 150   |              |              |              |              | 21           | J            |                |              |
| BENZO(A)PYRENE                              | 15    |              |              |              |              | 18           | J            |                |              |
| BENZO(B)FLUORANTHENE                        | 150   |              |              |              |              | 24           | J            |                |              |
| BENZO(G,H,I)PERYLENE                        | 1100  |              |              |              |              | 13           | J            |                |              |
| BENZO(K)FLUORANTHENE                        | 1100  |              |              |              |              | 11           | J            |                |              |
| CHRYSENE                                    | 1100  |              |              |              |              | 15           | J            |                |              |
| DIBENZO(A,H)ANTHRACENE                      | 15    |              |              |              |              | 9.4          | J            |                |              |
| FLUORANTHENE                                | 29000 |              |              |              |              | 15           | J            |                |              |
| FLUORENE                                    | 29000 |              |              |              |              | 25           | U            |                |              |
| INDENO(1,2,3-CD)PYRENE                      | 150   |              |              |              |              | 11           | J            |                |              |
| NAPHTHALENE                                 | 330   |              |              |              |              | 25           | U            |                |              |
| PHENANTHRENE                                | 29000 |              |              |              |              | 6.2          | J            |                |              |
| PYRENE                                      | 1100  |              |              |              |              | 15           | J            |                |              |
| <b>Explosives (mg/kg)</b>                   |       |              |              |              |              |              |              |                |              |
| NITROGLYCERIN                               | 6.1   |              |              |              |              |              |              |                |              |
| <b>XRF Field Parameters (mg/kg)</b>         |       |              |              |              |              |              |              |                |              |
| LEAD  | 11    | 85.333       | 285.667      | 38.667       | 50           | 113          | 199.333      | 175.333        | 838.667      |
| <b>Miscellaneous Parameters (meq/100)</b>   |       |              |              |              |              |              |              |                |              |
| CATION EXCHANGE CAPACITY                    | NA    |              |              |              |              |              |              |                |              |
| <b>Miscellaneous Parameters (s.u.)</b>      |       |              |              |              |              |              |              |                |              |
| PH  | NA    |              |              |              |              |              |              |                |              |
| <b>Miscellaneous Parameters (mg/kg)</b>     |       |              |              |              |              |              |              |                |              |
| TOTAL ORGANIC CARBON                        | NA    |              |              |              |              |              |              |                |              |
| <b>Miscellaneous Parameters (%)</b>         |       |              |              |              |              |              |              |                |              |
| TOTAL SOLIDS                                | NA    |              |              |              |              |              |              |                |              |
| <b>Miscellaneous Organic Parameters (%)</b> |       |              |              |              |              |              |              |                |              |
| TOTAL SOLIDS                                | NA    |              |              |              |              | 79           |              |                |              |

**Table A.2-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Old Skeet and Trap Range - UXO 15**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                    |       | X15SB013     | X15SB013       | X15SB014     | X15SB015     | X15SB016     | X15SB017     | X15SB018     | X15SB019     |    |
|---|-------|--------------|----------------|--------------|--------------|--------------|--------------|--------------|--------------|----|
| nsample                                     |       | X15SB0130102 | X15SB0130102RE | X15SS0140001 | X15SS0150001 | X15SS0160001 | X15SS0170001 | X15SS0180001 | X15SS0190001 |    |
| sample_dat                                  |       | 20090602     | 20090602       | 20090527     | 20090527     | 20090527     | 20090527     | 20090527     | 20090527     |    |
| qc_type                                     |       | NM           | NM             | NM           | NM           | NM           | NM           | NM           | NM           |    |
| sacode                                      |       | NORMAL       | NORMAL         | NORMAL       | NORMAL       | NORMAL       | NORMAL       | NORMAL       | NORMAL       |    |
| matrix                                      | PALs  | SO           | SO             | SO           | SO           | SO           | SO           | SO           | SO           |    |
| top_depth                                   |       | 1            | 1              | 0            | 0            | 0            | 0            | 0            | 0            |    |
| bottom_dep                                  |       | 2            | 2              | 1            | 1            | 1            | 1            | 1            | 1            |    |
| depth_unit                                  |       | FT           | FT             | FT           | FT           | FT           | FT           | FT           | FT           |    |
| submatrix                                   |       | SB           | SB             | SS           | SS           | SS           | SS           | SS           | SS           |    |
| composite                                   |       | N            | N              | N            | N            | N            | N            | N            | N            |    |
| <b>Inorganics (mg/kg)</b>                   |       |              |                |              |              |              |              |              |              |    |
| ANTIMONY                                    | 0.27  |              |                |              |              |              |              | 0.69         | J            |    |
| ARSENIC                                     | 0.39  |              |                |              |              |              |              | 3.2          |              |    |
| COPPER                                      | 100   |              |                |              |              |              |              | 8.8          | L            |    |
| LEAD  | 11    |              |                |              |              |              |              | 32           |              |    |
| TIN   | 0.89  |              |                |              |              |              |              | 1.3          | B            |    |
| ZINC  | 46    |              |                |              |              |              |              | 30.5         |              |    |
| <b>PAHs (ug/kg)</b>                         |       |              |                |              |              |              |              |              |              |    |
| 1-METHYLNAPHTHALENE                         | 22000 |              |                |              | 150          | J            |              |              | 26           | UJ |
| 2-METHYLNAPHTHALENE                         | 31000 |              |                |              | 230          |              |              |              | 26           | UJ |
| ACENAPHTHENE                                | 29000 |              |                |              | 2000         | J            |              |              | 26           | U  |
| ACENAPHTHYLENE                              | 29000 |              |                |              | 25           | U            |              |              | 26           | U  |
| ANTHRACENE                                  | 29000 |              |                |              | 2500         | J            |              |              | 26           | U  |
| BENZO(A)ANTHRACENE                          | 150   |              |                |              | 17000        |              |              |              | 37           | J  |
| BENZO(A)PYRENE                              | 15    |              |                |              | 23000        |              |              |              | 40           | J  |
| BENZO(B)FLUORANTHENE                        | 150   |              |                |              | 21000        |              |              |              | 42           | J  |
| BENZO(G,H,I)PERYLENE                        | 1100  |              |                |              | 11000        |              |              |              | 27           | J  |
| BENZO(K)FLUORANTHENE                        | 1100  |              |                |              | 8400         |              |              |              | 25           | J  |
| CHRYSENE                                    | 1100  |              |                |              | 22000        |              |              |              | 35           | J  |
| DIBENZO(A,H)ANTHRACENE                      | 15    |              |                |              | 3300         | J            |              |              | 13           | J  |
| FLUORANTHENE                                | 29000 |              |                |              | 16000        |              |              |              | 30           | J  |
| FLUORENE                                    | 29000 |              |                |              | 4200         | U            |              |              | 26           | U  |
| INDENO(1,2,3-CD)PYRENE                      | 150   |              |                |              | 12000        |              |              |              | 24           | J  |
| NAPHTHALENE                                 | 330   |              |                |              | 4200         | U            |              |              | 26           | U  |
| PHENANTHRENE                                | 29000 |              |                |              | 11000        |              |              |              | 11           | J  |
| PYRENE                                      | 1100  |              |                |              | 23000        |              |              |              | 28           | J  |
| <b>Explosives (mg/kg)</b>                   |       |              |                |              |              |              |              |              |              |    |
| NITROGLYCERIN                               | 6.1   |              |                |              |              |              |              |              |              |    |
| <b>XRF Field Parameters (mg/kg)</b>         |       |              |                |              |              |              |              |              |              |    |
| LEAD  | 11    | 36.667       | 39.667         | 77.333       | 45.333       | 45.667       | 106          | 47           | 35.333       |    |
| <b>Miscellaneous Parameters (meq/100)</b>   |       |              |                |              |              |              |              |              |              |    |
| CATION EXCHANGE CAPACITY                    | NA    |              |                |              |              |              |              |              |              |    |
| <b>Miscellaneous Parameters (s.u.)</b>      |       |              |                |              |              |              |              |              |              |    |
| PH  | NA    |              |                |              |              |              |              |              |              |    |
| <b>Miscellaneous Parameters (mg/kg)</b>     |       |              |                |              |              |              |              |              |              |    |
| TOTAL ORGANIC CARBON                        | NA    |              |                |              |              |              |              |              |              |    |
| <b>Miscellaneous Parameters (%)</b>         |       |              |                |              |              |              |              |              |              |    |
| TOTAL SOLIDS                                | NA    |              |                |              |              |              |              | 87           |              |    |
| <b>Miscellaneous Organic Parameters (%)</b> |       |              |                |              |              |              |              |              |              |    |
| TOTAL SOLIDS                                | NA    |              |                |              | 79           |              |              |              | 78           |    |

**Table A.2-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Old Skeet and Trap Range - UXO 15**  
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| location                                    |       | X15SB020     | X15SB021     | X15SB022     | X15SB023     | X15SB024     | X15SB025     | X15SB026     | X15SB027     |
|---|-------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| nsample                                     |       | X15SS0200001 | X15SS0210001 | X15SS0220001 | X15SS0230001 | X15SS0240001 | X15SS0250001 | X15SS0260001 | X15SS0270001 |
| sample_dat                                  |       | 20090527     | 20090527     | 20090527     | 20090527     | 20090527     | 20090527     | 20090527     | 20090528     |
| qc_type                                     |       | NM           |
| sacode                                      |       | NORMAL       |
| matrix                                      | PALs  | SO           |
| top_depth                                   |       | 0            | 0            | 0            | 0            | 0            | 0            | 0            | 0            |
| bottom_dep                                  |       | 1            | 1            | 1            | 1            | 1            | 1            | 1            | 1            |
| depth_unit                                  |       | FT           |
| submatrix                                   |       | SS           |
| composite                                   |       | N            | N            | N            | N            | N            | N            | N            | N            |
| <b>Inorganics (mg/kg)</b>                   |       |              |              |              |              |              |              |              |              |
| ANTIMONY                                    | 0.27  |              |              |              |              |              |              |              |              |
| ARSENIC                                     | 0.39  |              |              |              |              |              |              |              |              |
| COPPER                                      | 100   |              |              |              |              |              |              |              |              |
| LEAD  | 11    |              |              |              |              |              |              |              |              |
| TIN   | 0.89  |              |              |              |              |              |              |              |              |
| ZINC  | 46    |              |              |              |              |              |              |              |              |
| <b>PAHs (ug/kg)</b>                         |       |              |              |              |              |              |              |              |              |
| 1-METHYLNAPHTHALENE                         | 22000 |              | 27           | U            |              |              |              |              |              |
| 2-METHYLNAPHTHALENE                         | 31000 |              | 17           | J            |              |              |              |              |              |
| ACENAPHTHENE                                | 29000 |              | 49           |              |              |              |              |              |              |
| ACENAPHTHYLENE                              | 29000 |              | 27           | U            |              |              |              |              |              |
| ANTHRACENE                                  | 29000 |              | 93           |              |              |              |              |              |              |
| BENZO(A)ANTHRACENE                          | 150   |              | 3200         |              |              |              |              |              |              |
| BENZO(A)PYRENE                              | 15    |              | 2300         |              |              |              |              |              |              |
| BENZO(B)FLUORANTHENE                        | 150   |              | 1500         |              |              |              |              |              |              |
| BENZO(G,H,I)PERYLENE                        | 1100  |              | 1200         |              |              |              |              |              |              |
| BENZO(K)FLUORANTHENE                        | 1100  |              | 510          |              |              |              |              |              |              |
| CHRYSENE                                    | 1100  |              | 3600         |              |              |              |              |              |              |
| DIBENZO(A,H)ANTHRACENE                      | 15    |              | 820          |              |              |              |              |              |              |
| FLUORANTHENE                                | 29000 |              | 780          |              |              |              |              |              |              |
| FLUORENE                                    | 29000 |              | 29           |              |              |              |              |              |              |
| INDENO(1,2,3-CD)PYRENE                      | 150   |              | 700          |              |              |              |              |              |              |
| NAPHTHALENE                                 | 330   |              | 20           | J            |              |              |              |              |              |
| PHENANTHRENE                                | 29000 |              | 500          |              |              |              |              |              |              |
| PYRENE                                      | 1100  |              | 1400         |              |              |              |              |              |              |
| <b>Explosives (mg/kg)</b>                   |       |              |              |              |              |              |              |              |              |
| NITROGLYCERIN                               | 6.1   |              |              |              |              |              |              |              |              |
| <b>XRF Field Parameters (mg/kg)</b>         |       |              |              |              |              |              |              |              |              |
| LEAD  | 11    | 68.667       | 58.667       | 77           | 102          | 31           | 194.333      | 64.333       | 67           |
| <b>Miscellaneous Parameters (meq/100)</b>   |       |              |              |              |              |              |              |              |              |
| CATION EXCHANGE CAPACITY                    | NA    |              |              |              |              |              |              |              |              |
| <b>Miscellaneous Parameters (s.u.)</b>      |       |              |              |              |              |              |              |              |              |
| PH  | NA    |              |              |              |              |              |              |              |              |
| <b>Miscellaneous Parameters (mg/kg)</b>     |       |              |              |              |              |              |              |              |              |
| TOTAL ORGANIC CARBON                        | NA    |              |              |              |              |              |              |              |              |
| <b>Miscellaneous Parameters (%)</b>         |       |              |              |              |              |              |              |              |              |
| TOTAL SOLIDS                                | NA    |              |              |              |              |              |              |              |              |
| <b>Miscellaneous Organic Parameters (%)</b> |       |              |              |              |              |              |              |              |              |
| TOTAL SOLIDS                                | NA    |              | 75           |              |              |              |              |              |              |

**Table A.2-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Old Skeet and Trap Range - UXO 15**  
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| location                                    |       | X15SB028     | X15SB029     | X15SB030     | X15SB031     | X15SB032     | X15SB033     | X15SB034     | X15SB035     |    |  |         |   |        |    |        |
|---|-------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|----|--|---------|---|--------|----|--------|
| nsample                                     |       | X15SS0280001 | X15SS0290001 | X15SS0300001 | X15SS0310001 | X15SS0320001 | X15SS0330001 | X15SS0340001 | X15SS0350001 |    |  |         |   |        |    |        |
| sample_dat                                  |       | 20090527     | 20090527     | 20090527     | 20090528     | 20090528     | 20090527     | 20090528     | 20090528     |    |  |         |   |        |    |        |
| qc_type                                     |       | NM           |    |  |         |   |        |    |        |
| sacode                                      |       | NORMAL       |    |  |         |   |        |    |        |
| matrix                                      | PALs  | SO           |    |  |         |   |        |    |        |
| top_depth                                   |       | 0            | 0            | 0            | 0            | 0            | 0            | 0            | 0            |    |  |         |   |        |    |        |
| bottom_dep                                  |       | 1            | 1            | 1            | 1            | 1            | 1            | 1            | 1            |    |  |         |   |        |    |        |
| depth_unit                                  |       | FT           |    |  |         |   |        |    |        |
| submatrix                                   |       | SS           |    |  |         |   |        |    |        |
| composite                                   |       | N            | N            | N            | N            | N            | N            | N            | N            |    |  |         |   |        |    |        |
| <b>Inorganics (mg/kg)</b>                   |       |              |              |              |              |              |              |              |              |    |  |         |   |        |    |        |
| ANTIMONY                                    | 0.27  |              |              |              |              |              |              |              | 0.27         | J  |  |         |   |        |    |        |
| ARSENIC                                     | 0.39  |              |              |              |              |              |              |              | 2            |    |  |         |   |        |    |        |
| COPPER                                      | 100   |              |              |              |              |              |              |              | 9.6          | L  |  |         |   |        |    |        |
| LEAD  | 11    |              |              |              |              |              |              |              | 81.6         |    |  |         |   |        |    |        |
| TIN   | 0.89  |              |              |              |              |              |              |              | 3.9          | B  |  |         |   |        |    |        |
| ZINC  | 46    |              |              |              |              |              |              |              | 41           |    |  |         |   |        |    |        |
| <b>PAHs (ug/kg)</b>                         |       |              |              |              |              |              |              |              |              |    |  |         |   |        |    |        |
| 1-METHYLNAPHTHALENE                         | 22000 | 23           | UJ           | 27           | UJ           |              | 7700         | U            | 25           | UJ |  |         |   | 25     | UJ |        |
| 2-METHYLNAPHTHALENE                         | 31000 | 9.2          | J            | 27           | UJ           |              | 7700         | U            | 11           | J  |  |         |   | 19     | J  |        |
| ACENAPHTHENE                                | 29000 | 12           | J            | 4.2          | J            |              | 2600         | J            | 47           |    |  |         |   | 150    |    |        |
| ACENAPHTHYLENE                              | 29000 | 23           | U            | 27           | U            |              | 23           | U            | 25           | U  |  |         |   | 25     | U  |        |
| ANTHRACENE                                  | 29000 | 26           |              | 27           | U            |              | 3500         | J            | 98           |    |  |         |   | 200    |    |        |
| BENZO(A)ANTHRACENE                          | 150   | 400          |              | 53           |              |              | 18000        |              | 410          |    |  |         |   | 2000   |    |        |
| BENZO(A)PYRENE                              | 15    | 400          |              | 58           |              |              | 24000        |              | 440          |    |  |         |   | 2900   |    |        |
| BENZO(B)FLUORANTHENE                        | 150   | 240          |              | 66           |              |              | 26000        |              | 410          |    |  |         |   | 3200   |    |        |
| BENZO(G,H,I)PERYLENE                        | 1100  | 230          |              | 46           |              |              | 14000        |              | 270          |    |  |         |   | 1800   |    |        |
| BENZO(K)FLUORANTHENE                        | 1100  | 140          |              | 28           |              |              | 11000        |              | 270          |    |  |         |   | 1100   |    |        |
| CHRYSENE                                    | 1100  | 420          |              | 46           |              |              | 22000        |              | 290          |    |  |         |   | 2500   |    |        |
| DIBENZO(A,H)ANTHRACENE                      | 15    | 91           |              | 22           | J            |              | 4100         | J            | 100          |    |  |         |   | 460    |    |        |
| FLUORANTHENE                                | 29000 | 200          |              | 55           |              |              | 22000        |              | 620          |    |  |         |   | 1900   |    |        |
| FLUORENE                                    | 29000 | 8.3          | J            | 27           | U            |              | 7700         | U            | 32           |    |  |         |   | 60     |    |        |
| INDENO(1,2,3-CD)PYRENE                      | 150   | 170          |              | 36           |              |              | 16000        |              | 290          |    |  |         |   | 1900   |    |        |
| NAPHTHALENE                                 | 330   | 23           | U            | 27           | U            |              | 7700         | U            | 8.6          | J  |  |         |   | 56     |    |        |
| PHENANTHRENE                                | 29000 | 160          |              | 28           |              |              | 14000        |              | 350          |    |  |         |   | 840    |    |        |
| PYRENE                                      | 1100  | 400          |              | 47           |              |              | 24000        |              | 420          |    |  |         |   | 2500   |    |        |
| <b>Explosives (mg/kg)</b>                   |       |              |              |              |              |              |              |              |              |    |  |         |   |        |    |        |
| NITROGLYCERIN                               | 6.1   |              |              |              |              |              |              |              |              |    |  |         |   |        |    |        |
| <b>XRF Field Parameters (mg/kg)</b>         |       |              |              |              |              |              |              |              |              |    |  |         |   |        |    |        |
| LEAD  | 11    | 55.667       |              | 101.333      |              | 196.667      |              | 34.667       |              | 54 |  | 192.667 |   | 34.333 |    | 69.667 |
| <b>Miscellaneous Parameters (meq/100)</b>   |       |              |              |              |              |              |              |              |              |    |  |         |   |        |    |        |
| CATION EXCHANGE CAPACITY                    | NA    |              |              |              |              |              |              |              |              |    |  | 13      | K |        |    |        |
| <b>Miscellaneous Parameters (s.u.)</b>      |       |              |              |              |              |              |              |              |              |    |  |         |   |        |    |        |
| PH  | NA    |              |              |              |              |              |              |              |              |    |  | 5       |   |        |    |        |
| <b>Miscellaneous Parameters (mg/kg)</b>     |       |              |              |              |              |              |              |              |              |    |  |         |   |        |    |        |
| TOTAL ORGANIC CARBON                        | NA    |              |              |              |              |              |              |              |              |    |  | 8500    |   |        |    |        |
| <b>Miscellaneous Parameters (%)</b>         |       |              |              |              |              |              |              |              |              |    |  |         |   |        |    |        |
| TOTAL SOLIDS                                | NA    |              |              |              |              |              |              | 85           |              |    |  | 88      |   |        | 80 |        |
| <b>Miscellaneous Organic Parameters (%)</b> |       |              |              |              |              |              |              |              |              |    |  |         |   |        |    |        |
| TOTAL SOLIDS                                | NA    | 85           |              | 75           |              |              |              | 86           |              | 80 |  |         |   |        | 78 |        |

**Table A.2-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Old Skeet and Trap Range - UXO 15**  
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| location                                    |       | X15SB036     | X15SB037     | X15SB038     | X15SB039     | X15SB040     | X15SB041     | X15SB041     | X15SB042     |
|---|-------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| nsample                                     |       | X15SS0360001 | X15SS0370001 | X15SS0380001 | X15SS0390001 | X15SS0400001 | X15SS0410001 | X15SS0410102 | X15SS0420001 |
| sample_dat                                  |       | 20090528     | 20090528     | 20090528     | 20090528     | 20090528     | 20090528     | 20090602     | 20090528     |
| qc_type                                     |       | NM           |
| sacode                                      |       | NORMAL       |
| matrix                                      | PALs  | SO           |
| top_depth                                   |       | 0            | 0            | 0            | 0            | 0            | 0            | 1            | 0            |
| bottom_dep                                  |       | 1            | 1            | 1            | 1            | 1            | 1            | 2            | 1            |
| depth_unit                                  |       | FT           |
| submatrix                                   |       | SS           | SS           | SS           | SS           | SS           | SS           | SB           | SS           |
| composite                                   |       | N            | N            | N            | N            | N            | N            | N            | N            |
| <b>Inorganics (mg/kg)</b>                   |       |              |              |              |              |              |              |              |              |
| ANTIMONY                                    | 0.27  |              | 0.37         | J            |              |              |              |              |              |
| ARSENIC                                     | 0.39  |              | 1.6          |              |              |              |              |              |              |
| COPPER                                      | 100   |              | 7.3          | L            |              |              |              |              |              |
| LEAD  | 11    |              | 203          |              |              |              |              |              |              |
| TIN   | 0.89  |              | 1.4          | B            |              |              |              |              |              |
| ZINC  | 46    |              | 30.2         |              |              |              |              |              |              |
| <b>PAHs (ug/kg)</b>                         |       |              |              |              |              |              |              |              |              |
| 1-METHYLNAPHTHALENE                         | 22000 |              |              | 10000        | U            |              |              |              |              |
| 2-METHYLNAPHTHALENE                         | 31000 |              |              | 10000        | U            |              |              |              |              |
| ACENAPHTHENE                                | 29000 |              |              | 5000         | J            |              |              |              |              |
| ACENAPHTHYLENE                              | 29000 |              |              | 24           | U            |              |              |              |              |
| ANTHRACENE                                  | 29000 |              |              | 7200         | J            |              |              |              |              |
| BENZO(A)ANTHRACENE                          | 150   |              |              | 27000        |              |              |              |              |              |
| BENZO(A)PYRENE                              | 15    |              |              | 38000        |              |              |              |              |              |
| BENZO(B)FLUORANTHENE                        | 150   |              |              | 38000        |              |              |              |              |              |
| BENZO(G,H,I)PERYLENE                        | 1100  |              |              | 22000        |              |              |              |              |              |
| BENZO(K)FLUORANTHENE                        | 1100  |              |              | 18000        |              |              |              |              |              |
| CHRYSENE                                    | 1100  |              |              | 34000        |              |              |              |              |              |
| DIBENZO(A,H)ANTHRACENE                      | 15    |              |              | 7000         | J            |              |              |              |              |
| FLUORANTHENE                                | 29000 |              |              | 38000        |              |              |              |              |              |
| FLUORENE                                    | 29000 |              |              | 3100         | J            |              |              |              |              |
| INDENO(1,2,3-CD)PYRENE                      | 150   |              |              | 27000        |              |              |              |              |              |
| NAPHTHALENE                                 | 330   |              |              | 10000        | U            |              |              |              |              |
| PHENANTHRENE                                | 29000 |              |              | 30000        |              |              |              |              |              |
| PYRENE                                      | 1100  |              |              | 45000        |              |              |              |              |              |
| <b>Explosives (mg/kg)</b>                   |       |              |              |              |              |              |              |              |              |
| NITROGLYCERIN                               | 6.1   |              |              |              |              |              |              |              |              |
| <b>XRF Field Parameters (mg/kg)</b>         |       |              |              |              |              |              |              |              |              |
| LEAD  | 11    | 43           | 247.667      | 33           | 47.333       | 47.333       | 744.333      | 18           | 239.667      |
| <b>Miscellaneous Parameters (meq/100)</b>   |       |              |              |              |              |              |              |              |              |
| CATION EXCHANGE CAPACITY                    | NA    |              |              |              |              |              |              |              |              |
| <b>Miscellaneous Parameters (s.u.)</b>      |       |              |              |              |              |              |              |              |              |
| PH  | NA    |              |              |              |              |              |              |              |              |
| <b>Miscellaneous Parameters (mg/kg)</b>     |       |              |              |              |              |              |              |              |              |
| TOTAL ORGANIC CARBON                        | NA    |              |              |              |              |              |              |              |              |
| <b>Miscellaneous Parameters (%)</b>         |       |              |              |              |              |              |              |              |              |
| TOTAL SOLIDS                                | NA    |              | 86           |              |              |              |              |              |              |
| <b>Miscellaneous Organic Parameters (%)</b> |       |              |              |              |              |              |              |              |              |
| TOTAL SOLIDS                                | NA    |              |              | 82           |              |              |              |              |              |

**Table A.2-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Old Skeet and Trap Range - UXO 15**  
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| location                                    |       | X15SB043     | X15SB044     | X15SB045     | X15SB046     | X15SB047     | X15SB048     | X15SB049     | X15SB050     |       |   |
|---|-------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-------|---|
| nsample                                     |       | X15SS0430001 | X15SS0440001 | X15SS0450001 | X15SS0460001 | X15SS0470001 | X15SS0480001 | X15SS0490001 | X15SS0500001 |       |   |
| sample_dat                                  |       | 20090528     | 20090528     | 20090528     | 20090528     | 20090528     | 20090528     | 20090528     | 20090528     |       |   |
| qc_type                                     |       | NM           |       |   |
| sacode                                      |       | NORMAL       |       |   |
| matrix                                      | PALs  | SO           |       |   |
| top_depth                                   |       | 0            | 0            | 0            | 0            | 0            | 0            | 0            | 0            |       |   |
| bottom_dep                                  |       | 1            | 1            | 1            | 1            | 1            | 1            | 1            | 1            |       |   |
| depth_unit                                  |       | FT           |       |   |
| submatrix                                   |       | SS           |       |   |
| composite                                   |       | N            | N            | N            | N            | N            | N            | N            | N            |       |   |
| <b>Inorganics (mg/kg)</b>                   |       |              |              |              |              |              |              |              |              |       |   |
| ANTIMONY                                    | 0.27  |              |              |              |              |              |              |              |              |       |   |
| ARSENIC                                     | 0.39  |              |              |              |              |              |              |              |              |       |   |
| COPPER                                      | 100   |              |              |              |              |              |              |              |              |       |   |
| LEAD  | 11    |              |              |              |              |              |              |              |              |       |   |
| TIN   | 0.89  |              |              |              |              |              |              |              |              |       |   |
| ZINC  | 46    |              |              |              |              |              |              |              |              |       |   |
| <b>PAHs (ug/kg)</b>                         |       |              |              |              |              |              |              |              |              |       |   |
| 1-METHYLNAPHTHALENE                         | 22000 |              |              |              |              |              |              | 150          | J            | 86    | J |
| 2-METHYLNAPHTHALENE                         | 31000 |              |              |              |              |              |              | 200          |              | 120   |   |
| ACENAPHTHENE                                | 29000 |              |              |              |              |              |              | 1800         | J            | 1500  | J |
| ACENAPHTHYLENE                              | 29000 |              |              |              |              |              |              | 24           | U            | 25    | U |
| ANTHRACENE                                  | 29000 |              |              |              |              |              |              | 2400         | J            | 2000  | J |
| BENZO(A)ANTHRACENE                          | 150   |              |              |              |              |              |              | 10000        |              | 9700  |   |
| BENZO(A)PYRENE                              | 15    |              |              |              |              |              |              | 13000        |              | 12000 |   |
| BENZO(B)FLUORANTHENE                        | 150   |              |              |              |              |              |              | 14000        |              | 13000 |   |
| BENZO(G,H,I)PERYLENE                        | 1100  |              |              |              |              |              |              | 9000         |              | 8200  |   |
| BENZO(K)FLUORANTHENE                        | 1100  |              |              |              |              |              |              | 6100         |              | 5700  |   |
| CHRYSENE                                    | 1100  |              |              |              |              |              |              | 13000        |              | 14000 |   |
| DIBENZO(A,H)ANTHRACENE                      | 15    |              |              |              |              |              |              | 2300         | J            | 2600  | J |
| FLUORANTHENE                                | 29000 |              |              |              |              |              |              | 14000        |              | 12000 |   |
| FLUORENE                                    | 29000 |              |              |              |              |              |              | 1000         | J            | 4200  | U |
| INDENO(1,2,3-CD)PYRENE                      | 150   |              |              |              |              |              |              | 10000        |              | 8900  |   |
| NAPHTHALENE                                 | 330   |              |              |              |              |              |              | 4000         | U            | 330   |   |
| PHENANTHRENE                                | 29000 |              |              |              |              |              |              | 11000        |              | 8200  |   |
| PYRENE                                      | 1100  |              |              |              |              |              |              | 16000        |              | 14000 |   |
| <b>Explosives (mg/kg)</b>                   |       |              |              |              |              |              |              |              |              |       |   |
| NITROGLYCERIN                               | 6.1   |              |              |              |              |              |              |              |              |       |   |
| <b>XRF Field Parameters (mg/kg)</b>         |       |              |              |              |              |              |              |              |              |       |   |
| LEAD  | 11    | 28           | 20.333       | 53.667       | 212.333      | 196          | 130.333      | 151.333      | 65.333       |       |   |
| <b>Miscellaneous Parameters (meq/100)</b>   |       |              |              |              |              |              |              |              |              |       |   |
| CATION EXCHANGE CAPACITY                    | NA    |              |              |              |              |              | 21           | K            |              |       |   |
| <b>Miscellaneous Parameters (s.u.)</b>      |       |              |              |              |              |              |              |              |              |       |   |
| PH  | NA    |              |              |              |              |              | 5.5          |              |              |       |   |
| <b>Miscellaneous Parameters (mg/kg)</b>     |       |              |              |              |              |              |              |              |              |       |   |
| TOTAL ORGANIC CARBON                        | NA    |              |              |              |              |              | 12000        |              |              |       |   |
| <b>Miscellaneous Parameters (%)</b>         |       |              |              |              |              |              |              |              |              |       |   |
| TOTAL SOLIDS                                | NA    |              |              |              |              |              | 84           |              |              |       |   |
| <b>Miscellaneous Organic Parameters (%)</b> |       |              |              |              |              |              |              |              |              |       |   |
| TOTAL SOLIDS                                | NA    |              |              |              |              |              | 82           |              | 78           |       |   |

**Table A.2-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Old Skeet and Trap Range - UXO 15**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                    |       | X15SB051     | X15SB052     | X15SB053     | X15SB054     | X15SB055     | X15SB056     | X15SB059C     | X15SB060C     |
|---|-------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|---------------|
| nsample                                     |       | X15SS0510001 | X15SS0520001 | X15SS0530001 | X15SS0540001 | X15SS0550001 | X15SS0560001 | X15SS059C0001 | X15SS060C0001 |
| sample_dat                                  |       | 20090527     | 20090527     | 20090527     | 20090527     | 20090527     | 20090527     | 20090601      | 20090601      |
| qc_type                                     |       | NM            | NM            |
| sacode                                      |       | NORMAL        | NORMAL        |
| matrix                                      | PALs  | SO            | SO            |
| top_depth                                   |       | 0            | 0            | 0            | 0            | 0            | 0            | 0             | 0             |
| bottom_dep                                  |       | 1            | 1            | 1            | 1            | 1            | 1            | 1             | 1             |
| depth_unit                                  |       | FT            | FT            |
| submatrix                                   |       | SS            | SS            |
| composite                                   |       | N            | N            | N            | N            | N            | N            | Y             | Y             |
| <b>Inorganics (mg/kg)</b>                   |       |              |              |              |              |              |              |               |               |
| ANTIMONY                                    | 0.27  |              |              |              |              |              |              |               |               |
| ARSENIC                                     | 0.39  |              |              |              |              |              |              |               |               |
| COPPER                                      | 100   |              |              |              |              |              |              |               |               |
| LEAD  | 11    |              |              |              |              |              |              |               |               |
| TIN   | 0.89  |              |              |              |              |              |              |               |               |
| ZINC  | 46    |              |              |              |              |              |              |               |               |
| <b>PAHs (ug/kg)</b>                         |       |              |              |              |              |              |              |               |               |
| 1-METHYLNAPHTHALENE                         | 22000 |              | 230          | J            | 10000        | U            | 6.1          | J             |               |
| 2-METHYLNAPHTHALENE                         | 31000 |              | 3800         | U            | 10000        | U            | 20           | J             |               |
| ACENAPHTHENE                                | 29000 |              | 2600         | J            | 4200         | J            | 160          |               |               |
| ACENAPHTHYLENE                              | 29000 |              | 23           | U            | 25           | U            | 23           | U             |               |
| ANTHRACENE                                  | 29000 |              | 4100         |              | 5400         | J            | 230          |               |               |
| BENZO(A)ANTHRACENE                          | 150   |              | 23000        |              | 33000        |              | 1800         |               |               |
| BENZO(A)PYRENE                              | 15    |              | 27000        |              | 42000        |              | 2300         |               |               |
| BENZO(B)FLUORANTHENE                        | 150   |              | 26000        |              | 41000        |              | 2000         |               |               |
| BENZO(G,H,I)PERYLENE                        | 1100  |              | 15000        |              | 25000        |              | 1900         |               |               |
| BENZO(K)FLUORANTHENE                        | 1100  |              | 10000        |              | 16000        |              | 1200         |               |               |
| CHRYSENE                                    | 1100  |              | 31000        |              | 43000        |              | 2000         |               |               |
| DIBENZO(A,H)ANTHRACENE                      | 15    |              | 5100         |              | 7600         | J            | 620          |               |               |
| FLUORANTHENE                                | 29000 |              | 23000        |              | 37000        |              | 2200         |               |               |
| FLUORENE                                    | 29000 |              | 1500         | J            | 10000        | U            | 94           |               |               |
| INDENO(1,2,3-CD)PYRENE                      | 150   |              | 16000        |              | 27000        |              | 1700         |               |               |
| NAPHTHALENE                                 | 330   |              | 3800         | U            | 10000        | U            | 39           |               |               |
| PHENANTHRENE                                | 29000 |              | 17000        |              | 24000        |              | 960          |               |               |
| PYRENE                                      | 1100  |              | 26000        |              | 44000        |              | 1600         |               |               |
| <b>Explosives (mg/kg)</b>                   |       |              |              |              |              |              |              |               |               |
| NITROGLYCERIN                               | 6.1   |              |              |              |              |              |              |               |               |
| <b>XRF Field Parameters (mg/kg)</b>         |       |              |              |              |              |              |              |               |               |
| LEAD  | 11    | 68.333       | 96.333       | 58.333       | 32.667       | 40           | 85.333       | 60.667        | 129.333       |
| <b>Miscellaneous Parameters (meq/100)</b>   |       |              |              |              |              |              |              |               |               |
| CATION EXCHANGE CAPACITY                    | NA    |              |              |              |              |              |              |               |               |
| <b>Miscellaneous Parameters (s.u.)</b>      |       |              |              |              |              |              |              |               |               |
| PH  | NA    |              |              |              |              |              |              |               |               |
| <b>Miscellaneous Parameters (mg/kg)</b>     |       |              |              |              |              |              |              |               |               |
| TOTAL ORGANIC CARBON                        | NA    |              |              |              |              |              |              |               |               |
| <b>Miscellaneous Parameters (%)</b>         |       |              |              |              |              |              |              |               |               |
| TOTAL SOLIDS                                | NA    |              |              |              |              |              |              |               |               |
| <b>Miscellaneous Organic Parameters (%)</b> |       |              |              |              |              |              |              |               |               |
| TOTAL SOLIDS                                | NA    |              | 86           | 80           | 86           |              |              |               |               |





**Table A.2-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Old Skeet and Trap Range - UXO 15**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                    |             | X15SB073            | X15SB074            | X15SB075            | X15SB076            |
|---|-------------|---------------------|---------------------|---------------------|---------------------|
| <b>nsample</b>                              |             | <b>X15SS0730001</b> | <b>X15SS0740001</b> | <b>X15SS0750001</b> | <b>X15SS0760001</b> |
| sample_dat                                  |             | 20090602            | 20090602            | 20090602            | 20090602            |
| qc_type                                     |             | NM                  | NM                  | NM                  | NM                  |
| sacode                                      |             | NORMAL              | NORMAL              | NORMAL              | NORMAL              |
| matrix                                      | <b>PALs</b> | SO                  | SO                  | SO                  | SO                  |
| top_depth                                   |             | 0                   | 0                   | 0                   | 0                   |
| bottom_dep                                  |             | 1                   | 1                   | 1                   | 1                   |
| depth_unit                                  |             | FT                  | FT                  | FT                  | FT                  |
| submatrix                                   |             | SS                  | SS                  | SS                  | SS                  |
| composite                                   |             | N                   | N                   | N                   | N                   |
| <b>Inorganics (mg/kg)</b>                   |             |                     |                     |                     |                     |
| ANTIMONY                                    | 0.27        | 0.5                 | L                   |                     | 0.47                |
| ARSENIC                                     | 0.39        | 2.2                 |                     |                     | 2.7                 |
| COPPER                                      | 100         | 8.2                 |                     |                     | 26                  |
| LEAD  | 11          | 335                 |                     |                     | 238                 |
| TIN   | 0.89        | 1.3                 | B                   |                     | 2.2                 |
| ZINC  | 46          | 30.5                |                     |                     | 37.4                |
| <b>PAHs (ug/kg)</b>                         |             |                     |                     |                     |                     |
| 1-METHYLNAPHTHALENE                         | 22000       |                     |                     |                     |                     |
| 2-METHYLNAPHTHALENE                         | 31000       |                     |                     |                     |                     |
| ACENAPHTHENE                                | 29000       |                     |                     |                     |                     |
| ACENAPHTHYLENE                              | 29000       |                     |                     |                     |                     |
| ANTHRACENE                                  | 29000       |                     |                     |                     |                     |
| BENZO(A)ANTHRACENE                          | 150         |                     |                     |                     |                     |
| BENZO(A)PYRENE                              | 15          |                     |                     |                     |                     |
| BENZO(B)FLUORANTHENE                        | 150         |                     |                     |                     |                     |
| BENZO(G,H,I)PERYLENE                        | 1100        |                     |                     |                     |                     |
| BENZO(K)FLUORANTHENE                        | 1100        |                     |                     |                     |                     |
| CHRYSENE                                    | 1100        |                     |                     |                     |                     |
| DIBENZO(A,H)ANTHRACENE                      | 15          |                     |                     |                     |                     |
| FLUORANTHENE                                | 29000       |                     |                     |                     |                     |
| FLUORENE                                    | 29000       |                     |                     |                     |                     |
| INDENO(1,2,3-CD)PYRENE                      | 150         |                     |                     |                     |                     |
| NAPHTHALENE                                 | 330         |                     |                     |                     |                     |
| PHENANTHRENE                                | 29000       |                     |                     |                     |                     |
| PYRENE                                      | 1100        |                     |                     |                     |                     |
| <b>Explosives (mg/kg)</b>                   |             |                     |                     |                     |                     |
| NITROGLYCERIN                               | 6.1         |                     |                     |                     |                     |
| <b>XRF Field Parameters (mg/kg)</b>         |             |                     |                     |                     |                     |
| LEAD  | 11          | 490                 | 1260.333            | 130.333             | 552.667             |
| <b>Miscellaneous Parameters (meq/100)</b>   |             |                     |                     |                     |                     |
| CATION EXCHANGE CAPACITY                    | NA          |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (s.u.)</b>      |             |                     |                     |                     |                     |
| PH  | NA          |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (mg/kg)</b>     |             |                     |                     |                     |                     |
| TOTAL ORGANIC CARBON                        | NA          |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (%)</b>         |             |                     |                     |                     |                     |
| TOTAL SOLIDS                                | NA          | 84                  |                     |                     | 86                  |
| <b>Miscellaneous Organic Parameters (%)</b> |             |                     |                     |                     |                     |
| TOTAL SOLIDS                                | NA          |                     |                     |                     |                     |

TABLE A.2-3

BENZO(a)PYRENE EQUIVALENT CONCENTRATIONS IN DISCRETE SOIL SAMPLES  
 OLD SKEET AND TRAP RANGE - UXO 15  
 SITE INSPECTION  
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| location                                       | X15SB001     | X15SB002     | X15SB003     | X15SB011     | X15SB015     | X15SB019     | X15SB021     | X15SB028     | X15SB029     | X15SB031     |
|--|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| nsample  | X15SS0010001 | X15SS0020001 | X15SS0030001 | X15SS0110001 | X15SS0150001 | X15SS0190001 | X15SS0210001 | X15SS0280001 | X15SS0290001 | X15SS0310001 |
| matrix   | SO           |
| submatrix                                      | SS           |
| sacode   | NORMAL       |
| top_depth                                      | 0            | 0            | 0            | 0            | 0            | 0            | 0            | 0            | 0            | 0            |
| bottom_dep                                     | 1            | 1            | 1            | 1            | 1            | 1            | 1            | 1            | 1            | 1            |
| qc_type  | NM           |
| sample_dat                                     | 20090527     | 20090527     | 20090527     | 20090527     | 20090527     | 20090527     | 20090527     | 20090527     | 20090527     | 20090528     |
| <b>PAH Concentrations (ug/kg)</b>              |              |              |              |              |              |              |              |              |              |              |
| BENZO(A)ANTHRACENE                             | 1500         | 3000         | 20 J         | 21 J         | 17000        | 37 J         | 3200         | 400          | 53           | 18000        |
| BENZO(A)PYRENE                                 | 1600         | 3900         | 20 J         | 18 J         | 23000        | 40 J         | 2300         | 400          | 58           | 24000        |
| BENZO(B)FLUORANTHENE                           | 1700         | 4500         | 30           | 24 J         | 21000        | 42 J         | 1500         | 240          | 66           | 26000        |
| BENZO(K)FLUORANTHENE                           | 930          | 1600         | 12 J         | 11 J         | 8400         | 25 J         | 510          | 140          | 28           | 11000        |
| CHRYSENE                                       | 1400         | 3600         | 13 J         | 15 J         | 22000        | 35 J         | 3600         | 420          | 46           | 22000        |
| DIBENZO(A,H)ANTHRACENE                         | 420          | 620 J        | 7.8 J        | 9.4 J        | 3300 J       | 13 J         | 820          | 91           | 22 J         | 4100 J       |
| INDENO(1,2,3-CD)PYRENE                         | 1200         | 2500         | 12 J         | 11 J         | 12000        | 24 J         | 700          | 170          | 36           | 16000        |
| <b>Benzo(a)pyrene (BaP) Equivalent (ug/kg)</b> |              |              |              |              |              |              |              |              |              |              |
| BAP EQUIVALENT-HALFND                          | 2470.7       | 5539.6       | 34.133       | 33.125       | 31406        | 63.585       | 3668.7       | 573.82       | 95.826       | 34232        |

Toxicity Equivalency Factors (TEFs) for PAHs

| PAH                    | TEF   |
|------------------------|-------|
| BENZO(A)ANTHRACENE     | 0.1   |
| BENZO(A)PYRENE         | 1     |
| BENZO(B)FLUORANTHENE   | 0.1   |
| BENZO(K)FLUORANTHENE   | 0.01  |
| CHRYSENE               | 0.001 |
| DIBENZO(A,H)ANTHRACENE | 1     |
| INDENO(1,2,3-CD)PYRENE | 0.1   |

BaP Screening Levels

| Risk Level                            | 1E-06 | 1E-05 | 1E-04 |
|---------------------------------------|-------|-------|-------|
| Resid screening level for BaP (ug/kg) | 15    | 150   | 1500  |

Comparison to Residential Screening Level of 150 ug/kg

|                               |       |       |    |    |        |    |       |     |    |        |
|-------------------------------|-------|-------|----|----|--------|----|-------|-----|----|--------|
| BAP EQUIVALENT-HALFND (ug/kg) | 2,471 | 5,540 | 34 | 33 | 31,406 | 64 | 3,669 | 574 | 96 | 34,232 |
|-------------------------------|-------|-------|----|----|--------|----|-------|-----|----|--------|

TABLE A.2-3

BENZO(a)PYRENE EQUIVALENT CONCENTRATIONS IN DISCRETE SOIL SAMPLES  
 OLD SKEET AND TRAP RANGE - UXO 15  
 SITE INSPECTION  
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| location                                       | X15SB032            | X15SB035            | X15SB038            | X15SB049            | X15SB050            | X15SB052            | X15SB053            | X15SB054            |
|--|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| <b>nsample</b>                                 | <b>X15SS0320001</b> | <b>X15SS0350001</b> | <b>X15SS0380001</b> | <b>X15SS0490001</b> | <b>X15SS0500001</b> | <b>X15SS0520001</b> | <b>X15SS0530001</b> | <b>X15SS0540001</b> |
| matrix   | SO                  |
| submatrix                                      | SS                  |
| sacode   | NORMAL              |
| top_depth                                      | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   |
| bottom_dep                                     | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   |
| qc_type  | NM                  |
| sample_dat                                     | 20090528            | 20090528            | 20090528            | 20090528            | 20090528            | 20090527            | 20090527            | 20090527            |
| <b>PAH Concentrations (ug/kg)</b>              |                     |                     |                     |                     |                     |                     |                     |                     |
| BENZO(A)ANTHRACENE                             | 410                 | 2000                | 27000               | 10000               | 9700                | 23000               | 33000               | 1800                |
| BENZO(A)PYRENE                                 | 440                 | 2900                | 38000               | 13000               | 12000               | 27000               | 42000               | 2300                |
| BENZO(B)FLUORANTHENE                           | 410                 | 3200                | 38000               | 14000               | 13000               | 26000               | 41000               | 2000                |
| BENZO(K)FLUORANTHENE                           | 270                 | 1100                | 18000               | 6100                | 5700                | 10000               | 16000               | 1200                |
| CHRYSENE                                       | 290                 | 2500                | 34000               | 13000               | 14000               | 31000               | 43000               | 2000                |
| DIBENZO(A,H)ANTHRACENE                         | 100                 | 460                 | 7000 J              | 2300 J              | 2600 J              | 5100                | 7600 J              | 620                 |
| INDENO(1,2,3-CD)PYRENE                         | 290                 | 1900                | 27000               | 10000               | 8900                | 16000               | 27000               | 1700                |
| <b>Benzo(a)pyrene (BaP) Equivalent (ug/kg)</b> |                     |                     |                     |                     |                     |                     |                     |                     |
| BAP EQUIVALENT-HALFND                          | 653.99              | 4083.5              | 54414               | 18774               | 17831               | 38731               | 59903               | 3484                |

**Toxicity Equivalency Factors (TEFs) for PAHs**

| PAH                    | TEF   |
|------------------------|-------|
| BENZO(A)ANTHRACENE     | 0.1   |
| BENZO(A)PYRENE         | 1     |
| BENZO(B)FLUORANTHENE   | 0.1   |
| BENZO(K)FLUORANTHENE   | 0.01  |
| CHRYSENE               | 0.001 |
| DIBENZO(A,H)ANTHRACENE | 1     |
| INDENO(1,2,3-CD)PYRENE | 0.1   |

**BaP Screening Levels**

| Risk Level                            | 1E-06 | 1E-05 |
|---------------------------------------|-------|-------|
| Resid screening level for BaP (ug/kg) | 15    | 150   |

**Comparison to Residential Screening Level of 150 ug/kg**

|                               |     |       |        |        |        |        |        |       |
|-------------------------------|-----|-------|--------|--------|--------|--------|--------|-------|
| BAP EQUIVALENT-HALFND (ug/kg) | 654 | 4,084 | 54,414 | 18,774 | 17,831 | 38,731 | 59,903 | 3,484 |
|-------------------------------|-----|-------|--------|--------|--------|--------|--------|-------|

**Table A.3-1**  
**Summary of Chemicals Detected in Composite Soil Samples**  
**Firing Points**  
**Rum Point Skeet Range - UXO 16**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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|   |       |               |               |        |    |
|---|-------|---------------|---------------|--------|----|
| location                                    |       | X16SB080C     | X16SB081C     |        |    |
| nsample                                     |       | X16SS080C0001 | X16SS081C0001 |        |    |
| sample_dat                                  |       | 20090614      | 20090614      |        |    |
| qc_type                                     |       | NM            | NM            |        |    |
| sacode                                      |       | NORMAL        | NORMAL        |        |    |
| matrix                                      | PALs  | SO            | SO            |        |    |
| top_depth                                   |       | 0             | 0             |        |    |
| bottom_dep                                  |       | 1             | 1             |        |    |
| depth_unit                                  |       | FT            | FT            |        |    |
| submatrix                                   |       | SS            | SS            |        |    |
| composite                                   |       | Y             | Y             |        |    |
| <b>Inorganics (mg/kg)</b>                   |       |               |               |        |    |
| ANTIMONY                                    | 0.27  | 0.14          | L             | 0.42   | L  |
| ARSENIC                                     | 0.39  | 3             |               | 4.2    |    |
| COPPER                                      | 100   | 4.8           |               | 9.6    |    |
| LEAD  | 11    | 9.1           |               | 48.7   |    |
| TIN   | 0.89  | 1.2           | B             | 1.1    | B  |
| ZINC  | 46    | 18.7          |               | 29     |    |
| <b>PAHs (ug/kg)</b>                         |       |               |               |        |    |
| 1-METHYLNAPHTHALENE                         | 22000 | 23            | U             | 23     | U  |
| 2-METHYLNAPHTHALENE                         | 31000 | 3.5           | J             | 23     | U  |
| ACENAPHTHENE                                | 29000 | 23            | U             | 23     | U  |
| ACENAPHTHYLENE                              | 29000 | 23            | U             | 23     | U  |
| ANTHRACENE                                  | 29000 | 4.1           | J             | 5.6    | J  |
| BENZO(A)ANTHRACENE                          | 150   | 78            |               | 94     |    |
| BENZO(A)PYRENE                              | 15    | 91            |               | 100    |    |
| BENZO(B)FLUORANTHENE                        | 150   | 33            |               | 38     |    |
| BENZO(G,H,I)PERYLENE                        | 1100  | 41            |               | 50     |    |
| BENZO(K)FLUORANTHENE                        | 1100  | 5.8           | J             | 7.7    | J  |
| CHRYSENE                                    | 1100  | 97            |               | 130    |    |
| DIBENZO(A,H)ANTHRACENE                      | 15    | 12            | J             | 18     | J  |
| FLUORANTHENE                                | 29000 | 9.8           | J             | 13     | J  |
| FLUORENE                                    | 29000 | 23            | U             | 23     | U  |
| INDENO(1,2,3-CD)PYRENE                      | 150   | 9.1           | J             | 10     | J  |
| NAPHTHALENE                                 | 330   | 23            | U             | 23     | U  |
| PHENANTHRENE                                | 29000 | 21            | J             | 24     |    |
| PYRENE                                      | 1100  | 92            |               | 110    |    |
| <b>Explosives (mg/kg)</b>                   |       |               |               |        |    |
| NITROGLYCERIN                               | 6.1   | 1.2           | UJ            | 1.2    | UJ |
| <b>XRF Field Parameters (mg/kg)</b>         |       |               |               |        |    |
| LEAD  | 11    | 21            |               | 73.333 |    |
| <b>Miscellaneous Parameters (meq/100)</b>   |       |               |               |        |    |
| CATION EXCHANGE CAPACITY                    | NA    |               |               |        |    |
| <b>Miscellaneous Parameters (s.u.)</b>      |       |               |               |        |    |
| PH  | NA    |               |               |        |    |
| <b>Miscellaneous Parameters (mg/kg)</b>     |       |               |               |        |    |
| TOTAL ORGANIC CARBON                        | NA    |               |               |        |    |
| <b>Miscellaneous Parameters (%)</b>         |       |               |               |        |    |
| TOTAL SOLIDS                                | NA    | 88            |               | 89     |    |
| <b>Miscellaneous Organic Parameters (%)</b> |       |               |               |        |    |
| TOTAL SOLIDS                                | NA    | 88            |               | 88     |    |

**Table A.3-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Rum Point Skeet Range - UXO 16**  
**Site Inspection**  
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|   |       | X16SB001<br>X16SS0010001 | X16SB002<br>X16SS0020001 | X16SB003<br>X16SS0030001 | X16SB004<br>X16SS0040001 | X16SB005<br>X16SS0050001 | X16SB006<br>X16SS0060001 | X16SB007<br>X16SS0070001 | X16SB008<br>X16SS0080001 |    |
|---|-------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|----|
| location                                    |       |                          |                          |                          |                          |                          |                          |                          |                          |    |
| nsample                                     |       | 20090613                 | 20090613                 | 20090613                 | 20090613                 | 20090613                 | 20090613                 | 20090613                 | 20090613                 |    |
| sample_dat                                  |       |                          |                          |                          |                          |                          |                          |                          |                          |    |
| qc_type                                     |       | NM                       |    |
| sacode                                      |       | NORMAL                   |    |
| matrix                                      | PALs  | SO                       |    |
| top_depth                                   |       | 0                        | 0                        | 0                        | 0                        | 0                        | 0                        | 0                        | 0                        |    |
| bottom_dep                                  |       | 1                        | 1                        | 1                        | 1                        | 1                        | 1                        | 1                        | 1                        |    |
| depth_unit                                  |       | FT                       |    |
| submatrix                                   |       | SS                       |    |
| composite                                   |       | N                        | N                        | N                        | N                        | N                        | N                        | N                        | N                        |    |
| <b>Inorganics (mg/kg)</b>                   |       |                          |                          |                          |                          |                          |                          |                          |                          |    |
| ANTIMONY                                    | 0.27  |                          |                          | 0.62                     | L                        |                          |                          |                          | 1                        | L  |
| ARSENIC                                     | 0.39  |                          |                          | 4                        |                          |                          |                          |                          | 5.1                      |    |
| COPPER                                      | 100   |                          |                          | 6.9                      |                          |                          |                          |                          | 10.4                     | K  |
| LEAD  | 11    |                          |                          | 13.5                     |                          |                          |                          |                          | 616                      |    |
| TIN   | 0.89  |                          |                          | 1.1                      | B                        |                          |                          |                          | 1.9                      | B  |
| ZINC  | 46    |                          |                          | 19.8                     |                          |                          |                          |                          | 30.9                     |    |
| <b>PAHs (ug/kg)</b>                         |       |                          |                          |                          |                          |                          |                          |                          |                          |    |
| 1-METHYLNAPHTHALENE                         | 22000 |                          | 2.6                      | L                        |                          |                          |                          |                          | 23                       | U  |
| 2-METHYLNAPHTHALENE                         | 31000 |                          | 9.3                      | L                        |                          |                          |                          |                          | 23                       | UL |
| ACENAPHTHENE                                | 29000 |                          | 23                       | UL                       |                          |                          |                          |                          | 23                       | UL |
| ACENAPHTHYLENE                              | 29000 |                          | 23                       | UL                       |                          |                          |                          |                          | 23                       | U  |
| ANTHRACENE                                  | 29000 |                          | 32                       | L                        |                          |                          |                          |                          | 23                       | UL |
| BENZO(A)ANTHRACENE                          | 150   |                          | 630                      |                          |                          |                          |                          |                          | 6                        | J  |
| BENZO(A)PYRENE                              | 15    |                          | 630                      |                          |                          |                          |                          |                          | 7.6                      | J  |
| BENZO(B)FLUORANTHENE                        | 150   |                          | 200                      | L                        |                          |                          |                          |                          | 6                        | J  |
| BENZO(G,H,I)PERYLENE                        | 1100  |                          | 260                      | L                        |                          |                          |                          |                          | 4.6                      | J  |
| BENZO(K)FLUORANTHENE                        | 1100  |                          | 40                       | L                        |                          |                          |                          |                          | 23                       | U  |
| CHRYSENE                                    | 1100  |                          | 770                      |                          |                          |                          |                          |                          | 10                       | J  |
| DIBENZO(A,H)ANTHRACENE                      | 15    |                          | 120                      | L                        |                          |                          |                          |                          | 23                       | U  |
| FLUORANTHENE                                | 29000 |                          | 79                       | L                        |                          |                          |                          |                          | 8.9                      | L  |
| FLUORENE                                    | 29000 |                          | 4.2                      | L                        |                          |                          |                          |                          | 23                       | UL |
| INDENO(1,2,3-CD)PYRENE                      | 150   |                          | 78                       | L                        |                          |                          |                          |                          | 3.4                      | J  |
| NAPHTHALENE                                 | 330   |                          | 23                       | UL                       |                          |                          |                          |                          | 23                       | U  |
| PHENANTHRENE                                | 29000 |                          | 140                      | L                        |                          |                          |                          |                          | 3.2                      | L  |
| PYRENE                                      | 1100  |                          | 620                      |                          |                          |                          |                          |                          | 6.1                      | J  |
| <b>Explosives (mg/kg)</b>                   |       |                          |                          |                          |                          |                          |                          |                          |                          |    |
| NITROGLYCERIN                               | 6.1   |                          |                          |                          |                          |                          |                          |                          |                          |    |
| <b>XRF Field Parameters (mg/kg)</b>         |       |                          |                          |                          |                          |                          |                          |                          |                          |    |
| LEAD  | 11    | 19.667                   | 16.333                   | 17                       | 75.667                   | 20.333                   | 16                       | 75.333                   | 975.333                  |    |
| <b>Miscellaneous Parameters (meq/100)</b>   |       |                          |                          |                          |                          |                          |                          |                          |                          |    |
| CATION EXCHANGE CAPACITY                    | NA    |                          |                          |                          |                          |                          |                          |                          | 31                       | K  |
| <b>Miscellaneous Parameters (s.u.)</b>      |       |                          |                          |                          |                          |                          |                          |                          |                          |    |
| PH  | NA    |                          |                          |                          |                          |                          |                          |                          | 4.7                      |    |
| <b>Miscellaneous Parameters (mg/kg)</b>     |       |                          |                          |                          |                          |                          |                          |                          |                          |    |
| TOTAL ORGANIC CARBON                        | NA    |                          |                          |                          |                          |                          |                          |                          | 38000                    |    |
| <b>Miscellaneous Parameters (%)</b>         |       |                          |                          |                          |                          |                          |                          |                          |                          |    |
| TOTAL SOLIDS                                | NA    |                          |                          | 87                       |                          |                          |                          |                          | 74                       |    |
| <b>Miscellaneous Organic Parameters (%)</b> |       |                          |                          |                          |                          |                          |                          |                          |                          |    |
| TOTAL SOLIDS                                | NA    |                          | 87                       |                          |                          |                          |                          |                          | 87                       |    |

**Table A.3-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Rum Point Skeet Range - UXO 16**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                    |       | X16SB009     | X16SB010     | X16SB011     | X16SB012     | X16SB013     | X16SB014     | X16SB015     | X16SB016     |
|---|-------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| nsample                                     |       | X16SS0090001 | X16SS0100001 | X16SS0110001 | X16SS0120001 | X16SS0130001 | X16SS0140001 | X16SS0150001 | X16SS0160001 |
| sample_dat                                  |       | 20090614     | 20090613     | 20090613     | 20090613     | 20090613     | 20090614     | 20090613     | 20090613     |
| qc_type                                     |       | NM           |
| sacode                                      |       | NORMAL       |
| matrix                                      | PALs  | SO           |
| top_depth                                   |       | 0            | 0            | 0            | 0            | 0            | 0            | 0            | 0            |
| bottom_dep                                  |       | 1            | 1            | 1            | 1            | 1            | 1            | 1            | 1            |
| depth_unit                                  |       | FT           |
| submatrix                                   |       | SS           |
| composite                                   |       | N            | N            | N            | N            | N            | N            | N            | N            |
| <b>Inorganics (mg/kg)</b>                   |       |              |              |              |              |              |              |              |              |
| ANTIMONY                                    | 0.27  |              |              |              |              | 0.55         | L            |              |              |
| ARSENIC                                     | 0.39  |              |              |              |              | 2            |              |              |              |
| COPPER                                      | 100   |              |              |              |              | 11.4         | K            |              |              |
| LEAD  | 11    |              |              |              |              | 38.8         |              |              |              |
| TIN   | 0.89  |              |              |              |              | 1.2          | B            |              |              |
| ZINC  | 46    |              |              |              |              | 34.9         |              |              |              |
| <b>PAHs (ug/kg)</b>                         |       |              |              |              |              |              |              |              |              |
| 1-METHYLNAPHTHALENE                         | 22000 | 23           | UL           |              |              | 24           | U            | 23           | U            |
| 2-METHYLNAPHTHALENE                         | 31000 | 23           | UL           |              |              | 24           | U            | 23           | U            |
| ACENAPHTHENE                                | 29000 | 23           | UL           |              |              | 24           | U            | 23           | U            |
| ACENAPHTHYLENE                              | 29000 | 23           | UL           |              |              | 24           | U            | 23           | U            |
| ANTHRACENE                                  | 29000 | 23           | UL           |              |              | 1.8          | J            | 7.3          | J            |
| BENZO(A)ANTHRACENE                          | 150   | 8.8          | L            |              |              | 26           |              | 100          |              |
| BENZO(A)PYRENE                              | 15    | 8.7          | L            |              |              | 38           |              | 120          |              |
| BENZO(B)FLUORANTHENE                        | 150   | 11           | L            |              |              | 16           | J            | 47           |              |
| BENZO(G,H,I)PERYLENE                        | 1100  | 6.2          | L            |              |              | 22           | J            | 58           |              |
| BENZO(K)FLUORANTHENE                        | 1100  | 23           | UL           |              |              | 4.3          | J            | 9            | J            |
| CHRYSENE                                    | 1100  | 14           | L            |              |              | 41           |              | 120          |              |
| DIBENZO(A,H)ANTHRACENE                      | 15    | 23           | UL           |              |              | 6.4          | J            | 20           | J            |
| FLUORANTHENE                                | 29000 | 8            | L            |              |              | 7.4          | J            | 20           | J            |
| FLUORENE                                    | 29000 | 23           | UL           |              |              | 24           | U            | 23           | U            |
| INDENO(1,2,3-CD)PYRENE                      | 150   | 5.9          | L            |              |              | 8.1          | J            | 17           | J            |
| NAPHTHALENE                                 | 330   | 23           | UL           |              |              | 24           | U            | 23           | U            |
| PHENANTHRENE                                | 29000 | 23           | UL           |              |              | 5.3          | J            | 31           |              |
| PYRENE                                      | 1100  | 9.5          | L            |              |              | 26           |              | 110          |              |
| <b>Explosives (mg/kg)</b>                   |       |              |              |              |              |              |              |              |              |
| NITROGLYCERIN                               | 6.1   |              |              |              |              |              |              |              |              |
| <b>XRF Field Parameters (mg/kg)</b>         |       |              |              |              |              |              |              |              |              |
| LEAD  | 11    | 19.667       | 47.333       | 43.333       | 184.667      | 28           | 22           | 24           | 83.667       |
| <b>Miscellaneous Parameters (meq/100)</b>   |       |              |              |              |              |              |              |              |              |
| CATION EXCHANGE CAPACITY                    | NA    |              |              |              |              |              |              |              |              |
| <b>Miscellaneous Parameters (s.u.)</b>      |       |              |              |              |              |              |              |              |              |
| PH  | NA    |              |              |              |              | 7.9          |              |              |              |
| <b>Miscellaneous Parameters (mg/kg)</b>     |       |              |              |              |              |              |              |              |              |
| TOTAL ORGANIC CARBON                        | NA    |              |              |              |              | 9700         |              |              |              |
| <b>Miscellaneous Parameters (%)</b>         |       |              |              |              |              |              |              |              |              |
| TOTAL SOLIDS                                | NA    |              |              |              |              | 82           |              |              |              |
| <b>Miscellaneous Organic Parameters (%)</b> |       |              |              |              |              |              |              |              |              |
| TOTAL SOLIDS                                | NA    | 87           |              |              |              | 82           | 85           |              |              |

**Table A.3-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Rum Point Skeet Range - UXO 16**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                    |       | X16SB017     | X16SB018     | X16SB019     | X16SB020     | X16SB021     | X16SB022     | X16SB023     | X16SB023         |        |    |
|---|-------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|------------------|--------|----|
| nsample                                     |       | X16SS0170001 | X16SS0180001 | X16SS0190001 | X16SS0200001 | X16SS0210001 | X16SS0220001 | X16SS0230001 | X16SS0230001-AVG |        |    |
| sample_dat                                  |       | 20090613     | 20090613     | 20090614     | 20090613     | 20090613     | 20090613     | 20090613     | 20090613         |        |    |
| qc_type                                     |       | NM               |        |    |
| sacode                                      |       | NORMAL       | NORMAL       | NORMAL       | NORMAL       | NORMAL       | NORMAL       | ORIG         | AVG              |        |    |
| matrix                                      | PALs  | SO               |        |    |
| top_depth                                   |       | 0            | 0            | 0            | 0            | 0            | 0            | 0            | 0                |        |    |
| bottom_dep                                  |       | 1            | 1            | 1            | 1            | 1            | 1            | 1            | 1                |        |    |
| depth_unit                                  |       | FT               |        |    |
| submatrix                                   |       | SS               |        |    |
| composite                                   |       | N            | N            | N            | N            | N            | N            | N            | N                |        |    |
| <b>Inorganics (mg/kg)</b>                   |       |              |              |              |              |              |              |              |                  |        |    |
| ANTIMONY                                    | 0.27  | 0.45         | L            |              |              |              | 0.22         | L            |                  |        |    |
| ARSENIC                                     | 0.39  | 4.6          |              |              |              |              | 1.9          | B            |                  |        |    |
| COPPER                                      | 100   | 7.4          | K            |              |              |              | 5.5          |              |                  |        |    |
| LEAD  | 11    | 51.4         |              |              |              |              | 51.9         |              |                  |        |    |
| TIN   | 0.89  | 1.5          | B            |              |              |              | 1            | B            |                  |        |    |
| ZINC  | 46    | 26.2         |              |              |              |              | 22           |              |                  |        |    |
| <b>PAHs (ug/kg)</b>                         |       |              |              |              |              |              |              |              |                  |        |    |
| 1-METHYLNAPHTHALENE                         | 22000 |              |              | 22           | U            |              |              | 28           | U                | 25.5   | U  |
| 2-METHYLNAPHTHALENE                         | 31000 |              |              | 22           | U            |              |              | 28           | UL               | 25.5   | UL |
| ACENAPHTHENE                                | 29000 |              |              | 22           | U            |              |              | 28           | UL               | 25.5   | UL |
| ACENAPHTHYLENE                              | 29000 |              |              | 22           | U            |              |              | 28           | U                | 25.5   | U  |
| ANTHRACENE                                  | 29000 |              |              | 10           | J            |              |              | 12           | L                | 12     | L  |
| BENZO(A)ANTHRACENE                          | 150   |              |              | 170          |              |              |              | 210          | J                | 107.65 | J  |
| BENZO(A)PYRENE                              | 15    |              |              | 220          |              |              |              | 240          | J                | 123.8  | J  |
| BENZO(B)FLUORANTHENE                        | 150   |              |              | 79           |              |              |              | 89           | J                | 46.4   | J  |
| BENZO(G,H,I)PERYLENE                        | 1100  |              |              | 110          |              |              |              | 130          | J                | 67.15  | J  |
| BENZO(K)FLUORANTHENE                        | 1100  |              |              | 13           | J            |              |              | 13           | J                | 13     | J  |
| CHRYSENE                                    | 1100  |              |              | 210          |              |              |              | 240          | J                | 124.4  | J  |
| DIBENZO(A,H)ANTHRACENE                      | 15    |              |              | 42           |              |              |              | 41           | J                | 26.25  | J  |
| FLUORANTHENE                                | 29000 |              |              | 24           |              |              |              | 32           | L                | 17.25  | L  |
| FLUORENE                                    | 29000 |              |              | 22           | U            |              |              | 28           | UL               | 25.5   | UL |
| INDENO(1,2,3-CD)PYRENE                      | 150   |              |              | 28           |              |              |              | 36           |                  | 19.25  | J  |
| NAPHTHALENE                                 | 330   |              |              | 22           | U            |              |              | 28           | U                | 25.5   | U  |
| PHENANTHRENE                                | 29000 |              |              | 37           |              |              |              | 40           | L                | 25.75  | L  |
| PYRENE                                      | 1100  |              |              | 150          |              |              |              | 160          | J                | 82.3   | J  |
| <b>Explosives (mg/kg)</b>                   |       |              |              |              |              |              |              |              |                  |        |    |
| NITROGLYCERIN                               | 6.1   |              |              |              |              |              |              |              |                  |        |    |
| <b>XRF Field Parameters (mg/kg)</b>         |       |              |              |              |              |              |              |              |                  |        |    |
| LEAD  | 11    | 57.667       | 24.333       | 22           | 58           | 106          | 25           | 27.333       | 27.333           |        |    |
| <b>Miscellaneous Parameters (meq/100)</b>   |       |              |              |              |              |              |              |              |                  |        |    |
| CATION EXCHANGE CAPACITY                    | NA    |              |              |              |              |              |              |              |                  |        |    |
| <b>Miscellaneous Parameters (s.u.)</b>      |       |              |              |              |              |              |              |              |                  |        |    |
| PH  | NA    |              |              |              |              |              |              |              |                  |        |    |
| <b>Miscellaneous Parameters (mg/kg)</b>     |       |              |              |              |              |              |              |              |                  |        |    |
| TOTAL ORGANIC CARBON                        | NA    |              |              |              |              |              |              |              |                  |        |    |
| <b>Miscellaneous Parameters (%)</b>         |       |              |              |              |              |              |              |              |                  |        |    |
| TOTAL SOLIDS                                | NA    | 82           |              |              | 87           |              |              |              |                  |        |    |
| <b>Miscellaneous Organic Parameters (%)</b> |       |              |              |              |              |              |              |              |                  |        |    |
| TOTAL SOLIDS                                | NA    |              |              | 89           |              |              |              | 72           |                  | 80     |    |

**Table A.3-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Rum Point Skeet Range - UXO 16**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                    |       | X16SB023       | X16SB024     | X16SB025     | X16SB026     | X16SB027     | X16SB028     | X16SB029     | X16SB030     |
|---|-------|----------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| nsample                                     |       | X16SS0230001-D | X16SS0240001 | X16SS0250001 | X16SS0260001 | X16SS0270001 | X16SS0280001 | X16SS0290001 | X16SS0300001 |
| sample_dat                                  |       | 20090613       | 20090613     | 20090613     | 20090613     | 20090613     | 20090613     | 20090613     | 20090613     |
| qc_type                                     |       | FD             | NM           |
| sacode                                      |       | DUP            | NORMAL       |
| matrix                                      | PALs  | SO             | SO           | SO           | SO           | SO           | SO           | SO           | SO           |
| top_depth                                   |       | 0              | 0            | 0            | 0            | 0            | 0            | 0            | 0            |
| bottom_dep                                  |       | 1              | 1            | 1            | 1            | 1            | 1            | 1            | 1            |
| depth_unit                                  |       | FT             | FT           | FT           | FT           | FT           | FT           | FT           | FT           |
| submatrix                                   |       | SS             | SS           | SS           | SS           | SS           | SS           | SS           | SS           |
| composite                                   |       | N              | N            | N            | N            | N            | N            | N            | N            |
| <b>Inorganics (mg/kg)</b>                   |       |                |              |              |              |              |              |              |              |
| ANTIMONY                                    | 0.27  |                |              | 0.73         | B            |              |              |              |              |
| ARSENIC                                     | 0.39  |                |              | 4            | J            |              |              |              |              |
| COPPER                                      | 100   |                |              | 8.8          | J            |              |              |              |              |
| LEAD  | 11    |                |              | 159          | J            |              |              |              |              |
| TIN   | 0.89  |                |              | 1.2          | B            |              |              |              |              |
| ZINC  | 46    |                |              | 29.4         | J            |              |              |              |              |
| <b>PAHs (ug/kg)</b>                         |       |                |              |              |              |              |              |              |              |
| 1-METHYLNAPHTHALENE                         | 22000 | 23             | U            |              |              | 24           | U            |              |              |
| 2-METHYLNAPHTHALENE                         | 31000 | 23             | UL           |              |              | 24           | UL           |              |              |
| ACENAPHTHENE                                | 29000 | 23             | UL           |              |              | 24           | UL           |              |              |
| ACENAPHTHYLENE                              | 29000 | 23             | U            |              |              | 24           | U            |              |              |
| ANTHRACENE                                  | 29000 | 23             | UL           |              |              | 5.5          | L            |              |              |
| BENZO(A)ANTHRACENE                          | 150   | 5.3            | J            |              |              | 81           |              |              |              |
| BENZO(A)PYRENE                              | 15    | 7.6            | J            |              |              | 110          |              |              |              |
| BENZO(B)FLUORANTHENE                        | 150   | 3.8            | J            |              |              | 41           |              |              |              |
| BENZO(G,H,I)PERYLENE                        | 1100  | 4.3            | J            |              |              | 58           |              |              |              |
| BENZO(K)FLUORANTHENE                        | 1100  | 23             | U            |              |              | 6.6          | J            |              |              |
| CHRYSENE                                    | 1100  | 8.8            | J            |              |              | 110          |              |              |              |
| DIBENZO(A,H)ANTHRACENE                      | 15    | 23             | UJ           |              |              | 21           | J            |              |              |
| FLUORANTHENE                                | 29000 | 2.5            | L            |              |              | 17           | L            |              |              |
| FLUORENE                                    | 29000 | 23             | UL           |              |              | 24           | UL           |              |              |
| INDENO(1,2,3-CD)PYRENE                      | 150   | 2.5            | J            |              |              | 18           | J            |              |              |
| NAPHTHALENE                                 | 330   | 23             | U            |              |              | 24           | U            |              |              |
| PHENANTHRENE                                | 29000 | 23             | UL           |              |              | 21           | L            |              |              |
| PYRENE                                      | 1100  | 4.6            | J            |              |              | 71           |              |              |              |
| <b>Explosives (mg/kg)</b>                   |       |                |              |              |              |              |              |              |              |
| NITROGLYCERIN                               | 6.1   |                |              |              |              |              |              |              |              |
| <b>XRF Field Parameters (mg/kg)</b>         |       |                |              |              |              |              |              |              |              |
| LEAD  | 11    |                | 23           | 155.667      | 20.667       | 22           | 14           | 126          | 24           |
| <b>Miscellaneous Parameters (meq/100)</b>   |       |                |              |              |              |              |              |              |              |
| CATION EXCHANGE CAPACITY                    | NA    |                |              |              |              |              |              |              |              |
| <b>Miscellaneous Parameters (s.u.)</b>      |       |                |              |              |              |              |              |              |              |
| PH  | NA    |                |              |              |              |              |              |              |              |
| <b>Miscellaneous Parameters (mg/kg)</b>     |       |                |              |              |              |              |              |              |              |
| TOTAL ORGANIC CARBON                        | NA    |                |              |              |              |              |              |              |              |
| <b>Miscellaneous Parameters (%)</b>         |       |                |              |              |              |              |              |              |              |
| TOTAL SOLIDS                                | NA    |                |              | 85           |              |              |              |              |              |
| <b>Miscellaneous Organic Parameters (%)</b> |       |                |              |              |              |              |              |              |              |
| TOTAL SOLIDS                                | NA    | 88             |              |              |              | 83           |              |              |              |

**Table A.3-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Rum Point Skeet Range - UXO 16**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
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| location                                    |       | X16SB031     | X16SB032     | X16SB032         | X16SB032       | X16SB033     | X16SB034     | X16SB035     | X16SB036     |
|---|-------|--------------|--------------|------------------|----------------|--------------|--------------|--------------|--------------|
| nsample                                     |       | X16SS0310001 | X16SS0320001 | X16SS0320001-AVG | X16SS0320001-D | X16SS0330001 | X16SS0340001 | X16SS0350001 | X16SS0360001 |
| sample_dat                                  |       | 20090613     | 20090613     | 20090613         | 20090613       | 20090613     | 20090613     | 20090613     | 20090613     |
| qc_type                                     |       | NM           | NM           | NM               | FD             | NM           | NM           | NM           | NM           |
| sacode                                      |       | NORMAL       | ORIG         | AVG              | DUP            | NORMAL       | NORMAL       | NORMAL       | NORMAL       |
| matrix                                      | PALs  | SO           | SO           | SO               | SO             | SO           | SO           | SO           | SO           |
| top_depth                                   |       | 0            | 0            | 0                | 0              | 0            | 0            | 0            | 0            |
| bottom_dep                                  |       | 1            | 1            | 1                | 1              | 1            | 1            | 1            | 1            |
| depth_unit                                  |       | FT           | FT           | FT               | FT             | FT           | FT           | FT           | FT           |
| submatrix                                   |       | SS           | SS           | SS               | SS             | SS           | SS           | SS           | SS           |
| composite                                   |       | N            | N            | N                | N              | N            | N            | N            | N            |
| <b>Inorganics (mg/kg)</b>                   |       |              |              |                  |                |              |              |              |              |
| ANTIMONY                                    | 0.27  |              | 0.14         | B                | 0.14           | B            | 0.14         | B            |              |
| ARSENIC                                     | 0.39  |              | 4            |                  | 3.65           |              | 3.3          |              |              |
| COPPER                                      | 100   |              | 9.7          |                  | 8.85           |              | 8            |              |              |
| LEAD  | 11    |              | 13.9         |                  | 13.45          |              | 13           |              |              |
| TIN   | 0.89  |              | 1.2          | B                | 1.25           | B            | 1.3          | B            |              |
| ZINC  | 46    |              | 31.2         |                  | 28.8           |              | 26.4         |              |              |
| <b>PAHs (ug/kg)</b>                         |       |              |              |                  |                |              |              |              |              |
| 1-METHYLNAPHTHALENE                         | 22000 | 24           | UL           |                  |                |              |              |              |              |
| 2-METHYLNAPHTHALENE                         | 31000 | 6.4          | L            |                  |                |              |              |              |              |
| ACENAPHTHENE                                | 29000 | 24           | UL           |                  |                |              |              |              |              |
| ACENAPHTHYLENE                              | 29000 | 24           | L            |                  |                |              |              |              |              |
| ANTHRACENE                                  | 29000 | 19           | L            |                  |                |              |              |              |              |
| BENZO(A)ANTHRACENE                          | 150   | 300          | L            |                  |                |              |              |              |              |
| BENZO(A)PYRENE                              | 15    | 420          |              |                  |                |              |              |              |              |
| BENZO(B)FLUORANTHENE                        | 150   | 120          | L            |                  |                |              |              |              |              |
| BENZO(G,H,I)PERYLENE                        | 1100  | 170          | L            |                  |                |              |              |              |              |
| BENZO(K)FLUORANTHENE                        | 1100  | 20           | L            |                  |                |              |              |              |              |
| CHRYSENE                                    | 1100  | 390          |              |                  |                |              |              |              |              |
| DIBENZO(A,H)ANTHRACENE                      | 15    | 58           | L            |                  |                |              |              |              |              |
| FLUORANTHENE                                | 29000 | 48           | L            |                  |                |              |              |              |              |
| FLUORENE                                    | 29000 | 24           | UL           |                  |                |              |              |              |              |
| INDENO(1,2,3-CD)PYRENE                      | 150   | 43           | L            |                  |                |              |              |              |              |
| NAPHTHALENE                                 | 330   | 24           | UL           |                  |                |              |              |              |              |
| PHENANTHRENE                                | 29000 | 89           | L            |                  |                |              |              |              |              |
| PYRENE                                      | 1100  | 280          | L            |                  |                |              |              |              |              |
| <b>Explosives (mg/kg)</b>                   |       |              |              |                  |                |              |              |              |              |
| NITROGLYCERIN                               | 6.1   |              |              |                  |                |              |              |              |              |
| <b>XRF Field Parameters (mg/kg)</b>         |       |              |              |                  |                |              |              |              |              |
| LEAD  | 11    | 214.333      | 26.667       | 26.667           |                | 11.667       | 18.667       | 14.333       | 41.333       |
| <b>Miscellaneous Parameters (meq/100)</b>   |       |              |              |                  |                |              |              |              |              |
| CATION EXCHANGE CAPACITY                    | NA    |              |              |                  |                |              |              |              |              |
| <b>Miscellaneous Parameters (s.u.)</b>      |       |              |              |                  |                |              |              |              |              |
| PH  | NA    |              |              |                  |                |              |              |              |              |
| <b>Miscellaneous Parameters (mg/kg)</b>     |       |              |              |                  |                |              |              |              |              |
| TOTAL ORGANIC CARBON                        | NA    |              |              |                  |                |              |              |              |              |
| <b>Miscellaneous Parameters (%)</b>         |       |              |              |                  |                |              |              |              |              |
| TOTAL SOLIDS                                | NA    |              | 87           | 86.5             | 86             |              |              |              |              |
| <b>Miscellaneous Organic Parameters (%)</b> |       |              |              |                  |                |              |              |              |              |
| TOTAL SOLIDS                                | NA    | 83           |              |                  |                |              |              |              |              |

**Table A.3-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Rum Point Skeet Range - UXO 16**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                    |       | X16SB037     | X16SB037         | X16SB037       | X16SB038     | X16SB039     | X16SB040     | X16SB041     | X16SB042     |    |     |   |
|---|-------|--------------|------------------|----------------|--------------|--------------|--------------|--------------|--------------|----|-----|---|
| nsample                                     |       | X16SS0370001 | X16SS0370001-AVG | X16SS0370001-D | X16SS0380001 | X16SS0390001 | X16SS0400001 | X16SS0410001 | X16SS0420001 |    |     |   |
| sample_dat                                  |       | 20090613     | 20090613         | 20090613       | 20090613     | 20090613     | 20090613     | 20090613     | 20090613     |    |     |   |
| qc_type                                     |       | NM           | NM               | FD             | NM           | NM           | NM           | NM           | NM           |    |     |   |
| sacode                                      |       | ORIG         | AVG              | DUP            | NORMAL       | NORMAL       | NORMAL       | NORMAL       | NORMAL       |    |     |   |
| matrix                                      | PALs  | SO           | SO               | SO             | SO           | SO           | SO           | SO           | SO           |    |     |   |
| top_depth                                   |       | 0            | 0                | 0              | 0            | 0            | 0            | 0            | 0            |    |     |   |
| bottom_dep                                  |       | 1            | 1                | 1              | 1            | 1            | 1            | 1            | 1            |    |     |   |
| depth_unit                                  |       | FT           | FT               | FT             | FT           | FT           | FT           | FT           | FT           |    |     |   |
| submatrix                                   |       | SS           | SS               | SS             | SS           | SS           | SS           | SS           | SS           |    |     |   |
| composite                                   |       | N            | N                | N              | N            | N            | N            | N            | N            |    |     |   |
| <b>Inorganics (mg/kg)</b>                   |       |              |                  |                |              |              |              |              |              |    |     |   |
| ANTIMONY                                    | 0.27  |              |                  |                |              |              |              |              | 0.11         | B  |     |   |
| ARSENIC                                     | 0.39  |              |                  |                |              |              |              |              | 1.7          |    |     |   |
| COPPER                                      | 100   |              |                  |                |              |              |              |              | 3.9          | K  |     |   |
| LEAD  | 11    |              |                  |                |              |              |              |              | 12.1         |    |     |   |
| TIN   | 0.89  |              |                  |                |              |              |              |              | 1            | B  |     |   |
| ZINC  | 46    |              |                  |                |              |              |              |              | 16.6         |    |     |   |
| <b>PAHs (ug/kg)</b>                         |       |              |                  |                |              |              |              |              |              |    |     |   |
| 1-METHYLNAPHTHALENE                         | 22000 | 22           | U                | 22.5           | U            | 23           | U            |              | 24           | UL | 26  | U |
| 2-METHYLNAPHTHALENE                         | 31000 | 22           | UL               | 22.5           | UL           | 23           | UL           |              | 24           | UL | 26  | U |
| ACENAPHTHENE                                | 29000 | 22           | UL               | 22.5           | UL           | 23           | UL           |              | 24           | UL | 26  | U |
| ACENAPHTHYLENE                              | 29000 | 22           | U                | 22.5           | UL           | 23           | UL           |              | 24           | UL | 26  | U |
| ANTHRACENE                                  | 29000 | 22           | UL               | 22.5           | UL           | 23           | U            |              | 1.6          | L  | 26  | U |
| BENZO(A)ANTHRACENE                          | 150   | 22           | U                | 22.5           | U            | 23           | U            |              | 24           | L  | 3.9 | J |
| BENZO(A)PYRENE                              | 15    | 22           | U                | 22.5           | U            | 23           | U            |              | 29           | L  | 5.8 | J |
| BENZO(B)FLUORANTHENE                        | 150   | 22           | U                | 22.5           | U            | 23           | U            |              | 14           | L  | 26  | U |
| BENZO(G,H,I)PERYLENE                        | 1100  | 22           | U                | 22.5           | U            | 23           | U            |              | 18           | L  | 3.4 | J |
| BENZO(K)FLUORANTHENE                        | 1100  | 22           | U                | 22.5           | U            | 23           | U            |              | 24           | UL | 26  | U |
| CHRYSENE                                    | 1100  | 22           | U                | 3.3            | J            | 3.3          | J            |              | 30           | L  | 7.7 | J |
| DIBENZO(A,H)ANTHRACENE                      | 15    | 22           | U                | 22.5           | U            | 23           | U            |              | 6.1          | L  | 26  | U |
| FLUORANTHENE                                | 29000 | 22           | UL               | 22.5           | UL           | 23           | U            |              | 8.1          | L  | 26  | U |
| FLUORENE                                    | 29000 | 22           | UL               | 22.5           | UL           | 23           | UL           |              | 24           | UL | 26  | U |
| INDENO(1,2,3-CD)PYRENE                      | 150   | 22           | U                | 2.7            | J            | 2.7          | J            |              | 6.9          | L  | 26  | U |
| NAPHTHALENE                                 | 330   | 22           | U                | 22.5           | UL           | 23           | UL           |              | 24           | UL | 26  | U |
| PHENANTHRENE                                | 29000 | 22           | UL               | 22.5           | UL           | 23           | UL           |              | 6.5          | L  | 26  | U |
| PYRENE                                      | 1100  | 22           | U                | 22.5           | U            | 23           | U            |              | 24           | L  | 4.6 | J |
| <b>Explosives (mg/kg)</b>                   |       |              |                  |                |              |              |              |              |              |    |     |   |
| NITROGLYCERIN                               | 6.1   |              |                  |                |              |              |              |              |              |    |     |   |
| <b>XRF Field Parameters (mg/kg)</b>         |       |              |                  |                |              |              |              |              |              |    |     |   |
| LEAD  | 11    | 70.667       | 70.667           |                | 26.333       | 20.667       | 50.333       | 33.667       | 67.667       |    |     |   |
| <b>Miscellaneous Parameters (meq/100)</b>   |       |              |                  |                |              |              |              |              |              |    |     |   |
| CATION EXCHANGE CAPACITY                    | NA    |              |                  |                |              |              |              |              |              |    |     |   |
| <b>Miscellaneous Parameters (s.u.)</b>      |       |              |                  |                |              |              |              |              |              |    |     |   |
| PH  | NA    |              |                  |                |              |              |              |              | 7.9          |    |     |   |
| <b>Miscellaneous Parameters (mg/kg)</b>     |       |              |                  |                |              |              |              |              |              |    |     |   |
| TOTAL ORGANIC CARBON                        | NA    |              |                  |                |              |              |              |              | 13000        |    |     |   |
| <b>Miscellaneous Parameters (%)</b>         |       |              |                  |                |              |              |              |              |              |    |     |   |
| TOTAL SOLIDS                                | NA    |              |                  |                |              |              |              |              | 64           |    |     |   |
| <b>Miscellaneous Organic Parameters (%)</b> |       |              |                  |                |              |              |              |              |              |    |     |   |
| TOTAL SOLIDS                                | NA    | 89           | 87.5             | 86             |              |              | 82           |              | 78           |    |     |   |

**Table A.3-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Rum Point Skeet Range - UXO 16**  
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|   |       | X16SB043<br>X16SS0430001 | X16SB044<br>X16SS0440001 | X16SB045<br>X16SS0450001 | X16SB046<br>X16SS0460001 | X16SB047<br>X16SS0470001 | X16SB048<br>X16SS0480001 | X16SB049<br>X16SS0490001 | X16SB050<br>X16SS0500001 |
|---|-------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| location                                    |       |                          |                          |                          |                          |                          |                          |                          |                          |
| nsample                                     |       |                          |                          |                          |                          |                          |                          |                          |                          |
| sample_dat                                  |       | 20090613                 | 20090613                 | 20090613                 | 20090613                 | 20090613                 | 20090613                 | 20090613                 | 20090613                 |
| qc_type                                     |       | NM                       |
| sacode                                      |       | NORMAL                   |
| matrix                                      | PALs  | SO                       |
| top_depth                                   |       | 0                        | 0                        | 0                        | 0                        | 0                        | 0                        | 0                        | 0                        |
| bottom_dep                                  |       | 1                        | 1                        | 1                        | 1                        | 1                        | 1                        | 1                        | 1                        |
| depth_unit                                  |       | FT                       |
| submatrix                                   |       | SS                       |
| composite                                   |       | N                        | N                        | N                        | N                        | N                        | N                        | N                        | N                        |
| <b>Inorganics (mg/kg)</b>                   |       |                          |                          |                          |                          |                          |                          |                          |                          |
| ANTIMONY                                    | 0.27  |                          |                          |                          |                          |                          |                          |                          |                          |
| ARSENIC                                     | 0.39  |                          |                          |                          |                          |                          |                          |                          |                          |
| COPPER                                      | 100   |                          |                          |                          |                          |                          |                          |                          |                          |
| LEAD  | 11    |                          |                          |                          |                          |                          |                          |                          |                          |
| TIN   | 0.89  |                          |                          |                          |                          |                          |                          |                          |                          |
| ZINC  | 46    |                          |                          |                          |                          |                          |                          |                          |                          |
| <b>PAHs (ug/kg)</b>                         |       |                          |                          |                          |                          |                          |                          |                          |                          |
| 1-METHYLNAPHTHALENE                         | 22000 |                          |                          |                          | 24                       | U                        |                          |                          |                          |
| 2-METHYLNAPHTHALENE                         | 31000 |                          |                          |                          | 24                       | U                        |                          |                          |                          |
| ACENAPHTHENE                                | 29000 |                          |                          |                          | 24                       | U                        |                          |                          |                          |
| ACENAPHTHYLENE                              | 29000 |                          |                          |                          | 24                       | U                        |                          |                          |                          |
| ANTHRACENE                                  | 29000 |                          |                          |                          | 24                       | U                        |                          |                          |                          |
| BENZO(A)ANTHRACENE                          | 150   |                          |                          |                          | 2.6                      | J                        |                          |                          |                          |
| BENZO(A)PYRENE                              | 15    |                          |                          |                          | 24                       | U                        |                          |                          |                          |
| BENZO(B)FLUORANTHENE                        | 150   |                          |                          |                          | 3                        | J                        |                          |                          |                          |
| BENZO(G,H,I)PERYLENE                        | 1100  |                          |                          |                          | 24                       | U                        |                          |                          |                          |
| BENZO(K)FLUORANTHENE                        | 1100  |                          |                          |                          | 24                       | U                        |                          |                          |                          |
| CHRYSENE                                    | 1100  |                          |                          |                          | 4.3                      | J                        |                          |                          |                          |
| DIBENZO(A,H)ANTHRACENE                      | 15    |                          |                          |                          | 24                       | U                        |                          |                          |                          |
| FLUORANTHENE                                | 29000 |                          |                          |                          | 5                        | J                        |                          |                          |                          |
| FLUORENE                                    | 29000 |                          |                          |                          | 24                       | U                        |                          |                          |                          |
| INDENO(1,2,3-CD)PYRENE                      | 150   |                          |                          |                          | 3.1                      | J                        |                          |                          |                          |
| NAPHTHALENE                                 | 330   |                          |                          |                          | 24                       | U                        |                          |                          |                          |
| PHENANTHRENE                                | 29000 |                          |                          |                          | 24                       | U                        |                          |                          |                          |
| PYRENE                                      | 1100  |                          |                          |                          | 3.1                      | J                        |                          |                          |                          |
| <b>Explosives (mg/kg)</b>                   |       |                          |                          |                          |                          |                          |                          |                          |                          |
| NITROGLYCERIN                               | 6.1   |                          |                          |                          |                          |                          |                          |                          |                          |
| <b>XRF Field Parameters (mg/kg)</b>         |       |                          |                          |                          |                          |                          |                          |                          |                          |
| LEAD  | 11    | 38.667                   | 32                       | 27                       | 22.333                   | 32.333                   | 94.667                   | 64                       | 37                       |
| <b>Miscellaneous Parameters (meq/100)</b>   |       |                          |                          |                          |                          |                          |                          |                          |                          |
| CATION EXCHANGE CAPACITY                    | NA    |                          |                          |                          |                          |                          |                          |                          |                          |
| <b>Miscellaneous Parameters (s.u.)</b>      |       |                          |                          |                          |                          |                          |                          |                          |                          |
| PH  | NA    |                          |                          |                          |                          |                          |                          |                          |                          |
| <b>Miscellaneous Parameters (mg/kg)</b>     |       |                          |                          |                          |                          |                          |                          |                          |                          |
| TOTAL ORGANIC CARBON                        | NA    |                          |                          |                          |                          |                          |                          |                          |                          |
| <b>Miscellaneous Parameters (%)</b>         |       |                          |                          |                          |                          |                          |                          |                          |                          |
| TOTAL SOLIDS                                | NA    |                          |                          |                          |                          |                          |                          |                          |                          |
| <b>Miscellaneous Organic Parameters (%)</b> |       |                          |                          |                          |                          |                          |                          |                          |                          |
| TOTAL SOLIDS                                | NA    |                          |                          |                          | 82                       |                          |                          |                          |                          |

**Table A.3-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Rum Point Skeet Range - UXO 16**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
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| location                                    |       | X16SB051     | X16SB052     | X16SB053     | X16SB054     | X16SB055     | X16SB056     | X16SB057     | X16SB058     |   |
|---|-------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---|
| nsample                                     |       | X16SS0510001 | X16SS0520001 | X16SS0530001 | X16SS0540001 | X16SS0550001 | X16SS0560001 | X16SS0570001 | X16SS0580001 |   |
| sample_dat                                  |       | 20090613     | 20090614     | 20090614     | 20090614     | 20090614     | 20090614     | 20090614     | 20090614     |   |
| qc_type                                     |       | NM           |   |
| sacode                                      |       | NORMAL       |   |
| matrix                                      | PALs  | SO           |   |
| top_depth                                   |       | 0            | 0            | 0            | 0            | 0            | 0            | 0            | 0            |   |
| bottom_dep                                  |       | 1            | 1            | 1            | 1            | 1            | 1            | 1            | 1            |   |
| depth_unit                                  |       | FT           |   |
| submatrix                                   |       | SS           |   |
| composite                                   |       | N            | N            | N            | N            | N            | N            | N            | N            |   |
| <b>Inorganics (mg/kg)</b>                   |       |              |              |              |              |              |              |              |              |   |
| ANTIMONY                                    | 0.27  |              |              |              | 0.32         | L            |              | 0.14         | B            |   |
| ARSENIC                                     | 0.39  |              |              |              | 2.4          |              |              | 2.1          |              |   |
| COPPER                                      | 100   |              |              |              | 5.3          | K            |              | 4.5          | K            |   |
| LEAD  | 11    |              |              |              | 35           |              |              | 22.3         |              |   |
| TIN   | 0.89  |              |              |              | 1.1          | B            |              | 1.3          | B            |   |
| ZINC  | 46    |              |              |              | 27           |              |              | 21.1         |              |   |
| <b>PAHs (ug/kg)</b>                         |       |              |              |              |              |              |              |              |              |   |
| 1-METHYLNAPHTHALENE                         | 22000 | 24           | U            |              |              |              | 5.3          | J            | 26           | U |
| 2-METHYLNAPHTHALENE                         | 31000 | 24           | U            |              |              |              | 25           |              | 26           | U |
| ACENAPHTHENE                                | 29000 | 24           | U            |              |              |              | 3.6          | J            | 26           | U |
| ACENAPHTHYLENE                              | 29000 | 24           | U            |              |              |              | 24           | U            | 26           | U |
| ANTHRACENE                                  | 29000 | 18           | J            |              |              |              | 75           |              | 26           | U |
| BENZO(A)ANTHRACENE                          | 150   | 240          |              |              |              |              | 1700         |              | 2.6          | J |
| BENZO(A)PYRENE                              | 15    | 240          |              |              |              |              | 1900         |              | 26           | U |
| BENZO(B)FLUORANTHENE                        | 150   | 98           |              |              |              |              | 660          |              | 26           | U |
| BENZO(G,H,I)PERYLENE                        | 1100  | 82           |              |              |              |              | 830          |              | 26           | U |
| BENZO(K)FLUORANTHENE                        | 1100  | 21           | J            |              |              |              | 120          |              | 26           | U |
| CHRYSENE                                    | 1100  | 300          |              |              |              |              | 2200         |              | 5.6          | J |
| DIBENZO(A,H)ANTHRACENE                      | 15    | 37           |              |              |              |              | 240          |              | 26           | U |
| FLUORANTHENE                                | 29000 | 40           |              |              |              |              | 180          |              | 4.8          | J |
| FLUORENE                                    | 29000 | 24           | U            |              |              |              | 9.4          | J            | 26           | U |
| INDENO(1,2,3-CD)PYRENE                      | 150   | 26           |              |              |              |              | 220          |              | 3            | J |
| NAPHTHALENE                                 | 330   | 24           | U            |              |              |              | 24           | U            | 26           | U |
| PHENANTHRENE                                | 29000 | 67           |              |              |              |              | 300          |              | 26           | U |
| PYRENE                                      | 1100  | 200          |              |              |              |              | 1400         |              | 3.9          | J |
| <b>Explosives (mg/kg)</b>                   |       |              |              |              |              |              |              |              |              |   |
| NITROGLYCERIN                               | 6.1   |              |              |              |              |              |              |              |              |   |
| <b>XRF Field Parameters (mg/kg)</b>         |       |              |              |              |              |              |              |              |              |   |
| LEAD  | 11    | 22           | 31           | 36.667       | 195          | 48.333       | 49.667       | 25.667       | 43           |   |
| <b>Miscellaneous Parameters (meq/100)</b>   |       |              |              |              |              |              |              |              |              |   |
| CATION EXCHANGE CAPACITY                    | NA    |              |              |              |              |              |              |              |              |   |
| <b>Miscellaneous Parameters (s.u.)</b>      |       |              |              |              |              |              |              |              |              |   |
| PH  | NA    |              |              |              |              |              |              |              |              |   |
| <b>Miscellaneous Parameters (mg/kg)</b>     |       |              |              |              |              |              |              |              |              |   |
| TOTAL ORGANIC CARBON                        | NA    |              |              |              |              |              |              |              |              |   |
| <b>Miscellaneous Parameters (%)</b>         |       |              |              |              |              |              |              |              |              |   |
| TOTAL SOLIDS                                | NA    |              |              |              | 86           |              |              | 76           |              |   |
| <b>Miscellaneous Organic Parameters (%)</b> |       |              |              |              |              |              |              |              |              |   |
| TOTAL SOLIDS                                | NA    | 84           |              |              |              |              | 82           | 78           |              |   |

**Table A.3-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Rum Point Skeet Range - UXO 16**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                    |       | X16SB059     | X16SB060     | X16SB061     | X16SB062     | X16SB063     | X16SB064     | X16SB065     | X16SB066     |
|---|-------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| nsample                                     |       | X16SS0590001 | X16SS0600001 | X16SS0610001 | X16SS0620001 | X16SS0630001 | X16SS0640001 | X16SS0650001 | X16SS0660001 |
| sample_dat                                  |       | 20090614     | 20090614     | 20090614     | 20090614     | 20090614     | 20090614     | 20090614     | 20090614     |
| qc_type                                     |       | NM           |
| sacode                                      |       | NORMAL       |
| matrix                                      | PALs  | SO           |
| top_depth                                   |       | 0            | 0            | 0            | 0            | 0            | 0            | 0            | 0            |
| bottom_dep                                  |       | 1            | 1            | 1            | 1            | 1            | 1            | 1            | 1            |
| depth_unit                                  |       | FT           |
| submatrix                                   |       | SS           |
| composite                                   |       | N            | N            | N            | N            | N            | N            | N            | N            |
| <b>Inorganics (mg/kg)</b>                   |       |              |              |              |              |              |              |              |              |
| ANTIMONY                                    | 0.27  |              |              | 0.2          | L            |              |              |              |              |
| ARSENIC                                     | 0.39  |              |              | 6.5          |              |              |              |              |              |
| COPPER                                      | 100   |              |              | 6.5          | K            |              |              |              |              |
| LEAD  | 11    |              |              | 23.5         |              |              |              |              |              |
| TIN   | 0.89  |              |              | 1.8          | B            |              |              |              |              |
| ZINC  | 46    |              |              | 24.2         |              |              |              |              |              |
| <b>PAHs (ug/kg)</b>                         |       |              |              |              |              |              |              |              |              |
| 1-METHYLNAPHTHALENE                         | 22000 |              |              |              | 6.3          | J            |              |              |              |
| 2-METHYLNAPHTHALENE                         | 31000 |              |              |              | 22           | J            |              |              |              |
| ACENAPHTHENE                                | 29000 |              |              |              | 4.4          | J            |              |              |              |
| ACENAPHTHYLENE                              | 29000 |              |              |              | 24           | U            |              |              |              |
| ANTHRACENE                                  | 29000 |              |              |              | 68           |              |              |              |              |
| BENZO(A)ANTHRACENE                          | 150   |              |              |              | 1500         |              |              |              |              |
| BENZO(A)PYRENE                              | 15    |              |              |              | 1400         |              |              |              |              |
| BENZO(B)FLUORANTHENE                        | 150   |              |              |              | 550          |              |              |              |              |
| BENZO(G,H,I)PERYLENE                        | 1100  |              |              |              | 550          |              |              |              |              |
| BENZO(K)FLUORANTHENE                        | 1100  |              |              |              | 60           |              |              |              |              |
| CHRYSENE                                    | 1100  |              |              |              | 1800         |              |              |              |              |
| DIBENZO(A,H)ANTHRACENE                      | 15    |              |              |              | 200          |              |              |              |              |
| FLUORANTHENE                                | 29000 |              |              |              | 160          |              |              |              |              |
| FLUORENE                                    | 29000 |              |              |              | 11           | J            |              |              |              |
| INDENO(1,2,3-CD)PYRENE                      | 150   |              |              |              | 140          |              |              |              |              |
| NAPHTHALENE                                 | 330   |              |              |              | 3.1          | J            |              |              |              |
| PHENANTHRENE                                | 29000 |              |              |              | 400          |              |              |              |              |
| PYRENE                                      | 1100  |              |              |              | 1300         |              |              |              |              |
| <b>Explosives (mg/kg)</b>                   |       |              |              |              |              |              |              |              |              |
| NITROGLYCERIN                               | 6.1   |              |              |              |              |              |              |              |              |
| <b>XRF Field Parameters (mg/kg)</b>         |       |              |              |              |              |              |              |              |              |
| LEAD  | 11    | 30.667       | 23           | 150          | 22.333       | 19.667       | 18.333       | 82.667       | 31.333       |
| <b>Miscellaneous Parameters (meq/100)</b>   |       |              |              |              |              |              |              |              |              |
| CATION EXCHANGE CAPACITY                    | NA    |              |              |              |              |              |              |              |              |
| <b>Miscellaneous Parameters (s.u.)</b>      |       |              |              |              |              |              |              |              |              |
| PH  | NA    |              |              |              |              |              |              |              |              |
| <b>Miscellaneous Parameters (mg/kg)</b>     |       |              |              |              |              |              |              |              |              |
| TOTAL ORGANIC CARBON                        | NA    |              |              |              |              |              |              |              |              |
| <b>Miscellaneous Parameters (%)</b>         |       |              |              |              |              |              |              |              |              |
| TOTAL SOLIDS                                | NA    |              |              | 74           |              |              |              |              |              |
| <b>Miscellaneous Organic Parameters (%)</b> |       |              |              |              |              |              |              |              |              |
| TOTAL SOLIDS                                | NA    |              |              |              | 84           |              |              |              |              |

**Table A.3-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Rum Point Skeet Range - UXO 16**  
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|   |       | X16SB067<br>X16SS0670001 | X16SB069<br>X16SS0690001 | X16SB070<br>X16SS0700001 | X16SB071<br>X16SS0710001 | X16SB072<br>X16SS0720001 | X16SB073<br>X16SS0730001 | X16SB074<br>X16SS0740001 | X16SB075<br>X16SS0750001 |
|---|-------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| location                                    |       |                          |                          |                          |                          |                          |                          |                          |                          |
| nsample                                     |       |                          |                          |                          |                          |                          |                          |                          |                          |
| sample_dat                                  |       | 20090614                 | 20090614                 | 20090614                 | 20090614                 | 20090614                 | 20090614                 | 20090614                 | 20090614                 |
| qc_type                                     |       | NM                       |
| sacode                                      |       | NORMAL                   |
| matrix                                      | PALs  | SO                       |
| top_depth                                   |       | 0                        | 0                        | 0                        | 0                        | 0                        | 0                        | 0                        | 0                        |
| bottom_dep                                  |       | 1                        | 1                        | 1                        | 1                        | 1                        | 1                        | 1                        | 1                        |
| depth_unit                                  |       | FT                       |
| submatrix                                   |       | SS                       |
| composite                                   |       | N                        | N                        | N                        | N                        | N                        | N                        | N                        | N                        |
| <b>Inorganics (mg/kg)</b>                   |       |                          |                          |                          |                          |                          |                          |                          |                          |
| ANTIMONY                                    | 0.27  |                          |                          |                          |                          |                          | 0.92                     | L                        |                          |
| ARSENIC                                     | 0.39  |                          |                          |                          |                          |                          | 3.1                      |                          |                          |
| COPPER                                      | 100   |                          |                          |                          |                          |                          | 4.7                      | K                        |                          |
| LEAD  | 11    |                          |                          |                          |                          |                          | 40.1                     |                          |                          |
| TIN   | 0.89  |                          |                          |                          |                          |                          | 1.3                      | B                        |                          |
| ZINC  | 46    |                          |                          |                          |                          |                          | 22.6                     |                          |                          |
| <b>PAHs (ug/kg)</b>                         |       |                          |                          |                          |                          |                          |                          |                          |                          |
| 1-METHYLNAPHTHALENE                         | 22000 |                          |                          |                          | 2.4                      | J                        | 4.8                      | J                        |                          |
| 2-METHYLNAPHTHALENE                         | 31000 |                          |                          |                          | 10                       | J                        | 17                       | J                        |                          |
| ACENAPHTHENE                                | 29000 |                          |                          |                          | 23                       | U                        | 2.4                      | J                        |                          |
| ACENAPHTHYLENE                              | 29000 |                          |                          |                          | 23                       | U                        | 23                       | U                        |                          |
| ANTHRACENE                                  | 29000 |                          |                          |                          | 17                       | J                        | 38                       |                          |                          |
| BENZO(A)ANTHRACENE                          | 150   |                          |                          |                          | 420                      |                          | 690                      | L                        |                          |
| BENZO(A)PYRENE                              | 15    |                          |                          |                          | 480                      |                          | 820                      | L                        |                          |
| BENZO(B)FLUORANTHENE                        | 150   |                          |                          |                          | 170                      |                          | 220                      |                          |                          |
| BENZO(G,H,I)PERYLENE                        | 1100  |                          |                          |                          | 190                      |                          | 300                      |                          |                          |
| BENZO(K)FLUORANTHENE                        | 1100  |                          |                          |                          | 32                       |                          | 40                       |                          |                          |
| CHRYSENE                                    | 1100  |                          |                          |                          | 570                      |                          | 870                      | L                        |                          |
| DIBENZO(A,H)ANTHRACENE                      | 15    |                          |                          |                          | 59                       |                          | 110                      |                          |                          |
| FLUORANTHENE                                | 29000 |                          |                          |                          | 46                       |                          | 85                       |                          |                          |
| FLUORENE                                    | 29000 |                          |                          |                          | 23                       | U                        | 6.2                      | J                        |                          |
| INDENO(1,2,3-CD)PYRENE                      | 150   |                          |                          |                          | 48                       |                          | 78                       |                          |                          |
| NAPHTHALENE                                 | 330   |                          |                          |                          | 23                       | U                        | 23                       | U                        |                          |
| PHENANTHRENE                                | 29000 |                          |                          |                          | 86                       |                          | 160                      |                          |                          |
| PYRENE                                      | 1100  |                          |                          |                          | 380                      |                          | 620                      | L                        |                          |
| <b>Explosives (mg/kg)</b>                   |       |                          |                          |                          |                          |                          |                          |                          |                          |
| NITROGLYCERIN                               | 6.1   |                          |                          |                          |                          |                          |                          |                          |                          |
| <b>XRF Field Parameters (mg/kg)</b>         |       |                          |                          |                          |                          |                          |                          |                          |                          |
| LEAD  | 11    | 60.667                   | 78                       | 28.333                   | 24.333                   | 18                       | 42.667                   | 58.667                   | 23.667                   |
| <b>Miscellaneous Parameters (meq/100)</b>   |       |                          |                          |                          |                          |                          |                          |                          |                          |
| CATION EXCHANGE CAPACITY                    | NA    |                          |                          |                          |                          |                          | 15                       | K                        |                          |
| <b>Miscellaneous Parameters (s.u.)</b>      |       |                          |                          |                          |                          |                          |                          |                          |                          |
| PH  | NA    |                          |                          |                          |                          |                          | 6.4                      |                          |                          |
| <b>Miscellaneous Parameters (mg/kg)</b>     |       |                          |                          |                          |                          |                          |                          |                          |                          |
| TOTAL ORGANIC CARBON                        | NA    |                          |                          |                          |                          |                          | 9400                     |                          |                          |
| <b>Miscellaneous Parameters (%)</b>         |       |                          |                          |                          |                          |                          |                          |                          |                          |
| TOTAL SOLIDS                                | NA    |                          |                          |                          |                          |                          | 89                       |                          |                          |
| <b>Miscellaneous Organic Parameters (%)</b> |       |                          |                          |                          |                          |                          |                          |                          |                          |
| TOTAL SOLIDS                                | NA    |                          |                          |                          | 86                       |                          | 87                       |                          |                          |

**Table A.3-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Rum Point Skeet Range - UXO 16**  
**Site Inspection**  
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|   |       | X16SB076<br>X16SS0760001 | X16SB077<br>X16SS0770001 | X16SB078<br>X16SS0780001 | X16SB079<br>X16SS0790001 | X16SB082<br>X16SS0820001 | X16SB083<br>X16SS0830001 | X16SB084<br>X16SS0840001 | X16SB085<br>X16SS0850001 |
|---|-------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| location                                    |       |                          |                          |                          |                          |                          |                          |                          |                          |
| nsample                                     |       |                          |                          |                          |                          |                          |                          |                          |                          |
| sample_dat                                  |       | 20090614                 | 20090614                 | 20090614                 | 20090614                 | 20090616                 | 20090616                 | 20090616                 | 20090616                 |
| qc_type                                     |       | NM                       |
| sacode                                      |       | NORMAL                   |
| matrix                                      | PALs  | SO                       |
| top_depth                                   |       | 0                        | 0                        | 0                        | 0                        | 0                        | 0                        | 0                        | 0                        |
| bottom_dep                                  |       | 1                        | 1                        | 1                        | 1                        | 1                        | 1                        | 1                        | 1                        |
| depth_unit                                  |       | FT                       |
| submatrix                                   |       | SS                       |
| composite                                   |       | N                        | N                        | N                        | N                        | N                        | N                        | N                        | N                        |
| <b>Inorganics (mg/kg)</b>                   |       |                          |                          |                          |                          |                          |                          |                          |                          |
| ANTIMONY                                    | 0.27  |                          |                          |                          |                          | 1.2                      | L                        |                          |                          |
| ARSENIC                                     | 0.39  |                          |                          |                          |                          | 6.1                      |                          |                          |                          |
| COPPER                                      | 100   |                          |                          |                          |                          | 10.6                     | K                        |                          |                          |
| LEAD  | 11    |                          |                          |                          |                          | 267                      |                          |                          |                          |
| TIN   | 0.89  |                          |                          |                          |                          | 1.3                      | B                        |                          |                          |
| ZINC  | 46    |                          |                          |                          |                          | 31.6                     |                          |                          |                          |
| <b>PAHs (ug/kg)</b>                         |       |                          |                          |                          |                          |                          |                          |                          |                          |
| 1-METHYLNAPHTHALENE                         | 22000 | 16                       | L                        |                          | 23                       | UL                       |                          |                          |                          |
| 2-METHYLNAPHTHALENE                         | 31000 | 68                       | L                        |                          | 23                       | UL                       |                          |                          |                          |
| ACENAPHTHENE                                | 29000 | 7.7                      | L                        |                          | 23                       | UL                       |                          |                          |                          |
| ACENAPHTHYLENE                              | 29000 | 23                       | UL                       |                          | 23                       | UL                       |                          |                          |                          |
| ANTHRACENE                                  | 29000 | 110                      | L                        |                          | 5.2                      | L                        |                          |                          |                          |
| BENZO(A)ANTHRACENE                          | 150   | 2400                     |                          |                          | 100                      | L                        |                          |                          |                          |
| BENZO(A)PYRENE                              | 15    | 3200                     |                          |                          | 120                      | L                        |                          |                          |                          |
| BENZO(B)FLUORANTHENE                        | 150   | 1000                     |                          |                          | 52                       | L                        |                          |                          |                          |
| BENZO(G,H,I)PERYLENE                        | 1100  | 1500                     |                          |                          | 65                       | L                        |                          |                          |                          |
| BENZO(K)FLUORANTHENE                        | 1100  | 200                      | L                        |                          | 10                       | L                        |                          |                          |                          |
| CHRYSENE                                    | 1100  | 3000                     |                          |                          | 130                      | L                        |                          |                          |                          |
| DIBENZO(A,H)ANTHRACENE                      | 15    | 540                      |                          |                          | 22                       | L                        |                          |                          |                          |
| FLUORANTHENE                                | 29000 | 210                      | L                        |                          | 23                       | L                        |                          |                          |                          |
| FLUORENE                                    | 29000 | 21                       | J                        |                          | 23                       | UL                       |                          |                          |                          |
| INDENO(1,2,3-CD)PYRENE                      | 150   | 260                      | L                        |                          | 24                       | L                        |                          |                          |                          |
| NAPHTHALENE                                 | 330   | 7.2                      | L                        |                          | 23                       | UL                       |                          |                          |                          |
| PHENANTHRENE                                | 29000 | 620                      |                          |                          | 22                       | L                        |                          |                          |                          |
| PYRENE                                      | 1100  | 2000                     |                          |                          | 93                       | L                        |                          |                          |                          |
| <b>Explosives (mg/kg)</b>                   |       |                          |                          |                          |                          |                          |                          |                          |                          |
| NITROGLYCERIN                               | 6.1   |                          |                          |                          |                          |                          |                          |                          |                          |
| <b>XRF Field Parameters (mg/kg)</b>         |       |                          |                          |                          |                          |                          |                          |                          |                          |
| LEAD  | 11    | 28.667                   | 15                       | 16.667                   | 266.667                  | 135.333                  | 407                      | 409                      | 159.333                  |
| <b>Miscellaneous Parameters (meq/100)</b>   |       |                          |                          |                          |                          |                          |                          |                          |                          |
| CATION EXCHANGE CAPACITY                    | NA    |                          |                          |                          |                          |                          |                          |                          |                          |
| <b>Miscellaneous Parameters (s.u.)</b>      |       |                          |                          |                          |                          |                          |                          |                          |                          |
| PH  | NA    |                          |                          |                          |                          |                          |                          |                          |                          |
| <b>Miscellaneous Parameters (mg/kg)</b>     |       |                          |                          |                          |                          |                          |                          |                          |                          |
| TOTAL ORGANIC CARBON                        | NA    |                          |                          |                          |                          |                          |                          |                          |                          |
| <b>Miscellaneous Parameters (%)</b>         |       |                          |                          |                          |                          |                          |                          |                          |                          |
| TOTAL SOLIDS                                | NA    |                          |                          |                          | 74                       |                          |                          |                          |                          |
| <b>Miscellaneous Organic Parameters (%)</b> |       |                          |                          |                          |                          |                          |                          |                          |                          |
| TOTAL SOLIDS                                | NA    | 87                       |                          | 87                       |                          |                          |                          |                          |                          |





TABLE A.3-3

BENZO(a)PYRENE EQUIVALENT CONCENTRATIONS IN DISCRETE SURFACE SOIL SAMPLES  
 RUM POINT SKEET RANGE - UXO 16  
 SITE INSPECTION  
 NSF INDIAN HEAD - STUMP NECK ANNEX  
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| location                                       | X16SB002     | X16SB008     | X16SB009     | X16SB013     | X16SB014     | X16SB019     | X16SB023     | X16SB023         | X16SB023       |
|--|--------------|--------------|--------------|--------------|--------------|--------------|--------------|------------------|----------------|
| nsample  | X16SS0020001 | X16SS0080001 | X16SS0090001 | X16SS0130001 | X16SS0140001 | X16SS0190001 | X16SS0230001 | X16SS0230001-AVG | X16SS0230001-D |
| matrix   | SO               | SO             |
| submatrix                                      | SS               | SS             |
| sacode   | NORMAL       | NORMAL       | NORMAL       | NORMAL       | NORMAL       | NORMAL       | ORIG         | AVG              | DUP            |
| top_depth                                      | 0            | 0            | 0            | 0            | 0            | 0            | 0            | 0                | 0              |
| bottom_dep                                     | 1            | 1            | 1            | 1            | 1            | 1            | 1            | 1                | 1              |
| qc_type  | NM               | FD             |
| sample_dat                                     | 20090613     | 20090613     | 20090614     | 20090613     | 20090614     | 20090614     | 20090613     | 20090613         | 20090613       |
| <b>PAH Concentrations (ug/kg)</b>              |              |              |              |              |              |              |              |                  |                |
| BENZO(A)ANTHRACENE                             | 630          | 6.0 J        | 8.8 L        | 26           | 100          | 170          | 210 J        | 107.65 J         | 5.3 J          |
| BENZO(A)PYRENE                                 | 630          | 7.6 J        | 8.7 L        | 38           | 120          | 220          | 240 J        | 123.8 J          | 7.6 J          |
| BENZO(B)FLUORANTHENE                           | 200 L        | 6.0 J        | 11 L         | 16 J         | 47           | 79           | 89 J         | 46.4 J           | 3.8 J          |
| BENZO(K)FLUORANTHENE                           | 40 L         | 23 U         | 23 UL        | 4.3 J        | 9.0 J        | 13 J         | 13 J         | 13 J             | 23 U           |
| CHRYSENE                                       | 770          | 10 J         | 14 L         | 41           | 120          | 210          | 240 J        | 124.4 J          | 8.8 J          |
| DIBENZO(A,H)ANTHRACENE                         | 120 L        | 23 U         | 23 UL        | 6.4 J        | 20 J         | 42           | 41 J         | 26.25 J          | 23 UJ          |
| INDENO(1,2,3-CD)PYRENE                         | 78 L         | 3.4 J        | 5.9 L        | 8.1 J        | 17 J         | 28           | 36           | 19.25 J          | 2.5 J          |
| <b>Benzo(a)pyrene (BaP) Equivalent (ug/kg)</b> |              |              |              |              |              |              |              |                  |                |
| BAP EQUIVALENT-HALFND                          | 841.97       | 20.765       | 22.899       | 49.494       | 156.61       | 290.04       | 314.87       | 167.6344         | 20.3838        |

| PARAMETER              | TEF   |
|------------------------|-------|
| BENZO(A)ANTHRACENE     | 0.1   |
| BENZO(A)PYRENE         | 1     |
| BENZO(B)FLUORANTHENE   | 0.1   |
| BENZO(K)FLUORANTHENE   | 0.01  |
| CHRYSENE               | 0.001 |
| DIBENZO(A,H)ANTHRACENE | 1     |
| INDENO(1,2,3-CD)PYRENE | 0.1   |

**BaP Screening Levels**

| Risk Level                            | 1E-06 | 1E-05 | 1E-04 |
|---------------------------------------|-------|-------|-------|
| Resid screening level for BaP (ug/kg) | 15    | 150   | 1500  |

**Comparison to Residential Screening Level of 150 ug/kg**

|                       |     |    |    |    |     |     |     |     |    |
|-----------------------|-----|----|----|----|-----|-----|-----|-----|----|
| BAP EQUIVALENT-HALFND | 842 | 21 | 23 | 49 | 157 | 290 | 315 | 168 | 20 |
|-----------------------|-----|----|----|----|-----|-----|-----|-----|----|

TABLE A.3-3

BENZO(a)PYRENE EQUIVALENT CONCENTRATIONS IN DISCRETE SURFACE SOIL SAMPLES  
 RUM POINT SKEET RANGE - UXO 16  
 SITE INSPECTION  
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| location                                       | X16SB026     | X16SB031     | X16SB037     | X16SB037         | X16SB037       | X16SB040     | X16SB042     | X16SB046     | X16SB051     |
|--|--------------|--------------|--------------|------------------|----------------|--------------|--------------|--------------|--------------|
| nsample  | X16SS0260001 | X16SS0310001 | X16SS0370001 | X16SS0370001-AVG | X16SS0370001-D | X16SS0400001 | X16SS0420001 | X16SS0460001 | X16SS0510001 |
| matrix   | SO           | SO           | SO           | SO               | SO             | SO           | SO           | SO           | SO           |
| submatrix                                      | SS           | SS           | SS           | SS               | SS             | SS           | SS           | SS           | SS           |
| sacode   | NORMAL       | NORMAL       | ORIG         | AVG              | DUP            | NORMAL       | NORMAL       | NORMAL       | NORMAL       |
| top_depth                                      | 0            | 0            | 0            | 0                | 0              | 0            | 0            | 0            | 0            |
| bottom_dep                                     | 1            | 1            | 1            | 1                | 1              | 1            | 1            | 1            | 1            |
| qc_type  | NM           | NM           | NM           | NM               | FD             | NM           | NM           | NM           | NM           |
| sample_dat                                     | 20090613     | 20090613     | 20090613     | 20090613         | 20090613       | 20090613     | 20090613     | 20090613     | 20090613     |
| <b>PAH Concentrations (ug/kg)</b>              |              |              |              |                  |                |              |              |              |              |
| BENZO(A)ANTHRACENE                             | 81           | 300 L        | 22 U         | 22.5 U           | 23 U           | 24 L         | 3.9 J        | 2.6 J        | 240          |
| BENZO(A)PYRENE                                 | 110          | 420          | 22 U         | 22.5 U           | 23 U           | 29 L         | 5.8 J        | 24 U         | 240          |
| BENZO(B)FLUORANTHENE                           | 41           | 120 L        | 22 U         | 22.5 U           | 23 U           | 14 L         | 26 U         | 3.0 J        | 98           |
| BENZO(K)FLUORANTHENE                           | 6.6 J        | 20 L         | 22 U         | 22.5 U           | 23 U           | 24 UL        | 26 U         | 24 U         | 21 J         |
| CHRYSENE                                       | 110          | 390          | 22 U         | 3.3 J            | 3.3 J          | 30 L         | 7.7 J        | 4.3 J        | 300          |
| DIBENZO(A,H)ANTHRACENE                         | 21 J         | 58 L         | 22 U         | 22.5 U           | 23 U           | 6.1 L        | 26 U         | 24 U         | 37           |
| INDENO(1,2,3-CD)PYRENE                         | 18 J         | 43 L         | 22 U         | 2.7 J            | 2.7 J          | 6.9 L        | 26 U         | 3.1 J        | 26           |
| <b>Benzo(a)pyrene (BaP) Equivalent (ug/kg)</b> |              |              |              |                  |                |              |              |              |              |
| BAP EQUIVALENT-HALFND                          | 145.176      | 524.89       | 22 U         | 25.1358          | 25.6883        | 39.74        | 21.9277      | 24.9943      | 313.91       |

| PARAMETER              | TEF   |
|------------------------|-------|
| BENZO(A)ANTHRACENE     | 0.1   |
| BENZO(A)PYRENE         | 1     |
| BENZO(B)FLUORANTHENE   | 0.1   |
| BENZO(K)FLUORANTHENE   | 0.01  |
| CHRYSENE               | 0.001 |
| DIBENZO(A,H)ANTHRACENE | 1     |
| INDENO(1,2,3-CD)PYRENE | 0.1   |

BaP Screening Levels

| Risk Level                            | 1E-06 | 1E-05 |
|---------------------------------------|-------|-------|
| Resid screening level for BaP (ug/kg) | 15    | 150   |

Comparison to Residential Screening Level of 150 ug/kg

|                       |     |     |      |    |    |    |    |    |     |
|-----------------------|-----|-----|------|----|----|----|----|----|-----|
| BAP EQUIVALENT-HALFND | 145 | 525 | 22 U | 25 | 26 | 40 | 22 | 25 | 314 |
|-----------------------|-----|-----|------|----|----|----|----|----|-----|

TABLE A.3-3

BENZO(a)PYRENE EQUIVALENT CONCENTRATIONS IN DISCRETE SURFACE SOIL SAMPLES  
 RUM POINT SKEET RANGE - UXO 16  
 SITE INSPECTION  
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| location                                       | X16SB056            | X16SB057            | X16SB062            | X16SB071            | X16SB073            | X16SB076            | X16SB078            | X16SB080C            | X16SB081C            |
|--|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|----------------------|----------------------|
| <b>nsample</b>                                 | <b>X16SS0560001</b> | <b>X16SS0570001</b> | <b>X16SS0620001</b> | <b>X16SS0710001</b> | <b>X16SS0730001</b> | <b>X16SS0760001</b> | <b>X16SS0780001</b> | <b>X16SS080C0001</b> | <b>X16SS081C0001</b> |
| matrix   | SO                   | SO                   |
| submatrix                                      | SS                   | SS                   |
| sacode   | NORMAL               | NORMAL               |
| top_depth                                      | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   | 0                    | 0                    |
| bottom_dep                                     | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                    | 1                    |
| qc_type  | NM                   | NM                   |
| sample_dat                                     | 20090614            | 20090614            | 20090614            | 20090614            | 20090614            | 20090614            | 20090614            | 20090614             | 20090614             |
| <b>PAH Concentrations (ug/kg)</b>              |                     |                     |                     |                     |                     |                     |                     |                      |                      |
| BENZO(A)ANTHRACENE                             | 1700                | 2.6 J               | 1500                | 420                 | 690 L               | 2400                | 100 L               | 78                   | 94                   |
| BENZO(A)PYRENE                                 | 1900                | 26 U                | 1400                | 480                 | 820 L               | 3200                | 120 L               | 91                   | 100                  |
| BENZO(B)FLUORANTHENE                           | 660                 | 26 U                | 550                 | 170                 | 220                 | 1000                | 52 L                | 33                   | 38                   |
| BENZO(K)FLUORANTHENE                           | 120                 | 26 U                | 60                  | 32                  | 40                  | 200 L               | 10 L                | 5.8 J                | 7.7 J                |
| CHRYSENE                                       | 2200                | 5.6 J               | 1800                | 570                 | 870 L               | 3000                | 130 L               | 97                   | 130                  |
| DIBENZO(A,H)ANTHRACENE                         | 240                 | 26 U                | 200                 | 59                  | 110                 | 540                 | 22 L                | 12 J                 | 18 J                 |
| INDENO(1,2,3-CD)PYRENE                         | 220                 | 3.0 J               | 140                 | 48                  | 78                  | 260 L               | 24 L                | 9.1 J                | 10 J                 |
| <b>Benzo(a)pyrene (BaP) Equivalent (ug/kg)</b> |                     |                     |                     |                     |                     |                     |                     |                      |                      |
| BAP EQUIVALENT-HALFND                          | 2401.4              | 27.9956             | 1821.4              | 603.69              | 1030.07             | 4111                | 159.83              | 115.165              | 132.407              |

| PARAMETER              | TEF   |
|------------------------|-------|
| BENZO(A)ANTHRACENE     | 0.1   |
| BENZO(A)PYRENE         | 1     |
| BENZO(B)FLUORANTHENE   | 0.1   |
| BENZO(K)FLUORANTHENE   | 0.01  |
| CHRYSENE               | 0.001 |
| DIBENZO(A,H)ANTHRACENE | 1     |
| INDENO(1,2,3-CD)PYRENE | 0.1   |

**BaP Screening Levels**

| Risk Level                            | 1E-06 | 1E-05 |
|---------------------------------------|-------|-------|
| Resid screening level for BaP (ug/kg) | 15    | 150   |

**Comparison to Residential Screening Level of 150 ug/kg**

|                       |       |    |       |     |       |       |     |     |     |
|-----------------------|-------|----|-------|-----|-------|-------|-----|-----|-----|
| BAP EQUIVALENT-HALFND | 2,401 | 28 | 1,821 | 604 | 1,030 | 4,111 | 160 | 115 | 132 |
|-----------------------|-------|----|-------|-----|-------|-------|-----|-----|-----|

**Table A.4-1**  
**Summary of Chemicals Detected in Composite Surface Soil Samples**  
**Firing Line Area**  
**Small Arms (Pistol) Range - UXO 17**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                |      | X17SB008C     | X17SB009C     | X17SB010C     |   |         |   |
|---|------|---------------|---------------|---------------|---|---------|---|
| nsample                                 |      | X17SS008C0001 | X17SS009C0001 | X17SS010C0001 |   |         |   |
| sample_dat                              |      | 20090611      | 20090611      | 20090611      |   |         |   |
| qc_type                                 |      | NM            | NM            | NM            |   |         |   |
| sacode                                  |      | NORMAL        | NORMAL        | NORMAL        |   |         |   |
| matrix                                  | PALs | SO            | SO            | SO            |   |         |   |
| top_depth                               |      | 0             | 0             | 0             |   |         |   |
| bottom_dep                              |      | 1             | 1             | 1             |   |         |   |
| depth_unit                              |      | FT            | FT            | FT            |   |         |   |
| submatrix                               |      | SS            | SS            | SS            |   |         |   |
| composite                               |      | Y             | Y             | Y             |   |         |   |
| <b>Inorganics (mg/kg)</b>               |      |               |               |               |   |         |   |
| ANTIMONY                                | 0.27 | 0.39          | L             | 0.43          | L | 1.3     | L |
| ARSENIC                                 | 0.39 | 5             |               | 4.4           |   | 6.2     |   |
| COPPER                                  | 100  | 12            |               | 11.2          |   | 24      |   |
| LEAD                                    | 11   | 21            |               | 38.7          |   | 200     |   |
| TIN                                     | 0.89 | 0.92          | B             | 1.4           | B | 1.3     | B |
| ZINC                                    | 46   | 23.1          |               | 19            |   | 35.2    |   |
| <b>Explosives (mg/kg)</b>               |      |               |               |               |   |         |   |
| NITROGLYCERIN                           | 6.1  | 20.4          |               | 9.8           |   | 13      |   |
| <b>XRF Field Parameters (mg/kg)</b>     |      |               |               |               |   |         |   |
| LEAD                                    | 11   | 96.333        |               | 73.333        |   | 156.333 |   |
| <b>Miscellaneous Parameters (s.u.)</b>  |      |               |               |               |   |         |   |
| PH                                      | NA   |               |               |               |   |         |   |
| <b>Miscellaneous Parameters (mg/kg)</b> |      |               |               |               |   |         |   |
| TOTAL ORGANIC CARBON                    | NA   |               |               |               |   |         |   |
| <b>Miscellaneous Parameters (%)</b>     |      |               |               |               |   |         |   |
| TOTAL SOLIDS                            | NA   | 91            |               | 91            |   | 91      |   |

**Table A.4-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Small Arms (Pistol) Range - UXO 17**  
**Site Inspection**  
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| location                                |      | X17SB001     | X17SB001     | X17SB001     | X17SB001     | X17SB002     | X17SB002     | X17SB002     | X17SB002     |   |
|---|------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---|
| nsample                                 |      | X17SB0010004 | X17SB0010408 | X17SB0010810 | X17SS0010001 | X17SB0020004 | X17SB0020406 | X17SB0020608 | X17SB0020810 |   |
| sample_dat                              |      | 20090611     | 20090611     | 20090611     | 20090611     | 20090611     | 20090611     | 20090611     | 20090611     |   |
| qc_type                                 |      | NM           |   |
| sacode                                  |      | NORMAL       |   |
| matrix                                  | PALs | SO           |   |
| top_depth                               |      | 0            | 4            | 8            | 0            | 0            | 4            | 6            | 8            |   |
| bottom_dep                              |      | 4            | 8            | 10           | 1            | 4            | 6            | 8            | 10           |   |
| depth_unit                              |      | FT           |   |
| submatrix                               |      | SB           | SB           | SB           | SS           | SB           | SB           | SB           | SB           |   |
| composite                               |      | N            | N            | N            | N            | N            | N            | N            | N            |   |
| <b>Inorganics (mg/kg)</b>               |      |              |              |              |              |              |              |              |              |   |
| ANTIMONY                                | 0.27 | 0.15         | L            |              |              |              |              | 0.22         | L            |   |
| ARSENIC                                 | 0.39 | 4.6          |              |              |              |              |              | 7.8          |              |   |
| COPPER                                  | 100  | 6            |              |              |              |              |              | 8.2          |              |   |
| LEAD                                    | 11   | 9.1          |              |              |              |              |              | 8.1          |              |   |
| TIN                                     | 0.89 | 1.1          | B            |              |              |              |              | 0.92         | B            |   |
| ZINC                                    | 46   | 15.6         |              |              |              |              |              | 24.1         |              |   |
| <b>Explosives (mg/kg)</b>               |      |              |              |              |              |              |              |              |              |   |
| NITROGLYCERIN                           | 6.1  |              |              |              |              |              |              |              |              |   |
| <b>XRF Field Parameters (mg/kg)</b>     |      |              |              |              |              |              |              |              |              |   |
| LEAD                                    | 11   | 4.333        | 12.333       | 0            | U            |              | 3.667        | 85.333       | 0            | U |
| <b>Miscellaneous Parameters (s.u.)</b>  |      |              |              |              |              |              |              |              |              |   |
| PH                                      | NA   |              |              |              |              | 7.3          |              |              |              |   |
| <b>Miscellaneous Parameters (mg/kg)</b> |      |              |              |              |              |              |              |              |              |   |
| TOTAL ORGANIC CARBON                    | NA   |              |              |              |              | 660          |              |              |              |   |
| <b>Miscellaneous Parameters (%)</b>     |      |              |              |              |              |              |              |              |              |   |
| TOTAL SOLIDS                            | NA   | 92           |              |              |              | 91           |              | 88           |              |   |

**Table A.4-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Small Arms (Pistol) Range - UXO 17**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
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| location                                |             | X17SB003            | X17SB003            | X17SB003            | X17SB003            | X17SB004            | X17SB004            | X17SB004            | X17SB004            |     |
|---|-------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|-----|
| nsample                                 |             | <b>X17SB0030004</b> | <b>X17SB0030406</b> | <b>X17SB0030608</b> | <b>X17SB0030810</b> | <b>X17SB0040004</b> | <b>X17SB0040406</b> | <b>X17SB0040608</b> | <b>X17SB0040810</b> |     |
| sample_dat                              |             | 20090611            | 20090611            | 20090611            | 20090611            | 20090611            | 20090611            | 20090611            | 20090611            |     |
| qc_type                                 |             | NM                  |     |
| sacode                                  |             | NORMAL              |     |
| matrix                                  | <b>PALs</b> | SO                  |     |
| top_depth                               |             | 0                   | 4                   | 6                   | 8                   | 0                   | 4                   | 6                   | 8                   |     |
| bottom_dep                              |             | 4                   | 6                   | 8                   | 10                  | 4                   | 6                   | 8                   | 10                  |     |
| depth_unit                              |             | FT                  |     |
| submatrix                               |             | SB                  |     |
| composite                               |             | N                   | N                   | N                   | N                   | N                   | N                   | N                   | N                   |     |
| <b>Inorganics (mg/kg)</b>               |             |                     |                     |                     |                     |                     |                     |                     |                     |     |
| ANTIMONY                                | 0.27        |                     |                     | 0.3                 | L                   |                     | 2.2                 | L                   | 0.13                | B   |
| ARSENIC                                 | 0.39        |                     |                     | 5.7                 |                     |                     | 7                   |                     | 4.2                 |     |
| COPPER                                  | 100         |                     |                     | 8                   |                     |                     | 37.1                |                     | 5.3                 |     |
| LEAD                                    | 11          |                     |                     | 68.2                |                     |                     | 589                 |                     | 8.9                 |     |
| TIN                                     | 0.89        |                     |                     | 1                   | B                   |                     | 1.2                 | B                   | 0.76                | B   |
| ZINC                                    | 46          |                     |                     | 17.9                |                     |                     | 33.2                |                     | 14.8                |     |
| <b>Explosives (mg/kg)</b>               |             |                     |                     |                     |                     |                     |                     |                     |                     |     |
| NITROGLYCERIN                           | 6.1         |                     |                     |                     |                     |                     |                     |                     |                     |     |
| <b>XRF Field Parameters (mg/kg)</b>     |             |                     |                     |                     |                     |                     |                     |                     |                     |     |
| LEAD                                    | 11          | 16.333              | 85.333              | 126.333             | 7.667               | 2171                | 371.333             | 0                   | U                   | 156 |
| <b>Miscellaneous Parameters (s.u.)</b>  |             |                     |                     |                     |                     |                     |                     |                     |                     |     |
| PH                                      | NA          |                     |                     |                     |                     |                     |                     |                     |                     |     |
| <b>Miscellaneous Parameters (mg/kg)</b> |             |                     |                     |                     |                     |                     |                     |                     |                     |     |
| TOTAL ORGANIC CARBON                    | NA          |                     |                     |                     |                     |                     |                     |                     |                     |     |
| <b>Miscellaneous Parameters (%)</b>     |             |                     |                     |                     |                     |                     |                     |                     |                     |     |
| TOTAL SOLIDS                            | NA          |                     |                     | 90                  |                     | 91                  |                     | 91                  |                     |     |

**Table A.4-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Small Arms (Pistol) Range - UXO 17**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                |             | X17SB005            | X17SB005            | X17SB005            | X17SB005            | X17SB006            | X17SB006            | X17SB006            | X17SB006            |
|---|-------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| nsample                                 |             | <b>X17SB0050004</b> | <b>X17SB0050406</b> | <b>X17SB0050608</b> | <b>X17SB0050810</b> | <b>X17SB0060004</b> | <b>X17SB0060406</b> | <b>X17SB0060608</b> | <b>X17SB0060810</b> |
| sample_dat                              |             | 20090611            | 20090611            | 20090611            | 20090611            | 20090611            | 20090611            | 20090611            | 20090611            |
| qc_type                                 |             | NM                  |
| sacode                                  |             | NORMAL              |
| matrix                                  | <b>PALs</b> | SO                  |
| top_depth                               |             | 0                   | 4                   | 6                   | 8                   | 0                   | 4                   | 6                   | 8                   |
| bottom_dep                              |             | 4                   | 6                   | 8                   | 10                  | 4                   | 6                   | 8                   | 10                  |
| depth_unit                              |             | FT                  |
| submatrix                               |             | SB                  |
| composite                               |             | N                   | N                   | N                   | N                   | N                   | N                   | N                   | N                   |
| <b>Inorganics (mg/kg)</b>               |             |                     |                     |                     |                     |                     |                     |                     |                     |
| ANTIMONY                                | 0.27        | 1.7                 | L                   |                     |                     | 0.3                 | L                   | 1                   | L                   |
| ARSENIC                                 | 0.39        | 5.9                 |                     |                     |                     | 2.3                 | B                   | 2.4                 | B                   |
| COPPER                                  | 100         | 42                  | K                   |                     |                     | 7.8                 |                     | 10                  |                     |
| LEAD                                    | 11          | 620                 |                     |                     |                     | 32.4                |                     | 132                 |                     |
| TIN                                     | 0.89        | 1.6                 | B                   |                     |                     | 0.99                | B                   | 1                   | B                   |
| ZINC                                    | 46          | 23.8                |                     |                     |                     | 14                  |                     | 13.1                |                     |
| <b>Explosives (mg/kg)</b>               |             |                     |                     |                     |                     |                     |                     |                     |                     |
| NITROGLYCERIN                           | 6.1         |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>XRF Field Parameters (mg/kg)</b>     |             |                     |                     |                     |                     |                     |                     |                     |                     |
| LEAD                                    | 11          | 942.333             | 36.667              | 349.667             | 41.333              | 230                 | 191                 | 4.667               | 55.333              |
| <b>Miscellaneous Parameters (s.u.)</b>  |             |                     |                     |                     |                     |                     |                     |                     |                     |
| PH                                      | NA          |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (mg/kg)</b> |             |                     |                     |                     |                     |                     |                     |                     |                     |
| TOTAL ORGANIC CARBON                    | NA          |                     |                     |                     |                     |                     |                     |                     |                     |
| <b>Miscellaneous Parameters (%)</b>     |             |                     |                     |                     |                     |                     |                     |                     |                     |
| TOTAL SOLIDS                            | NA          | 87                  |                     |                     | 89                  |                     |                     | 91                  |                     |

**Table A.4-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Small Arms (Pistol) Range - UXO 17**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
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| location                                |             | X17SB007            | X17SB007            | X17SB007            | X17SB007            | X17SB011            | X17SB011            | X17SB012            | X17SB013            |        |   |
|---|-------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|--------|---|
| nsample                                 |             | <b>X17SB0070004</b> | <b>X17SB0070406</b> | <b>X17SB0070608</b> | <b>X17SB0070810</b> | <b>X17SS0110001</b> | <b>X17SB0110102</b> | <b>X17SS0120001</b> | <b>X17SB0130102</b> |        |   |
| sample_dat                              |             | 20090611            | 20090611            | 20090611            | 20090611            | 20090611            | 20090614            | 20090611            | 20090614            |        |   |
| qc_type                                 |             | NM                  |        |   |
| sacode                                  |             | NORMAL              |        |   |
| matrix                                  | <b>PALs</b> | SO                  |        |   |
| top_depth                               |             | 0                   | 4                   | 6                   | 8                   | 0                   | 1                   | 0                   | 1                   |        |   |
| bottom_dep                              |             | 4                   | 6                   | 8                   | 10                  | 1                   | 2                   | 1                   | 2                   |        |   |
| depth_unit                              |             | FT                  |        |   |
| submatrix                               |             | SB                  | SB                  | SB                  | SB                  | SS                  | SB                  | SS                  | SB                  |        |   |
| composite                               |             | N                   | N                   | N                   | N                   | N                   | N                   | N                   | N                   |        |   |
| <b>Inorganics (mg/kg)</b>               |             |                     |                     |                     |                     |                     |                     |                     |                     |        |   |
| ANTIMONY                                | 0.27        | 0.19                | L                   |                     |                     |                     |                     | 0.52                | L                   | 0.42   | L |
| ARSENIC                                 | 0.39        | 4.8                 |                     |                     |                     |                     |                     | 5.1                 |                     | 3.7    |   |
| COPPER                                  | 100         | 8.3                 |                     |                     |                     |                     |                     | 10.7                |                     | 8.6    |   |
| LEAD                                    | 11          | 8.2                 |                     |                     |                     |                     |                     | 82.1                |                     | 39.2   |   |
| TIN                                     | 0.89        | 1.3                 | B                   |                     |                     |                     |                     | 1.2                 | B                   | 0.86   | B |
| ZINC                                    | 46          | 17.5                |                     |                     |                     |                     |                     | 21.8                |                     | 13.2   |   |
| <b>Explosives (mg/kg)</b>               |             |                     |                     |                     |                     |                     |                     |                     |                     |        |   |
| NITROGLYCERIN                           | 6.1         |                     |                     |                     |                     |                     |                     |                     |                     |        |   |
| <b>XRF Field Parameters (mg/kg)</b>     |             |                     |                     |                     |                     |                     |                     |                     |                     |        |   |
| LEAD                                    | 11          | 4.333               | 24.333              | 0                   | U                   | 6.667               | 405                 | 101.667             | 10                  | 30.667 |   |
| <b>Miscellaneous Parameters (s.u.)</b>  |             |                     |                     |                     |                     |                     |                     |                     |                     |        |   |
| PH                                      | NA          |                     |                     |                     |                     |                     |                     |                     |                     |        |   |
| <b>Miscellaneous Parameters (mg/kg)</b> |             |                     |                     |                     |                     |                     |                     |                     |                     |        |   |
| TOTAL ORGANIC CARBON                    | NA          |                     |                     |                     |                     |                     |                     |                     |                     |        |   |
| <b>Miscellaneous Parameters (%)</b>     |             |                     |                     |                     |                     |                     |                     |                     |                     |        |   |
| TOTAL SOLIDS                            | NA          | 87                  |                     |                     |                     |                     |                     | 90                  |                     | 93     |   |

**Table A.4-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Small Arms (Pistol) Range - UXO 17**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
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| location                                |      | X17SB013     | X17SB014     | X17SB014     | X17SB015     | X17SB016     | X17SB017     | X17SB018     | X17SB019     |
|---|------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| nsample                                 |      | X17SS0130001 | X17SS0140001 | X17SB0140102 | X17SS0150001 | X17SS0160001 | X17SS0170001 | X17SS0180001 | X17SS0190001 |
| sample_dat                              |      | 20090614     | 20090611     | 20090614     | 20090611     | 20090611     | 20090611     | 20090611     | 20090611     |
| qc_type                                 |      | NM           |
| sacode                                  |      | NORMAL       |
| matrix                                  | PALs | SO           |
| top_depth                               |      | 0            | 0            | 1            | 0            | 0            | 0            | 0            | 0            |
| bottom_dep                              |      | 1            | 1            | 2            | 1            | 1            | 1            | 1            | 1            |
| depth_unit                              |      | FT           |
| submatrix                               |      | SS           | SS           | SB           | SS           | SS           | SS           | SS           | SS           |
| composite                               |      | N            | N            | N            | N            | N            | N            | N            | N            |
| <b>Inorganics (mg/kg)</b>               |      |              |              |              |              |              |              |              |              |
| ANTIMONY                                | 0.27 |              | 6 L          | 0.44 B       |              |              | 0.19 B       |              | 0.26 L       |
| ARSENIC                                 | 0.39 |              | 8.7          | 5.5          |              |              | 5.1          |              | 8.5          |
| COPPER                                  | 100  |              | 36.3         | 11.8         |              |              | 9.6          |              | 12           |
| LEAD                                    | 11   |              | 706          | 77.6         |              |              | 12.2 B       |              | 39.4         |
| TIN                                     | 0.89 |              | 1.5 B        | 1.5          |              |              | 1.3 B        |              | 0.56 B       |
| ZINC                                    | 46   |              | 23.5         | 25.4         |              |              | 19.5         |              | 24           |
| <b>Explosives (mg/kg)</b>               |      |              |              |              |              |              |              |              |              |
| NITROGLYCERIN                           | 6.1  |              |              |              |              |              |              |              |              |
| <b>XRF Field Parameters (mg/kg)</b>     |      |              |              |              |              |              |              |              |              |
| LEAD                                    | 11   | 3247         | 2501         | 40.667       | 18           | 13.667       | 9.667        | 7            | 36           |
| <b>Miscellaneous Parameters (s.u.)</b>  |      |              |              |              |              |              |              |              |              |
| PH                                      | NA   | 7.3          |              |              |              |              |              |              |              |
| <b>Miscellaneous Parameters (mg/kg)</b> |      |              |              |              |              |              |              |              |              |
| TOTAL ORGANIC CARBON                    | NA   | 10000        |              |              |              |              |              |              |              |
| <b>Miscellaneous Parameters (%)</b>     |      |              |              |              |              |              |              |              |              |
| TOTAL SOLIDS                            | NA   | 84           | 92           | 90           |              | 84           |              |              | 85           |

**Table A.4-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Small Arms (Pistol) Range - UXO 17**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                |      | X17SB020     | X17SB021     | X17SB022     | X17SB022         | X17SB022       | X17SB023     | X17SB024     | X17SB025     |        |   |         |   |
|---|------|--------------|--------------|--------------|------------------|----------------|--------------|--------------|--------------|--------|---|---------|---|
| nsample                                 |      | X17SS0200001 | X17SS0210001 | X17SS0220001 | X17SS0220001-AVG | X17SS0220001-D | X17SS0230001 | X17SS0240001 | X17SS0250001 |        |   |         |   |
| sample_dat                              |      | 20090611     | 20090611     | 20090611     | 20090611         | 20090611       | 20090611     | 20090611     | 20090612     |        |   |         |   |
| qc_type                                 |      | NM           | NM           | NM           | NM               | FD             | NM           | NM           | NM           |        |   |         |   |
| sacode                                  |      | NORMAL       | NORMAL       | ORIG         | AVG              | DUP            | NORMAL       | NORMAL       | NORMAL       |        |   |         |   |
| matrix                                  | PALs | SO           | SO           | SO           | SO               | SO             | SO           | SO           | SO           |        |   |         |   |
| top_depth                               |      | 0            | 0            | 0            | 0                | 0              | 0            | 0            | 0            |        |   |         |   |
| bottom_dep                              |      | 1            | 1            | 1            | 1                | 1              | 1            | 1            | 1            |        |   |         |   |
| depth_unit                              |      | FT           | FT           | FT           | FT               | FT             | FT           | FT           | FT           |        |   |         |   |
| submatrix                               |      | SS           | SS           | SS           | SS               | SS             | SS           | SS           | SS           |        |   |         |   |
| composite                               |      | N            | N            | N            | N                | N              | N            | N            | N            |        |   |         |   |
| <b>Inorganics (mg/kg)</b>               |      |              |              |              |                  |                |              |              |              |        |   |         |   |
| ANTIMONY                                | 0.27 |              |              | 0.13         | B                | 0.13           | B            | 0.13         | B            | 0.15   | B | 3.3     | B |
| ARSENIC                                 | 0.39 |              |              | 3.5          |                  | 3.55           |              | 3.6          |              | 3.9    |   | 5.1     |   |
| COPPER                                  | 100  |              |              | 8.2          |                  | 8.1            | K            | 8            | K            | 7.2    |   | 26      |   |
| LEAD                                    | 11   |              |              | 7            | B                | 5.35           |              | 7.2          |              | 10.3   | B | 479     |   |
| TIN                                     | 0.89 |              |              | 1            | B                | 1              | B            | 1            | B            | 1.2    | B | 0.96    | B |
| ZINC                                    | 46   |              |              | 13.7         |                  | 13.75          |              | 13.8         |              | 14.8   |   | 20      |   |
| <b>Explosives (mg/kg)</b>               |      |              |              |              |                  |                |              |              |              |        |   |         |   |
| NITROGLYCERIN                           | 6.1  |              |              |              |                  |                |              |              |              |        |   |         |   |
| <b>XRF Field Parameters (mg/kg)</b>     |      |              |              |              |                  |                |              |              |              |        |   |         |   |
| LEAD                                    | 11   | 39           | 31.333       | 26           | 26               |                |              | 0            | U            | 11.333 |   | 731.667 |   |
| <b>Miscellaneous Parameters (s.u.)</b>  |      |              |              |              |                  |                |              |              |              |        |   |         |   |
| PH                                      | NA   |              |              |              |                  |                |              |              |              |        |   |         |   |
| <b>Miscellaneous Parameters (mg/kg)</b> |      |              |              |              |                  |                |              |              |              |        |   |         |   |
| TOTAL ORGANIC CARBON                    | NA   |              |              |              |                  |                |              |              |              |        |   |         |   |
| <b>Miscellaneous Parameters (%)</b>     |      |              |              |              |                  |                |              |              |              |        |   |         |   |
| TOTAL SOLIDS                            | NA   |              |              | 87           | 87               | 87             |              | 87           |              | 87     |   | 92      |   |

**Table A.4-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Small Arms (Pistol) Range - UXO 17**  
**Site Inspection**  
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| location                                |      | X17SB025     | X17SB026     | X17SB027     | X17SB028     | X17SB029     |      |   |  |
|---|------|--------------|--------------|--------------|--------------|--------------|------|---|--|
| nsample                                 |      | X17SB0250102 | X17SS0260001 | X17SS0270001 | X17SS0280001 | X17SS0290001 |      |   |  |
| sample_dat                              |      | 20090614     | 20090612     | 20090612     | 20090612     | 20090614     |      |   |  |
| qc_type                                 |      | NM           | NM           | NM           | NM           | NM           |      |   |  |
| sacode                                  |      | NORMAL       | NORMAL       | NORMAL       | NORMAL       | NORMAL       |      |   |  |
| matrix                                  | PALs | SO           | SO           | SO           | SO           | SO           |      |   |  |
| top_depth                               |      | 1            | 0            | 0            | 0            | 0            |      |   |  |
| bottom_dep                              |      | 2            | 1            | 1            | 1            | 1            |      |   |  |
| depth_unit                              |      | FT           | FT           | FT           | FT           | FT           |      |   |  |
| submatrix                               |      | SB           | SS           | SS           | SS           | SS           |      |   |  |
| composite                               |      | N            | N            | N            | N            | N            |      |   |  |
| <b>Inorganics (mg/kg)</b>               |      |              |              |              |              |              |      |   |  |
| ANTIMONY                                | 0.27 | 0.55         | B            |              | 2.1          | L            | 0.5  | L |  |
| ARSENIC                                 | 0.39 | 4.6          |              |              | 3.6          |              | 4    |   |  |
| COPPER                                  | 100  | 10.9         |              |              | 5.6          | K            | 8.1  | K |  |
| LEAD                                    | 11   | 87.5         |              |              | 645          |              | 38.9 |   |  |
| TIN                                     | 0.89 | 1.2          | B            |              | 0.58         | B            | 1.1  | B |  |
| ZINC                                    | 46   | 24           |              |              | 10           |              | 13.5 |   |  |
| <b>Explosives (mg/kg)</b>               |      |              |              |              |              |              |      |   |  |
| NITROGLYCERIN                           | 6.1  |              |              |              |              |              |      |   |  |
| <b>XRF Field Parameters (mg/kg)</b>     |      |              |              |              |              |              |      |   |  |
| LEAD                                    | 11   | 126.667      | 95.333       | 128.667      | 39           |              | 256  |   |  |
| <b>Miscellaneous Parameters (s.u.)</b>  |      |              |              |              |              |              |      |   |  |
| PH                                      | NA   |              |              |              |              |              | 7.8  |   |  |
| <b>Miscellaneous Parameters (mg/kg)</b> |      |              |              |              |              |              |      |   |  |
| TOTAL ORGANIC CARBON                    | NA   |              |              |              |              |              | 3100 |   |  |
| <b>Miscellaneous Parameters (%)</b>     |      |              |              |              |              |              |      |   |  |
| TOTAL SOLIDS                            | NA   | 91           |              |              | 92           |              | 93   |   |  |

**Table A.5-1**  
**Summary of Chemicals Detected in Composite Soil Sample**  
**Firing Line Area**  
**Roach Road Rifle Range - UXO 25**  
**Site Inspection**  
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|   |      |                      |   |
|---|------|----------------------|---|
| location                                |      | X25SB034C            |   |
| nsample                                 |      | <b>X25SS034C0001</b> |   |
| sample_dat                              |      | 20090615             |   |
| qc_type                                 |      | NM                   |   |
| sacode                                  |      | NORMAL               |   |
| matrix                                  | PALs | SO                   |   |
| top_depth                               |      | 0                    |   |
| bottom_dep                              |      | 1                    |   |
| depth_unit                              |      | FT                   |   |
| submatrix                               |      | SS                   |   |
| composite                               |      | Y                    |   |
| <b>Inorganics (mg/kg)</b>               |      |                      |   |
| ANTIMONY                                | 0.27 | 0.1                  | L |
| ARSENIC                                 | 0.39 | <b>4.3</b>           |   |
| COPPER                                  | 100  | 8.5                  |   |
| LEAD                                    | 11   | 9.4                  |   |
| TIN                                     | 0.89 | 1.6                  | B |
| ZINC                                    | 46   | 30.2                 |   |
| <b>Explosives (mg/kg)</b>               |      |                      |   |
| NITROGLYCERIN                           | 6.1  | 1.2                  | U |
| <b>XRF Field Parameters (mg/kg)</b>     |      |                      |   |
| LEAD                                    | 11   | 0                    | U |
| <b>Miscellaneous Parameters (s.u.)</b>  |      |                      |   |
| PH                                      | NA   |                      |   |
| <b>Miscellaneous Parameters (mg/kg)</b> |      |                      |   |
| TOTAL ORGANIC CARBON                    | NA   |                      |   |
| <b>Miscellaneous Parameters (%)</b>     |      |                      |   |
| TOTAL SOLIDS                            | NA   | 90                   |   |

**Table A.5-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Roach Road Rifle Range - UXO 25**  
**Site Inspection**  
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| location                                |      | X25SB001     | X25SB002     | X25SB003     | X25SB004     | X25SB005     | X25SB006     | X25SB007     | X25SB007         | X25S    |
|---|------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|------------------|---------|
| nsample                                 |      | X25SS0010001 | X25SS0020001 | X25SS0030001 | X25SS0040001 | X25SS0050001 | X25SS0060001 | X25SS0070001 | X25SS0070001-AVG | X25SS00 |
| sample_dat                              |      | 20090615     | 20090615     | 20090615     | 20090615     | 20090615     | 20090615     | 20090615     | 20090615         | 2009    |
| qc_type                                 |      | NM               | F       |
| sacode                                  |      | NORMAL       | NORMAL       | NORMAL       | NORMAL       | NORMAL       | NORMAL       | ORIG         | AVG              | DL      |
| matrix                                  | PALs | SO               | Si      |
| top_depth                               |      | 0            | 0            | 0            | 0            | 0            | 0            | 0            | 0                | (       |
| bottom_dep                              |      | 1            | 1            | 1            | 1            | 1            | 1            | 1            | 1                | 1       |
| depth_unit                              |      | FT               | F       |
| submatrix                               |      | SS               | S       |
| composite                               |      | N            | N            | N            | N            | N            | N            | N            | N                | N       |
| <b>Inorganics (mg/kg)</b>               |      |              |              |              |              |              |              |              |                  |         |
| ANTIMONY                                | 0.27 | 0.02         | B            |              |              |              | 0.15         | B            |                  | 0.16    |
| ARSENIC                                 | 0.39 | 4.9          |              |              |              |              | 2.8          |              | 2.3              | 5.8     |
| COPPER                                  | 100  | 13.1         |              |              |              |              | 7.4          |              | 10.3             | 10.5    |
| LEAD                                    | 11   | 6.3          |              |              |              |              | 19.5         |              | 43.5             | 34.5    |
| TIN                                     | 0.89 | 0.56         | B            |              |              |              | 0.49         | B            | 0.62             | 0.68    |
| ZINC                                    | 46   | 36.4         |              |              |              |              | 30.6         |              | 27.5             | 32.8    |
| <b>Explosives (mg/kg)</b>               |      |              |              |              |              |              |              |              |                  |         |
| NITROGLYCERIN                           | 6.1  |              |              |              |              |              |              |              |                  |         |
| <b>XRF Field Parameters (mg/kg)</b>     |      |              |              |              |              |              |              |              |                  |         |
| LEAD                                    | 11   | 0            | U            | 12.667       | U            | 8.333        | 29.667       | 22           | 8.333            | 32      |
| <b>Miscellaneous Parameters (s.u.)</b>  |      |              |              |              |              |              |              |              |                  |         |
| PH                                      | NA   |              |              |              |              |              |              | 7.6          |                  |         |
| <b>Miscellaneous Parameters (mg/kg)</b> |      |              |              |              |              |              |              |              |                  |         |
| TOTAL ORGANIC CARBON                    | NA   |              |              |              |              |              |              | 4600         |                  |         |
| <b>Miscellaneous Parameters (%)</b>     |      |              |              |              |              |              |              |              |                  |         |
| TOTAL SOLIDS                            | NA   | 85           |              |              |              |              | 92           |              | 87               | 74      |

Table A.5-2  
 Summary of Chemicals Detected in Discrete Soil Samples  
 Roach Road Rifle Range - UXO 25  
 Site Inspection  
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| location                                |      | B007    | X25SB008     | X25SB009     | X25SB010     | X25SB011     | X25SB012     | X25SB013     | X25SB014     | X25SB015     |
|---|------|---------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| nsample                                 |      | 70001-D | X25SS0080001 | X25SS0090001 | X25SS0100001 | X25SS0110001 | X25SS0120001 | X25SS0130001 | X25SS0140001 | X25SS0150001 |
| sample_dat                              |      | 0615    | 20090615     | 20090615     | 20090615     | 20090615     | 20090615     | 20090615     | 20090615     | 20090615     |
| qc_type                                 |      | D       | NM           |
| sacode                                  |      | JP      | NORMAL       |
| matrix                                  | PALs | O       | SO           |
| top_depth                               |      | 0       | 0            | 0            | 0            | 0            | 0            | 0            | 0            | 0            |
| bottom_dep                              |      | 1       | 1            | 1            | 1            | 1            | 1            | 1            | 1            | 1            |
| depth_unit                              |      | T       | FT           |
| submatrix                               |      | S       | SS           |
| composite                               |      | N       | N            | N            | N            | N            | N            | N            | N            | N            |
| <b>Inorganics (mg/kg)</b>               |      |         |              |              |              |              |              |              |              |              |
| ANTIMONY                                | 0.27 | B       | 0.27         | L            |              | 0.48         | J            |              | 0.2          | J            |
| ARSENIC                                 | 0.39 | J       | 2.4          |              |              | 8.5          |              |              | 4.4          |              |
| COPPER                                  | 100  |         | 11           |              |              | 14           |              |              | 9.2          |              |
| LEAD                                    | 11   |         | 91.4         |              |              | 84           | J            |              | 19.8         | J            |
| TIN                                     | 0.89 | B       | 0.51         | B            |              | 1.4          | B            |              | 1.2          | B            |
| ZINC                                    | 46   |         | 26.6         |              |              | 33.4         |              |              | 36.3         |              |
| <b>Explosives (mg/kg)</b>               |      |         |              |              |              |              |              |              |              |              |
| NITROGLYCERIN                           | 6.1  |         |              |              |              |              |              |              |              |              |
| <b>XRF Field Parameters (mg/kg)</b>     |      |         |              |              |              |              |              |              |              |              |
| LEAD                                    | 11   |         | 94.667       | 12.333       | 158.667      | 41           | 21.667       | 12.333       | 11           | 36.333       |
| <b>Miscellaneous Parameters (s.u.)</b>  |      |         |              |              |              |              |              |              |              |              |
| PH                                      | NA   |         |              |              |              |              |              | 7.4          |              |              |
| <b>Miscellaneous Parameters (mg/kg)</b> |      |         |              |              |              |              |              |              |              |              |
| TOTAL ORGANIC CARBON                    | NA   |         |              |              |              |              |              | 14000        |              |              |
| <b>Miscellaneous Parameters (%)</b>     |      |         |              |              |              |              |              |              |              |              |
| TOTAL SOLIDS                            | NA   |         | 86           |              |              | 81           |              | 80           |              |              |

**Table A.5-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Roach Road Rifle Range - UXO 25**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                |      | X25SB016     | X25SB017     | X25SB018     | X25SB019     | X25SB020     | X25SB021     | X25SB021     | X25SB021         | X25SB021       | X25SB021       | X25SB021       | X25SB021       | X25SB021       | X25SB021       | X25SB021       | X25SB021       |      |
|---|------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|------|
| nsample                                 |      | X25SS0160001 | X25SS0170001 | X25SS0180001 | X25SS0190001 | X25SS0200001 | X25SS0210001 | X25SS0210001 | X25SS0210001-AVG | X25SS0210001-D |      |
| sample_dat                              |      | 20090615     | 20090615     | 20090615     | 20090615     | 20090615     | 20090615     | 20090615     | 20090615         | 20090615       | 20090615       | 20090615       | 20090615       | 20090615       | 20090615       | 20090615       | 20090615       |      |
| qc_type                                 |      | NM               | NM             | NM             | NM             | NM             | NM             | NM             | NM             | NM             |      |
| sacode                                  |      | NORMAL       | NORMAL       | NORMAL       | NORMAL       | NORMAL       | NORMAL       | ORIG         | AVG              | DUP            | NOR            |      |
| matrix                                  | PALs | SO               | SO             | SO             | SO             | SO             | SO             | SO             | SO             | SO             |      |
| top_depth                               |      | 0            | 0            | 0            | 0            | 0            | 0            | 0            | 0                | 0              | 0              | 0              | 0              | 0              | 0              | 0              | 0              |      |
| bottom_dep                              |      | 1            | 1            | 1            | 1            | 1            | 1            | 1            | 1                | 1              | 1              | 1              | 1              | 1              | 1              | 1              | 1              |      |
| depth_unit                              |      | FT               | FT             | FT             | FT             | FT             | FT             | FT             | FT             | FT             |      |
| submatrix                               |      | SS               | SS             | SS             | SS             | SS             | SS             | SS             | SS             | SS             |      |
| composite                               |      | N            | N            | N            | N            | N            | N            | N            | N                | N              | N              | N              | N              | N              | N              | N              | N              |      |
| <b>Inorganics (mg/kg)</b>               |      |              |              |              |              |              |              |              |                  |                |                |                |                |                |                |                |                |      |
| ANTIMONY                                | 0.27 | 0.4          | L            |              |              | 2.4          | L            | 4.4          | L                | 12.2           | L              | 0.3            | L              | 0.285          | L              | 0.27           | L              | 0.19 |
| ARSENIC                                 | 0.39 | 22.6         |              |              |              | 5.6          |              | 2.5          |                  | 5              |                | 2.4            |                | 2.65           |                | 2.9            |                | 3.8  |
| COPPER                                  | 100  | 24.8         |              |              |              | 48.5         |              | 130          |                  | 370            |                | 10.9           |                | 10.05          |                | 9.2            |                | 11   |
| LEAD                                    | 11   | 88.6         |              |              |              | 529          |              | 1060         |                  | 3450           |                | 131            |                | 129            |                | 127            |                | 62.6 |
| TIN                                     | 0.89 | 0.52         | B            |              |              | 0.55         | B            | 0.43         | B                | 0.56           | B              | 0.5            | B              | 0.485          | B              | 0.47           | B              | 0.51 |
| ZINC                                    | 46   | 43.8         |              |              |              | 32.4         |              | 45.1         |                  | 63.9           |                | 26.8           |                | 25.85          |                | 24.9           |                | 23.1 |
| <b>Explosives (mg/kg)</b>               |      |              |              |              |              |              |              |              |                  |                |                |                |                |                |                |                |                |      |
| NITROGLYCERIN                           | 6.1  |              |              |              |              |              |              |              |                  |                |                |                |                |                |                |                |                |      |
| <b>XRF Field Parameters (mg/kg)</b>     |      |              |              |              |              |              |              |              |                  |                |                |                |                |                |                |                |                |      |
| LEAD                                    | 11   | 64.667       |              | 78.333       | U            | 1676.333     |              | 2775         |                  | 3877           |                | 177.667        |                | 177.667        |                |                |                | 60   |
| <b>Miscellaneous Parameters (s.u.)</b>  |      |              |              |              |              |              |              |              |                  |                |                |                |                |                |                |                |                |      |
| PH                                      | NA   |              |              |              |              |              |              | 7.4          |                  |                |                |                |                |                |                |                |                |      |
| <b>Miscellaneous Parameters (mg/kg)</b> |      |              |              |              |              |              |              |              |                  |                |                |                |                |                |                |                |                |      |
| TOTAL ORGANIC CARBON                    | NA   |              |              |              |              |              |              | 42000        |                  |                |                |                |                |                |                |                |                |      |
| <b>Miscellaneous Parameters (%)</b>     |      |              |              |              |              |              |              |              |                  |                |                |                |                |                |                |                |                |      |
| TOTAL SOLIDS                            | NA   | 84           |              |              |              | 82           |              | 84           |                  | 80             |                | 80             |                | 82.5           |                | 85             |                | 86   |

**Table A.5-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Roach Road Rifle Range - UXO 25**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                |             | B022          | X25SB023            | X25SB024            | X25SB025            | X25SB026            | X25SB027            | X25SB028            | X25SB029            | X25SB030            |        |   |        |  |    |    |        |
|---|-------------|---------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|--------|---|--------|--|----|----|--------|
| nsample                                 |             | <b>Z20001</b> | <b>X25SS0230001</b> | <b>X25SS0240001</b> | <b>X25SS0250001</b> | <b>X25SS0260001</b> | <b>X25SS0270001</b> | <b>X25SS0280001</b> | <b>X25SS0290001</b> | <b>X25SS0300001</b> |        |   |        |  |    |    |        |
| sample_dat                              |             | 0615          | 20090615            | 20090615            | 20090615            | 20090615            | 20090615            | 20090615            | 20090615            | 20090615            |        |   |        |  |    |    |        |
| qc_type                                 |             | M             | NM                  |        |   |        |  |    |    |        |
| sacode                                  |             | MAL           | NORMAL              |        |   |        |  |    |    |        |
| matrix                                  | <b>PALs</b> | O             | SO                  |        |   |        |  |    |    |        |
| top_depth                               |             | 0             | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   | 0                   |        |   |        |  |    |    |        |
| bottom_dep                              |             | 1             | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   | 1                   |        |   |        |  |    |    |        |
| depth_unit                              |             | T             | FT                  |        |   |        |  |    |    |        |
| submatrix                               |             | S             | SS                  |        |   |        |  |    |    |        |
| composite                               |             | N             | N                   | N                   | N                   | N                   | N                   | N                   | N                   | N                   |        |   |        |  |    |    |        |
| <b>Inorganics (mg/kg)</b>               |             |               |                     |                     |                     |                     |                     |                     |                     |                     |        |   |        |  |    |    |        |
| ANTIMONY                                | 0.27        | L             | 1.3                 | L                   | 1.7                 | L                   | 0.27                | L                   | 0.21                | L                   | 0.26   | L |        |  |    |    |        |
| ARSENIC                                 | 0.39        |               | 2.6                 |                     | 3.2                 |                     | 3.7                 |                     | 3.6                 |                     | 2.8    |   |        |  |    |    |        |
| COPPER                                  | 100         |               | 44                  |                     | 50.2                |                     | 11.5                |                     | 9.6                 |                     | 11     |   |        |  |    |    |        |
| LEAD                                    | 11          |               | 546                 |                     | 522                 |                     | 34.2                |                     | 17.9                |                     | 50.3   |   |        |  |    |    |        |
| TIN                                     | 0.89        | B             | 0.55                | B                   | 0.58                | B                   | 0.5                 | B                   | 1.5                 | B                   | 1.7    | B |        |  |    |    |        |
| ZINC                                    | 46          |               | 37                  |                     | 40.6                |                     | 22                  |                     | 25.2                |                     | 28.4   |   |        |  |    |    |        |
| <b>Explosives (mg/kg)</b>               |             |               |                     |                     |                     |                     |                     |                     |                     |                     |        |   |        |  |    |    |        |
| NITROGLYCERIN                           | 6.1         |               |                     |                     |                     |                     |                     |                     |                     |                     |        |   |        |  |    |    |        |
| <b>XRF Field Parameters (mg/kg)</b>     |             |               |                     |                     |                     |                     |                     |                     |                     |                     |        |   |        |  |    |    |        |
| LEAD                                    | 11          |               | 538.333             |                     | 835.667             |                     | 48                  |                     | 36.667              |                     | 14.333 |   | 25.333 |  | 48 |    | 64.667 |
| <b>Miscellaneous Parameters (s.u.)</b>  |             |               |                     |                     |                     |                     |                     |                     |                     |                     |        |   |        |  |    |    |        |
| PH                                      | NA          |               |                     |                     |                     |                     |                     |                     |                     |                     |        |   |        |  |    |    |        |
| <b>Miscellaneous Parameters (mg/kg)</b> |             |               |                     |                     |                     |                     |                     |                     |                     |                     |        |   |        |  |    |    |        |
| TOTAL ORGANIC CARBON                    | NA          |               |                     |                     |                     |                     |                     |                     |                     |                     |        |   |        |  |    |    |        |
| <b>Miscellaneous Parameters (%)</b>     |             |               |                     |                     |                     |                     |                     |                     |                     |                     |        |   |        |  |    |    |        |
| TOTAL SOLIDS                            | NA          |               | 85                  |                     | 82                  |                     | 88                  |                     |                     |                     | 85     |   |        |  |    | 86 |        |

**Table A.5-2**  
**Summary of Chemicals Detected in Discrete Soil Samples**  
**Roach Road Rifle Range - UXO 25**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| location                                |      | X25SB031            | X25SB032            | X25SB033            |   |               |   |
|---|------|---------------------|---------------------|---------------------|---|---------------|---|
| nsample                                 |      | <b>X25SS0310001</b> | <b>X25SS0320001</b> | <b>X25SS0330001</b> |   |               |   |
| sample_dat                              |      | 20090615            | 20090615            | 20090615            |   |               |   |
| qc_type                                 |      | NM                  | NM                  | NM                  |   |               |   |
| sacode                                  |      | NORMAL              | NORMAL              | NORMAL              |   |               |   |
| matrix                                  | PALs | SO                  | SO                  | SO                  |   |               |   |
| top_depth                               |      | 0                   | 0                   | 0                   |   |               |   |
| bottom_dep                              |      | 1                   | 1                   | 1                   |   |               |   |
| depth_unit                              |      | FT                  | FT                  | FT                  |   |               |   |
| submatrix                               |      | SS                  | SS                  | SS                  |   |               |   |
| composit                                |      | N                   | N                   | N                   |   |               |   |
| <b>Inorganics (mg/kg)</b>               |      |                     |                     |                     |   |               |   |
| ANTIMONY                                | 0.27 | <b>0.53</b>         | L                   | 0.24                | L | 0.13          | B |
| ARSENIC                                 | 0.39 | 2.4                 | B                   | 2.1                 | B | 1.9           | B |
| COPPER                                  | 100  | 13.3                |                     | 13.4                |   | 9.5           |   |
| LEAD                                    | 11   | <b>142</b>          |                     | <b>60.2</b>         |   | <b>31.1</b>   |   |
| TIN                                     | 0.89 | 2.3                 | B                   | 1.8                 | B | 1.6           | B |
| ZINC                                    | 46   | 30.3                |                     | 30.8                |   | 35.2          |   |
| <b>Explosives (mg/kg)</b>               |      |                     |                     |                     |   |               |   |
| NITROGLYCERIN                           | 6.1  |                     |                     |                     |   |               |   |
| <b>XRF Field Parameters (mg/kg)</b>     |      |                     |                     |                     |   |               |   |
| LEAD                                    | 11   | <b>565</b>          |                     | <b>49</b>           |   | <b>40.333</b> |   |
| <b>Miscellaneous Parameters (s.u.)</b>  |      |                     |                     |                     |   |               |   |
| PH                                      | NA   |                     |                     | 7.5                 |   |               |   |
| <b>Miscellaneous Parameters (mg/kg)</b> |      |                     |                     |                     |   |               |   |
| TOTAL ORGANIC CARBON                    | NA   |                     |                     | 13000               |   |               |   |
| <b>Miscellaneous Parameters (%)</b>     |      |                     |                     |                     |   |               |   |
| TOTAL SOLIDS                            | NA   | 85                  |                     | 87                  |   | 86            |   |

**APPENDIX B**

**SUPPORTING DOCUMENTATION FOR  
HUMAN HEALTH RISK EVALUATION**

**Table B.1-1**  
**Identification of Human Health COPCs in Composite Surface Soil Samples from Firing Line**  
**Marine Rifle Range (MRR) - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| Chemical                  | Frequency of Detection | Minimum Non-Detect Concentration | Maximum Non-Detect Concentration | Minimum Detected Concentration | Average of All Detected Samples | Maximum Detected Concentration | Sample with Maximum Detected Concentration | Residential Direct Contact Risk-Based Screening Levels in Soil |                              | Risk-Based Screening Levels in Soil for Protection of Groundwater |         | Lowest Risk-Based Screening Level | Possible Human Health COPC? | Is Chemical Present Above Back-ground? | Human Health COPC? |
|---------------------------|------------------------|----------------------------------|----------------------------------|--------------------------------|---------------------------------|--------------------------------|--|--|------------------------------|---|---------|-----------------------------------|-----------------------------|--|--------------------|
|                           |                        |                                  |                                  |                                |                                 |                                |  | Cancer Risk (10 <sup>-6</sup> )                                | Noncancer Hazard Index (0.1) | Tap Water RSL   | MCL     |                                   |                             |  |                    |
| <b>Inorganics (mg/kg)</b> |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Antimony                  | 9/9                    | NA                               | NA                               | 0.13                           | 0.321                           | 1.4                            | X14SS004C0001                              |  | 3.1E+00                      | 6.6E-01   | 2.7E-01 | 2.7E-01                           | Y                           | Y                                      | Y                  |
| Arsenic                   | 9/9                    | NA                               | NA                               | 1.6                            | 2.67                            | 3.3                            | X14SS004C0001                              | 3.9E-01  | 2.2E+00                      | 1.3E-03   | 2.9E-01 | 1.3E-03                           | Y                           | n                                      | n                  |
| Copper                    | 9/9                    | NA                               | NA                               | 8                              | 16.8                            | 52.4                           | X14SS008C0001                              |  | 3.1E+02                      | 5.1E+01   | 4.6E+01 | 4.6E+01                           | Y                           | Y                                      | Y                  |
| Tin                       | 0/9                    | 1                                | 3.2                              | NA                             | NA                              | NA                             | NA   |  | 4.7E+03                      | 5.5E+03   |         | 4.7E+03                           | n                           |  | n                  |
| Zinc                      | 9/9                    | NA                               | NA                               | 25.1                           | 40.2                            | 66.5                           | X14SS004C0001                              |  | 2.3E+03                      | 6.8E+02   |         | 6.8E+02                           | n                           |  | n                  |
| <b>Explosives (mg/kg)</b> |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Nitroglycerin             | 1/9                    | 1.2                              | 1.2                              | 0.8                            | 0.8                             | 0.8                            | X14SS009C0001                              | 2.9E+01  | 6.1E-01                      | 1.7E-03   |         | 1.7E-03                           | Y                           |  | Y                  |
| <b>Lead (mg/kg)</b>       |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Lead-Lab                  | 9/9                    | NA                               | NA                               | 12                             | 24.5                            | 52.5                           | X14SS004C0001                              |  | 4.0E+02                      |   |         | 4.0E+02                           | n                           |  | n                  |
| Lead-XRF Field            | 9/9                    | NA                               | NA                               | 15.667                         | 27                              | 82.333                         | X14SS004C0001                              |  | 4.0E+02                      |   |         | 4.0E+02                           |                             |  |                    |

**Footnotes:**

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

1/2 the detection limit was used for B qualified data.

NA - Not applicable, statistic could not be calculated..

**Table B.1-2**  
**Identification of Human Health COPCs in Discrete Surface Soil Samples from Target Berm 1**  
**Marine Rifle Range (MRR) - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| Chemical                  | Frequency of Detection | Minimum Non-Detect Concentration | Maximum Non-Detect Concentration | Minimum Detected Concentration | Average of All Detected Samples | Maximum Detected Concentration | Sample with Maximum Detected Concentration | Residential Direct Contact Risk-Based Screening Levels in Soil |                              | Risk-Based Screening Levels in Soil for Protection of Groundwater |         | Lowest Risk-Based Screening Level | Possible Human Health COPC? | Is Chemical Present Above Back-ground? | Human Health COPC? |
|---------------------------|------------------------|----------------------------------|----------------------------------|--------------------------------|---------------------------------|--------------------------------|--|--|------------------------------|---|---------|-----------------------------------|-----------------------------|--|--------------------|
|                           |                        |                                  |                                  |                                |                                 |                                |  | Cancer Risk (10 <sup>-6</sup> )                                | Noncancer Hazard Index (0.1) | Tap Water RSL   | MCL     |                                   |                             |  |                    |
| <b>Inorganics (mg/kg)</b> |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Antimony                  | 5/5                    | NA                               | NA                               | 0.1                            | 0.13                            | 0.16                           | X14SS0390001                               |  | 3.1E+00                      | 6.6E-01   | 2.7E-01 | 2.7E-01                           | n                           |  | n                  |
| Arsenic                   | 5/5                    | NA                               | NA                               | 1.3                            | 2.52                            | 4.2                            | X14SS0220001                               | 3.9E-01  | 2.2E+00                      | 1.3E-03   | 2.9E-01 | 1.3E-03                           | Y                           | n                                      | n                  |
| Copper                    | 5/5                    | NA                               | NA                               | 9.2                            | 51.6                            | 107                            | X14SS0350001                               |  | 3.1E+02                      | 5.1E+01   | 4.6E+01 | 4.6E+01                           | Y                           | Y                                      | Y                  |
| Tin                       | 2/5                    | 1.8                              | 2.9                              | 4.1                            | 6.6                             | 9.1                            | X14SS0350001                               |  | 4.7E+03                      | 5.5E+03   |         | 4.7E+03                           | n                           |  | n                  |
| Zinc                      | 5/5                    | NA                               | NA                               | 18.6                           | 25.1                            | 33.3                           | X14SS0350001                               |  | 2.3E+03                      | 6.8E+02   |         | 6.8E+02                           | n                           |  | n                  |
| <b>Lead (mg/kg)</b>       |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Lead-Lab                  | 5/5                    | NA                               | NA                               | 9.6                            | 222                             | 543                            | X14SS0350001                               |  | 4.0E+02                      |   |         | 4.0E+02                           | Y                           | Y                                      | Y                  |
| Lead-XRF Field            | 35/35                  | NA                               | NA                               | 11.667                         | 120                             | 540.333                        | X14SS0350001                               |  | 4.0E+02                      |   |         | 4.0E+02                           |                             |  |                    |
| Lead-XRF Calc.            | 35/35                  | NA                               | NA                               | 29.383                         | 120                             | 468.177                        | X14SS0350001                               |  | 4.0E+02                      |   |         | 4.0E+02                           |                             |  |                    |

**Footnotes:**

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.  
1/2 the detection limit was used for B qualified data.  
NA - Not applicable, statistic could not be calculated..

**Table B.1-3**  
**Identification of Human Health COPCs in Discrete Surface Soil Samples from Target Berm 2**  
**Marine Rifle Range (MRR) - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| Chemical                  | Frequency of Detection | Minimum Non-Detect Concentration | Maximum Non-Detect Concentration | Minimum Detected Concentration | Average of All Detected Samples | Maximum Detected Concentration | Sample with Maximum Detected Concentration | Residential Direct Contact Risk-Based Screening Levels in Soil |                              | Risk-Based Screening Levels in Soil for Protection of Groundwater |         | Lowest Risk-Based Screening Level | Possible Human Health COPC? | Is Chemical Present Above Back-ground? | Human Health COPC? |
|---------------------------|------------------------|----------------------------------|----------------------------------|--------------------------------|---------------------------------|--------------------------------|--|--|------------------------------|---|---------|-----------------------------------|-----------------------------|--|--------------------|
|                           |                        |                                  |                                  |                                |                                 |                                |  | Cancer Risk (10 <sup>-6</sup> )                                | Noncancer Hazard Index (0.1) | Tap Water RSL   | MCL     |                                   |                             |  |                    |
| <b>Inorganics (mg/kg)</b> |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Antimony                  | 4/5                    | 0.11                             | 0.11                             | 0.13                           | 0.148                           | 0.17                           | X14SS0620001                               |  | 3.1E+00                      | 6.6E-01   | 2.7E-01 | 2.7E-01                           | n                           |  | n                  |
| Arsenic                   | 5/5                    | NA                               | NA                               | 1.6                            | 2.56                            | 3.3                            | X14SS0720001                               | 3.9E-01  | 2.2E+00                      | 1.3E-03   | 2.9E-01 | 1.3E-03                           | Y                           | n                                      | n                  |
| Copper                    | 5/5                    | NA                               | NA                               | 14.6                           | 51.7                            | 88.6                           | X14SS0580001                               |  | 3.1E+02                      | 5.1E+01   | 4.6E+01 | 4.6E+01                           | Y                           | Y                                      | Y                  |
| Tin                       | 1/5                    | 2                                | 3                                | 10.1                           | 10.1                            | 10.1                           | X14SS0580001                               |  | 4.7E+03                      | 5.5E+03   |         | 4.7E+03                           | n                           |  | n                  |
| Zinc                      | 5/5                    | NA                               | NA                               | 18.2                           | 28.6                            | 35.2                           | X14SS0620001                               |  | 2.3E+03                      | 6.8E+02   |         | 6.8E+02                           | n                           |  | n                  |
| <b>Lead (mg/kg)</b>       |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Lead-Lab                  | 5/5                    | NA                               | NA                               | 85.7                           | 288                             | 606                            | X14SS0580001                               |  | 4.0E+02                      |   |         | 4.0E+02                           | Y                           | Y                                      | Y                  |
| Lead-XRF Field            | 35/35                  | NA                               | NA                               | 21.333                         | 298                             | 783.667                        | X14SS0660001                               |  | 4.0E+02                      |   |         | 4.0E+02                           |                             |  |                    |
| Lead-XRF Calc.            | 35/35                  | NA                               | NA                               | 37.407                         | 267                             | 670.143                        | X14SS0660001                               |  | 4.0E+02                      |   |         | 4.0E+02                           |                             |  |                    |

**Footnotes:**

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.  
 1/2 the detection limit was used for B qualified data.  
 NA - Not applicable, statistic could not be calculated..

**Table B.1-4**  
**Identification of Human Health COPCs in Discrete Surface Soil Samples from Hillside Impact Area**  
**Marine Rifle Range (MRR) - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| Chemical                  | Frequency of Detection | Minimum Non-Detect Concentration | Maximum Non-Detect Concentration | Minimum Detected Concentration | Average of All Detected Samples | Maximum Detected Concentration | Sample with Maximum Detected Concentration | Residential Direct Contact Risk-Based Screening Levels in Soil |                              | Risk-Based Screening Levels in Soil for Protection of Groundwater |         | Lowest Risk-Based Screening Level | Possible Human Health COPC? | Is Chemical Present Above Back-ground? | Human Health COPC? |
|---------------------------|------------------------|----------------------------------|----------------------------------|--------------------------------|---------------------------------|--------------------------------|--|--|------------------------------|---|---------|-----------------------------------|-----------------------------|--|--------------------|
|                           |                        |                                  |                                  |                                |                                 |                                |  | Cancer Risk (10 <sup>-6</sup> )                                | Noncancer Hazard Index (0.1) | Tap Water RSL   | MCL     |                                   |                             |  |                    |
| <b>Inorganics (mg/kg)</b> |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Antimony                  | 5/17                   | 0.02                             | 0.32                             | 0.12                           | 0.188                           | 0.32                           | X14SS1340001                               |  | 3.1E+00                      | 6.6E-01   | 2.7E-01 | 2.7E-01                           | Y                           | n                                      | n                  |
| Arsenic                   | 16/17                  | 1.6                              | 1.6                              | 1.1                            | 3.28                            | 7.3                            | X14SS1340001                               | 3.9E-01  | 2.2E+00                      | 1.3E-03   | 2.9E-01 | 1.3E-03                           | Y                           | n                                      | n                  |
| Copper                    | 17/17                  | NA                               | NA                               | 8.6                            | 58.9                            | 276                            | X14SS1200001                               |  | 3.1E+02                      | 5.1E+01   | 4.6E+01 | 4.6E+01                           | Y                           | Y                                      | Y                  |
| Tin                       | 11/17                  | 0.49                             | 1.7                              | 1.6                            | 15.7                            | 81.8                           | X14SS1400001                               |  | 4.7E+03                      | 5.5E+03   |         | 4.7E+03                           | n                           |  | n                  |
| Zinc                      | 17/17                  | NA                               | NA                               | 7                              | 28.3                            | 60.3                           | X14SS1320001                               |  | 2.3E+03                      | 6.8E+02   |         | 6.8E+02                           | n                           |  | n                  |
| <b>Lead (mg/kg)</b>       |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Lead-Lab                  | 16/17                  | 11                               | 11                               | 17.9                           | 316                             | 904                            | X14SS1340001                               |  | 4.0E+02                      |   |         | 4.0E+02                           | Y                           | Y                                      | Y                  |
| Lead-XRF Field            | 64/64                  | NA                               | NA                               | 19.333                         | 1980                            | 19878                          | X14SS1020001                               |  | 4.0E+02                      |   |         | 4.0E+02                           |                             |  |                    |
| Lead-XRF Calc.            | 44/44                  | NA                               | NA                               | 35.747                         | 384                             | 2363.343                       | X14SS1280001                               |  | 4.0E+02                      |   |         | 4.0E+02                           |                             |  |                    |

**Footnotes:**

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.  
1/2 the detection limit was used for B qualified data.  
NA - Not applicable, statistic could not be calculated..

**Table B.1-5**  
**Identification of Human Health COPCs in Discrete Subsurface Soil Samples from Hillside Impact Area**  
**Marine Rifle Range (MRR) - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| Chemical                  | Frequency of Detection | Minimum Non-Detect Concentration | Maximum Non-Detect Concentration | Minimum Detected Concentration | Average of All Detected Samples | Maximum Detected Concentration | Sample with Maximum Detected Concentration | Residential Direct Contact Risk-Based Screening Levels in Soil |                              | Risk-Based Screening Levels in Soil for Protection of Groundwater |         | Lowest Risk-Based Screening Level | Possible Human Health COPC? | Is Chemical Present Above Back-ground? | Human Health COPC? |
|---------------------------|------------------------|----------------------------------|----------------------------------|--------------------------------|---------------------------------|--------------------------------|--|--|------------------------------|---|---------|-----------------------------------|-----------------------------|--|--------------------|
|                           |                        |                                  |                                  |                                |                                 |                                |  | Cancer Risk (10 <sup>-6</sup> )                                | Noncancer Hazard Index (0.1) | Tap Water RSL   | MCL     |                                   |                             |  |                    |
| <b>Inorganics (mg/kg)</b> |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Antimony                  | 0/3                    | 0.18                             | 0.88                             | NA                             | NA                              | NA                             | NA   |  | 3.1E+00                      | 6.6E-01   | 2.7E-01 | 2.7E-01                           | n                           |  | n                  |
| Arsenic                   | 3/3                    | NA                               | NA                               | 2.2                            | 4                               | 7.8                            | X14SB0840102                               | 3.9E-01  | 2.2E+00                      | 1.3E-03   | 2.9E-01 | 1.3E-03                           | Y                           | n                                      | n                  |
| Copper                    | 3/3                    | NA                               | NA                               | 113                            | 335                             | 849                            | X14SB0840102                               |  | 3.1E+02                      | 5.1E+01   | 4.6E+01 | 4.6E+01                           | Y                           | Y                                      | Y                  |
| Tin                       | 3/3                    | NA                               | NA                               | 29.3                           | 90.9                            | 139                            | X14SB1110102                               |  | 4.7E+03                      | 5.5E+03   |         | 4.7E+03                           | n                           |  | n                  |
| Zinc                      | 3/3                    | NA                               | NA                               | 9.8                            | 27.4                            | 53.9                           | X14SB0840102                               |  | 2.3E+03                      | 6.8E+02   |         | 6.8E+02                           | n                           |  | n                  |
| <b>Lead (mg/kg)</b>       |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Lead-Lab                  | 3/3                    | NA                               | NA                               | 1220                           | 2990                            | 6620                           | X14SB0840102                               |  | 4.0E+02                      |   |         | 4.0E+02                           | Y                           | Y                                      | Y                  |
| Lead-XRF Field            | 4/4                    | NA                               | NA                               | 357.667                        | 3380                            | 8931                           | X14SB1020102                               |  | 4.0E+02                      |   |         | 4.0E+02                           |                             |  |                    |
| Lead-XRF Calc.            | 1/1                    | NA                               | NA                               | 316.563                        | 317                             | 316.563                        | X14SB0840102, X14SB0840102-D               |  | 4.0E+02                      |   |         | 4.0E+02                           |                             |  |                    |

**Footnotes:**

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

1/2 the detection limit was used for B qualified data.

NA - Not applicable, statistic could not be calculated.

**Table B.1-6**  
**Risks and Hazard Indices for Direct Contact Exposures to Composite Surface Soil Samples from Firing Lines**  
**Marine Rifle Range (MRR) - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
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| Chemical                  | Average of All Detected Samples | Maximum Detected Concentration | Human Health COPC? | Residential Direct Contact Risk-Based Concentration in Soil |                            | Residential Risk/ Hazard Index Screening |                         | Non-residential Direct Contact Risk-Based Concentration in Soil |                            | Non-residential Risk/ Hazard Index Screening |                         |
|---------------------------|---------------------------------|--------------------------------|--------------------|---|----------------------------|--|-------------------------|---|----------------------------|--|-------------------------|
|                           |                                 |                                |                    | Based on Cancer Risk of 10 <sup>-6</sup>                    | Based on Hazard Index of 1 | Calculated Cancer Risk                   | Calculated Hazard Index | Based on Cancer Risk of 10 <sup>-6</sup>                        | Based on Hazard Index of 1 | Calculated Cancer Risk                       | Calculated Hazard Index |
| <b>Inorganics (mg/kg)</b> |                                 |                                |                    |   |                            |  |                         |   |                            |  |                         |
| Antimony                  | 0.321                           | 1.4                            | Y                  |   | 3.1E+01                    |  | 4.5E-02                 |   | 4.1E+02                    |  | 3.4E-03                 |
| Copper                    | 16.8                            | 52.4                           | Y                  |   | 3.1E+03                    |  | 1.7E-02                 |   | 4.1E+04                    |  | 1.3E-03                 |
| <b>Explosives (mg/kg)</b> |                                 |                                |                    |   |                            |  |                         |   |                            |  |                         |
| Nitroglycerin             | 0.8                             | 0.8                            | Y                  | 2.9E+01   | 6.1E+00                    | 2.8E-08                                  | 1.3E-01                 | 1.0E+02   | 6.2E+01                    | 8.0E-09                                      | 1.3E-02                 |
| <b>Total</b>              |                                 |                                |                    |   |                            | 2.8E-08                                  | 1.9E-01                 |   |                            | 8.0E-09                                      | 1.8E-02                 |

**Footnotes:**

NA - Not applicable, statistic could not be calculated.

**Table B.1-7**  
**Risks and Hazard Indices for Direct Contact Exposures to Discrete Surface Soil Samples from Target Berm 1**  
**Marine Rifle Range (MRR) - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
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| Chemical                  | Average of All Detected Samples | Maximum Detected Concentration | Human Health COPC? | Residential Direct Contact Risk-Based Concentration in Soil |                            | Residential Risk/ Hazard Index Screening |                         | Non-residential Direct Contact Risk-Based Concentration in Soil |                            | Non-residential Risk/ Hazard Index Screening |                         |
|---------------------------|---------------------------------|--------------------------------|--------------------|---|----------------------------|--|-------------------------|---|----------------------------|--|-------------------------|
|                           |                                 |                                |                    | Based on Cancer Risk of 10 <sup>-6</sup>                    | Based on Hazard Index of 1 | Calculated Cancer Risk                   | Calculated Hazard Index | Based on Cancer Risk of 10 <sup>-6</sup>                        | Based on Hazard Index of 1 | Calculated Cancer Risk                       | Calculated Hazard Index |
| <b>Inorganics (mg/kg)</b> |                                 |                                |                    |   |                            |  |                         |   |                            |  |                         |
| Copper                    | 51.6                            | 107                            | Y                  |   | 3.1E+03                    |  | 3.5E-02                 |   | 4.1E+04                    |  | 2.6E-03                 |
| <b>Total</b>              |                                 |                                |                    |   |                            | 0.0E+00                                  | 3.5E-02                 |   |                            | 0.0E+00                                      | 2.6E-03                 |

**Footnotes:**

NA - Not applicable, statistic could not be calculated.

**Table B.1-8**  
**Evaluation of Direct Contact Exposures to Lead in Discrete Surface Soil Samples from Target Berm 1**  
**Marine Rifle Range (MRR) - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
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| Chemical            | Average of All Detected Samples | Maximum Detected Concentration | Human Health COPC? | Residential Direct Contact Risk-Based Concentration in Soil |                     | Non-residential Direct Contact Risk-Based Concentration in Soil |                     |
|---------------------|---------------------------------|--------------------------------|--------------------|---|---------------------|---|---------------------|
|                     |                                 |                                |                    | Value   | Max. Exceeds Value? | Value   | Max. Exceeds Value? |
| <b>Lead (mg/kg)</b> |                                 |                                |                    |   |                     |   |                     |
| Lead-Lab            | 222                             | 543                            | Y                  | 4.0E+02   | Y                   | 8.0E+02   | n                   |

**Table B.1-9**  
**Risks and Hazard Indices for Direct Contact Exposures to Discrete Surface Soil Samples from Target Berm 2**  
**Marine Rifle Range (MRR) - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
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| Chemical                  | Average of All Detected Samples | Maximum Detected Concentration | Human Health COPC? | Residential Direct Contact Risk-Based Concentration in Soil |                            | Residential Risk/ Hazard Index Screening |                         | Non-residential Direct Contact Risk-Based Concentration in Soil |                            | Non-residential Risk/ Hazard Index Screening |                         |
|---------------------------|---------------------------------|--------------------------------|--------------------|---|----------------------------|--|-------------------------|---|----------------------------|--|-------------------------|
|                           |                                 |                                |                    | Based on Cancer Risk of 10 <sup>-6</sup>                    | Based on Hazard Index of 1 | Calculated Cancer Risk                   | Calculated Hazard Index | Based on Cancer Risk of 10 <sup>-6</sup>                        | Based on Hazard Index of 1 | Calculated Cancer Risk                       | Calculated Hazard Index |
| <b>Inorganics (mg/kg)</b> |                                 |                                |                    |   |                            |  |                         |   |                            |  |                         |
| Copper                    | 51.7                            | 88.6                           | Y                  |   | 3.1E+03                    |  | 2.9E-02                 |   | 4.1E+04                    |  | 2.2E-03                 |
| <b>Total</b>              |                                 |                                |                    |   |                            | 0.0E+00                                  | 2.9E-02                 |   |                            | 0.0E+00                                      | 2.2E-03                 |

**Footnotes:**

NA - Not applicable, statistic could not be calculated.

**Table B.1-10**  
**Evaluation of Direct Contact Exposures to Lead in Discrete Surface Soil Samples from Target Berm 2**  
**Marine Rifle Range (MRR) - UXO 14**  
**Site Inspection**  
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| Chemical            | Average of All Detected Samples | Maximum Detected Concentration | Human Health COPC? | Residential Direct Contact Risk-Based Concentration in Soil |                     | Non-residential Direct Contact Risk-Based Concentration in Soil |                     |
|---------------------|---------------------------------|--------------------------------|--------------------|---|---------------------|---|---------------------|
|                     |                                 |                                |                    | Value   | Max. Exceeds Value? | Value   | Max. Exceeds Value? |
| <b>Lead (mg/kg)</b> |                                 |                                |                    |   |                     |   |                     |
| Lead-Lab            | 288                             | 606                            | Y                  | 4.0E+02   | Y                   | 8.0E+02   | n                   |

**Table B.1-11**  
**Risks and Hazard Indices for Direct Contact Exposures to Discrete Surface Soil Samples from Hillside Impact Area**  
**Marine Rifle Range (MRR) - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
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| Chemical                  | Average of All Detected Samples | Maximum Detected Concentration | Human Health COPC? | Residential Direct Contact Risk-Based Concentration in Soil |                            | Residential Risk/ Hazard Index Screening |                         | Non-residential Direct Contact Risk-Based Concentration in Soil |                            | Non-residential Risk/ Hazard Index Screening |                         |
|---------------------------|---------------------------------|--------------------------------|--------------------|---|----------------------------|--|-------------------------|---|----------------------------|--|-------------------------|
|                           |                                 |                                |                    | Based on Cancer Risk of 10 <sup>-6</sup>                    | Based on Hazard Index of 1 | Calculated Cancer Risk                   | Calculated Hazard Index | Based on Cancer Risk of 10 <sup>-6</sup>                        | Based on Hazard Index of 1 | Calculated Cancer Risk                       | Calculated Hazard Index |
| <b>Inorganics (mg/kg)</b> |                                 |                                |                    |   |                            |  |                         |   |                            |  |                         |
| Copper                    | 58.9                            | 276                            | Y                  |   | 3.1E+03                    |  | 8.9E-02                 |   | 4.1E+04                    |  | 6.7E-03                 |
| <b>Total</b>              |                                 |                                |                    |   |                            | 0.0E+00                                  | 8.9E-02                 |   |                            | 0.0E+00                                      | 6.7E-03                 |

**Footnotes:**

NA - Not applicable, statistic could not be calculated.

**Table B.1-12**  
**Evaluation of Direct Contact Exposures to Lead in Discrete Surface Soil Samples from Hillside Impact Area**  
**Marine Rifle Range (MRR) - UXO 14**  
**Site Inspection**  
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| Chemical            | Average of All Detected Samples | Maximum Detected Concentration | Human Health COPC? | Residential Direct Contact Risk-Based Concentration in Soil |                     | Non-residential Direct Contact Risk-Based Concentration in Soil |                     |
|---------------------|---------------------------------|--------------------------------|--------------------|---|---------------------|---|---------------------|
|                     |                                 |                                |                    | Value   | Max. Exceeds Value? | Value   | Max. Exceeds Value? |
| <b>Lead (mg/kg)</b> |                                 |                                |                    |   |                     |   |                     |
| Lead-Lab            | 316                             | 904                            | Y                  | 4.0E+02   | Y                   | 8.0E+02   | Y                   |

**Table B.1-13**  
**Risks and Hazard Indices for Direct Contact Exposures to Discrete Subsurface Soil Samples from Hillside Impact Area**  
**Marine Rifle Range (MRR) - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
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| Chemical                  | Average of All Detected Samples | Maximum Detected Concentration | Human Health COPC? | Residential Direct Contact Risk-Based Concentration in Soil |                            | Residential Risk/ Hazard Index Screening |                         | Non-residential Direct Contact Risk-Based Concentration in Soil |                            | Non-residential Risk/ Hazard Index Screening |                         |
|---------------------------|---------------------------------|--------------------------------|--------------------|---|----------------------------|--|-------------------------|---|----------------------------|--|-------------------------|
|                           |                                 |                                |                    | Based on Cancer Risk of 10 <sup>-6</sup>                    | Based on Hazard Index of 1 | Calculated Cancer Risk                   | Calculated Hazard Index | Based on Cancer Risk of 10 <sup>-6</sup>                        | Based on Hazard Index of 1 | Calculated Cancer Risk                       | Calculated Hazard Index |
| <b>Inorganics (mg/kg)</b> |                                 |                                |                    |   |                            |  |                         |   |                            |  |                         |
| Copper                    | 335                             | 849                            | Y                  |   | 3.1E+03                    |  | 2.7E-01                 |   | 4.1E+04                    |  | 2.1E-02                 |
| <b>Total</b>              |                                 |                                |                    |   |                            | 0.0E+00                                  | 2.7E-01                 |   |                            | 0.0E+00                                      | 2.1E-02                 |

**Footnotes:**

NA - Not applicable, statistic could not be calculated.

**Table B.1-14**  
**Evaluation of Direct Contact Exposures to Lead in Discrete Subsurface Soil Samples from Hillside Impact Area**  
**Marine Rifle Range (MRR) - UXO 14**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| Chemical            | Average of All Detected Samples | Maximum Detected Concentration | Human Health COPC? | Residential Direct Contact Risk-Based Concentration in Soil |                     | Non-residential Direct Contact Risk-Based Concentration in Soil |                     |
|---------------------|---------------------------------|--------------------------------|--------------------|---|---------------------|---|---------------------|
|                     |                                 |                                |                    | Value   | Max. Exceeds Value? | Value   | Max. Exceeds Value? |
| <b>Lead (mg/kg)</b> |                                 |                                |                    |   |                     |   |                     |
| Lead-Lab            | 2990                            | 6620                           | Y                  | 4.0E+02   | Y                   | 8.0E+02   | Y                   |

**Table B.2-1**  
**Identification of Human Health COPCs in Composite Surface Soil Samples**  
**Old Skeet and Trap Range (OSTR) - UXO 15**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| Chemical                  | Frequency of Detection | Minimum Non-Detect Concentration | Maximum Non-Detect Concentration | Minimum Detected Concentration | Average of All Detected Samples | Maximum Detected Concentration | Sample with Maximum Detected Concentration | Residential Direct Contact Risk-Based Screening Levels in Soil |                              | Risk-Based Screening Levels in Soil for Protection of Groundwater |         | Lowest Risk-Based Screening Level | Possible Human Health COPC? | Is Chemical Present Above Back-ground? | Human Health COPC? |
|---------------------------|------------------------|----------------------------------|----------------------------------|--------------------------------|---------------------------------|--------------------------------|--|--|------------------------------|---|---------|-----------------------------------|-----------------------------|--|--------------------|
|                           |                        |                                  |                                  |                                |                                 |                                |  | Cancer Risk (10 <sup>-6</sup> )                                | Noncancer Hazard Index (0.1) | Tap Water RSL   | MCL     |                                   |                             |  |                    |
| <b>Inorganics (mg/kg)</b> |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Antimony                  | 2/2                    | NA                               | NA                               | 0.46                           | 0.57                            | 0.68                           | X15SS077C0001                              |  | 3.1E+00                      | 6.6E-01   | 2.7E-01 | 2.7E-01                           | Y                           | Y                                      | Y                  |
| Arsenic                   | 2/2                    | NA                               | NA                               | 2.6                            | 2.65                            | 2.7                            | X15SS078C0001                              | 3.9E-01  | 2.2E+00                      | 1.3E-03   | 2.9E-01 | 1.3E-03                           | Y                           | n                                      | n                  |
| Copper                    | 2/2                    | NA                               | NA                               | 14.8                           | 19.1                            | 23.3                           | X15SS077C0001                              |  | 3.1E+02                      | 5.1E+01   | 4.6E+01 | 4.6E+01                           | n                           |  | n                  |
| Tin                       | 0/2                    | 1.7                              | 1.8                              | NA                             | NA                              | NA                             | NA   |  | 4.7E+03                      | 5.5E+03   |         | 4.7E+03                           | n                           |  | n                  |
| Zinc                      | 2/2                    | NA                               | NA                               | 52.5                           | 53.5                            | 54.4                           | X15SS078C0001                              |  | 2.3E+03                      | 6.8E+02   |         | 6.8E+02                           | n                           |  | n                  |
| <b>Explosives (mg/kg)</b> |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Nitroglycerin             | 2/2                    | NA                               | NA                               | 0.49                           | 2.1                             | 3.7                            | X15SS077C0001                              | 2.9E+01  | 6.1E-01                      | 1.7E-03   |         | 1.7E-03                           | Y                           |  | Y                  |
| <b>Lead (mg/kg)</b>       |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Lead-Lab                  | 2/2                    | NA                               | NA                               | 66.7                           | 72                              | 77.2                           | X15SS078C0001                              |  | 4.0E+02                      |   |         | 4.0E+02                           | n                           |  | n                  |
| Lead-XRF Field            | 2/2                    | NA                               | NA                               | 67.667                         | 74.5                            | 81.333                         | X15SS078C0001                              |  | 4.0E+02                      |   |         | 4.0E+02                           |                             |  |                    |

**Footnotes:**

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

1/2 the detection limit was used for B qualified data.

NA - Not applicable, statistic could not be calculated..

**Table B.2-2**  
**Identification of Human Health COPCs in Discrete Surface Soil Samples**  
**Old Skeet and Trap Range (OSTR) - UXO 15**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| Chemical                  | Frequency of Detection | Minimum Non-Detect Concentration | Maximum Non-Detect Concentration | Minimum Detected Concentration | Average of All Detected Samples | Maximum Detected Concentration | Sample with Maximum Detected Concentration | Residential Direct Contact Risk-Based Screening Levels in Soil |                              | Risk-Based Screening Levels in Soil for Protection of Groundwater |         | Lowest Risk-Based Screening Level | Possible Human Health COPC? | Is Chemical Present Above Back-ground? | Human Health COPC? |
|---------------------------|------------------------|----------------------------------|----------------------------------|--------------------------------|---------------------------------|--------------------------------|--|--|------------------------------|---|---------|-----------------------------------|-----------------------------|--|--------------------|
|                           |                        |                                  |                                  |                                |                                 |                                |  | Cancer Risk (10 <sup>-6</sup> )                                | Noncancer Hazard Index (0.1) | Tap Water RSL   | MCL     |                                   |                             |  |                    |
| <b>Inorganics (mg/kg)</b> |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Antimony                  | 14/14                  | NA                               | NA                               | 0.16                           | 0.883                           | 4.8                            | X15SS0640001                               |  | 3.1E+00                      | 6.6E-01   | 2.7E-01 | 2.7E-01                           | Y                           | Y                                      | Y                  |
| Arsenic                   | 14/14                  | NA                               | NA                               | 1.6                            | 3.31                            | 7.2                            | X15SS0070001                               | 3.9E-01  | 2.2E+00                      | 1.3E-03   | 2.9E-01 | 1.3E-03                           | Y                           | n                                      | n                  |
| Copper                    | 14/14                  | NA                               | NA                               | 5.4                            | 13.3                            | 37.6                           | X15SS0680001                               |  | 3.1E+02                      | 5.1E+01   | 4.6E+01 | 4.6E+01                           | n                           | n                                      | n                  |
| Tin                       | 0/14                   | 1.2                              | 3.9                              | NA                             | NA                              | NA                             | NA   |  | 4.7E+03                      | 5.5E+03   |         | 4.7E+03                           | n                           | n                                      | n                  |
| Zinc                      | 14/14                  | NA                               | NA                               | 25.1                           | 35.5                            | 53.3                           | X15SS0680001                               |  | 2.3E+03                      | 6.8E+02   |         | 6.8E+02                           | n                           | n                                      | n                  |
| <b>PAHs (ug/kg)</b>       |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| 1-Methylnaphthalene       | 7/18                   | 23                               | 10000                            | 5.4                            | 95.6                            | 230                            | X15SS0520001                               | 2.2E+04  | 5.5E+05                      | 1.5E+01   |         | 1.5E+01                           | Y                           | Y                                      | Y                  |
| 2-Methylnaphthalene       | 10/18                  | 24                               | 10000                            | 9.2                            | 71                              | 230                            | X15SS0150001                               |  | 3.1E+04                      | 9.0E+02   |         | 9.0E+02                           | n                           | n                                      | n                  |
| Acenaphthene              | 15/18                  | 24                               | 26                               | 4.2                            | 1400                            | 5000                           | X15SS0380001                               |  | 3.4E+05                      | 2.7E+04   |         | 2.7E+04                           | n                           | n                                      | n                  |
| Acenaphthylene            | 0/18                   | 23                               | 27                               | NA                             | NA                              | NA                             | NA   |  | 3.4E+05                      | 2.7E+04   |         | 2.7E+04                           | n                           | n                                      | n                  |
| Anthracene                | 15/18                  | 25                               | 27                               | 1.9                            | 1940                            | 7200                           | X15SS0380001                               |  | 1.7E+06                      | 4.5E+05   |         | 4.5E+05                           | n                           | n                                      | n                  |
| Benzo(a)anthracene        | 18/18                  | NA                               | NA                               | 20                             | 8340                            | 33000                          | X15SS0530001                               | 1.5E+02  |                              | 1.4E+01   |         | 1.4E+01                           | Y                           | Y                                      | Y                  |
| Benzo(a)pyrene            | 18/18                  | NA                               | NA                               | 18                             | 10700                           | 42000                          | X15SS0530001                               | 1.5E+01  |                              | 4.6E+00   | 3.2E+02 | 4.6E+00                           | Y                           | Y                                      | Y                  |
| Benzo(b)fluoranthene      | 18/18                  | NA                               | NA                               | 24                             | 10700                           | 41000                          | X15SS0530001                               | 1.5E+02  |                              | 4.7E+01   |         | 4.7E+01                           | Y                           | Y                                      | Y                  |
| Benzo(g,h,i)perylene      | 18/18                  | NA                               | NA                               | 13                             | 6290                            | 25000                          | X15SS0530001                               |  | 1.7E+05                      | 1.5E+05   |         | 1.5E+05                           | n                           | n                                      | n                  |
| Benzo(k)fluoranthene      | 18/18                  | NA                               | NA                               | 11                             | 4500                            | 18000                          | X15SS0380001                               | 1.5E+03  |                              | 4.6E+02   |         | 4.6E+02                           | Y                           | Y                                      | Y                  |
| Chrysene                  | 18/18                  | NA                               | NA                               | 13                             | 10700                           | 43000                          | X15SS0530001                               | 1.5E+04  |                              | 1.4E+03   |         | 1.4E+03                           | Y                           | Y                                      | Y                  |
| Dibenzo(a,h)anthracene    | 18/18                  | NA                               | NA                               | 7.8                            | 1950                            | 7600                           | X15SS0530001                               | 1.5E+01  |                              | 1.6E+01   |         | 1.5E+01                           | Y                           | Y                                      | Y                  |
| Fluoranthene              | 18/18                  | NA                               | NA                               | 13                             | 9720                            | 38000                          | X15SS0380001                               |  | 2.3E+05                      | 2.1E+05   |         | 2.1E+05                           | n                           | n                                      | n                  |
| Fluorene                  | 10/18                  | 24                               | 10000                            | 8.3                            | 629                             | 3100                           | X15SS0380001                               |  | 2.3E+05                      | 3.3E+04   |         | 3.3E+04                           | n                           | n                                      | n                  |
| Indeno(1,2,3-cd)pyrene    | 18/18                  | NA                               | NA                               | 11                             | 6970                            | 27000                          | X15SS0380001,<br>X15SS0530001              | 1.5E+02  |                              | 1.6E+02   |         | 1.5E+02                           | Y                           | Y                                      | Y                  |
| Naphthalene               | 7/18                   | 23                               | 10000                            | 8.6                            | 118                             | 330                            | X15SS0500001                               | 3.9E+03  | 1.5E+04                      | 5.6E-01   |         | 5.6E-01                           | Y                           | Y                                      | Y                  |
| Phenanthrene              | 18/18                  | NA                               | NA                               | 5.4                            | 6820                            | 30000                          | X15SS0380001                               |  | 1.7E+05                      | 1.5E+05   |         | 1.5E+05                           | n                           | n                                      | n                  |
| Pyrene                    | 18/18                  | NA                               | NA                               | 11                             | 11400                           | 45000                          | X15SS0380001                               |  | 1.7E+05                      | 1.5E+05   |         | 1.5E+05                           | n                           | n                                      | n                  |
| <b>Lead (mg/kg)</b>       |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Lead-Lab                  | 14/14                  | NA                               | NA                               | 32                             | 320                             | 940                            | X15SS0640001                               |  | 4.0E+02                      |   |         | 4.0E+02                           | Y                           | Y                                      | Y                  |
| Lead-XRF Field            | 72/72                  | NA                               | NA                               | 20.333                         | 188                             | 1260.333                       | X15SS0740001                               |  | 4.0E+02                      |   |         | 4.0E+02                           |                             |  |                    |
| Lead-XRF Calc.            | 72/72                  | NA                               | NA                               | 40.047                         | 164                             | 957.647                        | X15SS0740001                               |  | 4.0E+02                      |   |         | 4.0E+02                           |                             |  |                    |

**Footnotes:**

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

1/2 the detection limit was used for B qualified data.

NA - Not applicable, statistic could not be calculated..

**Table B.2-3**  
**Identification of Human Health COPCs in Discrete Subsurface Soil Samples**  
**Old Skeet and Trap Range (OSTR) - UXO 15**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| Chemical                  | Frequency of Detection | Minimum Non-Detect Concentration | Maximum Non-Detect Concentration | Minimum Detected Concentration | Average of All Detected Samples | Maximum Detected Concentration | Sample with Maximum Detected Concentration | Residential Direct Contact Risk-Based Screening Levels in Soil |                              | Risk-Based Screening Levels in Soil for Protection of Groundwater |                | Lowest Risk-Based Screening Level | Possible Human Health COPC? | Is Chemical Present Above Back-ground? | Human Health COPC? |
|---------------------------|------------------------|----------------------------------|----------------------------------|--------------------------------|---------------------------------|--------------------------------|--|--|------------------------------|---|----------------|-----------------------------------|-----------------------------|--|--------------------|
|                           |                        |                                  |                                  |                                |                                 |                                |  | Cancer Risk (10 <sup>-6</sup> )                                | Noncancer Hazard Index (0.1) | Tap Water RSL   | MCL            |                                   |                             |  |                    |
| <b>Inorganics (mg/kg)</b> |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |                |                                   |                             |  |                    |
| Antimony                  | 1/1                    | NA                               | NA                               | 0.11                           | 0.11                            | 0.11                           | X15SB0050102                               |  | 3.1E+00                      | 6.6E-01   | 2.7E-01        | 2.7E-01                           | n                           |  | n                  |
| Arsenic                   | 1/1                    | NA                               | NA                               | 4.1                            | 4.1                             | 4.1                            | X15SB0050102                               | <b>3.9E-01</b>   | <b>2.2E+00</b>               | <b>1.3E-03</b>  | <b>2.9E-01</b> | <b>1.3E-03</b>                    | Y                           | n                                      | n                  |
| Copper                    | 1/1                    | NA                               | NA                               | 10.1                           | 10.1                            | 10.1                           | X15SB0050102                               |  | 3.1E+02                      | 5.1E+01   | 4.6E+01        | 4.6E+01                           | n                           |  | n                  |
| Tin                       | 0/1                    | 1.2                              | 1.2                              | NA                             | NA                              | NA                             | NA   |  | 4.7E+03                      | 5.5E+03   |                | 4.7E+03                           | n                           |  | n                  |
| Zinc                      | 1/1                    | NA                               | NA                               | 37.6                           | 37.6                            | 37.6                           | X15SB0050102                               |  | 2.3E+03                      | 6.8E+02   |                | 6.8E+02                           | n                           |  | n                  |
| <b>Lead (mg/kg)</b>       |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |                |                                   |                             |  |                    |
| Lead-Lab                  | 1/1                    | NA                               | NA                               | 12.2                           | 12.2                            | 12.2                           | X15SB0050102                               |  | 4.0E+02                      |   |                | 4.0E+02                           | n                           |  | n                  |
| Lead-XRF Field            | 6/6                    | NA                               | NA                               | 14.667                         | 37.6                            | 85.333                         | X15SB0070102                               |  | 4.0E+02                      |   |                | 4.0E+02                           |                             |  |                    |
| Lead-XRF Calc.            | 6/6                    | NA                               | NA                               | 35.853                         | 52.8                            | 88.147                         | X15SB0070102                               |  | 4.0E+02                      |   |                | 4.0E+02                           |                             |  |                    |

**Footnotes:**

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.  
1/2 the detection limit was used for B qualified data.  
NA - Not applicable, statistic could not be calculated..

**Table B.2-4**  
**Risks and Hazard Indices for Direct Contact Exposures to Composite Surface Soil Samples**  
**Old Skeet and Trap Range (OSTR) - UXO 15**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| Chemical                  | Average of All Detected Samples | Maximum Detected Concentration | Human Health COPC? | Residential Direct Contact Risk-Based Concentration in Soil |                            | Residential Risk/ Hazard Index Screening |                         | Non-residential Direct Contact Risk-Based Concentration in Soil |                            | Non-residential Risk/ Hazard Index Screening |                         |
|---------------------------|---------------------------------|--------------------------------|--------------------|---|----------------------------|--|-------------------------|---|----------------------------|--|-------------------------|
|                           |                                 |                                |                    | Based on Cancer Risk of 10 <sup>-6</sup>                    | Based on Hazard Index of 1 | Calculated Cancer Risk                   | Calculated Hazard Index | Based on Cancer Risk of 10 <sup>-6</sup>                        | Based on Hazard Index of 1 | Calculated Cancer Risk                       | Calculated Hazard Index |
| <b>Inorganics (mg/kg)</b> |                                 |                                |                    |   |                            |  |                         |   |                            |  |                         |
| Antimony                  | 0.57                            | 0.68                           | Y                  |   | 3.1E+01                    |  | 2.2E-02                 |   | 4.1E+02                    |  | 1.7E-03                 |
| <b>Explosives (mg/kg)</b> |                                 |                                |                    |   |                            |  |                         |   |                            |  |                         |
| Nitroglycerin             | 2.1                             | 3.7                            | Y                  | 2.9E+01   | 6.1E+00                    | 1.3E-07                                  | 6.1E-01                 | 1.0E+02   | 6.2E+01                    | 3.7E-08                                      | 6.0E-02                 |
| <b>Total</b>              |                                 |                                |                    |   |                            | 1.3E-07                                  | 6.3E-01                 |   |                            | 3.7E-08                                      | 6.1E-02                 |

**Table B.2-5**  
**Risks and Hazard Indices for Direct Contact Exposures to Discrete Surface Soil Samples**  
**Old Skeet and Trap Range (OSTR) - UXO 15**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| Chemical                  | Average of All Detected Samples | Maximum Detected Concentration | Human Health COPC? | Residential Direct Contact Risk-Based Concentration in Soil |                            | Residential Risk/ Hazard Index Screening |                                     |                                      | Non-residential Direct Contact Risk-Based Concentration in Soil |                            | Non-residential Risk/ Hazard Index Screening |                                     |                                      |
|---------------------------|---------------------------------|--------------------------------|--------------------|---|----------------------------|--|-------------------------------------|--------------------------------------|---|----------------------------|--|-------------------------------------|--------------------------------------|
|                           |                                 |                                |                    | Based on Cancer Risk of 10 <sup>-6</sup>                    | Based on Hazard Index of 1 | Calculated Cancer Risk (Using Max.)      | Calculated Cancer Risk (Using Avg.) | Calculated Hazard Index (Using Max.) | Based on Cancer Risk of 10 <sup>-6</sup>                        | Based on Hazard Index of 1 | Calculated Cancer Risk (Using Max.)          | Calculated Cancer Risk (Using Avg.) | Calculated Hazard Index (Using Max.) |
| <b>Inorganics (mg/kg)</b> |                                 |                                |                    |   |                            |  |                                     |                                      |   |                            |  |                                     |                                      |
| Antimony                  | 0.883                           | 4.8                            | Y                  |   | 3.1E+01                    |  |                                     | 1.5E-01                              |   | 4.1E+02                    |  |                                     | 1.2E-02                              |
| <b>PAHs (ug/kg)</b>       |                                 |                                |                    |   |                            |  |                                     |                                      |   |                            |  |                                     |                                      |
| 1-Methylnaphthalene       | 95.6                            | 230                            | Y                  | 2.2E+04   | 5.5E+06                    | 1.0E-08                                  | 4.3E-09                             | 4.2E-05                              | 9.9E+04   | 7.2E+07                    | 2.3E-09                                      | 9.7E-10                             | 3.2E-06                              |
| Benzo(a)anthracene        | 8340                            | 33000                          | Y                  | 1.5E+02   |                            | 2.2E-04                                  | 5.6E-05                             |                                      | 2.1E+03   |                            | 1.6E-05                                      | 4.0E-06                             |                                      |
| Benzo(a)pyrene            | 10700                           | 42000                          | Y                  | 1.5E+01   |                            | 2.8E-03                                  | 7.1E-04                             |                                      | 2.1E+02   |                            | 2.0E-04                                      | 5.1E-05                             |                                      |
| Benzo(b)fluoranthene      | 10700                           | 41000                          | Y                  | 1.5E+02   |                            | 2.7E-04                                  | 7.1E-05                             |                                      | 2.1E+03   |                            | 2.0E-05                                      | 5.1E-06                             |                                      |
| Benzo(k)fluoranthene      | 4500                            | 18000                          | Y                  | 1.5E+03   |                            | 1.2E-05                                  | 3.0E-06                             |                                      | 2.1E+04   |                            | 8.6E-07                                      | 2.1E-07                             |                                      |
| Chrysene                  | 10700                           | 43000                          | Y                  | 1.5E+04   |                            | 2.9E-06                                  | 7.1E-07                             |                                      | 2.1E+05   |                            | 2.0E-07                                      | 5.1E-08                             |                                      |
| Dibenzo(a,h)anthracene    | 1950                            | 7600                           | Y                  | 1.5E+01   |                            | 5.1E-04                                  | 1.3E-04                             |                                      | 2.1E+02   |                            | 3.6E-05                                      | 9.3E-06                             |                                      |
| Indeno(1,2,3-cd)pyrene    | 6970                            | 27000                          | Y                  | 1.5E+02   |                            | 1.8E-04                                  | 4.6E-05                             |                                      | 2.1E+03   |                            | 1.3E-05                                      | 3.3E-06                             |                                      |
| Naphthalene               | 118                             | 330                            | Y                  | 3.9E+03   | 1.5E+05                    | 8.5E-08                                  | 3.0E-08                             | 2.2E-03                              | 2.0E+04   | 6.7E+05                    | 1.7E-08                                      | 5.9E-09                             | 4.9E-04                              |
| <b>Total</b>              |                                 |                                |                    |   |                            | 4.0E-03                                  | 1.0E-03                             | 1.6E-01                              |   |                            | 2.9E-04                                      | 7.3E-05                             | 1.2E-02                              |

**Table B.2-6**  
**Evaluation of Direct Contact Exposures to Lead in Discrete Surface Soil Samples**  
**Old Skeet and Trap Range (OSTR) - UXO 15**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| Chemical            | Average of All Detected Samples | Maximum Detected Concentration | Human Health COPC? | Residential Direct Contact Risk-Based Concentration in Soil |                     | Non-residential Direct Contact Risk-Based Concentration in Soil |                     |
|---------------------|---------------------------------|--------------------------------|--------------------|---|---------------------|---|---------------------|
|                     |                                 |                                |                    | Value   | Max. Exceeds Value? | Value   | Max. Exceeds Value? |
| <b>Lead (mg/kg)</b> |                                 |                                |                    |   |                     |   |                     |
| Lead-Lab            | 320                             | 940                            | Y                  | 4.0E+02   | Y                   | 8.0E+02   | Y                   |

**Table B.3-1**  
**Identification of Human Health COPCs in Composite Surface Soil Samples**  
**Rum Point Skeet Range (RPSR) - UXO 16**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| Chemical                  | Frequency of Detection | Minimum Non-Detect Concentration | Maximum Non-Detect Concentration | Minimum Detected Concentration | Average of All Detected Samples | Maximum Detected Concentration | Sample with Maximum Detected Concentration | Residential Direct Contact Risk-Based Screening Levels in Soil |                              | Risk-Based Screening Levels in Soil for Protection of Groundwater |         | Lowest Risk-Based Screening Level | Possible Human Health COPC? | Is Chemical Present Above Back-ground? | Human Health COPC? |
|---------------------------|------------------------|----------------------------------|----------------------------------|--------------------------------|---------------------------------|--------------------------------|--|--|------------------------------|---|---------|-----------------------------------|-----------------------------|--|--------------------|
|                           |                        |                                  |                                  |                                |                                 |                                |  | Cancer Risk (10 <sup>-6</sup> )                                | Noncancer Hazard Index (0.1) | Tap Water RSL   | MCL     |                                   |                             |  |                    |
| <b>Inorganics (mg/kg)</b> |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Antimony                  | 2/2                    | NA                               | NA                               | 0.14                           | 0.28                            | 0.42                           | X16SS081C0001                              |  | 3.1E+00                      | 6.6E-01   | 2.7E-01 | 2.7E-01                           | Y                           | Y                                      | Y                  |
| Arsenic                   | 2/2                    | NA                               | NA                               | 3                              | 3.6                             | 4.2                            | X16SS081C0001                              | 3.9E-01  | 2.2E+00                      | 1.3E-03   | 2.9E-01 | 1.3E-03                           | Y                           | n                                      | n                  |
| Copper                    | 2/2                    | NA                               | NA                               | 4.8                            | 7.2                             | 9.6                            | X16SS081C0001                              |  | 3.1E+02                      | 5.1E+01   | 4.6E+01 | 4.6E+01                           | n                           |  | n                  |
| Tin                       | 0/2                    | 1.1                              | 1.2                              | NA                             | NA                              | NA                             | NA   |  | 4.7E+03                      | 5.5E+03   |         | 4.7E+03                           | n                           |  | n                  |
| Zinc                      | 2/2                    | NA                               | NA                               | 18.7                           | 23.9                            | 29                             | X16SS081C0001                              |  | 2.3E+03                      | 6.8E+02   |         | 6.8E+02                           | n                           |  | n                  |
| <b>PAHs (ug/kg)</b>       |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| 1-Methylnaphthalene       | 0/2                    | 23                               | 23                               | NA                             | NA                              | NA                             | NA   | 2.2E+04  | 5.5E+05                      | 1.5E+01   |         | 1.5E+01                           | n                           |  | n                  |
| 2-Methylnaphthalene       | 1/2                    | 23                               | 23                               | 3.5                            | 3.5                             | 3.5                            | X16SS080C0001                              |  | 3.1E+04                      | 9.0E+02   |         | 9.0E+02                           | n                           |  | n                  |
| Acenaphthene              | 0/2                    | 23                               | 23                               | NA                             | NA                              | NA                             | NA   |  | 3.4E+05                      | 2.7E+04   |         | 2.7E+04                           | n                           |  | n                  |
| Acenaphthylene            | 0/2                    | 23                               | 23                               | NA                             | NA                              | NA                             | NA   |  | 3.4E+05                      | 2.7E+04   |         | 2.7E+04                           | n                           |  | n                  |
| Anthracene                | 2/2                    | NA                               | NA                               | 4.1                            | 4.85                            | 5.6                            | X16SS081C0001                              |  | 1.7E+06                      | 4.5E+05   |         | 4.5E+05                           | n                           |  | n                  |
| Benzo(a)anthracene        | 2/2                    | NA                               | NA                               | 78                             | 86                              | 94                             | X16SS081C0001                              | 1.5E+02  |                              | 1.4E+01   |         | 1.4E+01                           | Y                           | n                                      | n                  |
| Benzo(a)pyrene            | 2/2                    | NA                               | NA                               | 91                             | 95.5                            | 100                            | X16SS081C0001                              | 1.5E+01  |                              | 4.6E+00   | 3.2E+02 | 4.6E+00                           | Y                           | n                                      | n                  |
| Benzo(b)fluoranthene      | 2/2                    | NA                               | NA                               | 33                             | 35.5                            | 38                             | X16SS081C0001                              | 1.5E+02  |                              | 4.7E+01   |         | 4.7E+01                           | n                           |  | n                  |
| Benzo(g,h,i)perylene      | 2/2                    | NA                               | NA                               | 41                             | 45.5                            | 50                             | X16SS081C0001                              |  | 1.7E+05                      | 1.5E+05   |         | 1.5E+05                           | n                           |  | n                  |
| Benzo(k)fluoranthene      | 2/2                    | NA                               | NA                               | 5.8                            | 6.75                            | 7.7                            | X16SS081C0001                              | 1.5E+03  |                              | 4.6E+02   |         | 4.6E+02                           | n                           |  | n                  |
| Chrysene                  | 2/2                    | NA                               | NA                               | 97                             | 114                             | 130                            | X16SS081C0001                              | 1.5E+04  |                              | 1.4E+03   |         | 1.4E+03                           | n                           |  | n                  |
| Dibenzo(a,h)anthracene    | 2/2                    | NA                               | NA                               | 12                             | 15                              | 18                             | X16SS081C0001                              | 1.5E+01  |                              | 1.6E+01   |         | 1.5E+01                           | Y                           | n                                      | n                  |
| Fluoranthene              | 2/2                    | NA                               | NA                               | 9.8                            | 11.4                            | 13                             | X16SS081C0001                              |  | 2.3E+05                      | 2.1E+05   |         | 2.1E+05                           | n                           |  | n                  |
| Fluorene                  | 0/2                    | 23                               | 23                               | NA                             | NA                              | NA                             | NA   |  | 2.3E+05                      | 3.3E+04   |         | 3.3E+04                           | n                           |  | n                  |
| Indeno(1,2,3-cd)pyrene    | 2/2                    | NA                               | NA                               | 9.1                            | 9.55                            | 10                             | X16SS081C0001                              | 1.5E+02  |                              | 1.6E+02   |         | 1.5E+02                           | n                           |  | n                  |
| Naphthalene               | 0/2                    | 23                               | 23                               | NA                             | NA                              | NA                             | NA   | 3.9E+03  | 1.5E+04                      | 5.6E-01   |         | 5.6E-01                           | n                           |  | n                  |
| Phenanthrene              | 2/2                    | NA                               | NA                               | 21                             | 22.5                            | 24                             | X16SS081C0001                              |  | 1.7E+05                      | 1.5E+05   |         | 1.5E+05                           | n                           |  | n                  |
| Pyrene                    | 2/2                    | NA                               | NA                               | 92                             | 101                             | 110                            | X16SS081C0001                              |  | 1.7E+05                      | 1.5E+05   |         | 1.5E+05                           | n                           |  | n                  |
| <b>Explosives (mg/kg)</b> |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Nitroglycerin             | 0/2                    | 1.2                              | 1.2                              | NA                             | NA                              | NA                             | NA   | 2.9E+01  | 6.1E-01                      | 1.7E-03   |         | 1.7E-03                           | n                           |  | n                  |
| <b>Lead (mg/kg)</b>       |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Lead-Lab                  | 2/2                    | NA                               | NA                               | 9.1                            | 28.9                            | 48.7                           | X16SS081C0001                              |  | 4.0E+02                      |   |         | 4.0E+02                           | n                           |  | n                  |
| Lead-XRF Field            | 2/2                    | NA                               | NA                               | 21                             | 47.2                            | 73.333                         | X16SS081C0001                              |  | 4.0E+02                      |   |         | 4.0E+02                           |                             |  |                    |

**Footnotes:**

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

1/2 the detection limit was used for B qualified data.

NA - Not applicable, statistic could not be calculated..

**Table B.3-2**  
**Identification of Human Health COPCs in Discrete Surface Soil Samples**  
**Rum Point Skeet Range (RPSR) - UXO 16**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| Chemical                  | Frequency of Detection | Minimum Non-Detect Concentration | Maximum Non-Detect Concentration | Minimum Detected Concentration | Average of All Detected Samples | Maximum Detected Concentration | Sample with Maximum Detected Concentration | Residential Direct Contact Risk-Based Screening Levels in Soil |                              | Risk-Based Screening Levels in Soil for Protection of Groundwater |         | Lowest Risk-Based Screening Level | Possible Human Health COPC? | Is Chemical Present Above Back-ground? | Human Health COPC? |
|---------------------------|------------------------|----------------------------------|----------------------------------|--------------------------------|---------------------------------|--------------------------------|--|--|------------------------------|---|---------|-----------------------------------|-----------------------------|--|--------------------|
|                           |                        |                                  |                                  |                                |                                 |                                |  | Cancer Risk (10 <sup>-6</sup> )                                | Noncancer Hazard Index (0.1) | Tap Water RSL   | MCL     |                                   |                             |  |                    |
| <b>Inorganics (mg/kg)</b> |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Antimony                  | 12/20                  | 0.03                             | 0.73                             | 0.2                            | 0.674                           | 1.6                            | X16SS0900001-D                             |  | 3.1E+00                      | 6.6E-01   | 2.7E-01 | 2.7E-01                           | Y                           | n                                      | n                  |
| Arsenic                   | 18/20                  | 0.16                             | 1.9                              | 1.1                            | 3.27                            | 6.5                            | X16SS0610001                               | 3.9E-01  | 2.2E+00                      | 1.3E-03   | 2.9E-01 | 1.3E-03                           | Y                           | n                                      | n                  |
| Copper                    | 20/20                  | NA                               | NA                               | 2.4                            | 6.28                            | 11.4                           | X16SS0130001                               |  | 3.1E+02                      | 5.1E+01   | 4.6E+01 | 4.6E+01                           | n                           | n                                      | n                  |
| Tin                       | 0/20                   | 0.75                             | 1.9                              | NA                             | NA                              | NA                             | NA   |  | 4.7E+03                      | 5.5E+03   |         | 4.7E+03                           | n                           | n                                      | n                  |
| Zinc                      | 20/20                  | NA                               | NA                               | 9.5                            | 23                              | 34.9                           | X16SS0130001                               |  | 2.3E+03                      | 6.8E+02   |         | 6.8E+02                           | n                           | n                                      | n                  |
| <b>PAHs (ug/kg)</b>       |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| 1-Methylnaphthalene       | 6/21                   | 22                               | 28                               | 2.4                            | 6.23                            | 16                             | X16SS0760001                               | 2.2E+04  | 5.5E+05                      | 1.5E+01   |         | 1.5E+01                           | Y                           | n                                      | n                  |
| 2-Methylnaphthalene       | 7/21                   | 22                               | 28                               | 6.4                            | 22.5                            | 68                             | X16SS0760001                               |  | 3.1E+04                      | 9.0E+02   |         | 9.0E+02                           | n                           | n                                      | n                  |
| Acenaphthene              | 4/21                   | 22                               | 28                               | 2.4                            | 4.53                            | 7.7                            | X16SS0760001                               |  | 3.4E+05                      | 2.7E+04   |         | 2.7E+04                           | n                           | n                                      | n                  |
| Acenaphthylene            | 1/21                   | 22                               | 28                               | 24                             | 24                              | 24                             | X16SS0310001                               |  | 3.4E+05                      | 2.7E+04   |         | 2.7E+04                           | n                           | n                                      | n                  |
| Anthracene                | 15/21                  | 22                               | 26                               | 1.6                            | 28                              | 110                            | X16SS0760001                               |  | 1.7E+06                      | 4.5E+05   |         | 4.5E+05                           | n                           | n                                      | n                  |
| Benzo(a)anthracene        | 20/21                  | 22                               | 23                               | 2.6                            | 426                             | 2400                           | X16SS0760001                               | 1.5E+02  |                              | 1.4E+01   |         | 1.4E+01                           | Y                           | Y                                      | Y                  |
| Benzo(a)pyrene            | 18/21                  | 22                               | 26                               | 5.8                            | 548                             | 3200                           | X16SS0760001                               | 1.5E+01  |                              | 4.6E+00   | 3.2E+02 | 4.6E+00                           | Y                           | Y                                      | Y                  |
| Benzo(b)fluoranthene      | 18/21                  | 22                               | 26                               | 3                              | 185                             | 1000                           | X16SS0760001                               | 1.5E+02  |                              | 4.7E+01   |         | 4.7E+01                           | Y                           | Y                                      | Y                  |
| Benzo(g,h,i)perylene      | 18/21                  | 22                               | 26                               | 3.4                            | 239                             | 1500                           | X16SS0760001                               |  | 1.7E+05                      | 1.5E+05   |         | 1.5E+05                           | n                           | n                                      | n                  |
| Benzo(k)fluoranthene      | 14/21                  | 22                               | 26                               | 4.3                            | 42.1                            | 200                            | X16SS0760001                               | 1.5E+03  |                              | 4.6E+02   |         | 4.6E+02                           | n                           | n                                      | n                  |
| Chrysene                  | 21/21                  | 22                               | 26                               | 3.3                            | 510                             | 3000                           | X16SS0760001                               | 1.5E+04  |                              | 1.4E+03   |         | 1.4E+03                           | Y                           | Y                                      | Y                  |
| Dibenzo(a,h)anthracene    | 15/21                  | 22                               | 26                               | 6.1                            | 101                             | 540                            | X16SS0760001                               | 1.5E+01  |                              | 1.6E+01   |         | 1.5E+01                           | Y                           | Y                                      | Y                  |
| Fluoranthene              | 19/21                  | 22                               | 26                               | 2.5                            | 52.2                            | 210                            | X16SS0760001                               |  | 2.3E+05                      | 2.1E+05   |         | 2.1E+05                           | n                           | n                                      | n                  |
| Fluorene                  | 5/21                   | 22                               | 28                               | 4.2                            | 10.4                            | 21                             | X16SS0760001                               |  | 2.3E+05                      | 3.3E+04   |         | 3.3E+04                           | n                           | n                                      | n                  |
| Indeno(1,2,3-cd)pyrene    | 20/21                  | 22                               | 26                               | 2.5                            | 51.6                            | 260                            | X16SS0760001                               | 1.5E+02  |                              | 1.6E+02   |         | 1.5E+02                           | Y                           | n                                      | n                  |
| Naphthalene               | 2/21                   | 22                               | 28                               | 3.1                            | 5.15                            | 7.2                            | X16SS0760001                               | 3.9E+03  | 1.5E+04                      | 5.6E-01   |         | 5.6E-01                           | Y                           | Y                                      | Y                  |
| Phenanthrene              | 16/21                  | 22                               | 26                               | 3.2                            | 126                             | 620                            | X16SS0760001                               |  | 1.7E+05                      | 1.5E+05   |         | 1.5E+05                           | n                           | n                                      | n                  |
| Pyrene                    | 20/21                  | 22                               | 23                               | 3.1                            | 369                             | 2000                           | X16SS0760001                               |  | 1.7E+05                      | 1.5E+05   |         | 1.5E+05                           | n                           | n                                      | n                  |
| <b>Lead (mg/kg)</b>       |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Lead-Lab                  | 20/20                  | NA                               | NA                               | 6.7                            | 90.9                            | 616                            | X16SS0080001                               |  | 4.0E+02                      |   |         | 4.0E+02                           | Y                           | Y                                      | Y                  |
| Lead-XRF Field            | 92/92                  | NA                               | NA                               | 11.667                         | 75.4                            | 975.333                        | X16SS0080001                               |  | 4.0E+02                      |   |         | 4.0E+02                           |                             |  |                    |

**Footnotes:**

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.  
1/2 the detection limit was used for B qualified data.  
NA - Not applicable, statistic could not be calculated.

**Table B.3-3**  
**Risks and Hazard Indices for Direct Contact Exposures to Composite Surface Soil Samples**  
**Rum Point Skeet Range (RPSR) - UXO 16**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| Chemical                  | Average of All Detected Samples | Maximum Detected Concentration | Human Health COPC? | Residential Direct Contact Risk-Based Concentration in Soil |                            | Residential Risk/ Hazard Index Screening |                         | Non-residential Direct Contact Risk-Based Concentration in Soil |                            | Non-residential Risk/ Hazard Index Screening |                         |
|---------------------------|---------------------------------|--------------------------------|--------------------|---|----------------------------|--|-------------------------|---|----------------------------|--|-------------------------|
|                           |                                 |                                |                    | Based on Cancer Risk of 10 <sup>-6</sup>                    | Based on Hazard Index of 1 | Calculated Cancer Risk                   | Calculated Hazard Index | Based on Cancer Risk of 10 <sup>-6</sup>                        | Based on Hazard Index of 1 | Calculated Cancer Risk                       | Calculated Hazard Index |
| <b>Inorganics (mg/kg)</b> |                                 |                                |                    |   |                            |  |                         |   |                            |  |                         |
| Antimony                  | 0.28                            | 0.42                           | Y                  |   | 3.1E+01                    |  | 1.4E-02                 |   | 4.1E+02                    |  | 1.0E-03                 |
| <b>Total</b>              |                                 |                                |                    |   |                            | 0.0E+00                                  | 1.4E-02                 |   |                            | 0.0E+00                                      | 1.0E-03                 |

**Footnotes:**

NA - Not applicable, statistic could not be calculated.

**Table B.3-4**  
**Risks and Hazard Indices for Direct Contact Exposures to Discrete Surface Soil Samples**  
**Rum Point Skeet Range (RPSR) - UXO 16**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| Chemical               | Average of All Detected Samples | Maximum Detected Concentration | Human Health COPC? | Residential Direct Contact Risk-Based Concentration in Soil |                            | Residential Risk/ Hazard Index Screening |                                     |                                      | Non-residential Direct Contact Risk-Based Concentration in Soil |                            | Non-residential Risk/ Hazard Index Screening |                                     |                                      |
|------------------------|---------------------------------|--------------------------------|--------------------|---|----------------------------|--|-------------------------------------|--------------------------------------|---|----------------------------|--|-------------------------------------|--------------------------------------|
|                        |                                 |                                |                    | Based on Cancer Risk of 10 <sup>-6</sup>                    | Based on Hazard Index of 1 | Calculated Cancer Risk (Using Max.)      | Calculated Cancer Risk (Using Avg.) | Calculated Hazard Index (Using Max.) | Based on Cancer Risk of 10 <sup>-6</sup>                        | Based on Hazard Index of 1 | Calculated Cancer Risk (Using Max.)          | Calculated Cancer Risk (Using Avg.) | Calculated Hazard Index (Using Max.) |
| <b>PAHs (ug/kg)</b>    |                                 |                                |                    |   |                            |  |                                     |                                      |   |                            |  |                                     |                                      |
| Benzo(a)anthracene     | 426                             | 2400                           | Y                  | 1.5E+02   |                            | 1.6E-05                                  | 2.8E-06                             |                                      | 2.1E+03   |                            | 1.1E-06                                      | 2.0E-07                             |                                      |
| Benzo(a)pyrene         | 548                             | 3200                           | Y                  | 1.5E+01   |                            | 2.1E-04                                  | 3.7E-05                             |                                      | 2.1E+02   |                            | 1.5E-05                                      | 2.6E-06                             |                                      |
| Benzo(b)fluoranthene   | 185                             | 1000                           | Y                  | 1.5E+02   |                            | 6.7E-06                                  | 1.2E-06                             |                                      | 2.1E+03   |                            | 4.8E-07                                      | 8.8E-08                             |                                      |
| Chrysene               | 510                             | 3000                           | Y                  | 1.5E+04   |                            | 2.0E-07                                  | 3.4E-08                             |                                      | 2.1E+05   |                            | 1.4E-08                                      | 2.4E-09                             |                                      |
| Dibenzo(a,h)anthracene | 101                             | 540                            | Y                  | 1.5E+01   |                            | 3.6E-05                                  | 6.7E-06                             |                                      | 2.1E+02   |                            | 2.6E-06                                      | 4.8E-07                             |                                      |
| Naphthalene            | 5.15                            | 7.2                            | Y                  | 3.9E+03   | 1.5E+05                    | 1.8E-09                                  | 1.3E-09                             | 4.8E-05                              | 2.0E+04   | 6.7E+05                    | 3.6E-10                                      | 2.6E-10                             | 1.1E-05                              |
| <b>Total</b>           |                                 |                                |                    |   |                            | 2.7E-04                                  | 4.7E-05                             | 4.8E-05                              |   |                            | 1.9E-05                                      | 3.4E-06                             | 1.1E-05                              |

**Footnotes:**

NA - Not applicable, statistic could not be calculated.

**Table B.3-5**  
**Evaluation of Direct Contact Exposures to Lead in Discrete Surface Soil Samples**  
**Rum Point Skeet Range (RPSR) - UXO 16**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| Chemical            | Average of All Detected Samples | Maximum Detected Concentration | Human Health COPC? | Residential Direct Contact Risk-Based Concentration in Soil |                     | Non-residential Direct Contact Risk-Based Concentration in Soil |                     |
|---------------------|---------------------------------|--------------------------------|--------------------|---|---------------------|---|---------------------|
|                     |                                 |                                |                    | Value   | Max. Exceeds Value? | Value   | Max. Exceeds Value? |
| <b>Lead (mg/kg)</b> |                                 |                                |                    |   |                     |   |                     |
| Lead-Lab            | 90.9                            | 616                            | Y                  | 4.0E+02   | Y                   | 8.0E+02   | n                   |

**Table B.4-1**  
**Identification of Human Health COPCs in Composite Surface Soil Samples**  
**Small Arms (Pistol) Range (SAPR) - UXO 17**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| Chemical                  | Frequency of Detection | Minimum Non-Detect Concentration | Maximum Non-Detect Concentration | Minimum Detected Concentration | Average of All Detected Samples | Maximum Detected Concentration | Sample with Maximum Detected Concentration | Residential Direct Contact Risk-Based Screening Levels in Soil |                              | Risk-Based Screening Levels in Soil for Protection of Groundwater |         | Lowest Risk-Based Screening Level | Possible Human Health COPC? | Is Chemical Present Above Back-ground? | Human Health COPC? |
|---------------------------|------------------------|----------------------------------|----------------------------------|--------------------------------|---------------------------------|--------------------------------|--|--|------------------------------|---|---------|-----------------------------------|-----------------------------|--|--------------------|
|                           |                        |                                  |                                  |                                |                                 |                                |  | Cancer Risk (10 <sup>-6</sup> )                                | Noncancer Hazard Index (0.1) | Tap Water RSL   | MCL     |                                   |                             |  |                    |
| <b>Inorganics (mg/kg)</b> |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Antimony                  | 3/3                    | NA                               | NA                               | 0.39                           | 0.707                           | 1.3                            | X17SS010C0001                              |  | 3.1E+00                      | 6.6E-01   | 2.7E-01 | 2.7E-01                           | Y                           | n                                      | n                  |
| Arsenic                   | 3/3                    | NA                               | NA                               | 4.4                            | 5.2                             | 6.2                            | X17SS010C0001                              | 3.9E-01  | 2.2E+00                      | 1.3E-03   | 2.9E-01 | 1.3E-03                           | Y                           | n                                      | n                  |
| Copper                    | 3/3                    | NA                               | NA                               | 11.2                           | 15.7                            | 24                             | X17SS010C0001                              |  | 3.1E+02                      | 5.1E+01   | 4.6E+01 | 4.6E+01                           | n                           |  | n                  |
| Tin                       | 0/3                    | 0.92                             | 1.4                              | NA                             | NA                              | NA                             | NA   |  | 4.7E+03                      | 5.5E+03   |         | 4.7E+03                           | n                           |  | n                  |
| Zinc                      | 3/3                    | NA                               | NA                               | 19                             | 25.8                            | 35.2                           | X17SS010C0001                              |  | 2.3E+03                      | 6.8E+02   |         | 6.8E+02                           | n                           |  | n                  |
| <b>Explosives (mg/kg)</b> |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Nitroglycerin             | 3/3                    | NA                               | NA                               | 9.8                            | 14.4                            | 20.4                           | X17SS008C0001                              | 2.9E+01  | 6.1E-01                      | 1.7E-03   |         | 1.7E-03                           | Y                           |  | Y                  |
| <b>Lead (mg/kg)</b>       |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Lead-Lab                  | 3/3                    | NA                               | NA                               | 21                             | 86.6                            | 200                            | X17SS010C0001                              |  | 4.0E+02                      |   |         | 4.0E+02                           | n                           |  | n                  |
| Lead-XRF Field            | 3/3                    | NA                               | NA                               | 73.333                         | 109                             | 156.333                        | X17SS010C0001                              |  | 4.0E+02                      |   |         | 4.0E+02                           |                             |  |                    |

**Footnotes:**

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

1/2 the detection limit was used for B qualified data.

NA - Not applicable, statistic could not be calculated..

**Table B.4-2**  
**Identification of Human Health COPCs in Discrete Surface Soil Samples**  
**Small Arms (Pistol) Range (SAPR) - UXO 17**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| Chemical                  | Frequency of Detection | Minimum Non-Detect Concentration | Maximum Non-Detect Concentration | Minimum Detected Concentration | Average of All Detected Samples | Maximum Detected Concentration | Sample with Maximum Detected Concentration | Residential Direct Contact Risk-Based Screening Levels in Soil |                              | Risk-Based Screening Levels in Soil for Protection of Groundwater |         | Lowest Risk-Based Screening Level | Possible Human Health COPC? | Is Chemical Present Above Back-ground? | Human Health COPC? |
|---------------------------|------------------------|----------------------------------|----------------------------------|--------------------------------|---------------------------------|--------------------------------|--|--|------------------------------|---|---------|-----------------------------------|-----------------------------|--|--------------------|
|                           |                        |                                  |                                  |                                |                                 |                                |  | Cancer Risk (10 <sup>-6</sup> )                                | Noncancer Hazard Index (0.1) | Tap Water RSL   | MCL     |                                   |                             |  |                    |
| <b>Inorganics (mg/kg)</b> |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Antimony                  | 8/12                   | 0.13                             | 3.3                              | 0.15                           | 1.64                            | 6                              | X17SS0140001                               |  | 3.1E+00                      | 6.6E-01   | 2.7E-01 | 2.7E-01                           | Y                           | Y                                      | Y                  |
| Arsenic                   | 12/12                  | NA                               | NA                               | 3.5                            | 5.4                             | 8.7                            | X17SS0140001                               | 3.9E-01  | 2.2E+00                      | 1.3E-03   | 2.9E-01 | 1.3E-03                           | Y                           | n                                      | n                  |
| Copper                    | 12/12                  | NA                               | NA                               | 5.6                            | 17.2                            | 42                             | X17SB0050004                               |  | 3.1E+02                      | 5.1E+01   | 4.6E+01 | 4.6E+01                           | n                           |  | n                  |
| Tin                       | 0/12                   | 0.56                             | 1.6                              | NA                             | NA                              | NA                             | NA   |  | 4.7E+03                      | 5.5E+03   |         | 4.7E+03                           | n                           |  | n                  |
| Zinc                      | 12/12                  | NA                               | NA                               | 10                             | 19.1                            | 33.2                           | X17SB0040004                               |  | 2.3E+03                      | 6.8E+02   |         | 6.8E+02                           | n                           |  | n                  |
| <b>Lead (mg/kg)</b>       |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Lead-Lab                  | 10/12                  | 7                                | 12.2                             | 7.2                            | 314                             | 706                            | X17SS0140001                               |  | 4.0E+02                      |   |         | 4.0E+02                           | Y                           | Y                                      | Y                  |
| Lead-XRF Field            | 25/26                  | 0                                | 0                                | 3.667                          | 439                             | 3247                           | X17SS0130001                               |  | 4.0E+02                      |   |         | 4.0E+02                           |                             |  |                    |

**Footnotes:**

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

1/2 the detection limit was used for B qualified data.

NA - Not applicable, statistic could not be calculated..

**Table B.4-3**  
**Identification of Human Health COPCs in Discrete Subsurface Soil Samples**  
**Small Arms (Pistol) Range (SAPR) - UXO 17**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| Chemical                  | Frequency of Detection | Minimum Non-Detect Concentration | Maximum Non-Detect Concentration | Minimum Detected Concentration | Average of All Detected Samples | Maximum Detected Concentration | Sample with Maximum Detected Concentration | Residential Direct Contact Risk-Based Screening Levels in Soil |                              | Risk-Based Screening Levels in Soil for Protection of Groundwater |         | Lowest Risk-Based Screening Level | Possible Human Health COPC? | Is Chemical Present Above Back-ground? | Human Health COPC? |
|---------------------------|------------------------|----------------------------------|----------------------------------|--------------------------------|---------------------------------|--------------------------------|--|--|------------------------------|---|---------|-----------------------------------|-----------------------------|--|--------------------|
|                           |                        |                                  |                                  |                                |                                 |                                |  | Cancer Risk (10 <sup>-6</sup> )                                | Noncancer Hazard Index (0.1) | Tap Water RSL   | MCL     |                                   |                             |  |                    |
| <b>Inorganics (mg/kg)</b> |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Antimony                  | 6/9                    | 0.13                             | 0.55                             | 0.22                           | 0.46                            | 1                              | X17SB0060406                               |  | 3.1E+00                      | 6.6E-01   | 2.7E-01 | 2.7E-01                           | Y                           | n                                      | n                  |
| Arsenic                   | 7/9                    | 2.3                              | 2.4                              | 3.7                            | 5.23                            | 7.8                            | X17SB0020406                               | 3.9E-01  | 2.2E+00                      | 1.3E-03   | 2.9E-01 | 1.3E-03                           | Y                           | n                                      | n                  |
| Copper                    | 9/9                    | NA                               | NA                               | 5.3                            | 9.03                            | 11.8                           | X17SB0140102                               |  | 3.1E+02                      | 5.1E+01   | 4.6E+01 | 4.6E+01                           | n                           |  | n                  |
| Tin                       | 1/9                    | 0.76                             | 1.2                              | 1.5                            | 1.5                             | 1.5                            | X17SB0140102                               |  | 4.7E+03                      | 5.5E+03   |         | 4.7E+03                           | n                           |  | n                  |
| Zinc                      | 9/9                    | NA                               | NA                               | 13.1                           | 18.7                            | 25.4                           | X17SB0140102                               |  | 2.3E+03                      | 6.8E+02   |         | 6.8E+02                           | n                           |  | n                  |
| <b>Lead (mg/kg)</b>       |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Lead-Lab                  | 9/9                    | NA                               | NA                               | 8.1                            | 59.6                            | 132                            | X17SB0060406                               |  | 4.0E+02                      |   |         | 4.0E+02                           | n                           |  | n                  |
| Lead-XRF Field            | 20/24                  | 0                                | 0                                | 4.667                          | 93.3                            | 371.333                        | X17SB0040406                               |  | 4.0E+02                      |   |         | 4.0E+02                           |                             |  |                    |

**Footnotes:**

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.  
 1/2 the detection limit was used for B qualified data.  
 NA - Not applicable, statistic could not be calculated..

**Table B.4-4**  
**Risks and Hazard Indices for Direct Contact Exposures to Composite Surface Soil Samples**  
**Small Arms (Pistol) Range (SAPR) - UXO 17**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
 Page 4 of 6

| Chemical                  | Average of All Detected Samples | Maximum Detected Concentration | Human Health COPC? | Residential Direct Contact Risk-Based Concentration in Soil |                            | Residential Risk/ Hazard Index Screening |                         | Non-residential Direct Contact Risk-Based Concentration in Soil |                            | Non-residential Risk/ Hazard Index Screening |                         |
|---------------------------|---------------------------------|--------------------------------|--------------------|---|----------------------------|--|-------------------------|---|----------------------------|--|-------------------------|
|                           |                                 |                                |                    | Based on Cancer Risk of 10 <sup>-6</sup>                    | Based on Hazard Index of 1 | Calculated Cancer Risk                   | Calculated Hazard Index | Based on Cancer Risk of 10 <sup>-6</sup>                        | Based on Hazard Index of 1 | Calculated Cancer Risk                       | Calculated Hazard Index |
| <b>Explosives (mg/kg)</b> |                                 |                                |                    |   |                            |  |                         |   |                            |  |                         |
| Nitroglycerin             | 14.4                            | 20.4                           | Y                  | 2.9E+01   | 6.1E+00                    | 7.0E-07                                  | 3.3E+00                 | 1.0E+02   | 6.2E+01                    | 2.0E-07                                      | 3.3E-01                 |
| <b>Total</b>              |                                 |                                |                    |   |                            | 7.0E-07                                  | 3.3E+00                 |   |                            | 2.0E-07                                      | 3.3E-01                 |

**Footnotes:**

NA - Not applicable, statistic could not be calculated.

**Table B.4-5**  
**Risks and Hazard Indices for Direct Contact Exposures to Discrete Surface Soil Samples**  
**Small Arms (Pistol) Range (SAPR) - UXO 17**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
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| Chemical                  | Average of All Detected Samples | Maximum Detected Concentration | Human Health COPC? | Residential Direct Contact Risk-Based Concentration in Soil |                            | Residential Risk/ Hazard Index Screening |                         | Non-residential Direct Contact Risk-Based Concentration in Soil |                            | Non-residential Risk/ Hazard Index Screening |                         |
|---------------------------|---------------------------------|--------------------------------|--------------------|---|----------------------------|--|-------------------------|---|----------------------------|--|-------------------------|
|                           |                                 |                                |                    | Based on Cancer Risk of 10 <sup>-6</sup>                    | Based on Hazard Index of 1 | Calculated Cancer Risk                   | Calculated Hazard Index | Based on Cancer Risk of 10 <sup>-6</sup>                        | Based on Hazard Index of 1 | Calculated Cancer Risk                       | Calculated Hazard Index |
| <b>Inorganics (mg/kg)</b> |                                 |                                |                    |   |                            |  |                         |   |                            |  |                         |
| Antimony                  | 1.64                            | 6                              | Y                  |   | 3.1E+01                    |  | 1.9E-01                 |   | 4.1E+02                    |  | 1.5E-02                 |
| <b>Total</b>              |                                 |                                |                    |   |                            | 0.0E+00                                  | 1.9E-01                 |   |                            | 0.0E+00                                      | 1.5E-02                 |

**Footnotes:**

NA - Not applicable, statistic could not be calculated.

**Table B.4-6**  
**Evaluation of Direct Contact Exposures to Lead in Discrete Surface Soil Samples**  
**Small Arms (Pistol) Range (SAPR) - UXO 17**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
**Page 6 of 6**

| Chemical            | Average of All Detected Samples | Maximum Detected Concentration | Human Health COPC? | Residential Direct Contact Risk-Based Concentration in Soil |                     | Non-residential Direct Contact Risk-Based Concentration in Soil |                     |
|---------------------|---------------------------------|--------------------------------|--------------------|---|---------------------|---|---------------------|
|                     |                                 |                                |                    | Value   | Max. Exceeds Value? | Value   | Max. Exceeds Value? |
| <b>Lead (mg/kg)</b> |                                 |                                |                    |   |                     |   |                     |
| Lead-Lab            | 314                             | 706                            | Y                  | 4.0E+02   | Y                   | 8.0E+02   | n                   |

**Table B.5-1**  
**Identification of Human Health COPCs in Composite Surface Soil Samples**  
**Roach Road Rifle Range (RRRR) - UXO 25**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
 Page 1 of 4

| Chemical                  | Frequency of Detection | Minimum Non-Detect Concentration | Maximum Non-Detect Concentration | Minimum Detected Concentration | Average of All Detected Samples | Maximum Detected Concentration | Sample with Maximum Detected Concentration | Residential Direct Contact Risk-Based Screening Levels in Soil |                              | Risk-Based Screening Levels in Soil for Protection of Groundwater |         | Lowest Risk-Based Screening Level | Possible Human Health COPC? | Is Chemical Present Above Back-ground? | Human Health COPC? |
|---------------------------|------------------------|----------------------------------|----------------------------------|--------------------------------|---------------------------------|--------------------------------|--|--|------------------------------|---|---------|-----------------------------------|-----------------------------|--|--------------------|
|                           |                        |                                  |                                  |                                |                                 |                                |  | Cancer Risk (10 <sup>-6</sup> )                                | Noncancer Hazard Index (0.1) | Tap Water RSL   | MCL     |                                   |                             |  |                    |
| <b>Inorganics (mg/kg)</b> |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Antimony                  | 1/1                    | NA                               | NA                               | 0.1                            | 0.1                             | 0.1                            | X25SS0200001                               |  | 3.1E+00                      | 6.6E-01   | 2.7E-01 | 2.7E-01                           | n                           |  | n                  |
| Arsenic                   | 1/1                    | NA                               | NA                               | 4.3                            | 4.3                             | 4.3                            | X25SS0160001                               | 3.9E-01  | 2.2E+00                      | 1.3E-03   | 2.9E-01 | 1.3E-03                           | Y                           | n                                      | n                  |
| Copper                    | 1/1                    | NA                               | NA                               | 8.5                            | 8.5                             | 8.5                            | X25SS0200001                               |  | 3.1E+02                      | 5.1E+01   | 4.6E+01 | 4.6E+01                           | n                           |  | n                  |
| Tin                       | 0/1                    | 1.6                              | 1.6                              | NA                             | NA                              | NA                             | NA   |  | 4.7E+03                      | 5.5E+03   |         | 4.7E+03                           | n                           |  | n                  |
| Zinc                      | 1/1                    | NA                               | NA                               | 30.2                           | 30.2                            | 30.2                           | X25SS0200001                               |  | 2.3E+03                      | 6.8E+02   |         | 6.8E+02                           | n                           |  | n                  |
| <b>Explosives (mg/kg)</b> |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Nitroglycerin             | 0/1                    | 1.2                              | 1.2                              | NA                             | NA                              | NA                             | NA   | 2.9E+01  | 6.1E-01                      | 1.7E-03   |         | 1.7E-03                           | n                           |  | n                  |
| <b>Lead (mg/kg)</b>       |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Lead-Lab                  | 1/1                    | NA                               | NA                               | 9.4                            | 9.4                             | 9.4                            | X25SS0200001                               |  | 4.0E+02                      |   |         | 4.0E+02                           | n                           |  | n                  |

**Footnotes:**

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

1/2 the detection limit was used for B qualified data.

NA - Not applicable, statistic could not be calculated..

**Table B.5-2**  
**Identification of Human Health COPCs in Discrete Surface Soil Samples**  
**Roach Road Rifle Range (RRRR) - UXO 25**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
 Page 2 of 4

| Chemical                  | Frequency of Detection | Minimum Non-Detect Concentration | Maximum Non-Detect Concentration | Minimum Detected Concentration | Average of All Detected Samples | Maximum Detected Concentration | Sample with Maximum Detected Concentration | Residential Direct Contact Risk-Based Screening Levels in Soil |                              | Risk-Based Screening Levels in Soil for Protection of Groundwater |         | Lowest Risk-Based Screening Level | Possible Human Health COPC? | Is Chemical Present Above Back-ground? | Human Health COPC? |
|---------------------------|------------------------|----------------------------------|----------------------------------|--------------------------------|---------------------------------|--------------------------------|--|--|------------------------------|---|---------|-----------------------------------|-----------------------------|--|--------------------|
|                           |                        |                                  |                                  |                                |                                 |                                |  | Cancer Risk (10 <sup>-6</sup> )                                | Noncancer Hazard Index (0.1) | Tap Water RSL   | MCL     |                                   |                             |  |                    |
| <b>Inorganics (mg/kg)</b> |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Antimony                  | 16/20                  | 0.02                             | 0.16                             | 0.19                           | 1.58                            | 12.2                           | X25SS0200001                               |  | 3.1E+00                      | 6.6E-01   | 2.7E-01 | 2.7E-01                           | Y                           | Y                                      | Y                  |
| Arsenic                   | 17/20                  | 1.9                              | 2.4                              | 2.3                            | 5.01                            | 22.6                           | X25SS0160001                               | 3.9E-01  | 2.2E+00                      | 1.3E-03   | 2.9E-01 | 1.3E-03                           | Y                           | n                                      | n                  |
| Copper                    | 20/20                  | NA                               | NA                               | 7.4                            | 41.1                            | 370                            | X25SS0200001                               |  | 3.1E+02                      | 5.1E+01   | 4.6E+01 | 4.6E+01                           | Y                           | Y                                      | Y                  |
| Tin                       | 0/20                   | 0.43                             | 2.3                              | NA                             | NA                              | NA                             | NA   |  | 4.7E+03                      | 5.5E+03   |         | 4.7E+03                           | n                           |  | n                  |
| Zinc                      | 20/20                  | NA                               | NA                               | 22                             | 33.9                            | 63.9                           | X25SS0200001                               |  | 2.3E+03                      | 6.8E+02   |         | 6.8E+02                           | n                           |  | n                  |
| <b>Lead (mg/kg)</b>       |                        |                                  |                                  |                                |                                 |                                |  |  |                              |   |         |                                   |                             |  |                    |
| Lead-Lab                  | 20/20                  | NA                               | NA                               | 6.3                            | 349                             | 3450                           | X25SS0200001                               |  | 4.0E+02                      |   |         | 4.0E+02                           | Y                           | Y                                      | Y                  |
| Lead-XRF Field            | 32/33                  | 0                                | 0                                | 8.333                          | 359                             | 3877                           | X25SS0200001                               |  | 4.0E+02                      |   |         | 4.0E+02                           |                             |  |                    |
| Lead-XRF Calc.            | 33/33                  | NA                               | NA                               | 1.49                           | 227                             | 2754.83                        | X25SS0200001                               |  | 4.0E+02                      |   |         | 4.0E+02                           |                             |  |                    |

**Footnotes:**

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.  
 1/2 the detection limit was used for B qualified data.  
 NA - Not applicable, statistic could not be calculated..

**Table B.5-3**  
**Risks and Hazard Indices for Direct Contact Exposures to Discrete Surface Soil Samples**  
**Roach Road Rifle Range (RRRR) - UXO 25**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
 Page 3 of 4

| Chemical                  | Average of All Detected Samples | Maximum Detected Concentration | Human Health COPC? | Residential Direct Contact Risk-Based Concentration in Soil |                            | Residential Risk/ Hazard Index Screening |                         | Non-residential Direct Contact Risk-Based Concentration in Soil |                            | Non-residential Risk/ Hazard Index Screening |                         |
|---------------------------|---------------------------------|--------------------------------|--------------------|---|----------------------------|--|-------------------------|---|----------------------------|--|-------------------------|
|                           |                                 |                                |                    | Based on Cancer Risk of 10 <sup>-6</sup>                    | Based on Hazard Index of 1 | Calculated Cancer Risk                   | Calculated Hazard Index | Based on Cancer Risk of 10 <sup>-6</sup>                        | Based on Hazard Index of 1 | Calculated Cancer Risk                       | Calculated Hazard Index |
| <b>Inorganics (mg/kg)</b> |                                 |                                |                    |   |                            |  |                         |   |                            |  |                         |
| Antimony                  | 1.58                            | 12.2                           | Y                  |   | 3.1E+01                    |  | 3.9E-01                 |   | 4.1E+02                    |  | 3.0E-02                 |
| Copper                    | 41.1                            | 370                            | Y                  |   | 3.1E+03                    |  | 1.2E-01                 |   | 4.1E+04                    |  | 9.0E-03                 |
| <b>Total</b>              |                                 |                                |                    |   |                            |  | 0.0E+00                 |   | 5.1E-01                    |  | 0.0E+00                 |

**Footnotes:**

NA - Not applicable, statistic could not be calculated.

**Table B.5-4**  
**Evaluation of Direct Contact Exposures to Lead in Discrete Surface Soil Samples**  
**Roach Road Rifle Range (RRRR) - UXO 25**  
**Site Inspection**  
**NSF Indian Head - Stump Neck Annex**  
**Indian Head, Maryland**  
**Page 4 of 4**

| Chemical            | Average of All Detected Samples | Maximum Detected Concentration | Human Health COPC? | Residential Direct Contact Risk-Based Concentration in Soil |                     | Non-residential Direct Contact Risk-Based Concentration in Soil |                     |
|---------------------|---------------------------------|--------------------------------|--------------------|---|---------------------|---|---------------------|
|                     |                                 |                                |                    | Value   | Max. Exceeds Value? | Value   | Max. Exceeds Value? |
| <b>Lead (mg/kg)</b> |                                 |                                |                    |   |                     |   |                     |
| Lead-Lab            | 349                             | 3450                           | Y                  | 4.0E+02   | Y                   | 8.0E+02   | Y                   |

**APPENDIX C**

**SUPPORTING DOCUMENTATION FOR  
ECOLOGICAL RISK EVALUATION**

TABLE C.1-1  
 OCCURRENCE, DISTRIBUTION, AND SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN - COMPOSITE SOIL  
 MARINE RIFLE RANGE (MRR) - UXO 14  
 FIRING LINE AREA  
 SITE INSPECTION  
 NSF INDIAN HEAD - STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND

| Parameter                 | Frequency of Detection <sup>(1)</sup> | Minimum Concentration <sup>(2)</sup> | Maximum Concentration <sup>(2)</sup> | Location of Maximum Concentration | Minimum Nondetect | Maximum Nondetect | Average of Positive Results <sup>(3)</sup> | Overall Average <sup>(4)</sup> | Ecological Screening Level |        |       |         | COPC (yes/no)? | Rationale for COPC selection |  |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-----------------------------------|-------------------|-------------------|--|--------------------------------|----------------------------|--------|-------|---------|----------------|------------------------------|--|
|                           |                                       |                                      |                                      |                                   |                   |                   |  |                                | Invertebrates              | Plants | Avian | Mammals |                |                              |  |
| <b>Inorganics (mg/kg)</b> |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |                |                              |  |
| ANTIMONY                  | 9/9                                   | 0.13 J                               | 1.4 J                                | X14SB004C                         | NA                | NA                | 0.32                                       | 0.32                           | 78                         | 5      | NA    | 0.27    | YES            | ASL/NSL                      |  |
| ARSENIC                   | 9/9                                   | 1.6                                  | 3.3                                  | X14SB004C                         | NA                | NA                | 2.7  | 2.7                            | 60                         | 18     | 43    | 46      | NO             | BSL                          |  |
| COPPER                    | 9/9                                   | 8 L                                  | 52.4 L                               | X14SB008C                         | NA                | NA                | 17   | 17                             | 80                         | 70     | 28    | 49      | YES            | ASL                          |  |
| LEAD                      | 9/9                                   | 12                                   | 52.5                                 | X14SB004C                         | NA                | NA                | 24   | 24                             | 1700                       | 120    | 11    | 56      | YES            | ASL                          |  |
| ZINC                      | 9/9                                   | 25.1                                 | 66.5                                 | X14SB004C                         | NA                | NA                | 40   | 40                             | 120                        | 160    | 46    | 79      | YES            | ASL                          |  |
| <b>XRF (mg/kg)</b>        |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |                |                              |  |
| LEAD                      | 9/9                                   | 15.667                               | 82.333                               | X14SB004C                         | NA                | NA                | 27   | 27                             | 1700                       | 120    | 11    | 56      | YES            | ASL                          |  |
| <b>Explosives (mg/kg)</b> |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |                |                              |  |
| NITROGLYCERIN             | 1/9                                   | 0.8 J                                | 0.8 J                                | X14SB009C                         | 1.2               | 1.2               | 0.80                                       | 0.62                           | NA                         | NA     | NA    | NA      | YES            | NSL                          |  |

Shaded cells indicate that the maximum concentration exceeds the screening level.

- 1 Sample and duplicate are considered as one sample when determining the frequency of detection.
- 2 Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected.
- 3 Average of detected concentrations only.
- 4 Average of all analytical results.

COPC = Chemical of Potential Concern  
 NA = Not available or not applicable  
 J = Estimated concentration  
 L = Biased low concentration

Rationale Codes for COPC Selection:  
 ASL = Above COPC Screening Level  
 BSL = Below COPC Screening Level  
 NSL = No Screening Level Available

**TABLE C.1-2**  
**TERRESTRIAL FOOD CHAIN MODEL - AVERAGE SCENARIO**  
**INSECTIVOROUS AND HERBIVOROUS RECEPTORS - COMPOSITE SOIL**  
**MARINE RIFLE RANGE (MRR) - UXO 14**  
**FIRING LINE AREA**  
**NSF INDIAN HEAD - STUMP NECK ANNEX**  
**INDIAN HEAD, MARYLAND**

| Chemical          | Herbivorous Receptors EEQs |         |             |         | Insectivorous Receptors EEQs |         |                    |         |
|-------------------|----------------------------|---------|-------------|---------|------------------------------|---------|--------------------|---------|
|                   | Bobwhite Quail             |         | Meadow Vole |         | Robin                        |         | Short-Tailed Shrew |         |
|                   | NOAEL                      | LOAEL   | NOAEL       | LOAEL   | NOAEL                        | LOAEL   | NOAEL              | LOAEL   |
| <b>Inorganics</b> |                            |         |             |         |                              |         |                    |         |
| ANTIMONY          | NA                         | NA      | 1.4E-02     | 3.1E-04 | NA                           | NA      | 4.9E-01            | 1.0E-02 |
| ARSENIC           | 1.4E-03                    | 6.8E-04 | 6.2E-03     | 1.4E-03 | 4.3E-02                      | 2.1E-02 | 4.3E-02            | 9.9E-03 |
| COPPER            | 2.0E-02                    | 2.3E-03 | 5.3E-02     | 3.6E-03 | 3.5E-01                      | 4.1E-02 | 1.4E-01            | 9.4E-03 |
| LEAD              | 2.2E-02                    | 8.1E-04 | 2.0E-02     | 4.9E-04 | 1.1E+00                      | 4.0E-02 | 2.1E-01            | 5.2E-03 |
| ZINC              | 7.0E-03                    | 2.7E-03 | 2.4E-02     | 6.2E-03 | 6.5E-01                      | 2.5E-01 | 3.4E-01            | 8.6E-02 |
| <b>Explosives</b> |                            |         |             |         |                              |         |                    |         |
| NITROGLYCERIN     | NA                         | NA      | 1.0E-02     | 9.6E-04 | NA                           | NA      | 1.9E-02            | 1.7E-03 |

NA = Not applicable because no NOAEL/LOAEL exists for this receptor.

Cells are shaded if the value is greater than 1.0

NOAEL - No Observed Adverse Effects Level

LOAEL - Lowest Observed Adverse Effects Level

EEQ - Ecological Effects Quotient

TABLE C.1-3  
 OCCURRENCE, DISTRIBUTION, AND SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN - SURFACE SOIL  
 MARINE RIFLE RANGE (MRR) - UXO 14  
 TARGET BERM 1  
 SITE INSPECTION  
 NSF INDIAN HEAD - STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND

| Parameter                 | Frequency of Detection <sup>(1)</sup> | Minimum Concentration <sup>(2)</sup> | Maximum Concentration <sup>(2)</sup> | Location of Maximum Concentration | Minimum Nondetect | Maximum Nondetect | Average of Positive Results <sup>(3)</sup> | Overall Average <sup>(4)</sup> | Ecological Screening Level |        |       |         | COPC (yes/no)? | Rationale for COPC selection |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-----------------------------------|-------------------|-------------------|--|--------------------------------|----------------------------|--------|-------|---------|----------------|------------------------------|
|                           |                                       |                                      |                                      |                                   |                   |                   |  |                                | Invertebrates              | Plants | Avian | Mammals |                |                              |
| <b>Inorganics (mg/kg)</b> |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |                |                              |
| ANTIMONY                  | 5/5                                   | 0.1 L                                | 0.16 L                               | X14SB039                          | NA                | NA                | 0.13                                       | 0.13                           | 78                         | 5      | NA    | 0.27    | YES            | NSL                          |
| ARSENIC                   | 5/5                                   | 1.3                                  | 4.2                                  | X14SB022                          | NA                | NA                | 2.5  | 2.5                            | 60                         | 18     | 43    | 46      | NO             | BSL                          |
| COPPER                    | 5/5                                   | 9.2                                  | 107                                  | X14SB035                          | NA                | NA                | 52   | 52                             | 80                         | 70     | 28    | 49      | YES            | ASL                          |
| LEAD                      | 5/5                                   | 9.6                                  | 543                                  | X14SB035                          | NA                | NA                | 222  | 222                            | 1700                       | 120    | 11    | 56      | YES            | ASL                          |
| TIN                       | 2/5                                   | 4.1                                  | 9.1                                  | X14SB035                          | 1.8               | 2.9               | 6.6  | 3.3                            | NA                         | 50     | NA    | 7.62    | YES            | ASL/NSL                      |
| ZINC                      | 5/5                                   | 18.6                                 | 33.3                                 | X14SB035                          | NA                | NA                | 25   | 25                             | 120                        | 160    | 46    | 79      | NO             | BSL                          |
| <b>XRF (mg/kg)</b>        |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |                |                              |
| LEAD                      | 35/35                                 | 11.667                               | 540.333                              | X14SB035                          | NA                | NA                | 120  | 120                            | 1700                       | 120    | 11    | 56      | YES            | ASL                          |
| LEAD-CALC                 | 35/35                                 | 29.383                               | 468.177                              | X14SB035                          | NA                | NA                | 120  | 120                            | 1700                       | 120    | 11    | 56      | YES            | ASL                          |

Shaded cells indicate that the maximum concentration exceeds the screening level.

1 Sample and duplicate are considered as one sample when determining the frequency of detection.

2 Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected.

3 Average of detected concentrations only.

4 Average of all analytical results.

COPC = Chemical of Potential Concern

NA = Not available or not applicable

L = Biased low concentration

Rationale Codes for COPC Selection:

ASL = Above COPC Screening Level

BSL = Below COPC Screening Level

NSL = No Screening Level Available

**TABLE C.1-4**  
**TERRESTRIAL FOOD CHAIN MODEL - AVERAGE SCENARIO**  
**INSECTIVOROUS AND HERBIVOROUS RECEPTORS - SURFACE SOIL**  
**MARINE RIFLE RANGE (MRR) - UXO 14**  
**TARGET BERM 1**  
**NSF INDIAN HEAD - STUMP NECK ANNEX**  
**INDIAN HEAD, MARYLAND**

| Chemical          | Herbivorous Receptors EEQs |         |             |         | Insectivorous Receptors EEQs |         |                    |         |
|-------------------|----------------------------|---------|-------------|---------|------------------------------|---------|--------------------|---------|
|                   | Bobwhite Quail             |         | Meadow Vole |         | Robin                        |         | Short-Tailed Shrew |         |
|                   | NOAEL                      | LOAEL   | NOAEL       | LOAEL   | NOAEL                        | LOAEL   | NOAEL              | LOAEL   |
| <b>Inorganics</b> |                            |         |             |         |                              |         |                    |         |
| ANTIMONY          | NA                         | NA      | 6.1E-03     | 1.3E-04 | NA                           | NA      | 2.0E-01            | 4.2E-03 |
| ARSENIC           | 1.3E-03                    | 6.4E-04 | 5.8E-03     | 1.3E-03 | 4.1E-02                      | 2.0E-02 | 4.2E-02            | 9.5E-03 |
| COPPER            | 3.6E-02                    | 4.1E-03 | 8.6E-02     | 5.8E-03 | 1.1E+00                      | 1.3E-01 | 4.3E-01            | 2.9E-02 |
| LEAD              | 1.4E-01                    | 5.0E-03 | 8.5E-02     | 2.1E-03 | 7.0E+00                      | 2.6E-01 | 1.2E+00            | 3.1E-02 |
| TIN               | 6.1E-03                    | 2.4E-03 | 7.0E-03     | 4.7E-03 | 7.7E-02                      | 3.1E-02 | 1.3E-02            | 8.5E-03 |
| ZINC              | 5.3E-03                    | 2.1E-03 | 1.9E-02     | 4.8E-03 | 5.5E-01                      | 2.1E-01 | 2.9E-01            | 7.4E-02 |

NA = Not applicable because no NOAEL/LOAEL exists for this receptor.

Cells are shaded if the value is greater than 1.0

NOAEL - No Observed Adverse Effects Level

LOAEL - Lowest Observed Adverse Effects Level

EEQ - Ecological Effects Quotient

TABLE C.1-5  
 OCCURRENCE, DISTRIBUTION, AND SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN - SURFACE SOIL  
 MARINE RIFLE RANGE (MRR) - UXO 14  
 TARGET BERM 2  
 SITE INSPECTION  
 NSF INDIAN HEAD - STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND

| Parameter                 | Frequency of Detection <sup>(1)</sup> | Minimum Concentration <sup>(2)</sup> | Maximum Concentration <sup>(2)</sup> | Location of Maximum Concentration | Minimum Nondetect | Maximum Nondetect | Average of Positive Results <sup>(3)</sup> | Overall Average <sup>(4)</sup> | Ecological Screening Level |        |       |         | COPC (yes/no)? | Rationale for COPC selection |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-----------------------------------|-------------------|-------------------|--|--------------------------------|----------------------------|--------|-------|---------|----------------|------------------------------|
|                           |                                       |                                      |                                      |                                   |                   |                   |  |                                | Invertebrates              | Plants | Avian | Mammals |                |                              |
| <b>Inorganics (mg/kg)</b> |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |                |                              |
| ANTIMONY                  | 4/5                                   | 0.13 L                               | 0.17 L                               | X14SB062                          | 0.11              | 0.11              | 0.15                                       | 0.13                           | 78                         | 5      | NA    | 0.27    | YES            | NSL                          |
| ARSENIC                   | 5/5                                   | 1.6                                  | 3.3                                  | X14SB072                          | NA                | NA                | 2.6  | 2.6                            | 60                         | 18     | 43    | 46      | NO             | BSL                          |
| COPPER                    | 5/5                                   | 14.6                                 | 88.6                                 | X14SB058                          | NA                | NA                | 52   | 52                             | 80                         | 70     | 28    | 49      | YES            | ASL                          |
| LEAD                      | 5/5                                   | 85.7                                 | 606                                  | X14SB058                          | NA                | NA                | 288  | 288                            | 1700                       | 120    | 11    | 56      | YES            | ASL                          |
| TIN                       | 1/5                                   | 10.1                                 | 10.1                                 | X14SB058                          | 2                 | 3                 | 10   | 3.0                            | NA                         | 50     | NA    | 7.62    | YES            | ASL/NSL                      |
| ZINC                      | 5/5                                   | 18.2                                 | 35.2                                 | X14SB062                          | NA                | NA                | 29   | 29                             | 120                        | 160    | 46    | 79      | NO             | BSL                          |
| <b>XRF (mg/kg)</b>        |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |                |                              |
| LEAD                      | 35/35                                 | 21.333                               | 783.667                              | X14SB066                          | NA                | NA                | 298  | 298                            | 1700                       | 120    | 11    | 56      | YES            | ASL                          |
| LEAD-CALC                 | 35/35                                 | 37.407                               | 670.143                              | X14SB066                          | NA                | NA                | 267  | 267                            | 1700                       | 120    | 11    | 56      | YES            | ASL                          |

Shaded cells indicate that the maximum concentration exceeds the screening level.

- 1 Sample and duplicate are considered as one sample when determining the frequency of detection.
- 2 Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected.
- 3 Average of detected concentrations only.
- 4 Average of all analytical results.

COPC = Chemical of Potential Concern  
 NA = Not available or not applicable  
 L = Biased low concentration

Rationale Codes for COPC Selection:  
 ASL = Above COPC Screening Level  
 BSL = Below COPC Screening Level  
 NSL = No Screening Level Available

TABLE C.1-6  
 TERRESTRIAL FOOD CHAIN MODEL - AVERAGE SCENARIO  
 INSECTIVOROUS AND HERBIVOROUS RECEPTORS - SURFACE SOIL  
 MARINE RIFLE RANGE (MRR) - UXO 14  
 TARGET BERM 2  
 NSF INDIAN HEAD - STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND

| Chemical          | Herbivorous Receptors EEQs |         |             |         | Insectivorous Receptors EEQs |         |                    |         |
|-------------------|----------------------------|---------|-------------|---------|------------------------------|---------|--------------------|---------|
|                   | Bobwhite Quail             |         | Meadow Vole |         | Robin                        |         | Short-Tailed Shrew |         |
|                   | NOAEL                      | LOAEL   | NOAEL       | LOAEL   | NOAEL                        | LOAEL   | NOAEL              | LOAEL   |
| <b>Inorganics</b> |                            |         |             |         |                              |         |                    |         |
| ANTIMONY          | NA                         | NA      | 6.0E-03     | 1.3E-04 | NA                           | NA      | 2.0E-01            | 4.2E-03 |
| ARSENIC           | 1.3E-03                    | 6.5E-04 | 5.9E-03     | 1.4E-03 | 4.2E-02                      | 2.1E-02 | 4.2E-02            | 9.6E-03 |
| COPPER            | 3.6E-02                    | 4.1E-03 | 8.6E-02     | 5.8E-03 | 1.1E+00                      | 1.3E-01 | 4.3E-01            | 2.9E-02 |
| LEAD              | 1.7E-01                    | 6.3E-03 | 1.0E-01     | 2.6E-03 | 8.7E+00                      | 3.2E-01 | 1.5E+00            | 3.8E-02 |
| TIN               | 5.4E-03                    | 2.2E-03 | 6.3E-03     | 4.2E-03 | 6.9E-02                      | 2.8E-02 | 1.1E-02            | 7.6E-03 |
| ZINC              | 5.8E-03                    | 2.2E-03 | 2.0E-02     | 5.1E-03 | 5.8E-01                      | 2.2E-01 | 3.0E-01            | 7.7E-02 |

NA = Not applicable because no NOAEL/LOAEL exists for this receptor.

Cells are shaded if the value is greater than 1.0

NOAEL - No Observed Adverse Effects Level

LOAEL - Lowest Observed Adverse Effects Level

EEQ - Ecological Effects Quotient

TABLE C.1-7  
 OCCURRENCE, DISTRIBUTION, AND SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN - SURFACE SOIL  
 MARINE RIFLE RANGE (MRR) - UXO 14  
 HILLSIDE IMPACT AREA  
 SITE INSPECTION  
 NSF INDIAN HEAD - STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND

| Parameter                 | Frequency of Detection <sup>(1)</sup> | Minimum Concentration <sup>(2)</sup> | Maximum Concentration <sup>(2)</sup> | Location of Maximum Concentration | Minimum Nondetect | Maximum Nondetect | Average of Positive Results <sup>(3)</sup> | Overall Average <sup>(4)</sup> | Ecological Screening Level |        |       |         | COPC (yes/no)? | Rationale for COPC selection |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-----------------------------------|-------------------|-------------------|--|--------------------------------|----------------------------|--------|-------|---------|----------------|------------------------------|
|                           |                                       |                                      |                                      |                                   |                   |                   |  |                                | Invertebrates              | Plants | Avian | Mammals |                |                              |
| <b>Inorganics (mg/kg)</b> |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |                |                              |
| ANTIMONY                  | 5/17                                  | 0.12 L                               | 0.32 L                               | X14SB134                          | 0.02              | 0.32              | 0.19                                       | 0.10                           | 78                         | 5      | NA    | 0.27    | YES            | ASL/NSL                      |
| ARSENIC                   | 16/17                                 | 1.1                                  | 7.3                                  | X14SB134                          | 1.6               | 1.6               | 3.3  | 3.1                            | 60                         | 18     | 43    | 46      | NO             | BSL                          |
| COPPER                    | 17/17                                 | 8.6                                  | 276                                  | X14SB120                          | NA                | NA                | 59   | 59                             | 80                         | 70     | 28    | 49      | YES            | ASL                          |
| LEAD                      | 16/17                                 | 17.9                                 | 904                                  | X14SB134                          | 11                | 11                | 316  | 298                            | 1700                       | 120    | 11    | 56      | YES            | ASL                          |
| TIN                       | 11/17                                 | 1.6                                  | 81.8                                 | X14SB140                          | 0.49              | 1.7               | 16   | 10                             | NA                         | 50     | NA    | 7.62    | YES            | ASL/NSL                      |
| ZINC                      | 17/17                                 | 7                                    | 60.3                                 | X14SB132                          | NA                | NA                | 28   | 28                             | 120                        | 160    | 46    | 79      | YES            | ASL                          |
| <b>XRF (mg/kg)</b>        |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |                |                              |
| LEAD                      | 64/64                                 | 19.333                               | 19878                                | X14SB102                          | NA                | NA                | 1978                                       | 1978                           | 1700                       | 120    | 11    | 56      | YES            | ASL                          |
| LEAD-CALC                 | 44/44                                 | 35.747                               | 2363.34                              | X14SB128                          | NA                | NA                | 384  | 384                            | 1700                       | 120    | 11    | 56      | YES            | ASL                          |

Shaded cells indicate that the maximum concentration exceeds the screening level.

- 1 Sample and duplicate are considered as one sample when determining the frequency of detection.
- 2 Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected.
- 3 Average of detected concentrations only.
- 4 Average of all analytical results.

COPC = Chemical of Potential Concern  
 NA = Not available or not applicable  
 L = Biased low concentration

Rationale Codes for COPC Selection:  
 ASL = Above COPC Screening Level  
 BSL = Below COPC Screening Level  
 NSL = No Screening Level Available

**TABLE C.1-8**  
**TERRESTRIAL FOOD CHAIN MODEL - AVERAGE SCENARIO**  
**INSECTIVOROUS AND HERBIVOROUS RECEPTORS - SURFACE SOIL**  
**MARINE RIFLE RANGE (MRR) - UXO 14**  
**HILLSIDE IMPACT AREA**  
**NSF INDIAN HEAD -STUMP NECK ANNEX**  
**INDIAN HEAD, MARYLAND**

| Chemical          | Herbivorous Receptors EEQs |         |             |         | Insectivorous Receptors EEQs |         |                    |         |
|-------------------|----------------------------|---------|-------------|---------|------------------------------|---------|--------------------|---------|
|                   | Bobwhite Quail             |         | Meadow Vole |         | Robin                        |         | Short-Tailed Shrew |         |
|                   | NOAEL                      | LOAEL   | NOAEL       | LOAEL   | NOAEL                        | LOAEL   | NOAEL              | LOAEL   |
| <b>Inorganics</b> |                            |         |             |         |                              |         |                    |         |
| ANTIMONY          | NA                         | NA      | 4.8E-03     | 1.0E-04 | NA                           | NA      | 1.5E-01            | 3.3E-03 |
| ARSENIC           | 1.6E-03                    | 8.0E-04 | 7.3E-03     | 1.7E-03 | 4.9E-02                      | 2.4E-02 | 4.9E-02            | 1.1E-02 |
| COPPER            | 3.8E-02                    | 4.5E-03 | 9.1E-02     | 6.1E-03 | 1.2E+00                      | 1.4E-01 | 4.9E-01            | 3.3E-02 |
| LEAD              | 1.8E-01                    | 6.4E-03 | 1.0E-01     | 2.6E-03 | 9.0E+00                      | 3.3E-01 | 1.6E+00            | 3.9E-02 |
| TIN               | 1.9E-02                    | 7.6E-03 | 2.2E-02     | 1.5E-02 | 2.4E-01                      | 9.6E-02 | 4.0E-02            | 2.7E-02 |
| ZINC              | 5.7E-03                    | 2.2E-03 | 2.0E-02     | 5.1E-03 | 5.8E-01                      | 2.2E-01 | 3.0E-01            | 7.7E-02 |

NA = Not applicable because no NOAEL/LOAEL exists for this receptor.

Cells are shaded if the value is greater than 1.0

NOAEL - No Observed Adverse Effects Level

LOAEL - Lowest Observed Adverse Effects Level

EEQ - Ecological Effects Quotient

TABLE C.2-1  
 OCCURRENCE, DISTRIBUTION, AND SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN - COMPOSITE SOIL  
 OLD SKEET AND TRAP RANGE (OSTR) - UXO 15  
 FIRING POINTS  
 SITE INSPECTION  
 NSF INDIAN HEAD - STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND

| Parameter                 | Frequency of Detection <sup>(1)</sup> | Minimum Concentration <sup>(2)</sup> | Maximum Concentration <sup>(2)</sup> | Location of Maximum Concentration | Minimum Nondetect | Maximum Nondetect | Average of Positive Results <sup>(3)</sup> | Overall Average <sup>(4)</sup> | Ecological Screening Level |        |       |         | COPC (yes/no)? | Rationale for COPC selection |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-----------------------------------|-------------------|-------------------|--|--------------------------------|----------------------------|--------|-------|---------|----------------|------------------------------|
|                           |                                       |                                      |                                      |                                   |                   |                   |  |                                | Invertebrates              | Plants | Avian | Mammals |                |                              |
| <b>Inorganics (mg/kg)</b> |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |                |                              |
| ANTIMONY                  | 2/2                                   | 0.46 L                               | 0.68 L                               | X15SB077C                         | NA                | NA                | 0.57                                       | 0.57                           | 78                         | 5      | NA    | 0.27    | YES            | ASL/NSL                      |
| ARSENIC                   | 2/2                                   | 2.6                                  | 2.7                                  | X15SB078C                         | NA                | NA                | 2.7  | 2.7                            | 60                         | 18     | 43    | 46      | NO             | BSL                          |
| COPPER                    | 2/2                                   | 14.8                                 | 23.3                                 | X15SB077C                         | NA                | NA                | 19   | 19                             | 80                         | 70     | 28    | 49      | NO             | BSL                          |
| LEAD                      | 2/2                                   | 66.7                                 | 77.2                                 | X15SB078C                         | NA                | NA                | 72   | 72                             | 1700                       | 120    | 11    | 56      | YES            | ASL                          |
| ZINC                      | 2/2                                   | 52.5                                 | 54.4                                 | X15SB078C                         | NA                | NA                | 53   | 53                             | 120                        | 160    | 46    | 79      | YES            | ASL                          |
| <b>XRF (mg/kg)</b>        |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |                |                              |
| LEAD                      | 2/2                                   | 67.667                               | 81.333                               | X15SB078C                         | NA                | NA                | 75   | 75                             | 1700                       | 120    | 11    | 56      | YES            | ASL                          |
| <b>Explosives (mg/kg)</b> |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |                |                              |
| NITROGLYCERIN             | 2/2                                   | 0.49 J                               | 3.7 J                                | X15SB077C                         | NA                | NA                | 2.1  | 2.1                            | NA                         | NA     | NA    | NA      | YES            | NSL                          |

Shaded cells indicate that the maximum concentration exceeds the screening level.

- 1 Sample and duplicate are considered as one sample when determining the frequency of detection.
- 2 Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected.
- 3 Average of detected concentrations only.
- 4 Average of all analytical results.

COPC = Chemical of Potential Concern      Rationale Codes for COPC Selection:  
 NA = Not available or not applicable      ASL = Above COPC Screening Level  
 J = Estimated concentration              BSL = Below COPC Screening Level  
 L = Biased low concentration              NSL = No Screening Level Available

TABLE C.2-2  
 TERRESTRIAL FOOD CHAIN MODEL - AVERAGE SCENARIO  
 INSECTIVOROUS AND HERBIVOROUS RECEPTORS - COMPOSITE SOIL  
 OLD SKEET AND TRAP RANGE (OSTR) - UXO 15  
 FIRING POINTS  
 NSF INDIAN HEAD - STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND

| Chemical          | Herbivorous Receptors EEQs |         |             |         | Insectivorous Receptors EEQs |         |                    |         |
|-------------------|----------------------------|---------|-------------|---------|------------------------------|---------|--------------------|---------|
|                   | Bobwhite Quail             |         | Meadow Vole |         | Robin                        |         | Short-Tailed Shrew |         |
|                   | NOAEL                      | LOAEL   | NOAEL       | LOAEL   | NOAEL                        | LOAEL   | NOAEL              | LOAEL   |
| <b>Inorganics</b> |                            |         |             |         |                              |         |                    |         |
| ANTIMONY          | NA                         | NA      | 2.5E-02     | 5.3E-04 | NA                           | NA      | 8.7E-01            | 1.9E-02 |
| COPPER            | 2.1E-02                    | 2.5E-03 | 5.6E-02     | 3.8E-03 | 4.0E-01                      | 4.7E-02 | 1.6E-01            | 1.1E-02 |
| LEAD              | 5.2E-02                    | 1.9E-03 | 3.9E-02     | 9.9E-04 | 2.7E+00                      | 9.9E-02 | 4.9E-01            | 1.2E-02 |
| ZINC              | 8.3E-03                    | 3.2E-03 | 2.9E-02     | 7.3E-03 | 7.1E-01                      | 2.7E-01 | 3.7E-01            | 9.4E-02 |
| <b>Explosives</b> |                            |         |             |         |                              |         |                    |         |
| NITROGLYCERIN     | NA                         | NA      | 3.4E-02     | 3.2E-03 | NA                           | NA      | 6.3E-02            | 5.9E-03 |

NA = Not applicable because no NOAEL/LOAEL exists for this receptor.

Cells are shaded if the value is greater than 1.0

NOAEL - No Observed Adverse Effects Level

LOAEL - Lowest Observed Adverse Effects Level

EEQ - Ecological Effects Quotient

TABLE C.2-3  
 OCCURRENCE, DISTRIBUTION, AND SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN - SURFACE SOIL  
 OLD SKEET AND TRAP RANGE (OSTR) - UXO 15  
 SHOT FALL/TARGET AREA  
 SITE INSPECTION  
 NSF INDIAN HEAD - STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND

| Parameter                 | Frequency of Detection <sup>(1)</sup> | Minimum Concentration <sup>(2)</sup> | Maximum Concentration <sup>(2)</sup> | Location of Maximum Concentration | Minimum Nondetect | Maximum Nondetect | Average of Positive Results <sup>(3)</sup> | Overall Average <sup>(4)</sup> | Ecological Screening Level |        |       |         | COPC (yes/no)? | Rationale for COPC selection |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-----------------------------------|-------------------|-------------------|--|--------------------------------|----------------------------|--------|-------|---------|----------------|------------------------------|
|                           |                                       |                                      |                                      |                                   |                   |                   |  |                                | Invertebrates              | Plants | Avian | Mammals |                |                              |
| <b>Inorganics (mg/kg)</b> |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |                |                              |
| ANTIMONY                  | 14/14                                 | 0.16 J                               | 4.8 J                                | X15SB064                          | NA                | NA                | 0.88                                       | 0.88                           | 78                         | 5      | NA    | 0.27    | YES            | ASL/NSL                      |
| ARSENIC                   | 14/14                                 | 1.6                                  | 7.2                                  | X15SB007                          | NA                | NA                | 3.3  | 3.3                            | 60                         | 18     | 43    | 46      | NO             | BSL                          |
| COPPER                    | 14/14                                 | 5.4                                  | 37.6 L                               | X15SB068                          | NA                | NA                | 13   | 13                             | 80                         | 70     | 28    | 49      | YES            | ASL                          |
| LEAD                      | 14/14                                 | 32                                   | 940                                  | X15SB064                          | NA                | NA                | 320  | 320                            | 1700                       | 120    | 11    | 56      | YES            | ASL                          |
| ZINC                      | 14/14                                 | 25.1                                 | 53.3                                 | X15SB068                          | NA                | NA                | 35   | 35                             | 120                        | 160    | 46    | 79      | YES            | ASL                          |
| <b>PAHs (ug/kg)</b>       |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |                |                              |
| 1-METHYLNAPHTHALENE       | 7/18                                  | 5.4 J                                | 230 J                                | X15SB052                          | 23                | 10000             | 96   | 812                            | 29000                      | NA     | NA    | 10000   | YES            | NSL                          |
| 2-METHYLNAPHTHALENE       | 10/18                                 | 9.2 J                                | 230                                  | X15SB015                          | 24                | 10000             | 71   | 917                            | 29000                      | NA     | NA    | 100000  | YES            | NSL                          |
| ACENAPHTHENE              | 15/18                                 | 4.2 J                                | 5000 J                               | X15SB038                          | 24                | 26                | 1399                                       | 1168                           | 29000                      | 20000  | 100   | 100000  | YES            | ASL                          |
| ANTHRACENE                | 15/18                                 | 1.9 J                                | 7200 J                               | X15SB038                          | 25                | 27                | 1935                                       | 1615                           | 29000                      | 100    | 100   | 100000  | YES            | ASL                          |
| BENZO(A)ANTHRACENE        | 18/18                                 | 20 J                                 | 33000                                | X15SB053                          | NA                | NA                | 8341                                       | 8341                           | 18000                      | 100    | 100   | 1100    | YES            | ASL                          |
| BENZO(A)PYRENE            | 18/18                                 | 18 J                                 | 42000                                | X15SB053                          | NA                | NA                | 10721                                      | 10721                          | 18000                      | 100    | 100   | 1100    | YES            | ASL                          |
| BENZO(B)FLUORANTHENE      | 18/18                                 | 24 J                                 | 41000                                | X15SB053                          | NA                | NA                | 10706                                      | 10706                          | 18000                      | 100    | 100   | 1100    | YES            | ASL                          |
| BENZO(G,H,I)PERYLENE      | 18/18                                 | 13 J                                 | 25000                                | X15SB053                          | NA                | NA                | 6294                                       | 6294                           | 18000                      | 100    | 100   | 1100    | YES            | ASL                          |
| BENZO(K)FLUORANTHENE      | 18/18                                 | 11 J                                 | 18000                                | X15SB038                          | NA                | NA                | 4501                                       | 4501                           | 18000                      | 100    | 100   | 1100    | YES            | ASL                          |
| CHRYSENE                  | 18/18                                 | 13 J                                 | 43000                                | X15SB053                          | NA                | NA                | 10718                                      | 10718                          | 18000                      | 100    | 100   | 1100    | YES            | ASL                          |
| DIBENZO(A,H)ANTHRACENE    | 18/18                                 | 7.8 J                                | 7600 J                               | X15SB053                          | NA                | NA                | 1955                                       | 1955                           | 18000                      | 100    | 100   | 1100    | YES            | ASL                          |
| FLUORANTHENE              | 18/18                                 | 13 J                                 | 38000                                | X15SB038                          | NA                | NA                | 9723                                       | 9723                           | 29000                      | 100    | 100   | 100000  | YES            | ASL                          |
| FLUORENE                  | 10/18                                 | 8.3 J                                | 3100 J                               | X15SB038                          | 24                | 10000             | 629  | 1077                           | 29000                      | 100    | 100   | 100000  | YES            | ASL                          |
|                           |                                       |                                      |                                      | X15SB038;                         |                   |                   |  |                                |                            |        |       |         |                |                              |
| INDENO(1,2,3-CD)PYRENE    | 18/18                                 | 11 J                                 | 27000                                | X15SB053                          | NA                | NA                | 6969                                       | 6969                           | 18000                      | 100    | 100   | 1100    | YES            | ASL                          |
| NAPHTHALENE               | 7/18                                  | 8.6 J                                | 330                                  | X15SB050                          | 23                | 10000             | 118  | 1152                           | 29000                      | 100    | 100   | 100000  | YES            | ASL                          |
| PHENANTHRENE              | 18/18                                 | 5.4 J                                | 30000                                | X15SB038                          | NA                | NA                | 6820                                       | 6820                           | 29000                      | 100    | 100   | 100000  | YES            | ASL                          |
| PYRENE                    | 18/18                                 | 11 J                                 | 45000                                | X15SB038                          | NA                | NA                | 11362                                      | 11362                          | 18000                      | 100    | 100   | 1100    | YES            | ASL                          |
| <b>XRF (mg/kg)</b>        |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |                |                              |
| LEAD                      | 72/72                                 | 20.333                               | 1260.33                              | X15SB074                          | NA                | NA                | 188  | 188                            | 1700                       | 120    | 11    | 56      | YES            | ASL                          |
| LEAD-CALC                 | 72/72                                 | 40.047                               | 957.647                              | X15SB074                          | NA                | NA                | 164  | 164                            | 1700                       | 120    | 11    | 56      | YES            | ASL                          |

Shaded cells indicate that the maximum concentration exceeds the screening level.

1 Sample and duplicate are considered as one sample when determining the frequency of detection.

2 Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected.

3 Average of detected concentrations only.

4 Average of all analytical results.

COPC = Chemical of Potential Concern

NA = Not available or not applicable

J = Estimated concentration

L = Biased low concentration

Rationale Codes for COPC Selection:

ASL = Above COPC Screening Level

BSL = Below COPC Screening Level

NSL = No Screening Level Available

**TABLE C.2-4**  
**TERRESTRIAL FOOD CHAIN MODEL - AVERAGE SCENARIO**  
**INSECTIVOROUS AND HERBIVOROUS RECEPTORS - SURFACE SOIL**  
**OLD SKEET AND TRAP RANGE (OSTR) - UXO 15**  
**SHOT FALL/TARGET AREA**  
**NSF INDIAN HEAD - STUMP NECK ANNEX**  
**INDIAN HEAD, MARYLAND**

| Chemical                     | Herbivorous Receptors EEQs |         |             |         | Insectivorous Receptors EEQs |         |                    |         |
|------------------------------|----------------------------|---------|-------------|---------|------------------------------|---------|--------------------|---------|
|                              | Bobwhite Quail             |         | Meadow Vole |         | Robin                        |         | Short-Tailed Shrew |         |
|                              | NOAEL                      | LOAEL   | NOAEL       | LOAEL   | NOAEL                        | LOAEL   | NOAEL              | LOAEL   |
| <b>Semivolatile Organics</b> |                            |         |             |         |                              |         |                    |         |
| 1-METHYLNAPHTHALENE          | 5.7E-04                    | 5.7E-05 | 6.9E-05     | 1.3E-05 | 2.2E-02                      | 2.2E-03 | 4.0E-04            | 7.3E-05 |
| 2-METHYLNAPHTHALENE          | 4.9E-04                    | 4.9E-05 | 6.0E-05     | 1.1E-05 | 1.6E-02                      | 1.6E-03 | 2.9E-04            | 5.4E-05 |
| ACENAPHTHENE                 | 4.4E-04                    | 4.4E-05 | 1.3E-05     | 2.4E-06 | 1.3E-01                      | 1.3E-02 | 2.3E-03            | 4.3E-04 |
| ANTHRACENE                   | 3.7E-03                    | 3.7E-04 | 4.2E-04     | 7.7E-05 | 3.0E-01                      | 3.0E-02 | 5.3E-03            | 9.8E-04 |
| BENZO(A)ANTHRACENE           | 4.3E-03                    | 4.3E-04 | 2.7E-02     | 4.3E-04 | 1.0E+00                      | 1.0E-01 | 1.9E+00            | 3.1E-02 |
| BENZO(A)PYRENE               | 1.1E-02                    | 1.1E-03 | 1.1E-01     | 1.8E-03 | 1.1E+00                      | 1.1E-01 | 2.1E+00            | 3.3E-02 |
| BENZO(B)FLUORANTHENE         | 2.3E-02                    | 2.3E-03 | 2.7E-01     | 4.4E-03 | 2.1E+00                      | 2.1E-01 | 4.0E+00            | 6.5E-02 |
| BENZO(G,H,I)PERYLENE         | 2.2E-02                    | 2.2E-03 | 2.8E-01     | 4.5E-03 | 1.4E+00                      | 1.4E-01 | 2.7E+00            | 4.3E-02 |
| BENZO(K)FLUORANTHENE         | 4.1E-03                    | 4.1E-04 | 3.8E-02     | 6.0E-04 | 8.9E-01                      | 8.9E-02 | 1.7E+00            | 2.7E-02 |
| CHRYSENE                     | 5.4E-03                    | 5.4E-04 | 3.2E-02     | 5.1E-04 | 1.9E+00                      | 1.9E-01 | 3.6E+00            | 5.7E-02 |
| DIBENZO(A,H)ANTHRACENE       | 2.2E-03                    | 2.2E-04 | 2.2E-02     | 3.5E-04 | 3.4E-01                      | 3.4E-02 | 6.6E-01            | 1.1E-02 |
| FLUORANTHENE                 | 3.2E-02                    | 3.2E-03 | 3.7E-03     | 6.8E-04 | 2.2E+00                      | 2.2E-01 | 4.0E-02            | 7.4E-03 |
| FLUORENE                     | 4.0E-04                    | 4.0E-05 | 1.2E-05     | 2.3E-06 | 7.7E-01                      | 7.7E-02 | 1.4E-02            | 2.6E-03 |
| INDENO(1,2,3-CD)PYRENE       | 6.9E-03                    | 6.9E-04 | 6.7E-02     | 1.1E-03 | 1.5E+00                      | 1.5E-01 | 2.9E+00            | 4.6E-02 |
| NAPHTHALENE                  | 8.4E-03                    | 8.4E-04 | 1.1E-03     | 2.0E-04 | 3.9E-02                      | 3.9E-03 | 7.1E-04            | 1.3E-04 |
| PHENANTHRENE                 | 1.9E-02                    | 1.9E-03 | 2.1E-03     | 3.9E-04 | 9.0E-01                      | 9.0E-02 | 1.6E-02            | 2.9E-03 |
| PYRENE                       | 5.2E-02                    | 5.2E-03 | 6.6E-01     | 1.1E-02 | 1.5E+00                      | 1.5E-01 | 2.9E+00            | 4.6E-02 |
| <b>Inorganics</b>            |                            |         |             |         |                              |         |                    |         |
| ANTIMONY                     | NA                         | NA      | 3.8E-02     | 8.1E-04 | NA                           | NA      | 1.3E+00            | 2.9E-02 |
| COPPER                       | 1.8E-02                    | 2.1E-03 | 4.8E-02     | 3.3E-03 | 2.8E-01                      | 3.3E-02 | 1.1E-01            | 7.5E-03 |
| LEAD                         | 1.9E-01                    | 6.9E-03 | 1.1E-01     | 2.8E-03 | 9.5E+00                      | 3.5E-01 | 1.7E+00            | 4.2E-02 |
| ZINC                         | 6.5E-03                    | 2.5E-03 | 2.3E-02     | 5.8E-03 | 6.2E-01                      | 2.4E-01 | 3.3E-01            | 8.3E-02 |

NA = Not applicable because no NOAEL/LOAEL exists for this receptor.

Cells are shaded if the value is greater than 1.0

NOAEL - No Observed Adverse Effects Level

LOAEL - Lowest Observed Adverse Effects Level

EEQ - Ecological Effects Quotient

TABLE C.3-1  
 OCCURRENCE, DISTRIBUTION, AND SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN - COMPOSITE SOIL  
 RUM POINT SKEET RANGE (RPSR) - UXO 16  
 FIRING POINTS  
 SITE INSPECTION  
 NSF INDIAN HEAD - STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND

| Parameter                 | Frequency of Detection <sup>(1)</sup> | Minimum Concentration <sup>(2)</sup> | Maximum Concentration <sup>(2)</sup> | Location of Maximum Concentration | Minimum Nondetect | Maximum Nondetect | Average of Positive Results <sup>(3)</sup> | Overall Average <sup>(4)</sup> | Ecological Screening Level |        |       |         | COPC (yes/no)? | Rationale for COPC selection |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-----------------------------------|-------------------|-------------------|--|--------------------------------|----------------------------|--------|-------|---------|----------------|------------------------------|
|                           |                                       |                                      |                                      |                                   |                   |                   |  |                                | Invertebrates              | Plants | Avian | Mammals |                |                              |
| <b>Inorganics (mg/kg)</b> |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |                |                              |
| ANTIMONY                  | 2/2                                   | 0.14 L                               | 0.42 L                               | X16SB081C                         | NA                | NA                | 0.28                                       | 0.28                           | 78                         | 5      | NA    | 0.27    | YES            | ASL/NSL                      |
| ARSENIC                   | 2/2                                   | 3                                    | 4.2                                  | X16SB081C                         | NA                | NA                | 3.6  | 3.6                            | 60                         | 18     | 43    | 46      | NO             | BSL                          |
| COPPER                    | 2/2                                   | 4.8                                  | 9.6                                  | X16SB081C                         | NA                | NA                | 7.2  | 7.2                            | 80                         | 70     | 28    | 49      | NO             | BSL                          |
| LEAD                      | 2/2                                   | 9.1                                  | 48.7                                 | X16SB081C                         | NA                | NA                | 29   | 29                             | 1700                       | 120    | 11    | 56      | YES            | ASL                          |
| ZINC                      | 2/2                                   | 18.7                                 | 29                                   | X16SB081C                         | NA                | NA                | 24   | 24                             | 120                        | 160    | 46    | 79      | NO             | BSL                          |
| <b>PAHs (ug/kg)</b>       |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |                |                              |
| 2-METHYLNAPHTHALENE       | 1/2                                   | 3.5 J                                | 3.5 J                                | X16SB080C                         | 23                | 23                | 3.5  | 7.5                            | 29000                      | NA     | NA    | 100000  | YES            | NSL                          |
| ANTHRACENE                | 2/2                                   | 4.1 J                                | 5.6 J                                | X16SB081C                         | NA                | NA                | 5  | 5                              | 29000                      | 100    | 100   | 100000  | NO             | BSL                          |
| BENZO(A)ANTHRACENE        | 2/2                                   | 78                                   | 94                                   | X16SB081C                         | NA                | NA                | 86   | 86                             | 18000                      | 100    | 100   | 1100    | NO             | BSL                          |
| BENZO(A)PYRENE            | 2/2                                   | 91                                   | 100                                  | X16SB081C                         | NA                | NA                | 96   | 96                             | 18000                      | 100    | 100   | 1100    | NO             | BSL                          |
| BENZO(B)FLUORANTHENE      | 2/2                                   | 33                                   | 38                                   | X16SB081C                         | NA                | NA                | 36   | 36                             | 18000                      | 100    | 100   | 1100    | NO             | BSL                          |
| BENZO(G,H,I)PERYLENE      | 2/2                                   | 41                                   | 50                                   | X16SB081C                         | NA                | NA                | 46   | 46                             | 18000                      | 100    | 100   | 1100    | NO             | BSL                          |
| BENZO(K)FLUORANTHENE      | 2/2                                   | 5.8 J                                | 7.7 J                                | X16SB081C                         | NA                | NA                | 6.8  | 6.8                            | 18000                      | 100    | 100   | 1100    | NO             | BSL                          |
| CHRYSENE                  | 2/2                                   | 97                                   | 130                                  | X16SB081C                         | NA                | NA                | 114  | 114                            | 18000                      | 100    | 100   | 1100    | YES            | ASL                          |
| DIBENZO(A,H)ANTHRACENE    | 2/2                                   | 12 J                                 | 18 J                                 | X16SB081C                         | NA                | NA                | 15   | 15                             | 18000                      | 100    | 100   | 1100    | NO             | BSL                          |
| FLUORANTHENE              | 2/2                                   | 9.8 J                                | 13 J                                 | X16SB081C                         | NA                | NA                | 11   | 11                             | 29000                      | 100    | 100   | 100000  | NO             | BSL                          |
| INDENO(1,2,3-CD)PYRENE    | 2/2                                   | 9.1 J                                | 10 J                                 | X16SB081C                         | NA                | NA                | 9.6  | 9.6                            | 18000                      | 100    | 100   | 1100    | NO             | BSL                          |
| PHENANTHRENE              | 2/2                                   | 21 J                                 | 24                                   | X16SB081C                         | NA                | NA                | 23   | 23                             | 29000                      | 100    | 100   | 100000  | NO             | BSL                          |
| PYRENE                    | 2/2                                   | 92                                   | 110                                  | X16SB081C                         | NA                | NA                | 101  | 101                            | 18000                      | 100    | 100   | 1100    | YES            | ASL                          |
| <b>XRF (mg/kg)</b>        |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |                |                              |
| LEAD                      | 2/2                                   | 21                                   | 73.333                               | X16SB081C                         | NA                | NA                | 47   | 47                             | 1700                       | 120    | 11    | 56      | YES            | ASL                          |

Shaded cells indicate that the maximum concentration exceeds the screening level.

1 Sample and duplicate are considered as one sample when determining the frequency of detection.

2 Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected.

3 Average of detected concentrations only.

4 Average of all analytical results.

COPC = Chemical of Potential Concern

NA = Not available or not applicable

J = Estimated concentration

L = Biased low concentration

Rationale Codes for COPC Selection:

ASL = Above COPC Screening Level

BSL = Below COPC Screening Level

NSL = No Screening Level Available

**TABLE C.3-2**  
**TERRESTRIAL FOOD CHAIN MODEL - AVERAGE SCENARIO**  
**INSECTIVOROUS AND HERBIVOROUS RECEPTORS - COMPOSITE SOIL**  
**RUM POINT SKEET RANGE (RPSR) - UXO 16**  
**FIRING POINTS**  
**NSF INDIAN HEAD - STUMP NECK ANNEX**  
**INDIAN HEAD, MARYLAND**

| Chemical                     | Herbivorous Receptors EEQs |         |             |         | Insectivorous Receptors EEQs |         |                    |         |
|------------------------------|----------------------------|---------|-------------|---------|------------------------------|---------|--------------------|---------|
|                              | Bobwhite Quail             |         | Meadow Vole |         | Robin                        |         | Short-Tailed Shrew |         |
|                              | NOAEL                      | LOAEL   | NOAEL       | LOAEL   | NOAEL                        | LOAEL   | NOAEL              | LOAEL   |
| <b>Semivolatile Organics</b> |                            |         |             |         |                              |         |                    |         |
| 2-METHYLNAPHTHALENE          | 1.2E-04                    | 1.2E-05 | 1.5E-05     | 2.8E-06 | 8.0E-04                      | 8.0E-05 | 1.4E-05            | 2.7E-06 |
| ANTHRACENE                   | 3.6E-05                    | 3.6E-06 | 4.4E-06     | 8.1E-07 | 8.9E-04                      | 8.9E-05 | 1.6E-05            | 2.9E-06 |
| BENZO(A)ANTHRACENE           | 1.2E-04                    | 1.2E-05 | 1.3E-03     | 2.1E-05 | 1.1E-02                      | 1.1E-03 | 2.0E-02            | 3.2E-04 |
| BENZO(A)PYRENE               | 1.1E-04                    | 1.1E-05 | 1.1E-03     | 1.8E-05 | 9.8E-03                      | 9.8E-04 | 1.9E-02            | 3.0E-04 |
| BENZO(B)FLUORANTHENE         | 7.7E-05                    | 7.7E-06 | 9.1E-04     | 1.5E-05 | 7.0E-03                      | 7.0E-04 | 1.3E-02            | 2.1E-04 |
| BENZO(G,H,I)PERYLENE         | 7.6E-05                    | 7.6E-06 | 8.5E-04     | 1.4E-05 | 1.0E-02                      | 1.0E-03 | 1.9E-02            | 3.1E-04 |
| BENZO(K)FLUORANTHENE         | 1.2E-05                    | 1.2E-06 | 1.3E-04     | 2.1E-06 | 1.3E-03                      | 1.3E-04 | 2.5E-03            | 4.1E-05 |
| CHRYSENE                     | 1.5E-04                    | 1.5E-05 | 1.6E-03     | 2.5E-05 | 2.0E-02                      | 2.0E-03 | 3.8E-02            | 6.0E-04 |
| DIBENZO(A,H)ANTHRACENE       | 1.7E-05                    | 1.7E-06 | 1.7E-04     | 2.7E-06 | 2.6E-03                      | 2.6E-04 | 5.0E-03            | 8.1E-05 |
| FLUORANTHENE                 | 3.7E-05                    | 3.7E-06 | 4.3E-06     | 8.0E-07 | 2.6E-03                      | 2.6E-04 | 4.7E-05            | 8.7E-06 |
| INDENO(1,2,3-CD)PYRENE       | 9.5E-06                    | 9.5E-07 | 9.2E-05     | 1.5E-06 | 2.1E-03                      | 2.1E-04 | 4.0E-03            | 6.3E-05 |
| PHENANTHRENE                 | 4.8E-04                    | 4.8E-05 | 6.0E-05     | 1.1E-05 | 3.0E-03                      | 3.0E-04 | 5.3E-05            | 9.7E-06 |
| PYRENE                       | 4.6E-04                    | 4.6E-05 | 5.9E-03     | 9.4E-05 | 1.4E-02                      | 1.4E-03 | 2.6E-02            | 4.1E-04 |
| <b>Inorganics</b>            |                            |         |             |         |                              |         |                    |         |
| ANTIMONY                     | NA                         | NA      | 1.3E-02     | 2.7E-04 | NA                           | NA      | 4.3E-01            | 9.1E-03 |
| ARSENIC                      | 1.8E-03                    | 9.2E-04 | 8.4E-03     | 1.9E-03 | 5.5E-02                      | 2.7E-02 | 5.4E-02            | 1.2E-02 |
| COPPER                       | 1.3E-02                    | 1.6E-03 | 3.8E-02     | 2.6E-03 | 1.5E-01                      | 1.8E-02 | 6.0E-02            | 4.1E-03 |
| LEAD                         | 2.5E-02                    | 9.2E-04 | 2.2E-02     | 5.5E-04 | 1.3E+00                      | 4.6E-02 | 2.3E-01            | 5.9E-03 |
| ZINC                         | 5.2E-03                    | 2.0E-03 | 1.8E-02     | 4.6E-03 | 5.4E-01                      | 2.1E-01 | 2.9E-01            | 7.2E-02 |

NA = Not applicable because no NOAEL/LOAEL exists for this receptor.

Cells are shaded if the value is greater than 1.0

NOAEL - No Observed Adverse Effects Level

LOAEL - Lowest Observed Adverse Effects Level

EEQ - Ecological Effects Quotient

TABLE C.3-3  
 OCCURRENCE, DISTRIBUTION, AND SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN - SURFACE SOIL  
 RUM POINT SKEET RANGE (RPSR) - UXO 16  
 SHOT FALL/TARGET AREA  
 SITE INSPECTION  
 NSF INDIAN HEAD - STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND

| Parameter                 | Frequency of Detection <sup>(1)</sup> | Minimum Concentration <sup>(2)</sup> | Maximum Concentration <sup>(2)</sup> | Location of Maximum Concentration | Minimum Nondetect | Maximum Nondetect | Average of Positive Results <sup>(3)</sup> | Overall Average <sup>(4)</sup> | Ecological Screening Level |        |       |         |              | COPC (yes/no)? | Rationale for COPC selection |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-----------------------------------|-------------------|-------------------|--|--------------------------------|----------------------------|--------|-------|---------|--------------|----------------|------------------------------|
|                           |                                       |                                      |                                      |                                   |                   |                   |  |                                | Invertebrates              | Plants | Avian | Mammals | Lowest Value |                |                              |
| <b>Inorganics (mg/kg)</b> |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |              |                |                              |
| ANTIMONY                  | 12/20                                 | 0.2 L                                | 1.6 J                                | X16SB090                          | 0.03              | 0.73              | 0.67                                       | 0.44                           | 78                         | 5      | NA    | 0.27    | 0.27         | YES            | ASL/NSL                      |
| ARSENIC                   | 18/20                                 | 1.1                                  | 6.5                                  | X16SB061                          | 0.16              | 1.9               | 3.3  | 3.0                            | 60                         | 18     | 43    | 46      | 18           | NO             | BSL                          |
| COPPER                    | 20/20                                 | 2.4 K                                | 11.4 K                               | X16SB013                          | NA                | NA                | 6.3  | 6.3                            | 80                         | 70     | 28    | 49      | 28           | NO             | BSL                          |
| LEAD                      | 20/20                                 | 6.7                                  | 616                                  | X16SB008                          | NA                | NA                | 91   | 91                             | 1700                       | 120    | 11    | 56      | 11           | YES            | ASL                          |
| ZINC                      | 20/20                                 | 9.5                                  | 34.9                                 | X16SB013                          | NA                | NA                | 23   | 23                             | 120                        | 160    | 46    | 79      | 46           | NO             | BSL                          |
| <b>PAHs (ug/kg)</b>       |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |              |                |                              |
| 1-METHYLNAPHTHALENE       | 6/21                                  | 2.4 J                                | 16 L                                 | X16SB076                          | 22                | 28                | 6.2  | 10                             | 29000                      | NA     | NA    | 100000  | 29000        | YES            | NSL                          |
| 2-METHYLNAPHTHALENE       | 7/21                                  | 6.4 L                                | 68 L                                 | X16SB076                          | 22                | 28                | 23   | 15                             | 29000                      | NA     | NA    | 100000  | 29000        | YES            | NSL                          |
| ACENAPHTHENE              | 4/21                                  | 2.4 J                                | 7.7 L                                | X16SB076                          | 22                | 28                | 4.5  | 10                             | 29000                      | 20000  | 100   | 100000  | 100          | NO             | BSL                          |
| ACENAPHTHYLENE            | 1/21                                  | 24 L                                 | 24 L                                 | X16SB031                          | 22                | 28                | 24   | 12                             | 29000                      | 100    | 100   | 100000  | 100          | NO             | BSL                          |
| ANTHRACENE                | 15/21                                 | 1.6 L                                | 110 L                                | X16SB076                          | 22                | 26                | 28   | 23                             | 29000                      | 100    | 100   | 100000  | 100          | YES            | ASL                          |
| BAP EQUIVALENT-HALFND     | 21/21                                 | 20.3838                              | 4111                                 | X16SB076                          | 22                | 22                | 610  | 610                            |                            |        |       |         | NA           |                |                              |
| BENZO(A)ANTHRACENE        | 20/21                                 | 2.6 J                                | 2400                                 | X16SB076                          | 22                | 23                | 426  | 406                            | 18000                      | 100    | 100   | 1100    | 100          | YES            | ASL                          |
| BENZO(A)PYRENE            | 18/21                                 | 5.8 J                                | 3200                                 | X16SB076                          | 22                | 26                | 548  | 472                            | 18000                      | 100    | 100   | 1100    | 100          | YES            | ASL                          |
| BENZO(B)FLUORANTHENE      | 18/21                                 | 3 J                                  | 1000                                 | X16SB076                          | 22                | 26                | 185  | 161                            | 18000                      | 100    | 100   | 1100    | 100          | YES            | ASL                          |
| BENZO(G,H,I)PERYLENE      | 18/21                                 | 3.4 J                                | 1500                                 | X16SB076                          | 22                | 26                | 239  | 206                            | 18000                      | 100    | 100   | 1100    | 100          | YES            | ASL                          |
| BENZO(K)FLUORANTHENE      | 14/21                                 | 4.3 J                                | 200 L                                | X16SB076                          | 22                | 26                | 42   | 32                             | 18000                      | 100    | 100   | 1100    | 100          | YES            | ASL                          |
| CHRYSENE                  | 21/21                                 | 3.3 J                                | 3000                                 | X16SB076                          | 22                | 22                | 510  | 510                            | 18000                      | 100    | 100   | 1100    | 100          | YES            | ASL                          |
| DIBENZO(A,H)ANTHRACENE    | 15/21                                 | 6.1 L                                | 540                                  | X16SB076                          | 22                | 26                | 101  | 75                             | 18000                      | 100    | 100   | 1100    | 100          | YES            | ASL                          |
| FLUORANTHENE              | 19/21                                 | 2.5 L                                | 210 L                                | X16SB076                          | 22                | 26                | 52   | 48                             | 29000                      | 100    | 100   | 100000  | 100          | YES            | ASL                          |
| FLUORENE                  | 5/21                                  | 4.2 L                                | 21 J                                 | X16SB076                          | 22                | 28                | 10   | 12                             | 29000                      | 100    | 100   | 100000  | 100          | NO             | BSL                          |
| INDENO(1,2,3-CD)PYRENE    | 20/21                                 | 2.5 J                                | 260 L                                | X16SB076                          | 22                | 26                | 52   | 50                             | 18000                      | 100    | 100   | 1100    | 100          | YES            | ASL                          |
| NAPHTHALENE               | 2/21                                  | 3.1 J                                | 7.2 L                                | X16SB076                          | 22                | 28                | 5.2  | 11                             | 29000                      | 100    | 100   | 100000  | 100          | NO             | BSL                          |
| PHENANTHRENE              | 16/21                                 | 3.2 L                                | 620                                  | X16SB076                          | 22                | 26                | 126  | 99                             | 29000                      | 100    | 100   | 100000  | 100          | YES            | ASL                          |
| PYRENE                    | 20/21                                 | 3.1 J                                | 2000                                 | X16SB076                          | 22                | 23                | 369  | 352                            | 18000                      | 100    | 100   | 1100    | 100          | YES            | ASL                          |
| <b>XRF (mg/kg)</b>        |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |              |                |                              |
| LEAD                      | 92/92                                 | 11.667                               | 975.333                              | X16SB008                          | NA                | NA                | 75   | 75                             | 1700                       | 120    | 11    | 56      | 11           | YES            | ASL                          |

Shaded values indicate that the maximum concentration exceeds the screening level.

1 Sample and duplicate are considered as one sample when determining the frequency of detection.

2 Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected.

3 Average of detected concentrations only.

4 Average of all analytical results.

COPC = Chemical of Potential Concern

NA = Not available or not applicable

J = Estimated concentration

K = Biased high concentration

L = Biased low concentration

Rationale Codes for COPC Selection:

ASL = Above COPC Screening Level

BSL = Below COPC Screening Level

NSL = No Screening Level Available

**TABLE C.3-4**  
**TERRESTRIAL FOOD CHAIN MODEL - AVERAGE SCENARIO**  
**INSECTIVOROUS AND HERBIVOROUS RECEPTORS - SURFACE SOIL**  
**RUM POINT SKEET RANGE (RPSR) - UXO 16**  
**SHOT FALL/TARGET AREA**  
**NSF INDIAN HEAD - STUMP NECK ANNEX**  
**INDIAN HEAD, MARYLAND**

| Chemical                     | Herbivorous Receptors EEQs |         |             |         | Insectivorous Receptors EEQs |         |                    |         |
|------------------------------|----------------------------|---------|-------------|---------|------------------------------|---------|--------------------|---------|
|                              | Bobwhite Quail             |         | Meadow Vole |         | Robin                        |         | Short-Tailed Shrew |         |
|                              | NOAEL                      | LOAEL   | NOAEL       | LOAEL   | NOAEL                        | LOAEL   | NOAEL              | LOAEL   |
| <b>Semivolatile Organics</b> |                            |         |             |         |                              |         |                    |         |
| 1-METHYLNAPHTHALENE          | 2.0E-04                    | 2.0E-05 | 2.5E-05     | 4.6E-06 | 2.4E-03                      | 2.4E-04 | 4.3E-05            | 7.9E-06 |
| 2-METHYLNAPHTHALENE          | 2.4E-04                    | 2.4E-05 | 3.0E-05     | 5.5E-06 | 3.5E-03                      | 3.5E-04 | 6.4E-05            | 1.2E-05 |
| ACENAPHTHENE                 | 2.3E-03                    | 2.3E-04 | 2.9E-04     | 5.3E-05 | 5.1E-04                      | 5.1E-05 | 9.1E-06            | 1.7E-06 |
| ACENAPHTHYLENE               | 6.2E-05                    | 6.2E-06 | 7.5E-06     | 1.4E-06 | 2.1E-02                      | 2.1E-03 | 3.9E-04            | 7.1E-05 |
| ANTHRACENE                   | 1.3E-04                    | 1.3E-05 | 1.5E-05     | 2.8E-06 | 4.3E-03                      | 4.3E-04 | 7.7E-05            | 1.4E-05 |
| BENZO(A)ANTHRACENE           | 3.7E-04                    | 3.7E-05 | 3.5E-03     | 5.6E-05 | 5.0E-02                      | 5.0E-03 | 9.4E-02            | 1.5E-03 |
| BENZO(A)PYRENE               | 5.2E-04                    | 5.2E-05 | 5.3E-03     | 8.5E-05 | 4.9E-02                      | 4.9E-03 | 9.1E-02            | 1.5E-03 |
| BENZO(B)FLUORANTHENE         | 3.5E-04                    | 3.5E-05 | 4.1E-03     | 6.6E-05 | 3.2E-02                      | 3.2E-03 | 6.1E-02            | 9.7E-04 |
| BENZO(G,H,I)PERYLENE         | 4.3E-04                    | 4.3E-05 | 5.0E-03     | 8.0E-05 | 4.6E-02                      | 4.6E-03 | 8.8E-02            | 1.4E-03 |
| BENZO(K)FLUORANTHENE         | 4.6E-05                    | 4.6E-06 | 5.1E-04     | 8.1E-06 | 6.3E-03                      | 6.3E-04 | 1.2E-02            | 1.9E-04 |
| CHRYSENE                     | 4.4E-04                    | 4.4E-05 | 4.0E-03     | 6.4E-05 | 8.9E-02                      | 8.9E-03 | 1.7E-01            | 2.7E-03 |
| DIBENZO(A,H)ANTHRACENE       | 8.4E-05                    | 8.4E-06 | 8.5E-04     | 1.4E-05 | 1.3E-02                      | 1.3E-03 | 2.5E-02            | 4.0E-04 |
| FLUORANTHENE                 | 1.6E-04                    | 1.6E-05 | 1.8E-05     | 3.4E-06 | 1.1E-02                      | 1.1E-03 | 2.0E-04            | 3.7E-05 |
| FLUORENE                     | 1.0E-03                    | 1.0E-04 | 1.3E-04     | 2.4E-05 | 8.2E-03                      | 8.2E-04 | 1.5E-04            | 2.8E-05 |
| INDENO(1,2,3-CD)PYRENE       | 5.0E-05                    | 5.0E-06 | 4.8E-04     | 7.7E-06 | 1.1E-02                      | 1.1E-03 | 2.1E-02            | 3.3E-04 |
| NAPHTHALENE                  | 3.7E-04                    | 3.7E-05 | 4.7E-05     | 8.6E-06 | 1.7E-03                      | 1.7E-04 | 3.1E-05            | 5.7E-06 |
| PHENANTHRENE                 | 1.2E-03                    | 1.2E-04 | 1.5E-04     | 2.8E-05 | 1.3E-02                      | 1.3E-03 | 2.3E-04            | 4.3E-05 |
| PYRENE                       | 1.6E-03                    | 1.6E-04 | 2.0E-02     | 3.3E-04 | 4.7E-02                      | 4.7E-03 | 9.0E-02            | 1.4E-03 |
| <b>Inorganics</b>            |                            |         |             |         |                              |         |                    |         |
| ANTIMONY                     | NA                         | NA      | 1.9E-02     | 4.1E-04 | NA                           | NA      | 6.7E-01            | 1.4E-02 |
| ARSENIC                      | 1.5E-03                    | 7.6E-04 | 7.0E-03     | 1.6E-03 | 4.7E-02                      | 2.3E-02 | 4.7E-02            | 1.1E-02 |
| COPPER                       | 1.3E-02                    | 1.5E-03 | 3.6E-02     | 2.4E-03 | 1.3E-01                      | 1.5E-02 | 5.2E-02            | 3.5E-03 |
| LEAD                         | 6.3E-02                    | 2.3E-03 | 4.6E-02     | 1.2E-03 | 3.3E+00                      | 1.2E-01 | 6.0E-01            | 1.5E-02 |
| ZINC                         | 5.1E-03                    | 2.0E-03 | 1.8E-02     | 4.5E-03 | 5.4E-01                      | 2.1E-01 | 2.8E-01            | 7.2E-02 |

NA = Not applicable because no NOAEL/LOAEL exists for this receptor.

Cells are shaded if the value is greater than 1.0

NOAEL - No Observed Adverse Effects Level

LOAEL - Lowest Observed Adverse Effects Level

EEQ - Ecological Effects Quotient



**TABLE C.4-2**  
**TERRESTRIAL FOOD CHAIN MODEL - AVERAGE SCENARIO**  
**INSECTIVOROUS AND HERBIVOROUS RECEPTORS - COMPOSITE SOIL**  
**SMALL ARMS (PISTOL) RANGE (SAPR) - UXO 17**  
**FIRING LINE AREA**  
**NSF INDIAN HEAD - STUMP NECK ANNEX**  
**INDIAN HEAD, MARYLAND**

| Chemical          | Herbivorous Receptors EEQs |         |             |         | Insectivorous Receptors EEQs |         |                    |         |
|-------------------|----------------------------|---------|-------------|---------|------------------------------|---------|--------------------|---------|
|                   | Bobwhite Quail             |         | Meadow Vole |         | Robin                        |         | Short-Tailed Shrew |         |
|                   | NOAEL                      | LOAEL   | NOAEL       | LOAEL   | NOAEL                        | LOAEL   | NOAEL              | LOAEL   |
| <b>Inorganics</b> |                            |         |             |         |                              |         |                    |         |
| ANTIMONY          | NA                         | NA      | 3.1E-02     | 6.5E-04 | NA                           | NA      | 1.1E+00            | 2.3E-02 |
| ARSENIC           | 2.7E-03                    | 1.3E-03 | 1.2E-02     | 2.8E-03 | 7.3E-02                      | 3.6E-02 | 7.0E-02            | 1.6E-02 |
| COPPER            | 1.9E-02                    | 2.3E-03 | 5.2E-02     | 3.5E-03 | 3.3E-01                      | 3.9E-02 | 1.3E-01            | 8.9E-03 |
| LEAD              | 6.1E-02                    | 2.2E-03 | 4.4E-02     | 1.1E-03 | 3.2E+00                      | 1.2E-01 | 5.7E-01            | 1.4E-02 |
| ZINC              | 5.4E-03                    | 2.1E-03 | 1.9E-02     | 4.8E-03 | 5.6E-01                      | 2.2E-01 | 2.9E-01            | 7.4E-02 |
| <b>Explosives</b> |                            |         |             |         |                              |         |                    |         |
| NITROGLYCERIN     | NA                         | NA      | 2.4E-01     | 2.2E-02 | NA                           | NA      | 4.3E-01            | 4.0E-02 |

NA = Not applicable because no NOAEL/LOAEL exists for this receptor.

Cells are shaded if the value is greater than 1.0

NOAEL - No Observed Adverse Effects Level

LOAEL - Lowest Observed Adverse Effects Level

EEQ - Ecological Effects Quotient

TABLE C.4-3  
 OCCURRENCE, DISTRIBUTION, AND SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN - SURFACE SOIL  
 SMALL ARMS (PISTOL) RANGE (SAPR) - UXO 17  
 TARGET AREA  
 SITE INSPECTION  
 NSF INDIAN HEAD - STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND

| Parameter                 | Frequency of Detection <sup>(1)</sup> | Minimum Concentration <sup>(2)</sup> | Maximum Concentration <sup>(2)</sup> | Location of Maximum Concentration | Minimum Nondetect | Maximum Nondetect | Average of Positive Results <sup>(3)</sup> | Overall Average <sup>(4)</sup> | Ecological Screening Level |        |       |         | COPC (yes/no)? | Rationale for COPC selection |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-----------------------------------|-------------------|-------------------|--|--------------------------------|----------------------------|--------|-------|---------|----------------|------------------------------|
|                           |                                       |                                      |                                      |                                   |                   |                   |  |                                | Invertebrates              | Plants | Avian | Mammals |                |                              |
| <b>Inorganics (mg/kg)</b> |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |                |                              |
| ANTIMONY                  | 8/12                                  | 0.15 L                               | 6 L                                  | X17SB014                          | 0.13              | 3.3               | 1.6  | 1.2                            | 78                         | 5      | NA    | 0.27    | YES            | ASL/NSL                      |
| ARSENIC                   | 12/12                                 | 3.5                                  | 8.7                                  | X17SB014                          | NA                | NA                | 5.4  | 5.4                            | 60                         | 18     | 43    | 46      | NO             | BSL                          |
| COPPER                    | 12/12                                 | 5.6 K                                | 42 K                                 | X17SB005                          | NA                | NA                | 17   | 17                             | 80                         | 70     | 28    | 49      | YES            | ASL                          |
| LEAD                      | 10/12                                 | 7.2                                  | 706                                  | X17SB014                          | 7                 | 12.2              | 314  | 263                            | 1700                       | 120    | 11    | 56      | YES            | ASL                          |
| ZINC                      | 12/12                                 | 10                                   | 33.2                                 | X17SB004                          | NA                | NA                | 19   | 19                             | 120                        | 160    | 46    | 79      | NO             | BSL                          |
| <b>XRF (mg/kg)</b>        |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |                |                              |
| LEAD                      | 25/26                                 | 3.667                                | 3247                                 | X17SB013                          | 0                 | 0                 | 439  | 422                            | 1700                       | 120    | 11    | 56      | YES            | ASL                          |

Shaded cells indicate that the maximum concentration exceeds the screening level.

- 1 Sample and duplicate are considered as one sample when determining the frequency of detection.
- 2 Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected.
- 3 Average of detected concentrations only.
- 4 Average of all analytical results.

COPC = Chemical of Potential Concern      Rationale Codes for COPC Selection:  
 NA = Not available or not applicable      ASL = Above COPC Screening Level  
 K = Biased high concentration          BSL = Below COPC Screening Level  
 L = Biased low concentration          NSL = No Screening Level Available

**TABLE C.4-4**  
**TERRESTRIAL FOOD CHAIN MODEL - AVERAGE SCENARIO**  
**INSECTIVOROUS AND HERBIVOROUS RECEPTORS - SURFACE SOIL**  
**SMALL ARMS (PISTOL) RANGE (SAPR) - UXO 17**  
**TARGET AREA**  
**NSF INDIAN HEAD - STUMP NECK ANNEX**  
**INDIAN HEAD, MARYLAND**

| Chemical          | Herbivorous Receptors EEQs |         |             |         | Insectivorous Receptors EEQs |         |                    |         |
|-------------------|----------------------------|---------|-------------|---------|------------------------------|---------|--------------------|---------|
|                   | Bobwhite Quail             |         | Meadow Vole |         | Robin                        |         | Short-Tailed Shrew |         |
|                   | NOAEL                      | LOAEL   | NOAEL       | LOAEL   | NOAEL                        | LOAEL   | NOAEL              | LOAEL   |
| <b>Inorganics</b> |                            |         |             |         |                              |         |                    |         |
| ANTIMONY          | NA                         | NA      | 5.2E-02     | 1.1E-03 | NA                           | NA      | 1.9E+00            | 4.1E-02 |
| ARSENIC           | 2.8E-03                    | 1.4E-03 | 1.3E-02     | 2.9E-03 | 7.5E-02                      | 3.7E-02 | 7.2E-02            | 1.6E-02 |
| COPPER            | 2.0E-02                    | 2.4E-03 | 5.4E-02     | 3.6E-03 | 3.6E-01                      | 4.2E-02 | 1.4E-01            | 9.7E-03 |
| LEAD              | 1.6E-01                    | 5.8E-03 | 9.5E-02     | 2.4E-03 | 8.1E+00                      | 2.9E-01 | 1.4E+00            | 3.6E-02 |
| ZINC              | 4.6E-03                    | 1.8E-03 | 1.6E-02     | 4.1E-03 | 5.1E-01                      | 1.9E-01 | 2.7E-01            | 6.7E-02 |

NA = Not applicable because no NOAEL/LOAEL exists for this receptor.

Cells are shaded if the value is greater than 1.0

NOAEL - No Observed Adverse Effects Level

LOAEL - Lowest Observed Adverse Effects Level

EEQ - Ecological Effects Quotient

TABLE C.5-1  
 OCCURRENCE, DISTRIBUTION, AND SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN - COMPOSITE SOIL  
 ROACH ROAD RIFLE RANGE (RRRR) - UXO 25  
 FIRING LINE AREA  
 SITE INSPECTION  
 NSF INDIAN HEAD - STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND

| Parameter                 | Frequency of Detection <sup>(1)</sup> | Minimum Concentration <sup>(2)</sup> | Maximum Concentration <sup>(2)</sup> | Location of Maximum Concentration | Minimum Nondetect | Maximum Nondetect | Average of Positive Results <sup>(3)</sup> | Overall Average <sup>(4)</sup> | Ecological Screening Level |        |       |         | COPC (yes/no)? | Rationale for COPC selection |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-----------------------------------|-------------------|-------------------|--|--------------------------------|----------------------------|--------|-------|---------|----------------|------------------------------|
|                           |                                       |                                      |                                      |                                   |                   |                   |  |                                | Invertebrates              | Plants | Avian | Mammals |                |                              |
| <b>Inorganics (mg/kg)</b> |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |                |                              |
| ANTIMONY                  | 1/1                                   | 0.1 L                                | 0.1 L                                | X25SB034C                         | NA                | NA                | 0.1  | 0.1                            | 78                         | 5      | NA    | 0.27    | YES            | NSL                          |
| ARSENIC                   | 1/2                                   | 4.3                                  | 4.3                                  | X25SB034C                         | NA                | NA                | 4.3  | 4.3                            | 60                         | 18     | 43    | 46      | NO             | BSL                          |
| COPPER                    | 1/3                                   | 8.5                                  | 8.5                                  | X25SB034C                         | NA                | NA                | 8.5  | 8.5                            | 80                         | 70     | 28    | 49      | NO             | BSL                          |
| LEAD                      | 1/4                                   | 9.4                                  | 9.4                                  | X25SB034C                         | NA                | NA                | 9.4  | 9.4                            | 1700                       | 120    | 11    | 56      | NO             | BSL                          |
| TIN                       | 1/5                                   | 1.6 B                                | 1.6 B                                | X25SB034C                         | NA                | NA                | 1.6  | 1.6                            | NA                         | 50     | NA    | 7.62    | YES            | NSL                          |
| ZINC                      | 1/6                                   | 30.2                                 | 30.2                                 | X25SB034C                         | NA                | NA                | 30   | 30                             | 120                        | 160    | 46    | 79      | NO             | BSL                          |

Shaded cells indicate that the maximum concentration exceeds the screening level.

1 Sample and duplicate are considered as one sample when determining the frequency of detection.

2 Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected.

3 Average of detected concentrations only.

4 Average of all analytical results.

COPC = Chemical of Potential Concern

NA = Not available or not applicable

B = Result may be due to blank contamination

L = Biased low concentration

Rationale Codes for COPC Selection:

ASL = Above COPC Screening Level

BSL = Below COPC Screening Level

NSL = No Screening Level Available

**TABLE C.5-2**  
**TERRESTRIAL FOOD CHAIN MODEL - AVERAGE SCENARIO**  
**INSECTIVOROUS AND HERBIVOROUS RECEPTORS - COMPOSITE SOIL**  
**ROACH ROAD RIFLE RANGE (RRRR) - UXO 25**  
**FIRING LINE AREA**  
**NSF INDIAN HEAD - STUMP NECK ANNEX**  
**INDIAN HEAD, MARYLAND**

| Chemical          | Herbivorous Receptors EEQs |         |             |         | Insectivorous Receptors EEQs |         |                    |         |
|-------------------|----------------------------|---------|-------------|---------|------------------------------|---------|--------------------|---------|
|                   | Bobwhite Quail             |         | Meadow Vole |         | Robin                        |         | Short-Tailed Shrew |         |
|                   | NOAEL                      | LOAEL   | NOAEL       | LOAEL   | NOAEL                        | LOAEL   | NOAEL              | LOAEL   |
| <b>Inorganics</b> |                            |         |             |         |                              |         |                    |         |
| ANTIMONY          | NA                         | NA      | 4.7E-03     | 1.0E-04 | NA                           | NA      | 1.5E-01            | 3.3E-03 |
| ARSENIC           | 2.2E-03                    | 1.1E-03 | 1.0E-02     | 2.3E-03 | 6.3E-02                      | 3.1E-02 | 6.1E-02            | 1.4E-02 |
| COPPER            | 1.5E-02                    | 1.7E-03 | 4.0E-02     | 2.7E-03 | 1.8E-01                      | 2.1E-02 | 7.1E-02            | 4.8E-03 |
| LEAD              | 1.1E-02                    | 3.9E-04 | 1.1E-02     | 2.7E-04 | 5.0E-01                      | 1.8E-02 | 9.4E-02            | 2.4E-03 |
| TIN               | 2.9E-03                    | 1.2E-03 | 3.4E-03     | 2.3E-03 | 3.7E-02                      | 1.5E-02 | 6.1E-03            | 4.1E-03 |
| ZINC              | 6.0E-03                    | 2.3E-03 | 2.1E-02     | 5.3E-03 | 5.9E-01                      | 2.3E-01 | 3.1E-01            | 7.8E-02 |

NA = Not applicable because no NOAEL/LOAEL exists for this receptor.

Cells are shaded if the value is greater than 1.0

NOAEL - No Observed Adverse Effects Level

LOAEL - Lowest Observed Adverse Effects Level

EEQ - Ecological Effects Quotient

TABLE C.5-3  
 OCCURRENCE, DISTRIBUTION, AND SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN - SURFACE SOIL  
 ROACH ROAD RIFLE RANGE (RRRR) - UXO 25  
 TARGET AREA  
 SITE INSPECTION  
 NSF INDIAN HEAD - STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND

| Parameter                 | Frequency of Detection <sup>(1)</sup> | Minimum Concentration <sup>(2)</sup> | Maximum Concentration <sup>(2)</sup> | Location of Maximum Concentration | Minimum Nondetect | Maximum Nondetect | Average of Positive Results <sup>(3)</sup> | Overall Average <sup>(4)</sup> | Ecological Screening Level |        |       |         | COPC (yes/no)? | Rationale for COPC selection |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-----------------------------------|-------------------|-------------------|--|--------------------------------|----------------------------|--------|-------|---------|----------------|------------------------------|
|                           |                                       |                                      |                                      |                                   |                   |                   |  |                                | Invertebrates              | Plants | Avian | Mammals |                |                              |
| <b>Inorganics (mg/kg)</b> |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |                |                              |
| ANTIMONY                  | 16/20                                 | 0.19 L                               | 12.2 L                               | X25SB020                          | 0.02              | 0.16              | 1.6  | 1.3                            | 78                         | 5      | NA    | 0.27    | YES            | ASL/NSL                      |
| ARSENIC                   | 17/20                                 | 2.3 J                                | 22.6                                 | X25SB016                          | 1.9               | 2.4               | 5.0  | 4.4                            | 60                         | 18     | 43    | 46      | YES            | ASL                          |
| COPPER                    | 20/20                                 | 7.4                                  | 370                                  | X25SB020                          | NA                | NA                | 41   | 41                             | 80                         | 70     | 28    | 49      | YES            | ASL                          |
| LEAD                      | 20/20                                 | 6.3                                  | 3450                                 | X25SB020                          | NA                | NA                | 349  | 349                            | 1700                       | 120    | 11    | 56      | YES            | ASL                          |
| ZINC                      | 20/20                                 | 22                                   | 63.9                                 | X25SB020                          | NA                | NA                | 34   | 34                             | 120                        | 160    | 46    | 79      | YES            | ASL                          |
| <b>XRF (mg/kg)</b>        |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |                |                              |
| LEAD                      | 32/33                                 | 8.333                                | 3877                                 | X25SB020                          | 0                 | 0                 | 359  | 348                            | 1700                       | 120    | 11    | 56      | YES            | ASL                          |
| LEAD-CALC                 | 33/33                                 | 1.49                                 | 2754.83                              | X25SB020                          | NA                | NA                | 227  | 227                            | 1700                       | 120    | 11    | 56      | YES            | ASL                          |

Shaded cells indicate that the maximum concentration exceeds the screening level.

- 1 Sample and duplicate are considered as one sample when determining the frequency of detection.
- 2 Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected.
- 3 Average of detected concentrations only.
- 4 Average of all analytical results.

COPC = Chemical of Potential Concern      Rationale Codes for COPC Selection:  
 NA = Not available or not applicable      ASL = Above COPC Screening Level  
 J = Estimated concentration              BSL = Below COPC Screening Level  
 L = Biased low concentration              NSL = No Screening Level Available

TABLE C.5-4  
 TERRESTRIAL FOOD CHAIN MODEL - AVERAGE SCENARIO  
 INSECTIVOROUS AND HERBIVOROUS RECEPTORS - SURFACE SOIL  
 ROACH ROAD RIFLE RANGE (RRRR) - UXO 25  
 TARGET AREA  
 NSF INDIAN HEAD - STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND

| Chemical          | Herbivorous Receptors EEQs |         |             |         | Insectivorous Receptors EEQs |         |                    |         |
|-------------------|----------------------------|---------|-------------|---------|------------------------------|---------|--------------------|---------|
|                   | Bobwhite Quail             |         | Meadow Vole |         | Robin                        |         | Short-Tailed Shrew |         |
|                   | NOAEL                      | LOAEL   | NOAEL       | LOAEL   | NOAEL                        | LOAEL   | NOAEL              | LOAEL   |
| <b>Inorganics</b> |                            |         |             |         |                              |         |                    |         |
| ANTIMONY          | NA                         | NA      | 5.4E-02     | 1.1E-03 | NA                           | NA      | 1.9E+00            | 4.2E-02 |
| ARSENIC           | 2.3E-03                    | 1.1E-03 | 1.0E-02     | 2.3E-03 | 6.4E-02                      | 3.2E-02 | 6.2E-02            | 1.4E-02 |
| COPPER            | 3.1E-02                    | 3.7E-03 | 7.8E-02     | 5.3E-03 | 8.7E-01                      | 1.0E-01 | 3.4E-01            | 2.3E-02 |
| LEAD              | 2.0E-01                    | 7.4E-03 | 1.2E-01     | 2.9E-03 | 1.0E+01                      | 3.7E-01 | 1.8E+00            | 4.5E-02 |
| ZINC              | 6.4E-03                    | 2.5E-03 | 2.2E-02     | 5.6E-03 | 6.1E-01                      | 2.4E-01 | 3.2E-01            | 8.1E-02 |

NA = Not applicable because no NOAEL/LOAEL exists for this receptor.

Cells are shaded if the value is greater than 1.0

NOAEL - No Observed Adverse Effects Level

LOAEL - Lowest Observed Adverse Effects Level

EEQ - Ecological Effects Quotient

**APPENDIX D**

**SOIL QUANTITY CALCULATIONS**

|  |                              |  |                      |
|--|------------------------------|--|----------------------|
| <b>Client:</b> NSF Indian Head Stump Neck Annex  |                              | <b>Project Number:</b> N62467-04-D-0055, CTO 423 |                      |
| <b>Subject:</b> Five Small Arms/Skeet Ranges Alternative 2 – Excavation and Off-Site Disposal  |                              |  |                      |
| <b>By:</b> X. Chen   | <b>Checked By:</b> S. Nesbit | <b>Approved By:</b> B. Becker                    | <b>Date:</b> 3/16/12 |
| <p><b>Purpose</b></p> <p>The purpose of this calculation is to provide an estimate of the removal volume of lead-, PAH-, and nitroglycerin-contaminated soils at the five former small arms/skeet ranges located at the Stump Neck Annex portion of Naval Support Facility Indian Head. The results of this calculation provide the basis for the cost estimate for Alternative 2.</p> <p><b>Assumptions</b></p> <ol style="list-style-type: none"> <li>1. Use the data presented in the Site Inspection Report (Tetra Tech, 2010) to determine the lateral and vertical extent of contamination (and subsequently, the excavation boundaries and volumes) at the five former small arms/skeet ranges.</li> <li>2. Figure 2-1 shows the initial limits of excavation at UXO 14 - Marine Rifle Range. Figure 2-2 shows the initial limits of excavation at UXO15 - Old Skeet and Trap Range. Figure 2-3 shows the initial limits of excavation at UXO16 - Rum Point Skeet Range. Figure 2-4 shows the initial limits of excavation at UXO 17 - Small Arms (Pistol) Range. Figure 2-5 shows the initial limits of excavation at UXO 25 - Roach Road Rifle Range. Excavation limits may be expanded, as necessary to meet cleanup goals, based on the confirmation sampling results.</li> <li>3. Clearing will be performed only within the excavation areas shown on Figures 2-1 to 2-5. However, woody vegetation that is 4 inches in diameter or greater (at 4.5 feet above the ground surface) will not be removed from UXO 14 or UXO 25 because of the need to preserve habitat and maintain the structural stability of the sloped areas. Grubbing will be performed incidental to excavation of contaminated soil from the indicated areas. Grubbed materials from the excavation areas will be disposed at an off-site solid or hazardous waste disposal facility, dependent on waste disposal characterization results.</li> <li>4. Temporary access roads will be constructed to provide access to the excavation areas at UXO 14 and UXO 25.</li> <li>5. Based on Phase 2 SI groundwater investigation results, groundwater is not expected to be encountered at the planned excavation depths within the areas marked for removal.</li> <li>6. Assume all PAH-contaminated soils and nitroglycerin-contaminated soils will be classified as nonhazardous waste. Contaminated soils will be shipped off-site for disposal as nonhazardous waste.</li> <li>7. Assume 80% of lead-contaminated soils will not meet the toxicity characteristic leaching procedure (TCLP) criterion for lead characteristic and, thus, will be classified as hazardous waste. All hazardous lead-contaminated soils will be shipped off-site for disposal as hazardous waste.</li> <li>8. Confirmation sampling for lead-contaminated soil includes in situ field screening and off-site</li> </ol> |                              |  |                      |

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| <b>By:</b> X. Chen  | <b>Checked By:</b> S. Nesbit | <b>Approved By:</b> B. Becker                    | <b>Date:</b> 3/16/12 |

laboratory testing. Lead analysis in the field of confirmatory samples will be conducted using field-portable X-ray fluorescence (XRF) instrumentation (i.e., XRF Environmental Metals Analyzer). The excavation and field screening process will be repeated until cleanup goals have been achieved at all excavation boundaries. Upon demonstrating attainment of cleanup goals through field screening, analytical samples will be collected and shipped to a fixed-based laboratory for final confirmation.

- Verification sampling will be conducted at PAH- and nitroglycerin-contaminated soil removal areas.
- Soil density is assumed to be 110 pounds per cubic foot (lbs/ft<sup>3</sup>).
- Excavations will be backfilled using clean fill obtained from outside the installation.

**Volume Estimates**

**Lead-Contaminated Soil Removal**

UXO 14 - Marine Rifle Range

Soil will be excavated to a depth of ~1-2 feet bgs from the Hillside Impact Area in the areas of bullet accumulations.

- Excavation area: 54,518 ft<sup>2</sup>.
- Volume of lead-contaminated soil = 1.5 ft x 54,518 ft<sup>2</sup> = 81,777 ft<sup>3</sup> = 3,029 cubic yards (yd<sup>3</sup>).

Trees 4 inches in diameter or larger will not be disturbed. Hence, the excavation will be limited to approximately 60% of the overall excavation area based on the observed density of trees at this site. The total amount of soil to be removed is estimated at 49,066 ft<sup>3</sup> = 1,817 yd<sup>3</sup>.

UXO15 - Old Skeet And Trap Range

Soil will be excavated to a depth of 1 foot bgs within three separate areas that contain sample locations X15SB064, X15SB013, and X15SB074, respectively.

- Excavation area:
  - X15SB064 Area: 8,753 ft<sup>2</sup>;
  - X15SB013 Area: 2,146 ft<sup>2</sup>;
  - X15SB074 Area: 3,301 ft<sup>2</sup>.

Volume of lead-contaminated soil = 1 ft x 14,200 ft<sup>2</sup> = 14,200 ft<sup>3</sup> = 526 yd<sup>3</sup>

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UXO 17 - Small Arms (Pistol) Range

Soil will be excavated to a depth of 1 foot bgs within two separate areas that contain sample locations X17SB013 and X17SB014, respectively, and to a depth of 4 feet bgs within one area that contains sample locations X17SB004 and X17SB0005.

- Excavation area:
  - X17SB013 Area: 1,043 ft<sup>2</sup>;
  - X17SB014 Area: 365 ft<sup>2</sup>;
  - X17SB004 and X17SB0005 Area: 852 ft<sup>2</sup>.
- Volume of lead-contaminated soil = 1 ft x 1,408 ft<sup>2</sup> + 4 ft x 852 ft<sup>2</sup> = 4,816 ft<sup>3</sup> = 178 yd<sup>3</sup>

UXO 25 - Roach Road Rifle Range

Soil will be excavated to a depth of ~1-2 feet bgs within one area that contains sample locations X25SB019 and X25SB020.

- Excavation area:
  - X25SB019 and X25SB020 Area: 985 ft<sup>2</sup>.
- Volume of lead-contaminated soil = 1.5 ft x 985 ft<sup>2</sup> = 1478 ft<sup>3</sup> = 55 yd<sup>3</sup>

Trees 4 inches in diameter or more will not be disturbed. Hence, the excavation will be limited to approximately 80% of the overall excavation area based on the observed density of trees at this site. The total amount of soil to be removed is estimated at 1,182 ft<sup>3</sup> = 44 yd<sup>3</sup>.

Total Quantities for All Sites

Total in-place volume of lead-contaminated soil designated for off-site disposal = 69,264 ft<sup>3</sup> = 2,565 yd<sup>3</sup>

Using an expansion factor of 20% for in-place to loose ("fluff") soil, the total loose volume of lead-contaminated soil designated for off-site disposal = 2,565 x 1.20 = 3,078 yd<sup>3</sup>.

Using a soil density of 110 lbs/ft<sup>3</sup>, the weight of lead-contaminated soil designated for off-site disposal = 69,264 ft<sup>3</sup> x 110 lbs/ft<sup>3</sup> / 2,000 pounds per ton = 3,810 tons.

In the absence of site-specific data, it is assumed that 80% of lead-contaminated soils will not meet the TCLP criterion for lead characteristic and will be classified as hazardous waste.

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The weight of hazardous lead-contaminated soils = 3810 tons x 80% = 3,048 tons.

These hazardous lead-contaminated soils will be containerized for transportation and disposal at a RCRA Subtitle C (i.e., hazardous waste) facility.

Approximately 762 tons of lead-contaminated soil will be shipped off-site for disposal as non-hazardous waste.

**PAH-Contaminated Soil Removal**

UXO15 - Old Skeet And Trap Range

Soil will be excavated to a depth of 2 feet bgs within one area that contains sample locations X15SB038 and X15SB053.

- Excavation area:  
X15SB038 and X15SB053 Area: 34,433 ft<sup>2</sup>.
- Volume of PAH-contaminated soil = 2 ft x 34,433 ft<sup>2</sup> = 68,866 ft<sup>3</sup> = 2,551 yd<sup>3</sup>.

UXO16 - Rum Point Skeet Range

Soil will be excavated to a depth of ~1-2 feet bgs within one area that contains sample locations X16SB056 and X16SB076.

- Excavation area:  
X16SB056 and X16SB076 Area: 59,215 ft<sup>2</sup>;
- Volume of PAH-contaminated soil = 1.5 ft x 59,215 ft<sup>2</sup> = 88,823 ft<sup>3</sup> = 3,290 yd<sup>3</sup>.

Total Quantities for All Sites

Total in-place volume of PAH-contaminated soil designated for off-site disposal = 157,689 ft<sup>3</sup> = 5,840 yd<sup>3</sup>

Using an expansion factor of 20% for in-place to loose ("fluff") soil, the total loose volume of PAH-contaminated soil designated for off-site disposal = 5,840 x 1.20 = 7,008 yd<sup>3</sup>.

Using a soil density of 110 lbs/ft<sup>3</sup>, the weight of PAH-contaminated soil designated for off-site disposal =

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157,689 ft<sup>3</sup> x 110 lbs/ft<sup>3</sup> / 2,000 pounds per ton = 8,673 tons.

**Nitroglycerin-Contaminated Soil Removal**

Soil will be excavated to a depth of 1 foot bgs within one area that contains sample locations X17SB008 and X17SB009.

- Excavation area:  
X17SB008 and X17SB009 Area: 10,880 ft<sup>2</sup>.
- Volume of lead-contaminated soil = 1 ft x 10,880 ft<sup>2</sup> = 10,880 ft<sup>3</sup> = 403 yd<sup>3</sup>.

Using an expansion factor of 20% for in-place to loose (“fluff”) soil, the total loose volume of nitroglycerin-contaminated soil designated for off-site disposal = 403 x 1.20 = 484 yd<sup>3</sup>.

Using a soil density of 110 lbs/ft<sup>3</sup>, the weight of nitroglycerin-contaminated soil designated for off-site disposal = 10,880 ft<sup>3</sup> x 110 lbs/ft<sup>3</sup> / 2,000 pounds per ton = 598 tons.

**Estimated Construction Duration**

- UXO 14 - Marine Rifle Range: 1.5 Months
- UXO 15 - Old Skeet And Trap Range: 1.5 Months
- UXO 16 - Rum Point Skeet Range: 1 Month
- UXO 17 - Small Arms (Pistol) Range: 3 Weeks
- UXO 25 - Roach Road Rifle Range: 1 Week

**Summary**

- Total 3,048 tons of hazardous lead-contaminated soil will be excavated and containerized for transportation and disposal at a RCRA Subtitle C (hazardous waste) facility.
- Total 762 tons of lead-contaminated soil will be shipped off-site for disposal as non-hazardous waste.
- Total 8,673 tons of PAH-contaminated soil will be shipped off-site for disposal as non-hazardous waste.
- Total 598 tons of nitroglycerin-contaminated soil will be shipped off-site for disposal as non-hazardous waste.
- Total in-place volume of contaminated soils designated for off-site disposal will be 8,809 yd<sup>3</sup>.  
Using an expansion factor of 20%, this is 10,571 yd<sup>3</sup> of loose soil.

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| <b>By:</b> X. Chen  | <b>Checked By:</b> S. Nesbit | <b>Approved By:</b> B. Becker                    | <b>Date:</b> 3/16/12 |
| <p>6. Total area to be backfilled = <math>154,487 \text{ ft}^2 = \underline{17,165 \text{ yd}^2}</math>. To ensure a proper vegetative base, the total volume of topsoil needed = <math>77,244 \text{ ft}^3 = \underline{2,861 \text{ yd}^3}</math>. The weight of topsoil = <math>77,244 \text{ ft}^3 \times 110 \text{ lbs/ft}^3 / 2,000 \text{ pounds per ton} = \underline{4,248 \text{ tons}}</math>.</p> <p>7. To restore each excavation area to its original elevation, the total volume of clean backfill needed = <math>8,809 \text{ yd}^3 - 2,861 \text{ yd}^3 = \underline{5,948 \text{ yd}^3}</math>. The weight of clean backfill = <math>5,948 \text{ yd}^3 \times 27 \text{ ft}^3 \times 110 \text{ lbs/ft}^3 / 2,000 \text{ pounds per ton} = \underline{8,833 \text{ tons}}</math>.</p> <p>8. The removal action (Alternative 2) will require approximately 5 months to complete at all five SASRs.</p> |                              |  |                      |

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| <b>By:</b> X. Chen  | <b>Checked By:</b> S. Nesbit | <b>Approved By :</b> B. Becker                   | <b>Date:</b> 3/6/12 |
| <p><b>Purpose</b></p> <p>The purpose of this calculation is to provide an estimate of the removal volume of lead-, PAH-, and nitroglycerin-contaminated soils at the five former small arms/skeet ranges located at the Stump Neck Annex portion of Naval Support Facility Indian Head. The results of this calculation provide the basis for the cost estimate for Alternative 3.</p> <p><b>Assumptions</b></p> <ol style="list-style-type: none"> <li>1. Use the data presented in the Site Inspection Report (Tetra Tech, 2010) to determine the lateral and vertical extent of contamination (and subsequently, the excavation boundaries and volumes) at the five former small arms/skeet ranges.</li> <li>2. Figure 2-1 shows the initial limits of excavation at UXO 14 - Marine Rifle Range. Figure 2-2 shows the initial limits of excavation at UXO15 - Old Skeet and Trap Range. Figure 2-3 shows the initial limits of excavation at UXO16 - Rum Point Skeet Range. Figure 2-4 shows the initial limits of excavation at UXO 17 - Small Arms (Pistol) Range. Figure 2-5 shows the initial limits of excavation at UXO 25 - Roach Road Rifle Range. Excavation limits may be expanded, as necessary to meet cleanup goals, based on the confirmation sampling results.</li> <li>3. Clearing will be performed only within the excavation areas shown on Figures 2-1 to 2-5. However, woody vegetation that is 4 inches in diameter or greater (at 4.5 feet above the ground surface) will not be removed from UXO 14 or UXO 25 because of the need to preserve habitat and maintain the structural stability of the sloped areas. Grubbing will be performed incidental to excavation of contaminated soil from the indicated areas. Grubbed materials from the excavation areas will be disposed at an off-site solid or hazardous waste disposal facility, dependent on waste disposal characterization results.</li> <li>4. Temporary access roads will be constructed to provide access to the excavation areas at UXO 14 and UXO 25.</li> <li>5. Based on Phase 2 SI groundwater investigation results, groundwater is not expected to be encountered at the planned excavation depths within the areas marked for removal.</li> <li>6. Assume all PAH-contaminated soils and nitroglycerin-contaminated soils will be classified as nonhazardous waste. Contaminated soils will be shipped off-site for disposal as nonhazardous waste.</li> <li>7. Assume 80% of lead-contaminated soils will not meet the toxicity characteristic leaching procedure (TCLP) criterion for lead characteristic and, thus, will be classified as hazardous waste. In-situ chemical treatment of lead-contaminated soils will be conducted prior to removal. Treated soils will be sampled to verify that they meet TCLP criterion for land disposal and, if so, will be</li> </ol> |                              |  |                     |

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shipped off-site for disposal as nonhazardous waste.

8. Confirmation sampling for lead-contaminated soil includes in situ field screening and off-site laboratory testing. Lead analysis in the field of confirmatory samples will be conducted using field-portable X-ray fluorescence (XRF) instrumentation (i.e., XRF Environmental Metals Analyzer). The excavation and field screening process will be repeated until cleanup goals have been achieved at all excavation boundaries. Upon demonstrating attainment of cleanup goals through field screening, analytical samples will be collected and shipped to a fixed-based laboratory for final confirmation.
9. Verification sampling will be conducted at PAH- and nitroglycerin-contaminated soil removal areas.
10. Soil density is assumed to be 110 pounds per cubic foot (lbs/ft<sup>3</sup>).
11. Excavations will be backfilled using clean fill obtained from outside the installation.

**Volume Estimates**

The lateral and vertical extents of soil removal for Alternative 3 are the same as that of Alternative 2.

**Lead-Contaminated Soil Removal**

UXO 14 - Marine Rifle Range

Soil will be excavated to a depth of ~1-2 feet bgs from the Hillside Impact Area in the areas of bullet accumulations. Trees 4 inches in diameter or more will not be disturbed. Hence, the excavation will be limited to approximately 60% of the overall excavation area based on the observed density of trees at this site. The total amount of soil to be removed is estimated at 49,066 ft<sup>3</sup> = 1,817 yd<sup>3</sup>.

UXO15 - Old Skeet And Trap Range

Soil will be excavated to a depth of 1 foot bgs within three separate areas that contain sample locations X15SB064, X15SB013, and X15SB074, respectively.

Volume of lead-contaminated soil = 1 ft x 14,200 ft<sup>2</sup> = 14,200 ft<sup>3</sup> = 526 yd<sup>3</sup>

UXO 17 - Small Arms (Pistol) Range

Soil will be excavated to a depth of 1 foot bgs within two separate areas that contain sample locations X17SB013 and X17SB014, respectively, and to a depth of 4 feet bgs within one area that contains

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sample locations X17SB004 and X17SB0005.

Volume of lead-contaminated soil =  $1 \text{ ft} \times 1,408 \text{ ft}^2 + 4 \text{ ft} \times 852 \text{ ft}^2 = 4,816 \text{ ft}^3 = 178 \text{ yd}^3$

UXO 25 - Roach Road Rifle Range

Soil will be excavated to a depth of ~1-2 feet bgs within one area that contains sample locations X25SB019 and X25SB020.

Volume of lead-contaminated soil =  $1.5 \text{ ft} \times 985 \text{ ft}^2 = 1,478 \text{ ft}^3 = 55 \text{ yd}^3$

Trees 4 inches in diameter or larger will not be disturbed. Hence, the excavation will be limited to approximately 80% of the overall excavation area based on the observed density of trees at this site. The total amount of soil to be removed is estimated at  $1,182 \text{ ft}^3 = 44 \text{ yd}^3$ .

Total Quantities for All Sites

Total in-place volume of lead-contaminated soil designated for off-site disposal =  $69,264 \text{ ft}^3 = \underline{2,565 \text{ yd}^3}$ .

Using an expansion factor of 20% for in-place to loose (“fluff”) soil, the total loose volume of lead-contaminated soil designated for off-site disposal =  $2,565 \times 1.20 = \underline{3,078 \text{ yd}^3}$ .

Using a soil density of  $110 \text{ lbs/ft}^3$ , the weight of lead-contaminated soil designated for off-site disposal =  $69,264 \text{ ft}^3 \times 110 \text{ lbs/ft}^3 / 2,000 \text{ pounds per ton} = \underline{3,810 \text{ tons}}$ .

In the absence of site-specific data, it is assumed that 80% of lead-contaminated soils will not meet the TCLP criterion for lead characteristic and will be classified as hazardous waste. These lead-contaminated soils will be subject to in-situ chemical stabilization prior to removal.

The weight of hazardous lead-contaminated soil requiring chemical treatment is estimated to be  $3,810 \text{ tons} \times 80\% = \underline{3,048 \text{ tons}}$ .

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| <b>By:</b> X. Chen  | <b>Checked By:</b> S. Nesbit | <b>Approved By :</b> B. Becker                   | <b>Date:</b> 3/6/12 |

**PAH-Contaminated Soil Removal**

UXO15 - Old Skeet And Trap Range

Soil will be excavated to a depth of 2 feet bgs within one area that contains sample locations X15SB038 and X15SB053.

Volume of PAH-contaminated soil = 2 ft x 34,433 ft<sup>2</sup> = 68,866 ft<sup>3</sup> = 2,551 yd<sup>3</sup>.

UXO16 - Rum Point Skeet Range

Soil will be excavated to a depth of ~1-2 feet bgs within one area that contains sample locations X16SB056 and X16SB076.

Volume of PAH-contaminated soil = 1.5 ft x 53,616 ft<sup>2</sup> = 80,424 ft<sup>3</sup> = 2,979 yd<sup>3</sup>.

Total Quantities for All Sites

Total in-place volume of PAH-contaminated soil designated for off-site disposal = 157,689 ft<sup>3</sup> = 5,840 yd<sup>3</sup>

Using an expansion factor of 20% for in-place to loose ("fluff") soil, the total loose volume of PAH-contaminated soil designated for off-site disposal = 5,840 x 1.20 = 7,008 yd<sup>3</sup>.

Using a soil density of 110 lbs/ft<sup>3</sup>, the weight of PAH-contaminated soil designated for off-site disposal = 157,689 ft<sup>3</sup> x 110 lbs/ft<sup>3</sup> / 2,000 pounds per ton = 8,673 tons.

**Nitroglycerin-Contaminated Soil Removal**

UXO 17 - Small Arms (Pistol) Range

Soil will be excavated to a depth of 1 foot bgs within one area that contains sample locations X17SB008 and X17SB009.

Volume of lead-contaminated soil = 1 ft x 10,880 ft<sup>2</sup> = 10,880 ft<sup>3</sup> = 403 yd<sup>3</sup>.

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Using an expansion factor of 20% for in-place to loose (“fluff”) soil, the total loose volume of nitroglycerin-contaminated soil designated for off-site disposal =  $403 \times 1.20 = 484 \text{ yd}^3$ .

Using a soil density of  $110 \text{ lbs/ft}^3$ , the weight of nitroglycerin-contaminated soil designated for off-site disposal =  $10,880 \text{ ft}^3 \times 110 \text{ lbs/ft}^3 / 2000 \text{ pounds per ton} = \underline{598 \text{ tons}}$ .

**Estimated Construction Duration**

1. UXO 14 - Marine Rifle Range: 1.5 Months
2. UXO 15 - Old Skeet And Trap Range: 1.5 Months
3. UXO 16 - Rum Point Skeet Range: 1 Month
4. UXO 17 - Small Arms (Pistol) Range: 3 Weeks
5. UXO 25 - Roach Road Rifle Range: 1 Week

**Summary**

1. Total 3,048 tons of hazardous lead-contaminated soil requires in-situ chemical stabilization prior to removal. Treated soil will be excavated and shipped off-site for disposal as non-hazardous waste.
2. Total 3,810 tons of lead-contaminated soil will be shipped off-site for disposal as non-hazardous waste.
3. Total 8,673 tons of PAH-contaminated soil will be shipped off-site for disposal as non-hazardous waste.
4. Total 598 tons of nitroglycerin-contaminated soil will be shipped off-site for disposal as non-hazardous waste.
5. Total in-place volume of contaminated soils designated for off-site disposal will be 8,809 yd<sup>3</sup>. Using an expansion factor of 20%, this is 10,571 yd<sup>3</sup> of loose soil.
6. Total area to be backfilled =  $154,487 \text{ ft}^2 = \underline{17,165 \text{ yd}^2}$ . To ensure a proper vegetative base, the total volume of topsoil needed =  $77,244 \text{ ft}^3 = \underline{2,861 \text{ yd}^3}$ . The weight of topsoil =  $77,244 \text{ ft}^3 \times 110 \text{ lbs/ft}^3 / 2,000 \text{ pounds per ton} = \underline{4,248 \text{ tons}}$ .
7. To restore each excavation area to its original elevation, the total volume of clean backfill needed =  $8,809 \text{ yd}^3 - 2,861 \text{ yd}^3 = \underline{5,948 \text{ yd}^3}$ . The weight of clean backfill =  $5,948 \text{ yd}^3 \times 27 \text{ ft}^3 \times 110 \text{ lbs/ft}^3 / 2,000 \text{ pounds per ton} = \underline{8,833 \text{ tons}}$ .
8. The removal action (Alternative 3) will require approximately 5 months to complete at the five former SASRs.

**APPENDIX E**

**POST-REMOVAL ACTION ECOLOGICAL RISK EVALUATION**

### **Post-Removal Action Ecological Risk Screening Evaluation**

The ecological risk assessment (ERA) screening conducted as part of the Site Inspection (SI) was updated to reflect the expected site conditions following the completion of the removal action at the five Small Arms/Skeet Ranges (SASRs). The data used in this evaluation consisted of: SI data (Tetra Tech, 2010) to represent soil located outside the planned removal action boundaries, and installation-wide background concentrations presented in the Background Soil Investigation Report (Tetra Tech, 2002) to represent clean backfill emplaced following the removal of contaminated soil from within the planned excavation boundaries.

This evaluation provided conservative estimates of potential risk posed to ecological receptors based on direct contact and food chain exposures to concentrations of contaminants in soil at the five SASRs. The evaluation included a comparison of average and maximum measured concentrations to screening level and threshold toxicity values, as well as the calculation of ecological effects quotients (EEQs) for contaminants with concentrations that exceeded those values. For chemicals retained as COPCs based on maximum exposure assumptions, the model input parameters were refined to reflect more realistic assumptions that focused the evaluation only on chemicals posing the greatest risk. Tables documenting the post-removal action ERA screening for each of the five SASRs are included in this appendix.

Results of the post-removal action ERA screening were used to identify COPCs for each site and determine whether further information was necessary to fully evaluate ecological risk to site receptors. For soil contaminants, the assessment endpoints (i.e., site receptors) included terrestrial plants and invertebrates, as well as wildlife (e.g., mammals and birds). The conclusions of the updated ERA screening at each site are discussed below for each of these receptor groups.

#### **UXO 14**

For UXO 14, only soil at the Hillside Impact Area will be affected by the planned removal action. Thus, the ERA screening evaluations conducted for the Firing Line Area and Target Berms during the SI also apply to post-removal action conditions at those subareas. The discussion below relates to surface soil at the Hillside Impact Area, only.

During the SI, copper was retained as a COPC for risks to plants, invertebrates, and wildlife; lead was retained as a COPC for risks to plants and wildlife; and tin was retained as a COPC for risk to plants. For the post-removal action evaluation, risks to plants, invertebrates, and wildlife from residual and background concentrations of copper, lead, and tin were re-evaluated assuming that contaminated soil was removed from all locations within the planned excavation boundaries and replaced with soil

containing background levels of these constituents. Results of the post-removal action ERA screening evaluation for UXO 14 are shown on Tables E.1-1 and E.1-2.

The maximum concentration of copper (63.4 mg/kg) was less than the screening values for protection of plants and invertebrates; therefore, copper was eliminated as a COPC for risks to plants and invertebrates. The maximum concentration of tin (7.1 mg/kg) was less than screening value for plants; therefore, tin was eliminated as a COPC for risks to plants. The maximum concentration of lead (293 mg/kg) was greater than the screening value for plants indicating potential risks to plants. However, the average lead concentration (94.7 mg/kg) was less than the screening value. Lead concentrations in three samples in a forested area and one sample along Roach Road exceeded the screening value for plants. Any potential impacts to plants due to lead exposure would be limited to a small area.

Based on food chain modeling using average chemical concentrations in surface soil, the EEQs for terrestrial receptors were all less than 1.0 for copper; therefore, copper was eliminated as a COPC for wildlife. Based on food chain modeling using average chemical concentrations in surface soil, the EEQ based on the no-observed-adverse-effects level (NOAEL) for lead was less than 1.0 for terrestrial mammals, but was slightly greater than 1.0 for terrestrial birds (3.4). However, the food chain model assumes that the receptors obtain their entire diet from the site or subarea being evaluated, and it is unlikely that wildlife receptors would obtain their entire diet from the Hillside Impact Area. Also, the EEQ based on the lowest-observed-adverse-effects level (LOAEL) for terrestrial birds was less than 1.0. Therefore, impacts to birds from lead are not expected.

## **UXO 15**

During the SI, antimony was retained as a COPC for risks to wildlife in surface soil; lead was retained as a COPC for risks to plants and wildlife in surface soil; and PAHs were retained as COPCs for risks to invertebrates and wildlife in surface soil. For the post-removal action evaluation, risks to plants, invertebrates, and wildlife from concentrations of antimony and lead in surface soil were re-evaluated assuming that contaminated soil was removed from all locations within the planned excavation boundaries and replaced with soil containing background levels of these constituents. Post-removal action risks did not need to be evaluated for PAHs because all sampling locations that exceeded the ecological screening levels lie within the planned excavation boundaries. Results of the post-removal action ERA screening evaluation for UXO 15 are shown on Tables E.2-1 and E.2-2.

The maximum concentration of lead (252 mg/kg) was greater than the screening value for plants, indicating potential risks to plants. However, the average lead concentration (84.9 mg/kg) was less than

the screening value. Lead concentrations in two samples exceeded the screening value for plants. Any potential impacts to plants from lead would be limited to a small area.

Based on food chain modeling using average chemical concentrations in surface soil, the EEQs for terrestrial receptors were less than 1.0 for antimony; therefore, antimony was eliminated as a COPC for wildlife. Based on food chain modeling using average chemical concentrations in surface soil, the EEQ based on the NOAEL for lead was less than 1.0 for terrestrial mammals, but slightly greater than 1.0 for terrestrial birds (3.1). However, the food chain model assumes that the receptors obtain their entire diet from the site or subarea being evaluated, and it is unlikely that wildlife receptors would obtain their entire diet from this site. Also, the EEQ based on the LOAEL for terrestrial birds was less than 1.0. Therefore, impacts to birds from lead are not expected.

#### **UXO 16**

During the SI, lead was retained as a COPC for risks to plants and wildlife in surface soil. For the post-removal action evaluation, risks to plants and wildlife from lead concentrations in surface soil were re-evaluated assuming that contaminated soil was removed from all locations within the planned excavation boundaries and replaced with soil containing background levels of these constituents. Results of the post-removal action ERA screening evaluation for UXO 16 are shown on Tables E.3-1 and E.3-2.

The maximum concentration of lead (616 mg/kg) was greater than the screening value for plants, indicating potential risks to plants. However, the average lead concentration (93.2 mg/kg) was below the screening value. Lead concentrations in five samples exceeded the screening value for plants, and nearby samples were less than screening values. Any potential impacts to plants from lead would be limited to a small area.

Based on food chain modeling using average chemical concentrations in surface soil, the EEQ based on the NOAEL for lead was less than 1.0 for terrestrial mammals, but slightly greater than 1.0 for terrestrial birds (3.4). However, the food chain model assumes that the receptors obtain their entire diet from the site or subarea being evaluated, and it is unlikely that wildlife receptors would obtain their entire diet from this site. Also, the EEQ based on the LOAEL for terrestrial birds was less than 1.0. Therefore, impacts to birds from lead are not expected.

#### **UXO 17**

During the SI, antimony was retained as a COPC for risks to wildlife in surface soil; nitroglycerin was retained as a COPC for risks to terrestrial invertebrates and plants because it was detected and no

screening levels were available; and lead was retained as a COPC for risks to plants and wildlife in surface soil. For the post-removal action evaluation, risks to plants and wildlife from concentrations of antimony and lead in surface soil were re-evaluated assuming that contaminated soil was removed from all locations within the planned excavation boundaries and replaced with soil containing background levels of these constituents. Post-removal action risks did not need to be evaluated for nitroglycerin because all sampling locations where this contaminant was detected lie within the planned excavation boundaries. Results of the post-removal action ERA screening evaluation for UXO 17 are shown on Tables E.4-1 and E.4-2.

The maximum concentration of lead (479 mg/kg) was greater than the screening value for plants, indicating potential risks to plants. However, the average lead concentration (76.7 mg/kg) was below the screening value. Lead concentrations in two samples exceeded the screening value for plants. Any potential impacts to plants from lead would be limited to a small area.

Based on food chain modeling using average chemical concentrations in surface soil, the EEQs for terrestrial receptors were less than 1.0 for antimony; therefore, antimony was eliminated as a COPC for wildlife. Based on food chain modeling using average chemical concentrations in surface soil, the EEQ based on the NOAEL for lead was less than 1.0 for terrestrial mammals, but slightly greater than 1.0 for terrestrial birds (2.9). However, the food chain model assumes that the receptors obtain their entire diet from the site or subarea being evaluated, and it is unlikely that wildlife receptors would obtain their entire diet from this site. Also, the EEQ based on the LOAEL for terrestrial birds was less than 1.0. Therefore, impacts to birds from lead are not expected.

## **UXO 25**

During the SI, antimony was retained as a COPC in the SI for risks to plants and wildlife in surface soil; copper was retained as a COPC for risks to plants and invertebrates in surface soil; and lead was retained as a COPC for risk to plants, invertebrates, and wildlife in surface soil. For the post-removal action evaluation, risks to plants, invertebrates, and wildlife from concentrations of antimony, copper, and lead in surface soil were re-evaluated assuming that contaminated soil was removed from all locations within the planned excavation boundaries and replaced with soil containing background levels of these constituents. Results of the post-removal action ERA screening evaluation for UXO 25 are shown on Tables E.5-1 and E.5-2.

The maximum concentration of antimony (0.53 mg/kg) was less than the screening value for plants; therefore, antimony was eliminated as a COPC for risks to plants. The maximum concentration of copper (24.8 mg/kg) was less than screening values based on protection of plants and invertebrates; therefore,

copper was eliminated as a COPC for risks to plants and invertebrates. The maximum concentration of lead (142 mg/kg) was greater than the screening value for plants, indicating potential risks to plants. However, the average lead concentration (53.8 mg/kg) was below the screening value. Lead from two locations exceeded the screening value for plants. Any potential impacts to plants from lead would be limited to a small area. The maximum concentration of lead was less than screening value for invertebrates; therefore, lead was eliminated as a COPC for risks to invertebrates.

Based on food chain modeling using average chemical concentrations in surface soil, the EEQs for terrestrial receptors were less than 1.0 for antimony; therefore, antimony was eliminated as a COPC for wildlife. Based on food chain modeling using average chemical concentrations in surface soil, the EEQ based on the NOAEL for lead was less than 1.0 for terrestrial mammals, but slightly greater than 1.0 for terrestrial birds (2.3). However, the food chain model assumes that the receptors obtain their entire diet from the site or subarea being evaluated, and it is unlikely that wildlife receptors would obtain their entire diet from this site. Also, the EEQ based on the LOAEL for terrestrial birds was less than 1.0. Therefore, impacts to birds from lead are not expected.

TABLE E.1-1  
 OCCURRENCE, DISTRIBUTION, AND SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN - SURFACE SOIL  
 MARINE RIFLE RANGE (MRR) - UXO 14  
 HILLSIDE IMPACT AREA  
 SITE INSPECTION  
 NSF INDIAN HEAD - STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND

| Parameter                 | Frequency of Detection <sup>(1)</sup> | Minimum Concentration <sup>(2)</sup> | Maximum Concentration <sup>(2)</sup> | Location of Maximum Concentration | Minimum Nondetect | Maximum Nondetect | Average of Positive Results <sup>(3)</sup> | Overall Average <sup>(4)</sup> | Ecological Screening Level |            |           |           | COPC (yes/no)? | Rationale for COPC selection |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-----------------------------------|-------------------|-------------------|--|--------------------------------|----------------------------|------------|-----------|-----------|----------------|------------------------------|
|                           |                                       |                                      |                                      |                                   |                   |                   |  |                                | Invertebrates              | Plants     | Avian     | Mammals   |                |                              |
| <b>Inorganics (mg/kg)</b> |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |            |           |           |                |                              |
| <b>COPPER</b>             | 17/17                                 | 8.6                                  | 63.4                                 | X14SB139                          | NA                | NA                | 23.3                                       | 23.3                           | 80                         | 70         | <b>28</b> | <b>49</b> | YES            | ASL                          |
| <b>LEAD</b>               | 16/17                                 | 17.9                                 | 293                                  | X14SB094                          | 11                | 11                | 100  | 94.7                           | 1700                       | <b>120</b> | <b>11</b> | <b>56</b> | YES            | ASL                          |
| <b>TIN</b>                | 5/17                                  | 1.6                                  | 7.1                                  | X14SB094                          | 0.49              | 1.7               | 3.6  | 1.6                            | <b>NA</b>                  | 50         | <b>NA</b> | 7.62      | YES            | ASL/NSL                      |

Shaded cells indicate that the overall average concentration exceeds the screening level or a screening level is not available. Bolded values/text indicate that the maximum concentration exceeds the screening level.

1 Sample and duplicate are considered as one sample when determining the frequency of detection.

2 Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected.

3 Average of detected concentrations only.

4 Average of all analytical results.

COPC = Chemical of Potential Concern

NA = Not available or not applicable

L = Biased low concentration

Rationale Codes for COPC Selection:

ASL = Above COPC Screening Level

BSL = Below COPC Screening Level

NSL = No Screening Level Available

**TABLE E.1-2**  
**TERRESTRIAL FOOD CHAIN MODEL - AVERAGE SCENARIO**  
**INSECTIVOROUS AND HERBIVOROUS RECEPTORS - SURFACE SOIL**  
**MARINE RIFLE RANGE (MRR) - UXO 14**  
**HILLSIDE IMPACT AREA**  
**NSF INDIAN HEAD -STUMP NECK ANNEX**  
**INDIAN HEAD, MARYLAND**

| Chemical          | Herbivorous Receptors EEQs |         |             |         | Insectivorous Receptors EEQs |         |                    |         |
|-------------------|----------------------------|---------|-------------|---------|------------------------------|---------|--------------------|---------|
|                   | Bobwhite Quail             |         | Meadow Vole |         | Robin                        |         | Short-Tailed Shrew |         |
|                   | NOAEL                      | LOAEL   | NOAEL       | LOAEL   | NOAEL                        | LOAEL   | NOAEL              | LOAEL   |
| <b>Inorganics</b> |                            |         |             |         |                              |         |                    |         |
| COPPER            | 1.6E-01                    | 1.8E-02 | 6.1E-02     | 4.1E-03 | 4.9E-01                      | 5.7E-02 | 1.9E-01            | 1.3E-02 |
| LEAD              | 4.4E-01                    | 1.6E-02 | 4.7E-02     | 1.2E-03 | 3.4E+00                      | 1.2E-01 | 6.2E-01            | 1.6E-02 |

Cells are shaded if the value is greater than 1.0

NOAEL - No Observed Adverse Effects Level

LOAEL - Lowest Observed Adverse Effects Level

EEQ - Ecological Effects Quotient

TABLE E.2-1  
 OCCURRENCE, DISTRIBUTION, AND SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN - SURFACE SOIL  
 OLD SKEET AND TRAP RANGE (OSTR) - UXO 15  
 SHOT FALL/TARGET AREA  
 SITE INSPECTION  
 NSF INDIAN HEAD - STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND

| Parameter                 | Frequency of Detection <sup>(1)</sup> | Minimum Concentration <sup>(2)</sup> | Maximum Concentration <sup>(2)</sup> | Location of Maximum Concentration | Minimum Nondetect | Maximum Nondetect | Average of Positive Results <sup>(3)</sup> | Overall Average <sup>(4)</sup> | Ecological Screening Level |        |       |         | COPC (yes/no)? | Rationale for COPC selection |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-----------------------------------|-------------------|-------------------|--|--------------------------------|----------------------------|--------|-------|---------|----------------|------------------------------|
|                           |                                       |                                      |                                      |                                   |                   |                   |  |                                | Invertebrates              | Plants | Avian | Mammals |                |                              |
| <b>Inorganics (mg/kg)</b> |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |                |                              |
| ANTIMONY                  | 14/14                                 | 0.11                                 | 0.99 J                               | X15SB005                          | NA                | NA                | 0.2  | 0.2                            | 78                         | 5      | NA    | 0.27    | YES            | ASL/NSL                      |
| LEAD                      | 14/14                                 | 33.3                                 | 252                                  | X15SB005                          | NA                | NA                | 84.9                                       | 84.9                           | 1700                       | 120    | 11    | 56      | YES            | ASL                          |

Shaded cells indicate that the overall average concentration exceeds the screening level or a screening level is not available. Bolded values/text indicate that the maximum concentration exceeds the screening level.

1 Sample and duplicate are considered as one sample when determining the frequency of detection.

2 Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected.

3 Average of detected concentrations only.

4 Average of all analytical results.

COPC = Chemical of Potential Concern

NA = Not available or not applicable

J = Estimated concentration

L = Biased low concentration

Rationale Codes for COPC Selection:

ASL = Above COPC Screening Level

BSL = Below COPC Screening Level

NSL = No Screening Level Available

**TABLE E.2-2**  
**TERRESTRIAL FOOD CHAIN MODEL - AVERAGE SCENARIO**  
**INSECTIVOROUS AND HERBIVOROUS RECEPTORS - SURFACE SOIL**  
**OLD SKEET AND TRAP RANGE (OSTR) - UXO 15**  
**SHOT FALL/TARGET AREA**  
**NSF INDIAN HEAD - STUMP NECK ANNEX**  
**INDIAN HEAD, MARYLAND**

| Chemical          | Herbivorous Receptors EEQs |         |             |         | Insectivorous Receptors EEQs |         |                    |         |
|-------------------|----------------------------|---------|-------------|---------|------------------------------|---------|--------------------|---------|
|                   | Bobwhite Quail             |         | Meadow Vole |         | Robin                        |         | Short-Tailed Shrew |         |
|                   | NOAEL                      | LOAEL   | NOAEL       | LOAEL   | NOAEL                        | LOAEL   | NOAEL              | LOAEL   |
| <b>Inorganics</b> |                            |         |             |         |                              |         |                    |         |
| ANTIMONY          | NV                         | NV      | 9.2E-03     | 2.0E-04 | NV                           | NV      | 3.0E-01            | 6.5E-03 |
| LEAD              | 4.0E-01                    | 1.5E-02 | 4.4E-02     | 1.1E-03 | 3.1E+00                      | 1.1E-01 | 5.6E-01            | 1.4E-02 |

Cells are shaded if the value is greater than 1.0

NV - Value Not Available

NOAEL - No Observed Adverse Effects Level

LOAEL - Lowest Observed Adverse Effects Level

EEQ - Ecological Effects Quotient

TABLE E.3-1  
 OCCURRENCE, DISTRIBUTION, AND SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN - SURFACE SOIL  
 RUM POINT SKEET RANGE (RPSR) - UXO 16  
 SHOT FALL/TARGET AREA  
 SITE INSPECTION  
 NSF INDIAN HEAD - STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND

| Parameter                 | Frequency of Detection <sup>(1)</sup> | Minimum Concentration <sup>(2)</sup> | Maximum Concentration <sup>(2)</sup> | Location of Maximum Concentration | Minimum Nondetect | Maximum Nondetect | Average of Positive Results <sup>(3)</sup> | Overall Average <sup>(4)</sup> | Ecological Screening Level |            |           |           | COPC (yes/no)? | Rationale for COPC selection |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-----------------------------------|-------------------|-------------------|--|--------------------------------|----------------------------|------------|-----------|-----------|----------------|------------------------------|
|                           |                                       |                                      |                                      |                                   |                   |                   |  |                                | Invertebrates              | Plants     | Avian     | Mammals   |                |                              |
| <b>Inorganics (mg/kg)</b> |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |            |           |           |                |                              |
| <b>LEAD</b>               | 20/20                                 | 6.7                                  | 616                                  | X16SB008                          | NA                | NA                | 93.2                                       | 93.2                           | 1700                       | <b>120</b> | <b>11</b> | <b>56</b> | YES            | ASL                          |

Shaded cells indicate that the overall average concentration exceeds the screening level or a screening level is not available. Bolded values/text indicate that the maximum concentration exceeds the screening level.

- 1 Sample and duplicate are considered as one sample when determining the frequency of detection.
- 2 Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected.
- 3 Average of detected concentrations only.
- 4 Average of all analytical results.

COPC = Chemical of Potential Concern  
 NA = Not available or not applicable  
 J = Estimated concentration  
 K = Biased high concentration  
 L = Biased low concentration

Rationale Codes for COPC Selection:  
 ASL = Above COPC Screening Level  
 BSL = Below COPC Screening Level  
 NSL = No Screening Level Available

**TABLE E.3-2**  
**TERRESTRIAL FOOD CHAIN MODEL - AVERAGE SCENARIO**  
**INSECTIVOROUS AND HERBIVOROUS RECEPTORS - SURFACE SOIL**  
**RUM POINT SKEET RANGE (RPSR) - UXO 16**  
**SHOT FALL/TARGET AREA**  
**NSF INDIAN HEAD - STUMP NECK ANNEX**  
**INDIAN HEAD, MARYLAND**

| Chemical          | Herbivorous Receptors EEQs |         |             |         | Insectivorous Receptors EEQs |         |                    |         |
|-------------------|----------------------------|---------|-------------|---------|------------------------------|---------|--------------------|---------|
|                   | Bobwhite Quail             |         | Meadow Vole |         | Robin                        |         | Short-Tailed Shrew |         |
|                   | NOAEL                      | LOAEL   | NOAEL       | LOAEL   | NOAEL                        | LOAEL   | NOAEL              | LOAEL   |
| <b>Inorganics</b> |                            |         |             |         |                              |         |                    |         |
| LEAD              | 4.3E-01                    | 1.6E-02 | 4.7E-02     | 1.2E-03 | 3.4E+00                      | 1.2E-01 | 6.1E-01            | 1.5E-02 |

Cells are shaded if the value is greater than 1.0

NOAEL - No Observed Adverse Effects Level

LOAEL - Lowest Observed Adverse Effects Level

EEQ - Ecological Effects Quotient

TABLE E.4-1  
 OCCURRENCE, DISTRIBUTION, AND SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN - SURFACE SOIL  
 SMALL ARMS (PISTOL) RANGE (SAPR) - UXO 17  
 TARGET AREA  
 SITE INSPECTION  
 NSF INDIAN HEAD - STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND

| Parameter                 | Frequency of Detection <sup>(1)</sup> | Minimum Concentration <sup>(2)</sup> | Maximum Concentration <sup>(2)</sup> | Location of Maximum Concentration | Minimum Nondetect | Maximum Nondetect | Average of Positive Results <sup>(3)</sup> | Overall Average <sup>(4)</sup> | Ecological Screening Level |        |       |         | COPC (yes/no)? | Rationale for COPC selection |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-----------------------------------|-------------------|-------------------|--|--------------------------------|----------------------------|--------|-------|---------|----------------|------------------------------|
|                           |                                       |                                      |                                      |                                   |                   |                   |  |                                | Invertebrates              | Plants | Avian | Mammals |                |                              |
| <b>Inorganics (mg/kg)</b> |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |        |       |         |                |                              |
| <b>ANTIMONY</b>           | 3/12                                  | 0.15 L                               | 0.5 L                                | X17SB028                          | 0.13              | 3.3               | 0.28                                       | 1.0                            | 78                         | 5      | NA    | 0.27    | YES            | ASL/NSL                      |
| <b>LEAD</b>               | 11/12                                 | 7.2                                  | 479                                  | X17SB025                          | 7                 | 10.3              | 83.2                                       | 76.7                           | 1700                       | 120    | 11    | 56      | YES            | ASL                          |

Shaded cells indicate that the overall average concentration exceeds the screening level or a screening level is not available. Bolded values/text indicate that the maximum concentration exceeds the screening level.

- 1 Sample and duplicate are considered as one sample when determining the frequency of detection.
- 2 Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected.
- 3 Average of detected concentrations only.
- 4 Average of all analytical results.

COPC = Chemical of Potential Concern  
 NA = Not available or not applicable  
 K = Biased high concentration  
 L = Biased low concentration

Rationale Codes for COPC Selection:  
 ASL = Above COPC Screening Level  
 BSL = Below COPC Screening Level  
 NSL = No Screening Level Available

**TABLE E.4-2**  
**TERRESTRIAL FOOD CHAIN MODEL - AVERAGE SCENARIO**  
**INSECTIVOROUS AND HERBIVOROUS RECEPTORS - SURFACE SOIL**  
**SMALL ARMS (PISTOL) RANGE (SAPR) - UXO 17**  
**TARGET AREA**  
**NSF INDIAN HEAD - STUMP NECK ANNEX**  
**INDIAN HEAD, MARYLAND**

| Chemical          | Herbivorous Receptors EEQs |         |             |         | Insectivorous Receptors EEQs |         |                    |         |  |
|-------------------|----------------------------|---------|-------------|---------|------------------------------|---------|--------------------|---------|--|
|                   | Bobwhite Quail             |         | Meadow Vole |         | Robin                        |         | Short-Tailed Shrew |         |  |
|                   | NOAEL                      | LOAEL   | NOAEL       | LOAEL   | NOAEL                        | LOAEL   | NOAEL              | LOAEL   |  |
| <b>Inorganics</b> |                            |         |             |         |                              |         |                    |         |  |
| LEAD              | 3.7E-01                    | 1.3E-02 | 4.1E-02     | 1.0E-03 | 2.9E+00                      | 1.0E-01 | 5.2E-01            | 1.3E-02 |  |

Cells are shaded if the value is greater than 1.0

NOAEL - No Observed Adverse Effects Level

LOAEL - Lowest Observed Adverse Effects Level

EEQ - Ecological Effects Quotient

TABLE E.5-1  
 OCCURRENCE, DISTRIBUTION, AND SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN - SURFACE SOIL  
 ROACH ROAD RIFLE RANGE (RRRR) - UXO 25  
 TARGET AREA  
 SITE INSPECTION  
 NSF INDIAN HEAD - STUMP NECK ANNEX  
 INDIAN HEAD, MARYLAND

| Parameter                 | Frequency of Detection <sup>(1)</sup> | Minimum Concentration <sup>(2)</sup> | Maximum Concentration <sup>(2)</sup> | Location of Maximum Concentration | Minimum Nondetect | Maximum Nondetect | Average of Positive Results <sup>(3)</sup> | Overall Average <sup>(4)</sup> | Ecological Screening Level |            |           |             | COPC (yes/no)? | Rationale for COPC selection |
|---------------------------|---------------------------------------|--------------------------------------|--------------------------------------|-----------------------------------|-------------------|-------------------|--|--------------------------------|----------------------------|------------|-----------|-------------|----------------|------------------------------|
|                           |                                       |                                      |                                      |                                   |                   |                   |  |                                | Invertebrates              | Plants     | Avian     | Mammals     |                |                              |
| <b>Inorganics (mg/kg)</b> |                                       |                                      |                                      |                                   |                   |                   |  |                                |                            |            |           |             |                |                              |
| <b>ANTIMONY</b>           | 10/20                                 | 0.19 L                               | 0.53 L                               | X25SB031                          | 0.02              | 0.16              | 0.29                                       | 0.18                           | 78                         | 5          | <b>NA</b> | <b>0.27</b> | YES            | ASL/NSL                      |
| <b>COPPER</b>             | 20/20                                 | 7.4                                  | 24.8                                 | X25SB016                          | NA                | NA                | 14.4                                       | 14.4                           | 80                         | 70         | 28        | 49          | NO             | BSL                          |
| <b>LEAD</b>               | 20/20                                 | 6.3                                  | 142                                  | X25SB031                          | NA                | NA                | 58.3                                       | 58.3                           | 1700                       | <b>120</b> | <b>11</b> | <b>56</b>   | YES            | ASL                          |

Shaded cells indicate that the overall average concentration exceeds the screening level or a screening level is not available. Bolded values/text indicate that the maximum concentration exceeds the screening level.

- 1 Sample and duplicate are considered as one sample when determining the frequency of detection.
- 2 Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations detected.
- 3 Average of detected concentrations only.
- 4 Average of all analytical results.

COPC = Chemical of Potential Concern  
 NA = Not available or not applicable  
 J = Estimated concentration  
 L = Biased low concentration

Rationale Codes for COPC Selection:  
 ASL = Above COPC Screening Level  
 BSL = Below COPC Screening Level  
 NSL = No Screening Level Available

**TABLE E.5-2**  
**TERRESTRIAL FOOD CHAIN MODEL - AVERAGE SCENARIO**  
**INSECTIVOROUS AND HERBIVOROUS RECEPTORS - SURFACE SOIL**  
**ROACH ROAD RIFLE RANGE (RRRR) - UXO 25**  
**TARGET AREA**  
**NSF INDIAN HEAD - STUMP NECK ANNEX**  
**INDIAN HEAD, MARYLAND**

| Chemical          | Herbivorous Receptors EEQs |         |             |         | Insectivorous Receptors EEQs |         |                    |         |
|-------------------|----------------------------|---------|-------------|---------|------------------------------|---------|--------------------|---------|
|                   | Bobwhite Quail             |         | Meadow Vole |         | Robin                        |         | Short-Tailed Shrew |         |
|                   | NOAEL                      | LOAEL   | NOAEL       | LOAEL   | NOAEL                        | LOAEL   | NOAEL              | LOAEL   |
| <b>Inorganics</b> |                            |         |             |         |                              |         |                    |         |
| LEAD              | 2.9E-01                    | 1.1E-02 | 3.4E-02     | 8.6E-04 | 2.3E+00                      | 8.3E-02 | 4.1E-01            | 1.0E-02 |

Cells are shaded if the value is greater than 1.0

NOAEL - No Observed Adverse Effects Level

LOAEL - Lowest Observed Adverse Effects Level

EEQ - Ecological Effects Quotient

**APPENDIX F**  
**COST ESTIMATES**

**APPENDIX F**  
**COST ESTIMATES**

This EE/CA was developed to evaluate removal action alternatives that address the lead-, PAH-, and nitroglycerin-contaminated soils that pose unacceptable risks at the five small arms/skeet ranges (SASRs). The cost estimates used for comparison in the alternatives analysis are based on the assumption that removal activities can be conducted at all five SASRs in a single mobilization. However, it is possible that funding constraints may dictate separate mobilizations for one or more of the sites. To assist with implementation planning, cost tables are presented in this appendix to address both potential funding scenarios. Detailed cost tables are presented for both Alternatives 2 and 3 based on: 1) all sites being addressed in a single mobilization, and 2) each site being addressed in a separate mobilization. A summary breakdown of the overall and site-specific cost estimates is presented in the table below.

| Scenario / Site                           | Alternative 2      | Alternative 3      |
|---|--------------------|--------------------|
| <b>All Sites in Single Mobilization</b>   |                    |                    |
| <b>Total</b>                              | <b>\$4,210,860</b> | <b>\$3,156,732</b> |
| <b>Each Site in Separate Mobilization</b> |                    |                    |
| <b>UXO 14</b>                             | \$1,734,240        | \$1,006,350        |
| <b>UXO 15</b>                             | \$1,224,637        | \$1,008,431        |
| <b>UXO 16</b>                             | \$913,565          | \$913,565          |
| <b>UXO 17</b>                             | \$385,116          | \$306,719          |
| <b>UXO 25</b>                             | \$131,648          | \$113,788          |
| <b>Total</b>                              | <b>\$4,389,206</b> | <b>\$3,348,853</b> |

NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
FIVE SMALL ARMS/SKEET RANGES  
Alternative 2: Excavation and Off-Site Disposal  
Capital Cost

| Item  | Quantity | Unit | Unit Cost   |            |                 | Extended Cost |           |                 | Subtotal |          |           |
|---|----------|------|-------------|------------|-----------------|---------------|-----------|-----------------|----------|----------|-----------|
|   |          |      | Subcontract | Material   | Labor Equipment | Subcontract   | Material  | Labor Equipment |          |          |           |
| <b>1 PROJECT PLANNING</b>                                 |          |      |             |            |                 |               |           |                 |          |          |           |
| 1.1 Prepare Documents & Plans                             | 300      | hr   |             |            | \$39.00         | \$0           | \$0       | \$11,700        | \$0      | \$11,700 |           |
| <b>2 INITIAL CHARACTERIZATION</b>                         |          |      |             |            |                 |               |           |                 |          |          |           |
| 2.1 Sample Collection (2 persons for 3 days)              | 1        | ls   |             | \$1,000.00 | \$1,500.00      | \$200.00      | \$0       | \$1,000         | \$1,500  | \$200    | \$2,700   |
| 2.2 Soil Sampling (TCLP Lead)                             | 20       | ea   | 150.00      | \$10.00    |                 |               | \$3,000   | \$200           | \$0      | \$0      | \$3,200   |
| 2.3 Characterization/Offsite Disposal Soil Testing        | 10       | ea   | 850.00      | \$20.00    |                 |               | \$8,500   | \$200           | \$0      | \$0      | \$8,700   |
| <b>3 MOBILIZATION, DEMOBILIZATION AND FIELD SUPPORT</b>   |          |      |             |            |                 |               |           |                 |          |          |           |
| 3.1 Office Trailer  | 5        | mo   |             |            |                 | \$400.00      | \$0       | \$0             | \$0      | \$2,000  | \$2,000   |
| 3.2 Field Office Support                                  | 5        | mo   |             | \$200.00   |                 |               | \$0       | \$1,000         | \$0      | \$0      | \$1,000   |
| 3.3 Storage Trailer                                       | 5        | mo   |             |            |                 | \$103.00      | \$0       | \$0             | \$0      | \$515    | \$515     |
| 3.4 Utility Connection/Disconnection (phone/electric)     | 1        | ls   | 4500.00     |            |                 |               | \$4,500   | \$0             | \$0      | \$0      | \$4,500   |
| 3.5 Site Utilities  | 5        | mo   | 200.00      |            |                 |               | \$1,000   | \$0             | \$0      | \$0      | \$1,000   |
| 3.6 Underground Utility Clearances                        | 1        | ls   | 4500.00     |            |                 |               | \$4,500   | \$0             | \$0      | \$0      | \$4,500   |
| 3.7 Construction Survey Support                           | 10       | day  | 1150.00     |            |                 |               | \$11,500  | \$0             | \$0      | \$0      | \$11,500  |
| 3.8 Equipment Mobilization/Demobilization                 | 5        | ea   |             |            | \$188.00        | \$566.00      | \$0       | \$0             | \$940    | \$2,830  | \$3,770   |
| 3.9 XRF Scientist   | 30       | day  |             | \$200.00   | \$300.00        |               | \$0       | \$6,000         | \$9,000  | \$0      | \$15,000  |
| 3.10 XRF Rental   | 2        | mo   |             |            |                 | \$3,500.00    | \$0       | \$0             | \$0      | \$7,000  | \$7,000   |
| 3.11 Site Superintendent                                  | 5        | mo   |             |            | \$8,229.76      |               | \$0       | \$0             | \$41,149 | \$0      | \$41,149  |
| 3.12 Site Health & Safety and QA/QC                       | 5        | mo   |             |            | \$6,827.04      |               | \$0       | \$0             | \$34,135 | \$0      | \$34,135  |
| 3.13 Materials Storage Pad, 25' X 25'                     | 5        | ls   |             | \$1,000.00 | \$250.00        | \$200.00      | \$0       | \$5,000         | \$1,250  | \$1,000  | \$7,250   |
| 3.14 Decontamination Services                             | 5        | mo   |             | \$1,100.00 | \$2,025.00      | \$1,400.00    | \$0       | \$5,500         | \$10,125 | \$7,000  | \$22,625  |
| <b>4 SITE PREPARATION</b>                                 |          |      |             |            |                 |               |           |                 |          |          |           |
| 4.1 Temporary Access Roads, 4" gravel, geotextile         | 1        | ls   |             | 6000.00    |                 |               | \$0       | \$6,000         | \$0      | \$0      | \$6,000   |
| 4.2 Clear Site, cut & chip trees to 4" diam.              | 2        | acre |             |            | \$3,600.00      | \$2,950.00    | \$0       | \$0             | \$7,200  | \$5,900  | \$13,100  |
| 4.3 Clear Site, grasses & brush                           | 4        | acre |             |            | \$370.00        | \$345.00      | \$0       | \$0             | \$1,480  | \$1,380  | \$2,860   |
| 4.4 Erosion and Sedimentation Controls                    | 1        | ls   | 15000.00    |            |                 |               | \$15,000  | \$0             | \$0      | \$0      | \$15,000  |
| 4.5 Equipment Decon Pad (5 Sites)                         | 1        | ls   |             | \$7,000.00 | \$6,000.00      | \$850.00      | \$0       | \$7,000         | \$6,000  | \$850    | \$13,850  |
| <b>5 EXCAVATION AND DISPOSAL</b>                          |          |      |             |            |                 |               |           |                 |          |          |           |
| 5.1 Excavator, 3/4cy Capacity                             | 5        | mo   |             |            | \$14,590.40     | \$11,569.68   | \$0       | \$0             | \$72,952 | \$57,848 | \$130,800 |
| 5.2 Site Labor, (1 laborer)                               | 5        | mo   |             |            | \$6,160.00      |               | \$0       | \$0             | \$30,800 | \$0      | \$30,800  |
| 5.3 Crawler Loader 1 to 1-1/2 cy (80HP)                   | 2        | mo   |             |            | \$11,102.12     | \$8,749.44    | \$0       | \$0             | \$22,204 | \$17,499 | \$39,703  |
| 5.4 Front End Loader, 3 cy (145HP)                        | 3        | mo   |             |            | \$11,102.12     | \$8,546.66    | \$0       | \$0             | \$33,306 | \$25,640 | \$58,946  |
| 5.5 UXO Technician  | 3        | mo   |             |            | \$6,827.04      |               | \$0       | \$0             | \$20,481 | \$0      | \$20,481  |
| 5.6 Off Site Disposal, Hazardous for Lead                 | 3,048    | ton  | 325.00      |            |                 |               | \$990,600 | \$0             | \$0      | \$0      | \$990,600 |
| 5.7 Off Site Disposal, Non-Hazardous Soil                 | 10,033   | ton  | 65.00       |            |                 |               | \$652,145 | \$0             | \$0      | \$0      | \$652,145 |
| 5.8 Confirmatory Sampling, (lead only, 72 hr TAT)         | 80       | ea   | 46.00       | \$10.00    |                 |               | \$3,680   | \$800           | \$0      | \$0      | \$4,480   |
| 5.9 Confirmatory Sampling, (PAHs only, 72 hr TAT)         | 35       | ea   | 250.00      | \$10.00    |                 |               | \$8,750   | \$350           | \$0      | \$0      | \$9,100   |
| 5.10 Confirmatory Sampling, (nitroglycerin only, 72 hr TA | 10       | ea   | 230.00      | \$10.00    |                 |               | \$2,300   | \$100           | \$0      | \$0      | \$2,400   |

NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
FIVE SMALL ARMS/SKEET RANGES  
Alternative 2: Excavation and Off-Site Disposal  
Capital Cost

| Item  | Quantity | Unit | Unit Cost   |          |             | Extended Cost |             |           |           | Subtotal  |                    |
|---|----------|------|-------------|----------|-------------|---------------|-------------|-----------|-----------|-----------|--------------------|
|   |          |      | Subcontract | Material | Labor       | Equipment     | Subcontract | Material  | Labor     |           | Equipment          |
| <b>6 SITE RESTORATION</b>   |          |      |             |          |             |               |             |           |           |           |                    |
| 6.1 Clean backfill  | 5,948    | cy   |             | \$19.60  | \$0.53      | \$0.34        | \$0         | \$116,581 | \$3,152   | \$2,022   | \$121,756          |
| 6.2 Topsoil, Furnish and Place, 6" thickness                                      | 17,165   | sy   |             | \$5.40   | \$0.63      | \$0.41        | \$0         | \$92,691  | \$10,814  | \$7,038   | \$110,543          |
| 6.3 Dozer, Crawler 105 H. P.  | 1        | mo   |             |          | \$11,281.60 | \$9,979.60    | \$0         | \$0       | \$11,282  | \$9,980   | \$21,261           |
| 6.4 Fine Grading and seeding, incl. lime, fert, and seed                          | 17,165   | sy   |             | \$0.56   | \$1.78      | \$0.33        | \$0         | \$9,612   | \$30,554  | \$5,664   | \$45,831           |
| <b>7 POST CONSTRUCTION COST</b>   |          |      |             |          |             |               |             |           |           |           |                    |
| 7.1 Contractor Completion Report  | 200      | hr   |             |          | \$39.00     |               | \$0         | \$0       | \$7,800   | \$0       | \$7,800            |
| <b>Subtotal</b>   |          |      |             |          |             |               | \$1,705,475 | \$252,034 | \$367,824 | \$154,366 | \$2,479,700        |
| <b>Local Area Adjustments</b>   |          |      |             |          |             |               | 100.0%      | 101.6%    | 86.0%     | 96.1%     |                    |
| <b>Subtotal</b>   |          |      |             |          |             |               | \$1,705,475 | \$256,067 | \$316,329 | \$148,346 | \$2,426,217        |
| Overhead on Labor Cost @ 30%  |          |      |             |          |             |               |             |           | \$94,899  |           | \$94,899           |
| G & A on Labor Cost @ 10%   |          |      |             |          |             |               |             |           | \$31,633  |           | \$31,633           |
| G & A on Material Cost @ 10%  |          |      |             |          |             |               |             | \$25,607  |           |           | \$25,607           |
| G & A on Equipment Cost @ 10%   |          |      |             |          |             |               |             |           |           | \$14,835  | \$14,835           |
| G & A on Subcontract Cost @ 10%   |          |      |             |          |             |               | \$170,548   |           |           |           | \$170,548          |
| Tax on Materials and Equipment Cost @ 6%  |          |      |             |          |             |               |             | \$15,364  |           | \$8,901   | \$24,265           |
| <b>Total Direct Cost</b>  |          |      |             |          |             |               | \$1,876,023 | \$297,037 | \$442,861 | \$172,081 | \$2,788,002        |
| Indirects on Total Direct Cost @ 25% (excluding transportation and disposal cost) |          |      |             |          |             |               |             |           |           |           | \$286,314          |
| Profit on Total Direct Cost @ 10%   |          |      |             |          |             |               |             |           |           |           | \$278,800          |
| <b>Subtotal</b>   |          |      |             |          |             |               |             |           |           |           | \$3,353,116        |
| Health & Safety Monitoring @ 2% (includes air quality monitoring)                 |          |      |             |          |             |               |             |           |           |           | \$67,062           |
| <b>Total Field Cost</b>   |          |      |             |          |             |               |             |           |           |           | \$3,420,179        |
| Contingency on Total Field Costs @ 20%  |          |      |             |          |             |               |             |           |           |           | \$684,036          |
| Engineering on Total Field Cost @ 6% (excluding transportation and disposal cost) |          |      |             |          |             |               |             |           |           |           | \$106,646          |
| <b>TOTAL CAPITAL COST</b>   |          |      |             |          |             |               |             |           |           |           | <b>\$4,210,860</b> |

NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
FIVE SMALL ARMS/SKEET RANGES  
Alternative 2: Excavation and Off-Site Disposal - UXO 14-Marine Rifle Range  
Capital Cost

| Item   | Quantity | Unit | Subcontract | Unit Cost  |             |             | Subcontract | Extended Cost |          |           | Subtotal  |
|--|----------|------|-------------|------------|-------------|-------------|-------------|---------------|----------|-----------|-----------|
|  |          |      |             | Material   | Labor       | Equipment   |             | Material      | Labor    | Equipment |           |
| <b>1 PROJECT PLANNING</b>                                |          |      |             |            |             |             |             |               |          |           |           |
| 1.1 Prepare Documents & Plans                            | 120      | hr   |             |            | \$39.00     |             | \$0         | \$0           | \$4,680  | \$0       | \$4,680   |
| <b>2 INITIAL CHARACTERIZATION</b>                        |          |      |             |            |             |             |             |               |          |           |           |
| 2.1 Sample Collection (2 persons for 2 days)             | 1        | ls   |             | \$400.00   | \$1,000.00  | \$150.00    | \$0         | \$400         | \$1,000  | \$150     | \$1,550   |
| 2.2 Soil Sampling (TCLP Lead)                            | 12       | ea   | 150.00      | \$10.00    |             |             | \$1,800     | \$120         | \$0      | \$0       | \$1,920   |
| 2.3 Characterization/Offsite Disposal Soil Testing       | 2        | ea   | 850.00      | \$20.00    |             |             | \$1,700     | \$40          | \$0      | \$0       | \$1,740   |
| <b>3 MOBILIZATION, DEMOBILIZATION AND FIELD SUPPORT</b>  |          |      |             |            |             |             |             |               |          |           |           |
| 3.1 Office Trailer                                       | 2        | mo   |             |            |             | \$400.00    | \$0         | \$0           | \$0      | \$600     | \$600     |
| 3.2 Field Office Support                                 | 2        | mo   |             | \$200.00   |             |             | \$0         | \$300         | \$0      | \$0       | \$300     |
| 3.3 Storage Trailer                                      | 2        | mo   |             |            |             | \$103.00    | \$0         | \$0           | \$0      | \$155     | \$155     |
| 3.4 Utility Connection/Disconnection (phone/electric)    | 1        | ls   | 1500.00     |            |             |             | \$1,500     | \$0           | \$0      | \$0       | \$1,500   |
| 3.5 Site Utilities                                       | 2        | mo   | 200.00      |            |             |             | \$400       | \$0           | \$0      | \$0       | \$400     |
| 3.6 Underground Utility Clearances                       | 1        | ls   | 1500.00     |            |             |             | \$1,500     | \$0           | \$0      | \$0       | \$1,500   |
| 3.7 Construction Survey Support                          | 6        | day  | 1150.00     |            |             |             | \$6,900     | \$0           | \$0      | \$0       | \$6,900   |
| 3.8 Equipment Mobilization/Demobilization                | 5        | ea   |             |            | \$188.00    | \$566.00    | \$0         | \$0           | \$940    | \$2,830   | \$3,770   |
| 3.9 XRF Scientist  | 15       | day  |             | \$200.00   | \$300.00    |             | \$0         | \$3,000       | \$4,500  | \$0       | \$7,500   |
| 3.10 XRF Rental  | 1        | mo   |             |            |             | \$3,500.00  | \$0         | \$0           | \$0      | \$3,500   | \$3,500   |
| 3.11 Site Superintendent                                 | 2        | mo   |             |            | \$8,229.76  |             | \$0         | \$0           | \$16,460 | \$0       | \$16,460  |
| 3.12 Site Health & Safety and QA/QC                      | 2        | mo   |             |            | \$6,827.04  |             | \$0         | \$0           | \$13,654 | \$0       | \$13,654  |
| 3.13 Materials Storage Pad, 25' X 25'                    | 1        | ls   |             | \$1,000.00 | \$250.00    | \$200.00    | \$0         | \$1,000       | \$250    | \$200     | \$1,450   |
| 3.14 Decontamination Services                            | 2        | mo   |             | \$1,100.00 | \$2,025.00  | \$1,400.00  | \$0         | \$2,200       | \$4,050  | \$2,800   | \$9,050   |
| <b>4 SITE PREPARATION</b>                                |          |      |             |            |             |             |             |               |          |           |           |
| 4.1 Temporary Access Roads, 4" gravel, geotextile        | 1        | ls   |             | 4000.00    |             |             | \$0         | \$4,000       | \$0      | \$0       | \$4,000   |
| 4.2 Clear Site, cut & chip trees to 4" diam.             | 1.5      | acre |             |            | \$3,600.00  | \$2,950.00  | \$0         | \$0           | \$5,400  | \$4,425   | \$9,825   |
| 4.3 Clear Site, grasses & brush                          | 1.5      | acre |             |            | \$370.00    | \$345.00    | \$0         | \$0           | \$555    | \$518     | \$1,073   |
| 4.4 Erosion and Sedimentation Controls                   | 1        | ls   | 8000.00     |            |             |             | \$8,000     | \$0           | \$0      | \$0       | \$8,000   |
| 4.5 Equipment Decon Pad                                  | 1        | ls   |             | \$3,500.00 | \$3,000.00  | \$425.00    | \$0         | \$3,500       | \$3,000  | \$425     | \$6,925   |
| <b>5 EXCAVATION AND DISPOSAL</b>                         |          |      |             |            |             |             |             |               |          |           |           |
| 5.1 Excavator, 3/4cy Capacity                            | 2        | mo   |             |            | \$14,590.40 | \$11,569.68 | \$0         | \$0           | \$29,181 | \$23,139  | \$52,320  |
| 5.2 Site Labor, (1 laborer)                              | 2        | mo   |             |            | \$6,160.00  |             | \$0         | \$0           | \$12,320 | \$0       | \$12,320  |
| 5.3 Crawler Loader 1 to 1-1/2 cy (80HP)                  | 2        | mo   |             |            | \$11,102.12 | \$8,749.44  | \$0         | \$0           | \$22,204 | \$17,499  | \$39,703  |
| 5.4 UXO Technician                                       | 2        | mo   |             |            | \$6,827.04  |             | \$0         | \$0           | \$13,654 | \$0       | \$13,654  |
| 5.5 Off Site Disposal, Hazardous for Lead                | 2,159    | ton  | 325.00      |            |             |             | \$701,675   | \$0           | \$0      | \$0       | \$701,675 |
| 5.6 Off Site Disposal, Non-Hazardous Soil                | 540      | ton  | 65.00       |            |             |             | \$35,100    | \$0           | \$0      | \$0       | \$35,100  |
| 5.7 Confirmatory Sampling, (lead only, 72 hr TAT)        | 50       | ea   | 46.00       | \$10.00    |             |             | \$2,300     | \$500         | \$0      | \$0       | \$2,800   |
| 5.8 Confirmatory Sampling, (PAHs only, 72 hr TAT)        | 0        | ea   | 250.00      | \$10.00    |             |             | \$0         | \$0           | \$0      | \$0       | \$0       |
| 5.9 Confirmatory Sampling, (nitroglycerin only, 72 hr TA | 0        | ea   | 230.00      | \$10.00    |             |             | \$0         | \$0           | \$0      | \$0       | \$0       |

NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
FIVE SMALL ARMS/SKEET RANGES  
Alternative 2: Excavation and Off-Site Disposal - UXO 14-Marine Rifle Range  
Capital Cost

| Item  | Quantity | Unit | Subcontract | Unit Cost |            |            | Subcontract | Extended Cost |           |           | Subtotal           |
|---|----------|------|-------------|-----------|------------|------------|-------------|---------------|-----------|-----------|--------------------|
|   |          |      |             | Material  | Labor      | Equipment  |             | Material      | Labor     | Equipment |                    |
| <b>6 SITE RESTORATION</b>   |          |      |             |           |            |            |             |               |           |           |                    |
| 6.1 Clean backfill  | 1,212    | cy   |             | \$19.60   | \$0.53     | \$0.34     | \$0         | \$23,755      | \$642     | \$412     | \$24,810           |
| 6.2 Topsoil, Furnish and Place, 6" thickness                                      | 3,635    | sy   |             | \$5.40    | \$0.63     | \$0.41     | \$0         | \$19,629      | \$2,290   | \$1,490   | \$23,409           |
| 6.3 Dozer, Crawler, 105 H. P.   | 2        | week |             |           | \$2,564.00 | \$2,754.00 | \$0         | \$0           | \$5,128   | \$5,508   | \$10,636           |
| 6.4 Fine Grading and seeding, incl. lime, fert, and seed                          | 3,635    | sy   |             | \$0.56    | \$1.78     | \$0.33     | \$0         | \$2,036       | \$6,470   | \$1,200   | \$9,705            |
| <b>7 POST CONSTRUCTION COST</b>   |          |      |             |           |            |            |             |               |           |           |                    |
| 7.1 Contractor Completion Report  | 100      | hr   |             |           | \$39.00    |            | \$0         | \$0           | \$3,900   | \$0       | \$3,900            |
| <b>Subtotal</b>   |          |      |             |           |            |            | \$760,875   | \$60,480      | \$150,278 | \$64,850  | \$1,036,483        |
| <b>Local Area Adjustments</b>   |          |      |             |           |            |            | 100.0%      | 101.6%        | 86.0%     | 96.1%     |                    |
| <b>Subtotal</b>   |          |      |             |           |            |            | \$760,875   | \$61,447      | \$129,239 | \$62,321  | \$1,013,883        |
| Overhead on Labor Cost @ 30%  |          |      |             |           |            |            |             |               | \$38,772  |           | \$38,772           |
| G & A on Labor Cost @ 10%   |          |      |             |           |            |            |             |               | \$12,924  |           | \$12,924           |
| G & A on Material Cost @ 10%  |          |      |             |           |            |            |             | \$6,145       |           |           | \$6,145            |
| G & A on Equipment Cost @ 10%   |          |      |             |           |            |            |             |               |           | \$6,232   | \$6,232            |
| G & A on Subcontract Cost @ 10%   |          |      |             |           |            |            | \$76,088    |               |           |           | \$76,088           |
| Tax on Materials and Equipment Cost @ 6%  |          |      |             |           |            |            |             | \$3,687       |           | \$3,739   | \$7,426            |
| <b>Total Direct Cost</b>  |          |      |             |           |            |            | \$836,963   | \$71,279      | \$180,935 | \$72,292  | \$1,161,469        |
| Indirects on Total Direct Cost @ 25% (excluding transportation and disposal cost) |          |      |             |           |            |            |             |               |           |           | \$106,174          |
| Profit on Total Direct Cost @ 10%   |          |      |             |           |            |            |             |               |           |           | \$116,147          |
| <b>Subtotal</b>   |          |      |             |           |            |            |             |               |           |           | \$1,383,790        |
| Health & Safety Monitoring @ 2% (includes air quality monitoring)                 |          |      |             |           |            |            |             |               |           |           | \$27,676           |
| <b>Total Field Cost</b>   |          |      |             |           |            |            |             |               |           |           | \$1,411,466        |
| Contingency on Total Field Costs @ 20%  |          |      |             |           |            |            |             |               |           |           | \$282,293          |
| Engineering on Total Field Cost @ 6% (excluding transportation and disposal cost) |          |      |             |           |            |            |             |               |           |           | \$40,481           |
| <b>TOTAL CAPITAL COST</b>   |          |      |             |           |            |            |             |               |           |           | <b>\$1,734,240</b> |

NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
FIVE SMALL ARMS/SKEET RANGES  
Alternative 2: Excavation and Off-Site Disposal - UXO 15 - Old Skeet and Trap Range  
Capital Cost

| Item   | Quantity | Unit | Subcontract | Unit Cost   |             |            | Subcontract | Extended Cost |          |           | Subtotal  |
|--|----------|------|-------------|-------------|-------------|------------|-------------|---------------|----------|-----------|-----------|
|  |          |      |             | Material    | Labor       | Equipment  |             | Material      | Labor    | Equipment |           |
| <b>1 PROJECT PLANNING</b>                                  |          |      |             |             |             |            |             |               |          |           |           |
| 1.1 Prepare Documents & Plans                              | 100      | hr   |             |             | \$39.00     |            | \$0         | \$0           | \$3,900  | \$0       | \$3,900   |
| <b>2 INITIAL CHARACTERIZATION</b>                          |          |      |             |             |             |            |             |               |          |           |           |
| 2.1 Sample Collection (2 persons for 1 day)                | 1        | ls   |             | \$300.00    | \$500.00    | \$80.00    | \$0         | \$300         | \$500    | \$80      | \$880     |
| 2.2 Soil Sampling (TCLP Lead)                              | 4        | ea   | 150.00      | \$10.00     |             |            | \$600       | \$40          | \$0      | \$0       | \$640     |
| 2.3 Characterization/Offsite Disposal Soil Testing         | 4        | ea   | 850.00      | \$20.00     |             |            | \$3,400     | \$80          | \$0      | \$0       | \$3,480   |
| <b>3 MOBILIZATION, DEMOBILIZATION AND FIELD SUPPORT</b>    |          |      |             |             |             |            |             |               |          |           |           |
| 3.1 Office Trailer   | 1.5      | mo   |             |             |             | \$400.00   | \$0         | \$0           | \$0      | \$600     | \$600     |
| 3.2 Field Office Support                                   | 1.5      | mo   |             | \$200.00    |             |            | \$0         | \$300         | \$0      | \$0       | \$300     |
| 3.3 Storage Trailer  | 1.5      | mo   |             |             |             | \$103.00   | \$0         | \$0           | \$0      | \$155     | \$155     |
| 3.4 Utility Connection/Disconnection (phone/electric)      | 1        | ls   | 1500.00     |             |             |            | \$1,500     | \$0           | \$0      | \$0       | \$1,500   |
| 3.5 Site Utilities   | 1.5      | mo   | 200.00      |             |             |            | \$300       | \$0           | \$0      | \$0       | \$300     |
| 3.6 Underground Utility Clearances                         | 1        | ls   | 1500.00     |             |             |            | \$1,500     | \$0           | \$0      | \$0       | \$1,500   |
| 3.7 Construction Survey Support                            | 2        | day  | 1150.00     |             |             |            | \$2,300     | \$0           | \$0      | \$0       | \$2,300   |
| 3.8 Equipment Mobilization/Demobilization                  | 5        | ea   |             |             | \$188.00    | \$566.00   | \$0         | \$0           | \$940    | \$2,830   | \$3,770   |
| 3.9 XRF Scientist  | 5        | day  |             | \$200.00    | \$300.00    |            | \$0         | \$1,000       | \$1,500  | \$0       | \$2,500   |
| 3.10 XRF Rental  | 1        | week |             |             |             | \$1,200.00 | \$0         | \$0           | \$0      | \$1,200   | \$1,200   |
| 3.11 Site Superintendent                                   | 1.5      | mo   |             |             | \$8,229.76  |            | \$0         | \$0           | \$12,345 | \$0       | \$12,345  |
| 3.12 Site Health & Safety and QA/QC                        | 1.5      | mo   |             |             | \$6,827.04  |            | \$0         | \$0           | \$10,241 | \$0       | \$10,241  |
| 3.13 Materials Storage Pad, 25' X 25'                      | 1        | ls   |             | \$1,000.00  | \$250.00    | \$200.00   | \$0         | \$1,000       | \$250    | \$200     | \$1,450   |
| 3.14 Decontamination Services                              | 1.5      | mo   |             | \$1,100.00  | \$2,025.00  | \$1,400.00 | \$0         | \$1,650       | \$3,038  | \$2,100   | \$6,788   |
| <b>4 SITE PREPARATION</b>                                  |          |      |             |             |             |            |             |               |          |           |           |
| 4.1 Clear Site, grasses & brush                            | 1        | acre |             |             | \$370.00    | \$345.00   | \$0         | \$0           | \$370    | \$345     | \$715     |
| 4.2 Erosion and Sedimentation Controls                     | 1        | ls   | 2500.00     |             |             |            | \$2,500     | \$0           | \$0      | \$0       | \$2,500   |
| 4.3 Equipment Decon Pad                                    | 1        | ls   |             | \$2,500.00  | \$1,500.00  | \$225.00   | \$0         | \$2,500       | \$1,500  | \$225     | \$4,225   |
| <b>5 EXCAVATION AND DISPOSAL</b>                           |          |      |             |             |             |            |             |               |          |           |           |
| 5.1 Excavator, 3/4cy Capacity                              | 1.5      | mo   |             | \$14,590.40 | \$11,569.68 |            | \$0         | \$0           | \$21,886 | \$17,355  | \$39,240  |
| 5.2 Site Labor, (1 laborer)                                | 1.5      | mo   |             | \$6,160.00  |             |            | \$0         | \$0           | \$9,240  | \$0       | \$9,240   |
| 5.3 Front End Loader, 3 cy (145HP)                         | 1.5      | mo   |             | \$11,102.12 | \$8,546.66  |            | \$0         | \$0           | \$16,653 | \$12,820  | \$29,473  |
| 5.4 UXO Technician   | 1.5      | mo   |             | \$6,827.04  |             |            | \$0         | \$0           | \$10,241 | \$0       | \$10,241  |
| 5.5 Off Site Disposal, Hazardous for Lead                  | 625      | ton  | 325.00      |             |             |            | \$203,125   | \$0           | \$0      | \$0       | \$203,125 |
| 5.6 Off Site Disposal, Non-Hazardous Soil                  | 3,944    | ton  | 65.00       |             |             |            | \$256,360   | \$0           | \$0      | \$0       | \$256,360 |
| 5.7 Confirmatory Sampling, (lead only, 72 hr TAT)          | 15       | ea   | 46.00       | \$10.00     |             |            | \$690       | \$150         | \$0      | \$0       | \$840     |
| 5.8 Confirmatory Sampling, (PAHs only, 72 hr TAT)          | 20       | ea   | 250.00      | \$10.00     |             |            | \$5,000     | \$200         | \$0      | \$0       | \$5,200   |
| 5.9 Confirmatory Sampling, (nitroglycerin only, 72 hr TAT) | 0        | ea   | 230.00      | \$10.00     |             |            | \$0         | \$0           | \$0      | \$0       | \$0       |

NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
FIVE SMALL ARMS/SKEET RANGES  
Alternative 2: Excavation and Off-Site Disposal - UXO 15 - Old Skeet and Trap Range  
Capital Cost

| Item  | Quantity | Unit | Subcontract | Unit Cost |            |            | Subcontract | Extended Cost |           |           | Subtotal           |
|---|----------|------|-------------|-----------|------------|------------|-------------|---------------|-----------|-----------|--------------------|
|   |          |      |             | Material  | Labor      | Equipment  |             | Material      | Labor     | Equipment |                    |
| <b>6 SITE RESTORATION</b>   |          |      |             |           |            |            |             |               |           |           |                    |
| 6.1 Clean backfill  | 2,176    | cy   |             | \$19.60   | \$0.53     | \$0.34     | \$0         | \$42,650      | \$1,153   | \$740     | \$44,543           |
| 6.2 Topsoil, Furnish and Place, 6" thickness                                      | 5,404    | sy   |             | \$5.40    | \$0.63     | \$0.41     | \$0         | \$29,182      | \$3,405   | \$2,216   | \$34,802           |
| 6.3 Dozer, Crawler, 105 H. P.   | 1        | week |             |           | \$2,564.00 | \$2,754.00 | \$0         | \$0           | \$2,564   | \$2,754   | \$5,318            |
| 6.4 Fine Grading and seeding, incl. lime, fert, and seed                          | 5,404    | sy   |             | \$0.56    | \$1.78     | \$0.33     | \$0         | \$3,026       | \$9,619   | \$1,783   | \$14,429           |
| <b>7 POST CONSTRUCTION COST</b>   |          |      |             |           |            |            |             |               |           |           |                    |
| 7.1 Contractor Completion Report  | 60       | hr   |             |           | \$39.00    |            | \$0         | \$0           | \$2,340   | \$0       | \$2,340            |
| <b>Subtotal</b>   |          |      |             |           |            |            | \$477,275   | \$82,077      | \$111,683 | \$45,402  | \$716,437          |
| <b>Local Area Adjustments</b>   |          |      |             |           |            |            | 100.0%      | 101.6%        | 86.0%     | 96.1%     |                    |
| <b>Subtotal</b>   |          |      |             |           |            |            | \$477,275   | \$83,391      | \$96,047  | \$43,631  | \$700,344          |
| Overhead on Labor Cost @ 30%  |          |      |             |           |            |            |             |               | \$28,814  |           | \$28,814           |
| G & A on Labor Cost @ 10%   |          |      |             |           |            |            |             |               | \$9,605   |           | \$9,605            |
| G & A on Material Cost @ 10%  |          |      |             |           |            |            |             | \$8,339       |           |           | \$8,339            |
| G & A on Equipment Cost @ 10%   |          |      |             |           |            |            |             |               |           | \$4,363   | \$4,363            |
| G & A on Subcontract Cost @ 10%   |          |      |             |           |            |            | \$47,728    |               |           |           | \$47,728           |
| Tax on Materials and Equipment Cost @ 6%  |          |      |             |           |            |            |             | \$5,003       |           | \$2,618   | \$7,621            |
| <b>Total Direct Cost</b>  |          |      |             |           |            |            | \$525,003   | \$96,733      | \$134,466 | \$50,612  | \$806,814          |
| Indirects on Total Direct Cost @ 25% (excluding transportation and disposal cost) |          |      |             |           |            |            |             |               |           |           | \$86,832           |
| Profit on Total Direct Cost @ 10%   |          |      |             |           |            |            |             |               |           |           | \$80,681           |
| <b>Subtotal</b>   |          |      |             |           |            |            |             |               |           |           | \$974,328          |
| Health & Safety Monitoring @ 2% (includes air quality monitoring)                 |          |      |             |           |            |            |             |               |           |           | \$19,487           |
| <b>Total Field Cost</b>   |          |      |             |           |            |            |             |               |           |           | \$993,814          |
| Contingency on Total Field Costs @ 20%  |          |      |             |           |            |            |             |               |           |           | \$198,763          |
| Engineering on Total Field Cost @ 6% (excluding transportation and disposal cost) |          |      |             |           |            |            |             |               |           |           | \$32,060           |
| <b>TOTAL CAPITAL COST</b>   |          |      |             |           |            |            |             |               |           |           | <b>\$1,224,637</b> |

NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
FIVE SMALL ARMS/SKEET RANGES  
Alternative 2: Excavation and Off-Site Disposal - UXO 16-Rum Point Skeet Range  
Capital Cost

| Item  | Quantity | Unit | Subcontract | Unit Cost  |             |             | Subcontract | Extended Cost |          |           | Subtotal  |
|---|----------|------|-------------|------------|-------------|-------------|-------------|---------------|----------|-----------|-----------|
|   |          |      |             | Material   | Labor       | Equipment   |             | Material      | Labor    | Equipment |           |
| <b>1 PROJECT PLANNING</b>                               |          |      |             |            |             |             |             |               |          |           |           |
| 1.1 Prepare Documents & Plans                           | 80       | hr   |             |            | \$39.00     |             | \$0         | \$0           | \$3,120  | \$0       | \$3,120   |
| <b>2 INITIAL CHARACTERIZATION</b>                       |          |      |             |            |             |             |             |               |          |           |           |
| 2.1 Sample Collection (2 persons for 1 day)             | 1        | ls   |             | \$50.00    | \$500.00    | \$80.00     | \$0         | \$50          | \$500    | \$80      | \$630     |
| 2.2 Characterization/Offsite Disposal Soil Testing      | 1        | ea   | 850.00      | \$20.00    |             |             | \$850       | \$20          | \$0      | \$0       | \$870     |
| <b>3 MOBILIZATION, DEMOBILIZATION AND FIELD SUPPORT</b> |          |      |             |            |             |             |             |               |          |           |           |
| 3.1 Office Trailer                                      | 1        | mo   |             |            |             | \$400.00    | \$0         | \$0           | \$0      | \$400     | \$400     |
| 3.2 Field Office Support                                | 1        | mo   |             | \$200.00   |             |             | \$0         | \$200         | \$0      | \$0       | \$200     |
| 3.3 Storage Trailer                                     | 1        | mo   |             |            |             | \$103.00    | \$0         | \$0           | \$0      | \$103     | \$103     |
| 3.4 Utility Connection/Disconnection (phone/electric)   | 1        | ls   | 1500.00     |            |             |             | \$1,500     | \$0           | \$0      | \$0       | \$1,500   |
| 3.5 Site Utilities                                      | 1        | mo   | 200.00      |            |             |             | \$200       | \$0           | \$0      | \$0       | \$200     |
| 3.6 Underground Utility Clearances                      | 1        | ls   | 1500.00     |            |             |             | \$1,500     | \$0           | \$0      | \$0       | \$1,500   |
| 3.7 Construction Survey Support                         | 2        | day  | 1150.00     |            |             |             | \$2,300     | \$0           | \$0      | \$0       | \$2,300   |
| 3.8 Equipment Mobilization/Demobilization               | 5        | ea   |             |            | \$188.00    | \$566.00    | \$0         | \$0           | \$940    | \$2,830   | \$3,770   |
| 3.9 Site Superintendent                                 | 1        | mo   |             |            | \$8,229.76  |             | \$0         | \$0           | \$8,230  | \$0       | \$8,230   |
| 3.10 Site Health & Safety and QA/QC                     | 1        | mo   |             |            | \$6,827.04  |             | \$0         | \$0           | \$6,827  | \$0       | \$6,827   |
| 3.11 Materials Storage Pad, 25' X 25'                   | 1        | ls   |             | \$1,000.00 | \$250.00    | \$200.00    | \$0         | \$1,000       | \$250    | \$200     | \$1,450   |
| 3.12 Decontamination Services                           | 1        | mo   |             | \$1,100.00 | \$2,025.00  | \$1,400.00  | \$0         | \$1,100       | \$2,025  | \$1,400   | \$4,525   |
| <b>4 SITE PREPARATION</b>                               |          |      |             |            |             |             |             |               |          |           |           |
| 4.1 Clear Site, grasses & brush                         | 1        | acre |             |            | \$370.00    | \$345.00    | \$0         | \$0           | \$370    | \$345     | \$715     |
| 4.2 Erosion and Sedimentation Controls                  | 1        | ls   | 2500.00     |            |             |             | \$2,500     | \$0           | \$0      | \$0       | \$2,500   |
| 4.3 Equipment Decon Pad                                 | 1        | ls   |             | \$2,500.00 | \$1,500.00  | \$225.00    | \$0         | \$2,500       | \$1,500  | \$225     | \$4,225   |
| <b>5 EXCAVATION AND DISPOSAL</b>                        |          |      |             |            |             |             |             |               |          |           |           |
| 5.1 Excavator, 3/4cy Capacity                           | 1        | mo   |             |            | \$14,590.40 | \$11,569.68 | \$0         | \$0           | \$14,590 | \$11,570  | \$26,160  |
| 5.2 Site Labor, (1 laborer)                             | 1        | mo   |             |            | \$6,160.00  |             | \$0         | \$0           | \$6,160  | \$0       | \$6,160   |
| 5.3 Front End Loader, 3 cy (145HP)                      | 1        | mo   |             |            | \$11,102.12 | \$8,546.66  | \$0         | \$0           | \$11,102 | \$8,547   | \$19,649  |
| 5.4 Off Site Disposal, Hazardous for Lead               | 0        | ton  | 325.00      |            |             |             | \$0         | \$0           | \$0      | \$0       | \$0       |
| 5.5 Off Site Disposal, Non-Hazardous Soil               | 4,885    | ton  | 65.00       |            |             |             | \$317,525   | \$0           | \$0      | \$0       | \$317,525 |
| 5.6 Confirmatory Sampling, (lead only, 72 hr TAT)       | 0        | ea   | 46.00       | \$10.00    |             |             | \$0         | \$0           | \$0      | \$0       | \$0       |
| 5.7 Confirmatory Sampling, (PAHs only, 72 hr TAT)       | 15       | ea   | 250.00      | \$10.00    |             |             | \$3,750     | \$150         | \$0      | \$0       | \$3,900   |

NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
FIVE SMALL ARMS/SKEET RANGES  
Alternative 2: Excavation and Off-Site Disposal - UXO 16-Rum Point Skeet Range  
Capital Cost

| Item  | Quantity | Unit | Subcontract | Unit Cost |            |            | Subcontract | Extended Cost |          |           | Subtotal         |
|---|----------|------|-------------|-----------|------------|------------|-------------|---------------|----------|-----------|------------------|
|   |          |      |             | Material  | Labor      | Equipment  |             | Material      | Labor    | Equipment |                  |
| <b>6 SITE RESTORATION</b>   |          |      |             |           |            |            |             |               |          |           |                  |
| 6.1 Clean backfill  | 2,193    | cy   |             | \$19.60   | \$0.53     | \$0.34     | \$0         | \$42,983      | \$1,162  | \$746     | \$44,891         |
| 6.2 Topsoil, Furnish and Place, 6" thickness                                      | 6,580    | sy   |             | \$5.40    | \$0.63     | \$0.41     | \$0         | \$35,532      | \$4,145  | \$2,698   | \$42,375         |
| 6.3 Dozer, Crawler, 105 H. P.   | 1        | week |             |           | \$2,564.00 | \$2,754.00 | \$0         | \$0           | \$2,564  | \$2,754   | \$5,318          |
| 6.4 Fine Grading and seeding, incl. lime, fert, and seed                          | 6,580    | sy   |             | \$0.56    | \$1.78     | \$0.33     | \$0         | \$3,685       | \$11,712 | \$2,171   | \$17,569         |
| <b>7 POST CONSTRUCTION COST</b>   |          |      |             |           |            |            |             |               |          |           |                  |
| 7.1 Contractor Completion Report  | 40       | hr   |             |           | \$39.00    |            | \$0         | \$0           | \$1,560  | \$0       | \$1,560          |
| <b>Subtotal</b>   |          |      |             |           |            |            | \$330,125   | \$87,220      | \$76,758 | \$34,068  | \$528,171        |
| <b>Local Area Adjustments</b>   |          |      |             |           |            |            | 100.0%      | 101.6%        | 86.0%    | 96.1%     |                  |
| <b>Subtotal</b>   |          |      |             |           |            |            | \$330,125   | \$88,615      | \$66,012 | \$32,740  | \$517,492        |
| Overhead on Labor Cost @ 30%  |          |      |             |           |            |            |             |               | \$19,804 |           | \$19,804         |
| G & A on Labor Cost @ 10%   |          |      |             |           |            |            |             |               | \$6,601  |           | \$6,601          |
| G & A on Material Cost @ 10%  |          |      |             |           |            |            |             | \$8,862       |          |           | \$8,862          |
| G & A on Equipment Cost @ 10%   |          |      |             |           |            |            |             |               |          | \$3,274   | \$3,274          |
| G & A on Subcontract Cost @ 10%   |          |      |             |           |            |            | \$33,013    |               |          |           | \$33,013         |
| Tax on Materials and Equipment Cost @ 6%  |          |      |             |           |            |            |             | \$5,317       |          | \$1,964   | \$7,281          |
| <b>Total Direct Cost</b>  |          |      |             |           |            |            | \$363,138   | \$102,794     | \$92,417 | \$37,978  | \$596,326        |
| Indirects on Total Direct Cost @ 25% (excluding transportation and disposal cost) |          |      |             |           |            |            |             |               |          |           | \$69,700         |
| Profit on Total Direct Cost @ 10%   |          |      |             |           |            |            |             |               |          |           | \$59,633         |
| <b>Subtotal</b>   |          |      |             |           |            |            |             |               |          |           | \$725,659        |
| Health & Safety Monitoring @ 2% (includes air quality monitoring)                 |          |      |             |           |            |            |             |               |          |           | \$14,513         |
| <b>Total Field Cost</b>   |          |      |             |           |            |            |             |               |          |           | \$740,172        |
| Contingency on Total Field Costs @ 20%  |          |      |             |           |            |            |             |               |          |           | \$148,034        |
| Engineering on Total Field Cost @ 6% (excluding transportation and disposal cost) |          |      |             |           |            |            |             |               |          |           | \$25,359         |
| <b>TOTAL CAPITAL COST</b>   |          |      |             |           |            |            |             |               |          |           | <b>\$913,565</b> |

NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
FIVE SMALL ARMS/SKEET RANGES  
Alternative 2: Excavation and Off-Site Disposal - UXO 17 - Small Arms (Pistol) Range  
Capital Cost

| Item   | Quantity | Unit | Subcontract | Unit Cost  |            |            | Subcontract | Extended Cost |         |           | Subtotal |
|--|----------|------|-------------|------------|------------|------------|-------------|---------------|---------|-----------|----------|
|  |          |      |             | Material   | Labor      | Equipment  |             | Material      | Labor   | Equipment |          |
| <b>1 PROJECT PLANNING</b>                                |          |      |             |            |            |            |             |               |         |           |          |
| 1.1 Prepare Documents & Plans                            | 60       | hr   |             |            | \$39.00    |            | \$0         | \$0           | \$2,340 | \$0       | \$2,340  |
| <b>2 INITIAL CHARACTERIZATION</b>                        |          |      |             |            |            |            |             |               |         |           |          |
| 2.1 Sample Collection (2 persons for 1 day)              | 1        | ls   |             | \$150.00   | \$500.00   | \$80.00    | \$0         | \$150         | \$500   | \$80      | \$730    |
| 2.2 Soil Sampling (TCLP Lead)                            | 3        | ea   | 150.00      | \$10.00    |            |            | \$450       | \$30          | \$0     | \$0       | \$480    |
| 2.3 Characterization/Offsite Disposal Soil Testing       | 2        | ea   | 850.00      | \$20.00    |            |            | \$1,700     | \$40          | \$0     | \$0       | \$1,740  |
| <b>3 MOBILIZATION, DEMOBILIZATION AND FIELD SUPPORT</b>  |          |      |             |            |            |            |             |               |         |           |          |
| 3.1 Office Trailer                                       | 1        | mo   |             |            |            | \$400.00   | \$0         | \$0           | \$0     | \$400     | \$400    |
| 3.2 Field Office Support                                 | 1        | mo   |             | \$200.00   |            |            | \$0         | \$200         | \$0     | \$0       | \$200    |
| 3.3 Storage Trailer                                      | 1        | mo   |             |            |            | \$103.00   | \$0         | \$0           | \$0     | \$103     | \$103    |
| 3.4 Utility Connection/Disconnection (phone/electric)    | 1        | ls   | 1500.00     |            |            |            | \$1,500     | \$0           | \$0     | \$0       | \$1,500  |
| 3.5 Site Utilities                                       | 1        | mo   | 200.00      |            |            |            | \$200       | \$0           | \$0     | \$0       | \$200    |
| 3.6 Underground Utility Clearances                       | 1        | ls   | 1500.00     |            |            |            | \$1,500     | \$0           | \$0     | \$0       | \$1,500  |
| 3.7 Construction Survey Support                          | 2        | day  | 1150.00     |            |            |            | \$2,300     | \$0           | \$0     | \$0       | \$2,300  |
| 3.8 Equipment Mobilization/Demobilization                | 5        | ea   |             |            | \$188.00   | \$566.00   | \$0         | \$0           | \$940   | \$2,830   | \$3,770  |
| 3.9 XRF Scientist  | 5        | day  |             | \$200.00   | \$300.00   |            | \$0         | \$1,000       | \$1,500 | \$0       | \$2,500  |
| 3.10 XRF Rental  | 1        | week |             |            |            | \$1,200.00 | \$0         | \$0           | \$0     | \$1,200   | \$1,200  |
| 3.11 Site Superintendent                                 | 3        | week |             |            | \$1,870.40 |            | \$0         | \$0           | \$5,611 | \$0       | \$5,611  |
| 3.12 Site Health & Safety and QA/QC                      | 3        | week |             |            | \$1,551.60 |            | \$0         | \$0           | \$4,655 | \$0       | \$4,655  |
| 3.13 Materials Storage Pad, 25' X 25'                    | 1        | ls   |             | \$1,000.00 | \$250.00   | \$200.00   | \$0         | \$1,000       | \$250   | \$200     | \$1,450  |
| 3.14 Decontamination Services                            | 3        | week |             | \$275.00   | \$506.25   | \$350.00   | \$0         | \$825         | \$1,519 | \$1,050   | \$3,394  |
| <b>4 SITE PREPARATION</b>                                |          |      |             |            |            |            |             |               |         |           |          |
| 4.1 Clear Site, cut & chip trees                         | 0.2      | acre |             |            | \$3,600.00 | \$2,950.00 | \$0         | \$0           | \$720   | \$590     | \$1,310  |
| 4.2 Clear Site, grasses & brush                          | 0.3      | acre |             |            | \$370.00   | \$345.00   | \$0         | \$0           | \$111   | \$104     | \$215    |
| 4.3 Erosion and Sedimentation Controls                   | 1        | ls   | 1000.00     |            |            |            | \$1,000     | \$0           | \$0     | \$0       | \$1,000  |
| 4.4 Equipment Decon Pad                                  | 1        | ls   |             | \$1,500.00 | \$1,000.00 | \$200.00   | \$0         | \$1,500       | \$1,000 | \$200     | \$2,700  |
| <b>5 EXCAVATION AND DISPOSAL</b>                         |          |      |             |            |            |            |             |               |         |           |          |
| 5.1 Excavator, 3/4cy Capacity                            | 3        | week |             |            | \$3,316.00 | \$3,236.00 | \$0         | \$0           | \$9,948 | \$9,708   | \$19,656 |
| 5.2 Site Labor, (1 laborer)                              | 3        | week |             |            | \$1,400.00 |            | \$0         | \$0           | \$4,200 | \$0       | \$4,200  |
| 5.3 Front End Loader, 3 cy (145HP)                       | 3        | week |             |            | \$2,564.00 | \$2,362.00 | \$0         | \$0           | \$7,692 | \$7,086   | \$14,778 |
| 5.4 Off Site Disposal, Hazardous for Lead                | 212      | ton  | 325.00      |            |            |            | \$68,900    | \$0           | \$0     | \$0       | \$68,900 |
| 5.5 Off Site Disposal, Non-Hazardous Soil                | 651      | ton  | 65.00       |            |            |            | \$42,315    | \$0           | \$0     | \$0       | \$42,315 |
| 5.6 Confirmatory Sampling, (lead only, 72 hr TAT)        | 10       | ea   | 46.00       | \$10.00    |            |            | \$460       | \$100         | \$0     | \$0       | \$560    |
| 5.7 Confirmatory Sampling, (PAHs only, 72 hr TAT)        | 0        | ea   | 250.00      | \$10.00    |            |            | \$0         | \$0           | \$0     | \$0       | \$0      |
| 5.8 Confirmatory Sampling, (nitroglycerin only, 72 hr TA | 10       | ea   | 230.00      | \$10.00    |            |            | \$2,300     | \$100         | \$0     | \$0       | \$2,400  |

NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
FIVE SMALL ARMS/SKEET RANGES  
Alternative 2: Excavation and Off-Site Disposal - UXO 17 - Small Arms (Pistol) Range  
Capital Cost

| Item  | Quantity | Unit | Subcontract | Unit Cost |          |           | Subcontract | Extended Cost |          |           | Subtotal         |
|---|----------|------|-------------|-----------|----------|-----------|-------------|---------------|----------|-----------|------------------|
|   |          |      |             | Material  | Labor    | Equipment |             | Material      | Labor    | Equipment |                  |
| <b>6 SITE RESTORATION</b>   |          |      |             |           |          |           |             |               |          |           |                  |
| 6.1 Clean backfill  | 338      | cy   |             | \$19.60   | \$0.53   | \$0.34    | \$0         | \$6,625       | \$179    | \$115     | \$6,919          |
| 6.2 Topsoil, Furnish and Place, 6" thickness                                      | 1,460    | sy   |             | \$5.40    | \$0.63   | \$0.41    | \$0         | \$7,884       | \$920    | \$599     | \$9,402          |
| 6.3 Dozer, Crawler, 105 H. P.   | 3        | day  |             |           | \$512.80 | \$751.80  | \$0         | \$0           | \$1,538  | \$2,255   | \$3,794          |
| 6.4 Fine Grading and seeding, incl. lime, fert, and seed                          | 1,460    | sy   |             | \$0.56    | \$1.78   | \$0.33    | \$0         | \$818         | \$2,599  | \$482     | \$3,898          |
| <b>7 POST CONSTRUCTION COST</b>   |          |      |             |           |          |           |             |               |          |           |                  |
| 7.1 Contractor Completion Report  | 40       | hr   |             |           | \$39.00  |           | \$0         | \$0           | \$1,560  | \$0       | \$1,560          |
| <b>Subtotal</b>   |          |      |             |           |          |           | \$122,625   | \$20,271      | \$47,782 | \$27,001  | \$217,680        |
| <b>Local Area Adjustments</b>   |          |      |             |           |          |           | 100.0%      | 101.6%        | 86.0%    | 96.1%     |                  |
| <b>Subtotal</b>   |          |      |             |           |          |           | \$122,625   | \$20,596      | \$41,092 | \$25,948  | \$210,261        |
| Overhead on Labor Cost @ 30%  |          |      |             |           |          |           |             |               | \$12,328 |           | \$12,328         |
| G & A on Labor Cost @ 10%   |          |      |             |           |          |           |             |               | \$4,109  |           | \$4,109          |
| G & A on Material Cost @ 10%  |          |      |             |           |          |           |             | \$2,060       |          |           | \$2,060          |
| G & A on Equipment Cost @ 10%   |          |      |             |           |          |           |             |               |          | \$2,595   | \$2,595          |
| G & A on Subcontract Cost @ 10%   |          |      |             |           |          |           | \$12,263    |               |          |           | \$12,263         |
| Tax on Materials and Equipment Cost @ 6%  |          |      |             |           |          |           |             | \$1,236       |          | \$1,557   | \$2,793          |
| <b>Total Direct Cost</b>  |          |      |             |           |          |           | \$134,888   | \$23,891      | \$57,529 | \$30,100  | \$246,408        |
| Indirects on Total Direct Cost @ 25% (excluding transportation and disposal cost) |          |      |             |           |          |           |             |               |          |           | \$33,798         |
| Profit on Total Direct Cost @ 10%   |          |      |             |           |          |           |             |               |          |           | \$24,641         |
| <b>Subtotal</b>   |          |      |             |           |          |           |             |               |          |           | \$304,847        |
| Health & Safety Monitoring @ 2% (includes air quality monitoring)                 |          |      |             |           |          |           |             |               |          |           | \$6,097          |
| <b>Total Field Cost</b>   |          |      |             |           |          |           |             |               |          |           | \$310,944        |
| Contingency on Total Field Costs @ 20%  |          |      |             |           |          |           |             |               |          |           | \$62,189         |
| Engineering on Total Field Cost @ 6% (excluding transportation and disposal cost) |          |      |             |           |          |           |             |               |          |           | \$11,984         |
| <b>TOTAL CAPITAL COST</b>   |          |      |             |           |          |           |             |               |          |           | <b>\$385,116</b> |

NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
FIVE SMALL ARMS/SKEET RANGES  
Alternative 2: Excavation and Off-Site Disposal - UXO 25 - Roach Road Rifle Range  
Capital Cost

| Item  | Quantity | Unit | Subcontract | Unit Cost  |            |            | Subcontract | Extended Cost |         |           | Subtotal |
|---|----------|------|-------------|------------|------------|------------|-------------|---------------|---------|-----------|----------|
|   |          |      |             | Material   | Labor      | Equipment  |             | Material      | Labor   | Equipment |          |
| <b>1 PROJECT PLANNING</b>                               |          |      |             |            |            |            |             |               |         |           |          |
| 1.1 Prepare Documents & Plans                           | 60       | hr   |             |            | \$39.00    |            | \$0         | \$0           | \$2,340 | \$0       | \$2,340  |
| <b>2 INITIAL CHARACTERIZATION</b>                       |          |      |             |            |            |            |             |               |         |           |          |
| 2.1 Sample Collection (2 persons for 1 day)             | 1        | ls   |             | \$300.00   | \$600.00   | \$100.00   | \$0         | \$300         | \$600   | \$100     | \$1,000  |
| 2.2 Soil Sampling (TCLP Lead)                           | 1        | ea   | 150.00      | \$10.00    |            |            | \$150       | \$10          | \$0     | \$0       | \$160    |
| 2.3 Characterization/Offsite Disposal Soil Testing      | 1        | ea   | 850.00      | \$20.00    |            |            | \$850       | \$20          | \$0     | \$0       | \$870    |
| <b>3 MOBILIZATION, DEMOBILIZATION AND FIELD SUPPORT</b> |          |      |             |            |            |            |             |               |         |           |          |
| 3.1 Office Trailer                                      | 0.5      | mo   |             |            |            | \$400.00   | \$0         | \$0           | \$0     | \$200     | \$200    |
| 3.2 Field Office Support                                | 0.5      | mo   |             | \$200.00   |            |            | \$0         | \$100         | \$0     | \$0       | \$100    |
| 3.3 Storage Trailer                                     | 0.5      | mo   |             |            |            | \$103.00   | \$0         | \$0           | \$0     | \$52      | \$52     |
| 3.4 Utility Connection/Disconnection (phone/electric)   | 1        | ls   | 1500.00     |            |            |            | \$1,500     | \$0           | \$0     | \$0       | \$1,500  |
| 3.5 Site Utilities                                      | 0.5      | mo   | 200.00      |            |            |            | \$100       | \$0           | \$0     | \$0       | \$100    |
| 3.6 Underground Utility Clearances                      | 1        | ls   | 1500.00     |            |            |            | \$1,500     | \$0           | \$0     | \$0       | \$1,500  |
| 3.7 Construction Survey Support                         | 2        | day  | 1150.00     |            |            |            | \$2,300     | \$0           | \$0     | \$0       | \$2,300  |
| 3.8 Equipment Mobilization/Demobilization               | 5        | ea   |             |            | \$188.00   | \$566.00   | \$0         | \$0           | \$940   | \$2,830   | \$3,770  |
| 3.9 XRF Scientist                                       | 3        | day  |             | \$200.00   | \$300.00   |            | \$0         | \$600         | \$900   | \$0       | \$1,500  |
| 3.10 XRF Rental   | 1        | week |             |            |            | \$1,200.00 | \$0         | \$0           | \$0     | \$1,200   | \$1,200  |
| 3.11 Site Superintendent                                | 1        | week |             |            | \$1,870.40 |            | \$0         | \$0           | \$1,870 | \$0       | \$1,870  |
| 3.12 Site Health & Safety and QA/QC                     | 1        | week |             |            | \$1,551.60 |            | \$0         | \$0           | \$1,552 | \$0       | \$1,552  |
| 3.13 Materials Storage Pad, 25' X 25'                   | 1        | ls   |             | \$1,000.00 | \$250.00   | \$200.00   | \$0         | \$1,000       | \$250   | \$200     | \$1,450  |
| 3.14 Decontamination Services                           | 1        | week |             | \$275.00   | \$506.25   | \$350.00   | \$0         | \$275         | \$506   | \$350     | \$1,131  |
| <b>4 SITE PREPARATION</b>                               |          |      |             |            |            |            |             |               |         |           |          |
| 4.1 Temporary Access Roads, 4" gravel, geotextile       | 1        | ls   |             | 2000.00    |            |            | \$0         | \$2,000       | \$0     | \$0       | \$2,000  |
| 4.2 Clear Site, cut & chip trees to 4" diam.            | 0.3      | acre |             |            | \$3,600.00 | \$2,950.00 | \$0         | \$0           | \$1,080 | \$885     | \$1,965  |
| 4.3 Clear Site, grasses & brush                         | 0.2      | acre |             |            | \$370.00   | \$345.00   | \$0         | \$0           | \$74    | \$69      | \$143    |
| 4.4 Erosion and Sedimentation Controls                  | 1        | ls   | 1000.00     |            |            |            | \$1,000     | \$0           | \$0     | \$0       | \$1,000  |
| 4.5 Equipment Decon Pad                                 | 1        | ls   |             | \$1,500.00 | \$1,000.00 | \$200.00   | \$0         | \$1,500       | \$1,000 | \$200     | \$2,700  |
| <b>5 EXCAVATION AND DISPOSAL</b>                        |          |      |             |            |            |            |             |               |         |           |          |
| 5.1 Excavator, 3/4cy Capacity                           | 1        | week |             |            | \$3,316.00 | \$3,236.00 | \$0         | \$0           | \$3,316 | \$3,236   | \$6,552  |
| 5.2 Site Labor, (1 laborer)                             | 1        | week |             |            | \$1,400.00 |            | \$0         | \$0           | \$1,400 | \$0       | \$1,400  |
| 5.3 Crawler Loader 1 to 1-1/2 cy (80HP)                 | 1        | week |             |            | \$2,564.00 | \$2,443.00 | \$0         | \$0           | \$2,564 | \$2,443   | \$5,007  |
| 5.4 Off Site Disposal, Hazardous for Lead               | 52       | ton  | 325.00      |            |            |            | \$16,900    | \$0           | \$0     | \$0       | \$16,900 |
| 5.5 Off Site Disposal, Non-Hazardous Soil               | 13       | ton  | 65.00       |            |            |            | \$845       | \$0           | \$0     | \$0       | \$845    |
| 5.6 Confirmatory Sampling, (lead only, 72 hr TAT)       | 5        | ea   | 46.00       | \$10.00    |            |            | \$230       | \$50          | \$0     | \$0       | \$280    |
| 5.7 Confirmatory Sampling, (PAHs only, 72 hr TAT)       | 0        | ea   | 250.00      | \$10.00    |            |            | \$0         | \$0           | \$0     | \$0       | \$0      |

NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
FIVE SMALL ARMS/SKEET RANGES  
Alternative 2: Excavation and Off-Site Disposal - UXO 25 - Roach Road Rifle Range  
Capital Cost

| Item  | Quantity | Unit | Subcontract | Unit Cost |            |            | Subcontract | Extended Cost |          |           | Subtotal         |
|---|----------|------|-------------|-----------|------------|------------|-------------|---------------|----------|-----------|------------------|
|   |          |      |             | Material  | Labor      | Equipment  |             | Material      | Labor    | Equipment |                  |
| <b>6 SITE RESTORATION</b>   |          |      |             |           |            |            |             |               |          |           |                  |
| 6.1 Clean backfill  | 30       | cy   |             | \$19.60   | \$0.53     | \$0.34     | \$0         | \$588         | \$16     | \$10      | \$614            |
| 6.2 Topsoil, Furnish and Place, 6" thickness                                      | 88       | sy   |             | \$5.40    | \$0.63     | \$0.41     | \$0         | \$475         | \$55     | \$36      | \$567            |
| 6.3 Dozer, Crawler 105 H. P.  | 1        | week |             |           | \$2,564.00 | \$2,754.00 | \$0         | \$0           | \$2,564  | \$2,754   | \$5,318          |
| 6.4 Fine Grading and seeding, incl. lime, fert, and seed                          | 88       | sy   |             | \$0.56    | \$1.78     | \$0.33     | \$0         | \$49          | \$157    | \$29      | \$235            |
| <b>7 POST CONSTRUCTION COST</b>   |          |      |             |           |            |            |             |               |          |           |                  |
| 7.1 Contractor Completion Report  | 40       | hr   |             |           | \$39.00    |            | \$0         | \$0           | \$1,560  | \$0       | \$1,560          |
| <b>Subtotal</b>   |          |      |             |           |            |            | \$25,375    | \$6,967       | \$22,744 | \$14,594  | \$69,681         |
| <b>Local Area Adjustments</b>   |          |      |             |           |            |            | 100.0%      | 101.6%        | 86.0%    | 96.1%     |                  |
| <b>Subtotal</b>   |          |      |             |           |            |            | \$25,375    | \$7,079       | \$19,560 | \$14,025  | \$66,039         |
| Overhead on Labor Cost @ 30%  |          |      |             |           |            |            |             |               | \$5,868  |           | \$5,868          |
| G & A on Labor Cost @ 10%   |          |      |             |           |            |            |             |               | \$1,956  |           | \$1,956          |
| G & A on Material Cost @ 10%  |          |      |             |           |            |            |             | \$708         |          |           | \$708            |
| G & A on Equipment Cost @ 10%   |          |      |             |           |            |            |             |               |          | \$1,402   | \$1,402          |
| G & A on Subcontract Cost @ 10%   |          |      |             |           |            |            | \$2,538     |               |          |           | \$2,538          |
| Tax on Materials and Equipment Cost @ 6%  |          |      |             |           |            |            |             | \$425         |          | \$841     | \$1,266          |
| <b>Total Direct Cost</b>  |          |      |             |           |            |            | \$27,913    | \$8,212       | \$27,384 | \$16,269  | \$79,777         |
| Indirects on Total Direct Cost @ 25% (excluding transportation and disposal cost) |          |      |             |           |            |            |             |               |          |           | \$15,508         |
| Profit on Total Direct Cost @ 10%   |          |      |             |           |            |            |             |               |          |           | \$7,978          |
| <b>Subtotal</b>   |          |      |             |           |            |            |             |               |          |           | \$103,262        |
| Health & Safety Monitoring @ 2% (includes air quality monitoring)                 |          |      |             |           |            |            |             |               |          |           | \$2,065          |
| <b>Total Field Cost</b>   |          |      |             |           |            |            |             |               |          |           | \$105,328        |
| Contingency on Total Field Costs @ 20%  |          |      |             |           |            |            |             |               |          |           | \$21,066         |
| Engineering on Total Field Cost @ 6% (excluding transportation and disposal cost) |          |      |             |           |            |            |             |               |          |           | \$5,255          |
| <b>TOTAL CAPITAL COST</b>   |          |      |             |           |            |            |             |               |          |           | <b>\$131,648</b> |

NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
FIVE SMALL ARMS/SKEET RANGES  
Alternative 3: Treatment, Excavation, and Off-Site Disposal  
Capital Cost

| Item   | Quantity | Unit | Unit Cost   |            |             | Extended Cost |             |          | Subtotal |          |           |
|--|----------|------|-------------|------------|-------------|---------------|-------------|----------|----------|----------|-----------|
|  |          |      | Subcontract | Material   | Labor       | Equipment     | Subcontract | Material |          | Labor    | Equipment |
| <b>1 PROJECT PLANNING</b>                                  |          |      |             |            |             |               |             |          |          |          |           |
| 1.1 Prepare Documents & Plans                              | 300      | hr   |             |            | \$39.00     |               | \$0         | \$0      | \$11,700 | \$0      | \$11,700  |
| <b>2 INITIAL CHARACTERIZATION</b>                          |          |      |             |            |             |               |             |          |          |          |           |
| 2.1 Sample Collection (2 persons for 3 days)               | 1        | ls   |             | \$1,000.00 | \$1,500.00  | \$200.00      | \$0         | \$1,000  | \$1,500  | \$200    | \$2,700   |
| 2.2 Soil Sampling (TCLP Lead)                              | 20       | ea   | 150.00      | \$10.00    |             |               | \$3,000     | \$200    | \$0      | \$0      | \$3,200   |
| 2.3 Characterization/Offsite Disposal Soil Testing         | 10       | ea   | 850.00      | \$20.00    |             |               | \$8,500     | \$200    | \$0      | \$0      | \$8,700   |
| <b>3 MOBILIZATION, DEMOBILIZATION AND FIELD SUPPORT</b>    |          |      |             |            |             |               |             |          |          |          |           |
| 3.1 Office Trailer   | 5        | mo   |             |            |             | \$400.00      | \$0         | \$0      | \$0      | \$2,000  | \$2,000   |
| 3.2 Field Office Support                                   | 5        | mo   |             | \$200.00   |             |               | \$0         | \$1,000  | \$0      | \$0      | \$1,000   |
| 3.3 Storage Trailer  | 5        | mo   |             |            |             | \$103.00      | \$0         | \$0      | \$0      | \$515    | \$515     |
| 3.4 Utility Connection/Disconnection (phone/electric)      | 1        | ls   | 4500.00     |            |             |               | \$4,500     | \$0      | \$0      | \$0      | \$4,500   |
| 3.5 Site Utilities   | 5        | mo   | 200.00      |            |             |               | \$1,000     | \$0      | \$0      | \$0      | \$1,000   |
| 3.6 Underground Utility Clearances                         | 1        | ls   | 4500.00     |            |             |               | \$4,500     | \$0      | \$0      | \$0      | \$4,500   |
| 3.7 Construction Survey Support                            | 10       | day  | 1150.00     |            |             |               | \$11,500    | \$0      | \$0      | \$0      | \$11,500  |
| 3.8 Equipment Mobilization/Demobilization                  | 5        | ea   |             |            | \$188.00    | \$566.00      | \$0         | \$0      | \$940    | \$2,830  | \$3,770   |
| 3.9 XRF Scientist  | 30       | day  |             | \$200.00   | \$300.00    |               | \$0         | \$6,000  | \$9,000  | \$0      | \$15,000  |
| 3.10 XRF Rental  | 2        | mo   |             |            |             | \$3,500.00    | \$0         | \$0      | \$0      | \$7,000  | \$7,000   |
| 3.11 Site Superintendent                                   | 5        | mo   |             |            | \$8,229.76  |               | \$0         | \$0      | \$41,149 | \$0      | \$41,149  |
| 3.12 Site Health & Safety and QA/QC                        | 5        | mo   |             |            | \$6,827.04  |               | \$0         | \$0      | \$34,135 | \$0      | \$34,135  |
| 3.13 Materials Storage Pad, 25' X 25'                      | 5        | ls   |             | \$1,000.00 | \$250.00    | \$200.00      | \$0         | \$5,000  | \$1,250  | \$1,000  | \$7,250   |
| 3.14 Decontamination Services                              | 5        | mo   |             | \$1,100.00 | \$2,025.00  | \$1,400.00    | \$0         | \$5,500  | \$10,125 | \$7,000  | \$22,625  |
| <b>4 SITE PREPARATION</b>                                  |          |      |             |            |             |               |             |          |          |          |           |
| 4.1 Temporary Access Roads, 4" gravel, geotextile          | 1        | ls   |             | 6000.00    |             |               | \$0         | \$6,000  | \$0      | \$0      | \$6,000   |
| 4.2 Clear Site, cut & chip trees to 4" diam.               | 2        | acre |             |            | \$3,600.00  | \$2,950.00    | \$0         | \$0      | \$7,200  | \$5,900  | \$13,100  |
| 4.3 Clear Site, grasses & brush                            | 4        | acre |             |            | \$370.00    | \$345.00      | \$0         | \$0      | \$1,480  | \$1,380  | \$2,860   |
| 4.4 Erosion and Sedimentation Controls                     | 1        | ls   | 15000.00    |            |             |               | \$15,000    | \$0      | \$0      | \$0      | \$15,000  |
| 4.5 Equipment Decon Pad (5 Sites)                          | 1        | ls   |             | \$7,000.00 | \$6,000.00  | \$850.00      | \$0         | \$7,000  | \$6,000  | \$850    | \$13,850  |
| <b>5 EXCAVATION AND DISPOSAL</b>                           |          |      |             |            |             |               |             |          |          |          |           |
| 5.1 Excavator, 3/4cy Capacity                              | 5        | mo   |             |            | \$14,590.40 | \$11,569.68   | \$0         | \$0      | \$72,952 | \$57,848 | \$130,800 |
| 5.2 Site Labor, (1 laborer)                                | 5        | mo   |             |            | \$6,160.00  |               | \$0         | \$0      | \$30,800 | \$0      | \$30,800  |
| 5.3 Crawler Loader 1 to 1-1/2 cy (80HP)                    | 2        | mo   |             |            | \$11,102.12 | \$8,749.44    | \$0         | \$0      | \$22,204 | \$17,499 | \$39,703  |
| 5.4 Front End Loader, 3 cy (145HP)                         | 3        | mo   |             |            | \$11,102.12 | \$8,546.66    | \$0         | \$0      | \$33,306 | \$25,640 | \$58,946  |
| 5.5 UXO Technician   | 3        | mo   |             |            | \$6,827.04  |               | \$0         | \$0      | \$20,481 | \$0      | \$20,481  |
| 5.6 Off Site Disposal, Hazardous for Lead                  | 0        | ton  | 325.00      |            |             |               | \$0         | \$0      | \$0      | \$0      | \$0       |
| 5.7 Off Site Disposal, Non-Hazardous Soil                  | 13,081   | ton  | 65.00       |            |             |               | \$850,265   | \$0      | \$0      | \$0      | \$850,265 |
| 5.8 Confirmatory Sampling, (lead only, 72 hr TAT)          | 80       | ea   | 46.00       | \$10.00    |             |               | \$3,680     | \$800    | \$0      | \$0      | \$4,480   |
| 5.9 Confirmatory Sampling, (PAHs only, 72 hr TAT)          | 35       | ea   | 250.00      | \$10.00    |             |               | \$8,750     | \$350    | \$0      | \$0      | \$9,100   |
| 5.10 Confirmatory Sampling, (nitroglycerin only, 72 hr TA` | 10       | ea   | 230.00      | \$10.00    |             |               | \$2,300     | \$100    | \$0      | \$0      | \$2,400   |

NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
FIVE SMALL ARMS/SKEET RANGES  
Alternative 3: Treatment, Excavation, and Off-Site Disposal  
Capital Cost

| Item   | Quantity | Unit | Subcontract | Unit Cost |             |            | Extended Cost |           |           |           | Subtotal           |
|--|----------|------|-------------|-----------|-------------|------------|---------------|-----------|-----------|-----------|--------------------|
|  |          |      |             | Material  | Labor       | Equipment  | Subcontract   | Material  | Labor     | Equipment |                    |
| <b>6 HAZARDOUS WASTE TREATMENT</b>                       |          |      |             |           |             |            |               |           |           |           |                    |
| 6.1 Hazardous Lead-Contaminated Soil Treatment           | 3,048    | ton  | 25.00       |           |             |            | \$76,200      | \$0       | \$0       | \$0       | \$76,200           |
| 6.2 Offsite Disposal Soil Testing (TCLP Lead only)       | 35       | ea   | 150.00      | \$10.00   |             |            | \$5,250       | \$350     | \$0       | \$0       | \$5,600            |
| <b>7 SITE RESTORATION</b>                                |          |      |             |           |             |            |               |           |           |           |                    |
| 7.1 Clean backfill                                       | 5,948    | cy   |             | \$19.60   | \$0.53      | \$0.34     | \$0           | \$116,581 | \$3,152   | \$2,022   | \$121,756          |
| 7.2 Topsoil, Furnish and Place, 6" thickness             | 17,165   | sy   |             | \$5.40    | \$0.63      | \$0.41     | \$0           | \$92,691  | \$10,814  | \$7,038   | \$110,543          |
| 7.3 Dozer, Crawler, 105 H. P.                            | 1        | mo   |             |           | \$11,281.60 | \$9,979.60 | \$0           | \$0       | \$11,282  | \$9,980   | \$21,261           |
| 7.4 Fine Grading and seeding, incl. lime, fert, and seed | 17,165   | sy   |             | \$0.56    | \$1.78      | \$0.33     | \$0           | \$9,612   | \$30,554  | \$5,664   | \$45,831           |
| <b>8 POST CONSTRUCTION COST</b>                          |          |      |             |           |             |            |               |           |           |           |                    |
| 8.1 Contractor Completion Report                         | 200      | hr   |             |           | \$39.00     |            | \$0           | \$0       | \$7,800   | \$0       | \$7,800            |
| <b>Subtotal</b>  |          |      |             |           |             |            | \$994,445     | \$252,384 | \$367,824 | \$154,366 | \$1,769,020        |
| <b>Local Area Adjustments</b>                            |          |      |             |           |             |            | 100.0%        | 101.6%    | 86.0%     | 96.1%     |                    |
| <b>Subtotal</b>  |          |      |             |           |             |            | \$994,445     | \$256,422 | \$316,329 | \$148,346 | \$1,715,542        |
| Overhead on Labor Cost @ 30%                             |          |      |             |           |             |            |               |           | \$94,899  |           | \$94,899           |
| G & A on Labor Cost @ 10%                                |          |      |             |           |             |            |               |           | \$31,633  |           | \$31,633           |
| G & A on Material Cost @ 10%                             |          |      |             |           |             |            |               | \$25,642  |           |           | \$25,642           |
| G & A on Equipment Cost @ 10%                            |          |      |             |           |             |            |               |           |           | \$14,835  | \$14,835           |
| G & A on Subcontract Cost @ 10%                          |          |      |             |           |             |            | \$99,445      |           |           |           | \$99,445           |
| Tax on Materials and Equipment Cost @ 6%                 |          |      |             |           |             |            |               | \$15,385  |           | \$8,901   | \$24,286           |
| <b>Total Direct Cost</b>                                 |          |      |             |           |             |            | \$1,093,890   | \$297,450 | \$442,861 | \$172,081 | \$2,006,281        |
| Indirects on Total Direct Cost @ 25%                     |          |      |             |           |             |            |               |           |           |           | \$289,004          |
| Profit on Total Direct Cost @ 10%                        |          |      |             |           |             |            |               |           |           |           | \$200,628          |
| <b>Subtotal</b>  |          |      |             |           |             |            |               |           |           |           | \$2,495,914        |
| Health & Safety Monitoring @ 2%                          |          |      |             |           |             |            |               |           |           |           | \$49,918           |
| <b>Total Field Cost</b>                                  |          |      |             |           |             |            |               |           |           |           | \$2,545,832        |
| Contingency on Total Field Costs @ 20%                   |          |      |             |           |             |            |               |           |           |           | \$509,166          |
| Engineering on Total Field Cost @ 6%                     |          |      |             |           |             |            |               |           |           |           | \$101,734          |
| <b>TOTAL CAPITAL COST</b>                                |          |      |             |           |             |            |               |           |           |           | <b>\$3,156,732</b> |

NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
FIVE SMALL ARMS/SKEET RANGES  
Alternative 3: Treatment, Excavation, and Off-Site Disposal - UXO 14 - Marine Rifle Range  
Capital Cost

| Item  | Quantity | Unit | Subcontract | Unit Cost  |             |             | Subcontract | Extended Cost |          |           | Subtotal  |
|---|----------|------|-------------|------------|-------------|-------------|-------------|---------------|----------|-----------|-----------|
|   |          |      |             | Material   | Labor       | Equipment   |             | Material      | Labor    | Equipment |           |
| <b>1 PROJECT PLANNING</b>                                 |          |      |             |            |             |             |             |               |          |           |           |
| 1.1 Prepare Documents & Plans                             | 120      | hr   |             |            | \$39.00     |             | \$0         | \$0           | \$4,680  | \$0       | \$4,680   |
| <b>2 INITIAL CHARACTERIZATION</b>                         |          |      |             |            |             |             |             |               |          |           |           |
| 2.1 Sample Collection (2 persons for 2 days)              | 1        | ls   |             | \$400.00   | \$1,000.00  | \$150.00    | \$0         | \$400         | \$1,000  | \$150     | \$1,550   |
| 2.2 Soil Sampling (TCLP Lead)                             | 12       | ea   | 150.00      | \$10.00    |             |             | \$1,800     | \$120         | \$0      | \$0       | \$1,920   |
| 2.3 Characterization/Offsite Disposal Soil Testing        | 2        | ea   | 850.00      | \$20.00    |             |             | \$1,700     | \$40          | \$0      | \$0       | \$1,740   |
| <b>3 MOBILIZATION, DEMOBILIZATION AND FIELD SUPPORT</b>   |          |      |             |            |             |             |             |               |          |           |           |
| 3.1 Office Trailer  | 2        | mo   |             |            |             | \$400.00    | \$0         | \$0           | \$0      | \$800     | \$800     |
| 3.2 Field Office Support                                  | 2        | mo   |             | \$200.00   |             |             | \$0         | \$400         | \$0      | \$0       | \$400     |
| 3.3 Storage Trailer                                       | 2        | mo   |             |            |             | \$103.00    | \$0         | \$0           | \$0      | \$206     | \$206     |
| 3.4 Utility Connection/Disconnection (phone/electric)     | 1        | ls   | 1500.00     |            |             |             | \$1,500     | \$0           | \$0      | \$0       | \$1,500   |
| 3.5 Site Utilities  | 2        | mo   | 200.00      |            |             |             | \$400       | \$0           | \$0      | \$0       | \$400     |
| 3.6 Underground Utility Clearances                        | 1        | ls   | 1500.00     |            |             |             | \$1,500     | \$0           | \$0      | \$0       | \$1,500   |
| 3.7 Construction Survey Support                           | 6        | day  | 1150.00     |            |             |             | \$6,900     | \$0           | \$0      | \$0       | \$6,900   |
| 3.8 Equipment Mobilization/Demobilization                 | 5        | ea   |             |            | \$188.00    | \$566.00    | \$0         | \$0           | \$940    | \$2,830   | \$3,770   |
| 3.9 XRF Scientist   | 15       | day  |             | \$200.00   | \$300.00    |             | \$0         | \$3,000       | \$4,500  | \$0       | \$7,500   |
| 3.10 XRF Rental   | 1        | mo   |             |            |             | \$3,500.00  | \$0         | \$0           | \$0      | \$3,500   | \$3,500   |
| 3.11 Site Superintendent                                  | 2        | mo   |             |            | \$8,229.76  |             | \$0         | \$0           | \$16,460 | \$0       | \$16,460  |
| 3.12 Site Health & Safety and QA/QC                       | 2        | mo   |             |            | \$6,827.04  |             | \$0         | \$0           | \$13,654 | \$0       | \$13,654  |
| 3.13 Materials Storage Pad, 25' X 25'                     | 1        | ls   |             | \$1,000.00 | \$250.00    | \$200.00    | \$0         | \$1,000       | \$250    | \$200     | \$1,450   |
| 3.14 Decontamination Services                             | 2        | mo   |             | \$1,100.00 | \$2,025.00  | \$1,400.00  | \$0         | \$2,200       | \$4,050  | \$2,800   | \$9,050   |
| <b>4 SITE PREPARATION</b>                                 |          |      |             |            |             |             |             |               |          |           |           |
| 4.1 Temporary Access Roads, 4" gravel, geotextile         | 1        | ls   |             | 6000.00    |             |             | \$0         | \$6,000       | \$0      | \$0       | \$6,000   |
| 4.2 Clear Site, cut & chip trees to 4" diam.              | 1.5      | acre |             |            | \$3,600.00  | \$2,950.00  | \$0         | \$0           | \$5,400  | \$4,425   | \$9,825   |
| 4.3 Clear Site, grasses & brush                           | 1.5      | acre |             |            | \$370.00    | \$345.00    | \$0         | \$0           | \$555    | \$518     | \$1,073   |
| 4.4 Erosion and Sedimentation Controls                    | 1        | ls   | 8000.00     |            |             |             | \$8,000     | \$0           | \$0      | \$0       | \$8,000   |
| 4.5 Equipment Decon Pad                                   | 1        | ls   |             | \$7,000.00 | \$6,000.00  | \$850.00    | \$0         | \$7,000       | \$6,000  | \$850     | \$13,850  |
| <b>5 EXCAVATION AND DISPOSAL</b>                          |          |      |             |            |             |             |             |               |          |           |           |
| 5.1 Excavator, 3/4cy Capacity                             | 2        | mo   |             |            | \$14,590.40 | \$11,569.68 | \$0         | \$0           | \$29,181 | \$23,139  | \$52,320  |
| 5.2 Site Labor, (1 laborer)                               | 2        | mo   |             |            | \$6,160.00  |             | \$0         | \$0           | \$12,320 | \$0       | \$12,320  |
| 5.3 Crawler Loader 1 to 1-1/2 cy (80HP)                   | 2        | mo   |             |            | \$11,102.12 | \$8,749.44  | \$0         | \$0           | \$22,204 | \$17,499  | \$39,703  |
| 5.4 UXO Technician  | 2        | mo   |             |            | \$6,827.04  |             | \$0         | \$0           | \$13,654 | \$0       | \$13,654  |
| 5.5 Off Site Disposal, Hazardous for Lead                 | 0        | ton  | 325.00      |            |             |             | \$0         | \$0           | \$0      | \$0       | \$0       |
| 5.6 Off Site Disposal, Non-Hazardous Soil                 | 2,699    | ton  | 65.00       |            |             |             | \$175,435   | \$0           | \$0      | \$0       | \$175,435 |
| 5.7 Confirmatory Sampling, (lead only, 72 hr TAT)         | 50       | ea   | 46.00       | \$10.00    |             |             | \$2,300     | \$500         | \$0      | \$0       | \$2,800   |
| 5.8 Confirmatory Sampling, (PAHs only, 72 hr TAT)         | 0        | ea   | 250.00      | \$10.00    |             |             | \$0         | \$0           | \$0      | \$0       | \$0       |
| 5.9 Confirmatory Sampling, (nitroglycerin only, 72 hr TA` | 0        | ea   | 230.00      | \$10.00    |             |             | \$0         | \$0           | \$0      | \$0       | \$0       |

NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
FIVE SMALL ARMS/SKEET RANGES  
Alternative 3: Treatment, Excavation, and Off-Site Disposal - UXO 14 - Marine Rifle Range  
Capital Cost

| Item   | Quantity | Unit | Subcontract | Unit Cost |            |            | Subcontract | Extended Cost |           |           | Subtotal           |
|--|----------|------|-------------|-----------|------------|------------|-------------|---------------|-----------|-----------|--------------------|
|  |          |      |             | Material  | Labor      | Equipment  |             | Material      | Labor     | Equipment |                    |
| <b>6 HAZARDOUS WASTE TREATMENT</b>                       |          |      |             |           |            |            |             |               |           |           |                    |
| 6.1 Hazardous Lead-Contaminated Soil Treatment           | 2,159    | ton  | 25.00       |           |            |            | \$53,975    | \$0           | \$0       | \$0       | \$53,975           |
| 6.2 Offsite Disposal Soil Testing (TCLP Lead only)       | 24       | ea   | 150.00      | \$10.00   |            |            | \$3,600     | \$240         | \$0       | \$0       | \$3,840            |
| <b>7 SITE RESTORATION</b>                                |          |      |             |           |            |            |             |               |           |           |                    |
| 7.1 Clean backfill                                       | 1,212    | cy   |             | \$19.60   | \$0.53     | \$0.34     | \$0         | \$23,755      | \$642     | \$412     | \$24,810           |
| 7.2 Topsoil, Furnish and Place, 6" thickness             | 3,635    | sy   |             | \$5.40    | \$0.63     | \$0.41     | \$0         | \$19,629      | \$2,290   | \$1,490   | \$23,409           |
| 7.3 Dozer, Crawler, 105 H. P.                            | 2        | week |             |           | \$2,564.00 | \$2,754.00 | \$0         | \$0           | \$5,128   | \$5,508   | \$10,636           |
| 7.4 Fine Grading and seeding, incl. lime, fert, and seed | 3,635    | sy   |             | \$0.56    | \$1.78     | \$0.33     | \$0         | \$2,036       | \$6,470   | \$1,200   | \$9,705            |
| <b>8 POST CONSTRUCTION COST</b>                          |          |      |             |           |            |            |             |               |           |           |                    |
| 8.1 Contractor Completion Report                         | 100      | hr   |             |           | \$39.00    |            | \$0         | \$0           | \$3,900   | \$0       | \$3,900            |
| <b>Subtotal</b>  |          |      |             |           |            |            | \$257,110   | \$66,320      | \$153,278 | \$65,527  | \$542,235          |
| <b>Local Area Adjustments</b>                            |          |      |             |           |            |            | 100.0%      | 101.6%        | 86.0%     | 96.1%     |                    |
| <b>Subtotal</b>  |          |      |             |           |            |            | \$257,110   | \$67,381      | \$131,819 | \$62,971  | \$519,282          |
| Overhead on Labor Cost @ 30%                             |          |      |             |           |            |            |             |               | \$39,546  |           | \$39,546           |
| G & A on Labor Cost @ 10%                                |          |      |             |           |            |            |             |               | \$13,182  |           | \$13,182           |
| G & A on Material Cost @ 10%                             |          |      |             |           |            |            |             | \$6,738       |           |           | \$6,738            |
| G & A on Equipment Cost @ 10%                            |          |      |             |           |            |            |             |               |           | \$6,297   | \$6,297            |
| G & A on Subcontract Cost @ 10%                          |          |      |             |           |            |            | \$25,711    |               |           |           | \$25,711           |
| Tax on Materials and Equipment Cost @ 6%                 |          |      |             |           |            |            |             | \$4,043       |           | \$3,778   | \$7,821            |
| <b>Total Direct Cost</b>                                 |          |      |             |           |            |            | \$282,821   | \$78,162      | \$184,547 | \$73,047  | \$618,577          |
| Indirects on Total Direct Cost @ 25%                     |          |      |             |           |            |            |             |               |           |           | \$110,785          |
| Profit on Total Direct Cost @ 10%                        |          |      |             |           |            |            |             |               |           |           | \$61,858           |
| <b>Subtotal</b>  |          |      |             |           |            |            |             |               |           |           | \$791,220          |
| Health & Safety Monitoring @ 2%                          |          |      |             |           |            |            |             |               |           |           | \$15,824           |
| <b>Total Field Cost</b>                                  |          |      |             |           |            |            |             |               |           |           | \$807,044          |
| Contingency on Total Field Costs @ 20%                   |          |      |             |           |            |            |             |               |           |           | \$161,409          |
| Engineering on Total Field Cost @ 6%                     |          |      |             |           |            |            |             |               |           |           | \$37,897           |
| <b>TOTAL CAPITAL COST</b>                                |          |      |             |           |            |            |             |               |           |           | <b>\$1,006,350</b> |

NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
FIVE SMALL ARMS/SKEET RANGES  
Alternative 3: Treatment, Excavation, and Off-Site Disposal -UXO 15 - Old Skeet and Trap Range  
Capital Cost

| Item   | Quantity | Unit | Subcontract | Unit Cost   |             |            | Subcontract | Extended Cost |          |           | Subtotal  |
|--|----------|------|-------------|-------------|-------------|------------|-------------|---------------|----------|-----------|-----------|
|  |          |      |             | Material    | Labor       | Equipment  |             | Material      | Labor    | Equipment |           |
| <b>1 PROJECT PLANNING</b>                                  |          |      |             |             |             |            |             |               |          |           |           |
| 1.1 Prepare Documents & Plans                              | 100      | hr   |             |             | \$39.00     |            | \$0         | \$0           | \$3,900  | \$0       | \$3,900   |
| <b>2 INITIAL CHARACTERIZATION</b>                          |          |      |             |             |             |            |             |               |          |           |           |
| 2.1 Sample Collection (2 persons for 1 day)                | 1        | ls   |             | \$300.00    | \$500.00    | \$80.00    | \$0         | \$300         | \$500    | \$80      | \$880     |
| 2.2 Soil Sampling (TCLP Lead)                              | 4        | ea   | 150.00      | \$10.00     |             |            | \$600       | \$40          | \$0      | \$0       | \$640     |
| 2.3 Characterization/Offsite Disposal Soil Testing         | 4        | ea   | 850.00      | \$20.00     |             |            | \$3,400     | \$80          | \$0      | \$0       | \$3,480   |
| <b>3 MOBILIZATION, DEMOBILIZATION AND FIELD SUPPORT</b>    |          |      |             |             |             |            |             |               |          |           |           |
| 3.1 Office Trailer   | 1.5      | mo   |             |             |             | \$400.00   | \$0         | \$0           | \$0      | \$600     | \$600     |
| 3.2 Field Office Support                                   | 1.5      | mo   |             | \$200.00    |             |            | \$0         | \$300         | \$0      | \$0       | \$300     |
| 3.3 Storage Trailer  | 1.5      | mo   |             |             |             | \$103.00   | \$0         | \$0           | \$0      | \$155     | \$155     |
| 3.4 Utility Connection/Disconnection (phone/electric)      | 1        | ls   | 1500.00     |             |             |            | \$1,500     | \$0           | \$0      | \$0       | \$1,500   |
| 3.5 Site Utilities   | 1.5      | mo   | 200.00      |             |             |            | \$300       | \$0           | \$0      | \$0       | \$300     |
| 3.6 Underground Utility Clearances                         | 1        | ls   | 1500.00     |             |             |            | \$1,500     | \$0           | \$0      | \$0       | \$1,500   |
| 3.7 Construction Survey Support                            | 2        | day  | 1150.00     |             |             |            | \$2,300     | \$0           | \$0      | \$0       | \$2,300   |
| 3.8 Equipment Mobilization/Demobilization                  | 5        | ea   |             |             | \$188.00    | \$566.00   | \$0         | \$0           | \$940    | \$2,830   | \$3,770   |
| 3.9 XRF Scientist  | 5        | day  |             | \$200.00    | \$300.00    |            | \$0         | \$1,000       | \$1,500  | \$0       | \$2,500   |
| 3.10 XRF Rental  | 1        | week |             |             |             | \$1,200.00 | \$0         | \$0           | \$0      | \$1,200   | \$1,200   |
| 3.11 Site Superintendent                                   | 1.5      | mo   |             |             | \$8,229.76  |            | \$0         | \$0           | \$12,345 | \$0       | \$12,345  |
| 3.12 Site Health & Safety and QA/QC                        | 1.5      | mo   |             |             | \$6,827.04  |            | \$0         | \$0           | \$10,241 | \$0       | \$10,241  |
| 3.13 Materials Storage Pad, 25' X 25'                      | 1        | ls   |             | \$1,000.00  | \$250.00    | \$200.00   | \$0         | \$1,000       | \$250    | \$200     | \$1,450   |
| 3.14 Decontamination Services                              | 1.5      | mo   |             | \$1,100.00  | \$2,025.00  | \$1,400.00 | \$0         | \$1,650       | \$3,038  | \$2,100   | \$6,788   |
| <b>4 SITE PREPARATION</b>                                  |          |      |             |             |             |            |             |               |          |           |           |
| 4.1 Clear Site, grasses & brush                            | 1        | acre |             |             | \$370.00    | \$345.00   | \$0         | \$0           | \$370    | \$345     | \$715     |
| 4.2 Erosion and Sedimentation Controls                     | 1        | ls   | 2500.00     |             |             |            | \$2,500     | \$0           | \$0      | \$0       | \$2,500   |
| 4.3 Equipment Decon Pad                                    | 1        | ls   |             | \$2,500.00  | \$1,500.00  | \$225.00   | \$0         | \$2,500       | \$1,500  | \$225     | \$4,225   |
| <b>5 EXCAVATION AND DISPOSAL</b>                           |          |      |             |             |             |            |             |               |          |           |           |
| 5.1 Excavator, 3/4cy Capacity                              | 1.5      | mo   |             | \$14,590.40 | \$11,569.68 |            | \$0         | \$0           | \$21,886 | \$17,355  | \$39,240  |
| 5.2 Site Labor, (1 laborer)                                | 1.5      | mo   |             | \$6,160.00  |             |            | \$0         | \$0           | \$9,240  | \$0       | \$9,240   |
| 5.3 Front End Loader, 3 cy (145HP)                         | 1.5      | mo   |             | \$11,102.12 | \$8,546.66  |            | \$0         | \$0           | \$16,653 | \$12,820  | \$29,473  |
| 5.4 UXO Technician   | 1.5      | mo   |             | \$6,827.04  |             |            | \$0         | \$0           | \$10,241 | \$0       | \$10,241  |
| 5.5 Off Site Disposal, Hazardous for Lead                  | 0        | ton  | 325.00      |             |             |            | \$0         | \$0           | \$0      | \$0       | \$0       |
| 5.6 Off Site Disposal, Non-Hazardous Soil                  | 4,569    | ton  | 65.00       |             |             |            | \$296,985   | \$0           | \$0      | \$0       | \$296,985 |
| 5.7 Confirmatory Sampling, (lead only, 72 hr TAT)          | 15       | ea   | 46.00       | \$10.00     |             |            | \$690       | \$150         | \$0      | \$0       | \$840     |
| 5.8 Confirmatory Sampling, (PAHs only, 72 hr TAT)          | 20       | ea   | 250.00      | \$10.00     |             |            | \$5,000     | \$200         | \$0      | \$0       | \$5,200   |
| 5.9 Confirmatory Sampling, (nitroglycerin only, 72 hr TAT) | 0        | ea   | 230.00      | \$10.00     |             |            | \$0         | \$0           | \$0      | \$0       | \$0       |

NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
FIVE SMALL ARMS/SKEET RANGES  
Alternative 3: Treatment, Excavation, and Off-Site Disposal -UXO 15 - Old Skeet and Trap Range  
Capital Cost

| Item   | Quantity | Unit | Subcontract | Unit Cost |            |  | Subcontract | Extended Cost |           |           | Subtotal           |
|--|----------|------|-------------|-----------|------------|--|-------------|---------------|-----------|-----------|--------------------|
|  |          |      |             | Material  | Labor      | Equipment                                    |             | Material      | Labor     | Equipment |                    |
| <b>6 HAZARDOUS WASTE TREATMENT</b>                       |          |      |             |           |            |  |             |               |           |           |                    |
| 6.1 Hazardous Lead-Contaminated Soil Treatment           | 625      | ton  | 25.00       |           |            |  | \$15,625    | \$0           | \$0       | \$0       | \$15,625           |
| 6.2 Offsite Disposal Soil Testing (TCLP Lead only)       | 7        | ea   | 150.00      | \$10.00   |            |  | \$1,050     | \$70          | \$0       | \$0       | \$1,120            |
| <b>7 SITE RESTORATION</b>                                |          |      |             |           |            |  |             |               |           |           |                    |
| 7.1 Clean backfill                                       | 2,176    | cy   |             | \$19.60   | \$0.53     | \$0.34                                       | \$0         | \$42,650      | \$1,153   | \$740     | \$44,543           |
| 7.2 Topsoil, Furnish and Place, 6" thickness             | 5,404    | sy   |             | \$5.40    | \$0.63     | \$0.41                                       | \$0         | \$29,182      | \$3,405   | \$2,216   | \$34,802           |
| 7.3 Dozer, Crawler, 105 H. P.                            | 1        | week |             |           | \$2,564.00 | \$2,754.00                                   | \$0         | \$0           | \$2,564   | \$2,754   | \$5,318            |
| 7.4 Fine Grading and seeding, incl. lime, fert, and seed | 5,404    | sy   |             | \$0.56    | \$1.78     | \$0.33                                       | \$0         | \$3,026       | \$9,619   | \$1,783   | \$14,429           |
| <b>8 POST CONSTRUCTION COST</b>                          |          |      |             |           |            |  |             |               |           |           |                    |
| 8.1 Contractor Completion Report                         | 60       | hr   |             |           | \$39.00    |  | \$0         | \$0           | \$2,340   | \$0       | \$2,340            |
| <b>Subtotal</b>  |          |      |             |           |            |  | \$331,450   | \$82,147      | \$111,683 | \$45,402  | \$570,682          |
| <b>Local Area Adjustments</b>                            |          |      |             |           |            |  | 100.0%      | 101.6%        | 86.0%     | 96.1%     |                    |
| <b>Subtotal</b>  |          |      |             |           |            |  | \$331,450   | \$83,462      | \$96,047  | \$43,631  | \$554,590          |
| Overhead on Labor Cost @ 30%                             |          |      |             |           |            |  |             |               | \$28,814  |           | \$28,814           |
| G & A on Labor Cost @ 10%                                |          |      |             |           |            |  |             |               | \$9,605   |           | \$9,605            |
| G & A on Material Cost @ 10%                             |          |      |             |           |            |  |             | \$8,346       |           |           | \$8,346            |
| G & A on Equipment Cost @ 10%                            |          |      |             |           |            |  |             |               |           | \$4,363   | \$4,363            |
| G & A on Subcontract Cost @ 10%                          |          |      |             |           |            |  | \$33,145    |               |           |           | \$33,145           |
| Tax on Materials and Equipment Cost @ 6%                 |          |      |             |           |            |  |             | \$5,008       |           | \$2,618   | \$7,626            |
| <b>Total Direct Cost</b>                                 |          |      |             |           |            |  | \$364,595   | \$96,816      | \$134,466 | \$50,612  | \$646,489          |
| Indirects on Total Direct Cost @ 25%                     |          |      |             |           |            | (excluding transportation and disposal cost) |             |               |           |           | \$87,376           |
| Profit on Total Direct Cost @ 10%                        |          |      |             |           |            |  |             |               |           |           | \$64,649           |
| <b>Subtotal</b>  |          |      |             |           |            |  |             |               |           |           | \$798,514          |
| Health & Safety Monitoring @ 2%                          |          |      |             |           |            | (includes air quality monitoring)            |             |               |           |           | \$15,970           |
| <b>Total Field Cost</b>                                  |          |      |             |           |            |  |             |               |           |           | \$814,484          |
| Contingency on Total Field Costs @ 20%                   |          |      |             |           |            |  |             |               |           |           | \$162,897          |
| Engineering on Total Field Cost @ 6%                     |          |      |             |           |            | (excluding transportation and disposal cost) |             |               |           |           | \$31,050           |
| <b>TOTAL CAPITAL COST</b>                                |          |      |             |           |            |  |             |               |           |           | <b>\$1,008,431</b> |

NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
FIVE SMALL ARMS/SKEET RANGES  
Alternative 3: Treatment, Excavation, and Off-Site Disposal - UXO 16-Rum Point Skeet Range  
Capital Cost

| Item  | Quantity | Unit | Unit Cost   |            |                 | Extended Cost |           |                 | Subtotal |          |           |
|---|----------|------|-------------|------------|-----------------|---------------|-----------|-----------------|----------|----------|-----------|
|   |          |      | Subcontract | Material   | Labor Equipment | Subcontract   | Material  | Labor Equipment |          |          |           |
| <b>1 PROJECT PLANNING</b>                               |          |      |             |            |                 |               |           |                 |          |          |           |
| 1.1 Prepare Documents & Plans                           | 80       | hr   |             |            | \$39.00         | \$0           | \$0       | \$3,120         | \$0      | \$3,120  |           |
| <b>2 INITIAL CHARACTERIZATION</b>                       |          |      |             |            |                 |               |           |                 |          |          |           |
| 2.1 Sample Collection (2 persons for 1 day)             | 1        | ls   |             | \$50.00    | \$500.00        | \$80.00       | \$0       | \$50            | \$500    | \$80     | \$630     |
| 2.2 Characterization/Offsite Disposal Soil Testing      | 1        | ea   | 850.00      | \$20.00    |                 |               | \$850     | \$20            | \$0      | \$0      | \$870     |
| <b>3 MOBILIZATION, DEMOBILIZATION AND FIELD SUPPORT</b> |          |      |             |            |                 |               |           |                 |          |          |           |
| 3.1 Office Trailer                                      | 1        | mo   |             |            |                 | \$400.00      | \$0       | \$0             | \$0      | \$400    | \$400     |
| 3.2 Field Office Support                                | 1        | mo   |             | \$200.00   |                 |               | \$0       | \$200           | \$0      | \$0      | \$200     |
| 3.3 Storage Trailer                                     | 1        | mo   |             |            |                 | \$103.00      | \$0       | \$0             | \$0      | \$103    | \$103     |
| 3.4 Utility Connection/Disconnection (phone/electric)   | 1        | ls   | 1500.00     |            |                 |               | \$1,500   | \$0             | \$0      | \$0      | \$1,500   |
| 3.5 Site Utilities                                      | 1        | mo   | 200.00      |            |                 |               | \$200     | \$0             | \$0      | \$0      | \$200     |
| 3.6 Underground Utility Clearances                      | 1        | ls   | 1500.00     |            |                 |               | \$1,500   | \$0             | \$0      | \$0      | \$1,500   |
| 3.7 Construction Survey Support                         | 2        | day  | 1150.00     |            |                 |               | \$2,300   | \$0             | \$0      | \$0      | \$2,300   |
| 3.8 Equipment Mobilization/Demobilization               | 5        | ea   |             |            | \$188.00        | \$566.00      | \$0       | \$0             | \$940    | \$2,830  | \$3,770   |
| 3.9 Site Superintendent                                 | 1        | mo   |             |            | \$8,229.76      |               | \$0       | \$0             | \$8,230  | \$0      | \$8,230   |
| 3.10 Site Health & Safety and QA/QC                     | 1        | mo   |             |            | \$6,827.04      |               | \$0       | \$0             | \$6,827  | \$0      | \$6,827   |
| 3.11 Materials Storage Pad, 25' X 25'                   | 1        | ls   |             | \$1,000.00 | \$250.00        | \$200.00      | \$0       | \$1,000         | \$250    | \$200    | \$1,450   |
| 3.12 Decontamination Services                           | 1        | mo   |             | \$1,100.00 | \$2,025.00      | \$1,400.00    | \$0       | \$1,100         | \$2,025  | \$1,400  | \$4,525   |
| <b>4 SITE PREPARATION</b>                               |          |      |             |            |                 |               |           |                 |          |          |           |
| 4.1 Clear Site, grasses & brush                         | 1        | acre |             |            | \$370.00        | \$345.00      | \$0       | \$0             | \$370    | \$345    | \$715     |
| 4.2 Erosion and Sedimentation Controls                  | 1        | ls   | 2500.00     |            |                 |               | \$2,500   | \$0             | \$0      | \$0      | \$2,500   |
| 4.3 Equipment Decon Pad                                 | 1        | ls   |             | \$2,500.00 | \$1,500.00      | \$225.00      | \$0       | \$2,500         | \$1,500  | \$225    | \$4,225   |
| <b>5 EXCAVATION AND DISPOSAL</b>                        |          |      |             |            |                 |               |           |                 |          |          |           |
| 5.1 Excavator, 3/4cy Capacity                           | 1        | mo   |             |            | \$14,590.40     | \$11,569.68   | \$0       | \$0             | \$14,590 | \$11,570 | \$26,160  |
| 5.2 Site Labor, (1 laborer)                             | 1        | mo   |             |            | \$6,160.00      |               | \$0       | \$0             | \$6,160  | \$0      | \$6,160   |
| 5.3 Front End Loader, 3 cy (145HP)                      | 1        | mo   |             |            | \$11,102.12     | \$8,546.66    | \$0       | \$0             | \$11,102 | \$8,547  | \$19,649  |
| 5.4 Off Site Disposal, Hazardous for Lead               | 0        | ton  | 325.00      |            |                 |               | \$0       | \$0             | \$0      | \$0      | \$0       |
| 5.5 Off Site Disposal, Non-Hazardous Soil               | 4,885    | ton  | 65.00       |            |                 |               | \$317,525 | \$0             | \$0      | \$0      | \$317,525 |
| 5.6 Confirmatory Sampling, (lead only, 72 hr TAT)       | 0        | ea   | 46.00       | \$10.00    |                 |               | \$0       | \$0             | \$0      | \$0      | \$0       |
| 5.7 Confirmatory Sampling, (PAHs only, 72 hr TAT)       | 15       | ea   | 250.00      | \$10.00    |                 |               | \$3,750   | \$150           | \$0      | \$0      | \$3,900   |

NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
FIVE SMALL ARMS/SKEET RANGES  
Alternative 3: Treatment, Excavation, and Off-Site Disposal - UXO 16-Rum Point Skeet Range  
Capital Cost

| Item  | Quantity | Unit | Unit Cost |            |            | Subcontract | Extended Cost |          |           | Subtotal         |
|---|----------|------|-----------|------------|------------|-------------|---------------|----------|-----------|------------------|
|   |          |      | Material  | Labor      | Equipment  |             | Material      | Labor    | Equipment |                  |
| <b>6 SITE RESTORATION</b>   |          |      |           |            |            |             |               |          |           |                  |
| 6.1 Clean backfill  | 2,193    | cy   | \$19.60   | \$0.53     | \$0.34     | \$0         | \$42,983      | \$1,162  | \$746     | \$44,891         |
| 6.2 Topsoil, Furnish and Place, 6" thickness                                      | 6,580    | sy   | \$5.40    | \$0.63     | \$0.41     | \$0         | \$35,532      | \$4,145  | \$2,698   | \$42,375         |
| 6.3 Dozer, Crawler, 105 H. P.   | 1        | week |           | \$2,564.00 | \$2,754.00 | \$0         | \$0           | \$2,564  | \$2,754   | \$5,318          |
| 6.4 Fine Grading and seeding, incl. lime, fert, and seed                          | 6,580    | sy   | \$0.56    | \$1.78     | \$0.33     | \$0         | \$3,685       | \$11,712 | \$2,171   | \$17,569         |
| <b>7 POST CONSTRUCTION COST</b>   |          |      |           |            |            |             |               |          |           |                  |
| 7.1 Contractor Completion Report  | 40       | hr   |           | \$39.00    |            | \$0         | \$0           | \$1,560  | \$0       | \$1,560          |
| <b>Subtotal</b>   |          |      |           |            |            | \$330,125   | \$87,220      | \$76,758 | \$34,068  | \$528,171        |
| <b>Local Area Adjustments</b>   |          |      |           |            |            | 100.0%      | 101.6%        | 86.0%    | 96.1%     |                  |
| <b>Subtotal</b>   |          |      |           |            |            | \$330,125   | \$88,615      | \$66,012 | \$32,740  | \$517,492        |
| Overhead on Labor Cost @ 30%  |          |      |           |            |            |             |               | \$19,804 |           | \$19,804         |
| G & A on Labor Cost @ 10%   |          |      |           |            |            |             |               | \$6,601  |           | \$6,601          |
| G & A on Material Cost @ 10%  |          |      |           |            |            |             | \$8,862       |          |           | \$8,862          |
| G & A on Equipment Cost @ 10%   |          |      |           |            |            |             |               |          | \$3,274   | \$3,274          |
| G & A on Subcontract Cost @ 10%   |          |      |           |            |            | \$33,013    |               |          |           | \$33,013         |
| Tax on Materials and Equipment Cost @ 6%  |          |      |           |            |            |             | \$5,317       |          | \$1,964   | \$7,281          |
| <b>Total Direct Cost</b>  |          |      |           |            |            | \$363,138   | \$102,794     | \$92,417 | \$37,978  | \$596,326        |
| Indirects on Total Direct Cost @ 25% (excluding transportation and disposal cost) |          |      |           |            |            |             |               |          |           | \$69,700         |
| Profit on Total Direct Cost @ 10%   |          |      |           |            |            |             |               |          |           | \$59,633         |
| <b>Subtotal</b>   |          |      |           |            |            |             |               |          |           | \$725,659        |
| Health & Safety Monitoring @ 2% (includes air quality monitoring)                 |          |      |           |            |            |             |               |          |           | \$14,513         |
| <b>Total Field Cost</b>   |          |      |           |            |            |             |               |          |           | \$740,172        |
| Contingency on Total Field Costs @ 20%  |          |      |           |            |            |             |               |          |           | \$148,034        |
| Engineering on Total Field Cost @ 6% (excluding transportation and disposal cost) |          |      |           |            |            |             |               |          |           | \$25,359         |
| <b>TOTAL CAPITAL COST</b>   |          |      |           |            |            |             |               |          |           | <b>\$913,565</b> |

NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
FIVE SMALL ARMS/SKEET RANGES  
Alternative 3: Treatment, Excavation, and Off-Site Disposal - UXO 17 - Small Arms (Pistol) Range  
Capital Cost

| Item   | Quantity | Unit | Subcontract | Unit Cost  |            |            | Extended Cost |          |         |           | Subtotal |
|--|----------|------|-------------|------------|------------|------------|---------------|----------|---------|-----------|----------|
|  |          |      |             | Material   | Labor      | Equipment  | Subcontract   | Material | Labor   | Equipment |          |
| <b>1 PROJECT PLANNING</b>                                |          |      |             |            |            |            |               |          |         |           |          |
| 1.1 Prepare Documents & Plans                            | 120      | hr   |             |            | \$39.00    |            | \$0           | \$0      | \$4,680 | \$0       | \$4,680  |
| <b>2 INITIAL CHARACTERIZATION</b>                        |          |      |             |            |            |            |               |          |         |           |          |
| 2.1 Sample Collection (2 persons for 1 day)              | 1        | ls   |             | \$150.00   | \$500.00   | \$80.00    | \$0           | \$150    | \$500   | \$80      | \$730    |
| 2.2 Soil Sampling (TCLP Lead)                            | 3        | ea   | 150.00      | \$10.00    |            |            | \$450         | \$30     | \$0     | \$0       | \$480    |
| 2.3 Characterization/Offsite Disposal Soil Testing       | 2        | ea   | 850.00      | \$20.00    |            |            | \$1,700       | \$40     | \$0     | \$0       | \$1,740  |
| <b>3 MOBILIZATION, DEMOBILIZATION AND FIELD SUPPORT</b>  |          |      |             |            |            |            |               |          |         |           |          |
| 3.1 Office Trailer                                       | 1        | mo   |             |            |            | \$400.00   | \$0           | \$0      | \$0     | \$400     | \$400    |
| 3.2 Field Office Support                                 | 1        | mo   |             | \$200.00   |            |            | \$0           | \$200    | \$0     | \$0       | \$200    |
| 3.3 Storage Trailer                                      | 1        | mo   |             |            |            | \$103.00   | \$0           | \$0      | \$0     | \$103     | \$103    |
| 3.4 Utility Connection/Disconnection (phone/electric)    | 1        | ls   | 1500.00     |            |            |            | \$1,500       | \$0      | \$0     | \$0       | \$1,500  |
| 3.5 Site Utilities                                       | 1        | mo   | 200.00      |            |            |            | \$200         | \$0      | \$0     | \$0       | \$200    |
| 3.6 Underground Utility Clearances                       | 1        | ls   | 1500.00     |            |            |            | \$1,500       | \$0      | \$0     | \$0       | \$1,500  |
| 3.7 Construction Survey Support                          | 2        | day  | 1150.00     |            |            |            | \$2,300       | \$0      | \$0     | \$0       | \$2,300  |
| 3.8 Equipment Mobilization/Demobilization                | 5        | ea   |             |            | \$188.00   | \$566.00   | \$0           | \$0      | \$940   | \$2,830   | \$3,770  |
| 3.9 XRF Scientist  | 5        | day  |             | \$200.00   | \$300.00   |            | \$0           | \$1,000  | \$1,500 | \$0       | \$2,500  |
| 3.10 XRF Rental  | 1        | week |             |            |            | \$1,200.00 | \$0           | \$0      | \$0     | \$1,200   | \$1,200  |
| 3.11 Site Superintendent                                 | 3        | week |             |            | \$1,870.40 |            | \$0           | \$0      | \$5,611 | \$0       | \$5,611  |
| 3.12 Site Health & Safety and QA/QC                      | 3        | week |             |            | \$1,551.60 |            | \$0           | \$0      | \$4,655 | \$0       | \$4,655  |
| 3.13 Materials Storage Pad, 25' X 25'                    | 1        | ls   |             | \$1,000.00 | \$250.00   | \$200.00   | \$0           | \$1,000  | \$250   | \$200     | \$1,450  |
| 3.14 Decontamination Services                            | 3        | week |             | \$275.00   | \$506.25   | \$350.00   | \$0           | \$825    | \$1,519 | \$1,050   | \$3,394  |
| <b>4 SITE PREPARATION</b>                                |          |      |             |            |            |            |               |          |         |           |          |
| 4.1 Clear Site, cut & chip trees                         | 0.2      | acre |             |            | \$3,600.00 | \$2,950.00 | \$0           | \$0      | \$720   | \$590     | \$1,310  |
| 4.2 Clear Site, grasses & brush                          | 0.3      | acre |             |            | \$370.00   | \$345.00   | \$0           | \$0      | \$111   | \$104     | \$215    |
| 4.3 Erosion and Sedimentation Controls                   | 1        | ls   | 1000.00     |            |            |            | \$1,000       | \$0      | \$0     | \$0       | \$1,000  |
| 4.4 Equipment Decon Pad                                  | 1        | ls   |             | \$1,500.00 | \$1,000.00 | \$200.00   | \$0           | \$1,500  | \$1,000 | \$200     | \$2,700  |
| <b>5 EXCAVATION AND DISPOSAL</b>                         |          |      |             |            |            |            |               |          |         |           |          |
| 5.1 Excavator, 3/4cy Capacity                            | 3        | week |             |            | \$3,316.00 | \$3,236.00 | \$0           | \$0      | \$9,948 | \$9,708   | \$19,656 |
| 5.2 Site Labor, (1 laborer)                              | 3        | week |             |            | \$1,400.00 |            | \$0           | \$0      | \$4,200 | \$0       | \$4,200  |
| 5.3 Front End Loader, 3 cy (145HP)                       | 3        | week |             |            | \$2,564.00 | \$2,362.00 | \$0           | \$0      | \$7,692 | \$7,086   | \$14,778 |
| 5.4 Off Site Disposal, Hazardous for Lead                | 0        | ton  | 325.00      |            |            |            | \$0           | \$0      | \$0     | \$0       | \$0      |
| 5.5 Off Site Disposal, Non-Hazardous Soil                | 763      | ton  | 65.00       |            |            |            | \$49,595      | \$0      | \$0     | \$0       | \$49,595 |
| 5.6 Confirmatory Sampling, (lead only, 72 hr TAT)        | 10       | ea   | 46.00       | \$10.00    |            |            | \$460         | \$100    | \$0     | \$0       | \$560    |
| 5.7 Confirmatory Sampling, (PAHs only, 72 hr TAT)        | 0        | ea   | 250.00      | \$10.00    |            |            | \$0           | \$0      | \$0     | \$0       | \$0      |
| 5.8 Confirmatory Sampling, (nitroglycerin only, 72 hr TA | 10       | ea   | 230.00      | \$10.00    |            |            | \$2,300       | \$100    | \$0     | \$0       | \$2,400  |

NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
FIVE SMALL ARMS/SKEET RANGES  
Alternative 3: Treatment, Excavation, and Off-Site Disposal - UXO 17 - Small Arms (Pistol) Range  
Capital Cost

| Item   | Quantity | Unit | Subcontract | Unit Cost |          |           | Subcontract | Extended Cost |          |           | Subtotal         |
|--|----------|------|-------------|-----------|----------|-----------|-------------|---------------|----------|-----------|------------------|
|  |          |      |             | Material  | Labor    | Equipment |             | Material      | Labor    | Equipment |                  |
| <b>6 HAZARDOUS WASTE TREATMENT</b>                       |          |      |             |           |          |           |             |               |          |           |                  |
| 6.1 Hazardous Lead-Contaminated Soil Treatment           | 212      | ton  | 25.00       |           |          |           | \$5,300     | \$0           | \$0      | \$0       | \$5,300          |
| 6.2 Offsite Disposal Soil Testing (TCLP Lead only)       | 3        | ea   | 150.00      | \$10.00   |          |           | \$450       | \$30          | \$0      | \$0       | \$480            |
| <b>7 SITE RESTORATION</b>                                |          |      |             |           |          |           |             |               |          |           |                  |
| 7.1 Clean backfill                                       | 338      | cy   |             | \$19.60   | \$0.53   | \$0.34    | \$0         | \$6,625       | \$179    | \$115     | \$6,919          |
| 7.2 Topsoil, Furnish and Place, 6" thickness             | 1,460    | sy   |             | \$5.40    | \$0.63   | \$0.41    | \$0         | \$7,884       | \$920    | \$599     | \$9,402          |
| 7.3 Dozer, Crawler, 105 H. P.                            | 3        | day  |             |           | \$512.80 | \$751.80  | \$0         | \$0           | \$1,538  | \$2,255   | \$3,794          |
| 7.4 Fine Grading and seeding, incl. lime, fert, and seed | 1,460    | sy   |             | \$0.56    | \$1.78   | \$0.33    | \$0         | \$818         | \$2,599  | \$482     | \$3,898          |
| <b>8 POST CONSTRUCTION COST</b>                          |          |      |             |           |          |           |             |               |          |           |                  |
| 8.1 Contractor Completion Report                         | 40       | hr   |             |           | \$39.00  |           | \$0         | \$0           | \$1,560  | \$0       | \$1,560          |
| <b>Subtotal</b>  |          |      |             |           |          |           | \$66,755    | \$20,301      | \$50,122 | \$27,001  | \$164,180        |
| <b>Local Area Adjustments</b>                            |          |      |             |           |          |           | 100.0%      | 101.6%        | 86.0%    | 96.1%     |                  |
| <b>Subtotal</b>  |          |      |             |           |          |           | \$66,755    | \$20,626      | \$43,105 | \$25,948  | \$156,434        |
| Overhead on Labor Cost @ 30%                             |          |      |             |           |          |           |             |               | \$12,931 |           | \$12,931         |
| G & A on Labor Cost @ 10%                                |          |      |             |           |          |           |             |               | \$4,310  |           | \$4,310          |
| G & A on Material Cost @ 10%                             |          |      |             |           |          |           |             | \$2,063       |          |           | \$2,063          |
| G & A on Equipment Cost @ 10%                            |          |      |             |           |          |           |             |               |          | \$2,595   | \$2,595          |
| G & A on Subcontract Cost @ 10%                          |          |      |             |           |          |           | \$6,676     |               |          |           | \$6,676          |
| Tax on Materials and Equipment Cost @ 6%                 |          |      |             |           |          |           |             | \$1,238       |          | \$1,557   | \$2,794          |
| <b>Total Direct Cost</b>                                 |          |      |             |           |          |           | \$73,431    | \$23,926      | \$60,347 | \$30,100  | \$187,804        |
| Indirects on Total Direct Cost @ 25%                     |          |      |             |           |          |           |             |               |          |           | \$34,412         |
| Profit on Total Direct Cost @ 10%                        |          |      |             |           |          |           |             |               |          |           | \$18,780         |
| <b>Subtotal</b>  |          |      |             |           |          |           |             |               |          |           | \$240,996        |
| Health & Safety Monitoring @ 2%                          |          |      |             |           |          |           |             |               |          |           | \$4,820          |
| <b>Total Field Cost</b>                                  |          |      |             |           |          |           |             |               |          |           | \$245,816        |
| Contingency on Total Field Costs @ 20%                   |          |      |             |           |          |           |             |               |          |           | \$49,163         |
| Engineering on Total Field Cost @ 6%                     |          |      |             |           |          |           |             |               |          |           | \$11,740         |
| <b>TOTAL CAPITAL COST</b>                                |          |      |             |           |          |           |             |               |          |           | <b>\$306,719</b> |

NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
FIVE SMALL ARMS/SKEET RANGES  
Alternative 3: Treatment, Excavation, and Off-Site Disposal- UXO 25 - Roach Road Rifle Range  
Capital Cost

| Item  | Quantity | Unit | Subcontract | Unit Cost  |            |            | Subcontract | Extended Cost |         |           | Subtotal |
|---|----------|------|-------------|------------|------------|------------|-------------|---------------|---------|-----------|----------|
|   |          |      |             | Material   | Labor      | Equipment  |             | Material      | Labor   | Equipment |          |
| <b>1 PROJECT PLANNING</b>                               |          |      |             |            |            |            |             |               |         |           |          |
| 1.1 Prepare Documents & Plans                           | 60       | hr   |             |            | \$39.00    |            | \$0         | \$0           | \$2,340 | \$0       | \$2,340  |
| <b>2 INITIAL CHARACTERIZATION</b>                       |          |      |             |            |            |            |             |               |         |           |          |
| 2.1 Sample Collection (2 persons for 1 day)             | 1        | ls   |             | \$300.00   | \$600.00   | \$100.00   | \$0         | \$300         | \$600   | \$100     | \$1,000  |
| 2.2 Soil Sampling (TCLP Lead)                           | 1        | ea   | 150.00      | \$10.00    |            |            | \$150       | \$10          | \$0     | \$0       | \$160    |
| 2.3 Characterization/Offsite Disposal Soil Testing      | 1        | ea   | 850.00      | \$20.00    |            |            | \$850       | \$20          | \$0     | \$0       | \$870    |
| <b>3 MOBILIZATION, DEMOBILIZATION AND FIELD SUPPORT</b> |          |      |             |            |            |            |             |               |         |           |          |
| 3.1 Office Trailer                                      | 0.5      | mo   |             |            |            | \$400.00   | \$0         | \$0           | \$0     | \$200     | \$200    |
| 3.2 Field Office Support                                | 0.5      | mo   |             | \$200.00   |            |            | \$0         | \$100         | \$0     | \$0       | \$100    |
| 3.3 Storage Trailer                                     | 0.5      | mo   |             |            |            | \$103.00   | \$0         | \$0           | \$0     | \$52      | \$52     |
| 3.4 Utility Connection/Disconnection (phone/electric)   | 1        | ls   | 1500.00     |            |            |            | \$1,500     | \$0           | \$0     | \$0       | \$1,500  |
| 3.5 Site Utilities                                      | 0.5      | mo   | 200.00      |            |            |            | \$100       | \$0           | \$0     | \$0       | \$100    |
| 3.6 Underground Utility Clearances                      | 1        | ls   | 1500.00     |            |            |            | \$1,500     | \$0           | \$0     | \$0       | \$1,500  |
| 3.7 Construction Survey Support                         | 2        | day  | 1150.00     |            |            |            | \$2,300     | \$0           | \$0     | \$0       | \$2,300  |
| 3.8 Equipment Mobilization/Demobilization               | 5        | ea   |             |            | \$188.00   | \$566.00   | \$0         | \$0           | \$940   | \$2,830   | \$3,770  |
| 3.9 XRF Scientist                                       | 3        | day  |             | \$200.00   | \$300.00   |            | \$0         | \$600         | \$900   | \$0       | \$1,500  |
| 3.10 XRF Rental   | 1        | week |             |            |            | \$1,200.00 | \$0         | \$0           | \$0     | \$1,200   | \$1,200  |
| 3.11 Site Superintendent                                | 1        | week |             |            | \$1,870.40 |            | \$0         | \$0           | \$1,870 | \$0       | \$1,870  |
| 3.12 Site Health & Safety and QA/QC                     | 1        | week |             |            | \$1,551.60 |            | \$0         | \$0           | \$1,552 | \$0       | \$1,552  |
| 3.13 Materials Storage Pad, 25' X 25'                   | 1        | ls   |             | \$1,000.00 | \$250.00   | \$200.00   | \$0         | \$1,000       | \$250   | \$200     | \$1,450  |
| 3.14 Decontamination Services                           | 1        | week |             | \$275.00   | \$506.25   | \$350.00   | \$0         | \$275         | \$506   | \$350     | \$1,131  |
| <b>4 SITE PREPARATION</b>                               |          |      |             |            |            |            |             |               |         |           |          |
| 4.1 Temporary Access Roads, 4" gravel, geotextile       | 1        | ls   |             | 2000.00    |            |            | \$0         | \$2,000       | \$0     | \$0       | \$2,000  |
| 4.2 Clear Site, cut & chip trees to 4" diam.            | 0.3      | acre |             |            | \$3,600.00 | \$2,950.00 | \$0         | \$0           | \$1,080 | \$885     | \$1,965  |
| 4.3 Clear Site, grasses & brush                         | 0.2      | acre |             |            | \$370.00   | \$345.00   | \$0         | \$0           | \$74    | \$69      | \$143    |
| 4.4 Erosion and Sedimentation Controls                  | 1        | ls   | 1000.00     |            |            |            | \$1,000     | \$0           | \$0     | \$0       | \$1,000  |
| 4.5 Equipment Decon Pad                                 | 1        | ls   |             | \$1,500.00 | \$1,000.00 | \$200.00   | \$0         | \$1,500       | \$1,000 | \$200     | \$2,700  |
| <b>5 EXCAVATION AND DISPOSAL</b>                        |          |      |             |            |            |            |             |               |         |           |          |
| 5.1 Excavator, 3/4cy Capacity                           | 1        | week |             |            | \$3,316.00 | \$3,236.00 | \$0         | \$0           | \$3,316 | \$3,236   | \$6,552  |
| 5.2 Site Labor, (1 laborer)                             | 1        | week |             |            | \$1,400.00 |            | \$0         | \$0           | \$1,400 | \$0       | \$1,400  |
| 5.3 Crawler Loader 1 to 1-1/2 cy (80HP)                 | 1        | week |             |            | \$2,564.00 | \$2,443.00 | \$0         | \$0           | \$2,564 | \$2,443   | \$5,007  |
| 5.4 Off Site Disposal, Hazardous for Lead               | 0        | ton  | 325.00      |            |            |            | \$0         | \$0           | \$0     | \$0       | \$0      |
| 5.5 Off Site Disposal, Non-Hazardous Soil               | 65       | ton  | 65.00       |            |            |            | \$4,225     | \$0           | \$0     | \$0       | \$4,225  |
| 5.6 Confirmatory Sampling, (lead only, 72 hr TAT)       | 5        | ea   | 46.00       | \$10.00    |            |            | \$230       | \$50          | \$0     | \$0       | \$280    |
| 5.7 Confirmatory Sampling, (PAHs only, 72 hr TAT)       | 0        | ea   | 250.00      | \$10.00    |            |            | \$0         | \$0           | \$0     | \$0       | \$0      |
| <b>6 HAZARDOUS WASTE TREATMENT</b>                      |          |      |             |            |            |            |             |               |         |           |          |
| 6.1 Hazardous Lead-Contaminated Soil Treatment          | 52       | ton  | 25.00       |            |            |            | \$1,300     | \$0           | \$0     | \$0       | \$1,300  |
| 6.2 Offsite Disposal Soil Testing (TCLP Lead only)      | 1        | ea   | 150.00      | \$10.00    |            |            | \$150       | \$10          | \$0     | \$0       | \$160    |

NSF INDIAN HEAD STUMP NECK ANNEX  
INDIAN HEAD, MARYLAND  
FIVE SMALL ARMS/SKEET RANGES  
Alternative 3: Treatment, Excavation, and Off-Site Disposal- UXO 25 - Roach Road Rifle Range  
Capital Cost

| Item  | Quantity | Unit | Unit Cost |            |            | Subcontract | Extended Cost |          |           | Subtotal         |
|---|----------|------|-----------|------------|------------|-------------|---------------|----------|-----------|------------------|
|   |          |      | Material  | Labor      | Equipment  |             | Material      | Labor    | Equipment |                  |
| <b>7 SITE RESTORATION</b>   |          |      |           |            |            |             |               |          |           |                  |
| 7.1 Clean backfill  | 30       | cy   | \$19.60   | \$0.53     | \$0.34     | \$0         | \$588         | \$16     | \$10      | \$614            |
| 7.2 Topsoil, Furnish and Place, 6" thickness                                      | 88       | sy   | \$5.40    | \$0.63     | \$0.41     | \$0         | \$475         | \$55     | \$36      | \$567            |
| 7.3 Dozer, Crawler 105 H. P.  | 1        | week |           | \$2,564.00 | \$2,754.00 | \$0         | \$0           | \$2,564  | \$2,754   | \$5,318          |
| 7.4 Fine Grading and seeding, incl. lime, fert, and seed                          | 88       | sy   | \$0.56    | \$1.78     | \$0.33     | \$0         | \$49          | \$157    | \$29      | \$235            |
| <b>8 POST CONSTRUCTION COST</b>   |          |      |           |            |            |             |               |          |           |                  |
| 8.1 Contractor Completion Report  | 40       | hr   |           | \$39.00    |            | \$0         | \$0           | \$1,560  | \$0       | \$1,560          |
| <b>Subtotal</b>   |          |      |           |            |            | \$13,305    | \$6,977       | \$22,744 | \$14,594  | \$57,621         |
| <b>Local Area Adjustments</b>   |          |      |           |            |            | 100.0%      | 101.6%        | 86.0%    | 96.1%     |                  |
| <b>Subtotal</b>   |          |      |           |            |            | \$13,305    | \$7,089       | \$19,560 | \$14,025  | \$53,979         |
| Overhead on Labor Cost @ 30%  |          |      |           |            |            |             |               | \$5,868  |           | \$5,868          |
| G & A on Labor Cost @ 10%   |          |      |           |            |            |             |               | \$1,956  |           | \$1,956          |
| G & A on Material Cost @ 10%  |          |      |           |            |            |             | \$709         |          |           | \$709            |
| G & A on Equipment Cost @ 10%   |          |      |           |            |            |             |               |          | \$1,402   | \$1,402          |
| G & A on Subcontract Cost @ 10%   |          |      |           |            |            | \$1,331     |               |          |           | \$1,331          |
| Tax on Materials and Equipment Cost @ 6%  |          |      |           |            |            |             | \$425         |          | \$841     | \$1,267          |
| <b>Total Direct Cost</b>  |          |      |           |            |            | \$14,636    | \$8,223       | \$27,384 | \$16,269  | \$66,512         |
| Indirects on Total Direct Cost @ 25% (excluding transportation and disposal cost) |          |      |           |            |            |             |               |          |           | \$15,572         |
| Profit on Total Direct Cost @ 10%   |          |      |           |            |            |             |               |          |           | \$6,651          |
| <b>Subtotal</b>   |          |      |           |            |            |             |               |          |           | \$88,734         |
| Health & Safety Monitoring @ 2% (includes air quality monitoring)                 |          |      |           |            |            |             |               |          |           | \$1,775          |
| <b>Total Field Cost</b>   |          |      |           |            |            |             |               |          |           | \$90,509         |
| Contingency on Total Field Costs @ 20%  |          |      |           |            |            |             |               |          |           | \$18,102         |
| Engineering on Total Field Cost @ 6% (excluding transportation and disposal cost) |          |      |           |            |            |             |               |          |           | \$5,177          |
| <b>TOTAL CAPITAL COST</b>   |          |      |           |            |            |             |               |          |           | <b>\$113,788</b> |