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# FINAL PRELIMINARY ASSESSMENT SITE INSPECTION REPORT FOR UNEXPLODED ORDNANCE SITE UXO 22 FORMER MUNITIONS DISPOSAL AREA MCB CAMP LEJEUNE NC

4/1/2013

CH2MHILL

Final

# Preliminary Assessment/Site Inspection Report
# Site UXO-22 – Former Munitions Disposal Area

## Marine Corps Installations East – Marine Corps Base Camp Lejeune
## Jacksonville, North Carolina

**Contract Task Order 0014**

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# Executive Summary

A Preliminary Assessment/Site Inspection (PA/SI) was conducted at Site unexploded ordnance (UXO)-22 – Former Munitions Disposal Area, located at Marine Corps Installations East-Marine Corps Base Camp Lejeune (MCIEAST-MCB CAMLEJ) in Jacksonville, North Carolina. Investigation activities were conducted to evaluate the presence and nature of munitions constituents (MC) contamination and a review of historical investigations was conducted to evaluate the risk from explosive hazards of munitions and explosives of concern (MEC) and to determine if additional investigations are warranted.

Site UXO-22 covers an area of approximately 75 acres on the Mainside area of the Base. The site is accessed from an unnamed dirt road that bisects the site from east to west and links Piney Green Road and Holcomb Boulevard. The site boundary of Site UXO-22 encompasses the location of the former Munitions Disposal Area and portions of Installation Restoration (IR) Sites 6 and 82 within Operable Unit (OU) 2.

The investigation at Site UXO-22 was conducted from December 2011 to March 2012 and included the collection of data from subsurface soil, groundwater, and surface soil samples. In the report, results from subsurface sampling conducted during the 2010 burial pit investigation of material potentially presenting an explosive hazard (MPPEH) and test pitting conducted during the 2011 chlorobenzene supplemental investigation of Site 6 were incorporated.

A total of 25 subsurface soil samples were analyzed from the three investigations, 11 from the PA/SI, 4 from the MPPEH burial pit excavation, and 10 from the Site 6 chlorobenzene investigation. One explosive, 2,4-dinitrotoluene, was detected in exceedance of regulatory standards in one of the 25 subsurface soil samples. Several metals were detected in exceedance across the study area, including antimony, hexavalent chromium, chromium, cobalt, lead, and manganese.

A total of 6 groundwater samples were collected and analyzed during the PA/SI. Two explosives, 2-nitrotoluene and nitrobenzene, were detected in exceedance of regulatory standards in one of the 6 samples. Several metals were detected in exceedance across the study area, including antimony, cadmium, and manganese.

Sediment sampling was conducted at an ephemeral drainage point at UXO-22, which was dry during sampling, leading the samples to be labeled as surface soil as opposed to sediment. While only two samples were analyzed, several metals were found to exceed regulatory standards including arsenic, cadmium, copper, iron, manganese, mercury, thallium, and zinc.

The data collected throughout the investigation was screened against applicable regulatory criteria and MCIEAST-MCB CAMLEJ background concentrations and was compared to human health and ecological screening values to evaluate impacts to human health and ecological receptors as part of the Human Health Risk Screening (HHRS) and Ecological Risk Screening (ERS). A Phase II Human Health Risk Assessment (HHRA) and an Ecological Risk Assessment (ERA) were conducted based on the HHRS and ERS with the objective of assessing health and ecological risks associated with exposure to subsurface soil, groundwater, and surface soil from the ephemeral drainage at UXO-22.

The HHRA determined that subsurface soil at UXO-22 may present unacceptable non-carcinogenic hazards and carcinogenic risks to potential future child and lifetime residents due to the levels of hexavalent chromium and thallium. Groundwater does not pose unacceptable risk to current or future residents at the site. Potential current and future contact with surface soil in the ephemeral drainage by child trespassers/visitors may result in unacceptable non-carcinogenic hazards due to the thallium concentration in one sample.

Access to many areas of the site is restricted by either fencing or vegetation and terrain. Generally, the accessible open gravel areas are unlikely to contain MEC/MPPEH on the surface. Because of the existing LUCs, the posted warning signs, and the UXO awareness training, it is unlikely that site workers would come into contact with MEC/MPPEH located below surface. Unauthorized site visitors or site workers who venture outside their typical work areas could encounter MEC/MPPEH, especially in the wooded areas where MEC surface clearance has not been performed. If MEC and MPPEH of the types previously discovered are on-site and did not function as designed, the probability of an unintentional detonation by casual contact, such as accidently stepping on it, is high. More aggressive contact, such as striking the MEC and MPPEH or putting it in a fire, would make the probability of detonation even higher.

The ERA determined that while constituents in groundwater are not expected to pose a significant risk to ecological receptor populations, terrestrial receptors are potentially at risk from metals in subsurface soil and the soils in the ephemeral drainage. The ephemeral drainage is not likely to support populations of aquatic organisms due to transient presence of water, but terrestrial receptors may be exposed. Wallace Creek and the associated wetlands, located northwest of the site, were not sampled during the investigation, but there is a potential that metals from site soils have been transported downgradient into these habitats.

Based on the results of this PA/SI, a Remedial Investigation (RI) is recommended at UXO-22 to further characterize the nature and extent of MEC. As there is a potential for explosives hazards at the site, the Explosives Safety Submission (ESS) must be followed, including oversight by properly trained UXO technicians and the establishment of exclusion zones whenever intrusive activities are performed on the site. This PA/SI also recommends no further action for metals at the site based on evidence that the exceedances are likely associated with long-term use as a historical storage and disposal area rather than the presence of MPPEH and MEC, potential unacceptable human health risks were calculated assuming direct contact with the highest concentrations as opposed to the more reasonable central tendency exposure (CTE) scenario, and groundwater at UXO-22 is not a current potable source nor is intended to be, especially as the site is encompassed within the aquifer use control boundary in place for OU 2. Potential unacceptable ecological risks from the subsurface soil and surface soil from the ephemeral drainage should be further evaluated as part of the Sites 6 and 82 supplemental investigations.

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**Appendixes**

## Tables



## Figures

# Acronyms and Abbreviations

| | |
|---|---|
| ºF | degrees Fahrenheit |
| ADAF | age-dependent adjustment factor |
| AST | aboveground storage tank |
| bgs | below ground surface |
| BTV | background threshold value |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CLEAN | Comprehensive Long-term Environmental Action—Navy |
| COPC | contaminant of potential concern |
| CSF | cancer slope factor |
| CSM | conceptual site model |
| CTE | central tendency exposure |
| DDESB | Department of Defense Explosives Safety Board |
| DDT | dichlorodiphenyltrichloroethane |
| DGM | digital geophysical mapping |
| DPT | direct-push technology |
| DRMO | Defense Reutilization and Marketing Office |
| EcoSSL | ecological soil screening level |
| ECP | environmental condition of property |
| ELCR | excess lifetime carcinogenic risk |
| EOD | Explosive Ordnance Disposal |
| EPC | exposure point concentration |
| ERA | ecological risk assessment |
| ERS | ecological risk screening |
| ESS | Explosives Safety Submission |
| ESV | ecological screening value |
| ft | feet |
| ft/ft | foot per foot |
| GI | gastrointestinal |
| GPR | ground-penetrating radar |
| HE | high explosive |
| HHRA | human health risk assessment |
| HHRS | human health risk screening |
| HI | hazard index |
| HQ | hazard quotient |
| ID | inside diameter |
| IDW | investigation-derived waste |
| IEUBK | Integrated Exposure Uptake |
| IRIS | Integrated Risk Information System |
| IRP | Installation Restoration Program |
| IUR | inhalation unit risks |
| LDSI | Land Design Surveying Inc. |
| LOAEL | Lowest Observed Adverse Effect Level |
| LTM | long-term monitoring |
| LUC | land use control |

| | |
|---|---|
| µg/dl | micrograms per deciliter |
| µg/kg | micrograms per kilogram |
| µg/L | micrograms per liter |
| MARCORSYSCOM | Marine Corps Systems Command |
| MC | munitions constituents |
| MCIEAST-MCB CAMLEJ | Marine Corps Installations East - Marine Corps Base Camp Lejeune |
| MCL | maximum contaminant level |
| MDAS | material documented as safe |
| MEC | munitions and explosives of concern |
| MF | modifying factor |
| mg/kg | milligrams per kilogram |
| mm | millimeter |
| MMOA | mutagenic mode of action |
| MMRP | Military Munitions Response Program |
| MPPEH | material potentially presenting an explosive hazard |
| MR | munitions response |
| MRP | Munitions Response Program |
| MRSPP | Munitions Response Site Prioritization Protocol |
| NAVFAC | Naval Facilities Engineering Command |
| NCDENR | North Carolina Department of Environment and Natural Resources |
| NCGWQS | North Carolina Groundwater Quality Standards |
| NC SSL | North Carolina Soil Screening Level |
| NOAEL | No Observed Adverse Effect Level |
| NRWQC | National Recommended Water Quality Criteria |
| OHM | OHM Remediation Services Corporation |
| OU | operable unit |
| PA/SI | Preliminary Assessment/Site Inspection |
| PCBs | polychlorinated biphenyls |
| PD | point detonating |
| PETN | pentaerythritol tetranitrate |
| PID | photoionization detector |
| PPRTV | Provisional Peer-Reviewed Toxicity Values |
| PSI | potential source investigation |
| QA/QC | quality assurance/quality control |
| RAGS | Risk Assessment Guidance for Superfund |
| RfC | reference concentration |
| RfD | reference dose |
| Rhea | Rhea Engineers and Consultants, Inc. |
| RI | remedial investigation |
| RME | reasonable maximum exposure |
| ROD | Record of Decision |
| RSL | Regional Screening Level |
| SAP | Sampling and Analysis Plan |
| SVOC | semivolatile organic compound |
| TAL | target analyte list |
| TCRA | time-critical removal action |
| TOC | total organic carbon |

| | |
|---|---|
| UCL | upper confidence limit |
| UF | uncertainty factor |
| USEPA | U.S. Environmental Protection Agency |
| UTL | upper tolerance limit |
| UXO | unexploded ordnance |
| VC | vinyl chloride |
| VOC | volatile organic compound |

SECTION 1

# Introduction

This report documents the findings of a Preliminary Assessment/Site Inspection (PA/SI) conducted at Military Munitions Response Program (MMRP) Site unexploded ordnance (UXO)-22 – Former Munitions Disposal Area, located at Marine Corps Installations East-Marine Corps Base Camp Lejeune (MCIEAST-MCB CAMLEJ or the Base) in Jacksonville, North Carolina (**Figure 1-1**).

This PA/SI was conducted by CH2M HILL under the Naval Facilities Engineering Command (NAVFAC) Navy Comprehensive Long-term Environmental Action—Navy (CLEAN) Contract N62470-08-D-1000, Contract Task Order 0014.

## 1.1 Objectives and Approach

MCIEAST-MCB CAMLEJ is in the process of investigating closed ranges and munitions disposal areas at the Base following the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. Reported historical disposal activities at Site UXO-22 have prompted this PA/SI, the first phase of the CERCLA process. In June 2012, UXO-22 was scored as Priority 4, out of 8, with respect to other munitions sites, based on the Department of Defense Munitions Response Site Prioritization Protocol Primer (MRSPP) (**Appendix A**).

The primary objective of this environmental investigation was to the identify potential environmental impacts related to munitions constituents (MC) that may be present related to historical munitions-related disposal practices within Site UXO-22, and to evaluate whether these impacts warrant further assessment. This objective was addressed by sampling and analysis of environmental media for MC, and by conducting human health and ecological risk screenings.

Site UXO-22 is comprised of portions of Operable Unit (OU) 2, Sites 6 and 82, which have undergone investigation and remediation associated with non-MC-related constituents under the Installation Restoration Program (IRP). During the previous activities, munitions and explosives of concern (MEC) were discovered. Therefore, a secondary objective of this PA/SI was to summarize past events at Site UXO-22 and to assess the potential for MEC to affect environmental media and receptors.

This PA/SI was conducted in accordance with the *Sampling and Analysis Plan (Field Sampling Plan and Quality Assurance Project Plan) for Preliminary Assessment/Site Inspection, Site UXO-22—Former Munitions Disposal Area, Marine Corps Base Camp Lejeune, Jacksonville, North Carolina (*Sampling and Analysis Plan [SAP]) (CH2M HILL, 2012b); and the *Munitions Response Program Master Project Plans, Marine Corps Base Camp Lejeune, Jacksonville, North Carolina* (CH2M HILL, 2008) (Munitions Response Program [MRP] Master Project Plans).

The general approach for this PA/SI was as follows:

- Conduct a thorough review and present a summary of all investigation and remediation documents to identify historical activities that may have resulted in MEC or MC contamination at the site, including a review of archival records.
- Evaluate the potential presence and nature of MC contamination by conducting sampling and laboratory analysis of soil and groundwater.
- Conduct human health and ecological risk screenings.

## 1.2 Report Organization

This PA/SI report is organized as follows:

- Section 1, Introduction – Objectives and approach

- Section 2, Site Background – Description of the Site location, setting, history, previous investigations, climate, geology, and hydrogeology
- Section 3, Field Investigation Activities – The technical approach, methods, operational procedures, and summary of field investigations conducted at the Site
- Section 4, Investigation Results – Presentation of analytical results and comparisons to screening values
- Section 5, Human Health Risk Evaluation – Evaluation of the potential for human health risks
- Section 6, Ecological Risk Screening – Evaluation of the potential for ecological risks associated with exposure of ecological receptors to MC
- Section 7, Conclusions and Recommendations – Summary of the conclusions and recommendations
- Section 8, References – List of references cited in the preceding sections.

Figures and tables are proved at the end of each section and appendices are provided at the end of the document.

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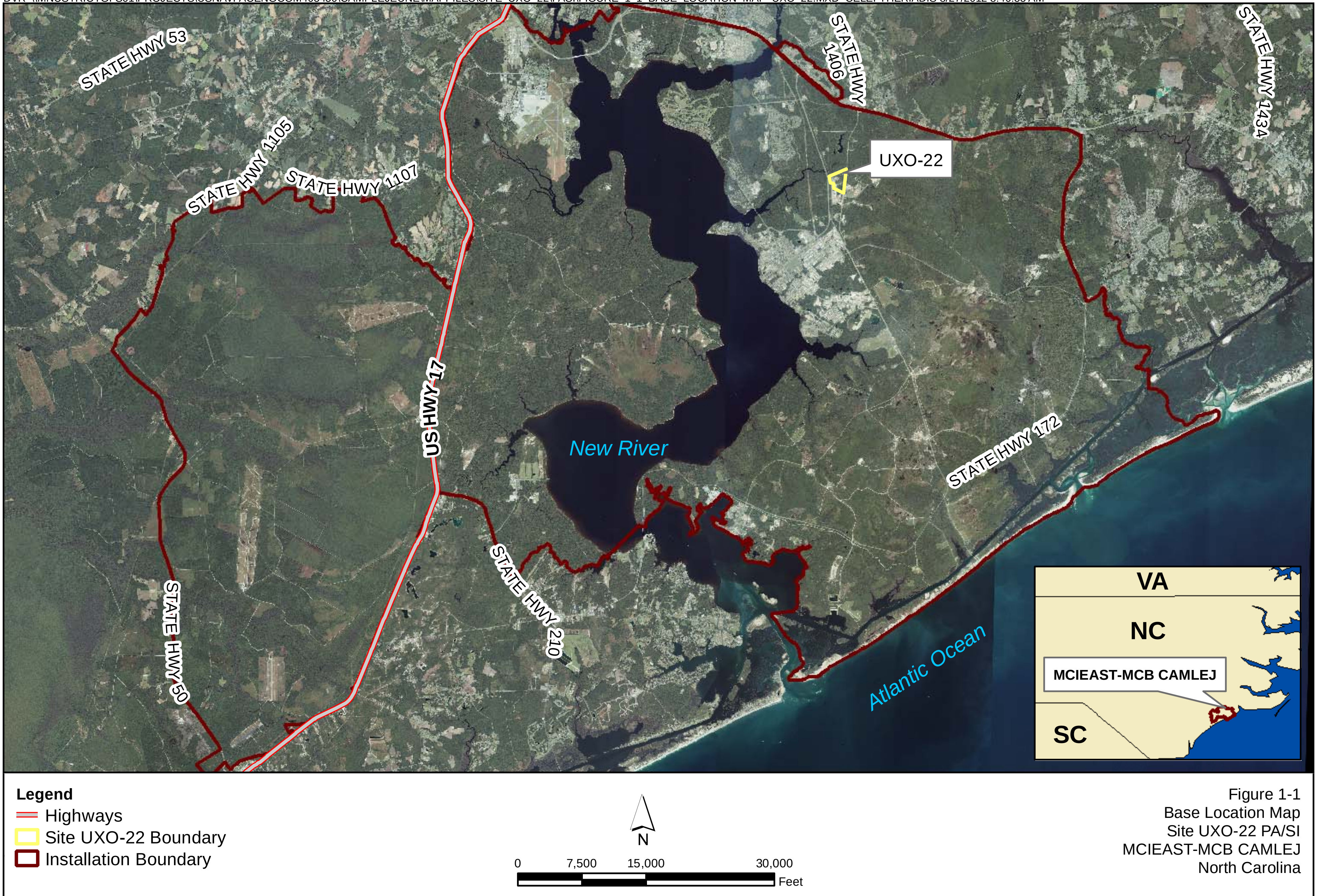


**Legend**

- Highways
- Site UXO-22 Boundary
- Installation Boundary

1 inch = 15,000 feet

Figure 1-1
Base Location Map
Site UXO-22 PA/SI
MCIEAST-MCB CAMLEJ
North Carolina

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SECTION 2
# Site Background

This section presents a summary of regional and site-specific information, including location, site setting, physical characteristics, and history.

## 2.1 Base Location and Description

MCIEAST-MCB CAMLEJ covers approximately 236 square miles in Onslow County, North Carolina, and is bisected by the New River, that flows in a southeasterly direction toward the Atlantic Ocean (**Figure 1-1**). Construction of the Base began in 1941 and since then has been the home of "Expeditionary Forces in Readiness" (Marine Corps Base Camp Lejeune, 2012).

The Base mission is to maintain combat-ready units for expeditionary deployment. The Base owns all the real estate, hosts entry-level and career-level formal schools and provides support and training for tenant commands. The Base and surrounding community is home to an active duty, dependent, retiree, and civilian population of approximately 170,000 people. Land use surrounding the Base is varied, with mainly commercial properties along the northern boundary. The eastern and western boundaries of the Base are a mix of agricultural and residential land. The southern boundary of the Base extends to the New River and Atlantic Ocean.

## 2.2 Site Setting

Site UXO-22 covers an area of approximately 75 acres on the Mainside area of the Base (**Figure 2-1**). The site is accessed from an unnamed dirt road that bisects the site from east to west and links Piney Green Road and Holcomb Boulevard. Access is restricted to military personnel and civilians authorized to enter the Base. Intrusive activities are also restricted through land use control (LUC) boundaries for Sites 6 and 82 (**Figure 2-2**). Signs are posted that provide notification of potential environmental hazards, and the former Defense Reutilization and Marketing Office (DRMO) lot is fenced and remains locked.

The surface topography within the central and southern portions of the site is generally level and slopes gently toward Wallace Creek in the northern portion of the site. A narrow, ephemeral drainage feature runs from the north-central portion of the site and trends northwest to Wallace Creek. Vegetative cover ranges from coniferous woodland to open grassy areas and compacted gravel or bare ground at Lots 201 and 203. Stormwater runoff from the northern portion of Site UXO-22 is expected to flow in a northerly direction toward the ephemeral drainage and then discharge into Wallace Creek. Runoff from the area south of the unnamed road flows in a southerly direction toward Bearhead Creek (a tributary of Wallace Creek) or a stormwater retention pond directly southwest of Site UXO-22 next to the Base truck scales.

Land uses at Site UXO-22 are industrial and commercial, consisting of the base truck scales, equipment staging areas, parking lots, and a groundwater remediation system for Site 82.

## 2.3 Site History and Previous Investigations

### 2.3.1 Site History

The earliest documentation of land use at Site UXO-22 is from archival aerial photography taken in 1948 that shows cleared land, the unnamed road between Holcomb Boulevard and Piney Green Road and areas of re-worked earth. Subsequent photographs and maps reveal the presence of structures in the 1960s that are no longer in existence. Historically, these areas of re-worked earth at Site UXO-22 were used for storage and disposal of wastes and supplies, including pesticides; transformers containing polychlorinated biphenyls (PCBs); solvents; electrolytes; waste oils; batteries; and other waste debris such as communication wire and material potentially presenting an explosive hazard (MPPEH). Lot 201 is used to store military equipment, vehicles, hydraulic oils, and other non-hazardous supplies. Most of Lot 203 is an open field, with 21 acres formerly used from 2001 through 2012 by DRMO as a temporary scrap and surplus storage lot. No former range activities are known to have occurred at the site. Site history, including interviews with current and former Base personnel, is discussed in detail in the Site UXO-22 Archival Records Search Report (**Appendix B**).

### 2.3.2 Previous Investigations

Since 1983, numerous phases of environmental investigation and remediation have been conducted at OU 2. These previous investigations identified potential unacceptable risks from exposure to pesticides, PCBs, and metals in soil and volatile organic compounds (VOCs) and metals in groundwater at Sites 6 and 82. A Record of Decision (ROD) was signed in 1993 and identified the selected remedy to include excavation of soil to achieve industrial use, groundwater extraction and treatment to address VOCs in groundwater, long-term monitoring (LTM) to monitor groundwater and potential migration, and LUCs to prevent exposure to impacted soil and groundwater, prevent non-industrial land use, and prevent aquifer use (Baker, 1993b) (**Figure 2-2**). The remedies are in-place at Sites 6 and 82 and supplemental investigations and actions have been conducted and are ongoing to delineate the nature and extent of chlorobenzene contamination at Site 6, further evaluate source areas, delineate the vertical and lateral extent of VOC contamination at Site 82, and conduct additional groundwater evaluation for metals at Sites 6 and 82. The remedy, including LUCs and LTM, for OU 2 may be updated based on these additional investigation results.

During the previous and ongoing investigation and remediation activities, MEC and MPPEH have been discovered at the site. **Table 2-1** presents a summary of the previous investigations where munitions-related items were found. The following MEC items have been discovered:

- Mortar Shell, 81-millimeter (mm), high explosive, M43 with fuze M45 (1) – 2010 MPPEH Pit Intrusive Investigation
- Mortar Shell, 60-mm, high explosive, M49 without fuze (1) – 2010 MPPEH Pit Intrusive Investigation
- Rocket, 3.5-inch, high explosive anti-tank HEAT, M28 (1) – 2010 MPPEH Pit Intrusive Investigation
- MK II hand grenade (7) – 1993 Remedial Investigation (RI) and 2012 Site 6 and 82 Supplemental Investigation

Over 2,000 MPPEH items including rocket motors, various practice projectiles, expended cartridge casings, and expended small arms ammunition casings have been discovered at Site UXO-22 and upon proper inspection subsequently been determined to be material documented as safe (MDAS). **Figure 2-3** presents the locations and types of MEC and MPPEH items discovered.

Following the discovery of a MPPEH burial pit between the former DRMO and Base Scales in 2008, an Explosives Safety Submission (ESS) (CH2MHILL, 2009a), and subsequent ESS Amendment (CH2MHILL, 2009b) were prepared for completing the MPPEH burial pit investigation and subsequent activities conducted at the site. Site UXO-22 was incorporated into the MMRP in May 2010.

## 2.4 MCIEAST-MCB CAMLEJ Regional Climate

Mild winters and hot, humid summers generally characterize climatic conditions within southeastern North Carolina and at the Base. Winters are usually short and mild with occasional short, cold periods. Summers are long, hot, and humid, with an average humidity of 75 percent. Average annual net precipitation is approximately 54 inches. Ambient air temperatures generally range from 37 to 60 degrees Fahrenheit (°F) in the winter months and 71°F to 88°F during the summer months. Winds are generally south-southwesterly in the summer and north-northwesterly in the winter (NOAA website, 2012).

## 2.5 Geology and Hydrogeology

Regional geology and hydrogeology at the Base are discussed in Sections 1.6 and 1.7, respectively, of the MRP Master Project Plans (CH2M HILL, 2008). Potable water available to the Base and the surrounding residential area is provided by water supply wells that pump groundwater from the deep Castle Hayne aquifer. There is an aquifer use control in-place to prevent aquifer use in the area surrounding UXO-22 (**Figure 2-2**).

Site UXO-22 is underlain by light-colored, fine-grained sands extending to depths of at least 50 feet (ft) below ground surface (bgs), with discontinuous silty or clayey sand lenses occurring at depths from 10 to 50 ft bgs.

Beneath the finer-grained lenses lie massive fine-grained sands and occasional cemented limestone beds of the River Bend and Castle Hayne formations, extending to more than 200 ft bgs. Anthropogenic disturbances have re-worked the surficial lithology up to depths of 18.5 ft bgs at select locations at the site due to excavation and dumping activities. In addition, a layer of burned material is encountered at depths less than 5 ft bgs throughout much of the central portion of the site encompassing the former DRMO.

**Figure 2-4** depicts the potentiometric surface of the water table in December 2011, indicating that groundwater flow on the site was generally to the north and northwest. The direction of groundwater flow within the surficial and underlying upper Castle Hayne aquifers is north toward Wallace Creek. This mimics the surface topography, which is generally flat until the ground slopes down toward Wallace Creek in the northern portion of the DRMO.

Depth to water ranges from 7 ft bgs in the south to 17 ft bgs in the north. The potentiometric surface elevations **(Table 2-2)** range from 9.70 to 16.68 ft above mean sea level. The horizontal hydraulic gradients in December 2012 ranged from 0.004 foot/foot (ft/ft) in the central portion of the site to 0.007 ft/ft in the northwest portion.

TABLE 2-1
Previous and Ongoing Investigations Where MPPEH/MEC Were Discovered
*Site UXO-22 PA/SI*
*MCIEAST-MCB CAMLEJ, North Carolina*

| Previous Investigation | Date | Activities | MEC/MPPEH Found |
|---|---|---|---|
| OU 2Remedial Investigation (RI) (Baker, 1993a) | 1993 | Evaluated the nature and extent of contamination at OU2 (Sites, 6, 9, and 82).<br>Geophysical survey at IR Site 6 included EM-31, magnetometer and ground-penetrating radar (GPR) surveys in formerly cleared areas identified on historical aerial photographs. Results indicated geophysical anomalies within the former DRMO area.<br>A UXO survey conducted as part of the RI performed at IR Site 6 included clearance of monitoring well and soil borings and test pit and trenching activities. MEC and MPPEH items were discovered in both the subsurface and surface during clearance activities. MEC was disposed of by Base Explosive Ordnance Disposal (EOD) and MPPEH was scrapped.<br>Organic compounds (primarily PCBs, pesticides, VOCs, and semi-volatile organic compounds [SVOCs]) and inorganic compounds (primarily barium, cadmium, chromium, lead, manganese, and zinc) were detected in soil and groundwater at Site 6. VOCs and chlorinated VOCs were identified throughout Sites 6 and 82. The Human Health Risk Assessment (HHRA) identified potential human health risks due to exposure to vinyl chloride (VC), arsenic, and beryllium in groundwater and PCB-1260 in biota from Wallace Creek. The findings of the Ecological Risk Assessment (ERA) indicated that OU2 may be adversely impacting the ecological integrity of Wallace Creek, Bear Head Creek, and the ephemeral drainage. | MEC<br>• Mark II Grenade (3)<br>MPPEH<br>• 50-Caliber Cartridges (40)<br>• 3.5-inch practice rockets (15)<br>• 20-mm cartridges (10)<br>• 30-mm cartridges (23)<br>• 40-mm cartridges (54)<br>• 90/95/105/106-mm cartridges (~1000)<br>• Rocket motors, 3.5-inch (unknown)<br>Small Arms Ammunition<br>• 7.62-mm Ammunition rounds (100) |
| OU 2 Time-Critical Removal Actions (TCRAs) (Baker Environmental, 1997 and OHM Remediation Services Corporation (OHM), 1997) | 1993-97 | Aboveground storage tanks (AST) purging and removal along railroad line. 20 drums of 4,4'-dichlorodiphenyltrichloroethane (DDT), empty drums, batteries, and debris were removed, and contaminated soil was excavated and disposed of offsite. During these actions, approximately 2,655 cubic yards of soil and debris were removed from Sites 6 and 82. | Unknown amount of expended 105 mm cartridge casings discovered in battery trenches in southern portion of what is now Site UXO-22 |
| IR Site 6 Chlorobenzene Investigation (CH2M HILL, 2005, 2009c, 2010b, 2012a) | 2005-2011 | Surface clearance, geophysical survey, test-pitting, monitoring well installation, and groundwater and soil sampling were conducted.<br>Surface clearance of a 1.5-acre area (MEC Surface Clearance Area on **Figure 2-3**) was conducted so that vegetation could be removed in preparation for digital geophysical mapping (DGM). All MPPEH recovered was reclassified as MDAS upon proper inspection and disposed of at recycling facility.<br>During investigation activities, a MPPEH burial pit was discovered with subsequent EOD Response in December 2008. Recovered MPPEH was determined to be MDAS and placed inside a secure storage container inside a 6-ft-tall chain-link fence onsite. MDAS disposed at recycling facility in 2009. Site placed under an ESS and subsequent amendments and entered the MMRP in May 2010.<br>Digital geophysical mapping (DGM) was conducted using a magnetometer along transects spaced 5 feet apart and an EM-31 conductivity instrument along transects spaced 10 feet apart over a 2.8-acre area (Geophysical Investigation Area 1 on **Figure 2-3**)to identify anomalies representing potential subsurface disposal trenches.<br>In 2011, during the test-pitting activities, drums containing chlorobenzene and other debris, three 3.5-inch rocket motors were discovered. These MPPEH items were determined to be MDAS, demilitarized and disposed of on July 6, 2011 by witnessed smelting. Soil samples were collected for MC in 12 test pits. Eight metals (antimony, arsenic, chromium, hexavalent chromium, cobalt, iron, lead, and manganese) were detected at concentrations greater than screening criteria. The drums containing chlorobenzene were removed through a Time-Critical Removal Action (TCRA) in 2011. | MPPEH<br>• M-2 Antipersonnel, mine, bounding (4)<br>• 57-mm brass cartridges (5)<br>• M-29 Rocket, practice warhead only (23)<br>• Rocket motors, 3.5-inch expended (43)<br>• M-29 Rocket, 3.5-inch with M-405 Fuze (5)<br>• M48 trip flares (empty), practice (8)<br>• Full and partial 105-mm shipping containers (8)<br>• Empty 105-mm cartridge (1)<br>• Empty 75-mm recoilless rifle cartridge (1) |
| IR Site 6 Intrusive Investigation (CH2MHILL, 2010c) | 2010 | Investigation activities at the MPPEH burial pit included removal of MPPEH and other debris to the water table as per the ESS until no further visible evidence of MPPEH was observed. MEC items were disposed by controlled detonation on September 21, 2010. The remaining MPPEH was determined to be MDAS upon proper inspection. A total of 16,100 pounds of MDAS was recovered during the excavation of the burial pit and disposed between February 1 and February 7, 2011. The MDAS was disposed of by witnessed smelting.<br>Confirmatory soil samples were collected from the four sidewalls of the excavation. One explosives residue, 2,4-dinitrotoluene and four metals (cadmium, chromium, copper and iron) were detected in exceedance of screening criteria. | MEC<br>• Mortar Shell, 81-mm, high explosive, M43 with fuze M45(1)<br>• Mortar Shell, 60-mm, high explosive, M49 without fuze (1)<br>• Rocket, 3.5-inch, high explosive anti-tank HEAT, M28 (1)<br>MPPEH<br>• M-29 rockets, practice warhead only (39)<br>• M-29 rocket motors, 3.5-inch, expended (52)<br>• Stabilizer assemblies. M9 AT, rifle grenades (2)<br>• Grenades, practice, MK21, empty (2)<br>• Warheads for rockets, 3.5-inch, model unknown (8)<br>• Rocket fuzes, 3.5-inch, model unknown (3)<br>• 3.5-inch rockets believed to be M29 practice (22)<br>• 3.5-inch rocket fuzes believed to be practice (49)<br>• MK21 practice hand grenades (42)<br>• M45 mortar fuze, expended (1)<br>• Mortar shells, 60-mm, practice, M50A2 (4)<br>• Rocket motors (1,500) |
| Phase II, Lot 203 Environmental Condition of Property (ECP) (Rhea Engineers and Consultants, Inc (Rhea), 2010) | 2010 | Records review, a geophysical survey, test-pitting, and groundwater sampling was conducted at IR Sites 6 and 82.<br>The geophysical survey used an EM-31conductivity instrument to identify subsurface anomalies along transects spaced 40-feet apart (area (Geophysical Investigation Area 2 on **Figure 2-3**). Large anomalies were detected within the former DRMO in IR Site 6 and in the southwest corner of IR Site 82.<br>The ECP assessment concluded that the former DRMO area was suitable for its intended use with the provision that intrusive activities would not be conducted. | Unknown number of expended, unidentified small arms casings discovered in 2 of the test pits located within the former DRMO |

TABLE 2-1
**Previous and Ongoing Investigations Where MPPEH/MEC Were Discovered**
*Site UXO-22 PA/SI*
*MCIEAST-MCB CAMLEJ, North Carolina*

| Previous Investigation | Date | Activities | MEC/MPPEH Found |
|---|---|---|---|
| IR Site 82 Potential Source Investigation (PSI) (Rhea, 2011) | 2011 | Conduct an intrusive investigation to identify the nature of the geophysical anomalies discovered north of groundwater remediation system during the Phase II ECP. Vegetation clearance and excavation of test pits and trenches to a maximum depth of 18.5 ft bgs. Scrap metal, communications wire, batteries and MPPEH discovered and removed. The MPPEH was determined to be MDAS and disposed of as scrap. | MPPEH<br>• 75-mm cartridges (52)<br>• 75-mm cartridge fragments (2lbs)<br>• Propellant canister (1) |
| IR Sites 6 & 82 Supplemental Investigation (CH2M HILL) | 2012 | During site preparation, UXO technicians identified MEC and MPPEH within the vicinity of proposed environmental sampling locations at the former DRMO. A total of 4 MEC items (MK II grenades), were found. The grenades were discovered at a depth of 4-6-inches bgs and disposed of by controlled detonation on August 16, 2012. The 40 mm cartridge casing was found on the surface and removed from the site by MCIEAST-MCB CAMLEJ EOD unit. Other MPPEH items found on the surface included 3.5" practice rocket, 3.5" rocket parts, and expended 40 mm cartridges. These items are located within the locked fenced area of the former DRMO and signs warning of potential UXO are posted. | MEC<br>• Mark II Hand Grenade (4)<br>MPPEH<br>• 40-mm practice projectiles (approximately 100)<br>• 40-mm practice cartridges (approximately 100)<br>• M27A1 Signal Illuminating ground flares (6)<br>• Mark 13 Grenade Diversionary (2)<br>• 3.5" rocket motors/parts (6)<br>• 30-mm expended cartridge casing(1)<br>• 40 mm expended cartridge casing (1) |

TABLE 2-2

Water Level Measurements and Well Construction Information

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Well ID | Date | Top of Casing Elevation (feet above msl) | Total Well Depth (feet BTOC) | Top of Screened Interval (feet BLS) | Bottom of Screened Interval (feet BLS) | Depth to Water (feet BTOC) | Groundwater Elevation (feet above msl) |
|---|---|---|---|---|---|---|---|
| MR22-MW01 | 2/8/2012 | NS | 30.42 | 19.0 | 29.0 | 19.83 | NA |
| MR22-MW02 | 12/19/2011 | 29.13 | 26.40 | 14.0 | 24.0 | 17.60 | 11.53 |
| MR22-MW03 | 12/14/2011 | 26.33 | 17.45 | 5.0 | 15.0 | 9.65 | 16.68 |
| IR06-GW03 | 12/16/2011 | 30.70 | 26.20 | 15.0 | 25.0 | 19.45 | 11.25 |
| IR06-GW11* | -- | -- | -- | -- | -- | NM | -- |
| IR06-GW31 | 12/16/2011 | 30.30 | 26.50 | 11.5 | 26.5 | 16.59 | 13.71 |
| IR06-GW26 | 12/12/2011 | 23.66 | 22.60 | 5.0 | 19.7 | 13.96 | 9.70 |

Legend:
msl - mean sea level
BTOC - below top of casing
BLS - below land surface
NS - not surveyed
NA - not available
* IR06-GW11 was damaged and could not be gauged

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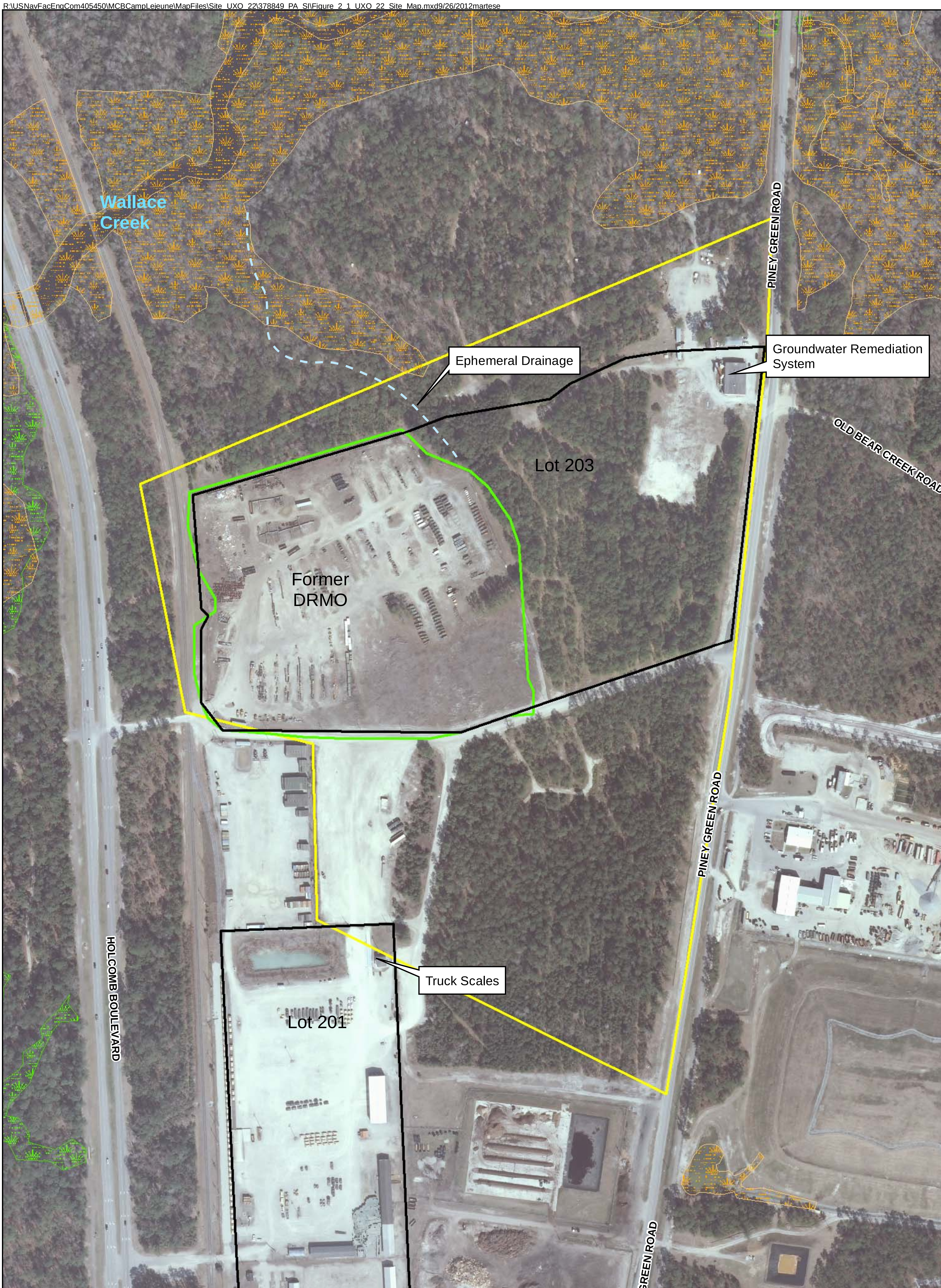


**Legend**

- Ephemeral Drainage Feature
- UXO-22 Boundary
- Planning Wetland Area
- Jurisdictional Wetland Area
- Former DRMO-Defense Reutilization and Marketing Office
- Lots 201 and 203

N

0 150 300 600 Feet

1 inch = 300 feet

2009 Aerial Photograph

Figure 2-1
Site Map
Site UXO-22 PA/SI Report
MCIEAST-MCB CAMLEJ
North Carolina

CH2MHILL

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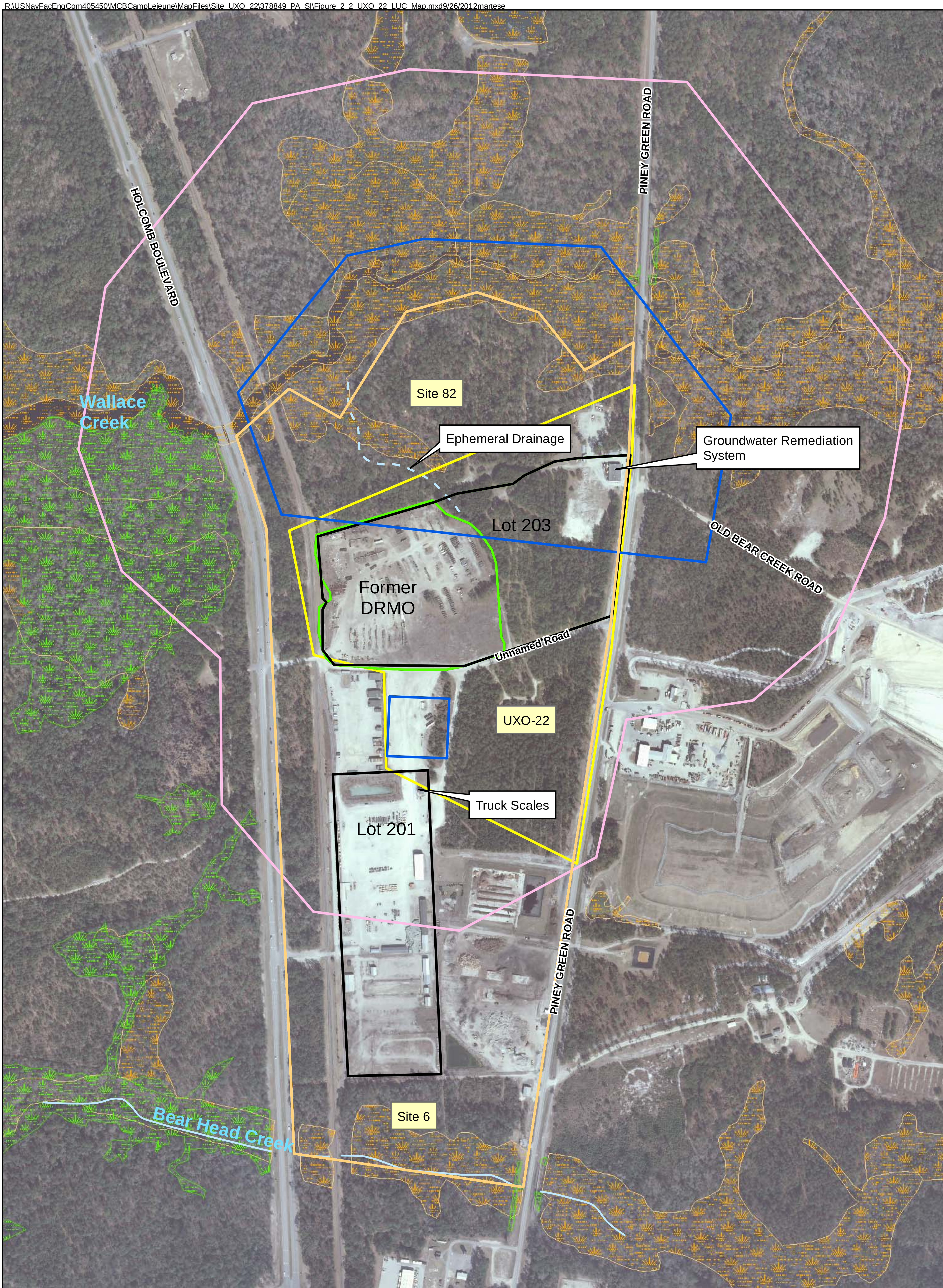



**Legend**

- Aquifer Use Control Boundary
- Non-Industrial Use and Intrusive Activites (Soil) Control Boundary
- Intrusive Activities Control Boundary (Groundwater)
- Lots 201 and 203
- Former DRMO-Defense Reutilization and Marketing Office
- UXO-22 Boundary
- Jurisdictional Wetland Area
- Planning Wetland Area
- Ephemeral Drainage Feature
- Surface Water Course

N

0 275 550 1,100
Feet

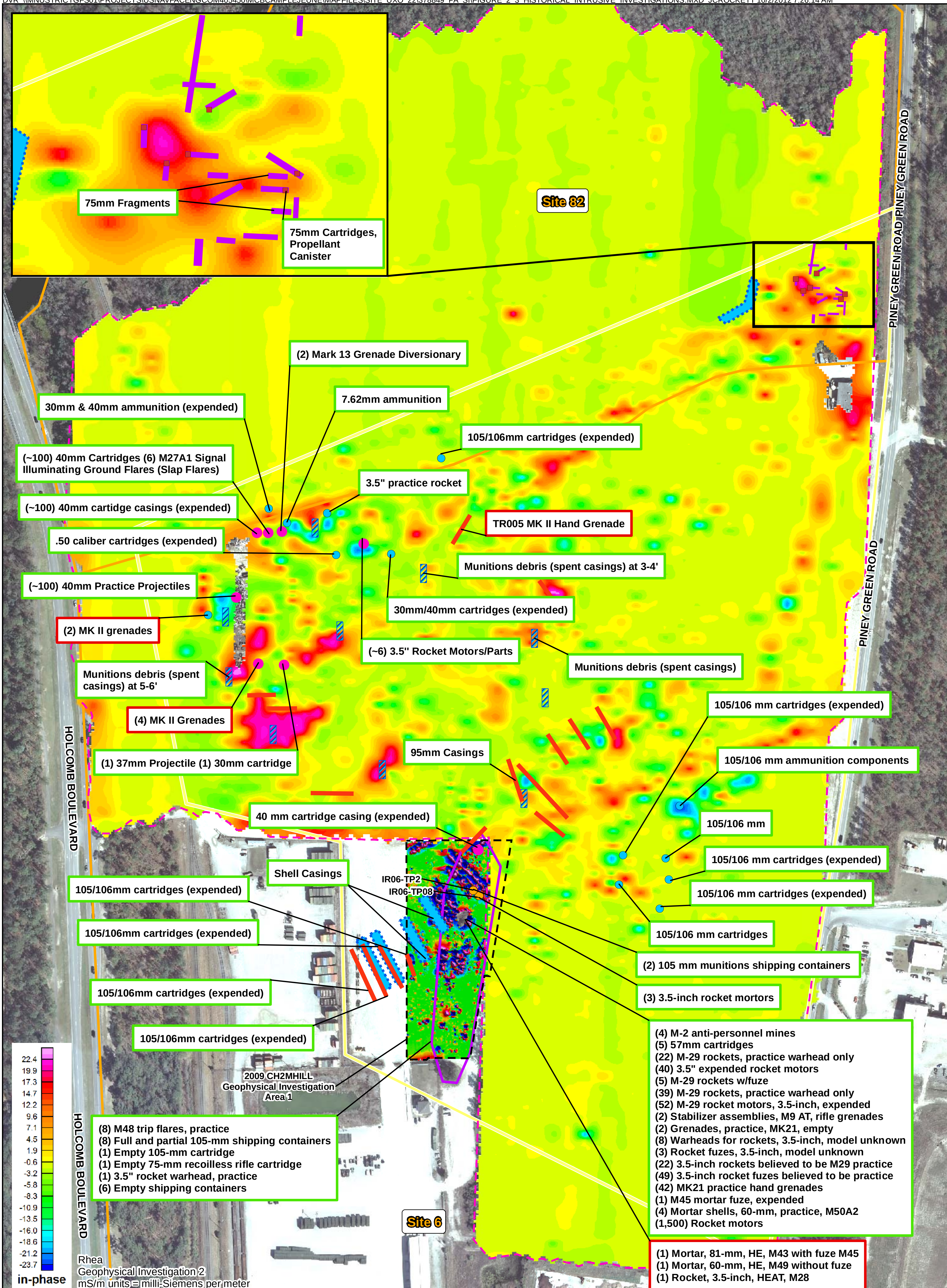
1 inch = 550 feet

2009 Aerial Photograph

Figure 2-2
Land Use Control Map
Site UXO-22 PA/SI
MCIEAST-MCB CAMLEJ
North Carolina

CH2MHILL

DVR \\MNUSTRICTGFS01\PROJECTS\USNAVFACENGCOM405450\MCBCAMPLEJEUNE\MAPFILES\SITE_UXO_22\378849_PA_SI\FIGURE_2_3_HISTORICAL_INTRUSIVE_INVESTIGATIONS.MXD JCROCKETT 10/2/2012 7:26:14 AM




**Legend**

- Test Pit (Rhea, 2011)
- Site 6 Chlorobenzene Investigation Test Pits (CH2M Hill, 2010)
- RI Soil Boring Location (Baker, 1993)
- Field Reconnaissance (CH2M Hill, 2012)
- Trench (Baker, 1993)
- MEC Surface Clearance Area (CH2M Hill, 2009)
- OU2 Boundary
- Trench (Rhea, 2011)
- Limit of Geophysical Investigation Area 1
- Limit of Geophysical Investigation Area 2
- Phase II ECP DRMO Test Pit (Rhea, 2010)
- Source Removal Trenches (OHM, 1997)
- UXO-22 Boundary
- MEC Item
- MPPEH Item

N

0 125 250 500 Feet

1 inch = 250 feet

Vertical Gradient
nT/m
-13147 -276 -112 -51 -24 -10 -0 7 14 34 76 190 878

Geophysical Investigation 1
nT/m = nano-Tesla per meter

Figure 2-3
Historical Munitions Related Intrusive Investigation Results
Site UXO-22 PA/SI
MCIEAST-MCB CAMLEJ
North Carolina

CH2MHILL

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**Legend**

- Monitoring Well
- Temporary Monitoring Well/Soil Boring
- Estimated Direction of Groundwater Flow
- Potentiometric Surface Contour, dashed where inferred
- Ephemeral Drainage Feature
- UXO-22 Boundary

Note:
NM - Not measured
NS – Not surveyed
9.70 - Groundwater elevations are feet above mean sea level
Potentiometric surface contours have been interpolated between monitoring well locations. Actual conditions may differ from those shown here

N

0 125 250 500
Feet

1 inch = 250 feet

Figure 2-4
Water Table Map (December 2011)
Site UXO-22 PA/SI
MCIEAST-MCB CAMLEJ
North Carolina

CH2MHILL

SECTION 3

# Field Investigation Activities

The Site UXO-22 PA/SI field investigation was conducted from December 2011 to March 2012 to collect data in order to evaluate whether releases of MC had occurred within the 75-acre investigation site. Field investigation activities were conducted in accordance with a *Site-Specific Work Plan Addendum* (CH2M HILL, 2009c), the *Site-Specific Work Plan Addendum for Intrusive Investigation Activities at UXO-22* (CH2M HILL, 2010c) and the *Site UXO-22 SAP* (CH2M HILL, 2012b). The technical approach included in the Work Plans and SAP were developed by the MCIEAST-MCBCAMLEJ Tier I Partnering Team, which comprised of representatives from the Navy, MCIEAST-MCBCAMLEJ, U.S. Environmental Protection Agency (USEPA) Region 4, and North Carolina Department of Environment and Natural Resources (NCDENR).

This section presents a summary of field activities, which included:

- Site preparation and support (MEC avoidance, utility clearance, and surveying)
- Collecting 11 subsurface soil samples for explosives residues, pentaerythritol tetranitrate (PETN), nitroglycerin, perchlorate, and metals analysis to further evaluate for potential human health and ecological risk
- Installing three temporary monitoring wells and collecting groundwater samples from these wells and three existing wells for explosives residues, PETN, nitroglycerin, perchlorate, and metals analysis to further evaluate for potential human health and ecological risk; dissolved metals were collected from two wells to evaluate for ecological risk
- Collecting two sediment samples for explosives residues, PETN, nitroglycerin, perchlorate, metals, total organic carbon (TOC), and grain size analysis to further evaluate for potential human health and ecological risk. The sediment samples are referred to as surface soil from ephemeral drainage, as the sample locations were dry.

This report also incorporates the results from subsurface soil sampling from the 2010 MPPEH burial pit investigation and test pitting during the 2011 chlorobenzene investigation at IR Site 6. Collection and analyses of these samples are discussed below and the results are presented in Section 5.

## 3.1 Site Preparation

### 3.1.1 MEC Avoidance

Due to the potential presence of MEC, avoidance measures were implemented in accordance with the approved ESS (CH2M HILL, 2010a). UXO technicians, qualified in accordance with Department of Defense Explosives Safety Board Technical Paper 18 (DDESB, 2004), provided MEC escort and avoidance services to the subcontractors conducting surveying, utility locating, and direct-push technology (DPT) services and CH2MHILL personnel for oversight and sampling.

### 3.1.2 Buried Utility Clearance

The North Carolina One-Call Center was contacted regarding the proposed well installation activities. Accumark, of Ashland, Virginia, was subcontracted by CH2M HILL to locate and mark underground utilities at subsurface soil and drilling locations.

## 3.2 Environmental Investigation Activities

### 3.2.1 Subsurface Soil Sampling

Subsurface soil sampling was conducted using a DPT drill rig operated by Parratt Wolff, Inc. of Hillsborough, North Carolina (December 2011), and Probe Technologies of Concord, North Carolina (February 2012). Surface soil samples were not collected as part of this investigation (with the exception of the two locations in the ephemeral drainage) as contamination was not expected to be found in the surface, since the site has never been used as a range and previous investigations indicate burial of MD in the subsurface.

Eleven subsurface soil sampling locations were cleared by a third-party buried utility locator in addition to using the North Carolina One-Call Center to notify subsurface utility providers. A UXO Technician provided escort and avoidance and verified that borings were clear of ferrous metallic objects from the surface to 5 ft bgs using a downhole magnetometer. The subsurface soil samples, MR22-IS01 through MR22-IS11, were collected from unsaturated soil cores taken from immediately above the estimated water table at depths ranging from 4.5 to 19 ft bgs. The DPT sampling method used included an open core barrel sampling device with disposable acetate liners. Sampling equipment was decontaminated between sample depths, and new liners were used to retrieve each successive soil core. The soil cores retrieved from these borings were examined and logged by the CH2M HILL geologist using the Unified Soil Classification System, and screened with a MiniRAE 2000 photoionization detector (PID). Soil boring logs are provided in **Appendix C**, and sampling locations are shown on **Figure 3-1**.

During the 2010 MPPEH burial pit investigation, four soil samples were collected from the each sidewall of the excavation (designated as UXO-TP-S-NE, UXO-TP-S-NW, UXO-TP-S-SE, and UXO-TP-S-SW). Subsurface soil samples were also collected from 11 of the 12 test pits during the 2011 chlorobenzene investigation and sampled for MC, VOCs, SVOCs, PCBs, hexavalent chromium, and pesticides. All analyses except MC are reported in the *Final Time-Critical Removal Action Summary, Site 6 – Storage Lots 201 and 203, Technical Memorandum* (CH2M HILL, 2011d). The MC results are reported in Section 5.

Subsurface soil samples were submitted to Empirical Laboratories (2010 MPPEH burial pit and UXO-22 PASI) and Katahdin Analytical Services (2011 chlorobenzene investigation) and analyzed for the following:

- Explosives residues (SW-846 USEPA Method 8330)
- PETN (SW-846 USEPA Method 8330)
- Nitroglycerine (SW-846 USEPA Method 8330)
- Perchlorate (SW-846 USEPA Method 6850)
- Target analyte list (TAL) metals (SW-846 USEPA Method 6010B)

### 3.2.2 Temporary Well Installation

Following the completion of the subsurface soil sampling, soil boring locations MR22-IS01, MR22-IS05, and MR22-IS10 were converted to temporary groundwater monitoring wells MR22-MW01, MR22-MW-02, and MR22-MW03, respectively. Well MR22-MW01 was originally placed to bracket what appeared to be perched groundwater with a screened interval from 4 to 14 ft bgs. Although the soil at that interval was saturated during drilling, the subsequent well was found to be dry and was re-located in February 2012 to a location approximately 80 feet north and was re-installed to bracket the water table at 19 to 29 ft bgs. The revised location was necessary to minimize impacts to Base operations. Each of these boring locations was overdrilled using 4.25-inch inside diameter (ID) hollow-stem augers. **Figure 3-1** shows the temporary well locations, and **Appendix C** contains the well construction details. The total depths of the temporary wells installed at Site UXO-22 ranged from 14 to 29 ft bgs. The temporary wells were screened to bracket the water table.

Each temporary well was constructed with 2-inch ID Schedule 40 polyvinyl chloride casing and 10 feet of 2-inch ID, 0.010-inch machine slotted Schedule 40 polyvinyl chloride screen. Each well was then completed with a 10-25 sieve size filter pack from the bottom of the well to 2 feet above the top of the screen interval. A 2-ft thickness of bentonite pellets was installed above the filter pack and allowed to hydrate for at least 30 minutes before development.

The temporary wells were developed using a submersible pump alternately pumped and surged across the length of the well screen. Development continued until the water was visually clear, preferably with turbidity below 10 nephelometric turbidity units, and water quality parameters had stabilized. All of the wells were developed the day of installation. Following development, the wells were allowed to equilibrate overnight before purging and sampling.

### 3.2.3 Groundwater Sampling

In December 2011, groundwater samples were collected from two temporary monitoring wells, as well as from three existing permanent wells (IR06-GW26, IR06-GW03, and IR06-GW31) (Figure 3-1). The SAP also included collection of a groundwater sample from monitoring well IR06-GW11; however, this well was accidentally destroyed by DRMO activities so a sample could not be collected. A groundwater sample was also collected from MR22-MW01 in February 2012. Before well purging and sampling, water level measurements were recorded from each monitoring well.

Groundwater samples were collected using a peristaltic pump equipped with disposable polyethylene tubing and low-flow purging and sampling techniques in accordance with the SAP (CH2M HILL, 2012b). Water quality parameters (specific conductance, pH, turbidity, temperature, dissolved oxygen, and oxidation-reduction potential) were measured during the purging phase using a YSI Model 556 water quality meter and Hanna turbidity meter and recorded in a field notebook. Field parameters are summarized in **Table 3-1**. Groundwater samples were collected after all field parameters had stabilized over three successive readings. Parameters were considered stabilized over three successive readings when measurements agreed as follows:

- Temperatures within 1 degree Celsius
- Conductivity within 3 percent
- Dissolved oxygen within 10 percent
- pH within 0.1 pH units
- Oxidation-reduction potential within 10 millivolts
- Turbidity within 10 percent or as low as practicable for three consecutive readings

Before sample collection, the water quality meter flow-through cell was disconnected from the peristaltic pump so that the pump discharge flowed directly into the laboratory-supplied sample bottles. New, clean pump tubing was used for purging and sampling each well.

Once sample collection was complete, the sample bottles were placed in iced coolers and prepared for shipment under chain-of-custody control to Empirical Laboratories, and analyzed for the following analytes:

- Explosives residues, including PETN and nitroglycerine (SW-846 USEPA Method 8330)
- Perchlorate (SW-846 USEPA Method 6850)
- TAL total metals (SW-846 USEPA Method 6010B)
- TAL dissolved metals (SW-846 USEPA Method 6010B) for wells MW01 and GW03 for ecological risk screening (ERS)

Following sampling and surveying, all temporary wells and well IR06-GW11 were abandoned by Parratt Wolff and Probe Technologies, in accordance with North Carolina well construction standards.

### 3.2.4 Surface Soil Sampling from Ephemeral Drainage

The original intent of the SAP was to collect up to four collocated surface water and sediment samples from the ephemeral drainage. However, this feature was generally dry during the numerous mobilizations made to the site during the PA/SI. Given the intermittent nature of this drainage feature, only two samples were collected and are referred to as surface soil samples from ephemeral drainage (**Figure 3-1**). Surface soil samples were collected on March 19, 2012, by advancing a decontaminated stainless steel trowel approximately 1 to 3 inches into the ground surface. Visual observations noted disposed communication battery packs and munitions related items on the banks of the drainage.

Surface soil samples were placed in iced coolers and prepared for shipment under chain-of-custody control to Empirical Laboratories, and analyzed using the following methods:

- Explosives residues (SW-846 USEPA Method 8330)
- PETN (SW-846 USEPA Method 8330)
- Nitroglycerine (SW-846 USEPA Method 8330)

- Perchlorate (SW-846 USEPA Method 6850)
- TAL metals (SW-846 USEPA Method 6010B)
- Total Organic Carbon (Lloyd Kahn)
- Grain Size (ASTM D422)

### 3.2.5 Quality Assurance/Quality Control (QA/QC) Sampling

Appropriate QA/QC sampling was performed in accordance with Navy CLEAN and CH2M HILL protocols, including field blanks, equipment blanks, duplicates, and matrix spike/matrix spike duplicates. Required QA/QC samples and the frequency of collection are shown in **Table 3-2.**

### 3.2.6 Investigation-derived Waste Management

Investigation-derived waste (IDW) was managed and disposed of in accordance with the Investigation and Remediation Waste Management Plan (CH2M HILL, 2011a). IDW generated during field events consisted of drill cuttings, well development and purge water, decontamination fluids, disposable sampling equipment, and used personal protective equipment. A total of twelve 55-gallon drums were generated, labeled, and staged at the storage facility on Parachute Tower Road. Disposable equipment, including, plastic sheeting, paper towels, and aluminum foil, was placed in black contractor's trash bags and disposed of in an on-Base dumpster.

### 3.2.7 Site Survey

Following completion of sampling activities, Land Design Surveying Inc. (LDSI) of Charlotte, North Carolina surveyed horizontal coordinates, casing elevations, and ground elevations for the two temporary wells: MR22-MW02 and MR22-MW03. The original location for MR22-MW01 was also surveyed at this time, but because the well was dry, the data were not used for potentiometric mapping. Elevations were accurate to the nearest 0.01 ft (0.1 ft for unpaved ground surface) and tied to the nearest North American Vertical Datum of 1988 benchmark. Horizontal controls were based on the metric system and referenced to the North American Datum of 1983 and the Universal Transverse Mercator grid system. Land surveying was conducted in accordance with the MRP Master Project Plans (CH2M HILL, 2008).

TABLE 3-1

Groundwater Field Parameters

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Sample ID | Date Collected | Purge Volume (gallons) | pH (SU) | Conductivity (mS/cm) | Turbidity (NTU) | Dissolved Oxygen (mg/L) | Temperature ($^oC$) | Oxidation-Reduction Potential (mV) |
|---|---|---|---|---|---|---|---|---|
| MR22-MW01 | 2/7/2012 | 4.4 | 6.38 | 0.220 | 1.72 | 0.98 | 17.39 | -35.7 |
| MR22-MW02 | 12/19/2011 | 3.6 | 6.50 | 0.362 | 3.1 | 3.02 | 18.22 | 60.1 |
| MR22-MW03 | 12/14/2011 | 5.0 | 6.16 | 0.325 | 5.9 | 0.79 | 17.57 | 36.5 |
| IR06-MW03 | 12/16/2011 | 3.9 | 5.99 | 0.243 | 3.4 | 0.76 | 20.69 | 123.5 |
| IR06-MW31 | 12/16/2011 | 3.2 | 6.25 | 0.394 | 4.0 | 0.13 | 20.76 | 62.9 |
| IR06-MW26 | 12/12/2011 | 5.8 | 6.22 | 0.290 | 3.5 | 0.33 | 18.82 | -38.7 |

Notes:
SU - Standard Unit
mS/cm - milliSiemens per centimeter
NTU - Nephelometric Turbidity Units
mg/L - milligrams per liter
C - Celsius
mV - millivolt

TABLE 3-2

QA/QC Sampling Program

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Analysis | Sample Matrix | Field Samples | Field Duplicates | Equipment Blanks | Field Blanks | MS/MSDs |
|---|---|---|---|---|---|---|
| **Subsurface Soil** | | | | | | |
| Explosives Residues, including PETN and Nitroglycerine | Solid | 11 | 2 | 2 | 2 | 2 |
| Perchlorate | | 11 | 2 | 2 | 2 | 2 |
| Total Metals | | 11 | 2 | 2 | 2 | 2 |
| **Groundwater** | | | | | | |
| Explosives Residues, including PETN and Nitroglycerine | Aqueous | 6 | 2 | 2 | 2 | 2 |
| Perchlorate | | 6 | 2 | 2 | 2 | 2 |
| Total Metals | | 6 | 2 | 2 | 2 | 2 |
| Dissolved Metals | | 2 | 2 | 1 | 0 | 1 |
| **Sediment** | | | | | | |
| Explosives Residues, including PETN and Nitroglycerine | Solid | 2 | 1 | 1 | 1 | 1 |
| Perchlorate | | 2 | 1 | 1 | 1 | 1 |
| Total Metals | | 2 | 1 | 1 | 1 | 1 |
| Total Organic Carbon | | 2 | 1 | 1 | 1 | 1 |
| Grain Size | | 2 | 1 | 0 | 0 | 1 |

Notes:
MS/MSD = matrix spike and matrix spike duplicate
Field duplicates are collected at the rate of 1 for every 10 environmental samples
Equipment rinsate blanks are typically collected at the rate of 1 per box/roll of equipment per medium
Field blanks are typically collected at the rate of 1 per week
MS/MSDs are collected at the rate of 1 for every 20 samples or 1 per field event

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**Legend**

- Existing Monitoring Well
- Soil Boring
- Temporary Monitoring Well/Soil Boring
- Surface Soil Sample Location From Ephemeral Drainage
- Ephemeral Drainage Feature
- Surface Water Centerline
- Test Pit
- MPPEH Disposal Pit
- UXO-22 Boundary

N

0 125 250 500 Feet

1 inch = 250 feet

Figure 3-1
Environmental Sampling Locations
Site UXO-22 PA/SI
MCIEAST-MCB CAMLEJ
North Carolina

SECTION 4

# Investigation Results

This section presents the findings of the analytical MC investigation activities conducted at Site UXO-22 during the MPPEH/MD Burial Pit excavation in September and October 2010, the IR Site 6 chlorobenzene supplemental investigation in January 2011, and the UXO-22 PA/SI from December 2011 through March 2012. The complete analytical results are provided in **Appendix D**.

## 4.1 Data Screening Process

Analytical results for all media were compared against regulatory standards and the most recent Base-specific background criteria.

Soil concentrations were compared against the following:

- MCIEAST-MCB CAMLEJ Background Threshold Values for soil (BTV) (CH2M HILL, 2011b). Based on the Site UXO-22 location, the BTVs for developed locations were used for data comparisons to evaluate whether site conditions may be indicative of background or are site-related.
- Adjusted USEPA Regional Screening Levels (RSLs) for industrial and residential soil (USEPA, 2012a)
- NCDENR Soil Screening Levels (NC SSLs) (NCDENR, 2011)

Surface Soil from the Ephemeral Drainage concentrations were compared against the following:

- Adjusted USEPA RSLs for industrial and residential soil (USEPA, 2012a)
- MCIEAST-MCB CAMLEJ BTVs for Developed Surface Soil (BTV) (CH2MHILL, 2011b). Due to the ephemeral nature of the drainage which lacked water during numerous field mobilizations

Groundwater concentrations were compared against the following:

- MCIEAST-MCB CAMLEJ BTVs for groundwater. Based on the depth of the temporary and permanent monitoring wells, the BTVs for the surficial aquifer were used for data comparisons to evaluate whether site conditions may be indicative of background or are site-related.
- Adjusted USEPA Tap Water RSLs (USEPA, 2012a)
- The more conservative value of the North Carolina Groundwater Quality Standards (NCGWQS) (NCDENR, 2011) and USEPA drinking water maximum contaminant level (MCLs)

The RSLs based on non-carcinogenic effects were adjusted by dividing by 10 to account for exposure to multiple constituents; the RSLs based on carcinogenic effects were used as presented in the USEPA RSL table.

Soil and groundwater concentrations were considered to be in exceedance of the comparison criteria only if analyte concentrations were greater than both the BTVs and at least one additional regulatory standard (i.e., adjusted RSLs or NCSSLs/NCGWQS).

## 4.2 Analytical Results Subsurface Soil

A total of 25 soil samples were collected from the MPPEH burial pit excavation (4), Site 6 chlorobenzene supplemental investigation (10), and the Site UXO-22 PA/SI (11). These samples were collected from locations ranging in depth from 2 to 19 feet bgs.

**Figure 4-1** illustrates the locations of the subsurface soil samples where target analytes were detected at concentrations greater than BTVs and greater than at least one of the regulatory standards (NC SSLs or the Adjusted RSLs).

- **Explosives residues and perchlorate**
  - One explosives residue, 2,4-dinitrotoluene, was detected at an estimated concentration of 34.6 J micrograms per kilogram (µg/kg), in exceedance of the NC SSL (**Table 4-1**).

TABLE 4-1
Summary of Explosives Residue Exceedances in Subsurface Soil
*Site UXO-22*
*MCIEAST-MCBCAMLEJ, North Carolina*

| Chemical Name | Frequency of Detection (# detected / # analyzed) | Minimum Concentration (µg/kg) | Maximum Concentration (µg/kg) | Location of Maximum Concentration | Regulatory standards (µg /kg) | | Frequency of Exceedances |
|---|---|---|---|---|---|---|---|
| 2,4-Dinitrotoluene | 1 / 25 | 34.6 J | 34.6 J | UXO22-TP-S-NW | NC SSL | 1.6 | 1 |

µg/kg = micrograms per kilogram

J - Analyte present, value may or may not be accurate or precise

NC SSL= North Carolina Soil Screening Level

- **Metals**
  - Six metals (antimony, chromium, hexavalent chromium, cobalt, lead, and manganese) were detected at concentrations greater than BTVs <u>and</u> greater than at least one of the regulatory standards (NC SSLs or the Adjusted RSLs). **Table 4-2** presents a summary of the metal exceedances.

TABLE 4-2
Summary of Metals Exceedances in Subsurface Soil
*Site UXO-22*
*MCIEAST-MCBCAMLEJ, North Carolina*

| Chemical Name | Frequency of Detection (# detected / # analyzed) | Minimum Concentration (mg/kg) | Maximum Concentration (mg/kg) | Location of Maximum Concentration | Regulatory Standards (mg/kg) | | Frequency of Exceedances |
|---|---|---|---|---|---|---|---|
| Antimony | 5 / 25 | 0.35 J | 13.5 J | IR06-TP01 | BTV | 1.79 | 2 |
| | | | | | NC SSL | 0.9 | 3 |
| | | | | | Residential RSL | 3.1 | 2 |
| Chromium (hexavalent) | 7 / 10 | 0.43 | 490 | IR06-TP09 | BTV | 6.15 | 1 |
| | | | | | NC SSL | 3.8 | 1 |
| | | | | | Residential RSL | 0.29 | 7 |
| | | | | | Industrial RSL | 5.6 | 1 |
| Chromium | 25 / 25 | 2.05 | 596 | IR06-TP09 | BTV | 32.7 | 1 |
| | | | | | NC SSL | 3.8 | 13 |
| | | | | | Residential RSL | 0.29 | 25 |
| | | | | | Industrial RSL | 5.6 | 8 |
| Cobalt | 14 / 25 | 0.09 J | 6.2 | IR06-TP01 | BTV | 1 | 2 |
| | | | | | NC SSL | 0.9 | 4 |
| | | | | | Residential RSL | 2.3 | 3 |

TABLE 4-2
Summary of Metals Exceedances in Subsurface Soil
*Site UXO-22*
*MCIEAST-MCBCAMLEJ, North Carolina*

| Chemical Name | Frequency of Detection (# detected / # analyzed) | Minimum Concentration (mg/kg) | Maximum Concentration (mg/kg) | Location of Maximum Concentration | Regulatory Standards (mg/kg) | | Frequency of Exceedances |
|---|---|---|---|---|---|---|---|
| Lead | 25/ 25 | 2.2 | 2,800 | IR06-TP09 | BTV | 14.4 | 4 |
| | | | | | NC SSL | 270 | 1 |
| | | | | | Residential RSL | 400 | 1 |
| | | | | | Industrial RSL | 800 | 1 |
| Manganese | 25 / 25 | 0.953 | 360 | IR06-TP09 | BTV | 16.9 | 4 |
| | | | | | NC SSL | 65 | 3 |
| | | | | | Residential RSL | 180 | 2 |

mg/kg = Milligrams per kilogram

J = Analyte present, value may or may not be accurate or precise

BTV = Background Threshold Value

RSL= Regional Screening Level

NC SSL= North Carolina Soil Screening Level

# 4.3 Analytical Results for Groundwater

A total of 6 groundwater samples were collected and analyzed during the PA/SI. Several metals were detected in these samples at concentrations greater than regulatory standards.

**Tables 4-3, 4-4, and 4-5** present a summary of the analytical results for groundwater samples collected from Site UXO-22. **Figure 4-2** depicts the locations of groundwater samples that contained target analytes at concentrations greater than at least one of the regulatory standards (i.e., NCGWQS, USEPA Tap Water RSLs, or MCLs) or Surficial Aquifer BTVs**.**

- **Explosives residues**
  - Three explosives residues (1,3,5-trinitrobenzene, nitrobenzene, and 3-nitrotoluene) were detected in three of the six groundwater samples collected at Site UXO-22. The concentrations of nitrobenzene and 3-nitrotoluene (0.306 [micrograms per liter] µg/L and 0.421 µg/L, respectively) detected in the sample collected from MR22-MW01 exceeded the Adjusted Tap Water RSLs (**Table 4-3**).

TABLE 4-3
Summary of Explosive Residue Exceedances in Groundwater
*Site UXO-22*
*MCIEAST-MCB CAMLEJ, North Carolina*

| Chemical Name | Frequency of Detection (# detections / # analyzed) | Minimum Concentration (µg/L) | Maximum Concentration (µg/L) | Location of Maximum Concentration | Regulatory standards (µg/L) | | Frequency of Exceedances |
|---|---|---|---|---|---|---|---|
| 3-Nitrotoluene | 1 / 6 | 0.421 J | 0.421 J | MR22-MW01 | Tap Water RSL | 0.13 | 1 |
| Nitrobenzene | 1 / 6 | 0.306 J | 0.306 J | MR22-MW01 | Tap Water RSL | 0.12 | 1 |

µg/L = micrograms per liter

J = Analyte present, value may or may not be accurate or precise

RSL= Regional Screening Level

- **Perchlorate** was detected below the screening level at a concentration of 0.554 µg/L in the sample collected from MR22-MW02.
- **Total Metals**
  - Three metals (antimony, cadmium, and manganese) were detected at concentrations that exceeded the regulatory standards and were the only metals that exceeded both the BTV and either the NCGWQS, Adjusted Tap Water RSLs, or MCLs. No BTV exists for cadmium. **Table 4-4** presents a summary of the total metals exceedances at Site UXO-22.

TABLE 4-4
Summary of Total Metal Exceedances in Groundwater
*Site UXO-22*
*MCIEAST-MCB CAMLEJ, North Carolina*

| Chemical Name | Frequency of Detections (# detections / # analyzed) | Minimum Concentration (µg/L) | Maximum Concentration (µg/L) | Location of Maximum Concentration | Regulatory standards (µg/L) | | Frequency of Exceedances |
|---|---|---|---|---|---|---|---|
| Antimony | 3 / 6 | 2.55 | 15.1 | MR22-MW02 | Surficial Aquifer BTV | 3.91 | 2 |
| | | | | | Tap Water RSL | 0.6 | 3 |
| | | | | | NCGWQS | 1 | 3 |
| Cadmium | 2 / 6 | 0.282 J | 6.08 | IR06-MW03 | Surficial Aquifer BTV | -- | -- |
| | | | | | Tap Water RSL | 0.69 | 1 |
| | | | | | NCGWQS | 2 | 1 |
| Manganese | 6 / 6 | 2.18 J | 198 | MR22-MW03 | Surficial Aquifer BTV | 176 | 1 |
| | | | | | Tap Water RSL | 32 | 1 |
| | | | | | NCGWQS | 50 | 1 |

µg/L = micrograms per liter
J = Analyte present, value may or may not be accurate or precise
BTV= Background Threshold Value
RSL= Regional Screening Level
NCGWQS= North Carolina Groundwater Quality Standards

- **Dissolved Metals**
  - No metals were detected at concentrations exceeding the regulatory standards and BTV. Cadmium was detected at concentrations exceeding the regulatory standards and no BTV exists for cadmium (**Table 4-5**).

TABLE 4-5
Summary of Dissolved Metal Exceedances in Groundwater
*Site UXO-22*
*MCIEAST-MCB CAMLEJ, North Carolina*

| Chemical Name | Frequency of Detection (# detections / # analyzed) | Minimum Concentration (µg/L) | Maximum Concentration (µg/L) | Location of Maximum Concentration | Regulatory standards (µg/L) | | Frequency of Exceedances |
|---|---|---|---|---|---|---|---|
| Cadmium | 1 / 2 | -- | 5.86 | IR06-MW03 | Surficial Aquifer BTV | -- | -- |
| | | | | | Tap Water RSL | 0.69 | 1 |
| | | | | | NCGWQS | 2 | 1 |

µg/L = micrograms per liter
J = Analyte present, value may or may not be accurate or precise
BTV= Background Threshold Value
RSL= Regional Screening Level
NCGWQS= North Carolina Groundwater Quality Standards

### 4.3.1 Surface Soil from Ephemeral Drainage

Several metals were detected in surface soil from ephemeral drainage at concentrations greater than regulatory standards. **Figure 4-3** depicts the locations of surface soil from ephemeral drainage samples that contained target analytes at concentrations greater than industrial and residential RSLs.

- **Explosives Residues**
  - Three explosives residues (4 amino-2,6-dinitrotolulene, nitrobenzene and 2-nitrotoluene) were detected in surface soil. 4-Amino-2,6-dinitrotolulene, a breakdown daughter product of trinitrotoluene, was detected in MR22-SD01 at a concentration of 0.174 mg/kg. In MR22-02D, the following explosives residues were detected: nitrobenzene (0.37 mg/kg), 4 amino-2,6-dinitrotolulene (0.0988 mg/kg), and 2-nitrotoluene (0.137 mg/kg). All detections were below regulatory standards.
- **Metals**
  - Ten metals were detected above regulatory standards in surface soil. Arsenic, chromium, manganese, and thallium were the only metals detected at concentrations above both the industrial and residential RSLs. **Table 4-6** presents a summary of metals exceeding regulatory standards.

TABLE 4-6
Summary of Metal Exceedances in Surface Soil from Ephemeral Drainage
*Site UXO-22*
*MCIEAST-MCB CAMLEJ, North Carolina*

| Chemical Name | Frequency of Detection (# detections / # analyzed) | Minimum Concentration (mg/kg) | Maximum Concentration (mg/kg) | Location of Maximum Concentration | Regulatory Standards (mg/kg) | | Frequency of Exceedances |
|---|---|---|---|---|---|---|---|
| Arsenic | 2 / 2 | 4.75 | 10.3J | MR22-SD01 | BTV | 2.42 | 2 |
| | | | | | Residential RSL | 0.39 | 2 |
| | | | | | Industrial RSL | 1.6 | 2 |
| Cadmium | 2/2 | 3.5J | 10J | MR22-SD01 | BTV | 0.517 | 2 |
| | | | | | Residential RSL | 7 | 2 |
| Copper | 2/2 | 62.4 | 421 | MR22-SD01 | BTV | 2.5 | 2 |
| | | | | | Residential RSL | 310 | 1 |
| Iron | 2/2 | 7,940 | 11,900 | MR22-SD01 | BTV | 11,100 | 1 |
| | | | | | Residential RSL | 5,500 | 2 |
| Manganese | 2 /2 | 254 | 4,740 | MR22-SD01 | BTV | 18.3 | 2 |
| | | | | | Residential RSL | 180 | 2 |
| | | | | | Industrial RSL | 2,300 | 1 |
| Mercury | 2/2 | 0.881J | 19.8J | MR22-SD01 | BTV | 0.121 | 2 |
| | | | | | Residential RSL | 2.3 | 1 |
| Thallium | 2 / 2 | 0.432J | 9.59J | MR22-SD01 | BTV | -- | -- |
| | | | | | Residential RSL | 0.078 | 2 |
| | | | | | Industrial RSL | 1 | 1 |
| Zinc | 2/2 | 453 | 11,600 | MR22-SD01 | BTV | 16.2 | 2 |
| | | | | | Residential RSL | 2,300 | 1 |

mg/kg= Milligrams per kilogram
J = Analyte present, value may or may not be accurate or precise
RSL= Regional Screening Level

Grain size analysis and TOC were also analyzed. Grain size analysis indicated the samples were predominantly fine-grained sand with minor amounts of fines and gravel. **Appendix D** contains details for grain size and TOC data.

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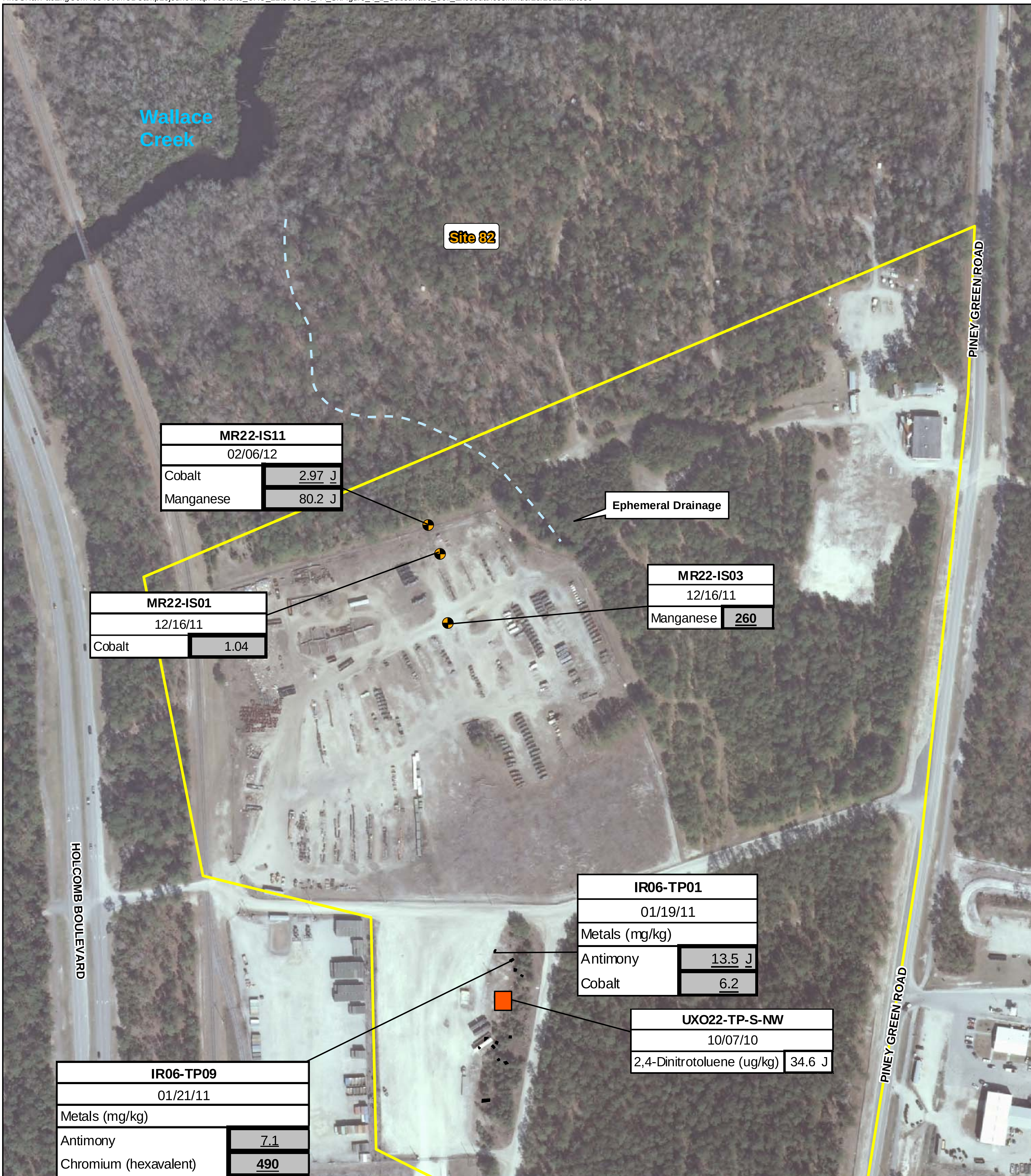


| Comparison Criteria | | | | |
|---|---|---|---|---|
| Contaminant | Developed Subsurface Soil Combined BTV | NCSSLs | Adjusted Industrial Soil RSLs | Adjusted Residential Soil RSLs |
| **Explosives Residues (µg/kg)** | | | | |
| 2,4-Dinitrotoluene | -- | 1.6 | 5,500 | 1,600 |
| **Metals (mg/kg)** | | | | |
| Antimony | 1.79 | 0.9 | 41 | 3.1 |
| Chromium (hexavalent) | 6.15 | 3.8 | 5.6 | 0.29 |
| Chromium | 32.7 | 3.8 | 5.6 | 0.29 |
| Cobalt | 1 | 0.9 | 30 | 2.3 |
| Lead | 14.4 | 270 | 800 | 400 |
| Manganese | 16.9 | 65 | 2,300 | 180 |

**Legend**

- Temporary Monitoring Well/Soil Boring
- Ephemeral Drainage Feature
- Test Pit
- MPPEH Disposal Pit
- UXO-22 Boundary

Notes:
Shading indicates exceedance of developed subsurface soil combined BTV for background
Bold box indicates exceedance of NC SSLs
**Bold text indicates exceedance of Adjusted Industrial Soil RSLs**
Underline indicates exceedance of Adjusted Residential Soil RSLs
RSLs were adjusted for noncarcinogens to account for exposure to multiple constituents
BTV - Background threshold value
J - Analyte present, value may or may not be accurate or precise
SB - Subsurface soil

N

0 125 250 500 Feet

1 inch = 250 feet

Figure 4-1
Subsurface Soil Exceedances
Site UXO-22 PA/SI
MCIEAST-MCB CAMLEJ
North Carolina

CH2MHILL

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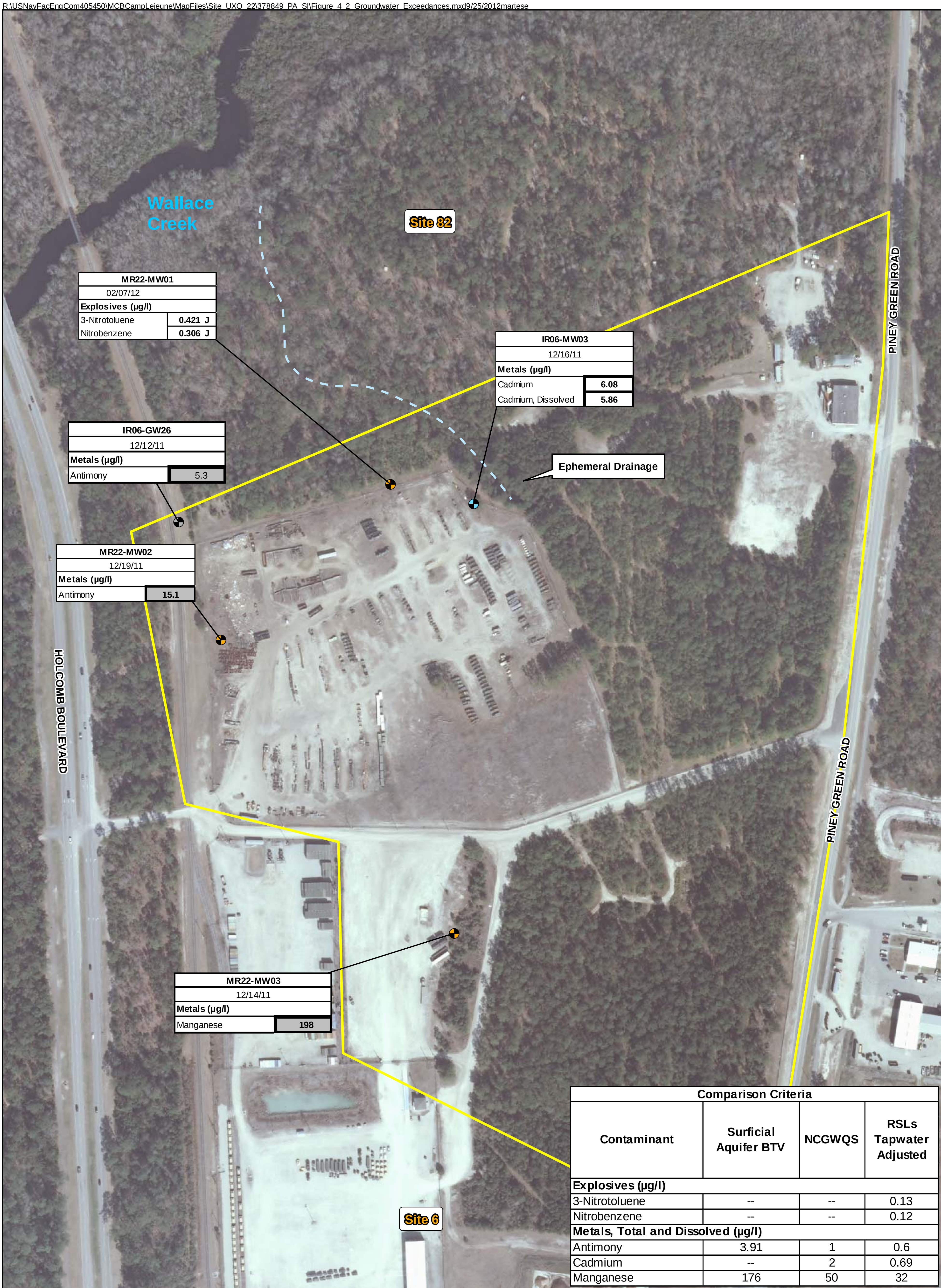



**Comparison Criteria**

| Contaminant | Surficial Aquifer BTV | NCGWQS | RSLs Tapwater Adjusted |
|---|---|---|---|
| **Explosives (µg/l)** | | | |
| 3-Nitrotoluene | -- | -- | 0.13 |
| Nitrobenzene | -- | -- | 0.12 |
| **Metals, Total and Dissolved (µg/l)** | | | |
| Antimony | 3.91 | 1 | 0.6 |
| Cadmium | -- | 2 | 0.69 |
| Manganese | 176 | 50 | 32 |

**Legend**

- Monitoring Well
- Existing Monitoring Well
- Temporary Monitoring Well/Soil Boring
- Intermittent Drainage Feature
- UXO-22 Boundary

Notes:
Shading indicates exceedance of surficial aquifer BTV for groundwater (September, 2012)
Bold box indicates exceedance of NCGWQS or the more conservative MCL (January, 2010)
**Bold text indicates exceedance of Adjusted Tap Water RSLs (November, 2011)**
RSLs were adjusted for noncarcinogens to account for exposure to multiple constituents
* - The MCL-Groundwater value is reported in place of the NCGWQS where the MCL value is more conservative.
BTV - Background threshold value
J - Analyte present, value may or may not be accurate or precise

N

0 125 250 500
Feet

1 inch = 250 feet

Figure 4-2
Groundwater Exceedances
Site UXO-22 PA/SI
MCIEAST-MCB CAMLEJ
North Carolina

CH2MHILL


| Station ID | MR22-SD01 |
|---|---|
| Sample ID | MR22-SD01-12A |
| Sample Date | 03/19/12 |
| Total Metals (mg/kg) | |
| Arsenic | **10.3 J** |
| Cadmium | 10 J |
| Copper | 421 |
| Iron | 11,900 |
| Lead | 594 |
| Manganese | **4,740** |
| Mercury | 19.8 J |
| Thallium | **9.59 J** |
| Zinc | 11,600 |

| Station ID | MR22-SD02 |
|---|---|
| Sample ID | MR22-SD02-12A |
| Sample Date | 03/19/12 |
| Total Metals (mg/kg) | |
| Arsenic | **5.15** |
| Manganese | 259 |
| Thallium | 0.432 J |

| Station ID<br>Sample ID<br>Sample Date | Developed Surface Soil Combined BTV | Adjusted Industrial Soil RSLs | Adjusted Residential Soil RSLs |
|---|---|---|---|
| Total Metals (mg/kg) | | | |
| Arsenic | 2.42 | 1.6 | 0.39 |
| Cadmium | 0.517 | 80 | 7 |
| Copper | 2.5 | 4,100 | 310 |
| Iron | 11,100 | 72,000 | 5,500 |
| Lead | 20.2 | 800 | 400 |
| Manganese | 18.3 | 2,300 | 180 |
| Mercury | 0.121 | 31 | 2.3 |
| Thallium | -- | 1 | 0.078 |
| Zinc | 16.2 | 31,000 | 2,300 |

**Legend**

- Sediment Sample Location
- Ephemeral Drainage Feature
- UXO-22 Boundary

Notes:
Shading indicates exceedance of developed surface soil combined BTV for background
**Bold text indicates exceedance of Adjusted Industrial Soil RSLs**
Underline indicates exceedance of Adjusted Residential Soil RSLs
RSLs were adjusted for noncarcinogens to account for exposure to multiple constituents
BTV - Background threshold value

N

0 125 250 500 Feet

1 inch = 250 feet

Figure 4-3
Surface Soil from Ephemeral Drainage Exceedances
Site UXO-22 PA/SI
MCIEAST-MCB CAMLEJ
North Carolina

CH2MHILL

SECTION 5

# Human Health Risk Evaluation

Analytical data for subsurface soil, surface soil from the ephemeral drainage, and groundwater, collected in 2010, 2011, and/or 2012, at Site UXO-22 were evaluated to determine the potential for human health risks associated with exposure to these media. The risk evaluation was performed in two phases. The first phase, a human health risk screening (HHRS), entailed comparing the site data to appropriate human health risk-based screening values and basewide background concentrations, and performing a risk ratio evaluation. If any of the media indicated the potential for unacceptable human health risks based on the HHRS, those media were carried forward to the second phase of the risk evaluation; a complete human health risk assessment (HHRA). Only those media that indicated the potential for human health risks based on the first phase were carried forward to the second phase of evaluation. MEC and MPPEH data were also evaluated for potential risks and explosive hazards.

Section 5.1 presents the human health conceptual site model, Section 5.2 presents a summary of the analytical data evaluated in the risk assessment, Section 5.3 presents the Phase I HHRS, Section 5.4 presents the Phase II HHRA, Section 5.5 presents the evaluation of explosive hazards and Section 5.6 summarizes the results of the human health risk evaluation. The HHRS Tables are included in **Appendix E.1** and the HHRA Tables are presented in **Appendix E.2**

## 5.1 Human Health Conceptual Site Model

The human health conceptual site model (CSM) presents an overview of site conditions, potential contaminant migration pathways, and exposure pathways to potential receptors. The human health CSM is presented as **Figure 5-1**. Sections 2.2 and 2.3 presented the site setting and history.

No receptors are currently exposed to subsurface soil or groundwater at Site UXO-022. There is the possibility that current trespassers/visitors could be exposed to the surface soil in the narrow ephemeral drainage that drains from the north-central portion of the site toward the northwest to Wallace Creek. Exposure routes for surface soil in this location include incidental ingestion of and dermal contact. The most likely potential future receptors are industrial site workers, military personnel, trespassers/visitors, and construction workers. Although unlikely, future receptors could also include residents. Future receptors could be exposed to subsurface soil if houses or industrial buildings are constructed at the site, or any type of excavation is performed and the soil is re-worked, bringing the subsurface soil to the surface. Exposure routes include incidental ingestion of and dermal contact with the soil, and inhalation of particulate emissions from soil.

Potable water supplies for MCIEAST-MCB CAMLEJ and the surrounding residential area are provided by water supply wells that pump groundwater from the Castle Hayne aquifer. Although freshwater is present within the surficial, Castle Hayne, Beaufort, and Peedee aquifers, all of which are located below MCIEAST-MCB CAMLEJ, only the Castle Hayne aquifer is used by MCIEAST-MCB CAMLEJ as a water supply source (Cardinell et al., 1993). The groundwater use patterns are already established for the Base and areas outside the LUCs for OU 2 that surround Site UXO-22, so use of site groundwater for industrial or residential purposes is restricted. However, state and federal governing policies assume that underground fresh water resources are potable, and should be maintained as such. Therefore, it is assumed that the surficial aquifer groundwater beneath the site could be used as a potable water supply. Under this assumption, the residents in a residential future use scenario would be exposed to the groundwater used as a potable water supply through ingestion, dermal contact, and inhalation while bathing, and the industrial site workers (and military workers), under an industrial future groundwater use scenario could be exposed to the groundwater through ingestion. It is expected that the industrial workers would not consistently shower at work, and therefore dermal contact and inhalation while showering would be minimal for the industrial worker. Additionally, due to the groundwater depth (less than 10 ft bgs in the southern portion of Site UXO-22), construction workers could be exposed to the groundwater by dermal contact in an excavation and inhalation of volatile emissions from groundwater in an excavation during construction activities.

## 5.2 Analytical Data Summary

All of the data used in the evaluation were validated and were found to be reliable for use in the HHRS and HHRA. The samples evaluated are discussed below and identified in **Table 5-1**. The analytical data are presented in **Appendix D**. A review of the data identified the following criteria for data usability:

- Estimated values flagged with a J qualifier were treated as detected concentrations.
- Data qualified with an R (rejected) were not used in the risk evaluation.
- For duplicate samples, the maximum concentration between the two samples was used as the sample concentration.

### 5.2.1 Groundwater

Groundwater samples were collected from five monitoring wells in December 2011 and one monitoring well in January 2012. The groundwater samples were analyzed for explosives and dissolved and total metals.

### 5.2.2 Subsurface Soil

Five subsurface soil samples (includes one duplicate) were collected from the MPPEH disposal pit excavation in October 2010 and analyzed for explosives and metals. Eleven subsurface soil samples, and one duplicate, were collected from test pits in January 2011 and analyzed for VOCs, SVOCs, PCBs, pesticides, explosives, and metals. Ten subsurface soil samples, and one duplicate, were collected in December 2011, and one subsurface soil sample and one duplicate were collected in February 2012, and analyzed for explosives and metals.

### 5.2.3 Surface Soil from Ephemeral Drainage

Two surface soil (originally classified as sediment) samples and one duplicate were collected from the ephemeral drainage feature in March 2012 and analyzed for explosives and metals.

## 5.3 Phase I – Human Health Risk Screening

The HHRS was conducted in three steps using a risk ratio technique (Navy, 2000). Contaminants of potential concern (COPCs) identified in Step 1 were evaluated in Step 2 (**Table 5-2**). If COPCs were identified in Step 2, they were evaluated in Step 3.

### 5.3.1 Step 1

The maximum detected concentrations for each medium were compared to USEPA risk-based screening levels (RSLs; USEPA, 2012a), other human health risk screening levels (if appropriate), and the MCIEAST-MCB CAMLEJ BTVs (CH2M HILL, 2011b and c). RSLs based on non-carcinogenic effects were divided by 10 to account for exposure to multiple constituents (i.e., were adjusted to a hazard quotient [HQ] of 0.1, from the HQ of 1 used in the RSL table). RSLs based on carcinogenic endpoints were used as presented in the RSL table, and are based on a carcinogenic risk of $1 \times 10^{-6}$.

The groundwater data were compared to tap water RSLs and the BTV Surficial Aquifer groundwater concentrations (CH2M HILL, 2011c). Lead concentrations in groundwater were compared to the lead federal action level for drinking water of 15 μg/L (USEPA, 2009b). Groundwater data were also compared to MCLs (USEPA, 2009b) and the NCGWQS (NCDENR, 2010); however, these comparisons were not used to identify the groundwater COPCs to carry forward to Step 2.

The subsurface soil data were compared to residential soil RSLs. Residential soil RSLs are more conservative (i.e., lower) than industrial soil RSLs and are therefore protective of all potential receptors (e.g., military personnel, trespassers/visitors, residents, industrial workers, construction workers). The subsurface soil data were also compared to the subsurface soil BTVs for combined soil types in developed areas (CH2M HILL, 2011b). The NC SSLs (NCDENR, 2011) are shown on the Step 1 soil screening tables; however, they were not used to identify COPCs.

The surface soil from the ephemeral drainage data were also compared to the surface soil BTVs for combined soil areas (CH2M HILL, 2011b) and to residential soil RSLs.

If the maximum detected concentration of a constituent in groundwater, subsurface or surface soil exceeded the applicable screening value and BTV, the screening level risk evaluation proceeded to Step 2.

In addition to comparing the detected concentrations to the screening levels, the project team compared the detection limits for non-detected analytes to the screening levels. Non-detected analytes with detection limits exceeding the screening level were not identified as COPCs to carry forward to Step 2, but are discussed below to evaluate the potential for underestimating the total risks.

### 5.3.2 Step 2

For analytes identified as COPCs in Step 1, a corresponding risk level was calculated using the following equation:

$$\textit{corresponding risk level} = \frac{\textit{concentration} \times \textit{acceptable risk level}}{\textit{RSL}}$$

The concentration is the maximum detected concentration (the same concentration that was used in Step 1). The acceptable risk level is 1 for non-carcinogens and $10^{-6}$ for carcinogens. RSLs for non-carcinogenic effects were not adjusted by 10 as was done in Step 1, they are used as presented in the RSL table.

The corresponding risk levels for each analyte within a medium were summed to calculate the cumulative corresponding hazard index (HI) (for non-carcinogens) and cumulative corresponding carcinogenic risk (for carcinogens). A cumulative corresponding HI was also calculated for each target organ/effect. If the cumulative corresponding HI for a target organ/effect was greater than 0.5, or the cumulative corresponding carcinogenic risk was greater than $5\times10^{-5}$, the analytes contributing to these values were retained as COPCs and carried forward to Step 3.

### 5.3.3 Step 3

A corresponding risk level was calculated as discussed above for Step 2; however, the 95 percent upper confidence limit (UCL) was used in place of the maximum detected concentration, if more than five samples were available for that medium, to obtain a more site-specific risk ratio. If the cumulative corresponding HI by target organ/effect was greater than 0.5, or the cumulative corresponding carcinogenic risk was greater than $5\times10^{-5}$, then constituents contributing to these values were considered COPCs.

ProUCL Version 4.1 (USEPA, 2010b) was used to identify the data distribution and calculate the 95 percent UCL used for the Step 3 risk ratio calculations. In cases where the recommended UCL exceeded the maximum detected concentration, the maximum concentration was used as the exposure point concentration (EPC).

### 5.3.4 Groundwater HHRS

Tables 2.1 through 2.1b in **Appendix E.1** show the results of the risk-based screening and risk ratio evaluation for groundwater. As shown in Table 2.1, **Appendix E.1**, nitrobenzene, 3-nitrotoluene, antimony, cadmium, and manganese were identified as COPCs for evaluation in Step 2. Based on Step 2 of the screening process (risk ratio using maximum detected concentration, Table 2.1a, **Appendix E.1**), nitrobenzene and 3-nitroltoluene were eliminated as COPCs; however, antimony, cadmium, and manganese could not be eliminated as COPCs. Based on Step 3 of the screening process (risk ratio using 95 percent UCL), antimony, cadmium, and manganese remained as COPCs.

Antimony was detected in three of the six groundwater samples. Two of the detected concentrations exceeded the BTV, and all three exceeded the screening level (the tap water RSL divided by 10). However, only the maximum detected concentration (15.1 µg/L in sample MR22-GW02-11D) exceeded the tap water RSL of 6 µg/L. Cadmium was detected in two of the six groundwater samples (from one location plus the duplicate). Only the maximum detected concentration (6.08 µg/L in sample IR06-GW03-11D) exceeded the screening level (the tap water RSL divided by 10); however, it did not exceed the tap water RSL of 6.9 µg/L. Manganese was detected in all six of the groundwater samples. Only the maximum detected concentration (198 µg/L in sample MR22-GW03-

11D) exceeded the BTV and the risk-based screening level (the tap water RSL divided by 10), however, it did not exceed the tap water RSL of 320 µg/L. Additionally, manganese is an essential human nutrient, and the maximum detected groundwater concentration would result in an intake of manganese below the adequate intake level (Institute of Medicine, 2001) for an adult and child if the groundwater were used as a potable water supply.

Based on the HHRS, future potable use of shallow groundwater at Site UXO-22 could potentially result in risks above acceptable levels and groundwater is evaluated in the Phase II HHRA.

### 5.3.5 Subsurface Soil HHRS

Tables 2.2 through 2.2b in **Appendix E.1** show the risk-based screening and risk ratio evaluation for subsurface soil. As shown in Table 2.2, **Appendix E.1**, antimony, hexavalent chromium, cobalt, lead, manganese, and thallium were identified as COPCs for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations, Table 2.2a, **Appendix E.1**), hexavalent chromium was carried forward to Step 3. Based on Step 3 (risk ratio using 95 percent UCL concentrations, Table 2.2b, **Appendix E.1**), hexavalent chromium was retained as a COPC for subsurface soil. The hexavalent chromium risk is associated primarily with the concentration in sample IR06-TP09-2-3-11A (490 mg/kg), the only sample with a concentration of hexavalent chromium greater than the BTV of 3.7 mg/kg. When this sample is not included in the data set, there is no unacceptable risk associated with exposure to the subsurface soil. Therefore, the risk associated with subsurface soil is associated with the concentration of hexavalent chromium detected in sample IR06-TP09-2-3-11A. Subsurface soil is evaluated in the Phase II HHRA.

Lead was detected in all 26 samples, but was detected in only 1 of the samples at a concentration exceeding the regulatory standards (sample IR06-TP09-2-3-11 at a concentration of 2,800 mg/kg, exceeding the residential soil screening level of 400 mg/kg and the industrial soil screening level of 800 mg/kg). All other detections of lead in the subsurface soil were below the regulatory standards, which would indicate a potential hot spot for lead in the area of sample IR06-TP09-2-3-11. This is the same location where the highest hexavalent chromium detection was recorded.

### 5.3.6 Surface Soil from the Ephemeral Drainage HHRS

Tables 2.3 and 2.3a in **Appendix E.1** show the risk-based screening and risk ratio evaluation for surface soil from the ephemeral drainage. As shown in Table 2.3, **Appendix E.1**, arsenic, cadmium, copper, iron, lead, manganese, mercury, thallium, and zinc were identified as COPCs for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations, Table 2.3a, **Appendix E.1**), arsenic, manganese, mercury, and thallium were carried forward to Step 3 (risk ratio using 95 percent UCL concentrations). However, Step 3 was not performed because only two surface soil samples were collected (Section 3.5.4) and a 95 percent UCL concentration cannot be calculated with only two samples. Therefore, these four metals are retained as COPCs for surface soil from the ephemeral drainage.

Lead was detected in both samples, but was only detected in one of the samples at a concentration exceeding the regulatory standards (sample MR22-SD01-12A at a concentration of 594 mg/kg, above the residential soil screening level of 400 mg/kg, but below the industrial screening level of 800 mg/kg). The other detected concentration of lead in sediment was below the regulatory standards. The residential soil screening level for lead reflects more frequent exposure to soil than would be expected for contact with this media. Therefore, the use of the residential soil screening level for lead likely overstates potential exposures to this surface soil in the ephemeral drainage. Therefore, exceeding this level does not necessarily indicate that lead poses a risk to potential receptors.

### 5.3.7 Non-detected Analytes

For groundwater, there were four explosives residues and one metal that were not detected in any groundwater samples but had detection limits that exceeded the screening level. All of the detection limits for the four explosives residues were within an order of magnitude of the screening value. The detection limit for the one metal, thallium was equal to the thallium MCL.

For subsurface soil and surface soil from the ephemeral drainage, nitroglycerin was the only constituent with a detection limit above its screening value; however, the detection limit was within an order of magnitude of the screening level.

Based on the evaluation of detection limits for non-detected analytes in both subsurface and surface soil, no non-detected analytes are expected to be present at the site that would result in unacceptable risks or changes in the HHRS results.

# 5.4 Phase II Human Health Risk Assessment

An HHRA was performed for surface soil from the ephemeral drainage, subsurface soil, and groundwater based on the results of the Phase I HHRS (Section 5.3) Supplemental information used in this HHRA, and the risk calculations, are presented in **Appendix E.2** and include the *Risk Assessment Guidance for Superfund* (RAGS*), Volume 1, Human Health Evaluation Manual Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments* (RAGS Part D; USEPA, 2001b) tables, and additional supporting tables. Guidance documents used for preparing the risk assessment include *RAGS Part A* (USEPA, 1989), *RAGS Part D* (USEPA, 2001b), *RAGS Part E* (USEPA, 2004), *RAGS Part F* (USEPA, 2009a), and USEPA Region IV *Supplemental Guidance to RAGS: Region IV Bulletins* (USEPA, 2000).

The primary objective of the HHRA was to assess the health risks associated with exposure to surface soil from the ephemeral drainage, subsurface soil, and groundwater. The risk assessment is comprised of the following components:

- **Identification of Chemicals of Potential Concern**—Identification of the chemicals found onsite and selection of the COPCs. COPCs are the focus of the subsequent evaluation in the risk assessment.
- **Exposure Assessment**—Identification of the potential pathways of human exposure, characterization of the potentially exposed populations, and estimation of the magnitude, frequency, and duration of these exposures.
- **Toxicity Assessment**—Assessment of the potential adverse effects of the COPCs and compilation of the toxicity values used for developing numerical risk estimates.
- **Risk Characterization**—Integration of the results of the exposure assessment and toxicity assessment to develop numerical estimates of health risks.
- **Uncertainty Assessment**—Identification and discussion of sources of uncertainty associated with the data, methodology, and values used in the risk assessment.

These components are described briefly in the following sections.

## 5.4.1 Identification of Chemicals of Potential Concern

All of the data used in the Phase I HHRS evaluation were quantitatively evaluated in Phase II of the risk assessment. The COPC screening is presented in Tables 2.1 through 2.5 in **Appendix E.2**. The methodology used to select the COPCs for quantitative evaluation in the HHRA was the same as Step 1 of the Phase I HHRS, as described in Section 5.3. In addition, the soil to air pathway was evaluated to identify any COPCs associated with volatile and fugitive emissions from soil and the groundwater to air pathway was evaluated to identify any COPCs associated with volatile emissions from groundwater to air, as described below.

- **Comparison with Health-based Criteria for Ambient Air:** Concentrations of chemicals in air emanating from contaminated soil by volatilization and/or fugitive dust emissions were compared to the USEPA residential air RSLs. RSLs based on non-carcinogenic effects were divided by 10 to account for exposure to multiple constituents. RSLs based on carcinogenic effects were used as presented in the RSL table. The ambient air concentrations were calculated following USEPA's soil screening guidance (USEPA, 2002), as shown in **Appendix E.2**, Tables 2.3 and 2.3A.

- **Comparison with Health-based Criteria for Groundwater Ambient Air:** Constituents detected in groundwater considered to be volatile were compared to the USEPA tap water RSLs (USEPA, 2012a), as shown in **Appendix E.2**, Table 2.5.

## 5.4.2 Exposure Assessment

Exposure assessment is the estimation of the likelihood, magnitude, frequency, duration, and routes of exposure to a chemical. Exposure refers to the potential contact of an individual (or receptor) with a chemical. Exposure can occur when contaminants migrate from a source to an exposure point, or when a receptor comes into direct contact with contaminated media.

The three components of exposure assessment include:

- Characterization of exposure setting
- Identification of exposure pathways
- Quantification of exposure

### Characterization of Exposure Setting

Descriptions and the history of MCIEAST-MCB CAMLEJ and Site UXO-22 are included in Section 2 as well as summarized in Section 5.1. Section 5.1 also describes the potential receptors at Site UXO-22.

### Identification of Exposure Pathways

An exposure pathway can be described as the physical course that a COPC takes from the point of release (or source) to a receptor. To be complete, an exposure pathway must have all of the following components:

- A source (e.g., constituent residues in soil);
- A mechanism for chemical release and migration (e.g., leaching);
- An environmental transport medium (e.g., groundwater);
- A point or site of potential human contact (exposure point, e.g., drinking water); and
- A route of intake (e.g., ingestion of groundwater used as a drinking water source).

In the absence of any one of these components, an exposure pathway is considered incomplete and, by definition, there is no risk or hazard. In some cases, a receptor may contact a source directly, eliminating the release and transport pathways.

The potential exposure pathways for all media for Site UXO-22 are identified in the CSM (**Figure 5-1**) and shown in Table 1, **Appendix E.2**.

The current land use exposure routes quantitatively evaluated in the HHRA include:

- **Trespasser/Visitor (adult, youth, and child) —** Incidental ingestion of and dermal contact with surface soils in the ephemeral drainage.

The future land use exposure routes quantitatively evaluated in the HHRA include the current exposure routes and:

- **Resident (adult and child)—**Incidental ingestion of and dermal contact with subsurface soil and inhalation of dust from subsurface soil, ingestion of groundwater, inhalation and dermal contact with groundwater while showering/bathing.

- **Construction Worker—**Incidental ingestion of and dermal contact with subsurface soil and inhalation of dust from subsurface soil disturbed during construction, and dermal contact with and inhalation of volatile emissions from groundwater.

- **Industrial Worker—** Incidental ingestion of and dermal contact with subsurface soil and inhalation of dust from subsurface soil disturbed during construction, and ingestion of groundwater.

- **Trespasser/Visitor (adult, youth, and child) —** Incidental ingestion of and dermal contact with surface soils in the ephemeral drainage, and incidental ingestion of and dermal contact with subsurface soil and inhalation of dust from subsurface soil disturbed during construction.

Future military personnel could also be exposed to subsurface soil and groundwater, as shown on Figure 5-1, however, risks to future military personnel are not quantified in the HHRS since the risks to the more conservative industrial worker are quantified.

## Quantification of Exposure

Exposure is quantified by estimating the EPCs of COPCs in environmental media and COPC intake by the receptor. Both reasonable maximum exposure (RME) and central tendency exposure (CTE) intakes were included in this evaluation. CTE intakes were calculated for exposure scenarios with RME cumulative cancer risks greater than $1 \times 10^{-4}$ or cumulative non-cancer hazards greater than 1.

## Exposure Concentrations

EPCs are estimated constituent concentrations that a receptor may contact and are specific to each exposure medium and exposure area. EPCs may be directly measured or estimated using environmental fate and transport models. Constituent concentrations in sediment, subsurface soil, and groundwater were measured in this assessment. Fate and transport modeling conducted for the Site UXO-22 risk assessment included estimating fugitive dust and volatile emissions from subsurface soil for the COPC screening following the methods in USEPA's Soil Screening Guidance Document (USEPA, 2002), as shown in Tables 2.3 and 2.3.A, **Appendix E.2**, estimating volatile emissions from groundwater while showering using the Foster and Chrostowski (1987) shower model for residential receptors (Table 7.4.RME Supplement C, Table 7.5.RME Supplement B, Table 7.2.CTE Supplement B, and Table 7.3.CTE Supplement C, **Appendix E.2**), and estimating volatile emissions from groundwater in an open excavation for a construction scenario using a Two-Film Model (Table 7.7.RME Supplement B in **Appendix E.2**).

No groundwater contaminant plume has been identified for UXO-22. Therefore, the average groundwater concentration was used as the groundwater EPC for metals, consistent with USEPA Region IV risk assessment guidance (USEPA, 2000). The maximum detected concentration was used as the EPC for nitrobenzene and 2-nitroluene since these constituents were detected in just 1 sample.

ProUCL software Version 4.1 (USEPA, 2010b) was used to calculate the EPCs for soil as well as to determine the distribution that the data fit and to calculate the 95 percent UCLs used as the RME EPC. ProUCL identifies three possible data distributions: normal distribution, log-normal distribution, and gamma distribution. The UCL calculation method is then selected based on the data distribution (normal, lognormal, gamma, or nonparametric if the data do not fit any of the distributions). The recommendations outlined in the ProUCL software documentation were followed to select the appropriate UCL. The maximum detected concentration was used as the RME EPC in cases where the estimated 95 percent UCL was greater than the maximum detected concentration, less than 5 samples were available for a data grouping (such as for sediment), or the COPC was detected in only one sample. The mean concentration based on the method used for the RME EPC (i.e., normal mean or non-parametric mean) was used as the CTE EPC. CTE risk evaluations were performed for exposure pathways that resulted in a risk above $1 \times 10^{-4}$, or an HI above 1 (see **Section 5.4.4** on risk characterization).

**Appendix E.2**, Tables 3.1.RME through 3.5.RME and 3.1.CTE through 3.5.CTE present the EPCs for the COPCs for each medium and the rationale for the selected EPC.

## Estimation of Chemical Intakes

Chemical intake is the amount of the chemical constituent entering the receptor's body. The quantification of exposure is based on an estimate of the average daily intake, the average amount of the chemical contaminant entering the receptor's body per day. Chemical intakes for the ingestion and dermal pathways are generally expressed as follows:

$$ADI = \frac{C \times CR \times EF \times ED}{BW \times AT}$$

Where:

- ADI = average daily intake (mg/kg-day)
- C = chemical concentration (mg/kg)
- CR = contact rate (mg/day)
- EF = exposure frequency (days/year)
- ED = exposure duration (years)
- BW = body weight (kg)
- AT = averaging time (days)

For the dermal pathway, the contact rate incorporates the skin surface area in contact with the exposure medium (sediment, water, or soil), and an absorption factor. The intake equation for the dermal exposure pathway is shown in the **Appendix E.2**, Tables 4.1.RME, 4.2.RME, 4.4.RME, 4.1.CTE, 4.2CTE, and 4.4.CTE.

Chemical exposure estimates for the inhalation pathway are generally expressed as follows:

$$EC = \frac{C_a \times ET \times EF \times ED \times CT}{AT}$$

Where:

- EC = exposure concentration (mg/m$^3$)
- $C_a$ = chemical concentration in air (mg/m$^3$)
- ET = exposure time (hours/day)
- EF = exposure frequency (days/year)
- ED = exposure duration (years)
- CF = conversion factor (day/24 hours)
- AT = averaging time (days)

The intake and exposure concentration equations require exposure parameters that are specific to each exposure pathway. Exposure parameters are often assumed values, and their magnitude influences the estimates of potential exposure (and risk). The reliability of the values chosen can also contribute substantially to the uncertainty of the resulting risk estimates. Many of the exposure parameters have default values, which were used for this assessment. These assumptions, based on estimates of body weights, media intake levels, and exposure frequencies and duration, are provided in USEPA guidance. Other assumptions (e.g., for the trespasser/visitor scenarios) require consideration of location-specific information and were determined using professional judgment. Both RME and CTE exposure parameters were compiled. CTE exposure parameters are provided only for scenarios where the RME risk was greater than USEPA's non-carcinogenic hazard or carcinogenic risk target levels, as these were the only CTE scenarios quantified in the HHRA. Tables 4.1(RME and CTE) for sediment, 4.2(RME and CTE), and 4.3 (RME and CTE) for subsurface soil and 4.4 (RME and CTE), and 4.5 (RME and CTE) for groundwater, in **Appendix E-2,** identify the exposure parameters and intake equations for each of the scenarios evaluated in the risk assessment.

### 5.4.3 Toxicity Assessment

Toxicity assessment defines the relationship between the magnitude of exposure and possible severity of adverse effects, and weighs the quality of available toxicological evidence. Toxicity assessment generally consists of two steps: hazard identification and dose-response assessment. Hazard identification is the process of determining the potential adverse effects from exposure to the chemical along with the type of health effect involved. Dose-response assessment is the process of quantitatively evaluating the toxicity information and characterizing the relationship between the dose of the constituent administered or received and the incidence of adverse health effects in the exposed population. Toxicity criteria (e.g., reference doses [RfDs], reference concentrations [RfCs], cancer slope factors [CSFs], and inhalation unit risks [IURs]) are derived from the dose-response relationship.

USEPA recommends that a tiered approach be used to obtain the toxicity values (RfDs, RfCs, CSFs, and IURs) that are used to calculate non-carcinogenic hazards and carcinogenic risks, respectively (USEPA, 2003). The hierarchy of toxicity value sources it the following:

1. Integrated Risk Information System (IRIS; USEPA, 2012b)
2. Provisional Peer-Reviewed Toxicity Values (PPRTV)
3. Other USEPA and non-USEPA sources including the (HEAST; USEPA, 1997)

Three of the COPCs, nitrobenzene, arsenic, and chromium, elicit both systemic (non-carcinogenic) toxic effects and cancer (carcinogenic) effects. Because of this, these constituents are evaluated as both non-carcinogens and carcinogens. The health risks for carcinogenic and non-carcinogenic effects were calculated separately based on different toxicity values.

The use of toxicity values from sources other than IRIS increases the uncertainty of the quantitative risk estimates. If toxicity values were not available for a detected constituent, surrogate constituents were selected, if appropriate, and their RSLs were used for the COPC selection process. Surrogates were selected based on previous recommendations from USEPA. The surrogates are identified in Tables 2.1 through 2.5 in **Appendix E.2**. None of the constituents screened during the COPC selection process using surrogates were identified as COPCs.

Dermal RfDs and CSFs were calculated from the oral RfDs and CSFs using an oral to dermal adjustment factor, or gastrointestinal (GI) absorption factor. This factor is designed to convert the orally administered dose toxicity factors to dermically absorbed dose toxicity factors (USEPA, 2004). The oral RfDs were converted to dermal RfDs by multiplying by the GI absorption factor and the oral CSFs were converted to dermal CSFs by dividing by the GI absorption factor. If a chemical-specific GI absorption factor was not available or was greater than 50 percent, a GI absorption factor of 100 percent was assumed. The dermal RfDs are included in Table 5.1, **Appendix E.2**. The dermal CSFs are presented in Table 6.1, **Appendix E.2**.

### Toxicity Information for Non-carcinogenic Effects

Non-carcinogenic health effects include a variety of toxic effects on body systems, ranging from toxicity to the kidneys to central nervous system disorders. The toxicity of a chemical is assessed through a review of toxic effects noted in short-term (acute) animal studies, long-term (chronic) animal studies, and epidemiological investigations.

USEPA (1989) defines the chronic RfD and RfC as a dose that is likely to be without appreciable risk of deleterious effects during a lifetime of exposure. Chronic RfDs and RfCs are specifically developed to be protective for long-term exposure to a compound (for example, 7 years to a lifetime), and consider uncertainty in the toxicological database and sensitive receptors. Subchronic RfDs and RfCs (applicable for exposures less than 7 years), which are all provisional values (i.e., not verified by USEPA), were used for the construction worker scenario.

In the development of RfDs and RfCs, all available studies examining the toxicity of a chemical following exposure are considered on the basis of scientific merit. The lowest dose level at which an observed toxic effect occurs is identified as the Lowest Observed Adverse Effect Level (LOAEL), and the dose at which no effect is observed is identified as the No Observed Adverse Effect Level (NOAEL). Several uncertainty factors (UFs) may be applied to account for uncertainties such as limited data quality, extrapolation of data from animal studies to human exposures, or the use of subchronic studies to develop chronic criteria. These UFs range from 3 to 10,000, and are based on professional judgment. Consequently, there are varying degrees of uncertainty in the toxicity criteria, which range from 3 to 3,000 for the COPCs for this site. USEPA-derived oral RfDs, and associated UF and modifying factor (MF) values, available for the COPCs are presented in **Appendix E.2**, Table 5.1. USEPA-derived inhalation RfCs and associated UF and MF values are presented in **Appendix E.2**, Table 5.2.

### Toxicity Information for Carcinogenic Effects

Potential carcinogenic effects are quantified as CSFs or IURs that convert estimated exposures directly to incremental lifetime carcinogenic risks.

CSFs and IURs may be derived from the results of chronic animal bioassays, human epidemiological studies, or both. Animal bioassays are usually conducted at dose levels that are much higher than are likely to be encountered in the environment. This design detects possible adverse effects in the relatively small test populations used in the studies. The actual risks from exposure to a potential carcinogen are not likely to exceed the estimated risks and are probably much lower or even zero. USEPA-derived CSFs and IURs are presented in Tables 6.1 and 6.2 in **Appendix E.2**.

### Approach for Lead

Lead is not included in the quantitative risk estimates because a dose-response toxicity value is not available for lead. Quantitative oral toxicity criteria are not available for lead. As a screening tool, lead is screened at 400 mg/kg in soil based on residential exposure and 15 µg/L in groundwater based on the Safe Drinking Water Act lead action level. Lead was identified as a COPC for surface soil in the ephemeral drainage and subsurface soil. Exposure to lead is quantitatively evaluated for the resident using the Integrated Exposure Uptake (IEUBK) Model, as discussed in Section 5.4.4.

### Approach for Potential Mutagenic Effects

To remain consistent with the Cancer Guidelines and Supplemental Guidance (USEPA, 2005a and 2005b), cancer risks for COPCs which act via a mutagenic mode of action (MMOA) were estimated using age-dependent, adjustment factors (ADAFs). Hexavalent chromium was the only COPC that is categorized as a chemical with a MMOA. The calculation of cancer risk using ADAFs is presented in Tables 7.6.RME Supplement A and 7.3.CTE Supplement A of **Appendix E.2**. As chemical-specific data are not available for hexavalent chromium, default ADAFs, as included in the USEPA Region 3 memorandum *Derivation of RBCs for Carcinogens That Act via a Mutagenic Mode of Action and Incorporate Default ADAFs* (USEPA, 2006), were used for the MMOA evaluation. The default ADAFs used to adjust the CSF are 10 for 0-2 year olds, 3 for 2-6 year olds, 3 for 6-12 year olds, and 1 for 16-30 year olds. The CSF was multiplied by the appropriate ADAF to derive the age-specific CSF for a receptor to calculate the total carcinogenic risk. Additionally, the exposure factors for children 0–2 years old and 2–6 years old were assumed to be the same as the parameters for a child 0–6 years old, with the exception of the exposure duration, which was instead 2 years and 4 years, respectively. The exposure factors for the adult residential receptor were used for residents 6–16 years old and 16–30 years old, with the exception of the exposure durations, which were 10 years and 14 years, respectively.

## 5.4.4 Risk Characterization

Risk characterization combines the results of the previous elements of the risk assessment to evaluate the potential health risks associated with exposure to the COPCs.

Potential human health risks are discussed independently for carcinogenic and non-carcinogenic constituents because of the different toxicological endpoints, relevant exposure duration, and methods used to characterize risk. Some constituents may produce both non-carcinogenic and carcinogenic effects, and were evaluated in both groups. The methodology used to estimate non-carcinogenic hazards and carcinogenic risks is described below. Following the description of the methodology, the non-carcinogenic hazards and carcinogenic risks for Site UXO-022 are discussed.

### Non-carcinogenic Hazard Estimation

Non-carcinogenic health risks are estimated by comparing the calculated intake to an RfD (or exposure concentration to RfC). The calculated intake divided by the RfD (or exposure concentration divided by the RfC) is equal to the hazard quotient (HQ):

*HQ = Intake / RfD* or *Exposure Concentration / RfC*

The intake and RfD (or exposure concentration and RfC) represent the same exposure period (i.e., chronic or subchronic) and the same exposure route (i.e., oral intakes are divided by oral RfDs, inhalation exposure concentrations are divided by inhalation RfCs). An HQ that exceeds 1 (i.e., the intake exceeds the RfD) indicates that there is a potential for adverse health effects associated with exposure to that constituent.

To assess the potential for non-carcinogenic health effects posed by exposure to multiple constituents, a hazard index approach is used (USEPA, 1986). This approach assumes that non-carcinogenic hazards associated with exposure to more than one constituent are additive. Synergistic or antagonistic interactions between constituents are not considered. The HI may exceed 1 even if all of the individual HQs are less than 1. HIs are also added across exposure routes and media to estimate the cumulative non-carcinogenic health effects to a receptor posed by exposure through multiple routes and media. If the HI is greater than 1, separate HIs are estimated for each target organ to assess whether the HI for a specific target organ is greater than 1. A target-organ-specific HI greater than 1 indicates that there is some potential for adverse non-carcinogenic health effects associated with exposure to the COPCs, possibly warranting remedial action. If the HI for each target organ does not exceed 1, non-carcinogenic hazards are not expected.

### Carcinogenic Risk Estimation.

The potential for carcinogenic effects due to exposure to site-related constituents is evaluated by estimating the excess lifetime carcinogenic risk (ELCR). ELCR is the incremental increase in the probability of developing cancer during one's lifetime in addition to developing cancer associated with exposure to all non-site related sources of carcinogenic.

Carcinogenic risk is calculated by multiplying the intake by the CSF (or exposure concentration by the IUR).

$$ELCR = Intake \times CSF \text{ or } Exposure\ Concentration \times IUR$$

The combined risk from exposure to multiple constituents was evaluated by adding the risks from individual constituents. Risks were also added across the exposure routes if an individual would be exposed through multiple routes.

When a cumulative carcinogenic risk to an individual receptor under the assumed RME exposure conditions at the site exceeds one in ten thousand (i.e., $10^{-4}$ excess carcinogenic risk), CERCLA generally requires remedial action to reduce risks at the site. If the cumulative risk is less than $10^{-4}$, action generally is not required (USEPA, 1991).

### Approach for Lead

Risk assessments for lead are addressed using the IEUBK Lead Model for Windows®, Version 1.1, Build 11 (USEPA, 2010a). The IEUBK model was designed to provide predictions of the probability of elevated blood lead levels for children from ages 0 to 7 years with potential exposure to lead in various media. The IEUBK model was used to evaluate potential risks associated with future residential child exposures to lead in sediment and subsurface soil. The arithmetic mean of the lead concentration was used with the default input parameters to represent site-specific exposures to lead. The IEUBK model results are expressed as the predicted geometric mean blood lead level for children and the percent of the population potentially experiencing concentrations above USEPA's recommended level of 10 micrograms per deciliter (µg/dL); below which adverse manifestations are not expected). USEPA considers lead not to be a health concern if 95 percent of the population has a blood-lead level less than 10 µg/dl.

## 5.4.5 Risk Assessment Results

The results of the risk characterization are presented below by receptor. The risks are calculated in Appendix E.2, Tables 7.1.RME through 7.11.RME, and Tables 7.1.CTE through 7.4.CTE. The risks are summarized in Appendix E.2, Tables 9.1.RME through 9.11.RME and 9.1.CTE through 9.4.CTE. A summary of the RME results is shown in **Table 5-3** and a summary of the CTE results is shown in **Table 5-4**. CTE risks were calculated only when the RME hazard exceeded 1 or the RME carcinogenic risk exceeded $10^{-4}$.

### Current/Future Adult Trespasser/Visitor (Table 9.1.RME, Appendix E.2)

The risk assessment assumed that a current/future adult trespasser/visitor could be exposed to the surface soil from the ephemeral drainage via incidental ingestion and dermal contact. The RME non-carcinogenic hazard (0.3) is below USEPA's target hazard index of 1. The RME carcinogenic risk ($2 \times 10^{-6}$) is within the USEPA's target risk range of $1 \times 10^{-6}$ to $1 \times 10^{-4}$.

### Current/Future Youth Trespasser/Visitor (Table 9.2.RME, Appendix E.2)

The risk assessment assumed that a current/future youth trespasser/visitor could be exposed to surface soil from the ephemeral drainage via incidental ingestion and dermal contact. The RME non-carcinogenic hazard (0.5) is below USEPA's target hazard index of 1. The RME carcinogenic risk ($1x10^{-6}$) is within the USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

### Current/Future Child Trespasser/Visitor (Tables 9.3.RME, and 9.1.CTE, Appendix E.2)

The risk assessment assumed that a current/future child trespasser/visitor could be exposed to surface soil from the ephemeral drainage via incidental ingestion and dermal contact. The RME non-carcinogenic hazard (3) exceeds USEPA's target hazard index of 1. The hazard is associated with ingestion of thallium, the only COPC with an HI above 1, resulting in a target organ HI for hair of 2. The RME carcinogenic risk ($3x10^{-6}$) is within the USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$. Thallium was detected in both surface soil samples, but only the concentration in MR22-SD01-12A exceeds the RSL for thallium.

The CTE non-carcinogenic hazard (0.3) is below USEPA's target hazard index of 1.

Lead was identified as a COPC for the surface soil from the ephemeral drainage. Lead was detected in both samples, but was only detected in one of the samples at a concentration exceeding the screening criteria (sample MR22-SD01-12A at a concentration of 594 mg/kg, above the residential soil screening level of 400 mg/kg). The other detected concentration of lead in was below the screening criteria. The residential soil screening level for lead reflects more frequent exposure to soil than would be expected for contact with this particular surface soil location by trespasser/visitor receptors. The IEUBK model was used to evaluate exposure to lead using the conservative default exposure assumptions (i.e. intake rate and exposure frequency for residential child) for soil used by the IEUBK model. The mean concentration of lead detected in the samples (345 mg/kg) was used, along with the model default assumptions for all other parameters. The IEUBK evaluation resulted in a geometric mean blood concentration of 4.0 µg/dl of blood () for children 0 to 7 years old. Less than 5 percent (i.e., 2.6%) of this population had a blood-lead level above USEPA's recommended level of 10 µg/dl (need reference to IEUBK model output). Therefore, lead in the surface soil from the ephemeral drainage does not pose an unacceptable health risk under residential use of the site.

### Future Adult Resident (non-carcinogenic hazard, Table 9.4.RME, Appendix E.2)

The risk assessment assumed that a future adult resident could be exposed to subsurface soil through incidental ingestion, dermal contact, and inhalation of fugitive dust emissions and to groundwater used as a potable water supply through ingestion, and dermal contact and inhalation while showering. Carcinogenic risks were not calculated for the adult resident but were calculated for a lifetime resident, in accordance with USEPA guidance.

The cumulative RME non-carcinogenic hazard associated with exposure to subsurface soil and groundwater (HI = 1) does not exceed the target HI of 1. The RME non-carcinogenic hazard associated with subsurface soil (HI = 0.3) and groundwater (HI = 0.9) are below the target hazard index of 1.

Lead was identified as a COPC in subsurface soil. Exposures to lead in subsurface soil were evaluated for the child resident using the IEUBK model. The results of the IEUBK model, described below for the future child resident, indicate that lead concentrations in subsurface soil would not result in any unacceptable adverse effects.

### Future Child Resident (non-carcinogenic hazard, Tables 9.5.RME, and 9.2.CTE, Appendix E.2)

The risk assessment assumed that a future child resident could be exposed to subsurface soil through incidental ingestion, dermal contact, and inhalation of fugitive dust emissions and to groundwater used as a potable water supply through ingestion, and dermal contact and inhalation while showering. Carcinogenic risks were not calculated for the child resident but were calculated for a lifetime resident, in accordance with USEPA guidance.

The cumulative RME non-carcinogenic hazard associated with exposure to subsurface soil and groundwater (HI = 5) exceeds the target HI of 1. The RME non-carcinogenic hazard associated with subsurface soil (HI = 3) exceeds the target hazard index of 1. The hazard is associated with ingestion of hexavalent chromium, the only COPC with an HI above 1. There is no target organ identified for hexavalent chromium. The RME non-carcinogenic hazards associated with groundwater (HI = 2), exceeds the target hazard index of 1. However, there are no target organ/effects with HIs above 1 for groundwater or for exposure to both groundwater and soil (as there is no target organ identified for hexavalent chromium).

The cumulative CTE non-carcinogenic hazard (2) exceeds the target index of 1, however, there are not target organ HIs above 1.

Lead was identified as a COPC in the subsurface soil and site-specific lead exposures were evaluated for residential children using the IEUBK model. This calculation was based on the mean concentration of lead detected in the subsurface soil (117 mg/kg) and the IEUBK model default values for all other parameters, including the groundwater concentration. The IEUBK evaluation resulted in a geometric mean blood concentration of 2.0 micrograms per deciliter of blood (µg/dl) for children 0 to 7 years old. Less than 1 percent (0.03%) of this population had a blood-lead level above USEPA's recommended level of 10 µg/dl. Therefore, lead in subsurface soil does not pose an unacceptable health risk under residential use of the site.

### Future Lifetime Resident (carcinogenic risk, Tables 9.6.RME, and 9.3.CTE, Appendix E.2)

The risk assessment assumed that a lifetime resident could be exposed to subsurface through incidental ingestion, dermal contact, and inhalation of particulate emissions, and to groundwater used as a potable water supply through ingestion, and dermal contact and inhalation while showering.

The cumulative RME carcinogenic risk associated with exposure to subsurface soil and groundwater ($2x10^{-3}$) exceeds the USEPA's target risk range of $10^{-6}$ to $10^{-4}$. The RME carcinogenic risk associated with subsurface soil ($2x10^{-3}$) exceeds the USEPA's target risk range of $10^{-6}$ to $10^{-4}$. The risk is associated with ingestion and dermal contact with hexavalent chromium ($2x10^{-3}$). The hexavalent chromium risk is associated primarily with the concentration in sample IR06-TP09-2-3-11A (490 mg/kg), the only sample with a concentration of hexavalent chromium greater than the BTV of 3.7 mg/kg. The RME carcinogenic risk associated with groundwater ($3x10^{-8}$) is below the USEPA's target risk range of $10^{-6}$ to $10^{-4}$.

The cumulative CTE cancer risk associated with subsurface soil ($5x10^{-5}$) is within the USEPA's target risk range of $10^{-6}$ to $10^{-4}$.

### Future Construction Worker (Table 9.7.RME, Appendix E.2)

The risk assessment assumed that a future construction worker could be exposed to subsurface soil through incidental ingestion, dermal contact, and inhalation of fugitive dust emissions, and to groundwater in an excavation through dermal contact and inhalation.

The cumulative RME non-carcinogenic hazard (0.2) is below USEPA's target HI of 1. The cumulative RME carcinogenic risk ($1x10^{-5}$) is within USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

### Future Industrial Worker (Table 9.8.RME, Appendix E.2)

The risk assessment assumed that a future industrial worker could be exposed subsurface soil through incidental ingestion, dermal contact, and inhalation of fugitive dust emissions and to groundwater used as a potable water supply through ingestion.

The cumulative RME non-carcinogenic hazard (0.6) is below USEPA's target HI of 1. The cumulative RME carcinogenic risk ($1x10^{-4}$) is within USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

### Future Adult Trespasser/Visitor (Table 9.9.RME, Appendix E.2)

The risk assessment assumed that a future adult trespasser/visitor could be exposed to surface soil from the ephemeral drainage via incidental ingestion and dermal contact and subsurface soil via incidental ingestion, dermal contact, and inhalation of particulate emissions. The RME non-carcinogenic hazard (0.4) is below USEPA's target hazard index of 1. The RME carcinogenic risk ($2x10^{-5}$) is within the USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

### Future Youth Trespasser/Visitor (Table 9.10.RME, Appendix E.2)

The risk assessment assumed that a future youth trespasser/visitor could be exposed to surface soils from the ephemeral drainage via incidental ingestion and dermal contact and subsurface soil via incidental ingestion, dermal contact, and inhalation of particulate emissions. The cumulative RME non-carcinogenic hazard (0.6) is below USEPA's target hazard index of 1. The RME carcinogenic risk ($1x10^{-5}$) is within the USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

### Future Child Trespasser/Visitor (Table 9.11.RME, and 9.4.CTE, Appendix E.2)

The risk assessment assumed that a future child trespasser/visitor could be exposed to surface soil from the ephemeral drainage via incidental ingestion and dermal contact and subsurface soil via incidental ingestion, dermal contact, and inhalation of particulate emissions. The cumulative RME non-carcinogenic hazard (3) exceeds USEPA's target hazard index of 1. The hazard is associated with ingestion of thallium in the surface soil from the ephemeral drainage, the only COPC with an HI above 1, resulting in a target organ HI for hair of 2. Thallium was detected in both surface soil from the ephemeral drainage samples, but only the concentration in MR22-SD01-12A exceeds the RSL for thallium. The cumulative CTE non-carcinogenic hazard (0.4) is below USEPA's target hazard index of 1.

The cumulative RME carcinogenic risk ($3x10^{-5}$) is within the USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

## 5.4.6 Uncertainty Associated with Human Health Assessment

The risk measures used in human health risk assessments are not fully probabilistic estimates of risk, but are conditional estimates given that a set of assumptions about exposure and toxicity are realized. Thus it is important to specify the assumptions and uncertainties inherent in the risk assessment to place the risk estimates in proper perspective (USEPA, 1989).

### General Uncertainty in COPC Selection

The sampling conducted at Site UXO-022 focused on areas of suspected impact from past site use based on previous sampling information. Therefore, the uncertainty in sampling and possibility of omitting a potential sampling location affected by site constituents where exposure is likely to occur is expected to be minimal. The uncertainty associated with the data analysis is minimal because the data were fully validated before being used in the risk assessment.

The general assumptions used in the COPC selection process were conservative to ensure that true COPCs were not eliminated from the quantitative risk assessment and that the highest possible risk was estimated. RSLs based on residential assumptions were used to select the COPCs for all of the scenarios, including non-residential scenarios.

### Uncertainty Associated with Exposure Assessment

Site-related contamination is expected to decrease with time due to naturally occurring attenuation processes (e.g., degradation due to weathering, volatilization, advection, dispersion, leaching due to infiltrating precipitation, etc.). The risk assessment assumed concentrations would remain constant throughout the exposure period and that these concentrations occur everywhere throughout the site. This assumption likely results in an over-estimation of risk.

Uncertainty in the exposure assessment was generally treated with conservative decision rules and assumptions, and therefore, the uncertainty likely overestimates actual exposure to COPCs. Several exposure pathways evaluated by this HHRA, such as assuming residential homes will be constructed at Site UXO-22 in the future, are hypothetical and are not anticipated to exist in the future. Additionally, it is not likely that the groundwater would ever be used as a potable or industrial supply.

The maximum detected concentrations of the COPCs in the surface soil from the ephemeral drainage were used as the EPCs for these constituents, as there were only two samples available for inclusion. The maximum detected concentration of thallium in the subsurface soil was used as the EPC because it was detected in only 1 of 26 locations sampled. Use of the maximum detected concentrations as the EPCs, likely overestimates the risk.

The exposure factors used for the quantitation of exposure were conservative and reflect worst-case or upper-bound assumptions on the exposure. The reliability of the values chosen for the exposure factors also contributes substantially to the uncertainty of the resulting risk estimates. Because most of the exposure factors are worst-case or upper-bound assumptions, the resulting risks are worst-case and likely overestimate the actual risk.

The future subsurface soil exposure scenario adds additional conservatism by assuming that the subsurface soil will become surface soil during any future construction activities, and that future receptors may come in contact with what is the current subsurface soil in the future. During many construction projects, fill material such as topsoil is placed over the soil that is disturbed during excavation projects. The topsoil material is generally needed to support growth of grass and other landscape plants. This would decrease the possibility of future exposure to subsurface soil after any construction activities.

The percent of a constituent absorbed through the skin is another source of uncertainty and is likely to be affected by many parameters, including soil loading, moisture content, organic content, pH, and presence of other constituents. The availability of a constituent for absorption through the skin depends on site-specific fate and transport properties of the chemical species available for eventual absorption. Constituent concentrations, specific properties of the constituent, and the kinetics of constituents being released from sediment all affect the amount of a constituent that is absorbed. These factors contribute to the uncertainty associated with dermal absorption estimates, and make it difficult to quantify the amount of certain constituents absorbed through the skin from soil.

### Uncertainty Associated with Toxicity Assessment

Uncertainty associated with the non-carcinogenic toxicity factors is included in **Appendix E.2**, Tables 5.1 and 5.2. Several UFs were applied by USEPA to extrapolate dose points from animal studies to humans. These UFs range between 1 and 3,000. Additional modification factors are also used based on the professional judgment of USEPA. Therefore, there is a high degree of uncertainty in the non-carcinogenic toxicity criteria, based on the available scientific data for each constituent. The non-carcinogenic toxicity factors are most likely an overestimate of actual toxicity.

The uncertainty associated with CSFs and IURs is mostly due to the low dose extrapolation, where carcinogenicity at low doses is assumed to be a linear response. This is a conservative assumption, which introduces a high uncertainty into slope factors and unit risk factors that are extrapolated from this area of the dose-response curve. The CSFs and IURs are based on the assumption that there is no threshold level for carcinogenicity; however, most of the experimental studies indicate the existence of a threshold level. Therefore, CSFs and IURs developed by USEPA represent upper-bound estimates. Carcinogenic risks generated in this assessment should be regarded as an upper bound estimate on potential carcinogenic risks, rather than an accurate representation of carcinogenic risk. The true carcinogenic risk is likely to be less than the predicted value (USEPA, 1989). Uncertainty is also associated with the application of the MMOA for hexavalent chromium; this may over-estimate or under-estimate risks. Additionally, generic ADAFs were used in the MMOA calculations, as no chemical specific ADAFs are available.

Additional uncertainty lies in the prediction of relative sensitivities of different species of animals and the applicability of animal data to humans.

A large degree of uncertainty is associated with the oral-to-dermal adjustment factors (based on constituent-specific gastrointestinal absorption factors) used to transform the oral RfDs based on administered doses to dermal RfDs based on absorbed doses. It is not known if the adjustment factor results in an underestimate or overestimate of the actual toxicity associated with dermal exposure.

### Uncertainty in Risk Characterization

The uncertainties identified in each component of risk assessment ultimately contribute to uncertainty in risk characterization. The addition of risks and HIs across pathways and chemicals contributes to uncertainty based on the interaction of chemicals such as additivity, synergism, potentiation, and susceptibility of exposed receptors.

The simple assumption of additivity used for this site may or may not be accurate and may over- or under-estimate risk; however, a better alternative is not available at this time.

# 5.5 Evaluation of Explosive Hazards

As previously presented in Section 2, both MEC and MPPEH have been discovered on the surface and in the subsurface at Site UXO-22. This section presents a discussion of the explosive hazards associated with those discoveries.

## 5.5.1 Methods for the Evaluation of Explosive Hazards

An assessment of explosive hazards was conducted to evaluate the relative risks posed to human receptors by MEC and MPPEH potentially present at UXO-22. For the presence of MEC or MPPEH to result in a human injury or casualty, there must exist the presence of MEC, a human receptor in contact with, or in the vicinity of, the MEC, and an event to cause the functioning of the MEC.

In order to assess the likelihood of an explosive injury occurring, three types of factors were evaluated:

- Site Factors – These factors address site-specific features that impact the likelihood that a human receptor may come into contact with MEC/MPPEH, or be within close enough proximity of MEC/MPPEH to be injured during an explosive event. Site factors include physical features related to accessibility of the site.
- Human Factors – These factors address the likelihood that a human receptor would come into contact with or be in close proximity to MEC/MPPEH. Human factors include the number of people accessing the site, the frequency and duration of access, and the activities conducted while onsite.
- MEC Factors – These factors address whether an explosive event is likely to occur if contact is made with MEC/MPPEH and the severity of the explosive event if one did occur. MEC factors include type, sensitivity, location, density, and depth.

## 5.5.2 Site Factors

Land uses at UXO-22 are industrial and commercial, consisting of equipment staging areas, a groundwater remediation system, and parking areas. Generally, the site is comprised of either gravel lots or wooded areas. Site features related to accessibility of potentially present MEC/MPPEH are explained below for the different areas and land uses on-site (**Figure 2-1**).

- The former DRMO lot is a large gravel lot secured by a fence, signs warning of potential UXO are posted, and access is restricted.
- The Base truck scales is a large open gravel lot with an adjacent wooded area that is accessible. MR surface clearance has been conducted on the 1.5 acre wooded area in the central part of the site (**Figure 2-3**) and signs warning of potential UXO are posted. The gravel areas surrounding the Base truck scales, including the gravel road between Piney Green Road and Holcomb Boulevard, have been routinely graded over the last 15 years. In August 2012, during ditch grading along the road between Piney Green Road and Holcomb Boulevard, an expended 106 mm recoilless rifle cartridge was dislodged from the subsurface.
- The remaining open, gravel lot areas contain the groundwater remediation system and field trailers for environmental contractors working on-Base and are accessible.
- The surrounding wooded areas are not fenced but access in some areas is limited by physical features. For example, access to the ephemeral drainage is severely restricted by heavy vegetation growth and steep terrain. The wooded area between Piney Green Road and the Base truck scales is also heavily vegetated, but unauthorized site visitors could potentially venture into this area.

Except for two MKII hand grenades found on the surface in 1992, all MEC items at UXO-22 have been discovered beneath the surface. A land use control for OU2, encompassing UXO-22, is in place which restricts intrusive activities. Therefore, access to subsurface MEC and MPPEH should be unlikely.

### 5.5.3 Human Factors

The most active and accessible areas of the site are the gravel lots surrounding the groundwater remediation system and the Base truck scales. The staff that operates the groundwater remediation system and a limited number of contractors work out of field trailers around the groundwater remediation system. The truck scale attendants and truck drivers work at the truck scales. The responsibilities of these workers do not require them to venture into the wooded area; therefore, site workers generally remain in the gravel areas where MEC/ MPPEH is unlikely to be encountered on the surface. Furthermore, site workers are required to attend UXO awareness training. Therefore, it is unlikely that MEC/MPPEH would be encountered by site workers.

There are no residential or recreational areas within the vicinity of UXO-22. However, individuals attempting to access Wallace Creek and the Wallace Creek floodplain to the north of UXO-22 could potentially venture into the site. Also, because the gravel cut-through road is accessible, casual site visitors could enter or pass through the site. Therefore, site visitors or site workers who venture beyond their typical work areas could encounter MEC/MPPEH, especially in the wooded areas where MEC surface clearance has not been conducted.

### 5.5.4 MEC Factors

Ten MEC items and over 2,000 MPPEH items have been discovered on the ground surface or in the shallow subsurface during previous investigation activities (**Table 2-1** and **Figure 2-3**).

The following MEC items have been discovered with quantities noted:

- M43 81-mm high explosive (HE) mortar shell (fuzed) (1)
- M49 60-mm HE mortar shell (no fuze) (1)
- M28 HEAT rocket (1)
- MK II hand grenades (7)

Material recovered from this site does not indicate that any extraordinarily sensitive munitions were discovered at UXO 22; however, all MEC has associated hazards and does present a degree of risk. In almost all instances, some contact with MEC is required to cause it to function. The sensitivity of MEC depends largely on its condition when encountered and the probability of it functioning if encountered depends on the type of contact with the MEC.

MK II Hand Grenades were recovered at UXO 22. These grenades function much as all U.S. hand grenades do. A safety pin is pulled and the grenade is thrown. When the grenade is released, a spring loaded striker impacts a primer which ignites a short delay element. After a few seconds the delay functions the detonator, which in turns detonates the main charge. If the grenade fails to function as designed, the probability of an unintentional detonation by casual contact such as accidently stepping on it is high. More aggressive contact, such as striking the grenade or putting it in a fire, would raise the probability of detonation to even higher. The MK II does have a somewhat unique hazard associated with the explosive filler. Some early models were loaded with granulated TNT. Over time some TNT may have migrated to the threads of the fuze and grenade body. An attempt to loosen or tighten the grenade fuze may cause enough friction to detonate the TNT.

The 81 mm HE mortars recovered at the site had a point detonating fuze. During firing, physical forces such as setback and sustained acceleration allow the fuze to become armed. On impact, a striker is driven into a detonator causing the main charge to function. If the mortar fails to function as designed, the probability of an unintentional detonation by casual contact such as accidently stepping on it is high. More aggressive contact, such as striking the mortar or putting it in a fire, would make the probability of detonation even higher.

The 3.5 inch M 28 HEAT rockets discovered at the site are shoulder fired anti tank rockets with an integral base detonating fuze. The rocket is not armed until a safety band is removed and the rocket has fired and experienced inertia. A creep spring holds the firing mechanism away from the detonator while the rocket is in flight and also prevents it from striking the detonator if small objects such as thin brush or undergrowth are struck during flight. On impact with a more resistant object, impact inertia causes the creep spring to be overcome and the firing mechanism is allowed to strike the detonator. If the rocket fails to function as designed, the probability of an unintentional detonation by casual contact such as accidently stepping on it is high. More aggressive contact, such as striking the rocket or putting it in a fire, would raise the probability of detonation even higher.

### 5.5.5 Summary of Potential Explosive Hazards

This explosives hazard assessment considered site factors, human factors, and ordnance factors in the evaluation of potential explosive threats posed to human receptors by the potential presence of MEC/MPPEH.

Access to many areas of the site is restricted by either fencing or vegetation and terrain. Generally, the accessible open gravel areas are unlikely to contain MEC/MPPEH on the surface. Because of the existing LUCs, the posted warning signs, and the UXO awareness training, it is unlikely that site workers would come into contact with MEC/MPPEH located below surface. Unauthorized site visitors or site workers who venture outside their typical work areas could encounter MEC/MPPEH, especially in the wooded areas where MEC surface clearance has not been performed. If MEC and MPPEH of the types previously discovered are on-site and did not function as designed, the probability of an unintentional detonation by casual contact, such as accidently stepping on it, is high. More aggressive contact, such as striking the MEC and MPPEH or putting it in a fire, would make the probability of detonation even higher.

## 5.6 Summary

Based on the evaluation of available data, there are potential unacceptable risks based on the following:

- Potential current and future contact with surface soil in the ephemeral drainage by child trespassers/visitors may result in any unacceptable non-carcinogenic hazards. The hazard is primarily associated with thallium. Thallium was detected in both surface soil samples from the ephemeral drainage, but only the concentration in MR22-SD01-12A exceeds the RSL for thallium. Additional COCs for the surface soils from the ephemeral drainage include copper and manganese, contributing HIs above 0.1 but below 1. The CTE non-carcinogenic hazard was within acceptable levels.

- Potential future child and lifetime resident exposure to subsurface soil may result in unacceptable non-carcinogenic hazard and carcinogenic risks, primarily associated with hexavalent chromium. An additional COC for subsurface soil includes thallium (HI>0.1 but less than 1). The CTE non-carcinogenic hazard and carcinogenic risk associated with the future child and lifetime resident exposure to subsurface soil is within acceptable USEPA risk levels.

- Although the RME non-carcinogenic hazards for the child resident associated with groundwater (HI = 2) exceeds the target hazard index of 1, there are no target organ/effects with HIs above 1 for groundwater. Therefore, there are no unacceptable hazards associated with the potable use of groundwater.

- Access to many areas of the site is restricted by either fencing or vegetation and terrain. Generally, the accessible open gravel areas are unlikely to contain MEC/MPPEH on the surface. Because of the existing LUCs, the posted warning signs, and the UXO awareness training, it is unlikely that site workers would come into contact with MEC/MPPEH located below surface. Unauthorized site visitors or site workers who venture outside their typical work areas could encounter MEC/MPPEH, especially in the wooded areas where MEC surface clearance has not been performed. If MEC and MPPEH of the types previously discovered are on-site and did not function as designed, the probability of an unintentional detonation by casual contact, such as accidently stepping on it, is high. More aggressive contact, such as striking the MEC and MPPEH or putting it in a fire, would make the probability of detonation even higher.

TABLE 5-1

Summary of Samples Evaluated in the Human Health Risk Assessment

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Medium | Date of Sampling | Sample Location | Sample | Parameters |
|---|---|---|---|---|
| Groundwater | 12/12/11 | IR06-GW26 | IR06-GW26-11D | Explosives and Total Metals |
| | 12/16/11 | IR06-GW31 | IR06-GW31-11D | Explosives and Total Metals |
| | 12/16/11 | IR06-MW03 | IR06-GW03-11D | Explosives, Total and Dissolved Metals |
| | 12/16/11 | IR06-MW03 | IR06-GW03D-11D[1] | Explosives, Total and Dissolved Metals |
| | 02/07/12 | MR22-MW01 | MR22-MW01-12A | Explosives, Total and Dissolved Metals |
| | 02/07/12 | MR22-MW01 | MR22-MW01D-12A[1] | Explosives, Total and Dissolved Metals |
| | 12/19/11 | MR22-MW02 | MR22-GW02-11D | Explosives, Total and Dissolved Metals |
| | 12/14/11 | MR22-MW03 | MR22-GW03-11D | Explosives, Total and Dissolved Metals |
| Subsurface Soil | 01/19/11 | IR06-TP01 | IR06-TP01-N-4-5-11A | VOCs, SVOCs, PCBs, Pesticides, Explosives, and Metals |
| | 01/19/11 | IR06-TP01 | IR06-TP01-S-4-5-11A | VOCs, SVOCs, PCBs, Pesticides, Explosives, and Metals |
| | 01/20/11 | IR06-TP06 | IR06-TP06-N-2-3-11A | VOCs, SVOCs, PCBs, Pesticides, Explosives, and Metals |
| | 01/21/11 | IR06-TP08 | IR06-TP08-N-3-4-11A | VOCs, SVOCs, PCBs, Pesticides, Explosives, and Metals |
| | 01/21/11 | IR06-TP09 | IR06-TP09-2-3-11A | VOCs, SVOCs, PCBs, Pesticides, Explosives, and Metals |
| | 01/24/11 | IR06-TP10 | IR06-TP10-4-5-11A | VOCs, SVOCs, PCBs, Pesticides, Explosives, and Metals |
| | 01/24/11 | IR06-TP12 | IR06-TP12-N-2-3-11A | VOCs, SVOCs, PCBs, Pesticides, Explosives, and Metals |
| | 01/18/11 | IR06-TP2 | IR06-TP02-W-4-5-11A | VOCs, SVOCs, PCBs, Pesticides, Explosives, and Metals |
| | 01/21/11 | IR06-TP3 | IR06-TP03-N-3-4-11A | VOCs, SVOCs, PCBs, Pesticides, Explosives, and Metals |
| | 01/19/11 | IR06-TP4 | IR06-TP04-N-3-4-11A | VOCs, SVOCs, PCBs, Pesticides, Explosives, and Metals |
| | 01/19/11 | IR06-TP4 | IR06-TP04D-N-3-4-11A[1] | VOCs, SVOCs, PCBs, Pesticides, Explosives, and Metals |
| | 01/20/11 | IR06-TP7 | IR06-TP07-S-3-4-11A | VOCs, SVOCs, PCBs, Pesticides, Explosives, and Metals |
| | 12/16/11 | MR22-IS01 | MR22-IS01-3-5-11D | Explosives, Metals |
| | 12/16/11 | MR22-IS02 | MR22-IS02-7-9-11D | Explosives, Metals |
| | 12/16/11 | MR22-IS03 | MR22-IS03-5-7-11D | Explosives, Metals |
| | 12/16/11 | MR22-IS03 | MR22-IS03D-5-7-11D[1] | Explosives, Metals |
| | 12/16/11 | MR22-IS04 | MR22-IS04-7-9-11D | Explosives, Metals |
| | 12/16/11 | MR22-IS05 | MR22-IS05-13-15-11D | Explosives, Metals |
| | 12/16/11 | MR22-IS06 | MR22-IS06-11-13-11D | Explosives, Metals |
| | 12/16/11 | MR22-IS07 | MR22-IS07-7-9-11D | Explosives, Metals |
| | 12/16/11 | MR22-IS08 | MR22-IS08-7-9-11D | Explosives, Metals |
| | 12/12/11 | MR22-IS09 | MR22-IS09-5-7-11D | Explosives, Metals |
| | 12/12/11 | MR22-IS10 | MR22-IS10-5-7-11D | Explosives, Metals |
| | 02/06/12 | MR22-MW01 | MR22-IS11-17-19-12A | Explosives, Metals |
| | 02/06/12 | MR22-MW01 | MR22-IS11-17-19-12ADUP[1] | Explosives, Metals |
| | 10/07/10 | UXO22-TP01 | UXO22-TP-S-NE | Explosives, Metals |
| | 10/07/10 | UXO22-TP01 | UXO22-TP-S-NE-D[1] | Explosives, Metals |
| | 10/07/10 | UXO22-TP01 | UXO22-TP-S-NW | Explosives, Metals |
| | 10/07/10 | UXO22-TP01 | UXO22-TP-S-SE | Explosives, Metals |
| | 10/07/10 | UXO22-TP01 | UXO22-TP-S-SW | Explosives, Metals |
| Sediment | 3/19/2012 | MR22-SD01 | MR22-SD01-12A | Explosives, Metals |
| | 3/19/2012 | MR22-SD02 | MR22-SD02-12A | Explosives, Metals |
| | 3/19/2012 | MR22-SD02 | MR22-SD02D-12A[1] | Explosives, Metals |

PCBs - polychlorinated biphenyls
SVOC - semivolatile organic constituents
VOCs - volatile organic constituents
1. Duplicate sample of sample listed above.

TABLE 5-2

**Summary of COPCs for the Human Health Risk Assessment**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| ***Sediment*** |
|---|
| Arsenic |
| Cadmium |
| Copper |
| Iron |
| Lead |
| Manganese |
| Mercury |
| Thallium |
| Zinc |
| ***Subsurface Soil*** |
| Antimony |
| Chromium (hexavalent) |
| Cobalt |
| Lead |
| Manganese |
| Thallium |
| ***Air*** |
| Chromium (hexavalent) |
| ***Groundwater*** |
| Nitrobenzene |
| 3-Nitrotoluene |
| Antimony |
| Cadmium |
| Manganese |
| ***Air*** |
| Nitrobenzene |

TABLE 5-3

Summary of RME Cancer Risks and Hazard Indices

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Receptor | Media | Exposure Route | Cancer Risk | Chemicals with Cancer Risks $>10^{-4}$ | Chemicals with Cancer Risks $>10^{-5}$ and $<10^{-4}$ | Chemicals with Cancer Risks $>10^{-6}$ and $<10^{-5}$ | Hazard Index | Chemicals with HI>1 |
|---|---|---|---|---|---|---|---|---|
| Current/Future Trespasser/Visitor Adult | Sediment | Ingestion | 1E-06 | | | | 0.3 | |
| | | Dermal Contact | 1E-06 | | | | 0.06 | |
| | | Inhalation | N/A | | | | N/A | |
| | | Total | 2E-06 | | | Arsenic | 0.3 | |
| | All Media | Total | 2E-06 | | | | 0.3 | |
| Current/Future Trespasser/Visitor Youth | Sediment | Ingestion | 7E-07 | | | | 0.4 | |
| | | Dermal Contact | 5E-07 | | | | 0.07 | |
| | | Inhalation | N/A | | | | N/A | |
| | | Total | 1E-06 | | | | 0.5 | |
| | All Media | Total | 1E-06 | | | | 0.5 | |
| Current/Future Trespasser/Visitor Child | Sediment | Ingestion | 3E-06 | | | Arsenic | 3 | Thallium |
| | | Dermal Contact | 2E-07 | | | | 0.04 | |
| | | Inhalation | N/A | | | | N/A | |
| | | Total | 3E-06 | | | Arsenic | 3 | Thallium |
| | All Media | Total | 3E-06 | | | | 3 | |
| Future Resident Adult | Subsurface Soil | Ingestion | N/A | | | | 0.3 | |
| | | Dermal Contact | N/A | | | | 0.04 | |
| | | Inhalation | N/A | | | | 0.003 | |
| | | Total | N/A | | | | 0.3 | |
| | Groundwater | Ingestion | N/A | | | | 0.9 | |
| | | Dermal Contact | N/A | | | | 0.06 | |
| | | Inhalation | N/A | | | | 0.0002 | |
| | | Total | N/A | | | | 0.9 | |
| | All Media | Total | N/A | | | | 1 | |
| Future Resident Child | Subsurface Soil | Ingestion | N/A | | | | 3 | Chromium (hexavalent) |
| | | Dermal Contact | N/A | | | | 0.2 | |
| | | Inhalation | N/A | | | | 0.003 | |
| | | Total | N/A | | | | 3 | Chromium (hexavalent) |
| | Groundwater | Ingestion | N/A | | | | 2 | |
| | | Dermal Contact | N/A | | | | 0.2 | |
| | | Inhalation | N/A | | | | 0.0004 | |
| | | Total | N/A | | | | 2 | |
| | All Media | Total | N/A | | | | 5 | |
| Future Resident Child/Adult | Subsurface Soil | Ingestion | 2E-03 | Chromium (hexavalent) | | | N/A | |
| | | Dermal Contact | 2E-04 | Chromium (hexavalent) | | | N/A | |
| | | Inhalation | 1E-06 | | | | N/A | |
| | | Total | 2E-03 | Chromium (hexavalent) | | | N/A | |
| | Groundwater | Ingestion | N/A | | | | N/A | |
| | | Dermal Contact | N/A | | | | N/A | |
| | | Inhalation | 3E-08 | | | | N/A | |
| | | Total | 3E-08 | | | | N/A | |
| | All Media | Total | 2E-03 | | | | N/A | |

TABLE 5-3

Summary of RME Cancer Risks and Hazard Indices

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Receptor | Media | Exposure Route | Cancer Risk | Chemicals with Cancer Risks $>10^{-4}$ | Chemicals with Cancer Risks $>10^{-5}$ and $<10^{-4}$ | Chemicals with Cancer Risks $>10^{-6}$ and $<10^{-5}$ | Hazard Index | Chemicals with HI>1 |
|---|---|---|---|---|---|---|---|---|
| Future Construction Worker | Subsurface Soil | Ingestion | 1E-05 | | | Chromium (hexavalent) | 0.1 | |
| | | Dermal Contact | 9E-07 | | | | 0.007 | |
| | | Inhalation | 1E-07 | | | | 0.02 | |
| | | Total | 1E-05 | | | Chromium (hexavalent) | 0.2 | |
| | Groundwater | Ingestion | N/A | | | | N/A | |
| | | Dermal Contact | N/A | | | | 0.03 | |
| | | Inhalation | 9E-11 | | | | 0.000008 | |
| | | Total | 9E-11 | | | | 0.03 | |
| | All Media | Total | 1E-05 | | | | 0.2 | |
| Future Industrial Worker | Subsurface Soil | Ingestion | 9E-05 | | Chromium (hexavalent) | | 0.2 | |
| | | Dermal Contact | 2E-05 | | Chromium (hexavalent) | | 0.04 | |
| | | Inhalation | 2E-06 | | | Chromium (hexavalent) | 0.0008 | |
| | | Total | 1E-04 | | Chromium (hexavalent) | | 0.2 | |
| | Groundwater | Ingestion | N/A | | | | 0.3 | |
| | | Dermal Contact | N/A | | | | N/A | |
| | | Inhalation | N/A | | | | N/A | |
| | | Total | N/A | | | | 0.3 | |
| | All Media | Total | 1E-04 | | | | 0.6 | |
| Future Trespasser/Visitor Adult | Sediment | Ingestion | 1E-06 | | | | 0.3 | |
| | | Dermal Contact | 1E-06 | | | | 0.06 | |
| | | Inhalation | N/A | | | | N/A | |
| | | Total | 2E-06 | | | Arsenic | 0.3 | |
| | Subsurface Soil | Ingestion | 2E-05 | | Chromium (hexavalent) | | 0.04 | |
| | | Dermal Contact | 3E-06 | | | Chromium (hexavalent) | 0.05 | |
| | | Inhalation | 1E-07 | | | | 0.00004 | |
| | | Total | 2E-05 | | Chromium (hexavalent) | | 0.09 | |
| | All Media | Total | 2E-05 | | | | 0.4 | |
| Future Trespasser/Visitor Youth | Sediment | Ingestion | 7E-07 | | | | 0.4 | |
| | | Dermal Contact | 5E-07 | | | | 0.07 | |
| | | Inhalation | N/A | | | | N/A | |
| | | Total | 1E-06 | | | | 0.5 | |
| | Subsurface Soil | Ingestion | 1E-05 | | | Chromium (hexavalent) | 0.07 | |
| | | Dermal Contact | 7E-07 | | | | 0.004 | |
| | | Inhalation | 5E-08 | | | | 0.00004 | |
| | | Total | 1E-05 | | | Chromium (hexavalent) | 0.07 | |
| | All Media | Total | 1E-05 | | | | 0.6 | |
| Future Trespasser/Visitor Child | Sediment | Ingestion | 3E-06 | | | Arsenic | 3 | Thallium |
| | | Dermal Contact | 2E-07 | | | | 0.04 | |
| | | Inhalation | N/A | | | | N/A | |
| | | Total | 3E-06 | | | Arsenic | 3 | Thallium |
| | Subsurface Soil | Ingestion | 2E-05 | | Chromium (hexavalent) | | 0.2 | |
| | | Dermal Contact | 4E-06 | | | Chromium (hexavalent) | 0.04 | |
| | | Inhalation | 3E-08 | | | | 0.00004 | |
| | | Total | 2E-05 | | Chromium (hexavalent) | | 0.2 | |
| | All Media | Total | 3E-05 | | | | 3 | |

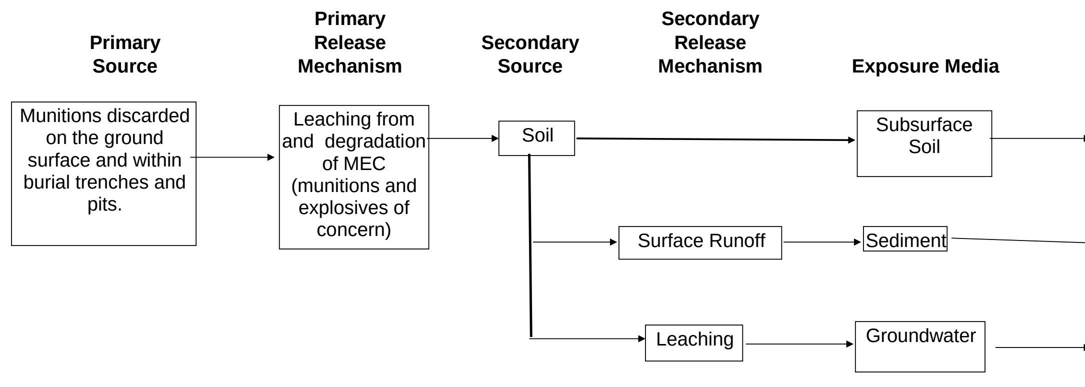
TABLE 5-4

Summary of CTE Cancer Risks and Hazard Indices

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Receptor | Media | Exposure Route | Cancer Risk | Chemicals with Cancer Risks >$10^{-4}$ | Chemicals with Cancer Risks >$10^{-5}$ and <$10^{-4}$ | Chemicals with Cancer Risks >$10^{-6}$ and <$10^{-5}$ | Hazard Index | Chemicals with HI>1 |
|---|---|---|---|---|---|---|---|---|
| Current/Future Trespasser/Visitor Child | Sediment | Ingestion | 5E-07 | | | | 0.3 | |
| | | Dermal Contact | 2E-08 | | | | 0.002 | |
| | | Inhalation | N/A | | | | N/A | |
| | | Total | 5E-07 | | | | 0.3 | |
| | All Media | Total | 5E-07 | | | | 0.3 | |
| Future Resident Child | Subsurface Soil | Ingestion | N/A | | | | 0.2 | |
| | | Dermal Contact | N/A | | | | 0.003 | |
| | | Inhalation | N/A | | | | 0.0002 | |
| | | Total | N/A | | | | 0.2 | |
| | Groundwater | Ingestion | N/A | | | | 1 | |
| | | Dermal Contact | N/A | | | | 0.05 | |
| | | Inhalation | N/A | | | | 0.00004 | |
| | | Total | N/A | | | | 1 | |
| | All Media | Total | N/A | | | | 2 | |
| Future Resident Child/Adult | Subsurface Soil | Ingestion | 5E-05 | | Chromium (hexavalent) | | N/A | |
| | | Dermal Contact | 2E-06 | | | Chromium (hexavalent) | N/A | |
| | | Inhalation | 6E-08 | | | | N/A | |
| | | Total | 5E-05 | | Chromium (hexavalent) | | N/A | |
| | Groundwater | Ingestion | N/A | | | | N/A | |
| | | Dermal Contact | N/A | | | | N/A | |
| | | Inhalation | 2E-09 | | | | N/A | |
| | | Total | 2E-09 | | | | N/A | |
| | All Media | Total | 5E-05 | | | | N/A | |
| Future Trespasser/Visitor Child | Sediment | Ingestion | 5E-07 | | | | 0.3 | |
| | | Dermal Contact | 8E-08 | | | | 0.01 | |
| | | Inhalation | N/A | | | | N/A | |
| | | Total | 6E-07 | | | | 0.4 | |
| | Subsurface Soil | Ingestion | 5E-07 | | | | 0.01 | |
| | | Dermal Contact | 4E-08 | | | | 0.0004 | |
| | | Inhalation | 1E-09 | | | | 0.000002 | |
| | | Total | 5E-07 | | | | 0.01 | |
| | All Media | Total | 1E-06 | | | | 0.4 | |




| | Potential Human Receptors | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Current | | | Future | | | | | | | |
| **Exposure Route** | **Trespasser/ Visitor: Adult** | **Trespasser/ Visitor: Youth** | **Trespasser/ Visitor: Child** | **Residential Adult** | **Residential Child** | **Military Personnel** | **Construction Worker** | **Industrial Worker** | **Trespasser/ Visitor: Adult** | **Trespasser/ Visitor: Youth** | **Trespasser/ Visitor: Child** |
| Ingestion | NA | NA | NA | X | X | X | X | X | X | X | X |
| Dermal Contact | NA | NA | NA | X | X | X | X | X | X | X | X |
| Inhalation | NA | NA | NA | X | X | X | X | X | X | X | X |
| Ingestion | X | X | X | NA | NA | NA | NA | NA | X | X | X |
| Dermal Contact | X | X | X | NA | NA | NA | NA | NA | X | X | X |
| Inhalation | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Ingestion | NA | NA | NA | X | X | X | NA | X | NA | NA | NA |
| Dermal Contact | NA | NA | NA | X | X | NA | X | NA | NA | NA | NA |
| Inhalation | NA | NA | NA | X | X | NA | X | NA | NA | NA | NA |

NA - Not Applicable or pathway is incomplete
X - Potentially complete exposure pathways

**FIGURE 5-1**
Human Health Conceptual Site Model
Site UXO-022 PA/SI
MCIEAST-MCB CAMLEJ
North Carolina

SECTION 6
# Ecological Risk Screening

An ecological risk screening (ERS) was conducted for Site UXO-22 located at MCIEAST-MCB CAMLEJ. Site UXO-22 encompasses about 75 acres within the IR Sites 6 and 82 site boundary located between Piney Green Road and Holcomb Boulevard. Storage Lot 203, which includes the 21-acre DRMO, is in the northern portion of Site UXO-22, and the northeastern corner of Storage Lot 201 overlaps the southern boundary of the site. The site is accessed from an unnamed dirt road that bisects the site from east to west between Piney Green Road and Holcomb Boulevard (**Figure 2-1**).

The Site UXO-22 area was historically used for disposal and storage of wastes and supplies, including pesticides, transformers containing PCBs, solvents, electrolytes, and waste oils. Lot 203 was previously used as a temporary scrap and surplus storage area. Military equipment, vehicles, hydraulic oils, and other non-hazardous supplies are currently stored on Lot 201. No range activities are known to have occurred at Site UXO-22.

## 6.1 Site Ecological Setting and Available Data

Coniferous woodlands occur in the eastern portion of Site UXO-22 and along the northern boundary. The DRMO is predominantly open field, and the remainder of the site generally consists of compacted gravel or bare ground. Surface topography is relatively flat. A narrow ephemeral drainage pathway that extends northwest from Lot 203 and discharges into forested wetland is located at the northern boundary of Site UXO-22. The site soils are predominantly sand, and surface water generally infiltrates into the ground. As a result, surface water is not typically retained within the ephemeral drainage, and therefore would not support aquatic receptors. The drainage pathway would receive runoff from the site during storm events. The ecological checklist in **Appendix F** identifies the terrestrial habitats onsite.

The water table (surficial aquifer) is encountered at a depth of approximately 5 to 10 ft bgs, within the shallow fine-grained sands. The direction of groundwater flow within the surficial and underlying upper Castle Hayne aquifers is north/northwest toward Wallace Creek.

Samples evaluated in this ERS were collected during three investigations of IR Site 6 and Site UXO-22:

- **IR Site 6 MPPEH/MD Burial Pit Excavation -** In October 2009, 4 subsurface soil samples were collected from test pit UXO22-TP01, at depths ranging from 1 to 5 ft bgs. All samples were analyzed for explosives and metals.
- **IR Site 6 Chlorobenzene Supplemental Investigation** - In January and May 2011, subsurface soil samples were collected from 12 test pits (plus 1 duplicate). Samples were collected at depths ranging from 2 to 5 ft bgs. All samples were analyzed for explosives and metals.
- **Site UXO-22 PA/SI** - In December 2011 and February 2012, subsurface soil samples were collected from 11 locations at a depth of 3 to 19 ft bgs. Groundwater samples were collected from 3 temporary monitoring wells and 3 permanent monitoring wells screened in the surficial aquifer for a total of 6 groundwater samples. The subsurface soil samples, groundwater and sediment samples were analyzed for explosives and metals. In addition, two of the groundwater samples were analyzed for dissolved metals. The sediment samples were collected from the ephemeral drainage onsite. The drainage feature was dry and does not support aquatic habitat.

No surface soil samples were collected during any of the investigations. However, samples collected from the ephemeral drainage were originally classified as sediment samples but were compared to surface soil BTV’s. Surface soil impacts are not expected because historical activities involved the burying of materials in trenches. Therefore, the project scope did not include the collection of surface soil samples.

## 6.2 Screening Methodology

For each medium (subsurface soil, groundwater, and surface soil from the ephemeral drainage), maximum and arithmetic mean concentrations of chemicals (i.e., exposure concentrations) were compared to ecological screening values (ESVs) intended to be protective of ecological receptors. HQs were calculated by dividing the exposure concentrations by the ESVs. It should be noted that ESVs for metals in water are generally based on dissolved concentrations. As a result, comparing them to total metals concentrations is conservative and may overestimate risk. When an ESV value was not available for a detected analyte, a supplemental screening value from published literature was used, as available.

For soil, the USEPA ecological soil screening levels (EcoSSL) (USEPA, 2011a) were preferentially selected over USEPA Region 4 values (USEPA, 2001a). When no EcoSSL was available for a constituent, the USEPA Region 4 value was selected. The data for sediment samples were screened against soil ESVs because the ephemeral drainage is not aquatic habitat.

A selection hierarchy was also applied to groundwater. The National Recommended Water Quality Criteria (NRWQC) (USEPA, 2011b) were preferentially selected over the USEPA Region 4 values. However, when no NRWQC was available for a constituent, the USEPA Region 4 value was selected as the ESV. Groundwater at Site UXO-22 discharges either to Wallace Creek or Bearhead Creek. Both water bodies are considered brackish or marine, so the surface water data were screened against marine ESVs.

Maximum concentrations of metals in subsurface soil and soils within the ephemeral drainage were also compared to the subsurface and surface soil BTV for undeveloped areas and combined soil types, respectively (CH2M HILL, 2011b). Maximum concentrations of metals in groundwater were also compared to the groundwater BTVs (CH2M HILL, 2011c). The BTV represents a 95/95 upper tolerance limit (UTL), which is an upper bound (with 95 percent confidence) of the background 95th percentile.

## 6.3 Screening Results

This section addresses constituents that were detected. Non-detected constituents are not expected to pose a risk to ecological receptors. **Appendix F**, Table 1, presents the subsurface soil screen, Table 2 presents the groundwater screen, and Table 3 presents the soil screen for the ephemeral drainage. For all media, nutrients (calcium, magnesium, potassium, and sodium) were not considered to pose a risk.

### 6.3.1 Subsurface Soil

Of the detected analytes with available ESVs or supplemental screening values, aluminum, antimony, cadmium, hexavalent chromium, chromium, copper, iron, lead, manganese, mercury, vanadium, and zinc had maximum-based HQs greater than 1. The maximum concentrations of aluminum, iron, and vanadium were consistent with background. Manganese and mercury concentrations exceeded the ESV in only 1 of 16 samples and both constituents had low a magnitude of exceedance (HQs less than 2.5). The mean-based HQs for manganese (HQ=0.15) and mercury (HQ=0.42) were also less than 1. As a result, these analytes are not expected to pose significant risk to ecological receptors.

Antimony, cadmium, hexavalent chromium, chromium, copper, lead, and zinc had maximum-based HQs greater than 1 and maximum concentrations that exceeded BTVs. These analytes are identified as potentially posing a risk to ecological receptors.

### 6.3.2 Groundwater

Manganese (total) and zinc (total and dissolved) had maximum-based HQs greater than 1. Total manganese had a low magnitude of exceedance (HQ = 1.65) based on a supplemental ESV, and the dissolved concentrations were consistent with background. Total and dissolved zinc both had a low magnitude of exceedance (HQs less than 3), and the mean-based HQ for both was either less than or equal to 1. Consequently, none of the constituents in groundwater are likely to pose a significant risk to ecological receptors.

### 6.3.3 Surface Soil from Ephemeral Drainage

Twelve metals in surface soils from the ephemeral drainage had maximum-based HQs greater than 1. However, aluminum and vanadium concentrations were consistent with the surface soil BTVs. The remaining metals, including antimony, cadmium, copper, iron, lead, manganese, mercury, selenium, thallium, and zinc, exceeded the BTV and had elevated HQs. As a result, these analytes potentially pose a risk to terrestrial receptors.

## 6.4 Summary

Constituents in groundwater are not expected to pose a significant risk to ecological receptor populations. However, terrestrial receptors are potentially at risk from metals in site subsurface soil and the soils in the ephemeral drainage. While the ephemeral drainage is not likely to support populations of aquatic organisms due to transient presence of water, terrestrial receptors may be exposed.

Wetlands and Wallace Creek, located downgradient of the ephemeral drainage, were not sampled during the investigation. There is the potential that metals from site soils have been transported downgradient into these habitats, which do support aquatic receptors.

SECTION 7
# Conclusions and Recommendations

This section presents the conclusions and recommendations.

## 7.1 Conclusions

### 7.1.1 Munitions Constituents

Three explosives residues (2,4-dinitrotoluene, 3-nitrotoluene, and nitrobenzene) and 13 metals (antimony, arsenic, cadmium, chromium, copper, hexavalent chromium, cobalt, iron, lead, manganese, mercury, thallium, and zinc) were detected in soil and groundwater samples at concentrations that exceeded regulatory standards and/or screening criteria (and the BTV for metals). Metals were detected in soil samples collected from areas across the site, including in areas where MPPEH and MEC were not discovered and, the samples containing the highest metal concentrations were collected in the ephemeral drainage where a potential source of metals (disposed batteries) was observed. The metals exceedances are likely associated with the long-term use as a historical storage and waste disposal area rather than with the presence of MPPEH and MEC.

Based on the results of the human health and ecological risk screenings, potential unacceptable risks were identified from exposure to metals in subsurface soil and surface soil in the ephemeral drainage. For subsurface soil, the unacceptable human health risk is primarily based on potential future child and lifetime residents from exposure to hexavalent chromium in one sample. For the drainage, the unacceptable human health risk is based on potential current and future contact by child trespassers/visitors, primarily from exposure to thallium. The potential human health risks were based on a RME, assuming direct contact with the highest concentrations whereas the CTE, based on more realistic exposure duration, ingestion rates, and average concentrations, are within USEPA's acceptable risk ranges. Additionally, there are LUCs in place for OU 2 to prevent non-industrial land use and restrict intrusive activities that encompasses UXO-22.

There is also an unacceptable risk to terrestrial and/or downgradient aquatic ecological receptors from exposure to 12 metals (antimony, cadmium, hexavalent chromium, chromium, copper, iron, lead, manganese, mercury, selenium, thallium and zinc) in soil and/or the ephemeral drainage.

### 7.1.2 Explosive Hazard

Access to many areas of the site is restricted by either fencing or vegetation and terrain. Generally, the accessible open gravel areas are unlikely to contain MEC/MPPEH on the surface. Because of the existing LUCs, the posted warning signs, and the UXO awareness training, it is unlikely that site workers would come into contact with MEC/MPPEH located below surface. Unauthorized site visitors or site workers who venture outside their typical work areas could encounter MEC/MPPEH, especially in the wooded areas where MEC surface clearance has not been performed. If MEC and MPPEH of the types previously discovered are on-site and did not function as designed, the probability of an unintentional detonation by casual contact, such as accidently stepping on it, is high. More aggressive contact, such as striking the MEC and MPPEH or putting it in a fire, would make the probability of detonation even higher.

## 7.2 Recommendations

The recommendations of the PA/SI are as follows.

- A Remedial Investigation is recommended at UXO-22 to further characterize the nature and extent of MEC.
- A MEC surface clearance should be considered to minimize explosive risks from unintentional detonations, especially in the wooded areas and in the former DRMO area. A MEC surface clearance would also reduce interference from surface metallic debris during the proposed DGM investigation for the Remedial Investigation.

- No further action is recommended for metals concentrations as part of future UXO-22 investigation; however, the potential unacceptable ecological risks associated with exposure to subsurface soil and the soils in the ephemeral drainage should be addressed as part of IR Sites 6 and 82 supplemental investigations.

SECTION 8

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# Appendix A
# MRSPP Site Summary Submittal to QA Panel

MRSPP SITE SUMMARY
SUBMITTAL TO QA PANEL

1. General: Provide the following general information:
   a. Site name: **UXO-22, Former Munitions Disposal Area**
   b. Site location: **MCB Camp Lejeune, North Carolina**
   c. Cognizant FEC: **NAVFAC Mid-Atlantic**
   d. Site POC **Charity M. Rychak**
      **Environmental Engineer**
      **EQB/EMD/I&E**
      **MCB, Camp Lejeune, NC 28542**
      **Ph: (910) 451-9385**

2. Munitions Type Known or Suspected: This section should address all munitions known or suspected to be present at the site including any practice or dummy munitions. This section should specifically address:
   a. Munitions type(s) – Identify Mk, Mod, or other identification specifics. Address any bulk explosives or chemical warfare materials (CWM), including chemical agent containers or chemical agent identification sets (CAIS).

   **Site UXO-22 was operated as a disposal and storage area for wastes and supplies, including pesticides, transformers containing polychlorinated biphenyls (PCBs), solvents, electrolytes, and waste oils. Subsequent and ongoing Environmental Investigations have discovered MPPEH and MEC at the site including:**

   **MEC:**
   - **Mark II Grenade (7)**
   - **7.62-mm Ammunition rounds (100)**
   - **Mortar Shell, 81-mm, high explosive, M43 with fuze M45(1)**
   - **Mortar Shell, 60-mm, high explosive, M49 without fuze (1)**
   - **Rocket, 3.5-inch, high explosive anti-tank HEAT, M28 (1)**

   **MPPEH:**
   - **50-Caliber Cartridges (40)**
   - **3.5-inch practice rockets (38)**
   - **20-mm cartridges (10)**
   - **30-mm cartridges (24)**
   - **40-mm cartridges (154)**
   - **90/95/105/106-mm cartridges (~1000)**
   - **Rocket motors, 3.5-inch (unknown)**
   - **M-2 Antipersonnel, mine, bounding (4)**
   - **57-mm brass cartridges (5)**
   - **M-29 Rocket, practice warhead only (69)**
   - **M-29 Rocket, 3.5-inch with M-405 Fuze (5)**
   - **M48 trip flares (empty), practice (8)**

- **Full and partial 105-mm shipping containers (8)**
- **Empty 105-mm cartridge (1)**
- **M-29 rocket motors, 3.5-inch, expended (92)**
- **Stabilizer assemblies. M9 AT, rifle grenades (2)**
- **Rocket fuzes, 3.5-inch, model unknown (52)**
- **MK21 practice hand grenades (44)**
- **M45 mortar fuze, expended (1)**
- **Mortar shells, 60-mm, practice, M50A2 (4)**
- **3.5-inch Rocket motors (1,503)**
- **Empty 75-mm recoilless rifle cartridges (53)**
- **75-mm cartridge fragments (2lbs)**
- **Propellant canister (1)**
- **40-mm practice projectiles (approximately 100)**
- **M27A1 Signal Illuminating ground flares (6)**
- **Mark 13 Grenade Diversionary (2)**
- **3.5-inch rocket motors/parts (6)**

b. Associated explosive fill or load – Identify for each of the munitions types
c. Associated fuzing – Indicate if the fuzing is considered sensitive or not for each of the identified munitions types

**Table 1. Types of Munitions and Fuzing at UXO-22 (CH2MHILL, 2012)**

| **Types of Munitions Employed** | **Fuzing** |
|---|---|
| **Type II Hand Grenade** | **unknown** |
| **81mm HE Mortar** | **M45** |
| **3.5-inch HEAT rocket** | **Unknown** |
| **M 29 3.5-inch practice rocket** | **M-405** |
| **3.5-inch rocket fuzes, model unknown** | **Unknown** |

d. Munitions determination – State if the munitions known or suspected to be present are UXO, damaged or undamaged DMM, or MC.

**Munitions suspected to be present potentially include UXO and damaged and undamaged DMM. The results of PASI indicate that MC is not present in concentrations that are a potential risk to human and ecological receptors.**

3. Source of Hazard: This section addresses the source of munitions, including CWM, known or suspected to be present at the site. This section should specifically describe any:

   a. Former bombing, grenade, maneuver areas, small arms, research, development, testing and evaluation (RDT&E) or other types of ranges or firing points. Identify any ranges used only for a particular type of munitions (e.g., small arms range).

**No former or active ranges are located at the site. The MEC and MPPEH located onsite are from disposal and dumping activities**

b. Former OB/OD or other munitions treatment sites.

c. Former munitions burial sites.

**MPPEH and MEC burial sites are throughout the site with known localities being an MPPEH burial pit in the southern portion of the site (CH2M HILL, 2012), MPPEH and MEC discovered in test pitting in the central and eastern area of the site (Baker, 1993, CH2MHILL, 2012), the northeastern portion (Rhea, 2011).**

d. Former munitions-related industrial areas used for the maintenance, manufacturing or demilitarization of munitions.

e. Former missile defense or air defense artillery emplacement not associated with a range.

f. Former storage or transfer points.

4. Location of Munitions: this section addresses the location of the known or suspected munitions and their potential to be exposed to receptors.

a. State if the presence of munitions is confirmed or suspected.

**Confirmed through environmental investigation**

b. Address if the evidence of the munitions presence is physical, historical, anecdotal or a combination of these sources.

**Evidence is historical and physical.**

c. Indicate if confirmed munitions are located on the surface, subsurface or both. **Both**

d. For confirmed, subsurface munitions, state if the geological conditions are active or stable. **Stable for the majority of the site. The exception being potential munitions located on the slopes or floor of the ravine located in northern portion of Site UXO-22 that may be eroding out and transported downstream**.

e. Describe any barriers at the site that prevent direct access to any subsurface munitions (e.g., water depth in excess of 120 ft). **Cultural items such as fences, railroad tracks, storage containers and trailers**

5. Ease of Access: This section addresses potential access to the MRS by considering barriers such as fencing or steep terrain that limit a receptor's ability to enter the site.

a. State if there is a complete or partial barrier to the MRS.

**The investigation area is mostly comprised of fenced-in, secured areas such as Lot 201 and Lot 203 that contain storage containers and construction trailers. Remaining portions of the site are open to Base Personnel and comprise of open ground and wooded areas. Steep terrain is encountered within the ravine located in the northern portion of the site.**

b. Describe any surveillance activities at the MRS and if they provide continual monitoring of access.

**Surveillance activities do not occur at the MRS, beyond surveillance that occurs at the entire base. It is located within the base property. The general public is precluded from entry to the area.**

6. Status of Property: This section addresses Navy control of the MRS.

a. Indicate if the property was or is currently owned by, leased to, or otherwise possessed or used by the Navy. If the property has been transferred, indicate transferee and date of transfer.

**The property is owned by the Navy and leased to the Marine Corps.**

b. Identify any property that is currently under Navy control, but is scheduled to be transferred from Navy control within 3 year.

**None**

7. Population/Activities: This section addresses the presence of potential receptors near the MRS.

a. Based on U.S. Census Bureau data indicate the density of the surrounding population in persons per square mile within a 2-mile radius of the MRS boundary.

**The density of the surrounding population is 24 persons per square mile within a 2-mile radius of the MRS boundary.**

b. Identify the total number of inhabited structures that are located within the MRS or within a 2-mile radius of the MRS boundary.

**There is one permanent and four temporary structures within the MRS boundary. The permanent building is a water treatment plant and the temporary buildings are contractor trailers. Structures are inhabited during normal business hours. Approximately 2287 structures are located within a 2-mile radius of the MRS boundary, with 2046 appearing to be inhabited structures.**

c. Describe the activities occurring in or near these structures.

**Water Treatment plant, job trailers, administration, land fill buildings, truck scales, warehouses, motor pools and classrooms for Base personnel.**

8. Ecological/Cultural Resources: This section addresses the presence of ecological or cultural resources near the MRS.

a. Identify if ecological or cultural resources or both are present on the MRS.

**No cultural resources on or near the MRS have been identified.**

**Ecological resources are as follows. A bald eagle's nest is documented on MCB Camp Lejeune. The nest is located at the junction of Sneads Creek and the New River, 8 miles from Site UXO-22. Habitat is currently devoid of any of the endangered or threatened species exists in the boundaries of UXO-22. No adverse impacts to listed species are expected to result from the proposed work at Site UXO-22. Project design features have been developed to prevent impacts to listed species. The following documents the threatened or endangered species of Onslow County, NC and those sighted on or near Camp Lejeune, NC. (CH2M HILL, 2009)**

**Table 2. Threatened or Endangered Species of Onslow County, NC (CH2M HILL, 2009)**

| Species | Federal Status | |
|---|---|---|
| American Alligator | T(S/A) | See Notes |
| Bald Eagle | BGPA | See Notes |
| Green Sea Turtle | T | Threatened |
| Leatherback Sea Turtle | E | Endangered |
| Loggerhead Sea Turtle | T | Threatened |
| Piping Plover | T | Threatened |
| Red-cockaded Woodpecker | E | Endangered |
| Shortnose Sturgeon | E | Endangered |
| West Indian Manatee | E | Endangered |
| Cooley's Meadowrue | E | Endangered |
| Golden Sedge | E | Endangered |
| Pondberry | E | Endangered |
| Rough-leaved Loosestrife | E | Endangered |
| Seabeach Amaranth | T | Threatened |

**Notes:**
**T(S/A) = threatened due to similarity of appearance**
**BGPA =Bald and Golden Eagle Protection Act**

9. Health Hazard Evaluation (This information should be captured within the NORM database): This section addresses the potential hazards to receptors from MC and any incidental non-munitions related contaminants in four specific media. Appendix B of the MRSPP Primer contains the list of comparison values for the contaminants to be evaluated.
   a. Identify and provide values for any contaminants present in background samples for the MRS.

      **No background samples were collected for this MRS; however, background concentrations of select analytes are available for MCB Camp Lejeune in soil and groundwater studies (CH2MHILL 2011a, 2011b).**

   b. Indicate the presence of any sole source drinking aquifer or use of groundwater as drinking source on or near the MRS. Discuss any water supply wells down gradient from the MRS. If possible, provide the EPA groundwater classification.

**The closest active water supply well; PSW-709, is located within 5,000 ft from Site UXO-22 (ADHEC, 2002). The water supply well is not expected to be impacted by the project site and is located outside the Land Use Controls (LUCs).**

c. List the uses for any surface water present on the MRS.

**Delineated wetlands draining into the New River are present outside the boundaries of Site UXO-22.**

d. Discuss any evidence of contaminate migration from the MRS by any of the four media.

**Metals contamination is present in surface and subsurface soil and groundwater. Current Land Use Controls (LUCs) at the site from a previous record of decision (ROD) prevent intrusive activities and the use of groundwater at the site.**

10. Supporting documentation: Cite the sources for the information provided.


**AH Environmental Consultants (AHEC). 2002. *MCB Camp Lejeune Wellhead Protection Plan 2002 Update, Marine Corps Base Camp Lejeune, North Carolina.***

**Baker Environmental, Inc. (Baker). 1993a. *Remedial Investigation Report for Operable Unit No. 2 (Sites 6 and 9), Marine Corps Base Camp Lejeune, North Carolina.* August.**

**CH2M HILL, 2009. *Site Specific Work Plan Addendum for Preliminary Assessment/Site Inspection Site UXO-02 Unnamed Explosives Range ASR #2.201.* November.**

**CH2M HILL. 2011a. *Final Expanded Soil Background Study Report, Marine Corps Base Camp Lejeune, North Carolina.* August.**

**CH2M HILL, 2011b. *Draft Expanded Groundwater Background Study Report, Marine Corps Base Camp Lejeune, North Carolina*. Draft.**

**CH2M HILL, 2012, *Sites 6 and 82 Supplemental Investigation, Marine Corps Base Camp Lejeune, North Carolina*, Draft.**

**Rhea Engineers & Consultants, Inc. (Rhea). 2010. *Final Phase II Lot 203 Environmental Condition of Property DRMO Area, Marine Corps Base Camp Lejeune, North Carolina.* March.**

**United States Army Corps of Engineers (USACE), St. Louis District. 2001. *Range Identification and Preliminary Range Assessment, Marine Corps Base Camp Lejeune, Onslow, North Carolina.* December.**

**United States Marine Corps (USMC). 2006. *Integrated Natural Resource Management Plan (INRMP) 2007-2011, Marine Corps Base Camp Lejeune, Onslow County, North Carolina.* November.**

# Appendix B
# Archival Records Search Report

# Archival Records Search Report
# Site UXO-22 - Former Munitions Disposal Area

## Marine Corps Base Camp Lejeune
## Jacksonville, North Carolina

**Contract Task Order 0014**

**August 2012**

Prepared for

**Department of the Navy**
**Naval Facilities Engineering Command**
**Mid-Atlantic**

Under the

**NAVFAC CLEAN 1000 Program**
**Contract N62470-08-D-1000**

Prepared by

CH2MHILL

**Raleigh, North Carolina**

# Contents

# Acronyms and Abbreviations

| | |
|---|---|
| AH | AH Environmental Consultants |
| AOC | area of concern |
| AST | aboveground storage tank |
| Baker | Baker Environmental, Inc. |
| BHC | benzenehexachloride |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| COC | contaminant of concern |
| COPC | contaminant of potential concern |
| CTO | Contract Task Order |
| CSM | conceptual site model |
| cVOC | chlorinated volatile organic compound |
| DDD | dichlorodiphenyldichloroenthane |
| DDE | dichlorodiphenyldichloroethylene |
| DDT | dichlorodiphenyltrichloroethane |
| DPT | direct push transmission |
| DRMO | Defense Reutilization and Marketing Office |
| EMD | Environmental Management Division |
| EOD | Explosives Ordnance Disposal |
| ERD | enhanced reductive dechlorination |
| ES&E | Environmental Science and Engineering, Inc. |
| ESS | Explosives Safety Submission |
| EVS | Environmental Visualization System |
| HHRA | Human Health Risk Assessment |
| IAS | Initial Assessment Study |
| IM | interim measure |
| IR | Installation Restoration |
| lbs | pounds |
| LTM | long term monitoring |
| LUC | land use control |
| MC | munitions constituents |
| MCB CamLej | Marine Corps Base Camp Lejeune |
| MD | munitions debris |
| MEC | munitions and explosives of concern |
| MIP | membrane interface probe |
| MMRP | Military Munitions Response Program |
| MPPEH | material potentially presenting an explosive hazard |
| MR | munitions response |
| MRP | Munitions Response Program |
| NARA | National Archives and Records Administration |
| NAVFAC | Naval Facilities Engineering Command |
| NCGWQS | North Carolina Groundwater Quality Standards |
| NFA | no further action |
| NUS | NUS Environmental Corporation |

| | |
|---|---|
| OCP | organochlorine pesticides |
| OHM | OHM Remediation Services Corp. |
| OU | operable unit |
| P&T | pump and treat |
| PA | Preliminary Assessment |
| PAH | polycyclic aromatic hydrocarbon |
| PCB | polychlorinated biphenyl |
| PID | photoionization detector |
| PSW | public supply well |
| RAO | Remedial Action Objective |
| RCRA | Resource Conservation and Recovery Act of 1976 |
| Rhea | Rhea Engineers & Consultants, Inc. |
| RI | Remedial Investigation |
| ROD | Record of Decision |
| SA | Site Assessment |
| SI | Site Inspection |
| SVE | Soil Vapor Extraction |
| SVOC | semivolatile organic compound |
| SWMU | Solid Waste Management Unit |
| TAL | Target Analyte List |
| TCE | trichloroethylene |
| TCL | Target Compound List |
| TCRA | time critical removal action |
| UXO | unexploded ordnance |
| VOC | volatile organic compound |
| WWII | World War II |

SECTION 1

# Introduction, Purpose, and Scope

Marine Corps Base Camp Lejeune (MCB CamLej), the Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic and CH2M HILL are conducting an investigation of closed ranges as part of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. Site Unexploded Ordnance (UXO)-22 was added to the Navy's Military Munitions Response Program (MMRP) in May 2010 and covers an area of approximately 75 acres on 'Mainside' MCB CamLej. A munitions response program (MRP) Preliminary Assessment (PA)/Site Inspection (SI) is being conducted at Site UXO-22 as shown in **Figure 1-1** under Contract Task Order (CTO)-014 Modification 5 in the *Site Specific Work Plan Addendum Preliminary Assessment/Site Inspection UXO-22 – Former Munitions Disposal Area* (CH2M HILL, 2011a).

The results of the PA/SI will determine if any impacts to soil and groundwater have occurred at Site UXO-22 due to historical activities. To support site investigation efforts, this archival records search report has been prepared to provide a narrative of the historical activities at Site UXO-22 that may have resulted in environmental contamination with munitions and explosives of concern (MEC) or munitions constituents (MC).

The archival records search is an investigative review of existing information about the site and its surrounding area, with an emphasis on obtaining information from personnel and historical resources that might indicate a potentially hazardous release to the environment. The scope of this report includes:

- A review of existing information about the site (including MCB CamLej maps, drawings, and reports, and interviews with current and former MCB CamLej personnel)
- Collection of additional information about the site

A listing of resources identified and investigated for this report is provided in **Attachment 1**. **Attachment 1** includes details concerning the reviews of the historical information from the Marine Corps Library at Quantico, National Archives and Records Administration (NARA) map and text files, and MCB CamLej base files.

SECTION 2

# 2 Site Information

## 2.1 Facility Information

MCB CamLej is located on the Atlantic coast in Jacksonville, North Carolina. The city of Jacksonville in Onslow County is the principal support community for the base. MCB CamLej occupies 153,000 acres including more than 450 miles of roads, approximately 6,800 buildings and facilities, and 14 miles of beach on the Atlantic Ocean for amphibious training. Approximately 14,000 acres of land have been developed for administrative, maintenance, logistics, and personnel support facilities. Originally established in 1941, the base is home to several tenant commands including II Marine Expeditionary Force, 2nd Marine Division, and 2nd Marine Logistics Group, two Navy commands, one Coast Guard command, and several Marine Corps formal schools. MCB CamLej supports a total population of approximately 150,000 people, including active duty military and dependents, retirees, and civilian employees (Global Security, 2008).

## 2.2 Ownership and Operational History

### 2.2.1 MCB CamLej Ownership History

The history of the land now occupied by MCB CamLej is documented primarily through land records and maps. Following the start of World War II (WW II), the War Department began purchasing tracts of land in 1941 from local residents to meet the need for an East Coast amphibious training facility. Prior to occupation by the Marine Corps, the land had been occupied by white and African-American communities and farms since the Colonial era. The land contained plantation houses, cabins, farm buildings, tobacco barns, stores, and various cemeteries (Global Security Website, 2008).

The initial land transferred to the government was acquired in 14 different transactions between April and October 1941 and totaled 173.8 square miles or 111,155 acres, of which there were 85,155 land acres and about 26,000 acres under water (Loftfield, 1981; Louis Berger Group, 2002). The individual tracts of land were grouped into various "areas" for consolidation. The facility was initially referred to as the Marine Barracks New River, which was changed to MCB CamLej in 1942 (Global Security Website, 2008).

### 2.2.2 Site UXO-22 Operational History

Site UXO-22 is located between Piney Green Road to the east and Holcomb Boulevard to the west on 'Mainside' MCB CamLej.  Site UXO-22 covers an area of approximately 75 acres that incorporates Storage Lots 201 and 203, wooded areas, portions of IR Site 6 and IR Site 82, and a ravine that drains north into Wallace Creek, as shown on **Figure A-1**. The topography of Site UXO-22 is relatively flat except for the ravine area.

**Site Descriptions and History**

Site UXO-22 is located within Operable Unit (OU) 2 between Holcomb Boulevard and Piney Green Road and includes portions of Installation IR Site 6 and IR Site 82, as seen in **Figure A-1**.  The land was purchased on May 3, 1941 by MCB CamLej, who has continued to be the owner of the property for the subsequent years.  Prior to acquisition from Annie Lee Avery and Lemuel Aman in 1941, the property was used as residential and farm land (Rhea, 2010).

Historically, the Site UXO-22 area was used for disposal and storage of wastes and supplies, including pesticides, transformers containing polychlorinated biphenyls (PCBs), solvents, electrolytes, and waste oils. Currently, Lot 201 is used to store military equipment, vehicles, hydraulic oils, and other "non-hazardous" supplies. Most of Lot 203 remains an open field, with 21 acres temporarily used by the Defense Reutilization Marketing Office as a scrap and surplus storage lot. No former range activities are known to have occurred at the site.

Currently, the closest public supply well (PSW) is PSW-633, located to the northwest adjacent to Holcomb Boulevard. It is an inactive water supply source according to the *Final Wellhead Protection Plan – 2002 Update* (AH, 2002).

OU2 consists of three sites: 6, 9, and 82 and covers an area of approximately 210 acres. It is bordered by Holcomb Boulevard to the west, Sneads Ferry Road to the south, Piney Green Road to the east, and Wallace Creek to the north. Rail lines are operated by MCB CamLej Railraoad parallel to Holcomb Boulevard.

Site 6 incorporates Storage Lots 201 and 203 (see below), the wooded area between the lots, and a ravine. The site covers an area of approximately 177 acres. It is bounded by Site 82 to the north, Piney Green Road to the east, Site 9 to the south and Holcomb Boulevard to the west. Surface water bodies associated with the site include Wallace Creek, Bear Head Creek, and a ravine. Surface water in the ravine is intermittent and is located in the wooded area north of Lot 203 and drains to Wallace Creek. The wooded areas and open fields composing the remainder of the site are relatively flat with some visible trenching and mounding and littered with debris from spent casings to empty/rusted drums. Historically the site has been used for the disposal and storage of wastes and supplies.

Site 9 is not located within the boundaries of UXO-22.

Site 82 was established north of Lot 203 and west of Piney Green Road as a result of the 1986 Site 6 site assessment and 1992 Site Inspection. The site is mostly wooded and covers an area of approximately 30 acres. It is relatively flat in the southern portion of the site with the exception of the ravine area but becomes steeper towards the Wallace Creek bank to the north. Site 82 is also bordered by Piney Green Road to the east, Holcomb Boulevard to the west, and Site 6 to the south. It is littered with debris from spent casings to communication wire, and empty/rusted drums. On a few drums markings indicating “lubrication oil” or “anti-freeze” were identified. Some trenching and mounding is visible in the southern portion of the site. No records have indicated Site 82 was used for disposal or waste handling activities.

Open Storage Lot 201 (Lot 201) is located in the south-central portion of Site 6 and covers an area of approximately 25 acres. It is a fenced, flat area with little vegetation adjacent to the fence lines. The lot has been used for storage of military vehicles, equipment, lumber, oils and lubricants, and non-PCB transformers among other supplies. Pesticides and transformers containing PCBs have also been reportedly stored at the site (Water and Air Research, 1983).

Open Storage Lot 203 (Lot 203) is located in the northern portion of Site 6 and covers an area off approximately 46 acres. It is bordered by Site 82 to the north, Piney Green Road to the east, woods to the south, and Holcomb Boulevard the the west. It is a fenced, relatively flat area comprised of both existing soil and fill material. A water treatment plant and several trailers used as field offices are located at an entrance off of Piney Green Road near the landfill. 55-gallon drums and empty storage tanks have been found on Lot 203. Labels indicating contents have included lubricants, petroleum products, corrosives, diesel fuel, gasoline and kerosene. The steepest area of the ravine is also located at Lot 203 and was historically littered with various debris including batteries, commodes, wire cables, empty unlabeled drums, and more. In addition, an empty drum and small canisters labeled “DDT” were also found within the lot. The canisters were dated “1958” (Baker, 1993a). The lot was used as a disposal area in the 1940s and then later known as the Defense Reutilization and Marketing Office (DRMO) Area used for storage of scrap metal, polychlorinated biphenyl (PCB) transformers, and dichlorodiphenyltrichloroethane (DDT) containers among other items. After the discovery of 55-gallon drums by a DRMO employee, the site was shut down in 1989. In addition, a retired employee, Mr. Joe Paliotti, was interviewed and identified areas where he remembered waste materials had been buried. The lot was closed to conduct an environmental investigation to ensure there was no danger to employees. The drums and contaminated soil were removed and the lot was reopened in 2001. A Solid Waste Management Unit (SWMU) is also located within Lot 203 northeast of the Base Scales facility used for weighing haul trucks. SWMU 359 is a former battery dump located approximately 100 yards west of Piney Green Road (Baker, 2005).

Since, the property use continues to be industrial utilized by the base DRMO as an open storage yard for scrap materials and general storage of military equipment awaiting distribution. There is little to no documentation on the disposal activities at this Lot such as what materials were disposed of, the volumes of disposed materials, or the disposal locations within the lot area (ATSDR, 2010). Also, to date there is no address for the DRMO Area since there has not been development on the property (Rhea, 2010).

### Site Investigations

Since 1983, numerous phases of environmental investigation have been performed at OU2. Most of these investigations were conducted before Site UXO-22's identification and admittance into the MRP and focused on IR Site 6 and IR Site 82 or a combination of the two. Non-Munitions Response (MR) investigations and remedial actions are summarized in **Table 2-1** and investigations where MPPEH and MEC were discovered are summarized on **Table 2-2:**

TABLE 2-1
OU2 Non- Munitions Historical Investigations and Remedial Actions
*Site UXO-22 Former Munitions Disposal Area*
*PA/SI*
*MCB CAMLEJ, North Carolina*

| Investigation Phase(Contractor) | Investigation Dates | Summary |
|---|---|---|
| IAS (WAR) | 1983 | The IAS identified Site 6 as a potential source of contamination and recommended performing a Confirmation Study. |
| Confirmation Studies (ESE) | 1984-1991 | Shallow soil samples collected from borings in Lots 201 and 203 revealed detections of pesticides. Surface water in Wallace Creek and groundwater samples collected from 2 water supply wells east of Site 6 were reported to contain VOCs, and resulted in the closure of the water supply wells and creation of IR Site 82. |
| Site Investigation (Halliburton NUS) | 1991 | Site investigation of IR Site 82. Pesticides and PCBs present in shallow soil, groundwater, surface water, and sediment. |
| RI (Baker) | 1993 | MEC discovered, see **Table 2-2** for summary. |
| TCRA (Baker) | 1993-97 | DMM discovered, see **Table 2-2** for summary. |
| Supplemental Investigation (Baker) | 1995 | Investigation of wetlands along south bank of Wallace Creek. Sediments, groundwater, and soils impacted by VOCs. Geophysical surveying detected subsurface metallic anomalies |
| Remedial Construction (OHM, Baker, Shaw, Rhea) | 1995-Present | Construction and operation of an SVE and groundwater pump-and-treat system. VOC concentrations remain high (>10,000 micrograms per liter [µg/L]) at depths of 80-120 ft bgs. |
| LTM (Baker, CH2M HILL) | 1997-Present | Natural attenuation with LTM for VOCs is the remedy-in-place for IR Site 6. During the 2000 LTM sampling event, an elevated chlorobenzene concentration (57,000 µg/L) was reported in the sample from monitoring well IR06-GW16 in the area between Lots 201 and 203. |
| SWMU [Solid Waste Management Unit] 359 Removal Action (OHM and Baker) | 2001-2002 | Removal of battery piles in the east-central portion of Site UXO-22. Confirmatory sampling indicated metals and pesticide concentrations above screening levels. A No Further Action (NFA) status was granted based upon LUCs placed by the 1993 ROD. |
| IR Site 6 Chlorobenzene Investigations (CH2M HILL) | 2002-2011 | Horizontal and vertical boundaries of chlorobenzene plume in IR Site 6 continue to be refined. Source location identified as a burial trench containing drums of chlorobenzene removed during a second TCRA in 2011. Continued LTM and MPPEH discovered in 2008. A summary is presented in **Table 2-2**. |

IAS = Initial Assessment Study; WAR = Water and Air Reseach; ESE = Environmental Science and Engineering; RI = Remedial Investigation; TCRA = Time-Critical Removal Action; SVE = Soil Vapor Extraction; NFA = No Further Action; LTM = long-term monitoring; LUC = land use control; µg/L = micrograms per liter; PCB = polychlorinated biphenyl; ROD = Record of Decision; ft bgs = feet below ground surface; VOC = volatile organic compound

TABLE 2-2
**Previous and Ongoing Investigations Where MPPEH/MEC Were Discovered**
*UXO-22 PA/SI*
*MCB CAMLEJ, North Carolina*

| Previous Investigation | Date | Activities | MEC/MPPEH Found |
|---|---|---|---|
| Remedial Investigation (RI) (Baker) | 1993 | Evaluated the nature and extent of contamination at OU2 (Sites, 6, 9, and 82).<br>Geophysical survey of Lot 203 at IR Site 6 included EM-31, magnetometer and GPR surveys along 100-foot transects. Results indicated geophysical anomalies within the former DRMO area.<br>A UXO survey conducted as part of the RI performed at IR Site 6 included clearance of monitoring well and soil borings and test pit and trenching activities. MEC and MPPEH items were discovered in both the subsurface and surface during clearance activities. MEC was disposed of by Base EOD and MPPEH was scrapped.<br>Organic compounds (primarily PCBs, pesticides, VOCs, and semi-volatile organic compounds [SVOCs]) and inorganic compounds (primarily barium, cadmium, chromium, lead, manganese, and zinc) were detected in soil and groundwater at Site 6. VOCs and chlorinated VOCs were identified throughout Sites 6 and 82. The Human Health Risk Assessment (HHRA) identified potential human health risks due to exposure to vinyl chloride (VC), arsenic, and beryllium in groundwater and PCB-1260 in biota from Wallace Creek. The findings of the Ecological Risk Assessment (ERA) indicated that OU2 may be adversely impacting the ecological integrity of Wallace Creek, Bear Head Creek, and the ravine. | MEC<br>• Mark II Grenade (3)<br>• 7.62-mm Ammunition rounds (100)<br>MPPEH<br>• 50-Caliber Cartridges (40)<br>• 3.5-inch practice rockets (15)<br>• 20-mm cartridges (10)<br>• 30-mm cartridges (23)<br>• 40-mm cartridges (54)<br>• 90/95/105/106-mm cartridges (~1000)<br>• Rocket motors, 3.5-inch (unknown) |
| TCRA's (Baker Environmental and OHM) | 1993-97 | AST purging and removal along railroad line. 20 drums of 4,4'-dichlorodiphenyltrichloroethane (DDT), empty drums, batteries, and debris were removed, and contaminated soil was excavated and disposed of offsite. During these actions, approximately 2,655 cubic yards of soil and debris were removed from Sites 6 and 82. | Unknown amount of spent shell casings discovered in battery trenched in southern portion of Site UXO-22 |
| Chlorobenzene Investigation (CH2M HILL) | 2005-2011 | 6 shallow and 4 intermediate monitoring wells installed.<br>Geophysical survey with digital geophysical mapping [DGM]) of a 2.8-acre portion of IR Site 6.<br>Interrupted by the discovery of MPPEH burial pit with subsequent EOD Response in December, 2008. Recovered MPPEH was reclassified as MDAS and placed inside a secure storage container inside a 6-ft-tall chain-link fence onsite. MDAS disposed at recycling facility in 2009. Site placed under an ESS and subsequent amendments and entered the MRP in May, 2010. | • M-2 Antipersonnel, mine, bounding (4)<br>• 57-mm brass cartridges (5)<br>• M-29 Rocket, practice warhead only (22)<br>• Rocket motors, 3.5-inch expended (40)<br>• M-29 Rocket, 3.5-inch with M-405 Fuze (5) |
| Surface Clearance (CH2MHILL) | 2009 | Surface clearance of a 1.5-acre vegetated area to conduct additional DGM as part of the chlorobenzene investigation. All MPPEH recovered was reclassified as MDAS and disposed of at recycling facility. | • M48 trip flares (empty), practice (8)<br>• Full and partial 105-mm shipping containers (8)<br>• Empty 105-mm cartridge (1)<br>• Empty 75-mm recoilless rifle cartridge (1)<br>• 3.5-in rocket warhead, practice (1) |

TABLE 2-2
**Previous and Ongoing Investigations Where MPPEH/MEC Were Discovered**
*UXO-22 PA/SI*
*MCB CAMLEJ, North Carolina*

| Previous Investigation | Date | Activities | MEC/MPPEH Found |
|---|---|---|---|
| Intrusive Investigation (CH2MHILL) | 2010 | Investigation activities at the MPPEH burial pit included removal of MPPEH and other debris to the water table as per the ESS until no further visible evidence of MPPEH was observed. MEC items were blown in place by controlled detonation on September 21, 2010. The remaining MPPEH was reclassified as MDAS. A total of 16,100 pounds of MDAS was recovered during the excavation of the burial pit and disposed between February 1 and February 7, 2011, the MDAS was disposed of by witnessed smelting.<br><br>Confirmatory soil samples were collected from the four sidewalls of the excavation. One explosives residue, 2,4-dinitrotoluene and four metals (cadmium, chromium, copper and iron) were detected in exceedance screening criteria. | MEC<br>• Mortar Shell, 81-mm, high explosive, M43 with fuze M45(1)<br>• Mortar Shell, 60-mm, high explosive, M49 without fuze (1)<br>• Rocket, 3.5-inch, high explosive anti-tank HEAT, M28 (1)<br>MPPEH<br>• M-29 rockets, practice warhead only (39)<br>• M-29 rocket motors, 3.5-inch, expended (52)<br>• Stabilizer assemblies. M9 AT, rifle grenades (2)<br>• Grenades, practice, MK21, empty (2)<br>• Warheads for rockets, 3.5-inch, model unknown (8)<br>• Rocket fuzes, 3.5-inch, model unknown (3)<br>• 3.5-inch rockets believed to be M29 practice (22)<br>• 3.5-inch rocket fuzes believed to be practice (49)<br>• MK21 practice hand grenades (42)<br>• M45 mortar fuze, expended (1)<br>• Mortar shells, 60-mm, practice, M50A2 (4)<br>• Rocket motors (1,500) |
| Phase II, Lot 203 ECP(Rhea) | 2010 | Records review, 10 test pits, GW sampling from 4 monitoring wells, geophysical survey of IR Site 6 and IR Site 82.<br><br>The geophysical survey used an EM-31 to delineate subsurface anomalies along ~22.5 miles of transects spaced over 40-foot intervals. Large anomalies were detected within the former DRMO in IR Site 6 and north of the pump and treat facility in IR Site 82.<br><br>The ECP assessment concluded that the former DRMO area was suitable for its intended use with the provision that intrusive activities would not be conducted. | Unknown number of spent, unidentified small arms casings discovered in 2 of the test pits located within the former DRMO |

TABLE 2-2
**Previous and Ongoing Investigations Where MPPEH/MEC Were Discovered**
*UXO-22 PA/SI*
*MCB CAMLEJ, North Carolina*

| Previous Investigation | Date | Activities | MEC/MPPEH Found |
|---|---|---|---|
| Chlorobenzene Investigation-Cont'd (CH2MHILL) | 2011 | 12 test pits were excavated to investigate the source of the subsurface geophysical anomalies identified by the 2009 geophysical investigation. In addition to drums containing chlorobenzene and other debris, three 3.5-inch rocket motors were discovered in test pits 2 and 8, respectively. These MPPEH items demilitarized and reclassified as MDAS and disposed of on July 6, 2011 by witnessed smelting.<br>Soil samples were collected for MC in the 12 test pits. Eight metals (antimony, arsenic, chromium, hexavalent chromium, cobalt, iron, lead, and manganese) were detected at concentrations greater than screening criteria | • 3.5-inch Rocket motors (3) |
| Potential Source Investigation (PSI) Site 82 (Rhea) | 2011 | Conduct an intrusive investigation to identify the nature of the geophysical anomalies discovered north of water treatment plant during Phase II ECP. Vegetation clearance and excavation of 14 test pits and trenches to max. depth of 18.5 ft bgs. Scrap metal, communications wire, batteries and MPPEH discovered and removed. The MPPEH was reclassified as MDAS and disposed of as scrap. | • 75-mm cartridges (52)<br>• 75-mm cartridge fragments (2lbs)<br>• Propellant canister (1) |
| Site 6 & 82 Supplemental Investigation (CH2M HILL) | 2012 | During site preparation for the Site 6 & 82 Supplemental Investigation, CH2M HILL UXO technicians identified MEC and MPPEH within the vicinity of proposed environmental sampling locations at the former DRMO. A total of 4 MEC items (MK II grenades), were found at a depth of 4-6-inches bgs and disposed of by controlled detonation on August 16, 2012 using blow-in-place procedures. All MPPEH identified was reclassified as MDAS and is currently stored onsite awaiting disposal by smelting. | MEC<br>• Mark II Hand Grenade (4)<br>MPPEH<br>• 40-mm practice projectiles (approximately 100)<br>• 40-mm practice cartridges (approximately 100)<br>• M27A1 Signal Illuminating ground flares (6)<br>• Mark 13 Grenade Diversionary (2)<br>• 3.5" rocket motors/parts (6)<br>• 30-mm cartridge (1) |

## Maps and Aerial Photographs

A review of base maps showing existing conditions from 1942 to present indicated that the Site UXO-22 area has developed over the proceeding decades but its use has not changed significantly. A General Area Map from 1942 (**Figure A-2**) indicates the railroad but no structures or dirt road running through the site from Holcomb Boulevard to Piney Green Road. An index sheet from 1949 (**Figure A-3**) annual report maps shows the boundaries of Lot 201 and a few structures including a railroad loading platform, open storage shed, and office building adjacent to the railroad tracks. In a map of MCB CamLej revised in 1955 (**Figure A-4**) one structure just to the north of the road in the Lot 203 area is shown. Power lines are shown running north to south along the Piney Green Road side of the site in a 1962 Map of Tracked Vehicle Trails Power and Telephone Lines (**Figure A-5**). Additional structures also appear in the Lot 203 and Lot 201 areas. A higher resolution of topography lines were used in the 1971 revision of a Camp Lejeune Quadrangle (**Figure A-6**), making the ravine easy to see. Finally, in Combat Training Charts from the 70s and 80s (**Figures A-7**), more formal roads were being established in the area. A current installation map shows further development of roads, particularly around the water treatment plant and field offices (MCB CamLej, 2006).

In the succession of aerials obtained from the Onslow County Soil and Water Conservation District; activity at both Lot 201 and Lot 203 is visible. In the 1949 photograph (**Figure A-8)**, Lot 203 in the northern portion of the site is cleared and Lot 201, adjacent to the railroad tracks further south in the lot, contains large items such as vehicles or conex boxes. A network of dirt roads or tank trails can be seen cut through the wooded area between the two lots and the ravine can be identified from the northern end of Lot 203 heading northwest to Wallace Creek. In the 1954 aerial (**Figure A-9**), the contents of Lot 201 appear to be more sparse and large items are now visible in Lot 203 as well. The trails through the wooded areas between the two lots have become more direct, indicating use for moving items between the two lots and the area around the ravine now contains vegetation. Finally, in an aerial from 1970 (**Figure A-10**) shows continued use of both lots for storage. The trails through the wooded area are diminishing and one main road appears to be forming between the two lots. Vegetation has recovered in areas making some features such as the ravine hard to distinguish. Furthermore, the 2009 imagery used in the Site UXO-22 Map (**Figure A-1**) shows both lots still in use, with the western area between the two lots, adjacent to the railroad tracks, is now cleared and also used for storage. Roads throughout the lots are more defined and trails through the wooded areas are minimal. The northeastern portion of the site adjacent to Piney Green Road now contains a water treatment plant and mobile buildings used as field offices. Trails throughout Site 82 in conjunction with the injection system can be recognized.

In 1948 a succession of oblique aerials were taken around MCB CamLej. Site UXO-22 can be located in detail (**Figures A-11 to A-14**). These photographs clearly identify the large items stored at Lot 201 as vehicles and conex boxes.

## Interviews

Four interviews with MCB CamLej employees were conducted between September 21, 2009 and October 9, 2009 in conjunction with the Phase II Lot 203 Environmental Condition of Property (ECP) Report. It was concluded from these conversations that the property had continually been used by the DRMO for industrial use. Personnel confirmed DRMO activities were transferred to Camp Geiger between 1989 and 2001 when 55-gallon drums were discovered. Existing condition maps were provided for the property and did not show any existing underground utilities. Areas were identified where materials potentially could have been buried in the southern portion of the site. Finally, interviewees stated that the planned future use is to continue being an open storage yard with no new uses or buildings.

Previously, when the site was shut down in 1989, a retired employee, Mr. Joe Paliotti, was interviewed and he provided a sketch indicating areas were disposal of chemicals or waste materials may have been buried (CH2M HILL, 2009).

## Historical Range Review

A review of historical range overlay maps (Plates 1-22) from the *Final Range Identification and Preliminary Range Assessment* (USACE, 2001) indicated that no ranges have been known to exist at the site. In addition, review of historical maps obtained from the Historical Reference Branch of the Marine Corps Library at Gray Research Center in Quantico, Virginia (**Figures A-15**) also confirmed no ranges have been known to exist at the site.

SECTION 3
# 3 References


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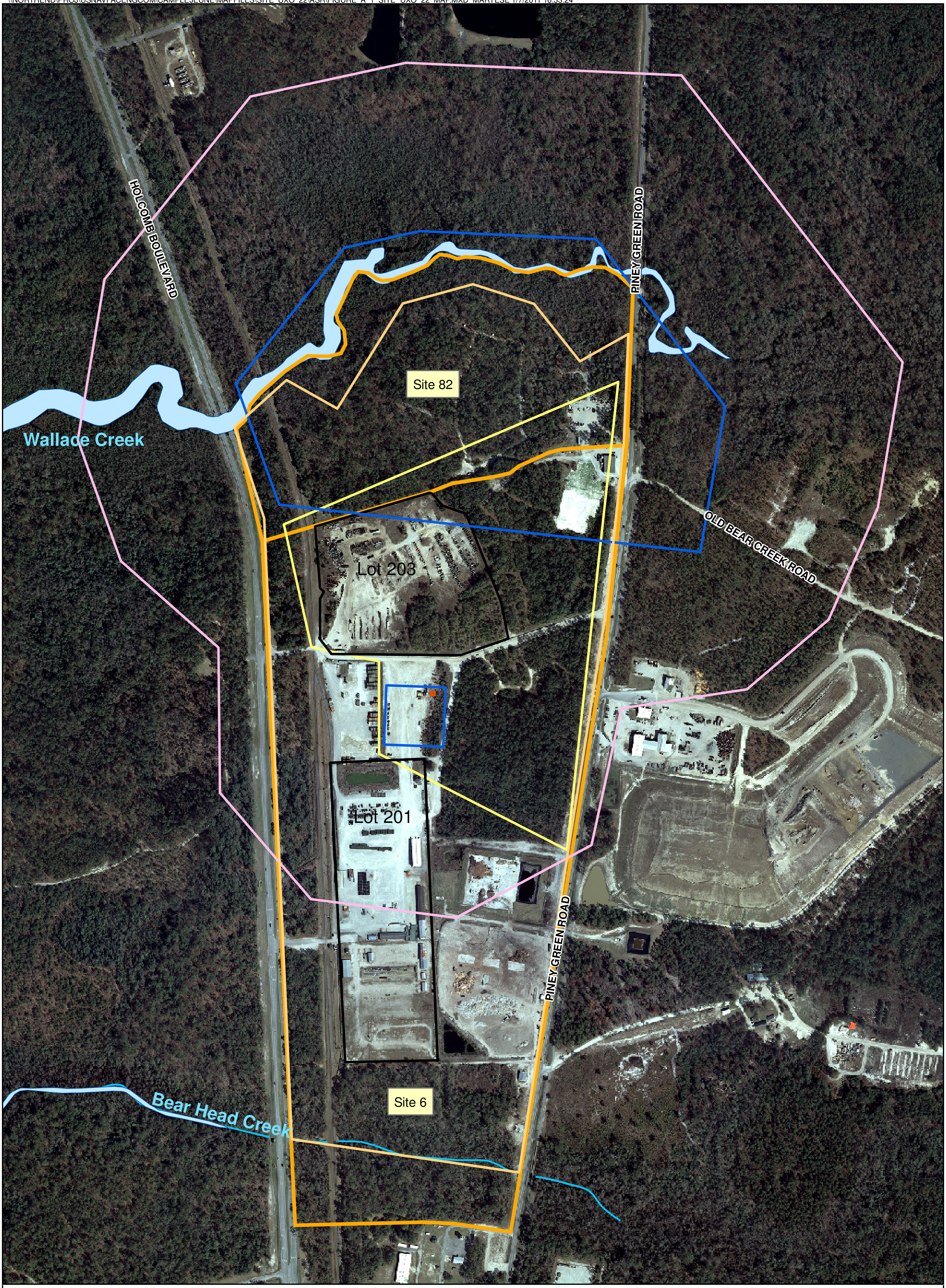
# Figures




**Legend**

- Aquifer Use Control Boundary
- Non-Industrial Use and Intrusive Activites (Soil) Control Boundary
- Intrusive Activites Control Boundary (Groundwater)
- Burial Pit Containing MPPEH
- Lots 201 and 203
- UXO-22 Boundary
- Site 6 and 82 Boundary (OU2)
- Surface Water Course Area
- Surface Water Course Centerline

N

0 275 550 1,100 Feet

1 inch = 550 feet

Figure A-1
Site UXO-22 Map
Site UXO-22 ASR
MCB CamLej
North Carolina

CH2MHILL

Generated by: *K. Rogers/RDU* Checked by: *D. Hockett/CLT*


Figure A-2-1942 Map

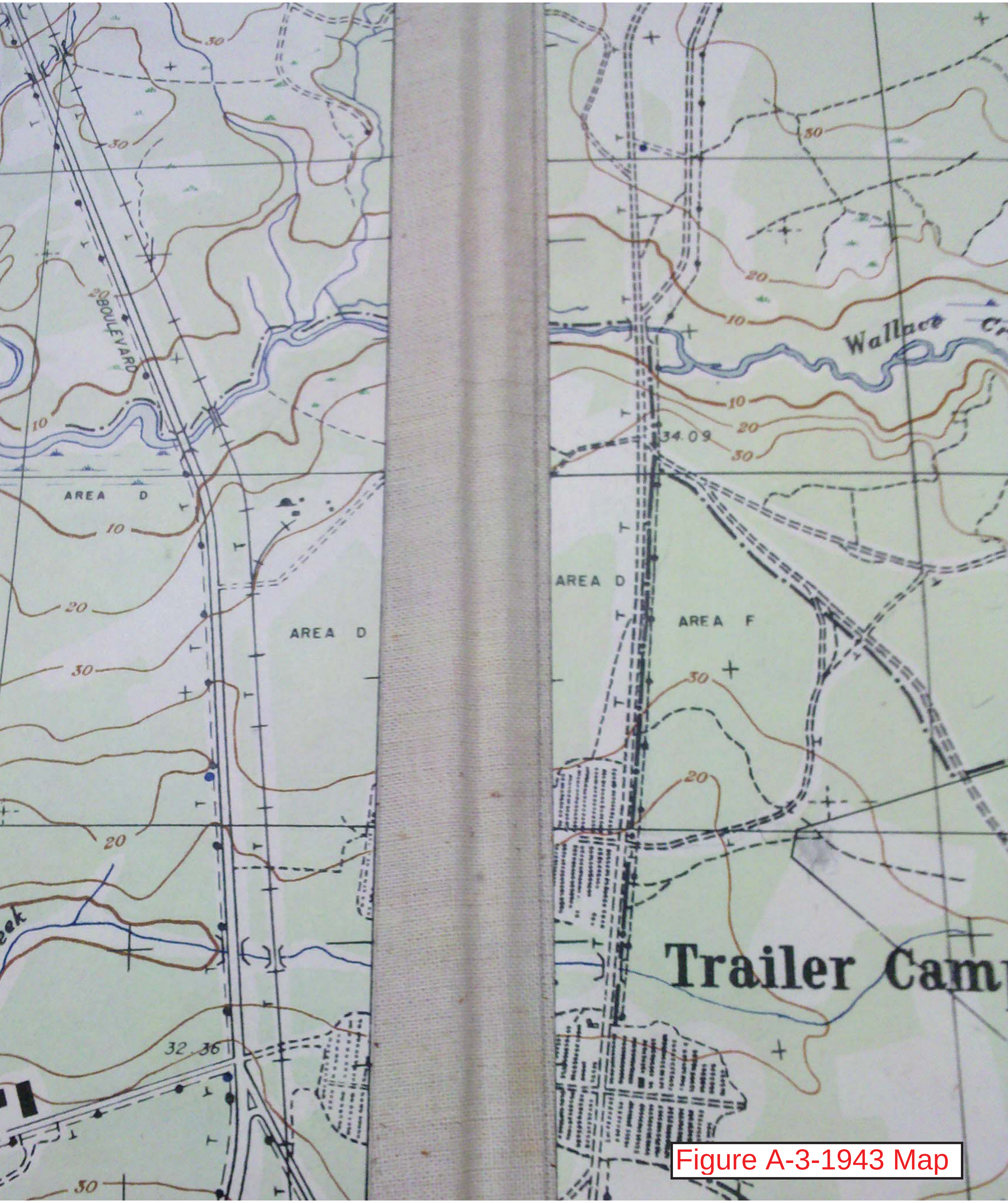


Figure A-3-1943 Map


Figure A-4-1955 Map

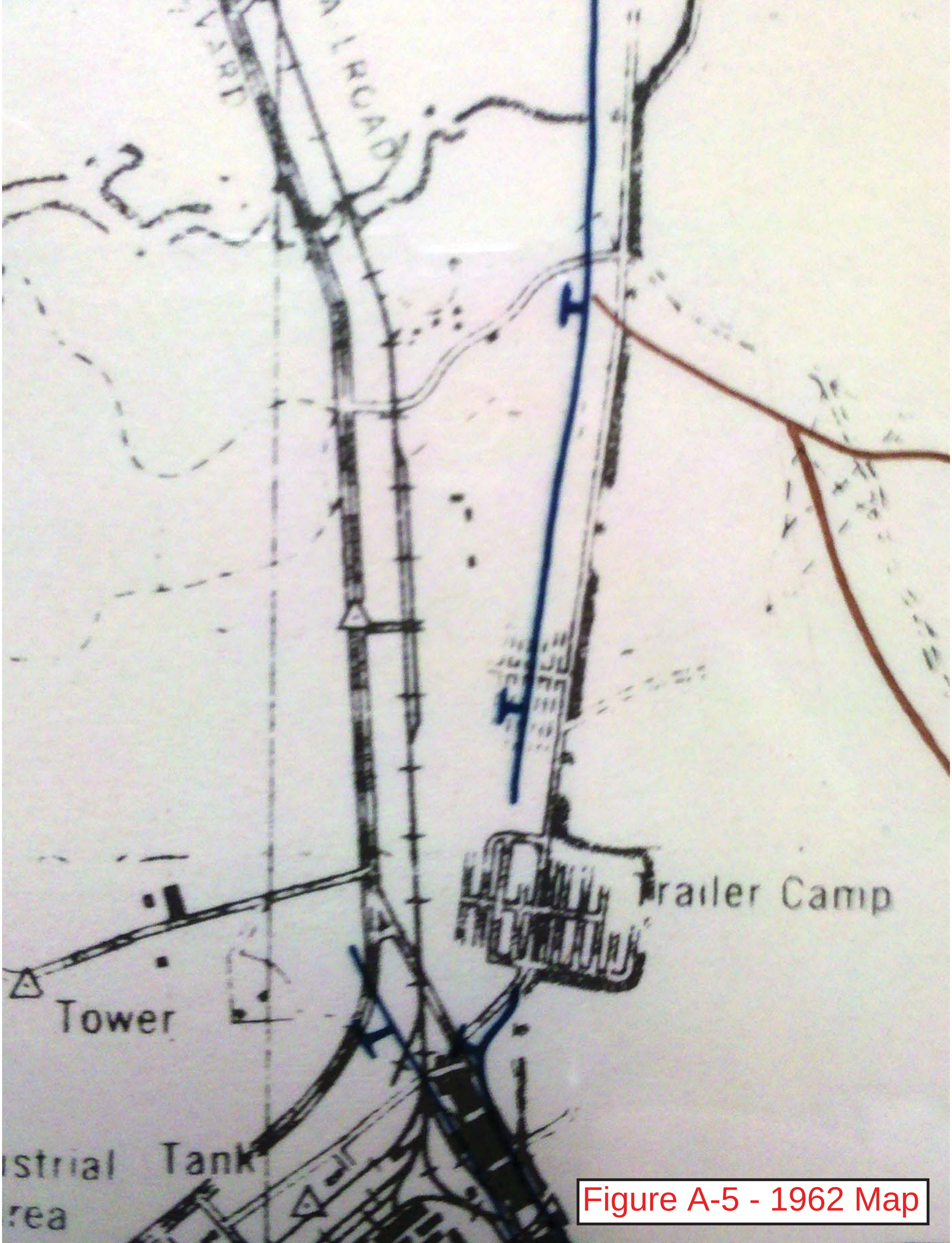



Figure A-5 - 1962 Map


Figure A-6 - 1971 Map

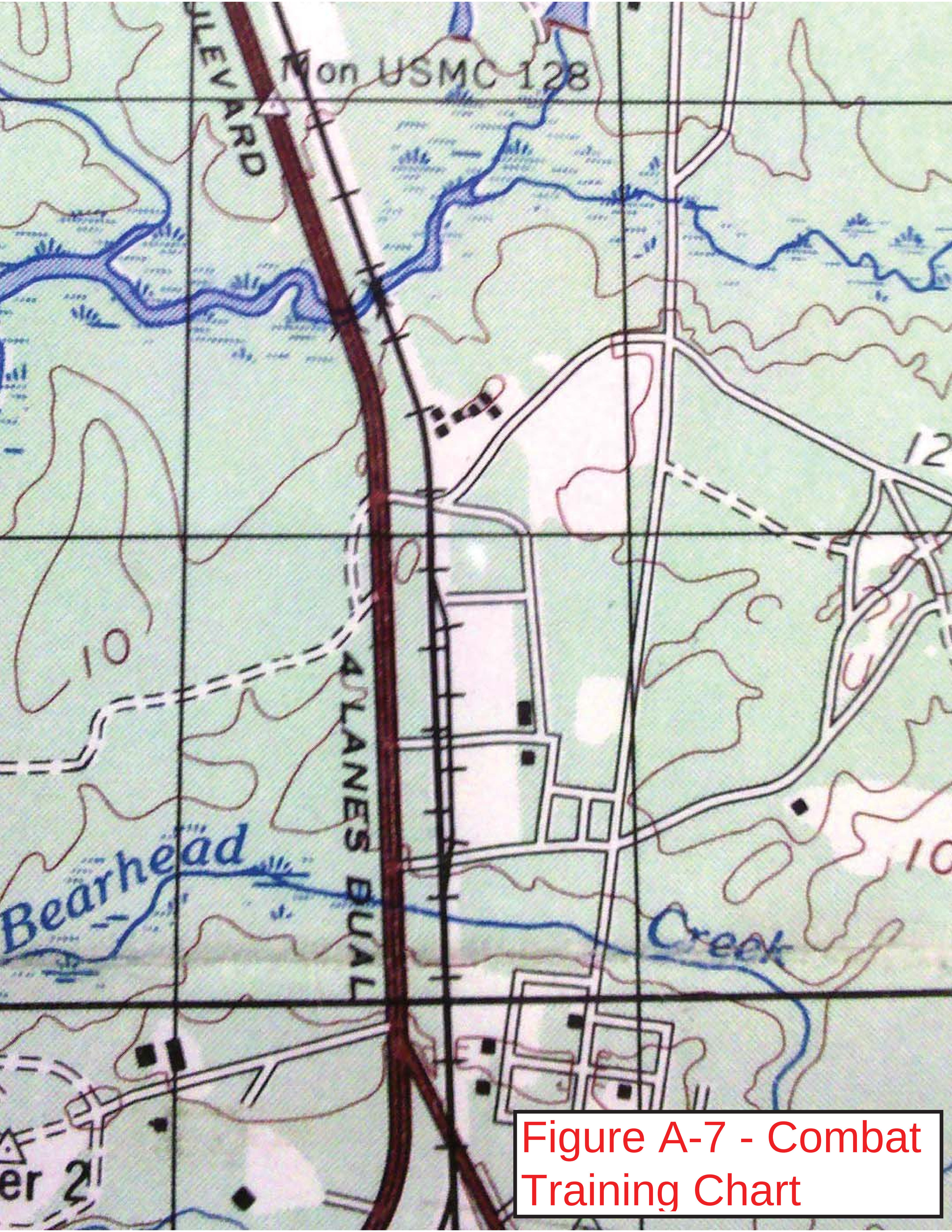


Figure A-7 - Combat Training Chart

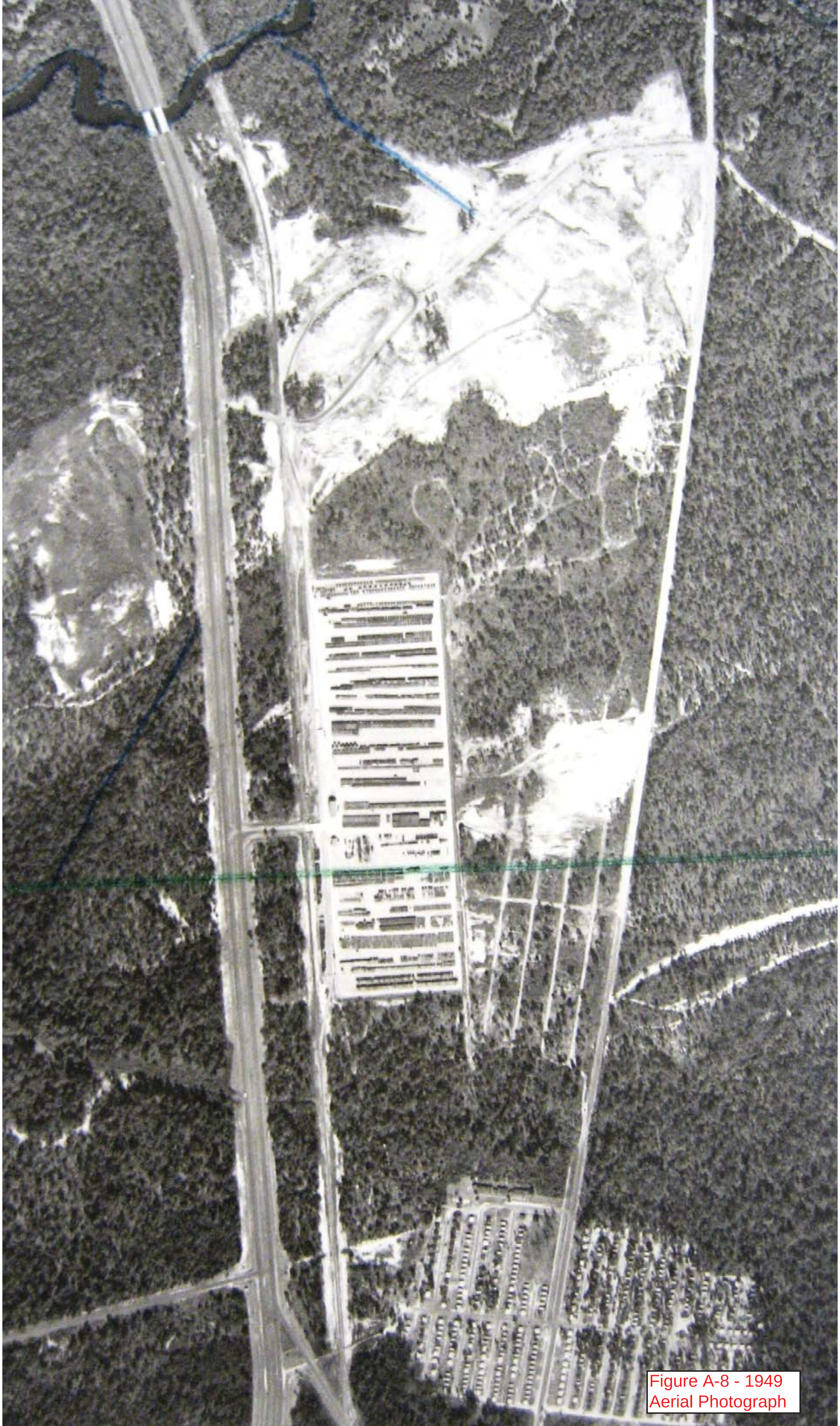


Figure A-8 - 1949
Aerial Photograph

Figure A-9 - 1955
Aerial Photograph

Figure A-10 - 1970
Aerial Photograph


Figure A-11 - 1948
Oblique Photograph
Looking North

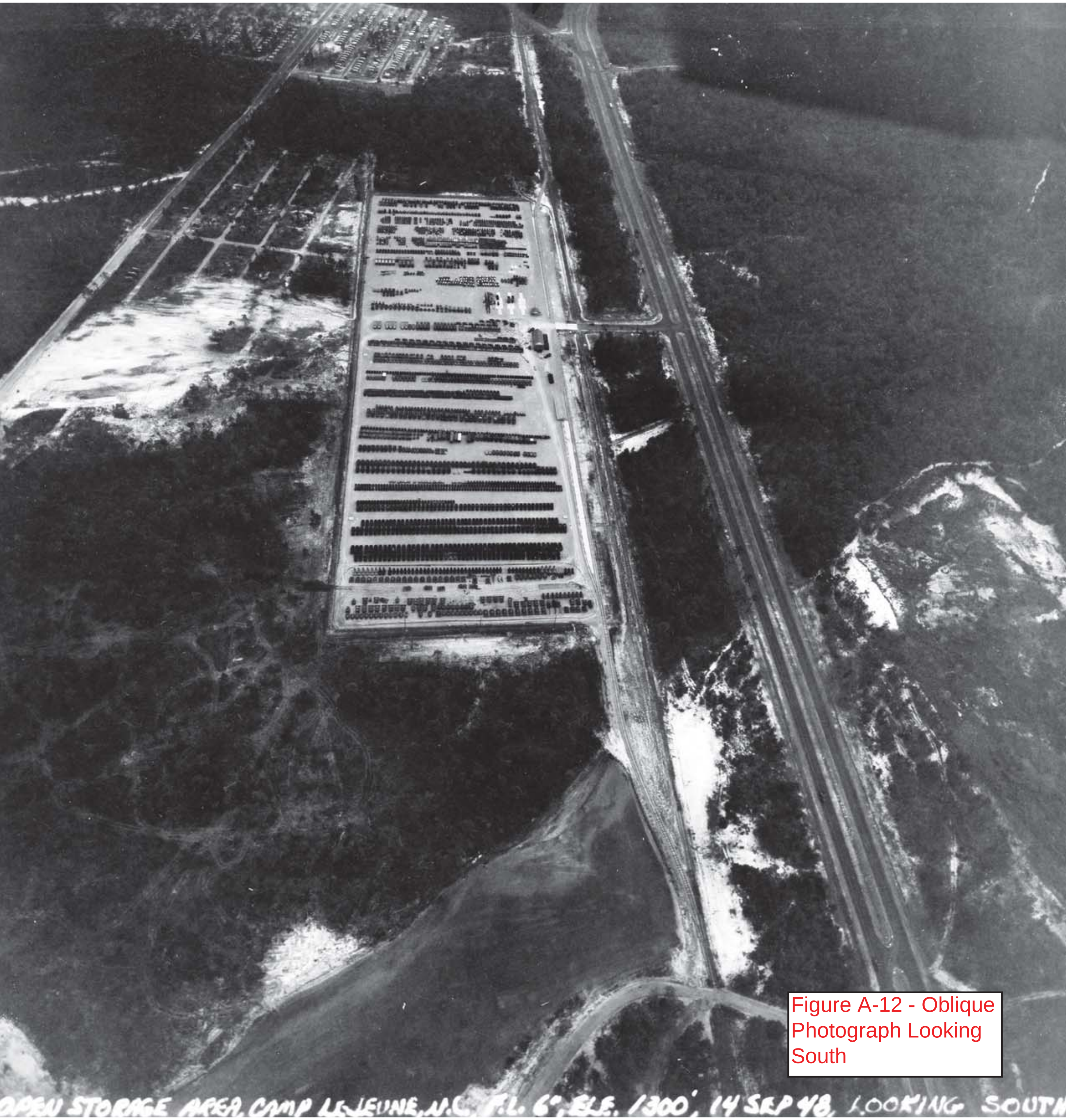



Figure A-12 - Oblique Photograph Looking South

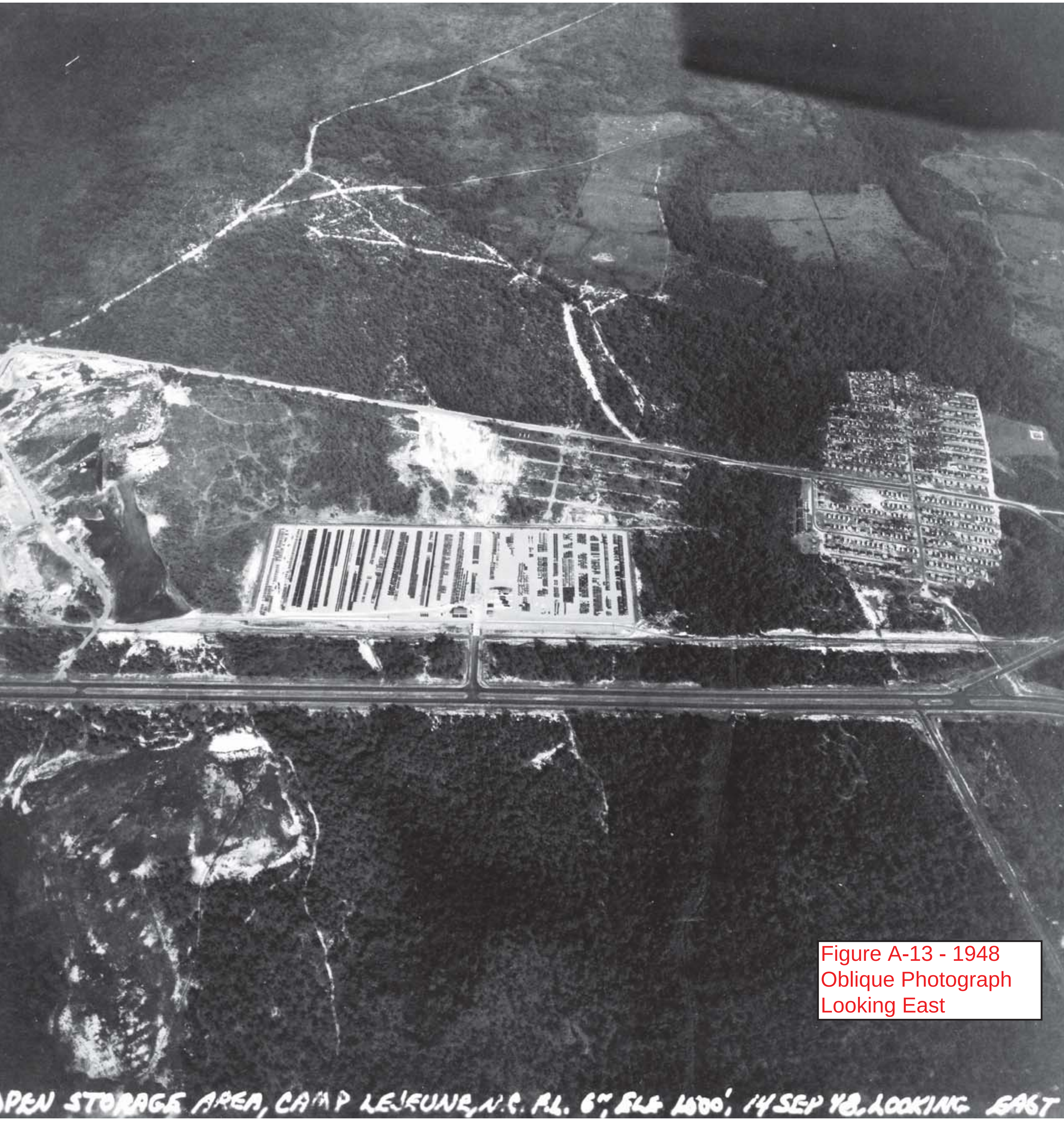



Figure A-13 - 1948
Oblique Photograph
Looking East

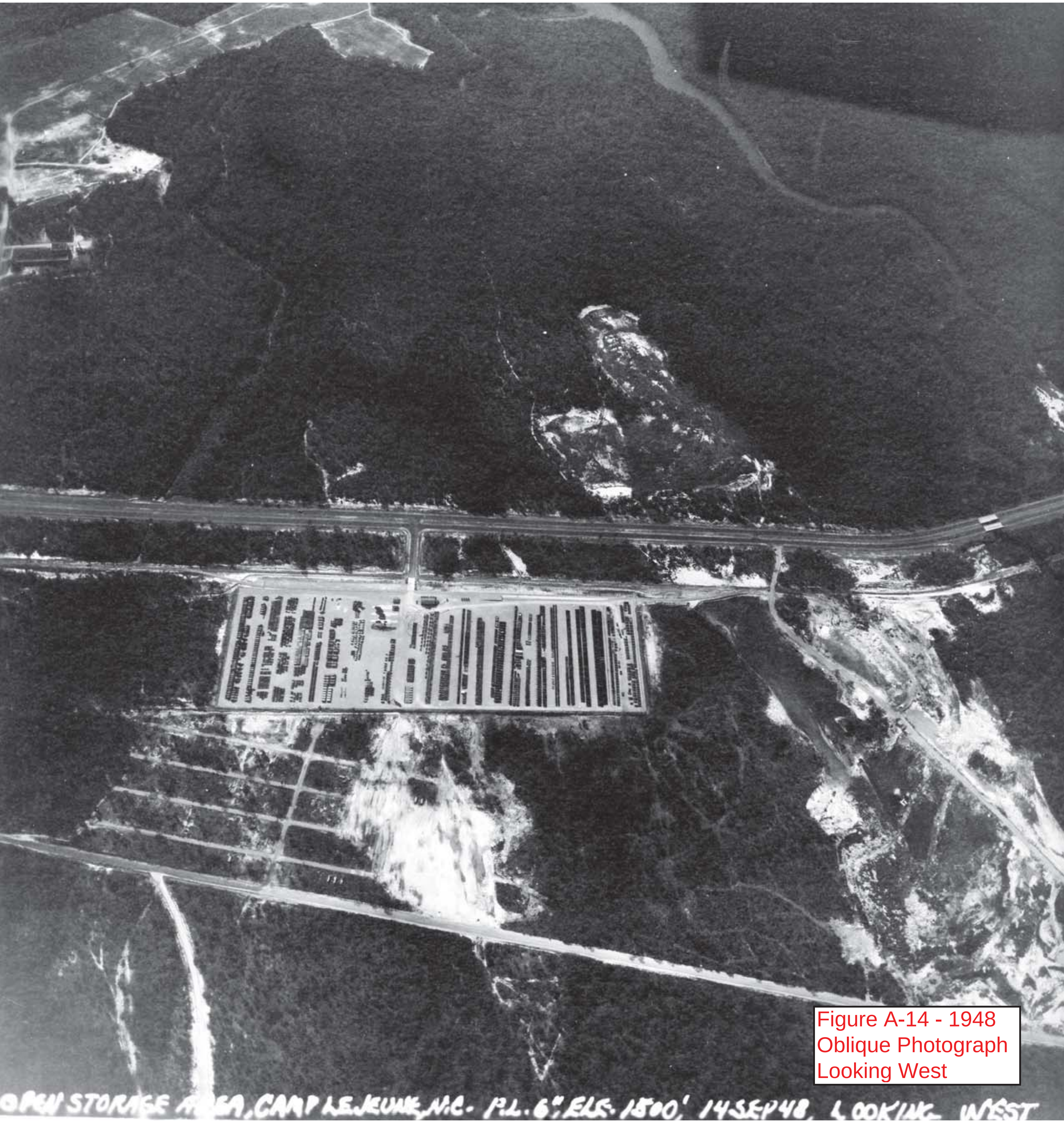



Figure A-14 - 1948
Oblique Photograph
Looking West

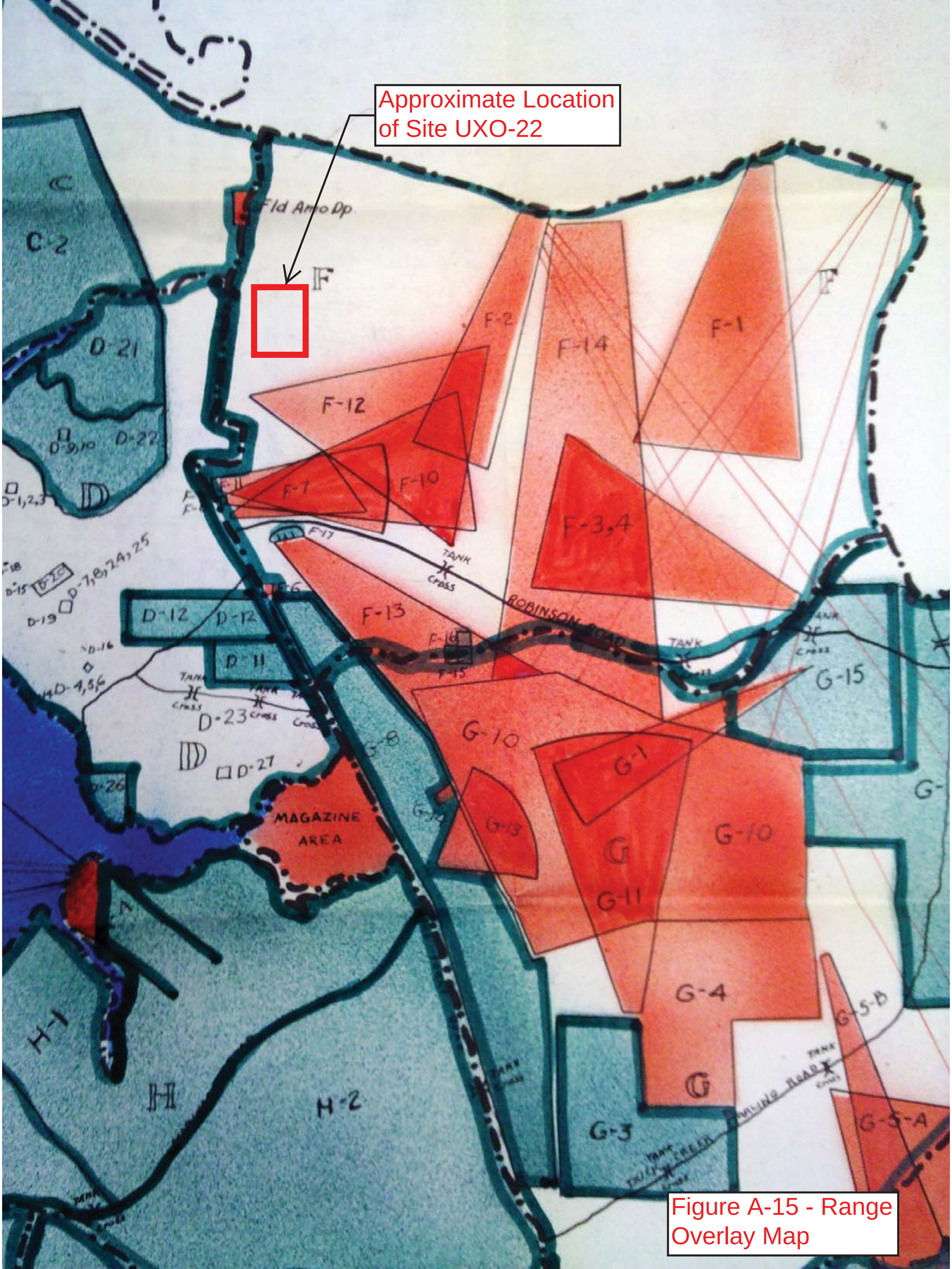



Figure A-15 - Range Overlay Map

# Attachment 1
# Resource Review Summary

# Resource Review Summary

The following table provides a summary of the specific references identified for review, interview, or contact for the archival report.

| Resource | Actions Completed |
|---|---|
| Quantico, Virginia, Marine Corps Library, Gray Research Center – Archives and Special Collections | Reviewed files related to Camp Lejeune. Made copies of relevant historic maps and text. October 18-19, 2010. |
| Quantico, Virginia, Marine Corps Library, Gray Research Center - Histories department | Reviewed text and photographs related to Camp Lejeune. Made copies of relevant text and photos. October 18-19, 2010. |
| Onslow County Soil and Water Conservation District Office | Reviewed and copied historical aerial photographs. October 26, 2010 |

# Marine Corps Library Review

## Archives and Special Collections: Text Division

United State Marine Corps Archives & Special Collections
2040 Broadway Street
Quantico, Virginia 22134

Site Visit: October 18-19, 2010
File review at Marine Corps Base, Quantico, Virginia, Gray Research Center, Marine Corps Archives and Special Collections.

Reviewed command chronologies from 1976-1989.

Box 420: Command Chronologies, MCB Camp Lejeune, July – December 1976 to January – June 1979

- Contained no pertinent information.

Box 421: Command Chronologies, MCB Camp Lejeune, July – December 1979 to January – June 1982

- Contained no pertinent information.

Box 422: Command Chronologies, MCB Camp Lejeune, July – December 1982 to January – June 1984

- Contained no pertinent information.

Box 423: Command Chronologies, MCB Camp Lejeune, July – December 1984 to July – December 1985

- Contained no pertinent information.

Box 424: Command Chronologies, MCB Camp Lejeune, 1986 to 1987

- Contained no pertinent information.

Box 425: Command Chronologies, MCB Camp Lejeune, 1988 to 1989

Boxes contained general chronological information for various branches at Camp Lejeune. Most relevant sections were in Base Training Facilities, Natural Resources & Environmental Affairs and Base Maintenance branches.

## List of Documents Obtained from Archives and Special Collections

- Excerpt from Command Chronology, MCB Camp Lejeune, Facilities Division, January – December 1988

## Historical Reference Branch

Photograph Historian: Lena M. Kaljot
Text Historian: Robert V. Aquilina
3079 Moreell Avenue
Quantico, Virginia 22134
www.history.usmc.mil

Site Visit: October 18-19, 2010
Reviewed documents, photographs and maps related to Camp Lejeune.

## List of Maps Obtained from Historical Reference Branch

- "Artillery Firing Problems Occurring Frequently, Camp G-3 Section", Camp Lejeune, N.C. undated
- "Camp Lejeune General Area Map" Marine Barracks, New River. Feb 19, 1942
- "Field Map" Lt. Col. FW Hopkins. 1943
- "Open Storage Area" Camp Lejeune, North Carolina. June 30, 1949
- "Camp Lejeune Ranges and Maneuvering Areas" Reference Map, North Carolina Approaches to New River. August 2, 1952
- "Training Areas and Facilities" February 16, 1953
- [Camp Lejeune Map]. 3rd Ed., Nov. 1950; Revised 3/28/55
- "Map of Tracked Vehicle Trails Power and Telephone Lines" February 21, 1962
- "Camp Lejeune Quadrangle" Camp Lejeune, N.C. 1952. Photorevised 1971
- "Combat Training Chart" [Marine Corps Base Camp Lejeune, NC] 1972
- "Combat Training Chart" [Marine Corps Base Camp Lejeune, NC] 1987

## List of Aerial Photographs Obtained from Historical Reference Branch

- "Camp Lejeune, NC – Looking North" May 6, 1948
- "Camp Lejeune, NC – Looking South" May 6, 1948
- "Camp Lejeune, NC – Looking East" May 6, 1948
- "Camp Lejeune, NC – Looking West" May 6, 1948
- "Open Storage Area, Camp Lejeune, NC – Looking North" September 14, 1948
- "Open Storage Area, Camp Lejeune, NC – Looking South" September 14, 1948
- "Open Storage Area, Camp Lejeune, NC – Looking East" September 14, 1948
- "Open Storage Area, Camp Lejeune, NC – Looking West" September 14, 1948
- "Trailer Camp Area, Camp Lejeune, NC – Looking North" September 20, 1948

# Onslow County Soil and Water Conservation District

William D. Norris
Onslow County Multipurpose Complex
4028 Richlands Highway
Jacksonville NC 28540
Tel: 910-455-4472 x3 • Fax: 910-989-2444
http://www.co.onslow.nc.us/soil/

Site Visit: October 27, 2010
Reviewed historical aerial photographs of Onslow County from 1949, 1954, and 1970.

## List of Aerial Photographs of Site UXO-22 obtained:

- [Onslow County]. October 21, 1949
- [Onslow County]. February 10, 1954
- [Onslow County]. October 4, 1970

# Appendix C
# Field Forms

IR06-GW11

# WELL ABANDONMENT RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

**WELL CONTRACTOR CERTIFICATION #** 3561-A

**1. WELL CONTRACTOR:**

Nick Currie
Well Contractor (Individual) Name

Probe Technology, Inc.
Well Contractor Company Name

P O Box 1369
Street Address

Concord, NC 28026
City or Town State Zip Code

(704) 933-5538
Area code Phone number

**2. WELL INFORMATION:**

**SITE WELL ID #** (if applicable) IR06-GW11

**STATE WELL PERMIT #** (if applicable) ____

**COUNTY WELL PERMIT #** (if applicable) ____

**DWQ or OTHER PERMIT #** (if applicable) ____

**WELL USE** (Check applicable use) X **Monitoring** ☐ **Residential** ☐ **Municipal/Public** ☐ **Industrial/Commercial** ☐ **Agricultural** ☐ **Recovery** ☐ **Injection** ☐ **Irrigation** ☐ Other (list use) ____

**3. WELL LOCATION:**

COUNTY Onslow QUADRANGLE NAME ____

NEAREST TOWN: Camp Lejeune

UXO-22/Site 6 Base DRMO Lot

(Street/Road Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:

☐ Slope ☐ Valley X Flat ☐ Ridge ☐ Other ____

(Check appropriate setting)

LATITUDE N 34 ° 41 ' 35.0 " DMS OR ____ DD

LONGITUDE W 77 ° 19 ' 43.7 " DMS OR ____ DD

Latitude/longitude source: X GPS ☐ Topographic map

*(location of well must be shown on a USGS topo map and attached to this form if not using GPS)*

**4a. FACILITY** - The name of the business where the well is located. Complete 4a and 4b
(If a residential well, skip 4a; complete 4b, well owner information only.)

**FACILITY ID #** (if applicable) ____

NAME OF FACILITY UXO-22 Site 6 MCB Camp Lejeune

STREET ADDRESS Base DRMO Lot

Jacksonville, NC
City or Town State Zip Code

**4b. CONTACT PERSON/WELL OWNER:**

NAME US DOD/US Navy / Charity Rzenak

STREET ADDRESS ____

**5. WELL DETAILS:**

a. Total Depth 30 ft. Diameter: 4 in.

b. Water Level (Below Measuring Point): ____ ft.
Measuring point is ____ ft. above land surface.

**6. CASING:** Length Diameter

a. Casing Depth (if known): 20 ft. 4 in.

b. Casing Removed: ____ ft. ____ in.

**7. DISINFECTION:** ____

(Amount of 65%75% calcium hypochlorite used)

**8. SEALING MATERIAL:**

**Neat Cement**
Cement 165 lb.
Water 12.5 gal.

**Sand Cement**
Cement ____ lb.
Water ____ gal.

**Bentonite**
Bentonite lb.
Type: ☐ Slurry ☐ Pellets
Water ____ gal.

**Other**
Type material ____
Amount ____

**9. EXPLAIN METHOD OF EMPLACEMENT OF MATERIAL:**

Boring filled from bottom up with cement grout.

**10. WELL DIAGRAM** : Draw a detailed sketch of the well on the back of this form showing total depth, depth and diameter of screens (if any) remaining in the well, gravel interval, intervals of casing perforations, and depths and types of fill materials used

**11. DATE WELL ABANDONED** 2-06-12

I DO HEREBY CERTIFY THAT THIS WELL WAS ABANDONED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

2-20-12

**SIGNATURE OF CERTIFIED WELL CONTRACTOR** **DATE**

**SIGNATURE OF PRIVATE WELL OWNER ABANDONING THE WELL** **DATE**
(The private well owner must be an individual who personally abandons his/her residential well in accordance with 15A NCAC 2C .0113.)

Nick Currie

**PRINTED NAME OF PERSON ABANDONING THE WELL**

**Submit a copy to the owner and the original to: Division of Water Quality - Information Processing, 1617 Mail Service Center, Raleigh, NC 27699-1617, Phone : (919) 807-6300**

Form GW-30
Rev. 5/10

# Boring Number: MR22-IS01

**Sheet:** 1 of 1

**Client:** NAVFAC Mid-Atlantic
**Project:** Navy CLEAN 1000-CTO-0014
**Location:** MCB CamLej UXO-22
**Project Number:** 378849

**Driller:** Parratt Wolff
**Drilling Method:** HSA
**Sampling Method:** DPT
**Logged by:** S. Kline
**Start/Finish Date:** 12/16/11

| Depth (ft) | Sample # | Sample Type | Recovery (%) | SPT (6"-6"-6") | Soil Log | Soil Description | Depth / Elev (ft) | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Ground Surface | | |
| 0 | | DPT | 80 | NA | | **Poorly graded sand (SP)** Light gray, damp, loose, fine grained quartz sand with fill material at 1' | 0 | Bare ground, some turf<br>PID (ppm): 0.4 |
| | | | | | | | 2 | |
| | | DPT | 85 | NA | | **Poorly graded sand (SP)** Medium brown coloration, moist, trace saturated silt at 4' - return to light gray coloration | 3 | PID (ppm): 0.2<br>Sample MR22-IS01-3-5-11D at 0840 |
| | | | | | | | 4 | |
| 5 | | DPT | 35 | NA | | | | PID (ppm): 0.3<br>PID (ppm): 0.2 |
| | | | | | | | | PID (ppm): 0.5 |
| 10 | | DPT | 75 | NA | | **Fat Clay (CH)** Dark gray, moist, very high plasticity, low stiffness, no sands/gravel; overbank deposit | 10 | |
| | | | | | | | 11 | PID (ppm): 0.3 |
| | | | | | | | | PID (ppm): 0.1 |
| | | DPT | 80 | NA | | **Poorly graded sand (SP)** Return of poorly graded sand. Light gray, damp, low density, fine grained quartz sand | 14 | |
| 15 | | | | | | | 15 | PID (ppm): 0.1 |
| | | | | | | End of Log | 16 | |
| 20 | | | | | | | | |

CH2MHILL

# Boring Number: MR22-IS02



**Client:** NAVFAC Mid-Atlantic
**Project:** Navy CLEAN 1000-CTO-0014
**Location:** MCB CamLej UXO-22
**Project Number:** 378849

**Driller:** Parratt Wolff
**Drilling Method:** HSA
**Sampling Method:** DPT
**Logged by:** S. Kline
**Start/Finish Date:** 12/16/11

| Depth (ft) | Sample # | Sample Type | Recovery (%) | SPT (6"-6"-6") | Soil Log | Soil Description | Depth / Elev (ft) | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Ground Surface | | |
| 0 | | DPT | 85 | NA | | **Poorly graded sand (SP)** Medium grayish-brown, damp, low density, fine-grained quartz sand | 0 | Surface: bare ground + grass |
| | | | | | | | 2 | PID (ppm): 0.0 |
| | | DPT | 90 | NA | | Charcoal and wood present | 3 | |
| | | | | | | Medium grayish-brown, damp, low density, fine-grained quartz sand | 4 | PID (ppm): 0.0 |
| 5 | | DPT | 80 | NA | | Change in moisture to moist and yellowish-orange-brown coloration | 5 | PID (ppm): 0.0 |
| | | | | | | | | Sample MR22-IS02-7-9-11D at 1015 |
| | | DPT | 60 | NA | | Light gray | 8 | PID (ppm): 0.0 |
| | | | | | | | 9 | |
| 10 | | | | | | End of Log | 10 | PID (ppm): 0.1 |
| 15 | | | | | | | | |
| 20 | | | | | | | | |

Sheet: 1 of 1

# Boring Number: MR22-IS03

**Client:** NAVFAC Mid-Atlantic
**Project:** Navy CLEAN 1000-CTO-0014
**Location:** MCB CamLej UXO-22
**Project Number:** 378849

**Driller:** Parratt Wolff
**Drilling Method:** HSA
**Sampling Method:** DPT
**Logged by:** S. Kline
**Start/Finish Date:** 12/16/11

| Depth (ft) | Sample # | Sample Type | Recovery (%) | SPT (6"-6"-6") | Soil Log | Soil Description | Depth / Elev (ft) | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Ground Surface | | |
| 0 | | DPT | 100 | NA | | **Well graded gravel (GW)**<br>Cobbles to 1' | 0 | Surface: Dirt road |
| | | DPT | 65 | NA | | Burn debris, wood, plastics present from 1-3', charcoal, moist, loose | 1 | PID (ppm): 0.0 |
| | | DPT | 100 | NA | | | 3 | PID (ppm): 0.1 |
| 5 | | DPT | 73 | NA | | **Poorly graded sand (SP)**<br>Gray, moist, low density, fine-grained quartz sand with clay lens at 7.5' | 5 | Sample MR22-IS03-5-7-11D at 1115<br>Sample MR22-IS03-5-7D-11D at 1120 |
| | | | | | | | 8 | |
| | | | | | | End of Log | 9 | |
| 10 | | | | | | | | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |

# Boring Number: MR22-IS04

**Sheet:** 1 of 1

**Client:** NAVFAC Mid-Atlantic
**Project:** Navy CLEAN 1000 CTO-0014
**Location:** MCB CamLej UXO-22
**Project Number:** 378849

**Driller:** Parratt Wolff
**Drilling Method:** HSA
**Sampling Method:** DPT
**Logged by:** S. Kline
**Start/Finish Date:** 12/16/11

| Depth (ft) | Sample # | Sample Type | Recovery (%) | SPT (6"-6"-6") | Soil Log | Soil Description | Depth / Elev (ft) | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Ground Surface | | |
| 0 | | DPT | 100 | NA | | **Poorly graded sand (SP)** Light gray, loose, dry, fine-grained quartz sand | 0 | Ground Surface: grass; PID (ppm): 0.0 |
| | | | | | | **Organic Soil (OH)** Burn layer, stiff, hard, charcoal and organics | 1 | PID (ppm): 0.0 |
| | | DPT | 37.5 | NA | | **Poorly graded sand (SP)** Light gray, loose, dry. fine-grained quartz sand | | PID (ppm): 0.0 |
| 5 | | | | | | | 4 | PID (ppm): 0.1; PID (ppm): 0.0 |
| | | DPT | 95 | NA | | Light gray, medium dense, fine-grained quartz sand, saturated at 9.5' | 8 | PID (ppm): 0.0; Sample MR22-IS04-7-9-11D at 1515 |
| 10 | | | | | | End of Log | 10 | PID (ppm): 0.0 |
| 15 | | | | | | | | |
| 20 | | | | | | | | |

# Boring Number: MR22-IS05/MW02



**Driller:** Parratt Wolff
**Drilling Method:** HSA
**Sampling Method:** DPT
**Logged by:** S. Kline
**Start/Finish Date:** 12/16/11

**Client:** NAVFAC Mid-Atlantic
**Project:** Navy CLEAN 1000 CTO-0014
**Location:** MCB CamLej UXO-22
**Project Number:** 378849

| Depth (ft) | Sample # | Sample Type | Recovery (%) | SPT (6"-6"-6") | Soil Log | Soil Description | Depth / Elev (ft) | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Ground Surface | | |
| 0 | | HSA | 75 | NA | | **Poorly graded sand (SP)** Light gray, damp, loose, fine-grained quartz sand with no fines | 0 | Ground Surface: Grass; PID (ppm): 0.0 |
| | | | | | | | 3 | PID (ppm): 0.1; PID (ppm): 0.0 |
| 5 | | DPT | 50 | NA | | | | PID (ppm): 0.0 |
| | | | | | | | 6 | PID (ppm): 0.1 |
| | | DPT | 50 | NA | | Yellowish-brown coloration, moist | 8 | PID (ppm): 0.0 |
| 10 | | | | | | Medium density, moist, black staining at 10' | 10 | PID (ppm): 0.0 |
| | | DPT | 75 | NA | | | | PID (ppm): 0.0 |
| | | | | | | Increase in quartz grain size from fine to fine-medium grained; saturated at 15.5 ft bgs | 14 | PID (ppm): 0.0; Sample MR02-IS05-13-15-11-D at 1130 |
| 15 | | | | | | | 15 | |
| | | DPT | 80 | NA | | | 19 | |
| 20 | | | | | | | | |

CH2MHILL

# Boring Number: MR22-IS05/MW02



**Client:** NAVFAC Mid-Atlantic
**Project:** Navy CLEAN 1000 CTO-0014
**Location:** MCB CamLej UXO-22
**Project Number:** 378849

**Driller:** Parratt Wolff
**Drilling Method:** HSA
**Sampling Method:** DPT
**Logged by:** S. Kline
**Start/Finish Date:** 12/16/11

| Depth (ft) | Sample # | Sample Type | Recovery (%) | SPT (6"-6"-6") | Soil Log | Soil Description | Depth / Elev (ft) | Comments |
|---|---|---|---|---|---|---|---|---|
| | | DPT | 100 | NA | | | | |
| | | | | | | End of Log | 24 | |
| 25 | | | | | | | | |
| 30 | | | | | | | | |
| 35 | | | | | | | | |
| 40 | | | | | | | | |

CH2MHILL

# Boring Number: MR22-IS06



**Client:** NAVFAC Mid-Atlantic
**Project:** Navy CLEAN 1000 CTO-0014
**Location:** MCB CamLej UXO-22
**Project Number:** 378849

**Driller:** Parratt Wolff
**Drilling Method:** HSA
**Sampling Method:** DPT
**Logged by:** S. Kline
**Start/Finish Date:** 12/16/11

| Depth (ft) | Sample # | Sample Type | Recovery (%) | SPT (6"-6"-6") | Soil Log | Soil Description | Depth / Elev (ft) | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Ground Surface | | |
| 0 | | DPT | 65 | NA | | **Poorly graded sand (SP)** Light brownish-gray, loose | 0, 1 | Ground Surface: Sand; PID (ppm): 0.0 |
| | | DPT | 80 | NA | | **Organic soil (OH)** Stained black with wood particles, loose | | |
| | | | | | | **Poorly graded sand (SP)** Light gray, loose, wood particles at 4.5 ft bgs | 3 | PID (ppm): 0.0 |
| 5 | | DPT | 100 | NA | | | | PID (ppm): 0.1 |
| | | DPT | 67.5 | NA | | | 9 | PID (ppm): 0.0; PID (ppm): 0.1 |
| 10 | | DPT | 75 | NA | | Medium density; Saturated at 13 ft bgs | 10, 13 | PID (ppm): 0.0; Sample MR22-IS06-11-13-11D at 1445 |
| | | | | | | End of Log | 14 | PID (ppm): 0.0 |
| 15 | | | | | | | | |
| 20 | | | | | | | | |

CH2MHILL

# Boring Number: MR22-IS07

**Sheet:** 1 of 1

**Driller:** Parratt Wolff
**Client:** NAVFAC Mid-Atlantic
**Drilling Method:** HSA
**Project:** Navy CLEAN 100 CTO-0014
**Sampling Method:** DPT
**Location:** MCB CamLej UXO-22
**Logged by:** S. Kline
**Project Number:** 378849
**Start/Finish Date:** 12/16/11

| Depth (ft) | Sample # | Sample Type | Recovery (%) | SPT (6"-6"-6") | Soil Log | Soil Description | Depth / Elev (ft) | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Ground Surface | | |
| 0 | | DPT | 55 | NA | | **Poorly graded sand (SP)** Light brownish-gray, damp, loose, fine-grained sand, textile material at 3', blackish staining | 0, 1 | Ground Surface: Grass<br>PID (ppm): 0.0 |
| | | DPT | 25 | NA | | | 3 | PID (ppm): 0.1 |
| 5 | | DPT | 45 | NA | | Moist | 4, 5 | PID (ppm): 0.2 |
| | | DPT | 72.5 | NA | | | 6, 9 | PID (ppm): 0.0<br>Sample MR22-IS07-7-9-11D at 1545<br>PID (ppm): 0.0<br>PID (ppm): 0.0 |
| 10 | | | | | | End of Log | 10 | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |

# Boring Number: MR22-IS08

**Sheet:** 1 of 1

**Client:** NAVFAC Mid-Atlantic
**Project:** Navy CLEAN 1000 CTO-0014
**Location:** MCB CamLej UXO-22
**Project Number:** 378849

**Driller:** Parratt Wolff
**Drilling Method:** HSA
**Sampling Method:** DPT
**Logged by:** S. Kline
**Start/Finish Date:** 12/16/11

| Depth (ft) | Sample Information: Sample # | Sample Type | Recovery (%) | SPT (6"-6"-6") | Soil Log | Soil Description | Depth / Elev (ft) | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Ground Surface | | Ground Surface: Grass |
| 0 | | DPT | 65 | NA | | **Poorly graded sand (SP)** Light brownish gray, loose, dry, fine-grained quartz sand | 0–1 | PID (ppm): 0.0 |
| | | DPT | 75 | NA | | | 1–4 | PID (ppm): 0.1 |
| 5 | | DPT | 80 | NA | | dark grayish-brown coloration, moist, loose, fine-grained sand | 4–6 | PID (ppm): 0.2 |
| | | DPT | 78 | NA | | Light brownish gray, medium density, moist, fine-grained quartz sand, saturated at 9.5' | 6–7, 7–9, 9–10 | PID (ppm): 0.0; PID (ppm): 0.1 |
| 10 | | | | | | End of Log | 10 | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |

**Sheet:** 1 of 1

# Boring Number: MR22-IS09

**Client:** NAVFAC Mid-Atlantic
**Project:** Navy CLEAN 1000 CTO-0014
**Location:** MCB CamLej UXO-22
**Project Number:** 378849

**Driller:** Parratt Wolff
**Drilling Method:** HSA
**Sampling Method:** DPT
**Logged by:** S. Kline
**Start/Finish Date:** 12/12/11

| Depth (ft) | Sample # | Sample Type | Recovery (%) | SPT (6"-6"-6") | Soil Log | Soil Description | Depth / Elev (ft) | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Ground Surface | | |
| 0 | | DPT | 75 | NA | | **Poorly graded sand (SP)** Dark grayish-brown, dry, loose, very fine quartz sand | 0 | Ground Surface: Hard gravel road |
| | | DPT | 100 | NA | | | 2 | PID (ppm): 0.1 |
| | | DPT | 100 | NA | | **Poorly graded sand (SP)** Light brownish-gray with yellow streaking, moist,orange streaking from 6-7 ft bgs, saturated at 6.5" | 4 | PID (ppm): 0.0 |
| 5 | | DPT | 80 | NA | | | | PID (ppm): 0.0 |
| | | | | | | End of Log | 7 | PID (ppm): 0.0 |
| 10 | | | | | | | | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |

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# Boring Number: MR22-IS10/MW03

**Sheet:** 1 of 1

**Client:** NAVFAC Mid-Atlantic
**Project:** Navy CLEAN 1000 CTO-0014
**Location:** MCB CamLej UXO-22
**Project Number:** 378849

**Driller:** Parratt Wolff
**Drilling Method:** HSA
**Sampling Method:** DPT
**Logged by:** S. Kline
**Start/Finish Date:** 12/12/11

| Depth (ft) | Sample # | Sample Type | Recovery (%) | SPT (6"-6"-6") | Soil Log | Soil Description | Depth / Elev (ft) | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Ground Surface | | |
| 0 | | DPT | 100 | NA | | **Poorly graded sand (SP)** Dark grayish-brown, damp, loose, very fine grained quartz sand | 0 | Ground Surface: Grass and bare earth; PID (ppm): 0.0 |
| | | DPT | 90 | NA | | Change in coloration to light gray | 3 | |
| | | | | | | | 4 | PID (ppm): 0.0 |
| 5 | | DPT | 95 | NA | | Moist, light brownish-gray coloration | 5 | PID (ppm): 0.0 |
| | | | | | | | 6 | Sample MR22-IS10-5-7-11D at 1345 |
| | | DPT | 90 | NA | | Dark grayish-brown, saturated at 7' | | Water Table |
| | | | | | | | 8 | PID (ppm): 0.0 |
| 10 | | DPT | 62.5 | NA | | Light brownish-gray, wet, loose, very fine-grained quartz sand | 10 | PID (ppm): 0.0; PID (ppm): 0.0 |
| | | DPT | 67.5 | NA | | Increase to medium dense, 2" clay interval at 15' | 14 | PID (ppm): 0.0 |
| 15 | | | | | | | | PID (ppm): 0.0 |
| | | | | | | End of Log | 16 | |
| 20 | | | | | | | | |

CH2MHILL

# Boring Number: MR22-IS11/MW01



**Client:** NAVFAC Mid-Atlantic
**Project:** Navy CLEAN 1000-CTO-0014
**Location:** MCB CamLej UXO-22
**Project Number:** 378849

**Driller:** Probe Technology
**Drilling Method:** HSA
**Sampling Method:** DPT
**Logged by:** K. Schrecengost and S. Kline
**Start/Finish Date:** 2/6/12

| Depth (ft) | Sample # | Sample Type | Recovery (%) | SPT (6"-6"-6") | Soil Log | Soil Description | Depth / Elev (ft) | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Ground Surface | | |
| 0 | | DPT | 74 | NA | | **Silty sand (SM)** Tan-yellow, damp, loose, high organic content at 0.5 ft bgs | 0 | Grass<br>PID (ppm): 0.4 |
| | | | | | | **Poorly graded sand (SP)** Tan-orange, damp to moist, medium dense | 2 | |
| | | | | | | | 4 | |
| 5 | | DPT | 72 | NA | | **Poorly graded Sand (SP)** Orange, moist, medium dense | 5 | PID (ppm): 3.6 |
| | | | | | | Light gray, moist, medium dense, fine to very fine grained sand | 6 | |
| | | | | | | Gray to dark gray, moist, medium dense, fine to very fine grained sand | 7 | PID (ppm): 9.4 |
| | | | | | | | 9 | PID (ppm): 4.5 |
| 10 | | DPT | 100 | NA | | **Poorly graded sand (SP)** Gray-orange, moist to saturated, medium dense to loose | 10 | |
| | | | | | | Gray, wet, loose | 11 | PID (ppm): 0.2 |
| | | | | | | **Poorly graded sand with silt (SP-SM)** Gray, wet, loose | 13 | PID (ppm): 0.0 |
| | | | | | | **Fat clay (CH)** Dark gray, moist,very high plasticity, low stiffness | | PID (ppm): 0.5 |
| 15 | | DPT | 90 | NA | | **Poorly graded sand with silt (SP-SM)** Tan-gray, moist, loose | 15 | PID (ppm): 0.9 |
| | | | | | | **Fat clay (CH)** Dark gray, moist, very high plasticity, low stiffness | 16 | PID (ppm): 4.5 |
| | | | | | | **Poorly graded sand with silt (SP-SM)** Gray, moist, loose | 18 | Sample MR22-IS11-17-19-12A at 1500 |
| | | | | | | **Poorly graded sand (SP)** Light gray, moist, medium dense, dark brown laminar bedding | 19 | PID (ppm): 1.6 |
| 20 | | | | | | | | |

CH2MHILL

# Boring Number: MR22-IS11/MW01



**Client:** NAVFAC Mid-Atlantic
**Project:** Navy CLEAN 1000-CTO-0014
**Location:** MCB CamLej UXO-22
**Project Number:** 378849

**Driller:** Probe Technology
**Drilling Method:** HSA
**Sampling Method:** DPT
**Logged by:** K. Schrecengost and S. Kline
**Start/Finish Date:** 2/6/12

| Depth (ft) | Sample # | Sample Type | Recovery (%) | SPT (6"-6"-6") | Soil Log | Soil Description | Depth / Elev (ft) | Comments |
|---|---|---|---|---|---|---|---|---|
| | | DPT | 100 | NA | | **Poorly graded sand (SP)** Red, damp, loose | | PID (ppm): 0.6 |
| | | | | | | **Poorly graded sand (SP)** Light gray, damp, medium dense | | |
| | | | | | | **Poorly graded sand (SP)** Orange-tan, damp, medium dense, very fine grained sand | 23 | |
| | | | | | | **Well graded sand (SW)** Orange, wet, loose, very fine to coarse grained sand | 24 | PID (ppm): 0.1 |
| 25 | | DPT | 100 | NA | | Orange, damp to wet, medium dense to loose, very fine to coarse grained sand | 26 | PID (ppm): 0.1 |
| | | | | | | | | PID (ppm): 0.7 |
| 30 | | | | | | End of Log | 30 | |
| 35 | | | | | | | | |
| 40 | | | | | | | | |

| PROJECT NUMBER | WELL NUMBER |
|---|---|
| 378849.01.SI.FK | MR22-MW01 SHEET 1 OF 3 |

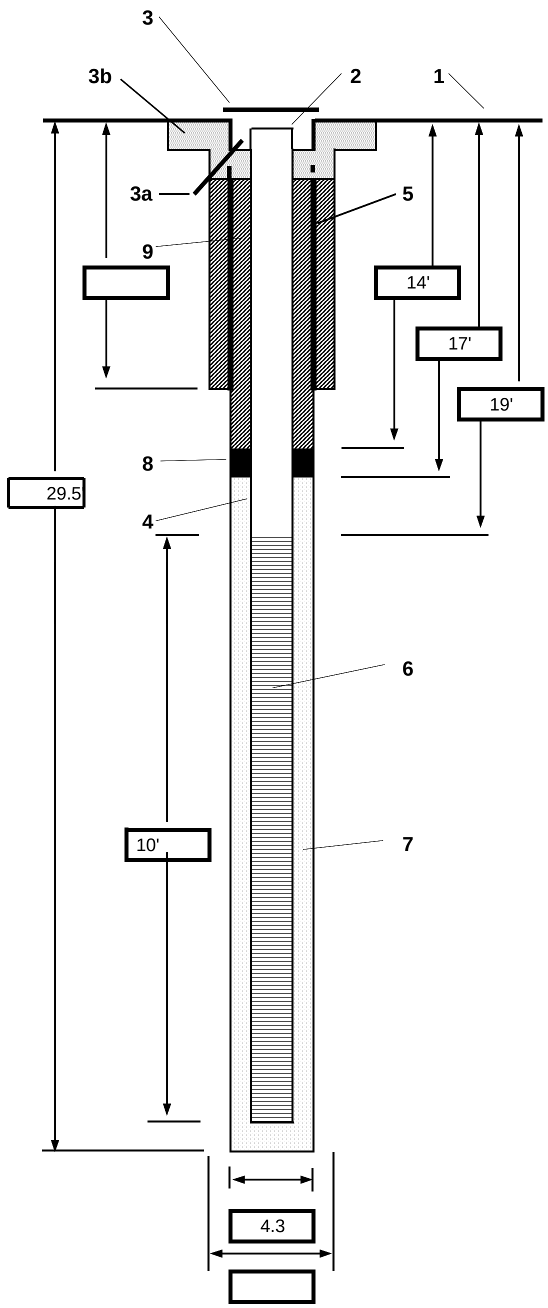
# WELL COMPLETION DIAGRAM

PROJECT : NavFAC Navy Clean 1000-CTO-0014 LOCATION : MCB CamLej UXO-22

DRILLING CONTRACTOR : Probe Technology

DRILLING METHOD AND EQUIPMENT USED : Geoprobe DPT/Hollow Stem Auger

WATER LEVELS : 19.80 ft btoc START : 02/6/12 1420 END : 02/6/12 1500 LOGGER : S. Kline/RDU




1- Ground elevation at well: NA

2- Top of casing elevation: NA

3- Wellhead protection cover type: 0.83' stick up
- a) drain tube?
- b) concrete pad dimensions

4- Dia./type of well casing: 2" ID SCH 40 PVC riser

5- Dia./type surface casing: NA

6- Type/slot/size of screen: 2" ID SCH 40 PVC 0.010" Slot

7- Type screen filter: Filter pack GP#2 Filter Media
- a) Quantity used: 6-0.50 $ft^3$ bags

8- Type of seal: 3/8" Baroid Hole Plug
- a) Quantity used: 1-50 lb. bag

9- Grout
- a) Grout mix used: NA
- b) Method of placement
- c) Vol.of surface casing grout
- d) Vol. of well casing grout

Development method: Overpump/surge

Development time: 1 hr

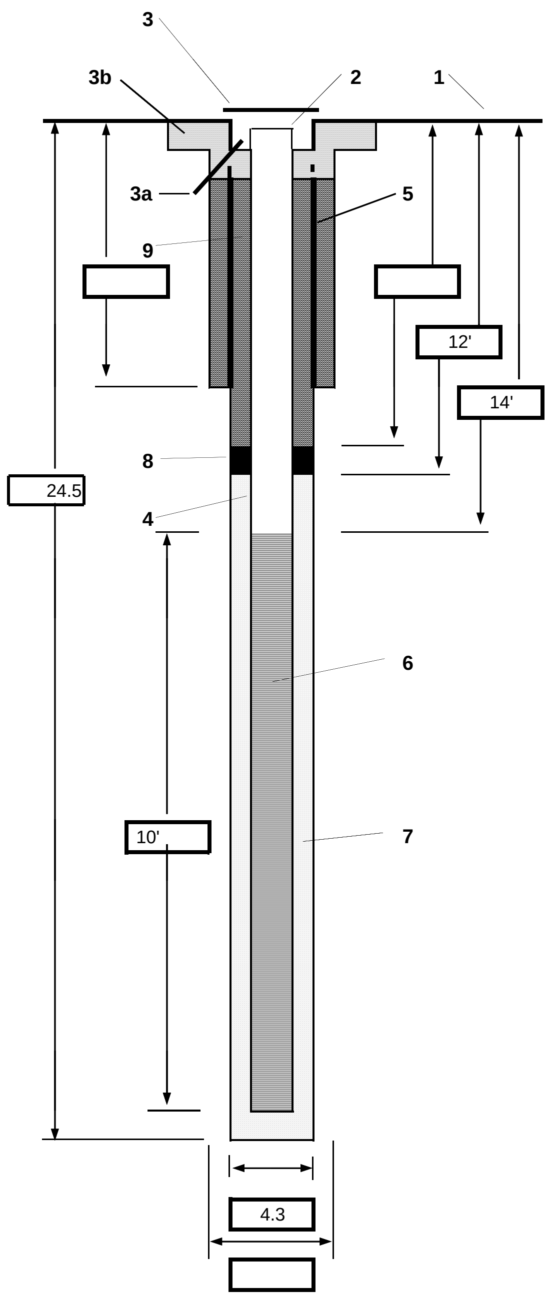
Estimated purge volume: 50 gallons

Comments

| PROJECT NUMBER | WELL NUMBER |
|---|---|
| 378849.01.SI.FK | **MR22-MW02** SHEET 2 OF 3 |

# WELL COMPLETION DIAGRAM

PROJECT : NavFAC Navy Clean 1000-CTO-0014 LOCATION : MCB CamLej UXO-22
DRILLING CONTRACTOR : Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : Geoprobe DPT/Hollow Stem Auger
WATER LEVELS : START : 12/16/11 1145 END : 12/16/11 1400 LOGGER : S. Kline/RDU




| | |
|---|---|
| 1- Ground elevation at well | NA |
| 2- Top of casing elevation | NA |
| 3- Wellhead protection cover type | NA |
| a) drain tube? | |
| b) concrete pad dimensions | |
| 4- Dia./type of well casing | 2" ID SCH 40 PVC riser |
| 5- Dia./type surface casing | NA |
| 6- Type/slot/size of screen | 2" ID SCH 40 PVC 0.010" Slot |
| 7- Type screen filter | DSI Brand GP#1 Filter pack |
| a) Quantity used | 5-50 lb bags |
| 8- Type of seal | Enviroplug medium granulated bentonite pellets |
| a) Quantity used | 1-50 lb. bag |
| 9- Grout | |
| a) Grout mix used | |
| b) Method of placement | |
| c) Vol.of surface casing grout | |
| d) Vol. of well casing grout | |
| Development method | Overpump/surge |
| Development time | 1 hr |
| Estimated purge volume | 50 gallons |
| Comments | |

| PROJECT NUMBER | WELL NUMBER |
|---|---|
| 378849.01.SI.FK | MR22-MW03 SHEET 3 OF 3 |

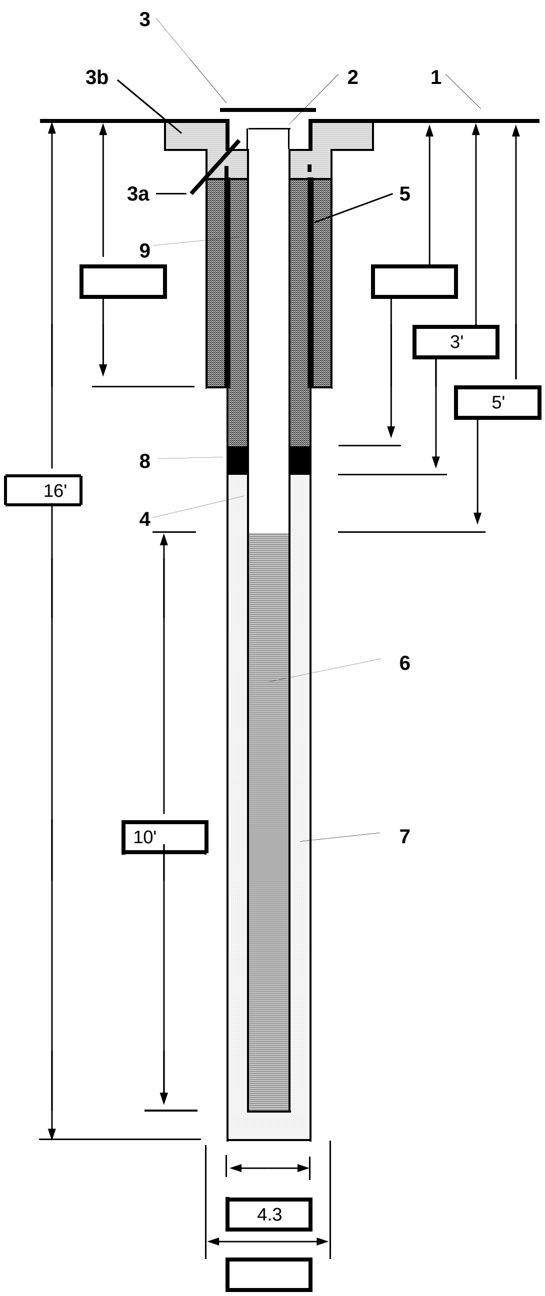
# WELL COMPLETION DIAGRAM

PROJECT : NavFAC Navy Clean 1000-CTO-0014 LOCATION : MCB CamLej UXO-22

DRILLING CONTRACTOR : Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : Geoprobe DPT/Hollow Stem Auger

WATER LEVELS : START : 12/12/11 1345 END : 12/12/11 1500 LOGGER : S. Kline/RDU




1- Ground elevation at well: N/A

2- Top of casing elevation: NA

3- Wellhead protection cover type: NA
- a) drain tube?
- b) concrete pad dimensions

4- Dia./type of well casing: 2" ID SCH 40 PVC riser

5- Dia./type surface casing: NA

6- Type/slot/size of screen: 2" ID SCH 40 PVC 0.010" Slot

7- Type screen filter: DSI Brand GP#1 Filter pack
- a) Quantity used: 5.5-50 lb bags

8- Type of seal: Enviroplug medium granulated bentonite pellets
- a) Quantity used: 1-50 lb. bag

9- Grout
- a) Grout mix used
- b) Method of placement
- c) Vol.of surface casing grout
- d) Vol. of well casing grout

Development method: Overpump/surge

Development time: 1 hr

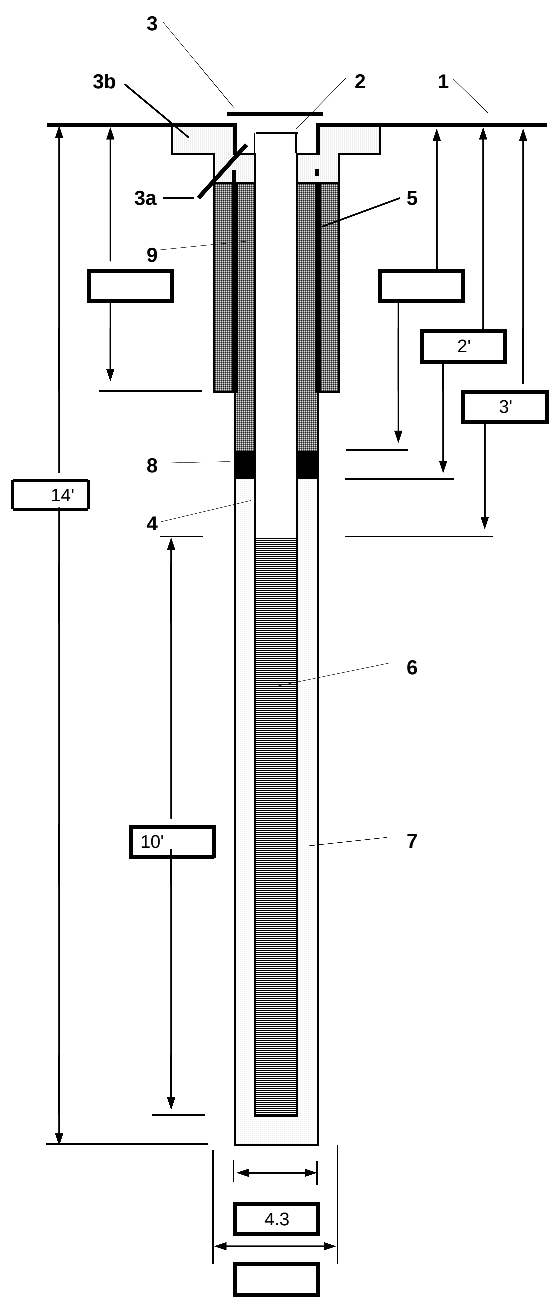
Estimated purge volume: 50 gallons

Comments

| PROJECT NUMBER | WELL NUMBER |
|---|---|
| 378849.01.SI.FK | MR22-MW01 SHEET 1 OF 3 |

# WELL COMPLETION DIAGRAM

PROJECT : NavFAC Navy Clean 1000-CTO-0014 LOCATION : MCB CamLej UXO-22
DRILLING CONTRACTOR : Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : Geoprobe DPT/Hollow Stem Auger
WATER LEVELS : START : 12/16/11 0800 END : 12/16/11 1015 LOGGER : S. Kline/RDU




1- Ground elevation at well: NA

2- Top of casing elevation: NA

3- Wellhead protection cover type: NA
   a) drain tube?
   b) concrete pad dimensions

4- Dia./type of well casing: 2" ID SCH 40 PVC riser

5- Dia./type surface casing: NA

6- Type/slot/size of screen: 2" ID SCH 40 PVC 0.010" Slot

7- Type screen filter: DSI Brand GP#1 Filter pack
   a) Quantity used: 5.75-50 lb bags

8- Type of seal: Enviroplug medium granulated bentonite pellets
   a) Quantity used: 0.75-50 lb. bag

9- Grout
   a) Grout mix used
   b) Method of placement
   c) Vol.of surface casing grout
   d) Vol. of well casing grout

Development method: Overpump/surge

Development time: 1 hr

Estimated purge volume: 50 gallons

Comments

# Appendix D
# Analytical Data

| Location Name | Site Name | Site Description | Location Type Code | Northing | Easting | Sample Date | Sample Matrix | Sample Beginning Depth | Sample Ending Depth | PROJECT | Sample Type Code | Sample Name | Sampling Company Code | Sample Remarks | SDG | Analytical Method | CAS Number | Analyte Name | GIS Analyte Name | Analyte ERPIMS Parlabel | Result Value | Result Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 8330A | 121-82-4 | RDX | | 389 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 8330A | 121-82-4 | RDX | | 389 | 277 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 8330A | 121-82-4 | RDX | | 389 | 331 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 8330A | 121-82-4 | RDX | | 389 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 8330A | 121-82-4 | RDX | | 389 | 67 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 8330A | 99-65-0 | 1,3-Dinitrobenzene | | 353 | 93.8 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 8330A | 99-65-0 | 1,3-Dinitrobenzene | | 353 | 35.5 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 6010B | 7440-23-5 | Sodium | | 122 | 183 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 8330A | 99-65-0 | 1,3-Dinitrobenzene | | 353 | 96.8 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 6010B | 7440-23-5 | Sodium | | 122 | 174 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 6010B | 7440-23-5 | Sodium | | 122 | 168 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 8330A | 99-65-0 | 1,3-Dinitrobenzene | | 353 | 63 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 6010B | 7440-23-5 | Sodium | | 122 | 189 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 8330A | 99-65-0 | 1,3-Dinitrobenzene | | 353 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 6010B | 7440-23-5 | Sodium | | 122 | 196 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 6010B | 7439-89-6 | Iron | | 114 | 992 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 6010B | 7440-38-2 | Arsenic | | 125 | 0.365 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 6010B | 7439-89-6 | Iron | | 114 | 201 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 6010B | 7440-38-2 | Arsenic | | 125 | 0.348 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 6010B | 7439-89-6 | Iron | | 114 | 542 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 6010B | 7440-38-2 | Arsenic | | 125 | 0.335 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 6010B | 7439-89-6 | Iron | | 114 | 430 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 6010B | 7440-38-2 | Arsenic | | 125 | 0.379 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 6010B | 7439-89-6 | Iron | | 114 | 1140 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 6010B | 7440-38-2 | Arsenic | | 125 | 0.256 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 8330A | 606-20-2 | 2,6-Dinitrotoluene | | 93 | 45.7 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 8330A | 606-20-2 | 2,6-Dinitrotoluene | | 93 | 93.8 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 8330A | 606-20-2 | 2,6-Dinitrotoluene | | 93 | 96.8 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 8330A | 606-20-2 | 2,6-Dinitrotoluene | | 93 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 8330A | 606-20-2 | 2,6-Dinitrotoluene | | 93 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 8330A | 88-72-2 | 2-Nitrotoluene | | 438 | 93.8 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 8330A | 88-72-2 | 2-Nitrotoluene | | 438 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 6010B | 7440-09-7 | Potassium | | 120 | 183 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 6010B | 7440-09-7 | Potassium | | 120 | 174 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 6010B | 7440-09-7 | Potassium | | 120 | 168 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 8330A | 88-72-2 | 2-Nitrotoluene | | 438 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 6010B | 7440-09-7 | Potassium | | 120 | 189 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 6010B | 7440-09-7 | Potassium | | 120 | 196 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 8330A | 88-72-2 | 2-Nitrotoluene | | 438 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 8330A | 88-72-2 | 2-Nitrotoluene | | 438 | 96.8 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 8330A | 118-96-7 | 2,4,6-Trinitrotoluene | | 509 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 8330A | 118-96-7 | 2,4,6-Trinitrotoluene | | 509 | 46.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 8330A | 118-96-7 | 2,4,6-Trinitrotoluene | | 509 | 132 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 8330A | 118-96-7 | 2,4,6-Trinitrotoluene | | 509 | 60.9 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 8330A | 118-96-7 | 2,4,6-Trinitrotoluene | | 509 | 159 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 8330A | 479-45-8 | Tetryl | | 508 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 8330A | 479-45-8 | Tetryl | | 508 | 93.8 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 8330A | 479-45-8 | Tetryl | | 508 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 8330A | 479-45-8 | Tetryl | | 508 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 8330A | 479-45-8 | Tetryl | | 508 | 96.8 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 6010B | 7440-02-0 | Nickel | | 119 | 1.1 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 6010B | 7440-47-3 | Chromium | | 129 | 2.36 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 6010B | 7440-02-0 | Nickel | | 119 | 0.527 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 6010B | 7440-47-3 | Chromium | | 129 | 2.05 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 6010B | 7440-02-0 | Nickel | | 119 | 1.14 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 6010B | 7440-47-3 | Chromium | | 129 | 2.52 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 6010B | 7440-02-0 | Nickel | | 119 | 3.36 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 6010B | 7440-47-3 | Chromium | | 129 | 2.99 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 6010B | 7440-02-0 | Nickel | | 119 | 1.47 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 6010B | 7440-47-3 | Chromium | | 129 | 11.4 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 8330A | 2691-41-0 | HMX | | 441 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 8330A | 2691-41-0 | HMX | | 441 | 93.8 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 6010B | 7440-39-3 | Barium | | 126 | 6.2 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 8330A | 2691-41-0 | HMX | | 441 | 73.2 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 6010B | 7440-39-3 | Barium | | 126 | 3.61 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 6010B | 7440-39-3 | Barium | | 126 | 6.99 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 8330A | 2691-41-0 | HMX | | 441 | 54.3 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 6010B | 7440-39-3 | Barium | | 126 | 5.98 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 6010B | 7440-39-3 | Barium | | 126 | 10 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 8330A | 2691-41-0 | HMX | | 441 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 6010B | 7440-36-0 | Antimony | | 124 | 0.487 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 6010B | 7440-36-0 | Antimony | | 124 | 0.465 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 6010B | 7440-36-0 | Antimony | | 124 | 0.447 | MG_KG |

| Location Name | Site Name | Site Description | Location Type Code | Northing | Easting | Sample Date | Sample Matrix | Sample Beginning Depth | Sample Ending Depth | PROJECT | Sample Type Code | Sample Name | Sampling Company Code | Sample Remarks | SDG | Analytical Method | CAS Number | Analyte Name | GIS Analyte Name | Analyte ERPIMS Parlabel | Result Value | Result Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 6010B | 7440-36-0 | Antimony | | 124 | 0.791 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 6010B | 7440-36-0 | Antimony | | 124 | 0.522 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 6010B | 7440-62-2 | Vanadium | | 132 | 1.41 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 6010B | 7440-62-2 | Vanadium | | 132 | 1.29 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 6010B | 7440-62-2 | Vanadium | | 132 | 1.44 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 6010B | 7440-62-2 | Vanadium | | 132 | 1.74 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 6010B | 7440-62-2 | Vanadium | | 132 | 2.47 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 6010B | 7440-28-0 | Thallium | | 123 | 0.243 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 6010B | 7440-28-0 | Thallium | | 123 | 0.232 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 6010B | 7440-28-0 | Thallium | | 123 | 0.224 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 6010B | 7440-28-0 | Thallium | | 123 | 0.253 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 6010B | 7440-28-0 | Thallium | | 123 | 0.261 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 6010B | 7440-66-6 | Zinc | | 133 | 47 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 6010B | 7440-66-6 | Zinc | | 133 | 12 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 6010B | 7440-66-6 | Zinc | | 133 | 52.6 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 6010B | 7440-66-6 | Zinc | | 133 | 65.7 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 6010B | 7440-66-6 | Zinc | | 133 | 231 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 6010B | 7440-70-2 | Calcium | | 134 | 581 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 6010B | 7440-70-2 | Calcium | | 134 | 125 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 6010B | 7440-70-2 | Calcium | | 134 | 466 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 6010B | 7440-70-2 | Calcium | | 134 | 501 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 6010B | 7440-70-2 | Calcium | | 134 | 1140 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 6010B | 7440-43-9 | Cadmium | | 128 | 1.1 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 6010B | 7782-49-2 | Selenium | | 147 | 0.338 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 6010B | 7440-43-9 | Cadmium | | 128 | 0.29 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 6010B | 7782-49-2 | Selenium | | 147 | 0.244 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 6010B | 7440-43-9 | Cadmium | | 128 | 1.81 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 6010B | 7782-49-2 | Selenium | | 147 | 0.251 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 6010B | 7440-43-9 | Cadmium | | 128 | 0.622 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 6010B | 7782-49-2 | Selenium | | 147 | 0.347 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 6010B | 7440-43-9 | Cadmium | | 128 | 0.759 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 6010B | 7782-49-2 | Selenium | | 147 | 0.381 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 6010B | 7439-92-1 | Lead | | 115 | 21.5 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 6010B | 7439-92-1 | Lead | | 115 | 8.71 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 6010B | 7439-92-1 | Lead | | 115 | 18.6 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 6010B | 7439-92-1 | Lead | | 115 | 12.8 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 6010B | 7439-92-1 | Lead | | 115 | 25.3 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 6010B | 7439-96-5 | Manganese | | 117 | 8.31 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 6010B | 7439-96-5 | Manganese | | 117 | 2.57 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 6010B | 7439-96-5 | Manganese | | 117 | 9.97 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 6010B | 7439-96-5 | Manganese | | 117 | 10.3 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 6010B | 7439-96-5 | Manganese | | 117 | 13.3 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 8330A | 19406-51-0 | dinitrotoluene | | 717 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 8330A | 19406-51-0 | dinitrotoluene | | 717 | 93.8 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 8330A | 19406-51-0 | dinitrotoluene | | 717 | 96.8 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 8330A | 19406-51-0 | dinitrotoluene | | 717 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 8330A | 19406-51-0 | dinitrotoluene | | 717 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 8330A | 99-99-0 | 4-Nitrotoluene | | 439 | 93.8 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 8330A | 99-99-0 | 4-Nitrotoluene | | 439 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 8330A | 99-99-0 | 4-Nitrotoluene | | 439 | 96.8 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 8330A | 99-99-0 | 4-Nitrotoluene | | 439 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 8330A | 99-99-0 | 4-Nitrotoluene | | 439 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 6010B | 7440-41-7 | Beryllium | | 127 | 0.122 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 6010B | 7440-41-7 | Beryllium | | 127 | 0.116 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 6010B | 7440-41-7 | Beryllium | | 127 | 0.112 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 6010B | 7440-41-7 | Beryllium | | 127 | 0.126 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 6010B | 7440-41-7 | Beryllium | | 127 | 0.131 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 6010B | 7439-95-4 | Magnesium | | 116 | 183 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 6010B | 7439-95-4 | Magnesium | | 116 | 174 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 6010B | 7439-95-4 | Magnesium | | 116 | 168 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 6010B | 7439-95-4 | Magnesium | | 116 | 189 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 6010B | 7439-95-4 | Magnesium | | 116 | 196 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 6010B | 7429-90-5 | Aluminum | | 113 | 1570 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 6010B | 7429-90-5 | Aluminum | | 113 | 1480 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 6010B | 7429-90-5 | Aluminum | | 113 | 1670 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 6010B | 7429-90-5 | Aluminum | | 113 | 2340 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 6010B | 7429-90-5 | Aluminum | | 113 | 3330 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 8330A | 121-14-2 | 2,4-Dinitrotoluene | | 38 | 34.6 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 8330A | 121-14-2 | 2,4-Dinitrotoluene | | 38 | 96.8 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 8330A | 121-14-2 | 2,4-Dinitrotoluene | | 38 | 93.8 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 8330A | 121-14-2 | 2,4-Dinitrotoluene | | 38 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 8330A | 121-14-2 | 2,4-Dinitrotoluene | | 38 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 6010B | 7440-50-8 | Copper | | 131 | 12.3 | MG_KG |

| Location Name | Site Name | Site Description | Location Type Code | Northing | Easting | Sample Date | Sample Matrix | Sample Beginning Depth | Sample Ending Depth | PROJECT | Sample Type Code | Sample Name | Sampling Company Code | Sample Remarks | SDG | Analytical Method | CAS Number | Analyte Name | GIS Analyte Name | Analyte ERPIMS Parlabel | Result Value | Result Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 6010B | 7440-50-8 | Copper | | 131 | 1.34 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 6010B | 7440-50-8 | Copper | | 131 | 11.8 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 6010B | 7440-50-8 | Copper | | 131 | 5.5 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 6010B | 7440-50-8 | Copper | | 131 | 10.1 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 8330A | 78-11-5 | PETN | | 603 | 164 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 8330A | 78-11-5 | PETN | | 603 | 156 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 8330A | 78-11-5 | PETN | | 603 | 123 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 8330A | 78-11-5 | PETN | | 603 | 164 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 8330A | 78-11-5 | PETN | | 603 | 161 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 8330A | 99-35-4 | Trinitrobenzene | | 507 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 8330A | 99-35-4 | Trinitrobenzene | | 507 | 93.8 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 8330A | 99-35-4 | Trinitrobenzene | | 507 | 96.8 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 8330A | 99-35-4 | Trinitrobenzene | | 507 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 8330A | 99-35-4 | Trinitrobenzene | | 507 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 6010B | 7440-22-4 | Silver | | 121 | 0.122 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 6010B | 7440-22-4 | Silver | | 121 | 0.116 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 6010B | 7440-22-4 | Silver | | 121 | 0.112 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 6010B | 7440-22-4 | Silver | | 121 | 0.126 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 6010B | 7440-22-4 | Silver | | 121 | 0.131 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 8330A | 98-95-3 | Nitrobenzene | | 189 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 8330A | 98-95-3 | Nitrobenzene | | 189 | 93.8 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 8330A | 98-95-3 | Nitrobenzene | | 189 | 96.8 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 8330A | 98-95-3 | Nitrobenzene | | 189 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 8330A | 98-95-3 | Nitrobenzene | | 189 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 8330A | 99-08-1 | 3-Nitrotoluene | | 437 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 8330A | 99-08-1 | 3-Nitrotoluene | | 437 | 93.8 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 8330A | 99-08-1 | 3-Nitrotoluene | | 437 | 96.8 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 8330A | 99-08-1 | 3-Nitrotoluene | | 437 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 8330A | 99-08-1 | 3-Nitrotoluene | | 437 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 7471A | 7439-97-6 | Mercury | | 118 | 0.0379 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 7471A | 7439-97-6 | Mercury | | 118 | 0.0198 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 7471A | 7439-97-6 | Mercury | | 118 | 0.0436 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 7471A | 7439-97-6 | Mercury | | 118 | 0.027 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 7471A | 7439-97-6 | Mercury | | 118 | 0.0333 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 6850 | 14797-73-0 | Perchlorate | | 777 | 2.54 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 6850 | 14797-73-0 | Perchlorate | | 777 | 2.58 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 6850 | 14797-73-0 | Perchlorate | | 777 | 2.7 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 6850 | 14797-73-0 | Perchlorate | | 777 | 2.25 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 6850 | 14797-73-0 | Perchlorate | | 777 | 2.31 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 8330A | 55-63-0 | Nitroglycerin | | 525 | 164 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 8330A | 35572-78-2 | dinitrotoluene | | 716 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 8330A | 55-63-0 | Nitroglycerin | | 525 | 156 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 8330A | 35572-78-2 | dinitrotoluene | | 716 | 93.8 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 6010B | 7440-48-4 | Cobalt | | 130 | 0.608 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 8330A | 55-63-0 | Nitroglycerin | | 525 | 161 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NE | NA | | 1010092 | 8330A | 35572-78-2 | dinitrotoluene | | 716 | 96.8 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 6010B | 7440-48-4 | Cobalt | | 130 | 0.581 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 6010B | 7440-48-4 | Cobalt | | 130 | 0.559 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 8330A | 55-63-0 | Nitroglycerin | | 525 | 164 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | FD | UXO22-TP-S-NE-D | NA | | 1010092 | 8330A | 35572-78-2 | dinitrotoluene | | 716 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SW | NA | | 1010092 | 6010B | 7440-48-4 | Cobalt | | 130 | 0.632 | MG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 8330A | 55-63-0 | Nitroglycerin | | 525 | 164 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-SE | NA | | 1010092 | 8330A | 35572-78-2 | dinitrotoluene | | 716 | 98.4 | UG_KG |
| UXO22-TP01 | UXO-22 | UXO-22 | TP | 3841216.232 | 286774.704 | 07-Oct-10 | SO | 999 | 999 | CTO-108, UXO-22, Testpit SO, 10-2010, Clean-1000 | N | UXO22-TP-S-NW | NA | MS/MSD Collected | 1010092 | 6010B | 7440-48-4 | Cobalt | | 130 | 0.653 | MG_KG |

| Method Detection Limit | Reporting Limit | Result Comments | Result Flag | BEST_RESULT | BEST_RESULT_R | BEST_RESULT_N_FD | BEST_RESULT_METHOD | Laboratory Code | Field Filtered | Location Ground Surface Elevation | Location Established Date | Analytical Group | Result Origin Identifier | Result Sequence Number | Screening Level | Screening Level Source | Exceeds Screening Level |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635584 | | | N |
| 31.2 | 188 | 2C; | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635705 | | | N |
| 32.8 | 197 | 2C; | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635664 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635746 | | | N |
| 32.3 | 194 | 2C; | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635634 | | | N |
| 31.2 | 188 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635704 | | | N |
| 32.8 | 197 | | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635595 | | | N |
| 60.8 | 304 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635607 | | | N |
| 32.3 | 194 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635624 | | | N |
| 58.1 | 290 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635727 | | | N |
| 55.9 | 279 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635647 | | | N |
| 32.8 | 197 | 2C; | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635663 | | | N |
| 63.2 | 316 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635687 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635744 | | | N |
| 65.3 | 326 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635567 | | | N |
| 1.83 | 6.08 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635600 | | | N |
| 0.183 | 0.365 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635610 | | | N |
| 1.74 | 5.81 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635720 | | | N |
| 0.174 | 0.348 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635730 | | | N |
| 1.68 | 5.59 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635640 | | | N |
| 0.168 | 0.335 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635650 | | | N |
| 1.89 | 6.32 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635680 | | | N |
| 0.189 | 0.379 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635690 | | | N |
| 1.96 | 6.53 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635560 | | | N |
| 0.196 | 0.392 | | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635570 | | | N |
| 32.8 | 197 | 2C; | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | SVOA | Oracle_HH | 175635594 | | | N |
| 31.2 | 188 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | SVOA | Oracle_HH | 175635716 | | | N |
| 32.3 | 194 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | SVOA | Oracle_HH | 175635633 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | SVOA | Oracle_HH | 175635675 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | SVOA | Oracle_HH | 175635755 | | | N |
| 31.2 | 188 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635707 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635597 | | | N |
| 60.8 | 304 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635605 | | | N |
| 58.1 | 290 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635725 | | | N |
| 55.9 | 279 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635645 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635666 | | | N |
| 63.2 | 316 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635685 | | | N |
| 65.3 | 326 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635565 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635756 | | | N |
| 32.3 | 194 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635635 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635589 | | | N |
| 31.2 | 188 | 2C; | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635711 | | | N |
| 32.8 | 197 | 2C; | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635670 | | | N |
| 32.8 | 197 | 2C; | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635750 | | | N |
| 32.3 | 194 | 2C; | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635637 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635588 | | | N |
| 31.2 | 188 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635718 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635669 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635749 | | | N |
| 32.3 | 194 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635636 | | | N |
| 0.183 | 1.22 | | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635604 | | | N |
| 0.122 | 0.304 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635614 | | | N |
| 0.174 | 1.16 | | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635724 | | | N |
| 0.116 | 0.29 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635734 | | | N |
| 0.168 | 1.12 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635644 | | | N |
| 0.112 | 0.279 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635654 | | | N |
| 0.189 | 1.26 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635684 | | | N |
| 0.126 | 0.316 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635694 | | | N |
| 0.196 | 1.31 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635564 | | | N |
| 0.131 | 0.326 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635574 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635586 | | | N |
| 31.2 | 188 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635709 | | | N |
| 0.304 | 2.43 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635611 | | | N |
| 32.3 | 194 | | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635628 | | | N |
| 0.29 | 2.32 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635731 | | | N |
| 0.279 | 2.24 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635651 | | | N |
| 32.8 | 197 | 2C; | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635678 | | | N |
| 0.316 | 2.53 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635691 | | | N |
| 0.326 | 2.61 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635571 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635758 | | | N |
| 0.304 | 1.22 | MSL; | UJ | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635609 | | | N |
| 0.29 | 1.16 | MSL; | UJ | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635729 | | | N |
| 0.279 | 1.12 | MSL; | UJ | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635649 | | | N |

| Method Detection Limit | Reporting Limit | Result Comments | Result Flag | BEST_RESULT | BEST_RESULT_R | BEST_RESULT_N_FD | BEST_RESULT_METHOD | Laboratory Code | Field Filtered | Location Ground Surface Elevation | Location Established Date | Analytical Group | Result Origin Identifier | Result Sequence Number | Screening Level | Screening Level Source | Exceeds Screening Level |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.316 | 1.26 | MSL; | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635689 | | | N |
| 0.326 | 1.31 | MSL; | UJ | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635569 | | | N |
| 0.304 | 1.22 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635617 | | | N |
| 0.29 | 1.16 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635737 | | | N |
| 0.279 | 1.12 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635657 | | | N |
| 0.316 | 1.26 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635697 | | | N |
| 0.326 | 1.31 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635577 | | | N |
| 0.183 | 0.487 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635608 | | | N |
| 0.174 | 0.465 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635728 | | | N |
| 0.168 | 0.447 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635648 | | | N |
| 0.253 | 0.505 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635688 | | | N |
| 0.261 | 0.522 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635568 | | | N |
| 0.304 | 1.22 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635618 | | | N |
| 0.29 | 1.16 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635738 | | | N |
| 0.279 | 1.12 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635658 | | | N |
| 0.316 | 1.26 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635698 | | | N |
| 0.326 | 1.31 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635578 | | | N |
| 60.8 | 304 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635619 | | | N |
| 58.1 | 290 | | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635739 | | | N |
| 55.9 | 279 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635659 | | | N |
| 63.2 | 316 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635699 | | | N |
| 65.3 | 326 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635579 | | | N |
| 0.0608 | 0.304 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635613 | | | N |
| 0.183 | 0.608 | | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635620 | | | N |
| 0.0581 | 0.29 | MBL; | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635733 | | | N |
| 0.174 | 0.581 | | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635740 | | | N |
| 0.0559 | 0.279 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635653 | | | N |
| 0.168 | 0.559 | | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635660 | | | N |
| 0.0632 | 0.316 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635693 | | | N |
| 0.189 | 0.632 | | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635700 | | | N |
| 0.0653 | 0.326 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635573 | | | N |
| 0.196 | 0.653 | | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635580 | | | N |
| 0.0913 | 0.183 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635601 | | | N |
| 0.0871 | 0.174 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635721 | | | N |
| 0.0838 | 0.168 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635641 | | | N |
| 0.0947 | 0.189 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635681 | | | N |
| 0.0979 | 0.196 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635561 | | | N |
| 0.183 | 1.22 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635603 | | | N |
| 0.174 | 1.16 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635723 | | | N |
| 0.168 | 1.12 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635643 | | | N |
| 0.189 | 1.26 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635683 | | | N |
| 0.196 | 1.31 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635563 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635593 | | | N |
| 31.2 | 188 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635715 | | | N |
| 32.3 | 194 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635632 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635674 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635754 | | | N |
| 31.2 | 188 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635708 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635598 | | | N |
| 32.3 | 194 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635627 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635667 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635757 | | | N |
| 0.0608 | 0.304 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635612 | | | N |
| 0.0581 | 0.29 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635732 | | | N |
| 0.0559 | 0.279 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635652 | | | N |
| 0.0632 | 0.316 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635692 | | | N |
| 0.0653 | 0.326 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635572 | | | N |
| 60.8 | 304 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635602 | | | N |
| 58.1 | 290 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635722 | | | N |
| 55.9 | 279 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635642 | | | N |
| 63.2 | 316 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635682 | | | N |
| 65.3 | 326 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635562 | | | N |
| 3.04 | 12.2 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635599 | | | N |
| 2.9 | 11.6 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635719 | | | N |
| 2.79 | 11.2 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635639 | | | N |
| 3.16 | 12.6 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635679 | | | N |
| 3.26 | 13.1 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635559 | | | N |
| 32.8 | 197 | 2C; | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | SVOA | Oracle_HH | 175635596 | | | N |
| 32.3 | 194 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | SVOA | Oracle_HH | 175635625 | | | N |
| 31.2 | 188 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | SVOA | Oracle_HH | 175635717 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | SVOA | Oracle_HH | 175635677 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | SVOA | Oracle_HH | 175635745 | | | N |
| 0.243 | 0.608 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635616 | | | N |

| Method Detection Limit | Reporting Limit | Result Comments | Result Flag | BEST_RESULT | BEST_RESULT_R | BEST_RESULT_N_FD | BEST_RESULT_METHOD | Laboratory Code | Field Filtered | Location Ground Surface Elevation | Location Established Date | Analytical Group | Result Origin Identifier | Result Sequence Number | Screening Level | Screening Level Source | Exceeds Screening Level |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.232 | 0.581 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635736 | | | N |
| 0.224 | 0.559 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635656 | | | N |
| 0.253 | 0.632 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635696 | | | N |
| 0.261 | 0.653 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635576 | | | N |
| 82 | 328 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635591 | | | N |
| 78.1 | 312 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635713 | | | N |
| 82 | 328 | 2C; | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635672 | | | N |
| 82 | 328 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635752 | | | N |
| 80.6 | 323 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635638 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635587 | | | N |
| 31.2 | 188 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635710 | | | N |
| 32.3 | 194 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635629 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635668 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635748 | | | N |
| 0.0608 | 0.304 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635606 | | | N |
| 0.0581 | 0.29 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635726 | | | N |
| 0.0559 | 0.279 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635646 | | | N |
| 0.0632 | 0.316 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635686 | | | N |
| 0.0653 | 0.326 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635566 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | SVOA | Oracle_HH | 175635583 | | | N |
| 31.2 | 188 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | SVOA | Oracle_HH | 175635703 | | | N |
| 32.3 | 194 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | SVOA | Oracle_HH | 175635623 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | SVOA | Oracle_HH | 175635676 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | SVOA | Oracle_HH | 175635743 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635585 | | | N |
| 31.2 | 188 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635706 | | | N |
| 32.3 | 194 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635626 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635665 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635747 | | | N |
| 0.015 | 0.0381 | | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635622 | | | N |
| 0.0122 | 0.033 | | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635742 | | | N |
| 0.0151 | 0.0383 | | | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635662 | | | N |
| 0.0135 | 0.0343 | | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635582 | | | N |
| 0.0162 | 0.0411 | | J | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635702 | | | N |
| 0.763 | 6.36 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635621 | | | N |
| 0.773 | 6.44 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635701 | | | N |
| 0.81 | 6.75 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635581 | | | N |
| 0.674 | 5.62 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635661 | | | N |
| 0.693 | 5.78 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635741 | | | N |
| 82 | 328 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635590 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635592 | | | N |
| 78.1 | 312 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635712 | | | N |
| 31.2 | 188 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635714 | | | N |
| 0.304 | 0.76 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635615 | | | N |
| 80.6 | 323 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635630 | | | N |
| 32.3 | 194 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635631 | | | N |
| 0.29 | 0.726 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635735 | | | N |
| 0.279 | 0.698 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635655 | | | N |
| 82 | 328 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635671 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635673 | | | N |
| 0.316 | 0.789 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635695 | | | N |
| 82 | 328 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635751 | | | N |
| 32.8 | 197 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | EXPLO | Oracle_HH | 175635753 | | | N |
| 0.326 | 0.816 | | U | Y | | Y | | ELABT | N | 999 | 01-Jan-50 | METAL | Oracle_HH | 175635575 | | | N |

CTO-014 UXO-22 March 2012 Sediment Validated RDE Table

| Sample ID<br>Sample Date | CLEAN MCB CamLej Background Undeveloped SS Combined Soil | Adjusted Industrial Soil RSLs (Nov 2011) | Adjusted Residential Soil RSLs (Nov 2011) | MR22-SD01-12A<br>3/19/12 | MR22-SD02-12A<br>3/19/12 | MR22-SD02D-12A<br>3/19/12 |
|---|---|---|---|---|---|---|
| **Chemical Name** | | | | | | |
| | | | | | | |
| **Explosives (MG/KG)** | | | | | | |
| 2-Nitrotoluene | -- | 13 | 2.9 | 0.174 U | 0.182 U | 0.37 |
| 4-Amino-2,6-dinitrotoluene | -- | 190 | 15 | 0.174 UJ | 0.182 U | 0.0988 J |
| Nitrobenzene | -- | 24 | 4.8 | 0.174 U | 0.182 U | 0.137 J |
| | | | | | | |
| **Total Metals (MG/KG)** | | | | | | |
| Aluminum | 12,800 | 99000 | 7700 | 3,500 | 5,950 | 6,080 |
| Antimony | 1.87 | 41 | 3.1 | 2.48 J | 1.71 J | 1.74 J |
| Arsenic | 1.17 | 1.6 | 0.39 | **10.3 J** | **5.15** | **4.75** |
| Barium | 36.7 | 19000 | 1500 | 42.9 | 93 | 90.7 |
| Beryllium | 0.195 | 200 | 16 | 0.142 J | 0.347 J | 0.35 J |
| Cadmium | 0.2 | 80 | 7 | 10 J | 3.5 J | 3.5 J |
| Calcium | 8,470 | -- | -- | 1,570 | 5,360 | 5,210 |
| Chromium | 17.4 | 5.6 | 0.29 | **14.1 J** | **10.2 J** | **10.4 J** |
| Cobalt | 0.414 | 30 | 2.3 | 1.99 | 2.24 | 2.22 J |
| Copper | 17.1 | 4100 | 310 | 421 | 61.5 | 62.4 |
| Iron | 7,210 | 72000 | 5500 | 11,900 | 7,940 | 6,410 |
| Lead | 27.5 | 800 | 400 | 594 | 95.9 | 95 |
| Magnesium | 904 | -- | -- | 144 J | 335 J | 346 J |
| Manganese | 37.0 | 2300 | 180 | **4,740** | 254 | 259 |
| Mercury | 0.161 | 31 | 2.3 | 19.8 J | 0.798 J | 0.881 J |
| Nickel | 3.11 | 2000 | 150 | 12 J | 7.69 | 7.66 |
| Potassium | 359 | -- | -- | 153 J | 413 J | 459 J |
| Selenium | 1.59 | 510 | 39 | 7.78 U | 1.36 | 1.45 J |
| Thallium | -- | 1 | 0.078 | **9.59 J** | 0.432 J | 0.837 U |
| Vanadium | 17.6 | 520 | 39 | 18.8 J | 12.6 | 12.8 |
| Zinc | 28.6 | 31000 | 2300 | 11,600 | 502 | 453 |
| | | | | | | |
| **Wet Chemistry (MG/KG)** | | | | | | |
| Total Organic Carbon (TOC) | -- | -- | -- | 45,200 N | 110,000 N | 111,000 N |
| | | | | | | |
| **Grain Size (PCT)** | | | | | | |
| COARSE SAND (%) | -- | -- | -- | 0.9 | 0.8 | 0.9 |
| FINE SAND (%) | -- | -- | -- | 81.5 | 79.1 | 68.1 |
| FINES (%) | -- | -- | -- | 11.2 | 16.8 | 27.9 |
| GRAVEL (%) | -- | -- | -- | 1.2 | 0.5 | 0.4 |
| MEDIUM SAND (%) | -- | -- | -- | 5.2 | 2.8 | 2.7 |
| SAND (%) | -- | -- | -- | 87.6 | 82.7 | 71.7 |

| Sample ID / Sample Date | CLEAN MCB CamLej Background Undeveloped SS Combined Soil | Adjusted Industrial Soil RSLs (Nov 2011) | Adjusted Residential Soil RSLs (Nov 2011) | MR22-SD01-12A 3/19/12 | MR22-SD02-12A 3/19/12 | MR22-SD02D-12A 3/19/12 |
|---|---|---|---|---|---|---|
| **Chemical Name** | | | | | | |
| | | | | | | |
| **Grain Size (PCT/P)** | | | | | | |
| GS03 SIEVE 3" (75 MM) | -- | -- | -- | 100 | 100 | 100 |
| GS05 SIEVE 2" (50 MM) | -- | -- | -- | 100 | 100 | 100 |
| GS06 SIEVE 1.5" (37.5 MM) | -- | -- | -- | 100 | 100 | 100 |
| GS07 SIEVE 1" (25.0 MM) | -- | -- | -- | 100 | 100 | 100 |
| GS08 SIEVE 0.75" (19.0 MM) | -- | -- | -- | 100 | 100 | 100 |
| GS10 SIEVE 0.375" (9.5 MM) | -- | -- | -- | 100 | 100 | 100 |
| SIEVE NO. 004 (4.75 MM) | -- | -- | -- | 98.8 | 99.5 | 99.6 |
| SIEVE NO. 010 (2.00 MM) | -- | -- | -- | 97.9 | 98.7 | 98.7 |
| SIEVE NO. 020 (850 UM) | -- | -- | -- | 96.5 | 97.8 | 97.7 |
| SIEVE NO. 040 (425 UM) | -- | -- | -- | 92.7 | 95.9 | 96 |
| SIEVE NO. 060 (250 UM) | -- | -- | -- | 78.3 | 86.6 | 88.2 |
| SIEVE NO. 080 (180 UM) | -- | -- | -- | 48.2 | 59.7 | 65.6 |
| SIEVE NO. 100 (150 UM) | -- | -- | -- | 26.1 | 35.6 | 45 |
| SIEVE NO. 200 (75 UM) | -- | -- | -- | 11.2 | 16.8 | 27.9 |

C:\Users\kmalley\Documents\Work\Graycochea_Kathleen\04_APRIL\April 8 - UXO-22 PA SI\Appendixes\Appendix D Raw Analytical Data\[CTO-014_UXO-22_March_SD_RDE Table_withBTVs.xls], Bianca Kleist, 04/17/2012

**Notes:**

**Bold text indicates exceedance of Adjusted Industrial Soil RSLs**

Underline indicates exceedance of Adjusted Residential Soil RSLs

J - Analyte present. Value may or may not be accurate or precise

MG/KG - Milligrams per kilogram

N - The MS/MSD accuracy and/or precision are outside criteria. The predigested spike recovery is not within control limits for the associated parameter

PCT - Percent

PCT/P - Percent Passed

U - The material was analyzed for, but not detected

UG/KG - Micrograms per kilogram

UJ - Analyte not detected, quantitation limit may be inaccurate

Shading indicates exceedance of CamLej Background Undeveloped SB Combined Soil

# CTO-014 UXO-22 March 2012 Sediment Validated RDE Table

| Sample ID | MR22-SD01-12A | MR22-SD02-12A | MR22-SD02D-12A |
|---|---|---|---|
| **Sample Date** | 3/19/12 | 3/19/12 | 3/19/12 |
| **Chemical Name** | | | |
| | | | |
| **Explosives (MG/KG)** | | | |
| 2-Nitrotoluene | 0.174 U | 0.182 U | 0.37 |
| 4-Amino-2,6-dinitrotoluene | 0.174 UJ | 0.182 U | 0.0988 J |
| Nitrobenzene | 0.174 U | 0.182 U | 0.137 J |
| | | | |
| **Total Metals (MG/KG)** | | | |
| Aluminum | 3,500 | 5,950 | 6,080 |
| Antimony | 2.48 J | 1.71 J | 1.74 J |
| Arsenic | 10.3 J | 5.15 | 4.75 |
| Barium | 42.9 | 93 | 90.7 |
| Beryllium | 0.142 J | 0.347 J | 0.35 J |
| Cadmium | 10 J | 3.5 J | 3.5 J |
| Calcium | 1,570 | 5,360 | 5,210 |
| Chromium | 14.1 J | 10.2 J | 10.4 J |
| Cobalt | 1.99 | 2.24 | 2.22 J |
| Copper | 421 | 61.5 | 62.4 |
| Iron | 11,900 | 7,940 | 6,410 |
| Lead | 594 | 95.9 | 95 |
| Magnesium | 144 J | 335 J | 346 J |
| Manganese | 4,740 | 254 | 259 |
| Mercury | 19.8 J | 0.798 J | 0.881 J |
| Nickel | 12 J | 7.69 | 7.66 |
| Potassium | 153 J | 413 J | 459 J |
| Selenium | 7.78 U | 1.36 | 1.45 J |
| Thallium | 9.59 J | 0.432 J | 0.837 U |
| Vanadium | 18.8 J | 12.6 | 12.8 |
| Zinc | 11,600 | 502 | 453 |
| | | | |
| **Wet Chemistry (MG/KG)** | | | |
| Total Organic Carbon (TOC) | 45,200 N | 110,000 N | 111,000 N |
| | | | |
| **Grain Size (PCT)** | | | |
| COARSE SAND (%) | 0.9 | 0.8 | 0.9 |
| FINE SAND (%) | 81.5 | 79.1 | 68.1 |
| FINES (%) | 11.2 | 16.8 | 27.9 |
| GRAVEL (%) | 1.2 | 0.5 | 0.4 |
| MEDIUM SAND (%) | 5.2 | 2.8 | 2.7 |
| SAND (%) | 87.6 | 82.7 | 71.7 |
| **Grain Size (PCT/P)** | | | |
| GS03 SIEVE 3" (75 MM) | 100 | 100 | 100 |
| GS05 SIEVE 2" (50 MM) | 100 | 100 | 100 |
| GS06 SIEVE 1.5" (37.5 MM) | 100 | 100 | 100 |
| GS07 SIEVE 1" (25.0 MM) | 100 | 100 | 100 |
| GS08 SIEVE 0.75" (19.0 MM) | 100 | 100 | 100 |
| GS10 SIEVE 0.375" (9.5 MM) | 100 | 100 | 100 |
| SIEVE NO. 004 (4.75 MM) | 98.8 | 99.5 | 99.6 |
| SIEVE NO. 010 (2.00 MM) | 97.9 | 98.7 | 98.7 |
| SIEVE NO. 020 (850 UM) | 96.5 | 97.8 | 97.7 |
| SIEVE NO. 040 (425 UM) | 92.7 | 95.9 | 96 |

| **Sample ID** | MR22-SD01-12A | MR22-SD02-12A | MR22-SD02D-12A |
|---|---|---|---|
| **Sample Date** | 3/19/12 | 3/19/12 | 3/19/12 |
| **Chemical Name** | | | |
| | | | |
| SIEVE NO. 060 (250 UM) | 78.3 | 86.6 | 88.2 |
| SIEVE NO. 080 (180 UM) | 48.2 | 59.7 | 65.6 |
| SIEVE NO. 100 (150 UM) | 26.1 | 35.6 | 45 |
| SIEVE NO. 200 (75 UM) | 11.2 | 16.8 | 27.9 |

**Notes:**

J - Analyte present.  Value may or may not be accurate or precise

MG/KG - Milligrams per kilogram

N - The MS/MSD accuracy and/or precision are outside criteria.
The predigested spike recovery is not within control limits for the associated parameter

PCT - Percent

PCT/P - Percent Passed

U - The material was analyzed for, but not detected

UG/KG - Micrograms per kilogram

UJ - Analyte not detected, quantitation limit may be inaccurate

Shading indicates detection

CTO-014 UXO-22 March 2012 Validated RDE Table

| **Sample ID** | MR22-SD01-12A | | MR22-SD02-12A | | MR22-SD02D-12A | |
|---|---|---|---|---|---|---|
| **Sample Date** | 3/19/12 | | 3/19/12 | | 3/19/12 | |
| **Chemical Name** | | | | | | |
| | | | | | | |
| **Explosives (MG/KG)** | | | | | | |
| 1,3,5-Trinitrobenzene | 0.174 | U | 0.182 | U | 0.167 | U |
| 1,3-Dinitrobenzene | 0.174 | U | 0.182 | U | 0.167 | U |
| 2,4,6-Trinitrotoluene | 0.174 | U | 0.182 | U | 0.167 | U |
| 2,4-Dinitrotoluene | 0.174 | U | 0.182 | U | 0.167 | U |
| 2,6-Dinitrotoluene | 0.174 | U | 0.182 | U | 0.167 | U |
| 2-Amino-4,6-dinitrotoluene | 0.174 | U | 0.182 | U | 0.167 | U |
| 2-Nitrotoluene | 0.174 | U | 0.182 | U | 0.37 | |
| 3-Nitrotoluene | 0.174 | U | 0.182 | U | 0.167 | U |
| 4-Amino-2,6-dinitrotoluene | 0.174 | UJ | 0.182 | U | 0.0988 | J |
| 4-Nitrotoluene | 0.174 | U | 0.182 | U | 0.167 | U |
| HMX | 0.174 | U | 0.182 | U | 0.167 | U |
| Nitrobenzene | 0.174 | U | 0.182 | U | 0.137 | J |
| Nitroglycerin | 0.435 | U | 0.455 | U | 0.417 | U |
| PETN | 0.435 | U | 0.455 | U | 0.417 | U |
| RDX | 0.174 | U | 0.182 | U | 0.167 | U |
| Tetryl | 0.174 | U | 0.182 | UJ | 0.167 | UJ |
| **Explosives (UG/KG)** | | | | | | |
| Perchlorate | 15.2 | U | 13.8 | U | 21 | U |
| | | | | | | |
| **Total Metals (MG/KG)** | | | | | | |
| Aluminum | 3,500 | | 5,950 | | 6,080 | |
| Antimony | 2.48 | J | 1.71 | J | 1.74 | J |
| Arsenic | 10.3 | J | 5.15 | | 4.75 | |
| Barium | 42.9 | | 93 | | 90.7 | |
| Beryllium | 0.142 | J | 0.347 | J | 0.35 | J |
| Cadmium | 10 | J | 3.5 | J | 3.5 | J |
| Calcium | 1,570 | | 5,360 | | 5,210 | |
| Chromium | 14.1 | J | 10.2 | J | 10.4 | J |
| Cobalt | 1.99 | | 2.24 | | 2.22 | J |
| Copper | 421 | | 61.5 | | 62.4 | |
| Iron | 11,900 | | 7,940 | | 6,410 | |
| Lead | 594 | | 95.9 | | 95 | |
| Magnesium | 144 | J | 335 | J | 346 | J |
| Manganese | 4,740 | | 254 | | 259 | |
| Mercury | 19.8 | J | 0.798 | J | 0.881 | J |
| Nickel | 12 | J | 7.69 | | 7.66 | |
| Potassium | 153 | J | 413 | J | 459 | J |
| Selenium | 7.78 | U | 1.36 | | 1.45 | J |
| Silver | 3.11 | U | 0.266 | U | 0.418 | U |
| Sodium | 233 | U | 399 | U | 627 | U |
| Thallium | 9.59 | J | 0.432 | J | 0.837 | U |
| Vanadium | 18.8 | J | 12.6 | | 12.8 | |
| Zinc | 11,600 | | 502 | | 453 | |
| | | | | | | |
| **Wet Chemistry (MG/KG)** | | | | | | |
| Total Organic Carbon (TOC) | 45,200 | N | 110,000 | N | 111,000 | N |
| | | | | | | |
| **Grain Size (PCT)** | | | | | | |
| COARSE SAND (%) | 0.9 | | 0.8 | | 0.9 | |
| FINE SAND (%) | 81.5 | | 79.1 | | 68.1 | |
| FINES (%) | 11.2 | | 16.8 | | 27.9 | |
| GRAVEL (%) | 1.2 | | 0.5 | | 0.4 | |

CTO-014 UXO-22 March 2012 Validated RDE Table

| **Sample ID** | MR22-SD01-12A | MR22-SD02-12A | MR22-SD02D-12A |
|---|---|---|---|
| **Sample Date** | 3/19/12 | 3/19/12 | 3/19/12 |
| **Chemical Name** | | | |
| | | | |
| MEDIUM SAND (%) | 5.2 | 2.8 | 2.7 |
| SAND (%) | 87.6 | 82.7 | 71.7 |
| **Grain Size (PCT/P)** | | | |
| GS03 SIEVE 3" (75 MM) | 100 | 100 | 100 |
| GS05 SIEVE 2" (50 MM) | 100 | 100 | 100 |
| GS06 SIEVE 1.5" (37.5 MM) | 100 | 100 | 100 |
| GS07 SIEVE 1" (25.0 MM) | 100 | 100 | 100 |
| GS08 SIEVE 0.75" (19.0 MM) | 100 | 100 | 100 |
| GS10 SIEVE 0.375" (9.5 MM) | 100 | 100 | 100 |
| SIEVE NO. 004 (4.75 MM) | 98.8 | 99.5 | 99.6 |
| SIEVE NO. 010 (2.00 MM) | 97.9 | 98.7 | 98.7 |
| SIEVE NO. 020 (850 UM) | 96.5 | 97.8 | 97.7 |
| SIEVE NO. 040 (425 UM) | 92.7 | 95.9 | 96 |
| SIEVE NO. 060 (250 UM) | 78.3 | 86.6 | 88.2 |
| SIEVE NO. 080 (180 UM) | 48.2 | 59.7 | 65.6 |
| SIEVE NO. 100 (150 UM) | 26.1 | 35.6 | 45 |
| SIEVE NO. 200 (75 UM) | 11.2 | 16.8 | 27.9 |

**Notes:**

J - Analyte present. Value may or may not be accurate or precise

MG/KG - Milligrams per kilogram

N - The MS/MSD accuracy and/or precision are outside criteria. The predigested spike recovery is not within control limits for the associated parameter

PCT - Percent

PCT/P - Percent Passed

U - The material was analyzed for, but not detected

UG/KG - Micrograms per kilogram

UJ - Analyte not detected, quantitation limit may be inaccurate

CTO-14
Camp Lejeune - UXO-22
Validated Groundwater Raw Analytical Results
December 2011 and February 2012

| **Station ID** | IR06-GW26 | IR06-GW31 | IR06-MW03 | | MR22-MW01 | | MR22-MW02 | MR22-MW03 |
|---|---|---|---|---|---|---|---|---|
| **Sample ID** | IR06-GW26-11D | IR06-GW31-11D | IR06-GW03-11D | IR06-GW03D-11D | MR22-MW01-12A | MR22-MW01D-12A | MR22-GW02-11D | MR22-GW03-11D |
| **Sample Date** | 12/12/11 | 12/16/11 | 12/16/11 | 12/16/11 | 02/07/12 | 02/07/12 | 12/19/11 | 12/14/11 |
| **Chemical Name** | | | | | | | | |
| | | | | | | | | |
| **Explosives (µg/l)** | | | | | | | | |
| 1,3,5-Trinitrobenzene | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.157 UJ | 0.16 UJ | 0.16 U | 0.583 J |
| 1,3-Dinitrobenzene | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.157 U | 0.16 U | 0.16 U | 0.157 U |
| 2,4,6-Trinitrotoluene | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.157 U | 0.16 U | 0.16 U | 0.157 U |
| 2,4-Dinitrotoluene | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.157 U | 0.16 U | 0.16 U | 0.157 U |
| 2,6-Dinitrotoluene | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.157 U | 0.16 U | 0.16 U | 0.157 U |
| 2-Amino-4,6-dinitrotoluene | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.339 U | 0.245 U | 0.16 U | 0.157 U |
| 2-Nitrotoluene | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.157 U | 0.16 U | 0.16 U | 0.157 U |
| 3-Nitrotoluene | 0.35 U | 0.157 U | 0.16 U | 0.154 U | 0.372 J | 0.421 J | 0.16 U | 0.551 U |
| 4-Amino-2,6-dinitrotoluene | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.157 U | 0.16 U | 0.16 U | 0.157 U |
| 4-Nitrotoluene | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.157 U | 0.16 U | 0.16 U | 0.157 U |
| HMX | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.157 U | 0.16 U | 0.16 U | 0.157 U |
| Nitrobenzene | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.306 J | 0.304 J | 0.16 U | 0.157 U |
| Nitroglycerin | 0.377 U | 0.392 U | 0.4 U | 0.385 U | 0.392 U | 0.4 U | 0.4 U | 0.392 U |
| Perchlorate | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 0.554 J | 1 U |
| PETN | 0.377 U | 0.392 U | 0.4 U | 0.385 U | 0.392 U | 0.4 U | 0.4 U | 0.392 U |
| RDX | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.157 U | 0.16 U | 0.16 U | 0.157 U |
| Tetryl | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.157 U | 0.16 U | 0.16 U | 0.157 U |
| | | | | | | | | |
| **Total Metals (µg/l)** | | | | | | | | |
| Aluminum | 141 | 31.8 J | 87.8 | 84.2 | 35.1 J | 40.2 J | 73.5 | 142 |
| Antimony | 5.3 | 2 U | 2.55 | 2.6 | 2 U | 2 U | 15.1 | 2 U |
| Arsenic | 1.5 U | 1.5 U | 1.5 U | 1.5 U | 1.5 U | 1.5 U | 1.5 U | 1.5 U |
| Barium | 28.8 | 48.3 | 37.2 | 36.8 | 23.6 | 23.1 | 26.9 | 26.1 |
| Beryllium | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| Cadmium | 0.282 J | 0.5 U | 6.06 | 6.08 | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| Calcium | 60,800 | 72,800 | 41,300 | 40,100 | 31,200 | 30,000 | 49,500 | 43,100 |
| Chromium | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 0.546 J |
| Cobalt | 2.5 U | 2.5 U | 2.5 U | 2.5 U | 2.5 U | 2.5 U | 2.5 U | 2.5 U |
| Copper | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U |
| Iron | 604 | 750 | 41.6 | 41.2 | 127 | 127 | 51 | 405 |
| Lead | 0.75 U | 0.75 U | 0.75 U | 0.75 U | 0.75 U | 0.75 U | 0.75 U | 0.75 U |
| Magnesium | 2,210 | 2,530 | 2,310 | 2,270 | 5,190 J | 4,920 J | 2,710 | 1,340 |
| Manganese | 2.18 J | 17.1 | 3.95 | 4.01 | 24.7 | 24.4 | 26.9 | 198 |
| Mercury | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U |
| Nickel | 1.5 U | 1.5 U | 1.5 U | 1.5 U | 0.895 J | 0.892 J | 1.5 U | 0.93 J |
| Potassium | 420 J | 2,810 | 3,280 | 3,240 | 1,080 J | 1,050 J | 2,080 | 510 J |
| Selenium | 1.57 J | 3.27 | 3.73 | 3.6 | 1.25 U | 1.25 U | 2.35 J | 1.25 U |
| Silver | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| Sodium | 3,210 | 3,470 | 4,700 | 4,640 | 4,340 J | 4,120 J | 3,060 | 4,840 |
| Thallium | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Vanadium | 7.49 | 2.5 U | 2.5 U | 2.5 U | 2.5 U | 2.5 U | 2.5 U | 1.6 J |
| Zinc | 225 | 1.88 J | 164 | 163 | 1.73 J | 1.82 J | 2.5 U | 2.5 U |
| | | | | | | | | |
| **Dissolved Metals (µg/l)** | | | | | | | | |
| Aluminum, Dissolved | NA | NA | 34.7 J | 35.7 J | 23.9 J | 24.7 J | NA | NA |
| Antimony, Dissolved | NA | NA | 2.65 | 2.5 J | 2 U | 2 U | NA | NA |
| Arsenic, Dissolved | NA | NA | 1.5 U | 1.5 U | 1.5 U | 1.5 U | NA | NA |
| Barium, Dissolved | NA | NA | 35.6 | 35.8 | 22.2 | 24.9 | NA | NA |
| Beryllium, Dissolved | NA | NA | 0.5 U | 0.5 U | 0.5 U | 0.5 U | NA | NA |
| Cadmium, Dissolved | NA | NA | 5.86 | 5.81 | 0.5 U | 0.5 U | NA | NA |
| Calcium, Dissolved | NA | NA | 39,200 | 39,400 | 29,600 | 34,100 | NA | NA |
| Chromium, Dissolved | NA | NA | 1 U | 1 U | 1 U | 1 U | NA | NA |
| Cobalt, Dissolved | NA | NA | 2.5 U | 2.5 U | 2.5 U | 2.5 U | NA | NA |
| Copper, Dissolved | NA | NA | 2 U | 2.07 J | 2 U | 2 U | NA | NA |
| Iron, Dissolved | NA | NA | 13.6 J | 17.4 J | 136 | 133 | NA | NA |
| Lead, Dissolved | NA | NA | 0.75 U | 0.75 U | 0.75 U | 0.75 U | NA | NA |
| Magnesium, Dissolved | NA | NA | 2,200 | 2,210 | 4,930 J | 5,560 J | NA | NA |
| Manganese, Dissolved | NA | NA | 3.91 | 4.35 | 23.3 | 27 | NA | NA |
| Mercury, Dissolved | NA | NA | 0.2 U | 0.2 U | 0.2 U | 0.2 U | NA | NA |

CTO-14
Camp Lejeune - UXO-22
Validated Groundwater Raw Analytical Results
December 2011 and February 2012

| **Station ID** | IR06-GW26 | IR06-GW31 | IR06-MW03 | | MR22-MW01 | | MR22-MW02 | MR22-MW03 |
|---|---|---|---|---|---|---|---|---|
| **Sample ID** | IR06-GW26-11D | IR06-GW31-11D | IR06-GW03-11D | IR06-GW03D-11D | MR22-MW01-12A | MR22-MW01D-12A | MR22-GW02-11D | MR22-GW03-11D |
| **Sample Date** | 12/12/11 | 12/16/11 | 12/16/11 | 12/16/11 | 02/07/12 | 02/07/12 | 12/19/11 | 12/14/11 |
| **Chemical Name** | | | | | | | | |
| Nickel, Dissolved | NA | NA | 1.5 U | 1.45 J | 0.977 J | 0.931 J | NA | NA |
| Potassium, Dissolved | NA | NA | 3,140 | 3,170 | 1,040 J | 1,180 J | NA | NA |
| Selenium, Dissolved | NA | NA | 3.61 | 3.34 | 1.25 U | 1.25 U | NA | NA |
| Silver, Dissolved | NA | NA | 0.5 U | 0.5 U | 0.5 U | 0.5 U | NA | NA |
| Sodium, Dissolved | NA | NA | 4,450 | 4,440 | 4,090 J | 4,550 J | NA | NA |
| Thallium, Dissolved | NA | NA | 1 U | 1 U | 1 U | 1 U | NA | NA |
| Vanadium, Dissolved | NA | NA | 2.5 U | 2.5 U | 2.5 U | 2.5 U | NA | NA |
| Zinc, Dissolved | NA | NA | 159 | 160 | 2.5 U | 2.5 U | NA | NA |
| | | | | | | | | |
| **Wet Chemistry (mg/l)** | | | | | | | | |
| Hardness | NA | 188 | 99 | 104 | NA | NA | 129 | NA |

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**Notes:**

Shading indicates detections
NA - Not analyzed
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
mg/l - Milligrams per liter
µg/l - Micrograms per liter

CTO-14
Camp Lejeune - UXO-22
Validated Groundwater Detected Analytical Results
December 2011 and February 2012

| Station ID | IR06-GW26 | IR06-GW31 | IR06-MW03 | | MR22-MW01 | | MR22-MW02 | MR22-MW03 |
|---|---|---|---|---|---|---|---|---|
| Sample ID | IR06-GW26-11D | IR06-GW31-11D | IR06-GW03-11D | IR06-GW03D-11D | MR22-MW01-12A | MR22-MW01D-12A | MR22-GW02-11D | MR22-GW03-11D |
| Sample Date | 12/12/11 | 12/16/11 | 12/16/11 | 12/16/11 | 02/07/12 | 02/07/12 | 12/19/11 | 12/14/11 |
| **Chemical Name** | | | | | | | | |
| **Explosives (µg/l)** | | | | | | | | |
| 1,3,5-Trinitrobenzene | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.157 UJ | 0.16 UJ | 0.16 U | 0.583 J |
| 3-Nitrotoluene | 0.35 U | 0.157 U | 0.16 U | 0.154 U | 0.372 J | 0.421 J | 0.16 U | 0.551 U |
| Nitrobenzene | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.306 J | 0.304 J | 0.16 U | 0.157 U |
| Perchlorate | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 0.554 J | 1 U |
| **Total Metals (µg/l)** | | | | | | | | |
| Aluminum | 141 | 31.8 J | 87.8 | 84.2 | 35.1 J | 40.2 J | 73.5 | 142 |
| Antimony | 5.3 | 2 U | 2.55 | 2.6 | 2 U | 2 U | 15.1 | 2 U |
| Barium | 28.8 | 48.3 | 37.2 | 36.8 | 23.6 | 23.1 | 26.9 | 26.1 |
| Cadmium | 0.282 J | 0.5 U | 6.06 | 6.08 | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| Calcium | 60,800 | 72,800 | 41,300 | 40,100 | 31,200 | 30,000 | 49,500 | 43,100 |
| Chromium | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 0.546 J |
| Iron | 604 | 750 | 41.6 | 41.2 | 127 | 127 | 51 | 405 |
| Magnesium | 2,210 | 2,530 | 2,310 | 2,270 | 5,190 J | 4,920 J | 2,710 | 1,340 |
| Manganese | 2.18 J | 17.1 | 3.95 | 4.01 | 24.7 | 24.4 | 26.9 | 198 |
| Nickel | 1.5 U | 1.5 U | 1.5 U | 1.5 U | 0.895 J | 0.892 J | 1.5 U | 0.93 J |
| Potassium | 420 J | 2,810 | 3,280 | 3,240 | 1,080 J | 1,050 J | 2,080 | 510 J |
| Selenium | 1.57 J | 3.27 | 3.73 | 3.6 | 1.25 U | 1.25 U | 2.35 J | 1.25 U |
| Sodium | 3,210 | 3,470 | 4,700 | 4,640 | 4,340 J | 4,120 J | 3,060 | 4,840 |
| Vanadium | 7.49 | 2.5 U | 2.5 U | 2.5 U | 2.5 U | 2.5 U | 2.5 U | 1.6 J |
| Zinc | 225 | 1.88 J | 164 | 163 | 1.73 J | 1.82 J | 2.5 U | 2.5 U |
| **Dissolved Metals (µg/l)** | | | | | | | | |
| Aluminum, Dissolved | NA | NA | 34.7 J | 35.7 J | 23.9 J | 24.7 J | NA | NA |
| Antimony, Dissolved | NA | NA | 2.65 | 2.5 J | 2 U | 2 U | NA | NA |
| Barium, Dissolved | NA | NA | 35.6 | 35.8 | 22.2 | 24.9 | NA | NA |
| Cadmium, Dissolved | NA | NA | 5.86 | 5.81 | 0.5 U | 0.5 U | NA | NA |
| Calcium, Dissolved | NA | NA | 39,200 | 39,400 | 29,600 | 34,100 | NA | NA |
| Copper, Dissolved | NA | NA | 2 U | 2.07 J | 2 U | 2 U | NA | NA |
| Iron, Dissolved | NA | NA | 13.6 J | 17.4 J | 136 | 133 | NA | NA |
| Magnesium, Dissolved | NA | NA | 2,200 | 2,210 | 4,930 J | 5,560 J | NA | NA |
| Manganese, Dissolved | NA | NA | 3.91 | 4.35 | 23.3 | 27 | NA | NA |
| Nickel, Dissolved | NA | NA | 1.5 U | 1.45 J | 0.977 J | 0.931 J | NA | NA |
| Potassium, Dissolved | NA | NA | 3,140 | 3,170 | 1,040 J | 1,180 J | NA | NA |
| Selenium, Dissolved | NA | NA | 3.61 | 3.34 | 1.25 U | 1.25 U | NA | NA |
| Sodium, Dissolved | NA | NA | 4,450 | 4,440 | 4,090 J | 4,550 J | NA | NA |
| Zinc, Dissolved | NA | NA | 159 | 160 | 2.5 U | 2.5 U | NA | NA |
| **Wet Chemistry (mg/l)** | | | | | | | | |
| Hardness | NA | 188 | 99 | 104 | NA | NA | 129 | NA |

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**Notes:**

Shading indicates detections
NA - Not analyzed
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
mg/l - Milligrams per liter
µg/l - Micrograms per liter

CTO-14
Camp Lejeune - UXO-22
Validated Groundwater Exceedance Analytical Results
December 2011 and February 2012

| Station ID | CLEAN MCB CamLej Background GW 2X Mean (1107) | NC2LGW (January, 2010) * | CLEAN RSLs Tapwater Adjusted 1111 | IR06-GW26 | IR06-GW31 | IR06-MW03 | | MR22-MW01 | | MR22-MW02 | MR22-MW03 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | | | | IR06-GW26-11D | IR06-GW31-11D | IR06-GW03-11D | IR06-GW03D-11D | MR22-MW01-12A | MR22-MW01D-12A | MR22-GW02-11D | MR22-GW03-11D |
| Sample Date | | | | 12/12/11 | 12/16/11 | 12/16/11 | 12/16/11 | 02/07/12 | 02/07/12 | 12/19/11 | 12/14/11 |
| Chemical Name | | | | | | | | | | | |
| **Explosives (µg/l)** | | | | | | | | | | | |
| 1,3,5-Trinitrobenzene | -- | -- | 46 | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.157 UJ | 0.16 UJ | 0.16 U | 0.583 J |
| 3-Nitrotoluene | -- | -- | 0.13 | 0.35 U | 0.157 U | 0.16 U | 0.154 U | **0.372 J** | **0.421 J** | 0.16 U | 0.551 U |
| Nitrobenzene | -- | -- | 0.12 | 0.151 U | 0.157 U | 0.16 U | 0.154 U | **0.306 J** | **0.304 J** | 0.16 U | 0.157 U |
| Perchlorate | -- | 2 | 1.1 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 0.554 J | 1 U |
| **Total Metals (µg/l)** | | | | | | | | | | | |
| Aluminum | 1,886 | -- | 1,600 | 141 | 31.8 J | 87.8 | 84.2 | 35.1 J | 40.2 J | 73.5 | 142 |
| Antimony | 3.28 | 1 | 0.6 | **5.3** | 2 U | **2.55** | **2.6** | 2 U | 2 U | **15.1** | 2 U |
| Barium | 86.2 | 700 | 290 | 28.8 | 48.3 | 37.2 | 36.8 | 23.6 | 23.1 | 26.9 | 26.1 |
| Cadmium | 0.358 | 2 | 0.69 | 0.282 J | 0.5 U | **6.06** | **6.08** | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| Calcium | 69,078 | -- | -- | 60,800 | 72,800 | 41,300 | 40,100 | 31,200 | 30,000 | 49,500 | 43,100 |
| Chromium | 3.13 | 10 | 0.031 | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | **0.546 J** |
| Iron | 5,999 | 300 | 1,100 | 604 | 750 | 41.6 | 41.2 | 127 | 127 | 51 | 405 |
| Magnesium | 6,363 | -- | -- | 2,210 | 2,530 | 2,310 | 2,270 | 5,190 J | 4,920 J | 2,710 | 1,340 |
| Manganese | 214 | 50 | 32 | 2.18 J | 17.1 | 3.95 | 4.01 | 24.7 | 24.4 | 26.9 | **198** |
| Nickel | 7.97 | 100 | 30 | 1.5 U | 1.5 U | 1.5 U | 1.5 U | 0.895 J | 0.892 J | 1.5 U | 0.93 J |
| Potassium | 3,277 | -- | -- | 420 J | 2,810 | 3,280 | 3,240 | 1,080 J | 1,050 J | 2,080 | 510 J |
| Selenium | 3.14 | 20 | 7.8 | 1.57 J | 3.27 | 3.73 | 3.6 | 1.25 U | 1.25 U | 2.35 J | 1.25 U |
| Sodium | 22,508 | -- | -- | 3,210 | 3,470 | 4,700 | 4,640 | 4,340 J | 4,120 J | 3,060 | 4,840 |
| Vanadium | 4.72 | 0.3 | 7.8 | 7.49 | 2.5 U | 2.5 U | 2.5 U | 2.5 U | 2.5 U | 2.5 U | 1.6 J |
| Zinc | 42.1 | 1,000 | 470 | 225 | 1.88 J | 164 | 163 | 1.73 J | 1.82 J | 2.5 U | 2.5 U |
| **Dissolved Metals (µg/l)** | | | | | | | | | | | |
| Aluminum, Dissolved | 1,886 | -- | 1,600 | NA | NA | 34.7 J | 35.7 J | 23.9 J | 24.7 J | NA | NA |
| Antimony, Dissolved | 3.28 | 1 | 0.6 | NA | NA | **2.65** | **2.5 J** | 2 U | 2 U | NA | NA |
| Barium, Dissolved | 86.2 | 700 | 290 | NA | NA | 35.6 | 35.8 | 22.2 | 24.9 | NA | NA |
| Cadmium, Dissolved | 0.358 | 2 | 0.69 | NA | NA | **5.86** | **5.81** | 0.5 U | 0.5 U | NA | NA |
| Calcium, Dissolved | 69,078 | -- | -- | NA | NA | 39,200 | 39,400 | 29,600 | 34,100 | NA | NA |
| Copper, Dissolved | 2.76 | 1,000 | 62 | NA | NA | 2 U | 2.07 J | 2 U | 2 U | NA | NA |
| Iron, Dissolved | 5,999 | 300 | 1,100 | NA | NA | 13.6 J | 17.4 J | 136 | 133 | NA | NA |
| Magnesium, Dissolved | 6,363 | -- | -- | NA | NA | 2,200 | 2,210 | 4,930 J | 5,560 J | NA | NA |
| Manganese, Dissolved | 214 | 50 | 32 | NA | NA | 3.91 | 4.35 | 23.3 | 27 | NA | NA |
| Nickel, Dissolved | 7.97 | 100 | 30 | NA | NA | 1.5 U | 1.45 J | 0.977 J | 0.931 J | NA | NA |
| Potassium, Dissolved | 3,277 | -- | -- | NA | NA | 3,140 | 3,170 | 1,040 J | 1,180 J | NA | NA |
| Selenium, Dissolved | 3.14 | 20 | 7.8 | NA | NA | 3.61 | 3.34 | 1.25 U | 1.25 U | NA | NA |
| Sodium, Dissolved | 22,508 | -- | -- | NA | NA | 4,450 | 4,440 | 4,090 J | 4,550 J | NA | NA |
| Zinc, Dissolved | 42.1 | 1,000 | 470 | NA | NA | 159 | 160 | 2.5 U | 2.5 U | NA | NA |
| **Wet Chemistry (mg/l)** | | | | | | | | | | | |
| Hardness | -- | -- | -- | NA | 188 | 99 | 104 | NA | NA | 129 | NA |

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**Notes:**

Shading indicates exceedance of two times the mean base background concentration for Groundwater

Bold box indicates exceedance of NCGWQS or the more conservative MCL

**Bold text indicates exceedance of Adjusted Tap Water RSLs**

RSLs were adjusted for noncarcinogens to account for exposure to multiple constituents

* - The MCL-Groundwater value is reported in place of the NC2LGW where the MCL value is more conservative.

NA - Not analyzed
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
mg/l - Milligrams per liter
µg/l - Micrograms per liter

CTO-14
Camp Lejeune - UXO-22
Validated Subsurface Soil Raw Analytical Results
December 2011 and February 2012

| Station ID | MR22-IS01 | MR22-IS02 | MR22-IS03 | | MR22-IS04 | MR22-IS05 | MR22-IS06 | MR22-IS07 | MR22-IS08 | MR22-IS09 | MR22-IS10 | MR22-MW01 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | MR22-IS01-3-5-11D | MR22-IS02-7-9-11D | MR22-IS03-5-7-11D | MR22-IS03D-5-7-11D | MR22-IS04-7-9-11D | MR22-IS05-13-15-11D | MR22-IS06-11-13-11D | MR22-IS07-7-9-11D | MR22-IS08-7-9-11D | MR22-IS09-5-7-11D | MR22-IS10-5-7-11D | MR22-IS11-17-19-12A | MR22-IS11-17-19-12ADUP |
| Sample Date | 12/16/11 | 12/16/11 | 12/16/11 | 12/16/11 | 12/16/11 | 12/16/11 | 12/16/11 | 12/16/11 | 12/16/11 | 12/12/11 | 12/12/11 | 02/06/12 | 02/06/12 |
| **Chemical Name** | | | | | | | | | | | | | |
| **Explosives (µg/kg)** | | | | | | | | | | | | | |
| 1,3,5-Trinitrobenzene | 200 U | 167 U | 182 U | 143 U | 154 U | 182 U | 174 U | 143 U | 138 U | 200 U | 200 U | 174 U | 174 U |
| 1,3-Dinitrobenzene | 200 U | 167 U | 182 U | 143 U | 154 U | 182 U | 174 U | 143 U | 138 U | 200 U | 200 U | 174 U | 174 U |
| 2,4,6-Trinitrotoluene | 200 U | 167 U | 182 U | 143 U | 154 U | 182 U | 174 U | 143 U | 138 U | 200 U | 200 U | 174 U | 174 U |
| 2,4-Dinitrotoluene | 200 U | 167 U | 182 U | 143 U | 154 U | 182 U | 174 U | 143 U | 138 U | 200 U | 200 U | 174 U | 174 U |
| 2,6-Dinitrotoluene | 200 U | 167 U | 182 U | 143 U | 154 U | 182 U | 174 U | 143 U | 138 U | 200 U | 200 U | 174 U | 174 U |
| 2-Amino-4,6-dinitrotoluene | 200 U | 167 U | 182 U | 143 U | 154 U | 182 U | 174 U | 143 U | 138 U | 200 U | 200 U | 174 U | 174 U |
| 2-Nitrotoluene | 200 U | 167 U | 182 U | 143 U | 154 U | 182 U | 174 U | 143 U | 138 U | 200 U | 200 U | 174 U | 174 U |
| 3-Nitrotoluene | 200 U | 167 U | 182 U | 143 U | 154 U | 182 U | 174 U | 143 U | 138 U | 200 U | 200 U | 174 U | 174 U |
| 4-Amino-2,6-dinitrotoluene | 200 U | 167 U | 182 U | 143 U | 154 U | 182 U | 174 U | 143 U | 138 U | 200 U | 200 U | 174 U | 174 U |
| 4-Nitrotoluene | 200 U | 167 U | 182 U | 143 U | 154 U | 182 U | 174 U | 143 U | 138 U | 200 U | 200 U | 174 U | 174 U |
| HMX | 200 U | 167 U | 182 U | 143 U | 154 U | 182 U | 174 U | 143 U | 138 U | 200 U | 200 U | 174 U | 174 U |
| Nitrobenzene | 200 U | 167 U | 182 U | 143 U | 154 U | 182 U | 174 U | 143 U | 138 U | 200 U | 200 U | 174 U | 174 U |
| Nitroglycerin | 500 U | 417 U | 455 U | 357 U | 385 U | 455 U | 435 U | 357 U | 345 U | 500 U | 500 U | 435 U | 435 U |
| Perchlorate | 12.5 U | 10.8 U | 11.5 U | 13 U | 11.5 U | 11.2 U | 11.6 U | 12.7 U | 12.8 U | 12.8 U | 12.1 U | 10.8 U | 14 U |
| PETN | 500 U | 417 U | 455 U | 357 U | 385 U | 455 U | 435 U | 357 U | 345 U | 500 U | 500 U | 435 U | 435 U |
| RDX | 200 U | 167 U | 182 U | 143 U | 154 U | 182 U | 174 U | 143 U | 138 U | 200 U | 200 U | 174 U | 174 U |
| Tetryl | 200 U | 167 U | 182 U | 143 U | 154 U | 182 U | 174 U | 143 U | 138 U | 200 U | 200 U | 174 U | 174 U |
| **Total Metals (mg/kg)** | | | | | | | | | | | | | |
| Aluminum | 3,090 | 3,020 | 5,270 | 8,640 | 4,350 | 3,970 | 1,820 | 4,330 | 7,850 | 9,100 | 2,150 | 8,890 J | 2,270 J |
| Antimony | 0.5 UJ | 0.422 UJ | 0.467 UJ | 0.35 J | 0.445 UJ | 0.45 UJ | 0.451 UJ | 1.26 J | 0.515 UJ | 0.49 U | 0.479 U | 0.422 R | 0.564 R |
| Arsenic | 2 | 1.67 | 1.11 | 1.86 | 0.399 J | 1.11 | 0.432 J | 0.284 J | 1.4 | 1.85 | 0.359 U | 7.55 J | 1.73 J |
| Barium | 4.37 | 3.83 | 11.2 | 21.9 | 6.55 | 7.78 | 2.71 | 7.51 | 10 | 8.46 | 2.15 J | 20.2 J | 5.86 J |
| Beryllium | 0.125 U | 0.106 U | 0.117 U | 0.0946 J | 0.111 U | 0.112 U | 0.113 U | 0.13 U | 0.129 U | 0.115 J | 0.12 U | 0.222 J | 0.141 U |
| Cadmium | 0.125 U | 0.106 U | 0.117 U | 0.135 J | 0.111 U | 0.112 U | 0.113 U | 0.13 U | 0.129 U | 0.122 U | 0.12 U | 0.106 U | 0.141 U |
| Calcium | 125 U | 106 U | 212 J | 729 J | 211 J | 287 | 138 J | 247 J | 242 J | 108 J | 120 U | 234 J | 141 U |
| Chromium | 4.78 J | 3.85 J | 5.79 J | 9.04 J | 4.32 J | 4.58 J | 2.19 J | 3.78 J | 8.65 J | 9.52 | 3.34 | 14.2 | 10.3 |
| Cobalt | 1.04 | 0.528 U | 0.353 J | 0.639 J | 0.315 J | 0.562 U | 0.564 U | 0.334 J | 0.644 U | 0.612 U | 0.598 U | 2.97 J | 0.651 J |
| Copper | 0.951 | 0.497 J | 1.18 J | 4.17 J | 0.964 | 0.704 | 0.414 J | 1.06 | 0.985 | 0.378 J | 0.784 | 3.62 | 1.71 |
| Iron | 2,400 | 2,600 | 3,260 | 4,960 | 832 | 1,800 | 638 | 782 | 2,890 | 3,610 J | 374 J | 10,900 J | 2,190 J |
| Lead | 3.08 | 1.81 | 3.65 J | 13.5 J | 1.85 | 2.81 | 1.5 | 3.71 | 4.56 | 3.99 | 1.27 | 7.7 | 3.2 |
| Magnesium | 129 J | 83.3 J | 175 J | 492 J | 146 J | 91.1 J | 169 U | 170 J | 172 J | 164 J | 180 U | 668 J | 119 J |
| Manganese | 12.1 | 1.34 | 138 | 260 | 2.39 | 0.953 | 0.976 | 3.33 | 2.32 | 2.11 | 1.63 | 80.2 J | 12.9 J |
| Mercury | 0.0364 U | 0.0355 U | 0.0335 U | 0.0346 J | 0.014 J | 0.0278 U | 0.0162 J | 0.035 U | 0.0334 U | 0.0452 U | 0.0315 U | 0.0281 U | 0.0347 U |
| Nickel | 1.83 | 0.609 | 1.14 | 2.26 | 1.39 | 0.441 J | 0.426 J | 1.52 | 1.5 | 1.3 | 1.02 | 5.69 J | 1.63 J |
| Potassium | 198 J | 105 J | 170 J | 232 J | 146 J | 129 J | 67.8 J | 175 J | 189 J | 220 J | 71 J | 664 J | 169 J |
| Selenium | 0.298 J | 0.224 J | 0.292 U | 0.24 J | 0.278 U | 0.281 U | 0.282 U | 0.325 U | 0.322 U | 0.409 J | 0.299 U | 0.168 J | 0.393 J |
| Silver | 0.125 U | 0.106 U | 0.117 U | 0.126 U | 0.111 U | 0.112 U | 0.113 U | 0.13 U | 0.129 U | 0.122 U | 0.12 U | 0.106 UJ | 0.141 U |
| Sodium | 188 U | 158 U | 175 U | 189 U | 167 U | 169 U | 169 U | 195 U | 193 U | 184 U | 180 U | 158 U | 211 U |
| Thallium | 0.25 U | 0.211 U | 0.234 U | 0.252 U | 0.222 U | 0.225 U | 0.226 U | 0.26 U | 0.258 U | 0.245 U | 0.239 U | 0.211 UJ | 0.282 U |
| Vanadium | 8.23 | 5.81 | 8.94 | 13.3 | 2.81 | 9.6 | 2.89 | 2.78 | 8.73 | 17.2 | 1.48 | 19.9 J | 6.24 J |
| Zinc | 3.56 | 1.1 U | 979 | 958 | 1.82 | 1.25 U | 0.865 U | 3.23 | 2.14 | 1.72 | 1.07 J | 21.9 J | 4.3 J |

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**Notes:**

Shading indicates detections
NA - Not analyzed
J - Analyte present, value may or may not be accurate or precise
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
mg/kg - Milligrams per kilogram
µg/kg - Micrograms per kilogram

CTO-14
Camp Lejeune - UXO-22
Validated Subsurface Soil Detected Analytical Results
December 2011 and February 2012

| **Station ID** | MR22-IS01 | MR22-IS02 | MR22-IS03 | | MR22-IS04 | MR22-IS05 | MR22-IS06 | MR22-IS07 | MR22-IS08 | MR22-IS09 | MR22-IS10 | MR22-MW01 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID** | MR22-IS01-3-5-11D | MR22-IS02-7-9-11D | MR22-IS03-5-7-11D | MR22-IS03D-5-7-11D | MR22-IS04-7-9-11D | MR22-IS05-13-15-11D | MR22-IS06-11-13-11D | MR22-IS07-7-9-11D | MR22-IS08-7-9-11D | MR22-IS09-5-7-11D | MR22-IS10-5-7-11D | MR22-IS11-17-19-12A | MR22-IS11-17-19-12ADUP |
| **Sample Date** | 12/16/11 | 12/16/11 | 12/16/11 | 12/16/11 | 12/16/11 | 12/16/11 | 12/16/11 | 12/16/11 | 12/16/11 | 12/12/11 | 12/12/11 | 02/06/12 | 02/06/12 |
| **Chemical Name** | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| **Explosives (µg/kg)** | | | | | | | | | | | | | |
| No Detections | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| **Total Metals (mg/kg)** | | | | | | | | | | | | | |
| Aluminum | 3,090 | 3,020 | 5,270 | 8,640 | 4,350 | 3,970 | 1,820 | 4,330 | 7,850 | 9,100 | 2,150 | 8,890 J | 2,270 J |
| Antimony | 0.5 UJ | 0.422 UJ | 0.467 UJ | 0.35 J | 0.445 UJ | 0.45 UJ | 0.451 UJ | 1.26 J | 0.515 UJ | 0.49 U | 0.479 U | 0.422 R | 0.564 R |
| Arsenic | 2 | 1.67 | 1.11 | 1.86 | 0.399 J | 1.11 | 0.432 J | 0.284 J | 1.4 | 1.85 | 0.359 U | 7.55 J | 1.73 J |
| Barium | 4.37 | 3.83 | 11.2 | 21.9 | 6.55 | 7.78 | 2.71 | 7.51 | 10 | 8.46 | 2.15 J | 20.2 J | 5.86 J |
| Beryllium | 0.125 U | 0.106 U | 0.117 U | 0.0946 J | 0.111 U | 0.112 U | 0.113 U | 0.13 U | 0.129 U | 0.115 J | 0.12 U | 0.222 J | 0.141 U |
| Cadmium | 0.125 U | 0.106 U | 0.117 U | 0.135 J | 0.111 U | 0.112 U | 0.113 U | 0.13 U | 0.129 U | 0.122 U | 0.12 U | 0.106 U | 0.141 U |
| Calcium | 125 U | 106 U | 212 J | 729 J | 211 J | 287 | 138 J | 247 J | 242 J | 108 J | 120 U | 234 J | 141 U |
| Chromium | 4.78 J | 3.85 J | 5.79 J | 9.04 J | 4.32 J | 4.58 J | 2.19 J | 3.78 J | 8.65 J | 9.52 | 3.34 | 14.2 | 10.3 |
| Cobalt | 1.04 | 0.528 U | 0.353 J | 0.639 J | 0.315 J | 0.562 U | 0.564 U | 0.334 J | 0.644 U | 0.612 U | 0.598 U | 2.97 J | 0.651 J |
| Copper | 0.951 | 0.497 J | 1.18 J | 4.17 J | 0.964 | 0.704 | 0.414 J | 1.06 | 0.985 | 0.378 J | 0.784 | 3.62 | 1.71 |
| Iron | 2,400 | 2,600 | 3,260 | 4,960 | 832 | 1,800 | 638 | 782 | 2,890 | 3,610 J | 374 J | 10,900 J | 2,190 J |
| Lead | 3.08 | 1.81 | 3.65 J | 13.5 J | 1.85 | 2.81 | 1.5 | 3.71 | 4.56 | 3.99 | 1.27 | 7.7 | 3.2 |
| Magnesium | 129 J | 83.3 J | 175 J | 492 J | 146 J | 91.1 J | 169 U | 170 J | 172 J | 164 J | 180 U | 668 J | 119 J |
| Manganese | 12.1 | 1.34 | 138 | 260 | 2.39 | 0.953 | 0.976 | 3.33 | 2.32 | 2.11 | 1.63 | 80.2 J | 12.9 J |
| Mercury | 0.0364 U | 0.0355 U | 0.0335 U | 0.0346 J | 0.014 J | 0.0278 U | 0.0162 J | 0.035 U | 0.0334 U | 0.0452 U | 0.0315 U | 0.0281 U | 0.0347 U |
| Nickel | 1.83 | 0.609 | 1.14 | 2.26 | 1.39 | 0.441 J | 0.426 J | 1.52 | 1.5 | 1.3 | 1.02 | 5.69 J | 1.63 J |
| Potassium | 198 J | 105 J | 170 J | 232 J | 146 J | 129 J | 67.8 J | 175 J | 189 J | 220 J | 71 J | 664 J | 169 J |
| Selenium | 0.298 J | 0.224 J | 0.292 U | 0.24 J | 0.278 U | 0.281 U | 0.282 U | 0.325 U | 0.322 U | 0.409 J | 0.299 U | 0.168 J | 0.393 J |
| Vanadium | 8.23 | 5.81 | 8.94 | 13.3 | 2.81 | 9.6 | 2.89 | 2.78 | 8.73 | 17.2 | 1.48 | 19.9 J | 6.24 J |
| Zinc | 3.56 | 1.1 U | 979 | 958 | 1.82 | 1.25 U | 0.865 U | 3.23 | 2.14 | 1.72 | 1.07 J | 21.9 J | 4.3 J |

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**Notes:**

Shading indicates detections
J - Analyte present, value may or may not be accurate or precise
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
mg/kg - Milligrams per kilogram
µg/kg - Micrograms per kilogram

CTO-14
Camp Lejeune - UXO-22
Validated Subsurface Soil Exceedance Analytical Results
December 2011 and February 2012

| Station ID | CLEAN MCB CamLej Background Undeveloped SB Combined Soil | CLEAN NCSSLs (June, 2011)* | Adjusted Industrial Soil RSLs | Adjusted Residential Soil RSLs | MR22-IS01 | MR22-IS02 | MR22-IS03 | | MR22-IS04 | MR22-IS05 | MR22-IS06 | MR22-IS07 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | | | | | MR22-IS01-3-5-11D | MR22-IS02-7-9-11D | MR22-IS03-5-7-11D | MR22-IS03D-5-7-11D | MR22-IS04-7-9-11D | MR22-IS05-13-15-11D | MR22-IS06-11-13-11D | MR22-IS07-7-9-11D |
| Sample Date | | | | | 12/16/11 | 12/16/11 | 12/16/11 | 12/16/11 | 12/16/11 | 12/16/11 | 12/16/11 | 12/16/11 |
| **Chemical Name** | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| **Explosives (µg/kg)** | | | | | | | | | | | | |
| No Detections | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| **Total Metals (mg/kg)** | | | | | | | | | | | | |
| Aluminum | 19,000 | -- | 99,000 | 7,700 | 3,090 | 3,020 | 5,270 | 8,640 | 4,350 | 3,970 | 1,820 | 4,330 |
| Antimony | 1.1 | 0.9 | 41 | 3.1 | 0.5 UJ | 0.422 UJ | 0.467 UJ | 0.35 J | 0.445 UJ | 0.45 UJ | 0.451 UJ | 1.26 J |
| Arsenic | 5.09 | 5.8 | 1.6 | 0.39 | **2** | **1.67** | 1.11 | **1.86** | 0.399 J | 1.11 | 0.432 J | 0.284 J |
| Barium | 28.3 | 580 | 19,000 | 1,500 | 4.37 | 3.83 | 11.2 | 21.9 | 6.55 | 7.78 | 2.71 | 7.51 |
| Beryllium | 0.332 | 63 | 200 | 16 | 0.125 U | 0.106 U | 0.117 U | 0.0946 J | 0.111 U | 0.112 U | 0.113 U | 0.13 U |
| Cadmium | 0.208 | 3 | 80 | 7 | 0.125 U | 0.106 U | 0.117 U | 0.135 J | 0.111 U | 0.112 U | 0.113 U | 0.13 U |
| Calcium | 1,530 | -- | -- | -- | 125 U | 106 U | 212 J | 729 J | 211 J | 287 | 138 J | 247 J |
| Chromium | 27.6 | 3.8 | 5.6 | 0.29 | 4.78 J | 3.85 J | **5.79 J** | **9.04 J** | 4.32 J | 4.58 J | 2.19 J | 3.78 J |
| Cobalt | 1.36 | 0.9 | 30 | 2.3 | 1.04 | 0.528 U | 0.353 J | 0.639 J | 0.315 J | 0.562 U | 0.564 U | 0.334 J |
| Copper | 6.05 | 700 | 4,100 | 310 | 0.951 | 0.497 J | 1.18 J | 4.17 J | 0.964 | 0.704 | 0.414 J | 1.06 |
| Iron | 12,700 | 150 | 72,000 | 5,500 | 2,400 | 2,600 | 3,260 | 4,960 | 832 | 1,800 | 638 | 782 |
| Lead | 11.2 | 270 | 800 | 400 | 3.08 | 1.81 | 3.65 J | 13.5 J | 1.85 | 2.81 | 1.5 | 3.71 |
| Magnesium | 776 | -- | -- | -- | 129 J | 83.3 J | 175 J | 492 J | 146 J | 91.1 J | 169 U | 170 J |
| Manganese | 18.3 | 65 | 2,300 | 180 | 12.1 | 1.34 | 138 | 260 | 2.39 | 0.953 | 0.976 | 3.33 |
| Mercury | 0.0852 | 1 | 31 | 2.3 | 0.0364 U | 0.0355 U | 0.0335 U | 0.0346 J | 0.014 J | 0.0278 U | 0.0162 J | 0.035 U |
| Nickel | 7.08 | 130 | 2,000 | 150 | 1.83 | 0.609 | 1.14 | 2.26 | 1.39 | 0.441 J | 0.426 J | 1.52 |
| Potassium | 620 | -- | -- | -- | 198 J | 105 J | 170 J | 232 J | 146 J | 129 J | 67.8 J | 175 J |
| Selenium | 0.736 | 2.1 | 510 | 39 | 0.298 J | 0.224 J | 0.292 U | 0.24 J | 0.278 U | 0.281 U | 0.282 U | 0.325 U |
| Vanadium | 35.6 | 6 | 520 | 39 | 8.23 | 5.81 | 8.94 | 13.3 | 2.81 | 9.6 | 2.89 | 2.78 |
| Zinc | 14.1 | 1,200 | 31,000 | 2,300 | 3.56 | 1.1 U | 979 | 958 | 1.82 | 1.25 U | 0.865 U | 3.23 |

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**Notes:**

Shading indicates exceedance of CamLej Background Undeveloped SB Combined Soi

Bold box indicates exceedance of NC SSL

**Bold text indicates exceedance of Adjusted Industrial Soil RSLs**

Underline indicates exceedance of Adjusted Residential Soil RSLs

RSLs were adjusted for noncarcinogens to account for exposure to multiple constituents

J - Analyte present, value may or may not be accurate or precise

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

mg/kg - Milligrams per kilogram

µg/kg - Micrograms per kilogram

CTO-14
Camp Lejeune - UXO-22
Validated Subsurface Soil Exceedance Analytical Results
December 2011 and February 2012

| Station ID | CLEAN MCB CamLej Background Undeveloped SB Combined Soil | CLEAN NCSSLs (June, 2011)* | Adjusted Industrial Soil RSLs | Adjusted Residential Soil RSLs | MR22-IS08 | MR22-IS09 | MR22-IS10 | MR22-MW01 | |
|---|---|---|---|---|---|---|---|---|---|
| Sample ID | | | | | MR22-IS08-7-9-11D | MR22-IS09-5-7-11D | MR22-IS10-5-7-11D | MR22-IS11-17-19-12A | MR22-IS11-17-19-12ADUP |
| Sample Date | | | | | 12/16/11 | 12/12/11 | 12/12/11 | 02/06/12 | 02/06/12 |
| **Chemical Name** | | | | | | | | | |
| | | | | | | | | | |
| **Explosives (µg/kg)** | | | | | | | | | |
| No Detections | | | | | | | | | |
| | | | | | | | | | |
| **Total Metals (mg/kg)** | | | | | | | | | |
| Aluminum | 19,000 | -- | 99,000 | 7,700 | 7,850 | 9,100 | 2,150 | 8,890 J | 2,270 J |
| Antimony | 1.1 | 0.9 | 41 | 3.1 | 0.515 UJ | 0.49 U | 0.479 U | 0.422 R | 0.564 R |
| Arsenic | 5.09 | 5.8 | 1.6 | 0.39 | 1.4 | **1.85** | 0.359 U | **7.55 J** | **1.73 J** |
| Barium | 28.3 | 580 | 19,000 | 1,500 | 10 | 8.46 | 2.15 J | 20.2 J | 5.86 J |
| Beryllium | 0.332 | 63 | 200 | 16 | 0.129 U | 0.115 J | 0.12 U | 0.222 J | 0.141 U |
| Cadmium | 0.208 | 3 | 80 | 7 | 0.129 U | 0.122 U | 0.12 U | 0.106 U | 0.141 U |
| Calcium | 1,530 | -- | -- | -- | 242 J | 108 J | 120 U | 234 J | 141 U |
| Chromium | 27.6 | 3.8 | 5.6 | 0.29 | **8.65 J** | **9.52** | 3.34 | **14.2** | **10.3** |
| Cobalt | 1.36 | 0.9 | 30 | 2.3 | 0.644 U | 0.612 U | 0.598 U | 2.97 J | 0.651 J |
| Copper | 6.05 | 700 | 4,100 | 310 | 0.985 | 0.378 J | 0.784 | 3.62 | 1.71 |
| Iron | 12,700 | 150 | 72,000 | 5,500 | 2,890 | 3,610 J | 374 J | 10,900 J | 2,190 J |
| Lead | 11.2 | 270 | 800 | 400 | 4.56 | 3.99 | 1.27 | 7.7 | 3.2 |
| Magnesium | 776 | -- | -- | -- | 172 J | 164 J | 180 U | 668 J | 119 J |
| Manganese | 18.3 | 65 | 2,300 | 180 | 2.32 | 2.11 | 1.63 | 80.2 J | 12.9 J |
| Mercury | 0.0852 | 1 | 31 | 2.3 | 0.0334 U | 0.0452 U | 0.0315 U | 0.0281 U | 0.0347 U |
| Nickel | 7.08 | 130 | 2,000 | 150 | 1.5 | 1.3 | 1.02 | 5.69 J | 1.63 J |
| Potassium | 620 | -- | -- | -- | 189 J | 220 J | 71 J | 664 J | 169 J |
| Selenium | 0.736 | 2.1 | 510 | 39 | 0.322 U | 0.409 J | 0.299 U | 0.168 J | 0.393 J |
| Vanadium | 35.6 | 6 | 520 | 39 | 8.73 | 17.2 | 1.48 | 19.9 J | 6.24 J |
| Zinc | 14.1 | 1,200 | 31,000 | 2,300 | 2.14 | 1.72 | 1.07 J | 21.9 J | 4.3 J |

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**Notes:**

Shading indicates exceedance of CamLej Background Undeveloped SB Combined Soi

Bold box indicates exceedance of NC SSL

**Bold text indicates exceedance of Adjusted Industrial Soil RSLs**

Underline indicates exceedance of Adjusted Residential Soil RSLs

RSLs were adjusted for noncarcinogens to account for exposure to multiple constituents

J - Analyte present, value may or may not be accurate or precise

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

mg/kg - Milligrams per kilogram

µg/kg - Micrograms per kilogram

CTO-108
Camp Lejeune - UXO-22
Validated Test Pit Raw Analytical Results
October 2010

| Station ID | UXO22-TP01 | | | | |
|---|---|---|---|---|---|
| Sample ID | UXO22-TP-S-NE | UXO22-TP-S-NE-D | UXO22-TP-S-NW | UXO22-TP-S-SE | UXO22-TP-S-SW |
| Sample Date | 10/07/10 | 10/07/10 | 10/07/10 | 10/07/10 | 10/07/10 |
| **Chemical Name** | | | | | |
| | | | | | |
| **Explosives (µg/kg)** | | | | | |
| 1,3,5-Trinitrobenzene | 96.8 U | 98.4 U | 98.4 U | 98.4 U | 93.8 U |
| 1,3-Dinitrobenzene | 96.8 U | 63 J | 35.5 J | 98.4 U | 93.8 U |
| 2,4,6-Trinitrotoluene | 159 J | 132 J | 98.4 U | 60.9 J | 46.4 J |
| 2,4-Dinitrotoluene | 96.8 U | 98.4 U | 34.6 J | 98.4 U | 93.8 U |
| 2,6-Dinitrotoluene | 96.8 U | 98.4 U | 45.7 J | 98.4 U | 93.8 U |
| 2-Amino-4,6-dinitrotoluene | 96.8 U | 98.4 U | 98.4 U | 98.4 U | 93.8 U |
| 2-Nitrotoluene | 96.8 U | 98.4 U | 98.4 U | 98.4 U | 93.8 U |
| 3-Nitrotoluene | 96.8 U | 98.4 U | 98.4 U | 98.4 U | 93.8 U |
| 4-Amino-2,6-dinitrotoluene | 96.8 U | 98.4 U | 98.4 U | 98.4 U | 93.8 U |
| 4-Nitrotoluene | 96.8 U | 98.4 U | 98.4 U | 98.4 U | 93.8 U |
| HMX | 73.2 J | 54.3 J | 98.4 U | 98.4 U | 93.8 U |
| Nitrobenzene | 96.8 U | 98.4 U | 98.4 U | 98.4 U | 93.8 U |
| Nitroglycerin | 161 U | 164 U | 164 U | 164 U | 156 U |
| Perchlorate | 2.54 U | 2.25 U | 2.7 U | 2.31 U | 2.58 U |
| PETN | 161 U | 123 J | 164 U | 164 U | 156 U |
| RDX | 67 J | 331 J | 98.4 U | 98.4 U | 277 J |
| Tetryl | 96.8 U | 98.4 U | 98.4 U | 98.4 U | 93.8 U |
| | | | | | |
| **Total Metals (mg/kg)** | | | | | |
| Aluminum | 1,570 | 1,670 | 3,330 | 1,480 | 2,340 |
| Antimony | 0.487 UJ | 0.447 UJ | 0.522 UJ | 0.465 UJ | 0.791 J |
| Arsenic | 0.365 U | 0.335 U | 0.256 J | 0.348 U | 0.379 U |
| Barium | 6.2 | 6.99 | 10 | 3.61 | 5.98 |
| Beryllium | 0.122 U | 0.112 U | 0.131 U | 0.116 U | 0.126 U |
| Cadmium | 1.1 | 1.81 | 0.759 | 0.29 U | 0.622 |
| Calcium | 581 | 466 | 1,140 | 125 J | 501 |
| Chromium | 2.36 | 2.52 | 11.4 | 2.05 | 2.99 |
| Cobalt | 0.608 U | 0.559 U | 0.653 U | 0.581 U | 0.632 U |
| Copper | 12.3 | 11.8 | 10.1 | 1.34 | 5.5 |
| Iron | 992 | 542 | 1,140 | 201 | 430 |
| Lead | 21.5 | 18.6 | 25.3 | 8.71 | 12.8 |
| Magnesium | 183 U | 168 U | 196 U | 174 U | 189 U |
| Manganese | 8.31 | 9.97 | 13.3 | 2.57 | 10.3 |
| Mercury | 0.0379 J | 0.0436 | 0.027 J | 0.0198 J | 0.0333 J |
| Nickel | 1.1 J | 1.14 | 1.47 | 0.527 J | 3.36 |
| Potassium | 183 U | 168 U | 196 U | 174 U | 189 U |
| Selenium | 0.338 J | 0.251 J | 0.381 J | 0.244 J | 0.347 J |
| Silver | 0.122 U | 0.112 U | 0.131 U | 0.116 U | 0.126 U |
| Sodium | 183 U | 168 U | 196 U | 174 U | 189 U |
| Thallium | 0.243 U | 0.224 U | 0.261 U | 0.232 U | 0.253 U |
| Vanadium | 1.41 | 1.44 | 2.47 | 1.29 | 1.74 |
| Zinc | 47 | 52.6 | 231 | 12 | 65.7 |

#REF!

**Notes:**

Shading indicates detections
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
mg/kg - Milligrams per kilogram
µg/kg - Micrograms per kilogram

CTO-108
Camp Lejeune - UXO-22
Validated Test Pit Detected Analytical Results
October 2010

| **Station ID** | UXO22-TP01 | | | | |
|---|---|---|---|---|---|
| **Sample ID** | UXO22-TP-S-NE | UXO22-TP-S-NE-D | UXO22-TP-S-NW | UXO22-TP-S-SE | UXO22-TP-S-SW |
| **Sample Date** | 10/07/10 | 10/07/10 | 10/07/10 | 10/07/10 | 10/07/10 |
| **Chemical Name** | | | | | |
| | | | | | |
| **Explosives (µg/kg)** | | | | | |
| 1,3-Dinitrobenzene | 96.8 U | 63 J | 35.5 J | 98.4 U | 93.8 U |
| 2,4,6-Trinitrotoluene | 159 J | 132 J | 98.4 U | 60.9 J | 46.4 J |
| 2,4-Dinitrotoluene | 96.8 U | 98.4 U | 34.6 J | 98.4 U | 93.8 U |
| 2,6-Dinitrotoluene | 96.8 U | 98.4 U | 45.7 J | 98.4 U | 93.8 U |
| HMX | 73.2 J | 54.3 J | 98.4 U | 98.4 U | 93.8 U |
| PETN | 161 U | 123 J | 164 U | 164 U | 156 U |
| RDX | 67 J | 331 J | 98.4 U | 98.4 U | 277 J |
| | | | | | |
| **Total Metals (mg/kg)** | | | | | |
| Aluminum | 1,570 | 1,670 | 3,330 | 1,480 | 2,340 |
| Antimony | 0.487 UJ | 0.447 UJ | 0.522 UJ | 0.465 UJ | 0.791 J |
| Arsenic | 0.365 U | 0.335 U | 0.256 J | 0.348 U | 0.379 U |
| Barium | 6.2 | 6.99 | 10 | 3.61 | 5.98 |
| Cadmium | 1.1 | 1.81 | 0.759 | 0.29 U | 0.622 |
| Calcium | 581 | 466 | 1,140 | 125 J | 501 |
| Chromium | 2.36 | 2.52 | 11.4 | 2.05 | 2.99 |
| Copper | 12.3 | 11.8 | 10.1 | 1.34 | 5.5 |
| Iron | 992 | 542 | 1,140 | 201 | 430 |
| Lead | 21.5 | 18.6 | 25.3 | 8.71 | 12.8 |
| Manganese | 8.31 | 9.97 | 13.3 | 2.57 | 10.3 |
| Mercury | 0.0379 J | 0.0436 | 0.027 J | 0.0198 J | 0.0333 J |
| Nickel | 1.1 J | 1.14 | 1.47 | 0.527 J | 3.36 |
| Selenium | 0.338 J | 0.251 J | 0.381 J | 0.244 J | 0.347 J |
| Vanadium | 1.41 | 1.44 | 2.47 | 1.29 | 1.74 |
| Zinc | 47 | 52.6 | 231 | 12 | 65.7 |

#REF!

**Notes:**

Shading indicates detections
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
mg/kg - Milligrams per kilogram
µg/kg - Micrograms per kilogram

CTO-108
Camp Lejeune - UXO-22
Validated Test Pit Exceedance Analytical Results
October 2010

| Station ID | CLEAN MCB CamLej Background Developed SB Combined Soil | CLEAN NCSSLs (June, 2011) | Adjusted Industrial Soil RSLs | Adjusted Residential Soil RSLs | UXO22-TP01 | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sample ID | | | | | UXO22-TP-S-NE | UXO22-TP-S-NE-D | UXO22-TP-S-NW | UXO22-TP-S-SE | UXO22-TP-S-SW |
| Sample Date | | | | | 10/07/10 | 10/07/10 | 10/07/10 | 10/07/10 | 10/07/10 |
| **Chemical Name** | | | | | | | | | |
| **Explosives (µg/kg)** | | | | | | | | | |
| 1,3-Dinitrobenzene | -- | -- | 6,200 | 610 | 96.8 U | 63 J | 35.5 J | 98.4 U | 93.8 U |
| 2,4,6-Trinitrotoluene | -- | -- | 42,000 | 3,600 | 159 J | 132 J | 98.4 U | 60.9 J | 46.4 J |
| 2,4-Dinitrotoluene | -- | 1.6 | 5,500 | 1,600 | 96.8 U | 98.4 U | 34.6 J | 98.4 U | 93.8 U |
| 2,6-Dinitrotoluene | -- | -- | 62,000 | 6,100 | 96.8 U | 98.4 U | 45.7 J | 98.4 U | 93.8 U |
| HMX | -- | -- | 4,900,000 | 380,000 | 73.2 J | 54.3 J | 98.4 U | 98.4 U | 93.8 U |
| PETN | -- | -- | 120,000 | 12,000 | 161 U | 123 J | 164 U | 164 U | 156 U |
| RDX | -- | -- | 24,000 | 5,600 | 67 J | 331 J | 98.4 U | 98.4 U | 277 J |
| **Total Metals (mg/kg)** | | | | | | | | | |
| Aluminum | 26,600 | -- | 99,000 | 7,700 | 1,570 | 1,670 | 3,330 | 1,480 | 2,340 |
| Antimony | 1.79 | 0.9 | 41 | 3.1 | 0.487 UJ | 0.447 UJ | 0.522 UJ | 0.465 UJ | 0.791 J |
| Arsenic | 14.7 | 5.8 | 1.6 | 0.39 | 0.365 U | 0.335 U | 0.256 J | 0.348 U | 0.379 U |
| Barium | 53.2 | 580 | 19,000 | 1,500 | 6.2 | 6.99 | 10 | 3.61 | 5.98 |
| Cadmium | 1.3 | 3 | 80 | 7 | 1.1 | 1.81 | 0.759 | 0.29 U | 0.622 |
| Calcium | 720 | -- | -- | -- | 581 | 466 | 1,140 | 125 J | 501 |
| Chromium | 32.7 | 3.8 | 5.6 | 0.29 | 2.36 | 2.52 | **11.4** | 2.05 | 2.99 |
| Copper | 6.61 | 700 | 4,100 | 310 | 12.3 | 11.8 | 10.1 | 1.34 | 5.5 |
| Iron | 33,600 | 150 | 72,000 | 5,500 | 992 | 542 | 1,140 | 201 | 430 |
| Lead | 14.4 | 270 | 800 | 400 | 21.5 | 18.6 | 25.3 | 8.71 | 12.8 |
| Manganese | 16.9 | 65 | 2,300 | 180 | 8.31 | 9.97 | 13.3 | 2.57 | 10.3 |
| Mercury | 0.148 | 1 | 31 | 2.3 | 0.0379 J | 0.0436 | 0.027 J | 0.0198 J | 0.0333 J |
| Nickel | 8.86 | 130 | 2,000 | 150 | 1.1 J | 1.14 | 1.47 | 0.527 J | 3.36 |
| Selenium | 0.948 | 2.1 | 510 | 39 | 0.338 J | 0.251 J | 0.381 J | 0.244 J | 0.347 J |
| Vanadium | 76.1 | 6 | 520 | 39 | 1.41 | 1.44 | 2.47 | 1.29 | 1.74 |
| Zinc | 16.6 | 1,200 | 31,000 | 2,300 | 47 | 52.6 | 231 | 12 | 65.7 |

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**Notes:**

Shading indicates exceedance of CamLej Background Undeveloped SB Combined Soi

Bold box indicates exceedance of NC SSL

**Bold text indicates exceedance of Adjusted Industrial Soil RSLs**

Underline indicates exceedance of Adjusted Residential Soil RSLs

RSLs were adjusted for noncarcinogens to account for exposure to multiple constituents

* - The MCL-Groundwater value is reported in place of the NCSSL where the MCL value is more conservative.

J - Analyte present, value may or may not be accurate or precise

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

mg/kg - Milligrams per kilogram

µg/kg - Micrograms per kilogram

CTO-0014
Camp Lejeune - UXO 22
Test Pit Raw Analytical Results
October 2010

| **Station ID** | UXO22-TP01 | | | | |
|---|---|---|---|---|---|
| **Sample ID** | UXO22-TP-S-NE | UXO22-TP-S-NE-D | UXO22-TP-S-NW | UXO22-TP-S-SE | UXO22-TP-S-SW |
| **Sample Date** | 10/07/10 | 10/07/10 | 10/07/10 | 10/07/10 | 10/07/10 |
| **Chemical Name** | | | | | |
| | | | | | |
| **Explosives (µg/kg)** | | | | | |
| 1,3,5-Trinitrobenzene | 96.8 U | 98.4 U | 98.4 U | 98.4 U | 93.8 U |
| 1,3-Dinitrobenzene | 96.8 U | 63 J | 35.5 J | 98.4 U | 93.8 U |
| 2,4,6-Trinitrotoluene | 159 J | 132 J | 98.4 U | 60.9 J | 46.4 J |
| 2,4-Dinitrotoluene | 96.8 U | 98.4 U | 34.6 J | 98.4 U | 93.8 U |
| 2,6-Dinitrotoluene | 96.8 U | 98.4 U | 45.7 J | 98.4 U | 93.8 U |
| 2-Amino-4,6-dinitrotoluene | 96.8 U | 98.4 U | 98.4 U | 98.4 U | 93.8 U |
| 2-Nitrotoluene | 96.8 U | 98.4 U | 98.4 U | 98.4 U | 93.8 U |
| 3-Nitrotoluene | 96.8 U | 98.4 U | 98.4 U | 98.4 U | 93.8 U |
| 4-Amino-2,6-dinitrotoluene | 96.8 U | 98.4 U | 98.4 U | 98.4 U | 93.8 U |
| 4-Nitrotoluene | 96.8 U | 98.4 U | 98.4 U | 98.4 U | 93.8 U |
| HMX | 73.2 J | 54.3 J | 98.4 U | 98.4 U | 93.8 U |
| Nitrobenzene | 96.8 U | 98.4 U | 98.4 U | 98.4 U | 93.8 U |
| Nitroglycerin | 161 U | 164 U | 164 U | 164 U | 156 U |
| Perchlorate | 2.54 U | 2.25 U | 2.7 U | 2.31 U | 2.58 U |
| PETN | 161 U | 123 J | 164 U | 164 U | 156 U |
| RDX | 67 J | 331 J | 98.4 U | 98.4 U | 277 J |
| Tetryl | 96.8 U | 98.4 U | 98.4 U | 98.4 U | 93.8 U |
| | | | | | |
| **Total Metals (mg/kg)** | | | | | |
| Aluminum | 1,570 | 1,670 | 3,330 | 1,480 | 2,340 |
| Antimony | 0.487 UJ | 0.447 UJ | 0.522 UJ | 0.465 UJ | 0.791 J |
| Arsenic | 0.365 U | 0.335 U | 0.256 J | 0.348 U | 0.379 U |
| Barium | 6.2 | 6.99 | 10 | 3.61 | 5.98 |
| Beryllium | 0.122 U | 0.112 U | 0.131 U | 0.116 U | 0.126 U |
| Cadmium | 1.1 | 1.81 | 0.759 | 0.29 U | 0.622 |
| Calcium | 581 | 466 | 1,140 | 125 J | 501 |
| Chromium | 2.36 | 2.52 | 11.4 | 2.05 | 2.99 |
| Cobalt | 0.608 U | 0.559 U | 0.653 U | 0.581 U | 0.632 U |
| Copper | 12.3 | 11.8 | 10.1 | 1.34 | 5.5 |
| Iron | 992 | 542 | 1,140 | 201 | 430 |
| Lead | 21.5 | 18.6 | 25.3 | 8.71 | 12.8 |
| Magnesium | 183 U | 168 U | 196 U | 174 U | 189 U |
| Manganese | 8.31 | 9.97 | 13.3 | 2.57 | 10.3 |
| Mercury | 0.0379 J | 0.0436 | 0.027 J | 0.0198 J | 0.0333 J |
| Nickel | 1.1 J | 1.14 | 1.47 | 0.527 J | 3.36 |
| Potassium | 183 U | 168 U | 196 U | 174 U | 189 U |
| Selenium | 0.338 J | 0.251 J | 0.381 J | 0.244 J | 0.347 J |
| Silver | 0.122 U | 0.112 U | 0.131 U | 0.116 U | 0.126 U |
| Sodium | 183 U | 168 U | 196 U | 174 U | 189 U |
| Thallium | 0.243 U | 0.224 U | 0.261 U | 0.232 U | 0.253 U |
| Vanadium | 1.41 | 1.44 | 2.47 | 1.29 | 1.74 |
| Zinc | 47 | 52.6 | 231 | 12 | 65.7 |

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**Notes:**

Shading indicates detections

NA - Not analyzed

J - Analyte present, value may or may not be accurate or precise

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

mg/kg - Milligrams per kilogram

µg/kg - Micrograms per kilogram

CTO-0014
Camp Lejeune - UXO 22
Test Pit Detected Analytical Results
October 2010

| Station ID | UXO22-TP01 | | | | |
|---|---|---|---|---|---|
| Sample ID | UXO22-TP-S-NE | UXO22-TP-S-NE-D | UXO22-TP-S-NW | UXO22-TP-S-SE | UXO22-TP-S-SW |
| Sample Date | 10/07/10 | 10/07/10 | 10/07/10 | 10/07/10 | 10/07/10 |
| **Chemical Name** | | | | | |
| | | | | | |
| **Explosives (µg/kg)** | | | | | |
| 1,3-Dinitrobenzene | 96.8 U | 63 J | 35.5 J | 98.4 U | 93.8 U |
| 2,4-Dinitrotoluene | 96.8 U | 98.4 U | 34.6 J | 98.4 U | 93.8 U |
| 2,6-Dinitrotoluene | 96.8 U | 98.4 U | 45.7 J | 98.4 U | 93.8 U |
| 2,4,6-Trinitrotoluene | 159 J | 132 J | 98.4 U | 60.9 J | 46.4 J |
| HMX | 73.2 J | 54.3 J | 98.4 U | 98.4 U | 93.8 U |
| PETN | 161 U | 123 J | 164 U | 164 U | 156 U |
| RDX | 67 J | 331 J | 98.4 U | 98.4 U | 277 J |
| | | | | | |
| **Total Metals (mg/kg)** | | | | | |
| Aluminum | 1,570 | 1,670 | 3,330 | 1,480 | 2,340 |
| Antimony | 0.487 UJ | 0.447 UJ | 0.522 UJ | 0.465 UJ | 0.791 J |
| Arsenic | 0.365 U | 0.335 U | 0.256 J | 0.348 U | 0.379 U |
| Barium | 6.2 | 6.99 | 10 | 3.61 | 5.98 |
| Cadmium | 1.1 | 1.81 | 0.759 | 0.29 U | 0.622 |
| Calcium | 581 | 466 | 1,140 | 125 J | 501 |
| Chromium | 2.36 | 2.52 | 11.4 | 2.05 | 2.99 |
| Copper | 12.3 | 11.8 | 10.1 | 1.34 | 5.5 |
| Iron | 992 | 542 | 1,140 | 201 | 430 |
| Lead | 21.5 | 18.6 | 25.3 | 8.71 | 12.8 |
| Manganese | 8.31 | 9.97 | 13.3 | 2.57 | 10.3 |
| Mercury | 0.0379 J | 0.0436 | 0.027 J | 0.0198 J | 0.0333 J |
| Nickel | 1.1 J | 1.14 | 1.47 | 0.527 J | 3.36 |
| Selenium | 0.338 J | 0.251 J | 0.381 J | 0.244 J | 0.347 J |
| Vanadium | 1.41 | 1.44 | 2.47 | 1.29 | 1.74 |
| Zinc | 47 | 52.6 | 231 | 12 | 65.7 |

**Notes:**

Shading indicates detections
NA - Not analyzed
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
mg/kg - Milligrams per kilogram
µg/kg - Micrograms per kilogram

CTO-0014
Camp Lejeune - UXO 22
Test Pit Exceedance Results
October 2010

| Station ID | Camp Lejeune Background Undeveloped SB Combined Soil | NCSSLs (June, 2011) | Adjusted Industrial Soil RSLs (Nov, 2011) | Adjusted Residential Soil RSLs (Nov, 2011) | UXO22-TP01 | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sample ID | | | | | UXO22-TP-S-NE | UXO22-TP-S-NE-D | UXO22-TP-S-NW | UXO22-TP-S-SE | UXO22-TP-S-SW |
| Sample Date | | | | | 10/07/10 | 10/07/10 | 10/07/10 | 10/07/10 | 10/07/10 |
| **Chemical Name** | | | | | | | | | |
| | | | | | | | | | |
| **Explosives (µg/kg)** | | | | | | | | | |
| 1,3-Dinitrobenzene | -- | -- | 6,200 | 610 | 96.8 U | 63 J | 35.5 J | 98.4 U | 93.8 U |
| 2,4,6-Trinitrotoluene | -- | -- | 42,000 | 3,600 | 159 J | 132 J | 98.4 U | 60.9 J | 46.4 J |
| 2,4-Dinitrotoluene | -- | 1.6 | 5,500 | 1,600 | 96.8 U | 98.4 U | 34.6 J | 98.4 U | 93.8 U |
| 2,6-Dinitrotoluene | -- | -- | 62,000 | 6,100 | 96.8 U | 98.4 U | 45.7 J | 98.4 U | 93.8 U |
| HMX | -- | -- | 4,900,000 | 380,000 | 73.2 J | 54.3 J | 98.4 U | 98.4 U | 93.8 U |
| PETN | -- | -- | 120,000 | 12,000 | 161 U | 123 J | 164 U | 164 U | 156 U |
| RDX | -- | -- | 24,000 | 5,600 | 67 J | 331 J | 98.4 U | 98.4 U | 277 J |
| | | | | | | | | | |
| **Total Metals (mg/kg)** | | | | | | | | | |
| Aluminum | 19,000 | -- | 99,000 | 7,700 | 1,570 | 1,670 | 3,330 | 1,480 | 2,340 |
| Antimony | 1.1 | 0.9 | 41 | 3.1 | 0.487 UJ | 0.447 UJ | 0.522 UJ | 0.465 UJ | 0.791 J |
| Arsenic | 5.09 | 5.8 | 1.6 | 0.39 | 0.365 U | 0.335 U | 0.256 J | 0.348 U | 0.379 U |
| Barium | 28.3 | 580 | 19,000 | 1,500 | 6.2 | 6.99 | 10 | 3.61 | 5.98 |
| Cadmium | 0.208 | 3 | 80 | 7 | 1.1 | 1.81 | 0.759 | 0.29 U | 0.622 |
| Calcium | 1,530 | -- | -- | -- | 581 | 466 | 1,140 | 125 J | 501 |
| Chromium | 27.6 | 3.8 | 5.6 | 0.29 | 2.36 | 2.52 | **11.4** | 2.05 | 2.99 |
| Copper | 6.05 | 700 | 4,100 | 310 | 12.3 | 11.8 | 10.1 | 1.34 | 5.5 |
| Iron | 12,700 | 150 | 72,000 | 5,500 | 992 | 542 | 1,140 | 201 | 430 |
| Lead | 11.2 | 270 | 800 | 400 | 21.5 | 18.6 | 25.3 | 8.71 | 12.8 |
| Manganese | 18.3 | 65 | 2,300 | 180 | 8.31 | 9.97 | 13.3 | 2.57 | 10.3 |
| Mercury | 0.0852 | 1 | 31 | 2.3 | 0.0379 J | 0.0436 | 0.027 J | 0.0198 J | 0.0333 J |
| Nickel | 7.08 | 130 | 2,000 | 150 | 1.1 J | 1.14 | 1.47 | 0.527 J | 3.36 |
| Selenium | 0.736 | 2.1 | 510 | 39 | 0.338 J | 0.251 J | 0.381 J | 0.244 J | 0.347 J |
| Vanadium | 35.6 | 6 | 520 | 39 | 1.41 | 1.44 | 2.47 | 1.29 | 1.74 |
| Zinc | 14.1 | 1,200 | 31,000 | 2,300 | 47 | 52.6 | 231 | 12 | 65.7 |

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**Notes:**

Shading indicates exceedance of background for undeveloped subsurface soils

Bold box indicates exceedance of NC SSLs

**Bold text indicates exceedance of Adjusted Industrial Soil RSLs**

Underline indicates exceedance of Adjusted Residential Soil RSLs

RSLs were adjusted for noncarcinogens to account for exposure to multiple constituents

NA - Not analyzed

J - Analyte present, value may or may not be accurate or precise

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

mg/kg - Milligrams per kilogram

µg/kg - Micrograms per kilogram

WE-35
Camp Lejeune - Site 6
Test Pit Subsurface Soil Raw Analytical Results
January 2011

| Station ID | IR06-TP01 | | IR06-TP06 | IR06-TP08 | IR06-TP09 | IR06-TP10 | IR06-TP12 | IR06-TP2 | IR06-TP3 | IR06-TP4 | | IR06-TP7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID** | IR06-TP01-N-4-5-11A | IR06-TP01-S-4-5-11A | IR06-TP06-N-2-3-11A | IR06-TP08-N-3-4-11A | IR06-TP09-2-3-11A | IR06-TP10-4-5-11A | IR06-TP12-N-2-3-11A | IR06-TP02-W-4-5-11A | IR06-TP03-N-3-4-11A | IR06-TP04D-N-3-4-11A | IR06-TP04-N-3-4-11A | IR06-TP07-S-3-4-11A |
| **Sample Date** | 01/19/11 | 01/19/11 | 01/20/11 | 01/21/11 | 01/21/11 | 01/24/11 | 01/24/11 | 01/18/11 | 01/21/11 | 01/19/11 | 01/19/11 | 01/20/11 |
| **Chemical Name** | | | | | | | | | | | | |
| **Volatile Organic Compounds (µg/kg)** | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| 1,1,2,2-Tetrachloroethane | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 U | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| 1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113) | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| 1,1,2-Trichloroethane | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 U | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| 1,1-Dichloroethane | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| 1,1-Dichloroethene | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| 1,2,4-Trichlorobenzene | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 U | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| 1,2-Dibromo-3-chloropropane | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 U | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| 1,2-Dibromoethane | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 U | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| 1,2-Dichlorobenzene | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 U | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| 1,2-Dichloroethane | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 U | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| 1,2-Dichloropropane | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 U | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| 1,3-Dichlorobenzene | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 U | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| 1,4-Dichlorobenzene | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 U | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| 2-Butanone | 12 UJ | 14 UJ | 14 UJ | 12 UJ | 14 UJ | 8,000,000 U | 12 UJ | 12 U | 12 UJ | 14 UJ | 12 UJ | 14 UJ |
| 2-Hexanone | 12 UJ | 14 UJ | 14 UJ | 12 UJ | 14 UJ | 8,000,000 U | 12 UJ | 12 U | 12 U | 14 UJ | 12 UJ | 14 UJ |
| 4-Methyl-2-pentanone | 12 UJ | 14 UJ | 14 UJ | 12 UJ | 14 UJ | 8,000,000 U | 12 UJ | 12 U | 12 U | 14 UJ | 12 UJ | 14 UJ |
| Acetone | 19 UJ | 14 UJ | 18 UJ | 18 UJ | 20 UJ | 8,000,000 U | 12 UJ | 12 U | 15 UJ | 14 UJ | 15 UJ | 14 UJ |
| Benzene | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 U | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| Bromodichloromethane | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 U | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| Bromoform | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 U | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| Bromomethane | 4.9 UJ | 5.5 UJ | 5.5 UJ | 5 UJ | 5.5 UJ | 3,200,000 U | 4.7 UJ | 5 U | 5 UJ | 5.5 UJ | 5 UJ | 5.5 UJ |
| Carbon disulfide | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| Carbon tetrachloride | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| Chlorobenzene | 2.4 UJ | 2.8 UJ | 2.8 UJ | 6.5 J | 10 J | 70,000,000 | 5.4 J | 2.5 U | 4.4 J | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| Chloroethane | 4.9 UJ | 5.5 UJ | 5.5 UJ | 5 UJ | 5.5 UJ | 3,200,000 U | 4.7 UJ | 5 U | 5 UJ | 5.5 UJ | 5 UJ | 5.5 UJ |
| Chloroform | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| Chloromethane | 4.9 UJ | 5.5 UJ | 5.5 UJ | 5 UJ | 5.5 UJ | 3,200,000 U | 4.7 UJ | 5 U | 5 UJ | 5.5 UJ | 5 UJ | 5.5 UJ |
| cis-1,2-Dichloroethene | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| cis-1,3-Dichloropropene | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 U | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| Cyclohexane | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 U | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| Dibromochloromethane | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 U | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| Dichlorodifluoromethane (Freon-12) | 4.9 UJ | 5.5 UJ | 5.5 UJ | 5 UJ | 5.5 UJ | 3,200,000 U | 4.7 UJ | 5 U | 5 UJ | 32 J | 59 J | 5.5 UJ |
| Ethylbenzene | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 U | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| Isopropylbenzene | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 U | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| Methyl acetate | 2.9 UJ | 3.3 UJ | 3.3 UJ | 3 UJ | 3.3 UJ | 1,900,000 U | 2.8 UJ | 3 U | 3 U | 3.3 UJ | 3 UJ | 3.3 UJ |
| Methylcyclohexane | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 U | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| Methylene chloride | 12 UJ | 14 UJ | 14 UJ | 12 UJ | 14 UJ | 8,000,000 U | 12 UJ | 12 U | 12 UJ | 14 UJ | 12 UJ | 14 UJ |
| Methyl-tert-butyl ether (MTBE) | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| Styrene | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 U | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| Tetrachloroethene | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 U | 3.3 J | 2.7 J | 2.8 UJ |
| Toluene | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 U | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| trans-1,2-Dichloroethene | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| trans-1,3-Dichloropropene | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 U | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| Trichloroethene | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 U | 0.91 J | 0.65 J | 2.8 UJ |
| Trichlorofluoromethane (Freon-11) | 4.9 UJ | 5.5 UJ | 5.5 UJ | 5 UJ | 5.5 UJ | 3,200,000 U | 4.7 UJ | 5 U | 5 UJ | 5.5 UJ | 5 UJ | 5.5 UJ |
| Vinyl chloride | 4.9 UJ | 5.5 UJ | 5.5 UJ | 5 UJ | 5.5 UJ | 3,200,000 U | 4.7 UJ | 5 U | 5 UJ | 5.5 UJ | 5 UJ | 5.5 UJ |
| Xylene, total | 7.4 UJ | 8.2 UJ | 8.2 UJ | 7.5 UJ | 8.2 UJ | 4,800,000 U | 7 UJ | 7.5 U | 7.5 U | 8.2 UJ | 7.5 UJ | 8.2 UJ |
| **Semivolatile Organic Compounds (µg/kg)** | | | | | | | | | | | | |
| 1,1-Biphenyl | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| 2,2'-Oxybis(1-chloropropane) | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| 2,4,5-Trichlorophenol | 650 U | 680 U | 710 U | 670 U | 690 U | 2,200 U | 690 U | 720 U | 710 U | 720 U | 750 U | 740 U |
| 2,4,6-Trichlorophenol | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| 2,4-Dichlorophenol | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| 2,4-Dimethylphenol | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| 2,4-Dinitrophenol | 650 U | 680 U | 710 U | 670 U | 690 U | 2,200 U | 690 U | 720 U | 710 U | 720 U | 750 U | 740 U |
| 2,4-Dinitrotoluene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U | 65 U | 57 U | 55 U | 57 U | 61 U |
| 2,6-Dinitrotoluene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U | 65 U | 57 U | 55 U | 57 U | 61 U |
| 2-Chloronaphthalene | 260 U | 270 U | 290 U | 270 U | 280 U | 2,200 | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| 2-Chlorophenol | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| 2-Methylnaphthalene | 260 U | 270 U | 290 U | 270 U | 280 U | 2,800 | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| 2-Methylphenol | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| 2-Nitroaniline | 650 U | 680 U | 710 U | 670 U | 690 U | 2,200 U | 690 U | 720 U | 710 U | 720 U | 750 U | 740 U |
| 2-Nitrophenol | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| 3- and 4-Methylphenol | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| 3,3'-Dichlorobenzidine | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 R |
| 3-Nitroaniline | 650 U | 680 U | 710 U | 670 U | 690 U | 2,200 U | 690 U | 720 U | 710 U | 720 U | 750 U | 740 U |
| 4,6-Dinitro-2-methylphenol | 650 U | 680 U | 710 U | 670 U | 690 U | 2,200 U | 690 U | 720 U | 710 U | 720 U | 750 U | 740 U |
| 4-Bromophenyl-phenylether | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| 4-Chloro-3-methylphenol | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| 4-Chloroaniline | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| 4-Chlorophenyl-phenylether | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| 4-Nitroaniline | 650 U | 680 U | 710 U | 670 U | 690 U | 2,200 U | 690 U | 720 U | 710 U | 720 U | 750 U | 740 U |

| **Station ID** | IR06-TP01 | | IR06-TP06 | IR06-TP08 | IR06-TP09 | IR06-TP10 | IR06-TP12 | IR06-TP2 | IR06-TP3 | IR06-TP4 | | IR06-TP7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID** | IR06-TP01-N-4-5-11A | IR06-TP01-S-4-5-11A | IR06-TP06-N-2-3-11A | IR06-TP08-N-3-4-11A | IR06-TP09-2-3-11A | IR06-TP10-4-5-11A | IR06-TP12-N-2-3-11A | IR06-TP02-W-4-5-11A | IR06-TP03-N-3-4-11A | IR06-TP04D-N-3-4-11A | IR06-TP04-N-3-4-11A | IR06-TP07-S-3-4-11A |
| **Sample Date** | 01/19/11 | 01/19/11 | 01/20/11 | 01/21/11 | 01/21/11 | 01/24/11 | 01/24/11 | 01/18/11 | 01/21/11 | 01/19/11 | 01/19/11 | 01/20/11 |
| **Chemical Name** | | | | | | | | | | | | |
| 4-Nitrophenol | 650 U | 680 U | 710 U | 670 U | 690 U | 2,200 U | 690 U | 720 U | 710 U | 720 U | 750 U | 740 U |
| Acenaphthene | 2.9 J | 2.2 J | 12 UJ | 11 U | 11 U | 36 U | 11 U | 12 UJ | 12 U | 12 UJ | 12 UJ | 12 UJ |
| Acenaphthylene | 11 U | 11 U | 12 U | 11 U | 11 U | 36 U | 11 U | 12 U | 12 U | 12 U | 12 U | 12 U |
| Acetophenone | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| Anthracene | 2.5 J | 11 U | 12 U | 11 U | 11 U | 36 U | 11 U | 12 U | 12 U | 12 U | 12 U | 12 U |
| Atrazine | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| Benzaldehyde | 260 UJ | 270 UJ | 290 UJ | 270 UJ | 280 UJ | 900 UJ | 280 UJ | 290 UJ | 290 UJ | 290 UJ | 300 UJ | 520 J |
| Benzo(a)anthracene | 15 J | 12 J | 2.5 J | 3 J | 11 U | 36 U | 7.2 J | 3.4 J | 12 U | 3.8 J | 4.6 J | 12 U |
| Benzo(a)pyrene | 17 J | 9.7 J | 12 U | 11 U | 11 U | 17 J | 11 U | 12 U | 12 U | 7.4 J | 20 J | 12 U |
| Benzo(b)fluoranthene | 28 J | 14 J | 12 U | 11 U | 11 U | 22 J | 11 U | 12 U | 12 U | 12 U | 12 U | 12 U |
| Benzo(g,h,i)perylene | 32 J | 5.4 J | 12 U | 11 U | 11 U | 36 U | 11 U | 12 U | 12 U | 51 | 110 | 12 U |
| Benzo(k)fluoranthene | 11 U | 11 U | 12 U | 11 UJ | 11 U | 36 U | 11 U | 12 U | 12 U | 12 U | 12 U | 12 U |
| bis(2-Chloroethoxy)methane | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| bis(2-Chloroethyl)ether | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| bis(2-Ethylhexyl)phthalate | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| Butylbenzylphthalate | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| Caprolactam | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| Carbazole | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| Chrysene | 11 J | 3.6 J | 12 U | 11 UJ | 11 U | 36 U | 11 U | 12 U | 12 U | 12 U | 12 U | 12 U |
| Dibenz(a,h)anthracene | 15 J | 2 J | 12 U | 11 U | 11 U | 36 U | 11 U | 12 U | 12 U | 12 U | 12 U | 12 U |
| Dibenzofuran | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| Diethylphthalate | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| Dimethyl phthalate | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| Di-n-butylphthalate | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| Di-n-octylphthalate | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| Fluoranthene | 27 | 22 J | 12 U | 11 U | 11 U | 36 U | 3.6 J | 12 U | 12 U | 12 U | 12 U | 12 U |
| Fluorene | 11 UJ | 11 UJ | 12 UJ | 11 U | 11 U | 36 U | 11 U | 12 UJ | 12 U | 12 UJ | 12 UJ | 12 UJ |
| Hexachlorobenzene | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| Hexachlorobutadiene | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| Hexachlorocyclopentadiene | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| Hexachloroethane | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| Indeno(1,2,3-cd)pyrene | 27 J | 10 J | 12 U | 11 U | 11 U | 36 U | 11 U | 12 U | 12 U | 22 J | 42 | 12 U |
| Isophorone | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| Naphthalene | 11 UJ | 11 UJ | 12 UJ | 11 U | 11 U | 5,700 | 11 U | 12 UJ | 12 U | 12 UJ | 12 UJ | 12 UJ |
| n-Nitroso-di-n-propylamine | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| n-Nitrosodiphenylamine | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| Nitrobenzene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U | 65 U | 57 U | 55 U | 57 U | 61 U |
| Pentachlorophenol | 650 U | 680 U | 710 U | 670 U | 690 U | 1,600 J | 690 U | 720 U | 710 U | 720 U | 750 U | 740 U |
| Phenanthrene | 21 J | 16 J | 12 U | 11 U | 2.4 J | 20 J | 5.1 J | 12 U | 12 U | 12 U | 12 U | 12 U |
| Phenol | 260 U | 270 U | 290 U | 270 U | 280 U | 900 U | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| Pyrene | 21 J | 15 J | 12 U | 11 U | 11 U | 36 U | 3.1 J | 12 U | 12 U | 12 U | 2.8 J | 12 U |
| | | | | | | | | | | | | |
| **Pesticide/Polychlorinated Biphenyls (µg/kg)** | | | | | | | | | | | | |
| 4,4'-DDD | 320 | 3.8 J | 2 U | 1.8 U | 0.59 J | 280 | 1.9 U | 0.94 J | 1.8 U | 200 J | 3 J | 2 U |
| 4,4'-DDE | 120 | 1.4 J | 2 U | 1.8 U | 15 | 45 J | 1.9 U | 0.73 J | 1.8 U | 71 J | 1.5 J | 2 UJ |
| 4,4'-DDT | 290 | 4 J | 2 U | 1.8 U | 2.7 J | 20 U | 1.9 U | 1 J | 1.8 U | 130 J | 6.3 J | 2 U |
| Aldrin | 0.9 U | 0.96 U | 1 U | 0.92 U | 0.94 U | 10 U | 0.99 U | 0.96 UJ | 0.92 U | 0.93 U | 0.81 J | 1 U |
| alpha-BHC | 0.9 U | 0.96 U | 1 U | 0.92 U | 0.94 U | 10 U | 0.99 U | 0.96 UJ | 0.92 U | 0.93 U | 1 U | 1 UJ |
| alpha-Chlordane | 0.9 U | 0.96 U | 1 U | 0.92 U | 0.43 J | 10 U | 0.99 U | 0.49 J | 0.92 U | 0.93 U | 1 U | 1 UJ |
| Aroclor-1016 | 9.1 U | 9.3 U | 10 U | 9.2 U | 9.4 U | 10 U | 9.9 U | 10 U | 9.2 U | 9.3 U | 10 U | 10 U |
| Aroclor-1221 | 9.1 U | 9.3 U | 10 U | 9.2 U | 9.4 U | 10 U | 9.9 U | 10 U | 9.2 U | 9.3 U | 10 U | 10 U |
| Aroclor-1232 | 11 U | 11 U | 12 U | 11 U | 11 U | 12 U | 12 U | 12 U | 11 U | 11 U | 12 U | 12 U |
| Aroclor-1242 | 9.1 U | 9.3 U | 10 U | 9.2 U | 9.4 U | 10 U | 9.9 U | 10 U | 9.2 U | 9.3 U | 10 U | 10 U |
| Aroclor-1248 | 9.1 U | 9.3 U | 10 U | 9.2 U | 9.4 U | 10 U | 9.9 U | 10 U | 9.2 U | 9.3 U | 10 U | 10 U |
| Aroclor-1254 | 9.1 U | 9.3 U | 10 U | 9.2 U | 9.4 U | 10 U | 9.9 U | 10 U | 9.2 U | 9.3 U | 10 U | 10 U |
| Aroclor-1260 | 9.1 U | 26 | 10 U | 9.2 U | 9.4 U | 10 U | 9.9 U | 10 U | 9.2 U | 9.3 U | 10 U | 10 U |
| Azinphos methyl | 30 U | 29 U | 6.5 U | 6.4 U | 6 U | 6.6 U | 6.6 U | 6.6 U | 6.2 U | 32 U | 32 U | 6.6 U |
| beta-BHC | 0.9 U | 0.96 U | 1 U | 0.92 U | 0.94 U | 220 | 0.99 U | 0.96 UJ | 0.92 U | 0.93 U | 1 U | 1 UJ |
| Bolstar | 30 U | 29 U | 6.5 U | 6.4 U | 6 U | 6.6 U | 6.6 U | 6.6 U | 6.2 U | 32 U | 32 U | 6.6 U |
| Chlorpyrifos | 30 U | 29 U | 6.5 U | 6.4 U | 6 U | 6.6 U | 6.6 U | 6.6 U | 6.2 U | 32 U | 32 U | 6.6 U |
| Coumaphos | 30 U | 29 U | 6.5 U | 6.4 U | 6 U | 6.6 U | 6.6 U | 6.6 U | 6.2 U | 32 U | 32 U | 6.6 U |
| delta-BHC | 0.9 U | 0.96 U | 1 U | 0.92 U | 0.94 U | 10 U | 0.99 U | 0.96 UJ | 0.92 U | 0.93 U | 1 U | 1 UJ |
| Demeton | 59 U | 59 U | 13 U | 13 U | 12 U | 13 U | 13 U | 13 U | 12 U | 65 U | 64 U | 13 U |
| Diazinon | 30 U | 29 U | 6.5 U | 6.4 U | 6 U | 6.6 U | 6.6 U | 6.6 U | 6.2 U | 32 U | 32 U | 6.6 U |
| Dichlorvos | 30 U | 29 U | 6.5 U | 6.4 U | 6 U | 6.6 U | 6.6 U | 6.6 U | 6.2 U | 32 U | 32 U | 6.6 U |
| Dieldrin | 49 J | 1.4 J | 0.9 J | 1.8 U | 0.9 J | 40 | 1.9 U | 1.1 J | 1.8 U | 51 J | 11 J | 0.97 J |
| Dimethoate | 30 U | 29 U | 6.5 U | 6.4 U | 6 U | 6.6 U | 6.6 U | 6.6 U | 6.2 U | 32 U | 32 U | 6.6 UJ |
| Disulfoton | 30 U | 29 U | 6.5 U | 6.4 U | 6 U | 6.6 U | 6.6 U | 6.6 U | 6.2 U | 32 U | 32 U | 6.6 U |
| Endosulfan I | 0.9 U | 0.96 U | 1 U | 0.92 U | 0.94 U | 10 U | 0.99 U | 0.96 UJ | 0.92 U | 0.93 U | 1 U | 1 U |
| Endosulfan II | 1.7 U | 1.9 U | 2 U | 1.8 U | 1.8 U | 20 U | 1.9 U | 1.9 UJ | 1.8 U | 1.8 U | 2 U | 2 U |
| Endosulfan sulfate | 1.7 U | 1.9 U | 2 U | 1.8 U | 1.8 U | 20 U | 1.9 U | 1.9 UJ | 1.8 U | 1.8 U | 2 U | 2 U |
| Endrin | 1.7 U | 1.9 U | 2 U | 1.8 U | 1.8 U | 20 U | 1.9 U | 1.9 UJ | 1.8 U | 1.8 U | 1.5 J | 2 UJ |
| Endrin aldehyde | 1.7 U | 1.9 U | 2 U | 1.8 U | 1.8 U | 20 U | 1.9 U | 1.9 UJ | 1.8 U | 1.8 U | 2 U | 2 U |
| Endrin ketone | 1.7 U | 1.9 U | 2 U | 1.8 U | 1.8 U | 20 U | 1.9 U | 1.9 UJ | 1.8 U | 1.8 U | 1.1 J | 2 UJ |
| Ethoprop | 30 U | 29 U | 6.5 U | 6.4 U | 6 U | 6.6 U | 6.6 U | 6.6 U | 6.2 U | 32 U | 32 U | 6.6 U |
| Famphur | 30 U | 29 U | 6.5 U | 6.4 U | 6 U | 6.6 U | 6.6 U | 6.6 U | 6.2 U | 32 U | 32 U | 6.6 UJ |

WE-35
Camp Lejeune - Site 6
Test Pit Subsurface Soil Raw Analytical Results
January 2011

| **Station ID** | IR06-TP01 | | IR06-TP06 | IR06-TP08 | IR06-TP09 | IR06-TP10 | IR06-TP12 | IR06-TP2 | IR06-TP3 | IR06-TP4 | | IR06-TP7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID** | IR06-TP01-N-4-5-11A | IR06-TP01-S-4-5-11A | IR06-TP06-N-2-3-11A | IR06-TP08-N-3-4-11A | IR06-TP09-2-3-11A | IR06-TP10-4-5-11A | IR06-TP12-N-2-3-11A | IR06-TP02-W-4-5-11A | IR06-TP03-N-3-4-11A | IR06-TP04D-N-3-4-11A | IR06-TP04-N-3-4-11A | IR06-TP07-S-3-4-11A |
| **Sample Date** | 01/19/11 | 01/19/11 | 01/20/11 | 01/21/11 | 01/21/11 | 01/24/11 | 01/24/11 | 01/18/11 | 01/21/11 | 01/19/11 | 01/19/11 | 01/20/11 |
| **Chemical Name** | | | | | | | | | | | | |
| Fensulfothion | 30 U | 29 U | 6.5 U | 6.4 U | 6 U | 6.6 U | 6.6 U | 6.6 U | 6.2 U | 32 U | 32 U | 6.6 U |
| Ethyl p-nitrophenyl phenylphosphorothioate | 30 U | 29 U | 6.5 U | 6.4 U | 6 U | 6.6 U | 6.6 U | 6.6 U | 6.2 U | 32 U | 32 U | 6.6 U |
| Fenthion | 30 U | 29 U | 6.5 U | 6.4 U | 6 U | 6.6 U | 6.6 U | 6.6 U | 6.2 U | 32 U | 32 U | 6.6 U |
| gamma-BHC (Lindane) | 0.9 U | 0.96 U | 1 U | 0.92 U | 0.94 U | 10 U | 0.99 U | 0.96 UJ | 0.92 U | 0.93 U | 1 U | 1 UJ |
| gamma-Chlordane | 0.9 U | 0.96 U | 1 U | 0.92 U | 0.56 J | 10 U | 0.99 U | 0.68 J | 0.92 U | 0.93 U | 1 U | 1 UJ |
| Heptachlor | 0.9 U | 0.96 U | 1 U | 0.92 U | 0.94 U | 10 U | 0.99 U | 0.96 UJ | 0.92 U | 0.93 U | 1 U | 1 U |
| Heptachlor epoxide | 0.45 J | 0.96 U | 1 U | 0.92 U | 0.94 U | 10 U | 0.99 U | 0.96 UJ | 0.92 U | 0.93 U | 1 U | 1 UJ |
| Malathion | 30 U | 29 U | 6.5 U | 6.4 U | 6 U | 6.6 U | 6.6 U | 6.6 U | 6.2 U | 32 U | 32 U | 6.6 U |
| Methoxychlor | 9 U | 9.6 U | 10 U | 9.2 U | 9.4 U | 100 U | 9.9 U | 9.6 UJ | 9.2 U | 9.3 U | 10 U | 10 U |
| Methyl parathion | 30 U | 29 U | 6.5 U | 6.4 U | 6 U | 6.6 U | 6.6 U | 6.6 U | 6.2 U | 32 U | 32 U | 6.6 U |
| Mevinphos | 30 U | 29 U | 6.5 U | 6.4 U | 6 U | 6.6 U | 6.6 U | 6.6 U | 6.2 U | 32 U | 32 U | 6.6 U |
| O,O,O-Triethyl phosphorothioate | 30 U | 29 U | 6.5 U | 6.4 U | 6 U | 6.6 U | 6.6 U | 6.6 U | 6.2 U | 32 U | 32 U | 6.6 U |
| Parathion | 30 U | 29 U | 6.5 U | 6.4 U | 6 U | 6.6 U | 6.6 U | 6.6 U | 6.2 U | 32 U | 32 U | 6.6 U |
| Phorate | 30 U | 29 U | 6.5 U | 6.4 U | 6 U | 6.6 U | 6.6 U | 6.6 U | 6.2 U | 32 U | 32 U | 6.6 U |
| Ronnel | 30 U | 29 U | 6.5 U | 6.4 U | 6 U | 6.6 U | 6.6 U | 6.6 U | 6.2 U | 32 U | 32 U | 6.6 U |
| Sulfotepp | 30 U | 29 U | 6.5 U | 6.4 U | 6 U | 6.6 U | 6.6 U | 6.6 U | 6.2 U | 32 U | 32 U | 6.6 U |
| Tetrachlorvinphos | 30 U | 29 U | 6.5 U | 6.4 U | 6 U | 6.6 U | 6.6 U | 6.6 U | 6.2 U | 32 U | 32 U | 6.6 U |
| Thionazin | 30 U | 29 U | 6.5 U | 6.4 U | 6 U | 6.6 U | 6.6 U | 6.6 U | 6.2 U | 32 U | 32 U | 6.6 U |
| Tokuthion (Prothiophos) | 30 U | 29 U | 6.5 U | 6.4 U | 6 U | 6.6 U | 6.6 U | 6.6 U | 6.2 U | 32 U | 32 U | 6.6 U |
| Toxaphene | 17 U | 18 U | 19 U | 18 U | 18 U | 200 U | 19 U | 18 UJ | 18 U | 17 U | 19 U | 19 U |
| Trichloronate | 30 U | 29 U | 6.5 U | 6.4 U | 6 U | 6.6 U | 6.6 U | 6.6 U | 6.2 U | 32 U | 32 U | 6.6 U |
| | | | | | | | | | | | | |
| **Explosives (µg/kg)** | | | | | | | | | | | | |
| 1,3,5-Trinitrobenzene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U | 65 U | 57 U | 55 U | 57 U | 61 U |
| 1,3-Dinitrobenzene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U | 65 U | 57 U | 55 U | 57 U | 61 U |
| 2,4,6-Trinitrotoluene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U | 65 U | 57 U | 55 U | 57 U | 61 U |
| 2-Amino-4,6-dinitrotoluene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U | 65 U | 57 U | 55 U | 57 U | 61 U |
| 2-Nitrotoluene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U | 65 U | 57 U | 55 U | 57 U | 61 U |
| 3-Nitrotoluene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U | 65 U | 57 U | 55 U | 57 U | 61 U |
| 4-Amino-2,6-dinitrotoluene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U | 65 U | 57 U | 55 U | 57 U | 61 U |
| 4-Nitrotoluene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U | 65 U | 57 U | 55 U | 57 U | 61 U |
| HMX | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U | 65 U | 57 U | 55 U | 57 U | 61 U |
| Nitroglycerin | 410 U | 450 U | 490 U | 470 U | 410 U | 490 U | 460 U | 520 U | 460 U | 440 U | 460 U | 490 U |
| Perchlorate | 0.45 U | 0.44 U | 0.49 U | 0.47 U | 0.45 U | 0.48 U | 0.48 U | 0.5 U | 0.45 U | 0.48 U | 0.47 U | 0.49 U |
| RDX | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U | 65 U | 57 U | 55 U | 57 U | 61 U |
| Tetryl | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U | 65 U | 57 U | 55 U | 57 U | 61 U |
| | | | | | | | | | | | | |
| **Total Metals (mg/kg)** | | | | | | | | | | | | |
| Aluminum | 4,180 | 3,660 | 5,140 | 8,840 | 3,940 | 1,530 | 3,700 | 1,990 | 3,140 | 3,900 | 3,570 | 3,120 |
| Antimony | 5.3 J | 13.5 J | 0.43 UJ | 0.43 U | 7.1 | 0.35 U | 0.45 U | 0.48 UJ | 0.46 U | 0.4 UJ | 0.42 UJ | 0.45 UJ |
| Arsenic | 2.7 | 7 | 0.27 J | 0.45 U | 3.4 | 0.35 U | 0.45 U | 0.08 J | 0.46 U | 0.18 J | 0.3 J | 0.1 J |
| Barium | 11.2 | 10.6 | 3 | 8.3 | 117 | 1.8 | 3.6 | 2.2 | 3 | 6 | 5.6 | 3.2 |
| Beryllium | 0.04 J | 0.04 J | 0.02 J | 0.05 J | 0.08 J | 0.01 J | 0.01 J | 0.01 J | 0.01 J | 0.02 J | 0.02 J | 0.02 J |
| Cadmium | 0.14 J | 0.09 J | 0.26 U | 0.03 J | 2.7 | 0.01 J | 0.02 J | 0.38 J | 0.03 J | 0.04 J | 0.08 J | 0.27 U |
| Calcium | 51,400 | 19,800 | 109 | 33.5 | 2,200 | 35.2 | 188 | 146 | 36.3 | 2,190 | 3,880 | 30.4 U |
| Chromium | 6.2 | 6.4 | 4 | 8.2 | 596 | 2.8 | 2.8 | 2.8 | 3.1 | 3.8 | 4.4 | 3.1 |
| Cobalt | 6.2 | 0.49 J | 0.1 J | 0.62 J | 4.8 J | 0.09 J | 0.64 J | 0.39 U | 0.14 J | 0.22 J | 0.23 J | 0.13 J |
| Copper | 5.1 | 4.2 | 0.31 J | 0.71 J | 180 | 0.75 J | 0.89 U | 9.6 | 0.5 J | 2.2 | 5.2 | 0.27 J |
| Iron | 2,110 | 6,330 | 358 | 1,060 | 22,000 | 413 | 878 | 2,740 | 314 | 839 | 2,390 | 403 |
| Lead | 17.9 | 23.6 | 3.5 | 4.6 | 2,800 | 6.4 | 4.4 | 31.7 | 2.8 | 16 | 17.4 | 2.2 |
| Magnesium | 734 | 1,160 | 75.8 | 228 | 164 | 47.7 | 66 | 59.5 | 65.6 | 106 | 146 | 80.4 |
| Manganese | 64.3 | 21.6 | 1.6 | 4.1 | 360 | 1.9 | 6 | 13.9 | 2.9 | 5 | 6.5 | 2.3 |
| Mercury | 0.01 J | 0.03 | 0.02 J | 0.018 U | 0.03 J | 0.08 | 0.03 J | 0.23 | 0.008 J | 0.02 J | 0.07 J | 0.02 J |
| Nickel | 8.3 | 7.8 | 1.1 J | 3.5 | 14.7 | 0.46 J | 1.5 J | 0.48 J | 0.8 J | 2.5 J | 2.1 J | 1.2 J |
| Potassium | 182 | 142 | 84.7 J | 232 | 90.5 | 50.6 J | 62.7 J | 62.5 J | 62.5 J | 75.3 J | 89.7 | 96.5 |
| Selenium | 0.54 U | 0.71 U | 0.6 U | 0.6 U | 1.1 U | 0.49 U | 0.62 U | 0.68 U | 0.64 U | 0.56 U | 0.39 J | 0.63 U |
| Silver | 0.02 J | 0.1 J | 0.34 U | 0.34 U | 0.9 J | 0.28 U | 0.36 U | 0.09 J | 0.37 U | 0.32 U | 0.04 J | 0.36 U |
| Sodium | 71.8 J | 56.7 J | 43 U | 23.8 J | 41.2 J | 17.4 J | 45 U | 48 U | 46 U | 40 U | 42 U | 45 U |
| Thallium | 0.24 J | 0.51 U | 0.43 U | 0.43 U | 0.8 U | 0.35 U | 0.45 U | 0.48 U | 0.46 U | 0.4 U | 0.42 U | 0.45 U |
| Vanadium | 5.7 | 4.3 | 2.8 | 7.7 | 4.4 | 1.6 J | 3.4 | 2.9 | 2.8 | 3.3 | 3.6 | 2.7 |
| Zinc | 44.9 | 35.2 | 0.92 U | 2.9 U | 537 | 42.2 | 7.5 | 92.1 | 3.3 U | 57.1 J | 183 J | 5.3 |
| | | | | | | | | | | | | |
| **Wet Chemistry** | | | | | | | | | | | | |
| Chromium (hexavalent) (mg/kg) | 0.84 J | 0.43 UJ | 0.95 UJ | 0.44 U | 490 | 0.46 U | 0.88 | 0.43 J | 0.49 J | 0.51 J | 0.42 UJ | 1.7 J |

**Notes:**
Shading indicates detections
NA - Not analyzed
J - Analyte present, value may or may not be accurate or precise
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
mg/kg - Milligrams per kilogram
µg/kg - Micrograms per kilogram

WE-35
Camp Lejeune - Site 6
Test Pit Subsurface Soil Detected Analytical Results
January 2011

| Station ID | IR06-TP01 | | IR06-TP06 | IR06-TP08 | IR06-TP09 | IR06-TP10 | IR06-TP12 | IR06-TP2 | IR06-TP3 | IR06-TP4 | | IR06-TP7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID** | IR06-TP01-N-4-5-11A | IR06-TP01-S-4-5-11A | IR06-TP06-N-2-3-11A | IR06-TP08-N-3-4-11A | IR06-TP09-2-3-11A | IR06-TP10-4-5-11A | IR06-TP12-N-2-3-11A | IR06-TP02-W-4-5-11A | IR06-TP03-N-3-4-11A | IR06-TP04D-N-3-4-11A | IR06-TP04-N-3-4-11A | IR06-TP07-S-3-4-11A |
| **Sample Date** | 01/19/11 | 01/19/11 | 01/20/11 | 01/21/11 | 01/21/11 | 01/24/11 | 01/24/11 | 01/18/11 | 01/21/11 | 01/19/11 | 01/19/11 | 01/20/11 |
| **Chemical Name** | | | | | | | | | | | | |
| **Volatile Organic Compounds (µg/kg)** | | | | | | | | | | | | |
| Chlorobenzene | 2.4 UJ | 2.8 UJ | 2.8 UJ | 6.5 J | 10 J | 70,000,000 | 5.4 J | 2.5 U | 4.4 J | 2.8 UJ | 2.5 UJ | 2.8 UJ |
| Dichlorodifluoromethane (Freon-12) | 4.9 UJ | 5.5 UJ | 5.5 UJ | 5 UJ | 5.5 UJ | 3,200,000 U | 4.7 UJ | 5 U | 5 UJ | 32 J | 59 J | 5.5 UJ |
| Tetrachloroethene | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 U | 3.3 J | 2.7 J | 2.8 UJ |
| Trichloroethene | 2.4 UJ | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ | 2.5 U | 2.5 U | 0.91 J | 0.65 J | 2.8 UJ |
| **Semivolatile Organic Compounds (µg/kg)** | | | | | | | | | | | | |
| 2-Chloronaphthalene | 260 U | 270 U | 290 U | 270 U | 280 U | 2,200 | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| 2-Methylnaphthalene | 260 U | 270 U | 290 U | 270 U | 280 U | 2,800 | 280 U | 290 U | 290 U | 290 U | 300 U | 300 U |
| Acenaphthene | 2.9 J | 2.2 J | 12 UJ | 11 U | 11 U | 36 U | 11 U | 12 UJ | 12 U | 12 UJ | 12 UJ | 12 UJ |
| Anthracene | 2.5 J | 11 U | 12 U | 11 U | 11 U | 36 U | 11 U | 12 U | 12 U | 12 U | 12 U | 12 U |
| Benzaldehyde | 260 UJ | 270 UJ | 290 UJ | 270 UJ | 280 UJ | 900 UJ | 280 UJ | 290 UJ | 290 UJ | 290 UJ | 300 UJ | 520 J |
| Benzo(a)anthracene | 15 J | 12 J | 2.5 J | 3 J | 11 U | 36 U | 7.2 J | 3.4 J | 12 U | 3.8 J | 4.6 J | 12 U |
| Benzo(a)pyrene | 17 J | 9.7 J | 12 U | 11 U | 11 U | 17 J | 11 U | 12 U | 12 U | 7.4 J | 20 J | 12 U |
| Benzo(b)fluoranthene | 28 J | 14 J | 12 U | 11 U | 11 U | 22 J | 11 U | 12 U | 12 U | 12 U | 12 U | 12 U |
| Benzo(g,h,i)perylene | 32 J | 5.4 J | 12 U | 11 U | 11 U | 36 U | 11 U | 12 U | 12 U | 51 | 110 | 12 U |
| Chrysene | 11 J | 3.6 J | 12 U | 11 UJ | 11 U | 36 U | 11 U | 12 U | 12 U | 12 U | 12 U | 12 U |
| Dibenz(a,h)anthracene | 15 J | 2 J | 12 U | 11 U | 11 U | 36 U | 11 U | 12 U | 12 U | 12 U | 12 U | 12 U |
| Fluoranthene | 27 | 22 J | 12 U | 11 U | 11 U | 36 U | 3.6 J | 12 U | 12 U | 12 U | 12 U | 12 U |
| Indeno(1,2,3-cd)pyrene | 27 J | 10 J | 12 U | 11 U | 11 U | 36 U | 11 U | 12 U | 12 U | 22 J | 42 | 12 U |
| Naphthalene | 11 UJ | 11 UJ | 12 UJ | 11 U | 11 U | 5,700 | 11 U | 12 UJ | 12 U | 12 UJ | 12 UJ | 12 UJ |
| Pentachlorophenol | 650 U | 680 U | 710 U | 670 U | 690 U | 1,600 J | 690 U | 720 U | 710 U | 720 U | 750 U | 740 U |
| Phenanthrene | 21 J | 16 J | 12 U | 11 U | 2.4 J | 20 J | 5.1 J | 12 U | 12 U | 12 U | 12 U | 12 U |
| Pyrene | 21 J | 15 J | 12 U | 11 U | 11 U | 36 U | 3.1 J | 12 U | 12 U | 12 U | 2.8 J | 12 U |
| **Pesticide/Polychlorinated Biphenyls (µg/kg)** | | | | | | | | | | | | |
| 4,4'-DDD | 320 | 3.8 J | 2 U | 1.8 U | 0.59 J | 280 | 1.9 U | 0.94 J | 1.8 U | 200 J | 3 J | 2 U |
| 4,4'-DDE | 120 | 1.4 J | 2 U | 1.8 U | 15 | 45 J | 1.9 U | 0.73 J | 1.8 U | 71 J | 1.5 J | 2 UJ |
| 4,4'-DDT | 290 | 4 J | 2 U | 1.8 U | 2.7 J | 20 U | 1.9 U | 1 J | 1.8 U | 130 J | 6.3 J | 2 U |
| Aldrin | 0.9 U | 0.96 U | 1 U | 0.92 U | 0.94 U | 10 U | 0.99 U | 0.96 UJ | 0.92 U | 0.93 U | 0.81 J | 1 U |
| alpha-Chlordane | 0.9 U | 0.96 U | 1 U | 0.92 U | 0.43 J | 10 U | 0.99 U | 0.49 J | 0.92 U | 0.93 U | 1 U | 1 UJ |
| Aroclor-1260 | 9.1 U | 26 | 10 U | 9.2 U | 9.4 U | 10 U | 9.9 U | 10 U | 9.2 U | 9.3 U | 10 U | 10 U |
| beta-BHC | 0.9 U | 0.96 U | 1 U | 0.92 U | 0.94 U | 220 | 0.99 U | 0.96 UJ | 0.92 U | 0.93 U | 1 U | 1 UJ |
| Dieldrin | 49 J | 1.4 J | 0.9 J | 1.8 U | 0.9 J | 40 | 1.9 U | 1.1 J | 1.8 U | 51 J | 11 J | 0.97 J |
| Endrin | 1.7 U | 1.9 U | 2 U | 1.8 U | 1.8 U | 20 U | 1.9 U | 1.9 UJ | 1.8 U | 1.8 U | 1.5 J | 2 UJ |
| Endrin ketone | 1.7 U | 1.9 U | 2 U | 1.8 U | 1.8 U | 20 U | 1.9 U | 1.9 UJ | 1.8 U | 1.8 U | 1.1 J | 2 UJ |
| gamma-Chlordane | 0.9 U | 0.96 U | 1 U | 0.92 U | 0.56 J | 10 U | 0.99 U | 0.68 J | 0.92 U | 0.93 U | 1 U | 1 UJ |
| Heptachlor epoxide | 0.45 J | 0.96 U | 1 U | 0.92 U | 0.94 U | 10 U | 0.99 U | 0.96 UJ | 0.92 U | 0.93 U | 1 U | 1 UJ |
| **Explosives (µg/kg)** | | | | | | | | | | | | |
| No Detections | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Total Metals (mg/kg)** | | | | | | | | | | | | |
| Aluminum | 4,180 | 3,660 | 5,140 | 8,840 | 3,940 | 1,530 | 3,700 | 1,990 | 3,140 | 3,900 | 3,570 | 3,120 |
| Antimony | 5.3 J | 13.5 J | 0.43 UJ | 0.43 U | 7.1 | 0.35 U | 0.45 U | 0.48 UJ | 0.46 U | 0.4 UJ | 0.42 UJ | 0.45 UJ |
| Arsenic | 2.7 | 7 | 0.27 J | 0.45 U | 3.4 | 0.35 U | 0.45 U | 0.08 J | 0.46 U | 0.18 J | 0.3 J | 0.1 J |
| Barium | 11.2 | 10.6 | 3 | 8.3 | 117 | 1.8 | 3.6 | 2.2 | 3 | 6 | 5.6 | 3.2 |
| Beryllium | 0.04 J | 0.04 J | 0.02 J | 0.05 J | 0.08 J | 0.01 J | 0.01 J | 0.01 J | 0.01 J | 0.02 J | 0.02 J | 0.02 J |
| Cadmium | 0.14 J | 0.09 J | 0.26 U | 0.03 J | 2.7 | 0.01 J | 0.02 J | 0.38 J | 0.03 J | 0.04 J | 0.08 J | 0.27 U |
| Calcium | 51,400 | 19,800 | 109 | 33.5 | 2,200 | 35.2 | 188 | 146 | 36.3 | 2,190 | 3,880 | 30.4 U |
| Chromium | 6.2 | 6.4 | 4 | 8.2 | 596 | 2.8 | 2.8 | 2.8 | 3.1 | 3.8 | 4.4 | 3.1 |
| Cobalt | 6.2 | 0.49 J | 0.1 J | 0.62 J | 4.8 J | 0.09 J | 0.64 J | 0.39 U | 0.14 J | 0.22 J | 0.23 J | 0.13 J |
| Copper | 5.1 | 4.2 | 0.31 J | 0.71 J | 180 | 0.75 J | 0.89 U | 9.6 | 0.5 J | 2.2 | 5.2 | 0.27 J |
| Iron | 2,110 | 6,330 | 358 | 1,060 | 22,000 | 413 | 878 | 2,740 | 314 | 839 | 2,390 | 403 |
| Lead | 17.9 | 23.6 | 3.5 | 4.6 | 2,800 | 6.4 | 4.4 | 31.7 | 2.8 | 16 | 17.4 | 2.2 |
| Magnesium | 734 | 1,160 | 75.8 | 228 | 164 | 47.7 | 66 | 59.5 | 65.6 | 106 | 146 | 80.4 |
| Manganese | 64.3 | 21.6 | 1.6 | 4.1 | 360 | 1.9 | 6 | 13.9 | 2.9 | 5 | 6.5 | 2.3 |
| Mercury | 0.01 J | 0.03 | 0.02 J | 0.018 U | 0.03 J | 0.08 | 0.03 J | 0.23 | 0.008 J | 0.02 J | 0.07 J | 0.02 J |
| Nickel | 8.3 | 7.8 | 1.1 J | 3.5 | 14.7 | 0.46 J | 1.5 J | 0.48 J | 0.8 J | 2.5 J | 2.1 J | 1.2 J |
| Potassium | 182 | 142 | 84.7 J | 232 | 90.5 | 50.6 J | 62.7 J | 62.5 J | 62.5 J | 75.3 J | 89.7 | 96.5 |
| Selenium | 0.54 U | 0.71 U | 0.6 U | 0.6 U | 1.1 U | 0.49 U | 0.62 U | 0.68 U | 0.64 U | 0.56 U | 0.39 J | 0.63 U |
| Silver | 0.02 J | 0.1 J | 0.34 U | 0.34 U | 0.9 J | 0.28 U | 0.36 U | 0.09 J | 0.37 U | 0.32 U | 0.04 J | 0.36 U |
| Sodium | 71.8 J | 56.7 J | 43 U | 23.8 J | 41.2 J | 17.4 J | 45 U | 48 U | 46 U | 40 U | 42 U | 45 U |
| Thallium | 0.24 J | 0.51 U | 0.43 U | 0.43 U | 0.8 U | 0.35 U | 0.45 U | 0.48 U | 0.46 U | 0.4 U | 0.42 U | 0.45 U |
| Vanadium | 5.7 | 4.3 | 2.8 | 7.7 | 4.4 | 1.6 J | 3.4 | 2.9 | 2.8 | 3.3 | 3.6 | 2.7 |
| Zinc | 44.9 | 35.2 | 0.92 U | 2.9 U | 537 | 42.2 | 7.5 | 92.1 | 3.3 U | 57.1 J | 183 J | 5.3 |
| **Wet Chemistry** | | | | | | | | | | | | |
| Chromium (hexavalent) (mg/kg) | 0.84 J | 0.43 UJ | 0.95 UJ | 0.44 U | 490 | 0.46 U | 0.88 | 0.43 J | 0.49 J | 0.51 J | 0.42 UJ | 1.7 J |

**Notes:**

Shading indicates detections

NA - Not analyzed

J - Analyte present, value may or may not be accurate or precise

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

mg/kg - Milligrams per kilogram

µg/kg - Micrograms per kilogram

**TABLE 5-2**
Test Pit Investigation Soil Analytical Results
*Site 6 Supplemental Investigation Report*
*MCB CamLej, North Carolina*

| Station ID | DRAFT MCB CamLej Background | NCSSLs | Adjusted Industrial Soil | Adjusted Residential Soil | Project Action | IR06-TP01 | | IR06-TP02 | IR06-TP03 | IR06-TP04 | | IR06-TP06 | IR06-TP07 | IR06-TP08 | IR06-TP09 | IR06-TP10 | IR06-TP12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | (CH2M HILL, 2011) | (January, 2010) | RSLs (Nov, 2010) | RSLs (Nov, 2010) | Limits* | IR06-TP01-N-4-5-11A | IR06-TP01-S-4-5-11A | IR06-TP02-W-4-5-11A | IR06-TP03-N-3-4-11A | IR06-TP04D-N-3-4-11A | IR06-TP04-N-3-4-11A | IR06-TP06-N-2-3-11A | IR06-TP07-S-3-4-11A | IR06-TP08-N-3-4-11A | IR06-TP09-2-3-11A | IR06-TP10-4-5-11A | IR06-TP12-N-2-3-11A |
| Sample Date | | | | | | 01/19/11 | 01/19/11 | 01/18/11 | 01/21/11 | 01/19/11 | 01/19/11 | 01/20/11 | 01/20/11 | 01/21/11 | 01/21/11 | 01/24/11 | 01/24/11 |
| **Chemical Name** | | | | | | | | | | | | | | | | | |
| **Volatile Organic Compounds (µg/kg)** | | | | | | | | | | | | | | | | | |
| Chlorobenzene | -- | 450 | 140,000 | 29,000 | 450 | 2.4 UJ | 2.8 UJ | 2.5 U | 4.4 J | 2.8 UJ | 2.5 UJ | 2.8 UJ | 2.8 UJ | 6.5 J | 10 J | **70,000,000** | 5.4 J |
| Dichlorodifluoromethane (Freon-12) | -- | 29,000 | 78,000 | 18,000 | 18,000 | 4.9 UJ | 5.5 UJ | 5 U | 5 UJ | 32 J | 59 J | 5.5 UJ | 5.5 UJ | 5 UJ | 5.5 UJ | 3,200,000 U | 4.7 UJ |
| Tetrachloroethene | -- | 5 | 2,600 | 550 | 5 | 2.4 UJ | 2.8 UJ | 2.5 U | 2.5 U | 3.3 J | 2.7 J | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ |
| Trichloroethene | -- | 18 | 14,000 | 2,800 | 18 | 2.4 UJ | 2.8 UJ | 2.5 U | 2.5 U | 0.91 J | 0.65 J | 2.8 UJ | 2.8 UJ | 2.5 UJ | 2.8 UJ | 1,600,000 U | 2.4 UJ |
| **Semivolatile Organic Compounds (µg/kg)** | | | | | | | | | | | | | | | | | |
| 2-Chloronaphthalene | -- | -- | 180,000 | 180,000 | 180,000 | 260 U | 270 U | 290 U | 290 U | 290 U | 300 U | 290 U | 300 U | 270 U | 280 U | 2,200 | 280 U |
| 2-Methylnaphthalene | -- | 1,600 | 370,000 | 31,000 | 1,600 | 260 U | 270 U | 290 U | 290 U | 290 U | 300 U | 290 U | 300 U | 270 U | 280 U | 2,800 | 280 U |
| Acenaphthene | -- | 8,400 | 3,300,000 | 340,000 | 8,400 | 2.9 J | 2.2 J | 12 UJ | 12 U | 12 UJ | 12 UJ | 12 UJ | 12 UJ | 11 U | 11 U | 36 U | 11 U |
| Anthracene | -- | 660,000 | 17,000,000 | 1,700,000 | 660,000 | 2.5 J | 11 U | 12 U | 12 U | 12 U | 12 U | 12 U | 12 U | 11 U | 11 U | 36 U | 11 U |
| Benzaldehyde | -- | -- | 1,200,000 | 780,000 | 780,000 | 260 UJ | 270 UJ | 290 UJ | 290 UJ | 290 UJ | 300 UJ | 290 UJ | 520 J | 270 UJ | 280 UJ | 900 UJ | 280 UJ |
| Benzo(a)anthracene | -- | 180 | 2,100 | 150 | 150 | 15 J | 12 J | 3.4 J | 12 U | 3.8 J | 4.6 J | 2.5 J | 12 U | 3 J | 11 U | 36 U | 7.2 J |
| Benzo(a)pyrene | -- | 59 | 210 | 15 | 15 | 17 J | 9.7 J | 12 U | 12 U | 7.4 J | 20 J | 12 U | 12 U | 11 U | 11 U | 17 J | 11 U |
| Benzo(b)fluoranthene | -- | 600 | 2,100 | 150 | 150 | 28 J | 14 J | 12 U | 12 U | 12 U | 12 U | 12 U | 12 U | 11 U | 11 U | 22 J | 11 U |
| Benzo(g,h,i)perylene | -- | 360,000 | 1,700,000 | 170,000 | 170,000 | 32 J | 5.4 J | 12 U | 12 U | 51 | 110 | 12 U | 12 U | 11 U | 11 U | 36 U | 11 U |
| Chrysene | -- | 18,000 | 210,000 | 15,000 | 15,000 | 11 J | 3.6 J | 12 U | 12 U | 12 U | 12 U | 12 U | 12 U | 11 UJ | 11 U | 36 U | 11 U |
| Dibenz(a,h)anthracene | -- | 190 | 210 | 15 | 15 | 15 J | 2 J | 12 U | 12 U | 12 U | 12 U | 12 U | 12 U | 11 U | 11 U | 36 U | 11 U |
| Fluoranthene | -- | 330,000 | 2,200,000 | 230,000 | 230,000 | 27 | 22 J | 12 U | 12 U | 12 U | 12 U | 12 U | 12 U | 11 U | 11 U | 36 U | 3.6 J |
| Indeno(1,2,3-cd)pyrene | -- | 2,000 | 2,100 | 150 | 150 | 27 J | 10 J | 12 U | 12 U | 22 J | 42 | 12 U | 12 U | 11 U | 11 U | 36 U | 11 U |
| Naphthalene | -- | 210 | 18,000 | 3,600 | 210 | 11 UJ | 11 UJ | 12 UJ | 12 U | 12 UJ | 12 UJ | 12 UJ | 12 UJ | 11 U | 11 U | 5,700 | 11 U |
| Pentachlorophenol | -- | 31 | 2,700 | 890 | 31 | 650 U | 680 U | 720 U | 710 U | 720 U | 750 U | 710 U | 740 U | 670 U | 690 U | 1,600 J | 690 U |
| Phenanthrene | -- | 57,000 | 17,000,000 | 1,700,000 | 57,000 | 21 J | 16 J | 12 U | 12 U | 12 U | 12 U | 12 U | 12 U | 11 U | 2.4 J | 20 J | 5.1 J |
| Pyrene | -- | 220,000 | 1,700,000 | 170,000 | 170,000 | 21 J | 15 J | 12 U | 12 U | 12 U | 2.8 J | 12 U | 12 U | 11 U | 11 U | 36 U | 3.1 J |
| **Pesticide/Polychlorinated Biphenyls (µg/kg)** | | | | | | | | | | | | | | | | | |
| 4,4'-DDD | -- | 240 | 7,200 | 2,000 | 240 | 320 | 3.8 J | 0.94 J | 1.8 U | 200 J | 3 J | 2 U | 2 U | 1.8 U | 0.59 J | 280 | 1.9 U |
| 4,4'-DDE | -- | -- | 5,100 | 1,400 | 1,400 | 120 | 1.4 J | 0.73 J | 1.8 U | 71 J | 1.5 J | 2 U | 2 UJ | 1.8 U | 15 | 45 J | 1.9 U |
| 4,4'-DDT | -- | 340 | 7,000 | 1,700 | 340 | 290 | 4 J | 1 J | 1.8 U | 130 J | 6.3 J | 2 U | 2 U | 1.8 U | 2.7 J | 20 U | 1.9 U |
| Aldrin | -- | -- | 100 | 29 | 29 | 0.9 U | 0.96 U | 0.96 UJ | 0.92 U | 0.93 U | 0.81 J | 1 U | 1 U | 0.92 U | 0.94 U | 10 U | 0.99 U |
| alpha-Chlordane | -- | 68 | 6,500 | 1,600 | 68 | 0.9 U | 0.96 U | 0.49 J | 0.92 U | 0.93 U | 1 U | 1 U | 1 UJ | 0.92 U | 0.43 J | 10 U | 0.99 U |
| Aroclor-1260 | -- | -- | 740 | 220 | 220 | 9.1 U | 26 | 10 U | 9.2 U | 9.3 U | 10 U | 10 U | 10 U | 9.2 U | 9.4 U | 10 U | 9.9 U |
| beta-BHC | -- | 1.2 | 960 | 270 | 270 | 0.9 U | 0.96 U | 0.96 UJ | 0.92 U | 0.93 U | 1 U | 1 U | 1 UJ | 0.92 U | 0.94 U | 220 | 0.99 U |
| Dieldrin | -- | 0.81 | 110 | 30 | 0.81 | 49 J | 1.4 J | 1.1 J | 1.8 U | 51 J | 11 J | 0.9 J | 0.97 J | 1.8 U | 0.9 J | 40 | 1.9 U |
| Endrin | -- | 810 | 18,000 | 1,800 | 810 | 1.7 U | 1.9 U | 1.9 UJ | 1.8 U | 1.8 U | 1.5 J | 2 U | 2 UJ | 1.8 U | 1.8 U | 20 U | 1.9 U |
| Endrin ketone | -- | 810 | 18,000 | 1,800 | 810 | 1.7 U | 1.9 U | 1.9 UJ | 1.8 U | 1.8 U | 1.1 J | 2 U | 2 UJ | 1.8 U | 1.8 U | 20 U | 1.9 U |
| gamma-Chlordane | -- | 68 | 6,500 | 1,600 | 68 | 0.9 U | 0.96 U | 0.68 J | 0.92 U | 0.93 U | 1 U | 1 U | 1 UJ | 0.92 U | 0.56 J | 10 U | 0.99 U |
| Heptachlor epoxide | -- | 0.82 | 190 | 53 | 0.82 | 0.45 J | 0.96 U | 0.96 UJ | 0.92 U | 0.93 U | 1 U | 1 U | 1 UJ | 0.92 U | 0.94 U | 10 U | 0.99 U |
| **Total Metals (mg/kg)** | | | | | | | | | | | | | | | | | |
| Aluminum | 26,600 | -- | 99,000 | 7,700 | 7,700 | 4,180 | 3,660 | 1,990 | 3,140 | 3,900 | 3,570 | 5,140 | 3,120 | 8,840 | 3,940 | 1,530 | 3,700 |
| Antimony | 1.79 | -- | 41 | 3.1 | 1.79 | 5.3 J | 13.5 J | 0.48 UJ | 0.46 U | 0.4 UJ | 0.42 UJ | 0.43 UJ | 0.45 UJ | 0.43 U | 7.1 | 0.35 U | 0.45 U |
| Arsenic | 14.7 | 5.8 | 1.6 | 0.39 | 0.39 | **2.7** | **7** | 0.08 J | 0.46 U | 0.18 J | 0.3 J | 0.27 J | 0.1 J | 0.45 U | **3.4** | 0.35 U | 0.45 U |
| Barium | 53.2 | 580 | 19,000 | 1,500 | 53.2 | 11.2 | 10.6 | 2.2 | 3 | 6 | 5.6 | 3 | 3.2 | 8.3 | 117 | 1.8 | 3.6 |
| Beryllium | -- | -- | 200 | 16 | 16 | 0.04 J | 0.04 J | 0.01 J | 0.01 J | 0.02 J | 0.02 J | 0.02 J | 0.02 J | 0.05 J | 0.08 J | 0.01 J | 0.01 J |
| Cadmium | 1.3 | 3 | 80 | 7 | 1.300 | 0.14 J | 0.09 J | 0.38 J | 0.03 J | 0.04 J | 0.08 J | 0.26 U | 0.27 U | 0.03 J | 2.7 | 0.01 J | 0.02 J |
| Calcium | 720 | -- | -- | -- | 720 | 51,400 | 19,800 | 146 | 36.3 | 2,190 | 3,880 | 109 | 30.4 U | 33.5 | 2,200 | 35.2 | 188 |
| Chromium | 32.7 | 3.8 | 5.6 | 0.29 | 0.29 | **6.2** | **6.4** | 2.8 | 3.1 | 3.8 | 4.4 | 4 | 3.1 | **8.2** | **596** | 2.8 | 2.8 |
| Chromium (hexavalent) (mg/kg) | 6.15 | 3.8 | 5.6 | 0.29 | 0.29 | 0.84 J | 0.43 UJ | 0.43 J | 0.49 J | 0.51 J | 0.42 UJ | 0.95 UJ | 1.7 J | 0.44 U | **490** | 0.46 U | 0.88 |
| Cobalt | 1 | -- | 30 | 2.3 | 1 | 6.2 | 0.49 J | 0.39 U | 0.14 J | 0.22 J | 0.23 J | 0.1 J | 0.13 J | 0.62 J | 4.8 J | 0.09 J | 0.64 J |
| Copper | 6.61 | 700 | 4,100 | 310 | 6.61 | 5.1 | 4.2 | 9.6 | 0.5 J | 2.2 | 5.2 | 0.31 J | 0.27 J | 0.71 J | 180 | 0.75 J | 0.89 U |
| Iron | 33,600 | 150 | 72,000 | 5,500 | 150 | 2,110 | 6,330 | 2,740 | 314 | 839 | 2,390 | 358 | 403 | 1,060 | 22,000 | 413 | 878 |
| Lead | 14.4 | 270 | 800 | 400 | 14.40 | 17.9 | 23.6 | 31.7 | 2.8 | 16 | 17.4 | 3.5 | 2.2 | 4.6 | **2,800** | 6.4 | 4.4 |
| Magnesium | 732 | -- | -- | -- | 732 | 734 | 1,160 | 59.5 | 65.6 | 106 | 146 | 75.8 | 80.4 | 228 | 164 | 47.7 | 66 |
| Manganese | 16.9 | 65 | 2,300 | 180 | 16.90 | 64.3 | 21.6 | 13.9 | 2.9 | 5 | 6.5 | 1.6 | 2.3 | 4.1 | 360 | 1.9 | 6 |
| Mercury | 0.148 | 1 | 31 | 2.3 | 0.148 | 0.01 J | 0.03 | 0.23 | 0.008 J | 0.02 J | 0.07 J | 0.02 J | 0.02 J | 0.018 U | 0.03 J | 0.08 | 0.03 J |
| Nickel | 8.86 | 130 | 2,000 | 150 | 8.86 | 8.3 | 7.8 | 0.48 J | 0.8 J | 2.5 J | 2.1 J | 1.1 J | 1.2 J | 3.5 | 14.7 | 0.46 J | 1.5 J |
| Potassium | 1,020 | -- | -- | -- | 1,020 | 182 | 142 | 62.5 J | 62.5 J | 75.3 J | 89.7 | 84.7 J | 96.5 | 232 | 90.5 | 50.6 J | 62.7 J |
| Selenium | 0.948 | 2.1 | 510 | 39 | 0.948 | 0.54 U | 0.71 U | 0.68 U | 0.64 U | 0.56 U | 0.39 J | 0.6 U | 0.63 U | 0.6 U | 1.1 U | 0.49 U | 0.62 U |
| Silver | -- | 3.4 | 510 | 39 | 3.4 | 0.02 J | 0.1 J | 0.09 J | 0.37 U | 0.32 U | 0.04 J | 0.34 U | 0.36 U | 0.34 U | 0.9 J | 0.28 U | 0.36 U |
| Sodium | 81.1 | -- | -- | -- | 81.1 | 71.8 J | 56.7 J | 48 U | 46 U | 40 U | 42 U | 43 U | 45 U | 23.8 J | 41.2 J | 17.4 J | 45 U |
| Thallium | -- | -- | -- | -- | -- | 0.24 J | 0.51 U | 0.48 U | 0.46 U | 0.4 U | 0.42 U | 0.43 U | 0.45 U | 0.43 U | 0.8 U | 0.35 U | 0.45 U |
| Vanadium | 76.10 | -- | 520 | 39 | 39 | 5.7 | 4.3 | 2.9 | 2.8 | 3.3 | 3.6 | 2.8 | 2.7 | 7.7 | 4.4 | 1.6 J | 3.4 |
| Zinc | 16.6 | 1,200 | 31,000 | 2,300 | 16.6 | 44.9 | 35.2 | 92.1 | 3.3 U | 57.1 J | 183 J | 0.92 U | 5.3 | 2.9 U | 537 | 42.2 | 7.5 |

Notes:
Shading indicates exceedance of background concentration for subsurface soil
Bold box indicates exceedance of NC SSLs
**Bold text indicates exceedance of Adjusted Industrial Soil RSLs**
Underline indicates exceedance of Adjusted Residential Soil RSLs
RSLs were adjusted for noncarcinogens to account for exposure to multiple constituents
NA - Not analyzed
J - Analyte present, value may or may not be accurate or precise
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
mg/kg - Milligrams per kilogram
µg/kg - Micrograms per kilogram
* - Project Action Limits represent the most conservative value among Base Background, RSL, and NCSSL. The criteria has been included for reference and no formatting has been added to the table to indicate exceedances of the PAL.

WE-35
Camp Lejeune - Site 6
Test Pit Subsurface Raw Analytical Results
January 2011

| Station ID | IR06-TP01 | | IR06-TP06 | IR06-TP08 | IR06-TP09 | IR06-TP10 | IR06-TP12 | IR06-TP2 | IR06-TP3 | IR06-TP4 | | IR06-TP7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID** | IR06-TP01-N-4-5-11A | IR06-TP01-S-4-5-11A | IR06-TP06-N-2-3-11A | IR06-TP08-N-3-4-11A | IR06-TP09-2-3-11A | IR06-TP10-4-5-11A | IR06-TP12-N-2-3-11A | IR06-TP02-W-4-5-11A | IR06-TP03-N-3-4-11A | IR06-TP04D-N-3-4-11A | IR06-TP04-N-3-4-11A | IR06-TP07-S-3-4-11A |
| **Sample Date** | 01/19/11 | 01/19/11 | 01/20/11 | 01/21/11 | 01/21/11 | 01/24/11 | 01/24/11 | 01/18/11 | 01/21/11 | 01/19/11 | 01/19/11 | 01/20/11 |
| **Chemical Name** | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| **Explosives (µg/kg)** | | | | | | | | | | | | |
| 1,3,5-Trinitrobenzene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U | 65 U | 57 U | 55 U | 57 U | 61 U |
| 1,3-Dinitrobenzene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U | 65 U | 57 U | 55 U | 57 U | 61 U |
| 2,4,6-Trinitrotoluene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U | 65 U | 57 U | 55 U | 57 U | 61 U |
| 2-Amino-4,6-dinitrotoluene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U | 65 U | 57 U | 55 U | 57 U | 61 U |
| 2-Nitrotoluene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U | 65 U | 57 U | 55 U | 57 U | 61 U |
| 3-Nitrotoluene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U | 65 U | 57 U | 55 U | 57 U | 61 U |
| 4-Amino-2,6-dinitrotoluene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U | 65 U | 57 U | 55 U | 57 U | 61 U |
| 4-Nitrotoluene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U | 65 U | 57 U | 55 U | 57 U | 61 U |
| HMX | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U | 65 U | 57 U | 55 U | 57 U | 61 U |
| Nitroglycerin | 410 U | 450 U | 490 U | 470 U | 410 U | 490 U | 460 U | 520 U | 460 U | 440 U | 460 U | 490 U |
| Perchlorate | 0.45 U | 0.44 U | 0.49 U | 0.47 U | 0.45 U | 0.48 U | 0.48 U | 0.5 U | 0.45 U | 0.48 U | 0.47 U | 0.49 U |
| PETN | 410 U | 450 U | 490 U | 470 U | 410 U | 490 U | 460 U | 520 U | 460 U | 440 U | 460 U | 490 U |
| RDX | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U | 65 U | 57 U | 55 U | 57 U | 61 U |
| Tetryl | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U | 65 U | 57 U | 55 U | 57 U | 61 U |

**Notes:**

Shading indicates detections
NA - Not analyzed
J - Analyte present, value may or may not be accurate or precise
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
mg/kg - Milligrams per kilogram
µg/kg - Micrograms per kilogram

WE-35
Camp Lejeune - Site 6
Test Pit Subsurface Detected Analytical Results
January 2011

| Station ID | IR06-TP01 | | IR06-TP06 | IR06-TP08 | IR06-TP09 | IR06-TP10 | IR06-TP12 | IR06-TP2 | IR06-TP3 | IR06-TP4 | | IR06-TP7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID** | IR06-TP01-N-4-5-11A | IR06-TP01-S-4-5-11A | IR06-TP06-N-2-3-11A | IR06-TP08-N-3-4-11A | IR06-TP09-2-3-11A | IR06-TP10-4-5-11A | IR06-TP12-N-2-3-11A | IR06-TP02-W-4-5-11A | IR06-TP03-N-3-4-11A | IR06-TP04D-N-3-4-11A | IR06-TP04-N-3-4-11A | IR06-TP07-S-3-4-11A |
| **Sample Date** | 01/19/11 | 01/19/11 | 01/20/11 | 01/21/11 | 01/21/11 | 01/24/11 | 01/24/11 | 01/18/11 | 01/21/11 | 01/19/11 | 01/19/11 | 01/20/11 |
| **Chemical Name** | | | | | | | | | | | | |
| **Explosives (µg/kg)** | | | | | | | | | | | | |
| No Detections | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

**Notes:**

Shading indicates detections
NA - Not analyzed
J - Analyte present, value may or may not be accurate or precise
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
mg/kg - Milligrams per kilogram
µg/kg - Micrograms per kilogram

# Appendix E
# Human Health Risk Screening and Assessment Tables

# Appendix E.1
# Human Health Risk Screening

TABLE 2.1

**Occurrence, Distribution, and Selection of Chemicals of Potential Concern**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Scenario Timeframe: Future<br>Medium: Groundwater<br>Exposure Medium: Groundwater |
|---|

| Exposure Point | CAS Number | Chemical | Minimum [1] Concentration Qualifier | Maximum [1] Concentration Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration [2] Used for Screening | Background [3] Value | Screening [4] Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for [5] Contaminant Deletion or Selection |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Groundwater | 121-14-2 | 2,4-Dinitrotoluene | ND | ND | UG/L | | 0/6 | 0.302 - 0.32 | 3.2E-01 | N/A | 2.0E-01 C | N/A | N/A | YES | DLASL |
| | 606-20-2 | 2,6-Dinitrotoluene | ND | ND | UG/L | | 0/6 | 0.302 - 0.32 | 3.2E-01 | N/A | 1.5E+00 N | N/A | N/A | NO | DLBSL |
| | **98-95-3** | **Nitrobenzene** | **3.1E-01 J** | **3.1E-01 J** | **UG/L** | **MR22-MW01-12A** | **1/6** | **0.302 - 0.32** | **3.1E-01** | **N/A** | **1.2E-01 C** | **N/A** | **N/A** | **YES** | **ASL** |
| | 99-35-4 | 1,3,5-Trinitrobenzene | 5.8E-01 J | 5.8E-01 J | UG/L | MR22-GW03-11D | 1/6 | 0.302 - 0.32 | 5.8E-01 | N/A | 4.6E+01 N | N/A | N/A | NO | BSL |
| | 99-65-0 | 1,3-Dinitrobenzene | ND | ND | UG/L | | 0/6 | 0.302 - 0.32 | 3.2E-01 | N/A | 1.5E-01 N | N/A | N/A | YES | DLASL |
| | 118-96-7 | 2,4,6-Trinitrotoluene | ND | ND | UG/L | | 0/6 | 0.302 - 0.32 | 3.2E-01 | N/A | 7.6E-01 N | N/A | N/A | NO | DLBSL |
| | 35572-78-2 | 2-Amino-4,6-dinitrotoluene | ND | ND | UG/L | | 0/6 | 0.302 - 0.32 | 3.2E-01 | N/A | 3.0E+00 N | N/A | N/A | NO | DLBSL |
| | 88-72-2 | 2-Nitrotoluene | ND | ND | UG/L | | 0/6 | 0.302 - 0.32 | 3.2E-01 | N/A | 2.7E-01 C | N/A | N/A | YES | DLASL |
| | **99-08-1** | **3-Nitrotoluene** | **4.2E-01 J** | **4.2E-01 J** | **UG/L** | **MR22-MW01D-12A** | **1/6** | **0.302 - 0.32** | **4.2E-01** | **N/A** | **1.3E-01 N** | **N/A** | **N/A** | **YES** | **ASL** |
| | 19406-51-0 | 4-Amino-2,6-dinitrotoluene | ND | ND | UG/L | | 0/6 | 0.302 - 0.32 | 3.2E-01 | N/A | 3.0E+00 N | N/A | N/A | NO | DLBSL |
| | 99-99-0 | 4-Nitrotoluene | ND | ND | UG/L | | 0/6 | 0.302 - 0.32 | 3.2E-01 | N/A | 3.7E+00 C | N/A | N/A | NO | DLBSL |
| | 2691-41-0 | HMX | ND | ND | UG/L | | 0/6 | 0.302 - 0.32 | 3.2E-01 | N/A | 7.8E+01 N | N/A | N/A | NO | DLBSL |
| | 55-63-0 | Nitroglycerin | ND | ND | UG/L | | 0/6 | 0.755 - 0.8 | 8.0E-01 | N/A | 1.5E-01 N | N/A | N/A | YES | DLASL |
| | 14797-73-0 | Perchlorate | 5.5E-01 J | 5.5E-01 J | UG/L | MR22-GW02-11D | 1/6 | 2 - 2 | 5.5E-01 | N/A | 1.1E+00 N | N/A | N/A | NO | BSL |
| | 78-11-5 | PETN | ND | ND | UG/L | | 0/6 | 0.755 - 0.8 | 8.0E-01 | N/A | 3.0E+00 N | N/A | N/A | NO | DLBSL |
| | 121-82-4 | RDX | ND | ND | UG/L | | 0/6 | 0.302 - 0.32 | 3.2E-01 | N/A | 6.1E-01 C | N/A | N/A | NO | DLBSL |
| | 479-45-8 | Tetryl | ND | ND | UG/L | | 0/6 | 0.302 - 0.32 | 3.2E-01 | N/A | 6.3E+00 N | N/A | N/A | NO | DLBSL |
| | 7429-90-5 | Aluminum | 3.2E+01 J | 1.4E+02 | UG/L | MR22-GW03-11D | 6/6 | 50 - 50 | 1.4E+02 | 1.4E+04 | 1.6E+03 N | N/A | N/A | NO | BSL |
| | **7440-36-0** | **Antimony** | **2.6E+00** | **1.5E+01** | **UG/L** | **MR22-GW02-11D** | **3/6** | **2.5 - 2.5** | **1.5E+01** | **3.9E+00** | **6.0E-01 N** | **6.0E+00** | **MCL** | **YES** | **ASL** |
| | 7440-38-2 | Arsenic | ND | ND | UG/L | | 0/6 | 2.5 - 2.5 | 2.5E+00 | 9.8E+00 | 4.5E-02 C | 1.0E+01 | MCL, 15A NCAC 2L | NO | BBK |
| | 7440-39-3 | Barium | 2.4E+01 | 4.8E+01 | UG/L | IR06-GW31-11D | 6/6 | 10 - 10 | 4.8E+01 | 3.6E+02 | 2.9E+02 N | 2.0E+03 | MCL | NO | BSL |
| | | | | | | | | | | | | 7.0E+02 | 15A NCAC 2L | | |
| | 7440-41-7 | Beryllium | ND | ND | UG/L | | 0/6 | 1.25 - 1.25 | 1.3E+00 | 8.7E-01 | 1.6E+00 N | 4.0E+00 | MCL | NO | DLBSL |
| | **7440-43-9** | **Cadmium** | **2.8E-01 J** | **6.1E+00** | **UG/L** | **IR06-GW03D-11D** | **2/6** | **1.25 - 1.25** | **6.1E+00** | **N/A** | **6.9E-01 N** | **5.0E+00** | **MCL** | **YES** | **ASL** |
| | | | | | | | | | | | | 2.0E+00 | 15A NCAC 2L | | |
| | 7440-70-2 | Calcium | 3.1E+04 | 7.3E+04 | UG/L | IR06-GW31-11D | 6/6 | 1250 - 1250 | 7.3E+04 | 1.8E+05 | N/A C | N/A | N/A | NO | NUT |
| | 7440-47-3 | Chromium | 5.5E-01 J | 5.5E-01 J | UG/L | MR22-GW03-11D | 1/6 | 2.5 - 2.5 | 5.5E-01 | 1.7E+01 | 3.1E-02 | 1.0E+02 | MCL | NO | BBK |
| | | | | | | | | | | | N | 1.0E+01 | 15A NCAC 2L | | |
| | 7440-48-4 | Cobalt | ND | ND | UG/L | | 0/6 | 3.12 - 3.12 | 3.1E+00 | 3.4E+00 | 4.7E-01 N | N/A | N/A | NO | DLBBK |
| | 7440-50-8 | Copper | ND | ND | UG/L | | 0/6 | 2.5 - 2.5 | 2.5E+00 | 6.6E+00 | 6.2E+01 | 1.3E+03 | MCL | NO | DLBSL |
| | | | | | | | | | | | N | 1.0E+03 | 15A NCAC 2L | | |
| | 7439-89-6 | Iron | 4.2E+01 | 7.5E+02 | UG/L | IR06-GW31-11D | 6/6 | 25 - 25 | 7.5E+02 | 1.6E+04 | 1.1E+03 N | 3.0E+02 | 15A NCAC 2L | NO | BSL |
| | 7439-92-1 | Lead | ND | ND | UG/L | | 0/6 | 0.75 - 0.75 | 7.5E-01 | 8.9E+00 | 1.5E+01 | 1.5E+01 | MCL, 15A NCAC 2L | NO | DLBSL |
| | 7439-95-4 | Magnesium | 1.3E+03 | 5.2E+03 J | UG/L | MR22-MW01-12A | 6/6 | 1250 - 1250 | 5.2E+03 | 1.4E+04 | N/A N | N/A | N/A | NO | NUT |
| | **7439-96-5** | **Manganese** | **2.2E+00 J** | **2.0E+02** | **UG/L** | **MR22-GW03-11D** | **6/6** | **3.75 - 3.75** | **2.0E+02** | **1.8E+02** | **3.2E+01 N** | **5.0E+01** | **15A NCAC 2L** | **YES** | **ASL** |
| | 7439-97-6 | Mercury | ND | ND | UG/L | | 0/6 | 0.2 - 0.2 | 2.0E-01 | N/A | 4.3E-01 | 2.0E+00 | MCL | NO | DLBSL |
| | | | | | | | | | | | N | 1.0E+00 | 15A NCAC 2L | | |

TABLE 2.1

**Occurrence, Distribution, and Selection of Chemicals of Potential Concern**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

| Exposure Point | CAS Number | Chemical | Minimum [1] Concentration Qualifier | Maximum [1] Concentration Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration [2] Used for Screening | Background [3] Value | Screening [4] Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for [5] Contaminant Deletion or Selection |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Groundwater | 7440-02-0 | Nickel | 9.0E-01 J | 9.3E-01 J | UG/L | MR22-GW03-11D | 2/6 | 2.5 - 2.5 | 9.3E-01 | 1.2E+01 | 3.0E+01 | 1.0E+02 | 15A NCAC 2L | NO | BSL |
| (cont'd) | 7440-09-7 | Potassium | 4.2E+02 J | 3.3E+03 | UG/L | IR06-GW03-11D | 6/6 | 1250 - 1250 | 3.3E+03 | 5.6E+03 | N/A N | N/A | N/A | NO | NUT |
| | 7782-49-2 | Selenium | 1.6E+00 J | 3.7E+00 | UG/L | IR06-GW03-11D | 4/6 | 2.5 - 2.5 | 3.7E+00 | N/A | 7.8E+00 | 5.0E+01 | MCL | NO | BSL |
| | | | | | | | | | | | N | 2.0E+01 | 15A NCAC 2L | | |
| | 7440-22-4 | Silver | ND | ND | UG/L | | 0/6 | 2.5 - 2.5 | 2.5E+00 | 7.2E-01 | 7.1E+00 | 2.0E+01 | 15A NCAC 2L | NO | DLBSL |
| | 7440-23-5 | Sodium | 3.1E+03 | 4.8E+03 | UG/L | MR22-GW03-11D | 6/6 | 1250 - 1250 | 4.8E+03 | 2.3E+04 | N/A N | N/A | N/A | NO | NUT |
| | 7440-28-0 | Thallium | ND | ND | UG/L | | 0/6 | 2 - 2 | 2.0E+00 | N/A | 1.6E-02 N | 2.0E+00 | MCL | YES | DLASL |
| | 7440-62-2 | Vanadium | 1.6E+00 J | 7.5E+00 | UG/L | IR06-GW26-11D | 2/6 | 3.12 - 3.12 | 7.5E+00 | 2.7E+01 | 7.8E+00 N | N/A | N/A | NO | BSL |
| | 7440-66-6 | Zinc | 1.8E+00 J | 2.3E+02 | UG/L | IR06-GW26-11D | 4/6 | 5 - 5 | 2.3E+02 | 4.1E+01 | 4.7E+02 N | 1.0E+03 | 15A NCAC 2L | NO | BSL |

[1] Minimum/Maximum detected concentration. Unfiltered results for metals since in general no significant difference between filtered and unfiltered results.

[2] Maximum concentration is used for screening. If chemical was not detected, the maximum detection limit is used for screening.

[3] Background values are the background threshold values (BTVs) shallow groundwater concentrations. Background values are from *Draft Expanded Groundwater Background Study Report, Marine Corps Base Camp Lejeune, Jacksonville, North Carolina* , CH2M Hill, September 2011.

[4] Oak Ridge National Laboratory (ORNL). May, 2012. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
http://epa-prgs.ornl.gov/chemicals/index.shtml. Adjusted (noncarcinogenic RSLs adjusted by dividing by 10) tap water RSLs.
RSL value for chromium(VI) used as surrogate for chromium.
RSL value for mercury (mercuric chloride) used as surrogate for mercury.
The tap water value of 15 ug/L for lead is the action level provided in the Drinking Water Regulations and Health Advisories.

[5] Rationale Codes

Selection Reason:
- Above Screening Levels (ASL)
- Detection Limit Above Screening Level (DLASL), not quantitatively evaluated in HHRA

Deletion Reason:
- No Toxicity Information (NTX)
- Essential Nutrient (NUT)
- Below Screening Level (BSL)
- Detection Limit Below Screening Level (DLBSL)
- Below Background Value (BBK)
- Detection Limit Below Background Screening Level (DLBBK)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
MCL = Maximum Contaminant Level from EPA's National Primary Drinking Water Standards
15A NCAC 2L = North Carolina Classifications and Groundwater Quality Standards, Amended January 2010.
J = Estimated Value
C = Carcinogenic
N = Noncarcinogenic
N/A = Not applicable/not available
ND = Not detected
UG/L = micrograms per liter

Table 2.1a

Risk Ratio Screening for Groundwater, Maximum Detected Concentration

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Analyte | Detection Frequency | Maximum Detected Concentration (Qualifier) | Sample Location of Maximum Detected Concentration | Tap Water RSL | Acceptable Risk Level | Corresponding Hazard Index[a] | Corresponding Cancer Risk[b] | Target Organ |
|---|---|---|---|---|---|---|---|---|
| Nitrobenzene | 1 / 6 | 3.1E-01 J | MR22-MW01-12A | 1.2E-01 | 1E-06 | N/A | 3E-06 | NA |
| 3-Nitrotoluene | 1 / 6 | 4.2E-01 J | MR22-MW01D-12A | 1.3E+00 | 1 | 0.3 | N/A | Spleen |
| **Metals (ug/L)** | | | | | | | | |
| Antimony | 3 / 6 | 1.5E+01 | MR22-GW02-11D | 6.0E+00 | 1 | 2.5 | N/A | Longevity, Blood |
| Cadmium | 2 / 6 | 6.1E+00 | IR06-GW03D-11D | 6.9E+00 | 1 | 0.9 | N/A | Kidney |
| Manganese | 6 / 6 | 2.0E+02 | MR22-GW03-11D | 3.2E+02 | 1 | 0.6 | N/A | CNS |
| **Cumulative Corresponding Hazard Index[c]** | | | | | | **4.3** | | |
| **Cumulative Corresponding Cancer Risk[d]** | | | | | | | **3E-06** | |

| | |
|---|---|
| Total Kidney HI = | **0.9** |
| Total Spleen HI = | 0.3 |
| Total Longevity HI = | **2.5** |
| Total Blood HI = | **2.5** |
| Total CNS HI = | **0.6** |

**Notes:**

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk leve

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

CNS = Central Nervous System

COPC = Chemical of Potential Concern

HI = Hazard Index

J = Estimated Value

ug/L = micrograms per liter

N/A = Not available/not applicable

Table 2.1b

Risk Ratio Screening for Groundwater, 95% UCL Concentration

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Analyte | Detection Frequency | 95% UCL | | 95% UCL Rationale | Residential Soil RSL | Acceptable Risk Level | Corresponding Hazard Index[a] | Corresponding Cancer Risk[b] | Target Organ |
|---|---|---|---|---|---|---|---|---|---|
| **Metals (ug/L)** | | | | | | | | | |
| Antimony | 3 / 6 | 9.7E+00 | 1, 2 | 95% KM-t | 6.0E+00 | 1 | 1.6 | N/A | Longevity, Blood |
| Cadmium | 2 / 6 | 6.1E+00 | 4, 5 | Max | 6.9E+00 | 1 | 0.9 | N/A | Kidney |
| Manganese | 6 / 6 | 2.0E+02 | 1, 3, 5 | Max | 3.2E+02 | 1 | 0.6 | N/A | CNS |
| **Cumulative Corresponding Hazard Index[c]** | | | | | | | **3.1** | | |
| **Cumulative Corresponding Cancer Risk[d]** | | | | | | | | **N/A** | |

| | |
|---|---|
| Total Kidney HI = | **0.9** |
| Total Longevity HI = | **1.6** |
| Total Blood HI = | **1.6** |
| Total CNS HI = | **0.6** |

**Notes:**

[a] Corresponding Hazard Index equals 95% UCL concentration divided by the RSL divided by the acceptable risk leve

[b] Corresponding Cancer Risk equals 95% UCL concentration divided by the RSL divided by the acceptable risk leve

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

CNS = Central Nervous System
COPC = Chemical of Potential Concern
ug/L = micrograms per liter
HI = Hazard Index
N/A = Not available/not applicable

ProUCL, Version 4.1.00 used to determine distribution of data and calculate 95% UCL, following recommendations in users guide (USEPA. May 2010. ProUCL, Version 4.1. Prepared by Lockheed Martin Environmental Services).
Options: 95% Kaplan-Meier (t) UCL (95% KM-t); Maximum Detected Concentration (Max)

Upper Confidence Limit (UCL) Rationale:
(1) Shapiro-Wilk W Test/Lilliefors test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test/Lilliefors indicates data are normally distributed.
(3) Test indicates data are gamma distributed.
(4) Distribution tests are inconclusive
(5) Max value used because 95% UCL greater than max

TABLE 2.2

**Occurrence, Distribution, and Selection of Chemicals of Potential Concern**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Medium: Subsurface Soil |
| Exposure Medium: Subsurface Soil |

| Exposure Point | CAS Number | Chemical | Minimum [1] Concentration Qualifier | Maximum [1] Concentration Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration [2] Used for Screening | Background [3] Value | Screening [4] Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for [5] Contaminant Deletion or Selection |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Subsurface Soil | 121-14-2 | 2,4-Dinitrotoluene | 3.5E-02 J | 3.5E-02 J | MG/KG | UXO22-TP-S-NW | 1/26 | 0.1 - 0.4 | 3.5E-02 | N/A | 1.6E+00 C | 1.6E-03 | NCSSL | NO | BSL |
| | 606-20-2 | 2,6-Dinitrotoluene | 4.6E-02 J | 4.6E-02 J | MG/KG | UXO22-TP-S-NW | 1/26 | 0.1 - 0.4 | 4.6E-02 | N/A | 6.1E+00 N | N/A | N/A | NO | BSL |
| | 98-95-3 | Nitrobenzene | ND | ND | MG/KG | | 0/26 | 0.1 - 0.4 | 4.0E-01 | N/A | 4.8E+00 C | N/A | N/A | NO | DLBSL |
| | 99-35-4 | 1,3,5-Trinitrobenzene | ND | ND | MG/KG | | 0/26 | 0.1 - 0.4 | 4.0E-01 | N/A | 2.2E+02 N | N/A | N/A | NO | DLBSL |
| | 99-65-0 | 1,3-Dinitrobenzene | 3.6E-02 J | 6.3E-02 J | MG/KG | UXO22-TP-S-NE-D | 2/26 | 0.1 - 0.4 | 6.3E-02 | N/A | 6.1E-01 N | N/A | N/A | NO | BSL |
| | 118-96-7 | 2,4,6-Trinitrotoluene | 4.6E-02 J | 1.6E-01 J | MG/KG | UXO22-TP-S-NE | 3/26 | 0.1 - 0.4 | 1.6E-01 | N/A | 3.6E+00 N | N/A | N/A | NO | BSL |
| | 35572-78-2 | 2-Amino-4,6-dinitrotoluene | ND | ND | MG/KG | | 0/26 | 0.1 - 0.4 | 4.0E-01 | N/A | 1.5E+01 N | N/A | N/A | NO | DLBSL |
| | 88-72-2 | 2-Nitrotoluene | ND | ND | MG/KG | | 0/26 | 0.1 - 0.4 | 4.0E-01 | N/A | 2.9E+00 C | N/A | N/A | NO | DLBSL |
| | 99-08-1 | 3-Nitrotoluene | ND | ND | MG/KG | | 0/26 | 0.1 - 0.4 | 4.0E-01 | N/A | 6.1E-01 N | N/A | N/A | NO | DLBSL |
| | 19406-51-0 | 4-Amino-2,6-dinitrotoluene | ND | ND | MG/KG | | 0/26 | 0.1 - 0.4 | 4.0E-01 | N/A | 1.5E+01 N | N/A | N/A | NO | DLBSL |
| | 99-99-0 | 4-Nitrotoluene | ND | ND | MG/KG | | 0/26 | 0.1 - 0.4 | 4.0E-01 | N/A | 2.4E+01 N | N/A | N/A | NO | DLBSL |
| | 2691-41-0 | HMX | 7.3E-02 J | 7.3E-02 J | MG/KG | UXO22-TP-S-NE | 1/26 | 0.1 - 0.4 | 7.3E-02 | N/A | 3.8E+02 N | N/A | N/A | NO | BSL |
| | 55-63-0 | Nitroglycerin | ND | ND | MG/KG | | 0/26 | 0.312 - 1 | 1.0E+00 | N/A | 6.1E-01 N | N/A | N/A | YES | DLASL |
| | 14797-73-0 | Perchlorate | ND | ND | MG/KG | | 0/26 | 0.0055 - 0.028 | 2.8E-02 | N/A | 5.5E+00 N | N/A | N/A | NO | DLBSL |
| | 78-11-5 | PETN | 1.2E-01 J | 1.2E-01 J | MG/KG | UXO22-TP-S-NE-D | 1/26 | 0.312 - 1 | 1.2E-01 | N/A | 1.2E+01 N | N/A | N/A | NO | BSL |
| | 121-82-4 | RDX | 2.8E-01 J | 3.3E-01 J | MG/KG | UXO22-TP-S-NE-D | 2/26 | 0.1 - 0.4 | 3.3E-01 | N/A | 5.6E+00 C | N/A | N/A | NO | BSL |
| | 479-45-8 | Tetryl | ND | ND | MG/KG | | 0/26 | 0.1 - 0.4 | 4.0E-01 | N/A | 2.4E+01 N | N/A | N/A | NO | DLBSL |
| | 7429-90-5 | Aluminum | 1.5E+03 | 9.1E+03 | MG/KG | MR22-IS09-5-7-11D | 26/26 | 10.6 - 30 | 9.1E+03 | 2.7E+04 | 7.7E+03 N | N/A | N/A | NO | BBK |
| | **7440-36-0** | **Antimony** | **3.5E-01 J** | **1.4E+01 J** | **MG/KG** | **IR06-TP01-S-4-5-11A** | **6/25** | **0.528 - 1.31** | **1.4E+01** | **1.8E+00** | **3.1E+00 N** | **9.0E-01** | **NCSSL** | **YES** | **ASL** |
| | 7440-38-2 | Arsenic | 8.0E-02 J | 7.6E+00 J | MG/KG | MR22-IS11-17-19-12A | 18/26 | 0.335 - 1.3 | 7.6E+00 | 1.5E+01 | 3.9E-01 C | 5.8E+00 | NCSSL | NO | BBK |
| | 7440-39-3 | Barium | 1.8E+00 | 1.2E+02 | MG/KG | IR06-TP09-2-3-11A | 26/26 | 0.35 - 2.82 | 1.2E+02 | 5.3E+01 | 1.5E+03 N | 5.8E+02 | NCSSL | NO | BSL |
| | 7440-41-7 | Beryllium | 1.0E-02 J | 2.2E-01 J | MG/KG | MR22-IS11-17-19-12A | 14/26 | 0.264 - 0.51 | 2.2E-01 | N/A | 1.6E+01 N | 6.3E+01 | NCSSL | NO | BSL |
| | 7440-43-9 | Cadmium | 1.0E-02 J | 2.7E+00 | MG/KG | IR06-TP09-2-3-11A | 13/26 | 0.264 - 1.6 | 2.7E+00 | 1.3E+00 | 7.0E+00 N | 3.0E+00 | NCSSL | NO | BSL |
| | 7440-70-2 | Calcium | 3.4E+01 | 5.1E+04 | MG/KG | IR06-TP01-N-4-5-11A | 22/26 | 7 - 352 | 5.1E+04 | 7.2E+02 | N/A | N/A | N/A | NO | NUT |
| | **18540-29-9** | **Chromium (hexavalent)** | **4.3E-01 J** | **4.9E+02** | **MG/KG** | **IR06-TP09-2-3-11A** | **7/11** | **0.68 - 11** | **4.9E+02** | **6.2E+00** | **2.9E-01 C** | **3.8E+00** | **N/A** | **YES** | **ASL** |
| | 7440-47-3 | Chromium | 2.1E+00 | 6.0E+02 | MG/KG | IR06-TP09-2-3-11A | 26/26 | 0.279 - 2.4 | 6.0E+02 | 3.3E+01 | 1.2E+04 N | N/A | N/A | NO | BSL |
| | **7440-48-4** | **Cobalt** | **9.0E-02 J** | **6.2E+00** | **MG/KG** | **IR06-TP01-N-4-5-11A** | **15/26** | **0.66 - 4.8** | **6.2E+00** | **1.0E+00** | **2.3E+00 N** | **9.0E-01** | **NCSSL** | **YES** | **ASL** |
| | 7440-50-8 | Copper | 2.7E-01 J | 1.8E+02 | MG/KG | IR06-TP09-2-3-11A | 25/26 | 0.528 - 4 | 1.8E+02 | 6.6E+00 | 3.1E+02 N | 7.0E+02 | NCSSL | NO | BSL |
| | 7439-89-6 | Iron | 2.0E+02 | 2.2E+04 | MG/KG | IR06-TP09-2-3-11A | 26/26 | 5.28 - 16 | 2.2E+04 | 3.4E+04 | 5.5E+03 N | 1.5E+02 | NCSSL | NO | BBK |
| | **7439-92-1** | **Lead** | **1.3E+00** | **2.8E+03** | **MG/KG** | **IR06-TP09-2-3-11A** | **26/26** | **0.158 - 0.8** | **2.8E+03** | **1.4E+01** | **4.0E+02 NL** | **2.7E+02** | **NCSSL** | **YES** | **ASL** |
| | 7439-95-4 | Magnesium | 4.8E+01 | 1.2E+03 | MG/KG | IR06-TP01-S-4-5-11A | 20/26 | 7 - 352 | 1.2E+03 | 7.3E+02 | N/A | N/A | N/A | NO | NUT |
| | **7439-96-5** | **Manganese** | **9.5E-01** | **3.6E+02** | **MG/KG** | **IR06-TP09-2-3-11A** | **26/26** | **0.35 - 1.31** | **3.6E+02** | **1.7E+01** | **1.8E+02 N** | **6.5E+01** | **NCSSL** | **YES** | **ASL** |
| | 7439-97-6 | Mercury | 8.0E-03 J | 2.3E-01 | MG/KG | IR06-TP02-W-4-5-11A | 17/26 | 0.0278 - 0.0452 | 2.3E-01 | 1.5E-01 | 2.3E+00 N | 1.0E+00 | NCSSL | NO | BSL |
| | 7440-02-0 | Nickel | 4.3E-01 J | 1.5E+01 | MG/KG | IR06-TP09-2-3-11A | 26/26 | 0.528 - 6.4 | 1.5E+01 | 8.9E+00 | 1.5E+02 N | 1.3E+02 | NCSSL | NO | BSL |
| | 7440-09-7 | Potassium | 5.1E+01 J | 6.6E+02 J | MG/KG | MR22-IS11-17-19-12A | 22/26 | 70 - 352 | 6.6E+02 | 1.0E+03 | N/A | N/A | N/A | NO | NUT |
| | 7782-49-2 | Selenium | 2.2E-01 J | 4.1E-01 J | MG/KG | MR22-IS09-5-7-11D | 10/26 | 0.528 - 1.6 | 4.1E-01 | 9.5E-01 | 3.9E+01 N | 2.1E+00 | NCSSL | NO | BSL |
| | 7440-22-4 | Silver | 2.0E-02 J | 9.0E-01 J | MG/KG | IR06-TP09-2-3-11A | 5/26 | 0.279 - 2.4 | 9.0E-01 | N/A | 3.9E+01 N | 3.4E+00 | NCSSL | NO | BSL |

TABLE 2.2

**Occurrence, Distribution, and Selection of Chemicals of Potential Concern**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Medium: Subsurface Soil |
| Exposure Medium: Subsurface Soil |

| Exposure Point | CAS Number | Chemical | Minimum [1] Concentration Qualifier | Maximum [1] Concentration Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration [2] Used for Screening | Background [3] Value | Screening [4] Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for [5] Contaminant Deletion or Selection |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 7440-23-5 | Sodium | 1.7E+01 J | 7.2E+01 J | MG/KG | IR06-TP01-N-4-5-11A | 5/26 | 70 - 352 | 7.2E+01 | 8.1E+01 | N/A | N/A | N/A | NO | NUT |
| | **7440-28-0** | **Thallium** | **2.4E-01 J** | **2.4E-01 J** | **MG/KG** | **IR06-TP01-N-4-5-11A** | **1/26** | **0.422 - 2.4** | **2.4E-01** | **N/A** | **7.8E-02 N** | **2.8E-01** | **NCSSL** | **YES** | **ASL** |
| | 7440-62-2 | Vanadium | 1.3E+00 | 2.0E+01 J | MG/KG | MR22-IS11-17-19-12A | 26/26 | 0.66 - 4 | 2.0E+01 | 7.6E+01 | 3.9E+01 N | 6.0E+00 | NCSSL | NO | BSL |
| | 7440-66-6 | Zinc | 1.1E+00 J | 9.8E+02 | MG/KG | MR22-IS03-5-7-11D | 20/26 | 1.06 - 2.52 | 9.8E+02 | 1.7E+01 | 2.3E+03 N | 1.2E+03 | NCSSL | NO | BSL |

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening. If chemical was not detected, the maximum detection limit is used for screening.

[3] Background values are the background threshold values (BTVs) for subsurface soil data in developed areas (combined soil types).
Background values are from Final Expanded Soil Background Study Report, Marine Corps Base Camp Lejeune, Jacksonville, North Carolina, CH2M HILL, August 2011.

[4] Oak Ridge National Laboratory (ORNL). May, 2012. Regional Screening Levels for Chemical Contaminants at Superfund Sites. [Online]. Adjusted (RSLs based on non-cancer (N) divided by 10) residential soil RSLs. Available: http://epa-prgs.ornl.gov/chemicals/index.shtml
RSL value for chromium (III) used as surrogate for total chromium.
The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.
RSL value for mercury (inorganic salts) used as surrogate for mercury.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Detection Limit Above Screening Level (DLASL), not quantitatively evaluated in HHRA

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)
Detection Limit Below Screening Level (DLBSL)
Below Background Value (BBK)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
C = Carcinogenic
N = Noncarcinogenic
NCSSL = North Carolina Preliminary Soil Remediation Goal, June 2011
MG/KG = millograms per kilogram
N = Noncarcinogenic
N/A = Not available
ND = Non-detect
NL = Noncarcinogenic lead residential soil RSL not adjusted by dividing by 10.

Table 2.2a

Risk Ratio Screening for Subsurface Soil, Maximum Detected Concentration

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Analyte | Detection Frequency | Maximum Detected Concentration (Qualifier) | Sample Location of Maximum Detected Concentration | Residential Soil RSL | Acceptable Risk Level | Corresponding Hazard Index[a] | Corresponding Cancer Risk[b] | Target Organ |
|---|---|---|---|---|---|---|---|---|
| **Metals (mg/kg)** | | | | | | | | |
| Antimony | 6 / 25 | 1.4E+01 J | IR06-TP01-S-4-5-11A | 3.1E+01 | 1 | 0.4 | N/A | Longevity, Blood |
| Chromium (hexavalent) | 7 / 11 | 4.9E+02 | IR06-TP09-2-3-11A | 2.9E-01 | 1E-06 | N/A | 2E-03 | N/A |
| Cobalt | 15 / 26 | 6.2E+00 | IR06-TP01-N-4-5-11A | 2.3E+01 | 1 | 0.3 | N/A | Thyroid |
| Manganese | 26 / 26 | 3.6E+02 | IR06-TP09-2-3-11A | 1.8E+03 | 1 | 0.2 | N/A | CNS |
| Thallium | 1 / 26 | 2.4E-01 J | IR06-TP01-N-4-5-11A | 7.8E-01 | 1 | 0.3 | N/A | Hair |
| **Cumulative Corresponding Hazard Index[c]** | | | | | | **1.2** | | |
| **Cumulative Corresponding Cancer Risk[d]** | | | | | | | **2E-03** | |

| | |
|---|---|
| Total Longevity HI = | 0.4 |
| Total Blood HI = | 0.4 |
| Total Thyroid HI = | 0.3 |
| Total CNS HI = | 0.2 |
| Total Hair HI = | 0.3 |

**Notes:**

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk leve

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

CNS = Central Nervous System

COPC = Chemical of Potential Concern

HI = Hazard Index

J = Estimated Value

mg/kg = milligrams per kilogram

N/A = Not available/not applicable

Table 2.2b

Risk Ratio Screening for Surface Soil, 95% UCL Concentration

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Analyte | Detection Frequency | 95% UCL | | 95% UCL Rationale | Residential Soil RSL | Acceptable Risk Level | Corresponding Hazard Index[a] | Corresponding Cancer Risk[b] | Target Organ |
|---|---|---|---|---|---|---|---|---|---|
| **Metals (mg/kg)** | | | | | | | | | |
| Chromium (hexavalent) | 7 / 11 | 4.9E+02 | 4, 5 | Max | 2.9E-01 | 1E-06 | NA | 2E-03 | NA |
| **Cumulative Corresponding Hazard Index[c]** | | | | | | | **NA** | | |
| **Cumulative Corresponding Cancer Risk[d]** | | | | | | | | **2E-03** | |

**Notes:**

[a] Corresponding Hazard Index equals 95% UCL concentration divided by the RSL divided by the acceptable risk leve

[b] Corresponding Cancer Risk equals 95% UCL concentration divided by the RSL divided by the acceptable risk leve

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituen

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

COPC = Chemical of Potential Concern

mg/kg = milligrams per kilogram

HI = Hazard Index

NA = Not available/not applicable

ProUCL, Version 4.1.00 used to determine distribution of data and calculate 95% UCL, following recommendations in users guide (USEPA. May 2010. ProUCL, Version 4.1. Prepared by Lockheed Martin Environmental Services).

Options: 95% Kaplan-Meier BCA (95% KM-BCA); Maximum Detected Concentration (Max)

Upper Confidence Limit (UCL) Rationale:

(1) Shapiro-Wilk W Test/Lilliefors test indicates data are log-normally distributed.

(2) Shapiro-Wilk W Test/Lilliefors indicates data are normally distributed.

(3) Test indicates data are gamma distributed.

(4) Distribution tests are inconclusive

(5) Max value used because 95% UCL greater than max

TABLE 2.3

**Occurrence, Distribution, and Selection of Chemicals of Potential Concern**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Medium: Surface Soil in the Ephemeral Drainage
Exposure Medium: Surface Soil in the Ephemeral Drainage

| Exposure Point | CAS Number | Chemical | Minimum [1] Concentration Qualifier | Maximum [1] Concentration Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration [2] Used for Screening | Background [3] Value | Screening [4] Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for [5] Contaminant Deletion or Selection |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ravine | 121-14-2 | 2,4-Dinitrotoluene | ND | ND | MG/KG | | 0/2 | N/A | N/A | N/A | 1.6E+00 C | 1.6E-03 | NCSSL | YES | DLASL |
| | 606-20-2 | 2,6-Dinitrotoluene | ND | ND | MG/KG | | 0/2 | N/A | N/A | N/A | 6.1E+00 N | N/A | N/A | YES | DLASL |
| | 98-95-3 | Nitrobenzene | 1.4E-01 J | 1.4E-01 J | MG/KG | MR22-SD02D-12A | 1/2 | N/A | 1.4E-01 | N/A | 4.8E+00 C | N/A | N/A | NO | BSL |
| | 99-35-4 | 1,3,5-Trinitrobenzene | ND | ND | MG/KG | | 0/2 | N/A | N/A | N/A | 2.2E+02 N | N/A | N/A | YES | DLASL |
| | 99-65-0 | 1,3-Dinitrobenzene | ND | ND | MG/KG | | 0/2 | N/A | N/A | N/A | 6.1E-01 N | N/A | N/A | YES | DLASL |
| | 118-96-7 | 2,4,6-Trinitrotoluene | ND | ND | MG/KG | | 0/2 | N/A | N/A | N/A | 3.6E+00 N | N/A | N/A | YES | DLASL |
| | 35572-78-2 | 2-Amino-4,6-dinitrotoluene | ND | ND | MG/KG | | 0/2 | N/A | N/A | N/A | 1.5E+01 N | N/A | N/A | YES | DLASL |
| | 88-72-2 | 2-Nitrotoluene | 3.7E-01 | 3.7E-01 | MG/KG | MR22-SD02D-12A | 1/2 | N/A | 3.7E-01 | N/A | 2.9E+00 C | N/A | N/A | NO | BSL |
| | 99-08-1 | 3-Nitrotoluene | ND | ND | MG/KG | | 0/2 | N/A | N/A | N/A | 6.1E-01 N | N/A | N/A | YES | DLASL |
| | 19406-51-0 | 4-Amino-2,6-dinitrotoluene | 9.9E-02 J | 9.9E-02 J | MG/KG | MR22-SD02D-12A | 1/2 | N/A | 9.9E-02 | N/A | 1.5E+01 N | N/A | N/A | NO | BSL |
| | 99-99-0 | 4-Nitrotoluene | ND | ND | MG/KG | | 0/2 | N/A | N/A | N/A | 2.4E+01 N | N/A | N/A | YES | DLASL |
| | 2691-41-0 | HMX | ND | ND | MG/KG | | 0/2 | N/A | N/A | N/A | 3.8E+02 N | N/A | N/A | YES | DLASL |
| | 55-63-0 | Nitroglycerin | ND | ND | MG/KG | | 0/2 | N/A | N/A | N/A | 6.1E-01 N | N/A | N/A | YES | DLASL |
| | 14797-73-0 | Perchlorate | ND | ND | MG/KG | | 0/2 | N/A | N/A | N/A | 5.5E+00 N | N/A | N/A | YES | DLASL |
| | 78-11-5 | PETN | ND | ND | MG/KG | | 0/2 | N/A | N/A | N/A | 1.2E+01 N | N/A | N/A | YES | DLASL |
| | 121-82-4 | RDX | ND | ND | MG/KG | | 0/2 | N/A | N/A | N/A | 5.6E+00 C | N/A | N/A | YES | DLASL |
| | 479-45-8 | Tetryl | ND | ND | MG/KG | | 0/2 | N/A | N/A | N/A | 2.4E+01 N | N/A | N/A | YES | DLASL |
| | 7429-90-5 | Aluminum | 3.5E+03 | 6.1E+03 | MG/KG | MR22-SD02D-12A | 2/2 | N/A | 6.1E+03 | 2.5E+04 | 7.7E+03 N | N/A | N/A | NO | BSL |
| | 7440-36-0 | Antimony | 1.7E+00 J | 2.5E+00 J | MG/KG | MR22-SD01-12A | 2/2 | N/A | 2.5E+00 | 1.7E+00 | 3.1E+00 N | 9.0E-01 | NCSSL | NO | BSL |
| | **7440-38-2** | **Arsenic** | **5.2E+00** | **1.0E+01 J** | **MG/KG** | **MR22-SD01-12A** | **2/2** | **N/A** | **1.0E+01** | **2.4E+00** | **3.9E-01 C** | **5.8E+00** | **NCSSL** | **YES** | **ASL** |
| | 7440-39-3 | Barium | 4.3E+01 | 9.3E+01 | MG/KG | MR22-SD02-12A | 2/2 | N/A | 9.3E+01 | 3.4E+01 | 1.5E+03 N | 5.8E+02 | NCSSL | NO | BSL |
| | 7440-41-7 | Beryllium | 1.4E-01 J | 3.5E-01 J | MG/KG | MR22-SD02D-12A | 2/2 | N/A | 3.5E-01 | N/A | 1.6E+01 N | 6.3E+01 | NCSSL | NO | BSL |
| | **7440-43-9** | **Cadmium** | **3.5E+00 J** | **1.0E+01 J** | **MG/KG** | **MR22-SD01-12A** | **2/2** | **N/A** | **1.0E+01** | **5.2E-01** | **7.0E+00 N** | **3.0E+00** | **NCSSL** | **YES** | **ASL** |
| | 7440-70-2 | Calcium | 1.6E+03 | 5.4E+03 | MG/KG | MR22-SD02-12A | 2/2 | N/A | 5.4E+03 | 3.8E+03 | N/A | N/A | N/A | NO | NUT |
| | 7440-47-3 | Chromium | 1.0E+01 J | 1.4E+01 J | MG/KG | MR22-SD01-12A | 2/2 | N/A | 1.4E+01 | 2.3E+01 | 2.9E-01 C | 3.8E+00 | N/A | NO | BBK |
| | 7440-48-4 | Cobalt | 2.0E+00 | 2.2E+00 | MG/KG | MR22-SD02-12A | 2/2 | N/A | 2.2E+00 | N/A | 2.3E+00 N | 9.0E-01 | NCSSL | NO | BSL |
| | **7440-50-8** | **Copper** | **6.2E+01** | **4.2E+02** | **MG/KG** | **MR22-SD01-12A** | **2/2** | **N/A** | **4.2E+02** | **2.5E+00** | **3.1E+02 N** | **7.0E+02** | **NCSSL** | **YES** | **ASL** |
| | **7439-89-6** | **Iron** | **7.9E+03** | **1.2E+04** | **MG/KG** | **MR22-SD01-12A** | **2/2** | **N/A** | **1.2E+04** | **1.1E+04** | **5.5E+03 N** | **1.5E+02** | **NCSSL** | **YES** | **ASL** |
| | **7439-92-1** | **Lead** | **9.6E+01** | **5.9E+02** | **MG/KG** | **MR22-SD01-12A** | **2/2** | **N/A** | **5.9E+02** | **2.0E+01** | **4.0E+02 NL** | **2.7E+02** | **NCSSL** | **YES** | **ASL** |
| | 7439-95-4 | Magnesium | 1.4E+02 J | 3.5E+02 J | MG/KG | MR22-SD02D-12A | 2/2 | N/A | 3.5E+02 | N/A | N/A | N/A | N/A | NO | NUT |
| | **7439-96-5** | **Manganese** | **2.6E+02** | **4.7E+03** | **MG/KG** | **MR22-SD01-12A** | **2/2** | **N/A** | **4.7E+03** | **1.8E+01** | **1.8E+02 N** | **6.5E+01** | **NCSSL** | **YES** | **ASL** |
| | **7439-97-6** | **Mercury** | **8.8E-01 J** | **2.0E+01 J** | **MG/KG** | **MR22-SD01-12A** | **2/2** | **N/A** | **2.0E+01** | **1.2E-01** | **2.3E+00 N** | **1.0E+00** | **NCSSL** | **YES** | **ASL** |
| | 7440-02-0 | Nickel | 7.7E+00 | 1.2E+01 J | MG/KG | MR22-SD01-12A | 2/2 | N/A | 1.2E+01 | 2.7E+00 | 1.5E+02 N | 1.3E+02 | NCSSL | NO | BSL |
| | 7440-09-7 | Potassium | 1.5E+02 J | 4.6E+02 J | MG/KG | MR22-SD02D-12A | 2/2 | N/A | 4.6E+02 | N/A | N/A | N/A | N/A | NO | NUT |
| | 7782-49-2 | Selenium | 1.5E+00 J | 1.5E+00 J | MG/KG | MR22-SD02D-12A | 1/2 | N/A | 1.5E+00 | 9.0E-01 | 3.9E+01 N | 2.1E+00 | NCSSL | NO | BSL |
| | 7440-22-4 | Silver | ND | ND | MG/KG | | 0/2 | N/A | N/A | N/A | 3.9E+01 N | 3.4E+00 | NCSSL | YES | DLASL |

TABLE 2.3

**Occurrence, Distribution, and Selection of Chemicals of Potential Concern**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Medium: Surface Soil in the Ephemeral Drainage |
| Exposure Medium: Surface Soil in the Ephemeral Drainage |

| Exposure Point | CAS Number | Chemical | Minimum [1] Concentration Qualifier | Maximum [1] Concentration Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration [2] Used for Screening | Background [3] Value | Screening [4] Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for [5] Contaminant Deletion or Selection |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 7440-23-5 | Sodium | ND | ND | MG/KG | | 0/2 | N/A | N/A | 8.0E+01 | N/A | N/A | N/A | YES | DLASL |
| | **7440-28-0** | **Thallium** | **4.3E-01 J** | **9.6E+00 J** | **MG/KG** | **MR22-SD01-12A** | **2/2** | **N/A** | **9.6E+00** | **N/A** | **7.8E-02 N** | **2.8E-01** | **NCSSL** | **YES** | **ASL** |
| | 7440-62-2 | Vanadium | 1.3E+01 | 1.9E+01 J | MG/KG | MR22-SD01-12A | 2/2 | N/A | 1.9E+01 | 3.4E+01 | 3.9E+01 N | 6.0E+00 | NCSSL | NO | BSL |
| | **7440-66-6** | **Zinc** | **5.0E+02** | **1.2E+04** | **MG/KG** | **MR22-SD01-12A** | **2/2** | **N/A** | **1.2E+04** | **1.6E+01** | **2.3E+03 N** | **1.2E+03** | **NCSSL** | **YES** | **ASL** |

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening. If chemical was not detected, the maximum detection limit is used for screening.

[3] Background values are the background threshold values (BTVs) for surface soil data in developed areas (combined soil types).

Background values are from Final Expanded Soil Background Study Report, Marine Corps Base Camp Lejeune, Jacksonville, North Carolina, CH2M HILL, August 2011.

[4] Oak Ridge National Laboratory (ORNL). May, 2012. Regional Screening Levels for Chemical Contaminants at Superfund Sites. [Online]. Adjusted (RSLs based on non-cancer (N) divided by 10) residential soil RSLs. Available: http://epa-prgs.ornl.gov/chemicals/index.shtml

RSL value for chromium (VI) used as surrogate for total chromium.

The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.

RSL value for mercury (inorganic salts) used as surrogate for mercury.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Detection Limit Above Screening Level (DLASL), not quantitatively evaluated in HHRA

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)
Detection Limit Below Screening Level (DLBSL)
Below Background Value (BBK)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
C = Carcinogenic
N = Noncarcinogenic
NCSSL = North Carolina Preliminary Soil Remediation Goal, June 2011
MG/KG = millograms per kilogram
N = Noncarcinogenic
N/A = Not available
ND = Non-detect
NL = Noncarcinogenic lead residential soil RSL not adjusted by dividing by 10.

Table 2.3a

**Risk Ratio Screening for Surface Soil in the Ephemeral Drainage, Maximum Detected Concentration**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Analyte | Detection Frequency | Maximum Detected Concentration (Qualifier) | Sample Location of Maximum Detected Concentration | Residential Soil RSL | Acceptable Risk Level | Corresponding Hazard Index[a] | Corresponding Cancer Risk[b] | Target Organ |
|---|---|---|---|---|---|---|---|---|
| **Metals (mg/kg)** | | | | | | | | |
| Arsenic | 2 / 2 | 1.0E+01 J | MR22-SD01-12A | 3.9E-01 | 1E-06 | N/A | 3E-05 | N/A |
| Cadmium | 2 / 2 | 1.0E+01 J | MR22-SD01-12A | 7.0E+01 | 1 | 0.1 | N/A | Kidney |
| Copper | 2 / 2 | 4.2E+02 | MR22-SD01-12A | 3.1E+03 | 1 | 0.1 | N/A | Gastrointestinal |
| Iron | 2 / 2 | 1.2E+04 | MR22-SD01-12A | 5.5E+04 | 1 | 0.2 | N/A | Gastrointestinal |
| Manganese | 2 / 2 | 4.7E+03 | MR22-SD01-12A | 1.8E+03 | 1 | 2.6 | N/A | CNS |
| Mercury | 2 / 2 | 2.0E+01 J | MR22-SD01-12A | 2.3E+01 | 1 | 0.9 | N/A | CNS |
| Thallium | 2 / 2 | 9.6E+00 J | MR22-SD01-12A | 7.8E-01 | 1 | 12.3 | N/A | Hair |
| Zinc | 2 / 2 | 1.2E+04 | MR22-SD01-12A | 2.3E+04 | 1 | 0.5 | N/A | Blood |
| **Cumulative Corresponding Hazard Index[c]** | | | | | | **16.3** | | |
| **Cumulative Corresponding Cancer Risk[d]** | | | | | | | **3E-05** | |

| | |
|---|---|
| Total Blood HI = | 0.5 |
| Total CNS HI = | **3.5** |
| Total Gastrointestinal HI = | 0.4 |
| Total Hair HI = | **12.3** |
| Total Kidney HI = | 0.1 |

**Notes:**

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk leve

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

CNS = Central Nervous System

COPC = Chemical of Potential Concern

HI = Hazard Index

J = Estimated Value

mg/kg = milligrams per kilogram

N/A = Not available/not applicable

# Appendix E.2
# Human Health Baseline Risk Assessment

TABLE 1

**Selection of Exposure Pathways**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Scenario Timeframe | Medium | Exposure Medium | Exposure Point | Receptor Population | Receptor Age | Exposure Route | On-Site/ Off-Site | Type of Analysis | Rationale for Selection or Exclusion of Exposure Pathway |
|---|---|---|---|---|---|---|---|---|---|
| Current/Future | Surface Soil in the Ephemeral Drainage | Surface Soil in the Ephemeral Drainage | Ravine | Trespasser / Visitor | Adult | Ingestion | On-site | Quant | Trespassers/visitors could be exposed to sediment in the narrow ravine that drains from the north-central portion of the site toward the northwest to Wallace Creek. |
| | | | | | | Dermal | On-site | Quant | |
| | | | | | Youth | Ingestion | On-site | Quant | |
| | | | | | | Dermal | On-site | Quant | |
| | | | | | Child | Ingestion | On-site | Quant | |
| | | | | | | Dermal | On-site | Quant | |
| Future | Subsurface Soil | Subsurface Soil | Subsurface Soil | Resident | Adult | Ingestion | On-site | Quant | Although unlikely, if site used for future residential development, residents could be exposed to subsurface soil if houses are constructed at the site, or any type of excavation is performed and the soil is re-worked, bringing the subsurface soil to the surface. |
| | | | | | | Dermal | On-site | Quant | |
| | | | | | Child | Ingestion | On-site | Quant | |
| | | | | | | Dermal | On-site | Quant | |
| | | | | | Child/Adult | Ingestion | On-site | Quant | |
| | | | | | | Dermal | On-site | Quant | |
| | | | | Military Personnel | Adult | Ingestion | On-site | Qual | Military personnel could be exposed to subsurface soil if houses or industrial buildings are constructed at the site, or any type of excavation is performed and the soil is re-worked, bringing the subsurface soil to the surface. However, the risks associated with this pathway will not be quantified, the risks to the more conservative industrial worker will be quantified. |
| | | | | | | Dermal | On-site | Qual | |
| | | | | Construction Worker | Adult | Ingestion | On-site | Quant | Construction worker could contact subsurface soil while performing excavation or construction activities at the site. |
| | | | | | | Dermal | On-site | Quant | |
| | | | | Industrial Worker | Adult | Ingestion | On-site | Quant | Future industrial workers could be exposed to subsurface soil if industrial buildings are constructed at the site, or any type of excavation is performed and the soil is re-worked, bringing the subsurface soil to the surface. |
| | | | | | | Dermal | On-site | Quant | |
| | | | | Trespasser / Visitor | Adult | Ingestion | On-site | Quant | Future trespassers/visitors could be exposed to subsurface soil if houses or industrial buildings are constructed at the site, or any type of excavation is performed and the soil is re-worked, bringing the subsurface soil to the surface. |
| | | | | | | Dermal | On-site | Quant | |
| | | | | | Youth | Ingestion | On-site | Quant | |
| | | | | | | Dermal | On-site | Quant | |
| | | | | | Child | Ingestion | On-site | Quant | |
| | | | | | | Dermal | On-site | Quant | |

TABLE 1

**Selection of Exposure Pathways**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Scenario Timeframe | Medium | Exposure Medium | Exposure Point | Receptor Population | Receptor Age | Exposure Route | On-Site/ Off-Site | Type of Analysis | Rationale for Selection or Exclusion of Exposure Pathway |
|---|---|---|---|---|---|---|---|---|---|
| Future | Subsurface Soil | Air | Emissions from Subsurface Soil | Resident | Adult | Inhalation | On-site | Quant | Although unlikely, if site used for future residential development, residents could inhale dust from subsurface soil. |
| | | | | | Child | Inhalation | On-site | Quant | |
| | | | | | Child/Adult | Inhalation | On-site | Quant | |
| | | | | Military Personnel | Adult | Inhalation | On-site | Qual | Military personnel could inhale particulate emissions from subsurface soil. However, the risks associated with this pathway will not be quantified, the risks to the more conservative industrial worker will be quantified. |
| | | | | Construction Worker | Adult | Inhalation | On-site | Quant | Construction worker could inhale dust from subsurface soil during construction and excavation activities. |
| | | | | Industrial Worker | Adult | Inhalation | On-site | Quant | Industrial worker could inhale could inhale dust from subsurface soil. |
| | | | | Trespasser / Visitor | Adult | Inhalation | On-site | Quant | Trespasser/visitor could inhale dust from site subsurface soil. |
| | | | | | Youth | Inhalation | On-site | Quant | |
| | | | | | Child | Inhalation | On-site | Quant | |
| | Groundwater | Groundwater | Surficial Aquifer - Tap Water | Resident | Adult | Ingestion | On-site | Quant | Although unlikely, groundwater will be evaluated for use as a future potable water supply. |
| | | | | | | Dermal | On-site | Quant | |
| | | | | | Child | Ingestion | On-site | Quant | |
| | | | | | | Dermal | On-site | Quant | |
| | | | | | Child/Adult | Ingestion | On-site | Quant | |
| | | | | | | Dermal | On-site | Quant | |
| | | | | Military Personnel | Adult | Ingestion | On-site | Qual | Future military workers may use groundwater as a potable water supply. However, the risks associated with this pathway will not be quantified, the risks to the more conservative industrial worker will be quantified. |
| | | | | | | Dermal | On-site | None | Assumed military workers would not shower regularly at site even if groundwater used as a potable water supply. |
| | | | | Industrial Worker | Adult | Ingestion | On-site | Quant | Future industrial workers may use groundwater as a potable water supply. |
| | | | | | | Dermal | On-site | None | Industrial workers would not be expected to shower regularly at site even if groundwater used as a potable water supply. |
| | | | Surficial Aquifer - Water in Excavation Pit | Construction Worker | Adult | Ingestion | On-site | None | Ingestion of groundwater during construction activities expected to be minimal. |
| | | | | | | Dermal | On-site | Quant | Construction worker may contact groundwater in an excavation during construction/excavation activities. |

TABLE 1

Selection of Exposure Pathways

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Scenario Timeframe | Medium | Exposure Medium | Exposure Point | Receptor Population | Receptor Age | Exposure Route | On-Site/ Off-Site | Type of Analysis | Rationale for Selection or Exclusion of Exposure Pathway |
|---|---|---|---|---|---|---|---|---|---|
| Future | Groundwater | Air | Surficial Aquifer - Water Vapors at Showerhead | Resident | Adult | Inhalation | On-site | Quant | Although unlikely, groundwater will be evaluated for use as future potable water supply. Future residents could inhale VOCs while showering/bathing. |
| | | | | | Child | Inhalation | On-site | Quant | |
| | | | | | Child/Adult | Inhalation | On-site | Quant | |
| | | | | Military Personnel | Adult | Inhalation | On-site | None | Military workers would not be expected to shower regularly at site even if groundwater used as a potable water supply. |
| | | | | Industrial Worker | Adult | Inhalation | On-site | None | Industrial workers would not be expected to shower regularly at site even if groundwater used as a potable water supply. |
| | | | Surficial Aquifer - Water Vapors in Excavation Pit | Construction Worker | Adult | Inhalation | On-site | Quant | Construction worker may inhale vapors from groundwater in an open excavation during construction/excavation activities. |

TABLE 2.1

**Occurrence, Distribution, and Selection of Chemicals of Potential Concern**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Current/Future
Medium: Surface Soil in the Ephemeral Drainage
Exposure Medium: Surface Soil in the Ephemeral Drainage

| Exposure Point | CAS Number | Chemical | Minimum [1] Concentration Qualifier | Maximum [1] Concentration Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration [2] Used for Screening | Background [3] Value | Screening [4] Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for [5] Contaminant Deletion or Selection |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ravine | 121-14-2 | 2,4-Dinitrotoluene | ND | ND | MG/KG | | 0/2 | 0.333 - 0.364 | 3.6E-01 | N/A | 1.6E+00 C | 1.6E-03 | NCSSL | NO | DLBSL |
| | 606-20-2 | 2,6-Dinitrotoluene | ND | ND | MG/KG | | 0/2 | 0.333 - 0.364 | 3.6E-01 | N/A | 6.1E+00 N | N/A | N/A | NO | DLBSL |
| | 98-95-3 | Nitrobenzene | 1.4E-01 J | 1.4E-01 J | MG/KG | MR22-SD02D-12A | 1/2 | 0.333 - 0.364 | 1.4E-01 | N/A | 4.8E+00 C | N/A | N/A | NO | BSL |
| | 99-35-4 | 1,3,5-Trinitrobenzene | ND | ND | MG/KG | | 0/2 | 0.333 - 0.364 | 3.6E-01 | N/A | 2.2E+02 N | N/A | N/A | NO | DLBSL |
| | 99-65-0 | 1,3-Dinitrobenzene | ND | ND | MG/KG | | 0/2 | 0.333 - 0.364 | 3.6E-01 | N/A | 6.1E-01 N | N/A | N/A | NO | DLBSL |
| | 118-96-7 | 2,4,6-Trinitrotoluene | ND | ND | MG/KG | | 0/2 | 0.333 - 0.364 | 3.6E-01 | N/A | 3.6E+00 N | N/A | N/A | NO | DLBSL |
| | 35572-78-2 | 2-Amino-4,6-dinitrotoluene | ND | ND | MG/KG | | 0/2 | 0.333 - 0.364 | 3.6E-01 | N/A | 1.5E+01 N | N/A | N/A | NO | DLBSL |
| | 88-72-2 | 2-Nitrotoluene | 3.7E-01 | 3.7E-01 | MG/KG | MR22-SD02D-12A | 1/2 | 0.333 - 0.364 | 3.7E-01 | N/A | 2.9E+00 C | N/A | N/A | NO | BSL |
| | 99-08-1 | 3-Nitrotoluene | ND | ND | MG/KG | | 0/2 | 0.333 - 0.364 | 3.6E-01 | N/A | 6.1E-01 N | N/A | N/A | NO | DLBSL |
| | 19406-51-0 | 4-Amino-2,6-dinitrotoluene | 9.9E-02 J | 9.9E-02 J | MG/KG | MR22-SD02D-12A | 1/2 | 0.333 - 0.364 | 9.9E-02 | N/A | 1.5E+01 N | N/A | N/A | NO | BSL |
| | 99-99-0 | 4-Nitrotoluene | ND | ND | MG/KG | | 0/2 | 0.333 - 0.364 | 3.6E-01 | N/A | 2.4E+01 N | N/A | N/A | NO | DLBSL |
| | 2691-41-0 | HMX | ND | ND | MG/KG | | 0/2 | 0.333 - 0.364 | 3.6E-01 | N/A | 3.8E+02 N | N/A | N/A | NO | DLBSL |
| | 55-63-0 | Nitroglycerin | ND | ND | MG/KG | | 0/2 | 0.833 - 0.909 | 9.1E-01 | N/A | 6.1E-01 N | N/A | N/A | YES | DLASL |
| | 14797-73-0 | Perchlorate | ND | ND | MG/KG | | 0/2 | 0.0276 - 0.042 | 4.2E-02 | N/A | 5.5E+00 N | N/A | N/A | NO | DLBSL |
| | 78-11-5 | PETN | ND | ND | MG/KG | | 0/2 | 0.833 - 0.909 | 9.1E-01 | N/A | 1.2E+01 N | N/A | N/A | NO | DLBSL |
| | 121-82-4 | RDX | ND | ND | MG/KG | | 0/2 | 0.333 - 0.364 | 3.6E-01 | N/A | 5.6E+00 C | N/A | N/A | NO | DLBSL |
| | 479-45-8 | Tetryl | ND | ND | MG/KG | | 0/2 | 0.333 - 0.364 | 3.6E-01 | N/A | 2.4E+01 N | N/A | N/A | NO | DLBSL |
| | 7429-90-5 | Aluminum | 3.5E+03 | 6.1E+03 | MG/KG | MR22-SD02D-12A | 2/2 | 15.6 - 41.8 | 6.1E+03 | 2.5E+04 | 7.7E+03 N | N/A | N/A | NO | BSL |
| | 7440-36-0 | Antimony | 1.7E+00 J | 2.5E+00 J | MG/KG | MR22-SD01-12A | 2/2 | 0.778 - 2.09 | 2.5E+00 | 1.7E+00 | 3.1E+00 N | 9.0E-01 | NCSSL | NO | BSL |
| | **7440-38-2** | **Arsenic** | **5.2E+00** | **1.0E+01 J** | **MG/KG** | **MR22-SD01-12A** | **2/2** | **1.33 - 15.6** | **1.0E+01** | **2.4E+00** | **3.9E-01 C** | **5.8E+00** | **NCSSL** | **YES** | **ASL** |
| | 7440-39-3 | Barium | 4.3E+01 | 9.3E+01 | MG/KG | MR22-SD02-12A | 2/2 | 3.11 - 8.37 | 9.3E+01 | 3.4E+01 | 1.5E+03 N | 5.8E+02 | NCSSL | NO | BSL |
| | 7440-41-7 | Beryllium | 1.4E-01 J | 3.5E-01 J | MG/KG | MR22-SD02D-12A | 2/2 | 0.389 - 1.05 | 3.5E-01 | N/A | 1.6E+01 N | 6.3E+01 | NCSSL | NO | BSL |
| | **7440-43-9** | **Cadmium** | **3.5E+00 J** | **1.0E+01 J** | **MG/KG** | **MR22-SD01-12A** | **2/2** | **0.389 - 1.05** | **1.0E+01** | **5.2E-01** | **7.0E+00 N** | **3.0E+00** | **NCSSL** | **YES** | **ASL** |
| | 7440-70-2 | Calcium | 1.6E+03 | 5.4E+03 | MG/KG | MR22-SD02-12A | 2/2 | 389 - 1050 | 5.4E+03 | 3.8E+03 | N/A | N/A | N/A | NO | NUT |
| | 7440-47-3 | Chromium | 1.0E+01 J | 1.4E+01 J | MG/KG | MR22-SD01-12A | 2/2 | 1.33 - 15.6 | 1.4E+01 | 2.3E+01 | 2.9E-01 C | 3.8E+00 | NCSSL | NO | BBK |
| | 7440-48-4 | Cobalt | 2.0E+00 | 2.2E+00 | MG/KG | MR22-SD02-12A | 2/2 | 0.972 - 2.61 | 2.2E+00 | N/A | 2.3E+00 N | 9.0E-01 | NCSSL | NO | BSL |
| | **7440-50-8** | **Copper** | **6.2E+01** | **4.2E+02** | **MG/KG** | **MR22-SD01-12A** | **2/2** | **0.778 - 2.09** | **4.2E+02** | **2.5E+00** | **3.1E+02 N** | **7.0E+02** | **NCSSL** | **YES** | **ASL** |
| | **7439-89-6** | **Iron** | **7.9E+03** | **1.2E+04** | **MG/KG** | **MR22-SD01-12A** | **2/2** | **13.3 - 156** | **1.2E+04** | **1.1E+04** | **5.5E+03 N** | **1.5E+02** | **NCSSL** | **YES** | **ASL** |
| | **7439-92-1** | **Lead** | **9.6E+01** | **5.9E+02** | **MG/KG** | **MR22-SD01-12A** | **2/2** | **0.399 - 4.67** | **5.9E+02** | **2.0E+01** | **4.0E+02 NL** | **2.7E+02** | **NCSSL** | **YES** | **ASL** |
| | 7439-95-4 | Magnesium | 1.4E+02 J | 3.5E+02 J | MG/KG | MR22-SD02D-12A | 2/2 | 389 - 1050 | 3.5E+02 | N/A | N/A | N/A | N/A | NO | NUT |
| | **7439-96-5** | **Manganese** | **2.6E+02** | **4.7E+03** | **MG/KG** | **MR22-SD01-12A** | **2/2** | **1.99 - 23.3** | **4.7E+03** | **1.8E+01** | **1.8E+02 N** | **6.5E+01** | **NCSSL** | **YES** | **ASL** |
| | **7439-97-6** | **Mercury** | **8.8E-01 J** | **2.0E+01 J** | **MG/KG** | **MR22-SD01-12A** | **2/2** | **0.0415 - 0.943** | **2.0E+01** | **1.2E-01** | **2.3E+00 N** | **1.0E+00** | **NCSSL** | **YES** | **ASL** |
| | 7440-02-0 | Nickel | 7.7E+00 | 1.2E+01 J | MG/KG | MR22-SD01-12A | 2/2 | 1.33 - 15.6 | 1.2E+01 | 2.7E+00 | 1.5E+02 N | 1.3E+02 | NCSSL | NO | BSL |
| | 7440-09-7 | Potassium | 1.5E+02 J | 4.6E+02 J | MG/KG | MR22-SD02D-12A | 2/2 | 389 - 1050 | 4.6E+02 | N/A | N/A | N/A | N/A | NO | NUT |
| | 7782-49-2 | Selenium | 1.5E+00 J | 1.5E+00 J | MG/KG | MR22-SD02D-12A | 1/2 | 1.33 - 15.6 | 1.5E+00 | 9.0E-01 | 3.9E+01 N | 2.1E+00 | NCSSL | NO | BSL |
| | 7440-22-4 | Silver | ND | ND | MG/KG | | 0/2 | 1.33 - 15.6 | 1.6E+01 | N/A | 3.9E+01 N | 3.4E+00 | NCSSL | NO | DLBSL |

TABLE 2.1

Occurrence, Distribution, and Selection of Chemicals of Potential Concern

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Current/Future |
| Medium: Surface Soil in the Ephemeral Drainage |
| Exposure Medium: Surface Soil in the Ephemeral Drainage |

| Exposure Point | CAS Number | Chemical | Minimum [1] Concentration Qualifier | Maximum [1] Concentration Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration [2] Used for Screening | Background [3] Value | Screening [4] Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for [5] Contaminant Deletion or Selection |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 7440-23-5 | Sodium | ND | ND | MG/KG | | 0/2 | 389 - 1050 | 1.1E+03 | 8.0E+01 | N/A | N/A | N/A | NO | NUT |
| | **7440-28-0** | **Thallium** | **4.3E-01 J** | **9.6E+00 J** | **MG/KG** | **MR22-SD01-12A** | **2/2** | **1.06 - 12.4** | **9.6E+00** | **N/A** | **7.8E-02 N** | **2.8E-01** | **NCSSL** | **YES** | **ASL** |
| | 7440-62-2 | Vanadium | 1.3E+01 | 1.9E+01 J | MG/KG | MR22-SD01-12A | 2/2 | 1.66 - 19.4 | 1.9E+01 | 3.4E+01 | 3.9E+01 N | 6.0E+00 | NCSSL | NO | BSL |
| | **7440-66-6** | **Zinc** | **5.0E+02** | **1.2E+04** | **MG/KG** | **MR22-SD01-12A** | **2/2** | **2.66 - 38.9** | **1.2E+04** | **1.6E+01** | **2.3E+03 N** | **1.2E+03** | **NCSSL** | **YES** | **ASL** |

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening. If chemical was not detected, the maximum detection limit is used for screening.

[3] Background values are the background threshold values (BTVs) for surface soil data in developed areas (combined soil types).
Background values are from Final Expanded Soil Background Study Report, Marine Corps Base Camp Lejeune, Jacksonville, North Carolina, CH2M HILL, August 2011.

[4] Oak Ridge National Laboratory (ORNL). May, 2012. Regional Screening Levels for Chemical Contaminants at Superfund Sites. [Online]. Adjusted (RSLs based on non-cancer (N) divided by 10) residential soil RSLs. Available: http://epa-prgs.ornl.gov/chemicals/index.shtml

RSL value for chromium (VI) used as surrogate for total chromium.

RSL value for mercury (inorganic salts) used as surrogate for mercury.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Detection Limit Above Screening Level (DLASL), not quantitatively evaluated in HHRA

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)
Detection Limit Below Screening Level (DLBSL)
Below Background Value (BBK)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
C = Carcinogenic
N = Noncarcinogenic
NCSSL = North Carolina Preliminary Soil Remediation Goal, June 2011
MG/KG = millograms per kilogram
N = Noncarcinogenic
N/A = Not available
ND = Non-detect
NL = Noncarcinogenic lead residential soil RSL not adjusted by dividing by 10.

TABLE 2.2

**Occurrence, Distribution, and Selection of Chemicals of Potential Concern**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

| Exposure Point | CAS Number | Chemical | Minimum [1] Concentration Qualifier | Maximum [1] Concentration Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration [2] Used for Screening | Background [3] Value | Screening [4] Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for [5] Contaminant Deletion or Selection |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Subsurface Soil | 121-14-2 | 2,4-Dinitrotoluene | 3.5E-02 J | 3.5E-02 J | MG/KG | UXO22-TP-S-NW | 1/26 | 0.1 - 0.4 | 3.5E-02 | N/A | 1.6E+00 C | 1.6E-03 | NCSSL | NO | BSL |
| | 606-20-2 | 2,6-Dinitrotoluene | 4.6E-02 J | 4.6E-02 J | MG/KG | UXO22-TP-S-NW | 1/26 | 0.1 - 0.4 | 4.6E-02 | N/A | 6.1E+00 N | N/A | N/A | NO | BSL |
| | 98-95-3 | Nitrobenzene | ND | ND | MG/KG | | 0/26 | 0.1 - 0.4 | 4.0E-01 | N/A | 4.8E+00 C | N/A | N/A | NO | DLBSL |
| | 99-35-4 | 1,3,5-Trinitrobenzene | ND | ND | MG/KG | | 0/26 | 0.1 - 0.4 | 4.0E-01 | N/A | 2.2E+02 N | N/A | N/A | NO | DLBSL |
| | 99-65-0 | 1,3-Dinitrobenzene | 3.6E-02 J | 6.3E-02 J | MG/KG | UXO22-TP-S-NE-D | 2/26 | 0.1 - 0.4 | 6.3E-02 | N/A | 6.1E-01 N | N/A | N/A | NO | BSL |
| | 118-96-7 | 2,4,6-Trinitrotoluene | 4.6E-02 J | 1.6E-01 J | MG/KG | UXO22-TP-S-NE | 3/26 | 0.1 - 0.4 | 1.6E-01 | N/A | 3.6E+00 N | N/A | N/A | NO | BSL |
| | 35572-78-2 | 2-Amino-4,6-dinitrotoluene | ND | ND | MG/KG | | 0/26 | 0.1 - 0.4 | 4.0E-01 | N/A | 1.5E+01 N | N/A | N/A | NO | DLBSL |
| | 88-72-2 | 2-Nitrotoluene | ND | ND | MG/KG | | 0/26 | 0.1 - 0.4 | 4.0E-01 | N/A | 2.9E+00 C | N/A | N/A | NO | DLBSL |
| | 99-08-1 | 3-Nitrotoluene | ND | ND | MG/KG | | 0/26 | 0.1 - 0.4 | 4.0E-01 | N/A | 6.1E-01 N | N/A | N/A | NO | DLBSL |
| | 19406-51-0 | 4-Amino-2,6-dinitrotoluene | ND | ND | MG/KG | | 0/26 | 0.1 - 0.4 | 4.0E-01 | N/A | 1.5E+01 N | N/A | N/A | NO | DLBSL |
| | 99-99-0 | 4-Nitrotoluene | ND | ND | MG/KG | | 0/26 | 0.1 - 0.4 | 4.0E-01 | N/A | 2.4E+01 N | N/A | N/A | NO | DLBSL |
| | 2691-41-0 | HMX | 7.3E-02 J | 7.3E-02 J | MG/KG | UXO22-TP-S-NE | 1/26 | 0.1 - 0.4 | 7.3E-02 | N/A | 3.8E+02 N | N/A | N/A | NO | BSL |
| | 55-63-0 | Nitroglycerin | ND | ND | MG/KG | | 0/26 | 0.312 - 1 | 1.0E+00 | N/A | 6.1E-01 N | N/A | N/A | YES | DLASL |
| | 14797-73-0 | Perchlorate | ND | ND | MG/KG | | 0/26 | 0.0055 - 0.028 | 2.8E-02 | N/A | 5.5E+00 N | N/A | N/A | NO | DLBSL |
| | 78-11-5 | PETN | 1.2E-01 J | 1.2E-01 J | MG/KG | UXO22-TP-S-NE-D | 1/26 | 0.312 - 1 | 1.2E-01 | N/A | 1.2E+01 N | N/A | N/A | NO | BSL |
| | 121-82-4 | RDX | 2.8E-01 J | 3.3E-01 J | MG/KG | UXO22-TP-S-NE-D | 2/26 | 0.1 - 0.4 | 3.3E-01 | N/A | 5.6E+00 C | N/A | N/A | NO | BSL |
| | 479-45-8 | Tetryl | ND | ND | MG/KG | | 0/26 | 0.1 - 0.4 | 4.0E-01 | N/A | 2.4E+01 N | N/A | N/A | NO | DLBSL |
| | 7429-90-5 | Aluminum | 1.5E+03 | 9.1E+03 | MG/KG | MR22-IS09-5-7-11D | 26/26 | 10.6 - 30 | 9.1E+03 | 2.7E+04 | 7.7E+03 N | N/A | N/A | NO | BBK |
| | **7440-36-0** | **Antimony** | **3.5E-01 J** | **1.4E+01 J** | **MG/KG** | **IR06-TP01-S-4-5-11A** | **6/25** | **0.528 - 1.31** | **1.4E+01** | **1.8E+00** | **3.1E+00 N** | **9.0E-01** | **NCSSL** | **YES** | **ASL** |
| | 7440-38-2 | Arsenic | 8.0E-02 J | 7.6E+00 J | MG/KG | MR22-IS11-17-19-12A | 18/26 | 0.335 - 1.3 | 7.6E+00 | 1.5E+01 | 3.9E-01 C | 5.8E+00 | NCSSL | NO | BBK |
| | 7440-39-3 | Barium | 1.8E+00 | 1.2E+02 | MG/KG | IR06-TP09-2-3-11A | 26/26 | 0.35 - 2.82 | 1.2E+02 | 5.3E+01 | 1.5E+03 N | 5.8E+02 | NCSSL | NO | BSL |
| | 7440-41-7 | Beryllium | 1.0E-02 J | 2.2E-01 J | MG/KG | MR22-IS11-17-19-12A | 14/26 | 0.264 - 0.51 | 2.2E-01 | N/A | 1.6E+01 N | 6.3E+01 | NCSSL | NO | BSL |
| | 7440-43-9 | Cadmium | 1.0E-02 J | 2.7E+00 | MG/KG | IR06-TP09-2-3-11A | 13/26 | 0.264 - 1.6 | 2.7E+00 | 1.3E+00 | 7.0E+00 N | 3.0E+00 | NCSSL | NO | BSL |
| | 7440-70-2 | Calcium | 3.4E+01 | 5.1E+04 | MG/KG | IR06-TP01-N-4-5-11A | 22/26 | 7 - 352 | 5.1E+04 | 7.2E+02 | N/A | N/A | N/A | NO | NUT |
| | **18540-29-9** | **Chromium (hexavalent)** | **4.3E-01 J** | **4.9E+02** | **MG/KG** | **IR06-TP09-2-3-11A** | **7/11** | **0.68 - 11** | **4.9E+02** | **6.2E+00** | **2.9E-01 C** | **3.8E+00** | **NCSSL** | **YES** | **ASL** |
| | 7440-47-3 | Chromium | 2.1E+00 | 6.0E+02 | MG/KG | IR06-TP09-2-3-11A | 26/26 | 0.279 - 2.4 | 6.0E+02 | 3.3E+01 | 1.2E+04 N | N/A | N/A | NO | BSL |
| | **7440-48-4** | **Cobalt** | **9.0E-02 J** | **6.2E+00** | **MG/KG** | **IR06-TP01-N-4-5-11A** | **15/26** | **0.66 - 4.8** | **6.2E+00** | **1.0E+00** | **2.3E+00 N** | **9.0E-01** | **NCSSL** | **YES** | **ASL** |
| | 7440-50-8 | Copper | 2.7E-01 J | 1.8E+02 | MG/KG | IR06-TP09-2-3-11A | 25/26 | 0.528 - 4 | 1.8E+02 | 6.6E+00 | 3.1E+02 N | 7.0E+02 | NCSSL | NO | BSL |
| | 7439-89-6 | Iron | 2.0E+02 | 2.2E+04 | MG/KG | IR06-TP09-2-3-11A | 26/26 | 5.28 - 16 | 2.2E+04 | 3.4E+04 | 5.5E+03 N | 1.5E+02 | NCSSL | NO | BBK |
| | **7439-92-1** | **Lead** | **1.3E+00** | **2.8E+03** | **MG/KG** | **IR06-TP09-2-3-11A** | **26/26** | **0.158 - 0.8** | **2.8E+03** | **1.4E+01** | **4.0E+02 NL** | **2.7E+02** | **NCSSL** | **YES** | **ASL** |
| | 7439-95-4 | Magnesium | 4.8E+01 | 1.2E+03 | MG/KG | IR06-TP01-S-4-5-11A | 20/26 | 7 - 352 | 1.2E+03 | 7.3E+02 | N/A | N/A | N/A | NO | NUT |
| | **7439-96-5** | **Manganese** | **9.5E-01** | **3.6E+02** | **MG/KG** | **IR06-TP09-2-3-11A** | **26/26** | **0.35 - 1.31** | **3.6E+02** | **1.7E+01** | **1.8E+02 N** | **6.5E+01** | **NCSSL** | **YES** | **ASL** |
| | 7439-97-6 | Mercury | 8.0E-03 J | 2.3E-01 | MG/KG | IR06-TP02-W-4-5-11A | 17/26 | 0.0278 - 0.0452 | 2.3E-01 | 1.5E-01 | 2.3E+00 N | 1.0E+00 | NCSSL | NO | BSL |
| | 7440-02-0 | Nickel | 4.3E-01 J | 1.5E+01 | MG/KG | IR06-TP09-2-3-11A | 26/26 | 0.528 - 6.4 | 1.5E+01 | 8.9E+00 | 1.5E+02 N | 1.3E+02 | NCSSL | NO | BSL |
| | 7440-09-7 | Potassium | 5.1E+01 J | 6.6E+02 J | MG/KG | MR22-IS11-17-19-12A | 22/26 | 70 - 352 | 6.6E+02 | 1.0E+03 | N/A | N/A | N/A | NO | NUT |
| | 7782-49-2 | Selenium | 2.2E-01 J | 4.1E-01 J | MG/KG | MR22-IS09-5-7-11D | 10/26 | 0.528 - 1.6 | 4.1E-01 | 9.5E-01 | 3.9E+01 N | 2.1E+00 | NCSSL | NO | BSL |
| | 7440-22-4 | Silver | 2.0E-02 J | 9.0E-01 J | MG/KG | IR06-TP09-2-3-11A | 5/26 | 0.279 - 2.4 | 9.0E-01 | N/A | 3.9E+01 N | 3.4E+00 | NCSSL | NO | BSL |

TABLE 2.2

**Occurrence, Distribution, and Selection of Chemicals of Potential Concern**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Scenario Timeframe: Future |
|---|
| Medium: Subsurface Soil |
| Exposure Medium: Subsurface Soil |

| Exposure Point | CAS Number | Chemical | Minimum [1] Concentration Qualifier | Maximum [1] Concentration Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration [2] Used for Screening | Background [3] Value | Screening [4] Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for [5] Contaminant Deletion or Selection |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 7440-23-5 | Sodium | 1.7E+01 J | 7.2E+01 J | MG/KG | IR06-TP01-N-4-5-11A | 5/26 | 70 - 352 | 7.2E+01 | 8.1E+01 | N/A | N/A | N/A | NO | NUT |
| | **7440-28-0** | **Thallium** | **2.4E-01 J** | **2.4E-01 J** | **MG/KG** | **IR06-TP01-N-4-5-11A** | **1/26** | **0.422 - 2.4** | **2.4E-01** | **N/A** | **7.8E-02 N** | **2.8E-01** | **NCSSL** | **YES** | **ASL** |
| | 7440-62-2 | Vanadium | 1.3E+00 | 2.0E+01 J | MG/KG | MR22-IS11-17-19-12A | 26/26 | 0.66 - 4 | 2.0E+01 | 7.6E+01 | 3.9E+01 N | 6.0E+00 | NCSSL | NO | BSL |
| | 7440-66-6 | Zinc | 1.1E+00 J | 9.8E+02 | MG/KG | MR22-IS03-5-7-11D | 20/26 | 1.06 - 2.52 | 9.8E+02 | 1.7E+01 | 2.3E+03 N | 1.2E+03 | NCSSL | NO | BSL |

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening. If chemical was not detected, the maximum detection limit is used for screening.

[3] Background values are the background threshold values (BTVs) for subsurface soil data in developed areas (combined soil types).
Background values are from Final Expanded Soil Background Study Report, Marine Corps Base Camp Lejeune, Jacksonville, North Carolina, CH2M HILL, August 2011.

[4] Oak Ridge National Laboratory (ORNL). May, 2012. Regional Screening Levels for Chemical Contaminants at Superfund Sites. [Online]. Adjusted (RSLs based on non-cancer (N) divided by 10) residential soil RSLs. Available: http://epa-prgs.ornl.gov/chemicals/index.shtml
RSL value for chromium (III) used as surrogate for total chromium.
RSL value for mercury (inorganic salts) used as surrogate for mercury.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Detection Limit Above Screening Level (DLASL), not quantitatively evaluated in HHRA

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)
Detection Limit Below Screening Level (DLBSL)
Below Background Value (BBK)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
C = Carcinogenic
N = Noncarcinogenic
NCSSL = North Carolina Preliminary Soil Remediation Goal, June 2011
MG/KG = milligrams per kilogram
N = Noncarcinogenic
N/A = Not available
ND = Non-detect
NL = Noncarcinogenic lead residential soil RSL not adjusted by dividing by 10.

TABLE 2.3

**Occurrence, Distribution, and Selection of Chemicals of Potential Concern**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air

| Exposure Point | CAS Number | Chemical | Minimum [1] Concentration Qualifier | Maximum [1] Concentration Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration [2] Used for Screening | Background [3] Value | Screening [4] Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for [5] Contaminant Deletion or Selection |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Emissions from Subsurface Soil | 121-14-2 | 2,4-Dinitrotoluene | 2.5E-08 J | 2.5E-08 J | UG/M3 | UXO22-TP-S-NW | 1/26 | -- | 2.5E-08 | N/A | 2.7E-02 C | N/A | N/A | NO | BSL |
| | 606-20-2 | 2,6-Dinitrotoluene | 3.4E-08 J | 3.4E-08 J | UG/M3 | UXO22-TP-S-NW | 1/26 | -- | 3.4E-08 | N/A | N/A | N/A | N/A | NO | NTX |
| | 98-95-3 | Nitrobenzene | ND | ND | UG/M3 | | 0/26 | -- | 4.5E-03 | N/A | 6.1E-03 C | N/A | N/A | NO | DLBSL |
| | 99-35-4 | 1,3,5-Trinitrobenzene | ND | ND | UG/M3 | | 0/26 | -- | 2.9E-07 | N/A | N/A | N/A | N/A | NO | NTX |
| | 99-65-0 | 1,3-Dinitrobenzene | 2.6E-08 J | 4.6E-08 J | UG/M3 | UXO22-TP-S-NE-D | 2/26 | -- | 4.6E-08 | N/A | N/A | N/A | N/A | NO | NTX |
| | 118-96-7 | 2,4,6-Trinitrotoluene | 3.4E-08 J | 1.2E-07 J | UG/M3 | UXO22-TP-S-NE | 3/26 | -- | 1.2E-07 | N/A | N/A | N/A | N/A | NO | NTX |
| | 35572-78-2 | 2-Amino-4,6-dinitrotoluene | ND | ND | UG/M3 | | 0/26 | -- | 2.9E-07 | N/A | N/A | N/A | N/A | NO | NTX |
| | 88-72-2 | 2-Nitrotoluene | ND | ND | UG/M3 | | 0/26 | -- | 2.4E-03 | N/A | N/A | N/A | N/A | NO | NTX |
| | 99-08-1 | 3-Nitrotoluene | ND | ND | UG/M3 | | 0/26 | -- | 2.9E-07 | N/A | N/A | N/A | N/A | NO | NTX |
| | 19406-51-0 | 4-Amino-2,6-dinitrotoluene | ND | ND | UG/M3 | | 0/26 | -- | 2.9E-07 | N/A | N/A | N/A | N/A | NO | NTX |
| | 99-99-0 | 4-Nitrotoluene | ND | ND | UG/M3 | | 0/26 | -- | 2.9E-07 | N/A | N/A | N/A | N/A | NO | NTX |
| | 2691-41-0 | HMX | 5.4E-08 J | 5.4E-08 J | UG/M3 | UXO22-TP-S-NE | 1/26 | -- | 5.4E-08 | N/A | N/A | N/A | N/A | NO | NTX |
| | 55-63-0 | Nitroglycerin | ND | ND | UG/M3 | | 0/26 | -- | 7.4E-07 | N/A | N/A | N/A | N/A | NO | NTX |
| | 14797-73-0 | Perchlorate | ND | ND | UG/M3 | | 0/26 | -- | 2.1E-08 | N/A | N/A | N/A | N/A | NO | NTX |
| | 78-11-5 | PETN | 9.0E-08 J | 9.0E-08 J | UG/M3 | UXO22-TP-S-NE-D | 1/26 | -- | 9.0E-08 | N/A | N/A | N/A | N/A | NO | NTX |
| | 121-82-4 | RDX | 2.0E-07 J | 2.4E-07 J | UG/M3 | UXO22-TP-S-NE-D | 2/26 | -- | 2.4E-07 | N/A | N/A | N/A | N/A | NO | NTX |
| | 479-45-8 | Tetryl | ND | ND | UG/M3 | | 0/26 | -- | 2.9E-07 | N/A | N/A | N/A | N/A | NO | NTX |
| | 7429-90-5 | Aluminum | 1.1E-03 | 6.7E-03 | UG/M3 | MR22-IS09-5-7-11D | 26/26 | -- | 6.7E-03 | N/A | 5.2E-01 N | N/A | N/A | NO | BSL |
| | 7440-36-0 | Antimony | 2.6E-07 J | 9.9E-06 J | UG/M3 | IR06-TP01-S-4-5-11A | 6/25 | -- | 9.9E-06 | N/A | N/A | N/A | N/A | NO | NTX |
| | 7440-38-2 | Arsenic | 5.9E-08 J | 5.6E-06 J | UG/M3 | MR22-IS11-17-19-12A | 18/26 | -- | 5.6E-06 | N/A | 5.7E-04 C | N/A | N/A | NO | BSL |
| | 7440-39-3 | Barium | 1.3E-06 | 8.6E-05 | UG/M3 | IR06-TP09-2-3-11A | 26/26 | -- | 8.6E-05 | N/A | 5.2E-02 N | N/A | N/A | NO | BSL |
| | 7440-41-7 | Beryllium | 7.4E-09 J | 1.6E-07 J | UG/M3 | MR22-IS11-17-19-12A | 14/26 | -- | 1.6E-07 | N/A | 1.0E-03 C | N/A | N/A | NO | BSL |
| | 7440-43-9 | Cadmium | 7.4E-09 J | 2.0E-06 | UG/M3 | IR06-TP09-2-3-11A | 13/26 | -- | 2.0E-06 | N/A | 1.4E-03 C | N/A | N/A | NO | BSL |
| | 7440-70-2 | Calcium | 2.5E-05 | 3.8E-02 | UG/M3 | IR06-TP01-N-4-5-11A | 22/26 | -- | 3.8E-02 | N/A | N/A | N/A | N/A | NO | NUT |
| | **18540-29-9** | **Chromium (hexavalent)** | **3.2E-07 J** | **3.6E-04** | **UG/M3** | **IR06-TP09-2-3-11A** | **7/11** | **--** | **3.6E-04** | **N/A** | **1.1E-05 C** | **N/A** | **N/A** | **YES** | **ASL** |
| | 7440-47-3 | Chromium | 1.5E-06 | 4.4E-04 | UG/M3 | IR06-TP09-2-3-11A | 26/26 | -- | 4.4E-04 | N/A | N/A | N/A | N/A | NO | NTX |
| | 7440-48-4 | Cobalt | 6.6E-08 J | 4.6E-06 | UG/M3 | IR06-TP01-N-4-5-11A | 15/26 | -- | 4.6E-06 | N/A | 2.7E-04 C | N/A | N/A | NO | BSL |
| | 7440-50-8 | Copper | 2.0E-07 J | 1.3E-04 | UG/M3 | IR06-TP09-2-3-11A | 25/26 | -- | 1.3E-04 | N/A | N/A | N/A | N/A | NO | NTX |
| | 7439-89-6 | Iron | 1.5E-04 | 1.6E-02 | UG/M3 | IR06-TP09-2-3-11A | 26/26 | -- | 1.6E-02 | N/A | N/A | N/A | N/A | NO | NTX |
| | 7439-92-1 | Lead | 9.3E-07 | 2.1E-03 | UG/M3 | IR06-TP09-2-3-11A | 26/26 | -- | 2.1E-03 | N/A | 1.5E-01 NL | N/A | N/A | NO | BSL |
| | 7439-95-4 | Magnesium | 3.5E-05 | 8.5E-04 | UG/M3 | IR06-TP01-S-4-5-11A | 20/26 | -- | 8.5E-04 | N/A | N/A | N/A | N/A | NO | NUT |
| | 7439-96-5 | Manganese | 7.0E-07 | 2.6E-04 | UG/M3 | IR06-TP09-2-3-11A | 26/26 | -- | 2.6E-04 | N/A | 5.2E-03 N | N/A | N/A | NO | BSL |
| | 7439-97-6 | Mercury | 5.9E-09 J | 1.7E-07 | UG/M3 | IR06-TP02-W-4-5-11A | 17/26 | -- | 1.7E-07 | N/A | 3.1E-03 N | N/A | N/A | NO | BSL |
| | 7440-02-0 | Nickel | 3.1E-07 J | 1.1E-05 | UG/M3 | IR06-TP09-2-3-11A | 26/26 | -- | 1.1E-05 | N/A | 9.4E-03 C | N/A | N/A | NO | BSL |
| | 7440-09-7 | Potassium | 3.7E-05 J | 4.9E-04 J | UG/M3 | MR22-IS11-17-19-12A | 22/26 | -- | 4.9E-04 | N/A | N/A | N/A | N/A | NO | NUT |
| | 7782-49-2 | Selenium | 1.6E-07 J | 3.0E-07 J | UG/M3 | MR22-IS09-5-7-11D | 10/26 | -- | 3.0E-07 | N/A | 2.1E+00 N | N/A | N/A | NO | BSL |
| | 7440-22-4 | Silver | 1.5E-08 J | 6.6E-07 J | UG/M3 | IR06-TP09-2-3-11A | 5/26 | -- | 6.6E-07 | N/A | N/A | N/A | N/A | NO | NTX |

TABLE 2.3

**Occurrence, Distribution, and Selection of Chemicals of Potential Concern**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air

| Exposure Point | CAS Number | Chemical | Minimum [1] Concentration Qualifier | Maximum [1] Concentration Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration [2] Used for Screening | Background [3] Value | Screening [4] Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for [5] Contaminant Deletion or Selection |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 7440-23-5 | Sodium | 1.3E-05 J | 5.3E-05 J | UG/M3 | IR06-TP01-N-4-5-11A | 5/26 | -- | 5.3E-05 | N/A | N/A | N/A | N/A | NO | NUT |
| | 7440-28-0 | Thallium | 1.8E-07 J | 1.8E-07 J | UG/M3 | IR06-TP01-N-4-5-11A | 1/26 | -- | 1.8E-07 | N/A | N/A | N/A | N/A | NO | NTX |
| | 7440-62-2 | Vanadium | 9.5E-07 | 1.5E-05 J | UG/M3 | MR22-IS11-17-19-12A | 26/26 | -- | 1.5E-05 | N/A | N/A | N/A | N/A | NO | NTX |
| | 7440-66-6 | Zinc | 7.9E-07 J | 7.2E-04 | UG/M3 | MR22-IS03-5-7-11D | 20/26 | -- | 7.2E-04 | N/A | N/A | N/A | N/A | NO | NTX |

[1] Minimum/Maximum calculated air concentrations from surface soil concentrations. Air concentrations calculated as Cair = Csoil*1000*(1/PEF + 1/VF).
PEF = 1.36E+09 m3/kg. VF calculated for volatile constituents only, on Table 2.3A. PEF and VF from USEPA's Soil Screening Guidance. (USEPA,Dec. 2002)

[2] Maximum concentration is used for screening. If chemical was not detected, the maximum detection limit is used for screening.

[3] Background values not available for air concentrations.

[4] Oak Ridge National Laboratory (ORNL). May 2012. Regional Screening Levels for Chemical Contaminants at Superfund Sites. [Online]. Adjusted (RSLs based on non-cancer (N) divided by 10) residential air RSLs. Available: http://epa-prgs.ornl.gov/chemicals/index.shtml

RSL value for chromium (III) used as surrogate for total chromium.

RSL value for mercury (inorganic salts) used as surrogate for mercury.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Detection Limit Above Screening Level (DLASL), not quantitatively evaluated in HHRA

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)
Detection Limit Below Screening Level (DLBSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
C = Carcinogenic
N = Noncarcinogenic
UG/M3 = micrograms per cubic meters
N = Noncarcinogenic
N/A = Not available
ND = Non-detect

Table 2.3A

Calculation of Volatilization Factor

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, Jacksonville, North Carolina*

| Chemical | CAS Number | Diffusivity in Air ($D_i$) (cm²/s) | Henry's Law Constant (H') (unitless) | Diffusivity in Water ($D_w$) (cm²/s) | Soil Organic Carbon Partition Coeff. ($K_{oc}$) (L/kg) | Soil Water Partition Coeff. ($K_d = K_{oc} \times F_{oc}$) (g/cm³) | Solubility in Water (S) (mg/L) | Apparent Diffusivity ($D_A$) (cm²/s) | Volatilization Factor (VF) (m³/kg) | Soil Saturation Concentration ($C_{sat}$) (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| Nitrobenzene | 98-95-3 | 6.8E-02 | 9.8E-04 | 9.4E-06 | 2.3E+02 | 1.4E+00 | 2.1E+03 | 2.5E-06 | 8.9E+04 | 3.0E+03 |
| 2-Nitrotoluene | 88-72-2 | 5.9E-02 | 5.1E-04 | 8.7E-06 | 3.7E+02 | 2.2E+00 | 6.5E+02 | 7.1E-07 | 1.7E+05 | 1.5E+03 |

**Volatilization factor (VF) = (m³/kg)**

$$VF = \frac{Q/C * (3.14 * D_A * T)^{1/2} * 10^{-4}\ m^2/cm^2}{2 * r_b * D_A}$$

**Apparent Diffusivity ($D_A$) = (cm²/s)**

$$D_A = \frac{[(Q_a^{10/3} * D_i * H' + Q_w^{10/3} * D_w)/n^2]}{(r_b * K_d + Q_w + Q_a * H')}$$

**Soil Saturation Concentration ($C_{sat)}$) =**

$$S/r_b * (K_d * r_b + Q_w + H' * Q_a)$$

| Parameters | Values |
|---|---|
| Q/C - Inverse of the mean concentration at the center of a 0.5-acre-square source located in Raleigh-Durham, NC (g/m²-s per kg/m³) | 77.26 |
| T - Exposure interval(s) | 9.5E+08 |
| $\rho_b$ - Soil bulk density (g/cm³) | 1.5 |
| $\Theta_a$ - Air-filled soil porosity ($L_{air}/L_{water}$) = n - $\Theta_w$ | 0.28 |
| n - Total soil porosity (Lpore/Lsoil) = 1 - ($\rho_b/\rho_s$) | 0.43 |
| $\Theta_w$ - Water-filled soil porosity (Lwater/Lsoil) | 0.15 |
| $\rho_s$ - Soil particle density (g/cm³) | 2.65 |
| $f_{oc}$ - fraction organic carbon in soil (g/g) | 0.006 |

**Notes:**

Equations from USEPA, 1996. *Soil Screening Guidance: User's Guide.* EPA/540/R-96/018.

Physical/chemical properties from Oak Ridge National Laboratory (ORNL).May 2012. Regional Screening Levels for Chemical Contaminants at Superfund Sites.

TABLE 2.4

**Occurrence, Distribution, and Selection of Chemicals of Potential Concern**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

| Exposure Point | CAS Number | Chemical | Minimum [1] Concentration Qualifier | Maximum [1] Concentration Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration [2] Used for Screening | Background [3] Value | Screening [4] Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for [5] Contaminant Deletion or Selection |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Surficial Aquifer - Tap Water | 121-14-2 | 2,4-Dinitrotoluene | ND | ND | UG/L | | 0/6 | 0.302 - 0.32 | 3.2E-01 | N/A | 2.0E-01 C | N/A | N/A | YES | DLASL |
| | 606-20-2 | 2,6-Dinitrotoluene | ND | ND | UG/L | | 0/6 | 0.302 - 0.32 | 3.2E-01 | N/A | 1.5E+00 N | N/A | N/A | NO | DLBSL |
| | **98-95-3** | **Nitrobenzene** | **3.1E-01 J** | **3.1E-01 J** | **UG/L** | **MR22-MW01-12A** | **1/6** | **0.302 - 0.32** | **3.1E-01** | **N/A** | **1.2E-01 C** | **N/A** | **N/A** | **YES** | **ASL** |
| | 99-35-4 | 1,3,5-Trinitrobenzene | 5.8E-01 J | 5.8E-01 J | UG/L | MR22-GW03-11D | 1/6 | 0.302 - 0.32 | 5.8E-01 | N/A | 4.6E+01 N | N/A | N/A | NO | BSL |
| | 99-65-0 | 1,3-Dinitrobenzene | ND | ND | UG/L | | 0/6 | 0.302 - 0.32 | 3.2E-01 | N/A | 1.5E-01 N | N/A | N/A | YES | DLASL |
| | 118-96-7 | 2,4,6-Trinitrotoluene | ND | ND | UG/L | | 0/6 | 0.302 - 0.32 | 3.2E-01 | N/A | 7.6E-01 N | N/A | N/A | NO | DLBSL |
| | 35572-78-2 | 2-Amino-4,6-dinitrotoluene | ND | ND | UG/L | | 0/6 | 0.302 - 0.32 | 3.2E-01 | N/A | 3.0E+00 N | N/A | N/A | NO | DLBSL |
| | 88-72-2 | 2-Nitrotoluene | ND | ND | UG/L | | 0/6 | 0.302 - 0.32 | 3.2E-01 | N/A | 2.7E-01 C | N/A | N/A | YES | DLASL |
| | **99-08-1** | **3-Nitrotoluene** | **4.2E-01 J** | **4.2E-01 J** | **UG/L** | **MR22-MW01D-12A** | **1/6** | **0.302 - 0.32** | **4.2E-01** | **N/A** | **1.3E-01 N** | **N/A** | **N/A** | **YES** | **ASL** |
| | 19406-51-0 | 4-Amino-2,6-dinitrotoluene | ND | ND | UG/L | | 0/6 | 0.302 - 0.32 | 3.2E-01 | N/A | 3.0E+00 N | N/A | N/A | NO | DLBSL |
| | 99-99-0 | 4-Nitrotoluene | ND | ND | UG/L | | 0/6 | 0.302 - 0.32 | 3.2E-01 | N/A | 3.7E+00 C | N/A | N/A | NO | DLBSL |
| | 2691-41-0 | HMX | ND | ND | UG/L | | 0/6 | 0.302 - 0.32 | 3.2E-01 | N/A | 7.8E+01 N | N/A | N/A | NO | DLBSL |
| | 55-63-0 | Nitroglycerin | ND | ND | UG/L | | 0/6 | 0.755 - 0.8 | 8.0E-01 | N/A | 1.5E-01 N | N/A | N/A | YES | DLASL |
| | 14797-73-0 | Perchlorate | 5.5E-01 J | 5.5E-01 J | UG/L | MR22-GW02-11D | 1/6 | 2 - 2 | 5.5E-01 | N/A | 1.1E+00 N | N/A | N/A | NO | BSL |
| | 78-11-5 | PETN | ND | ND | UG/L | | 0/6 | 0.755 - 0.8 | 8.0E-01 | N/A | 3.0E+00 N | N/A | N/A | NO | DLBSL |
| | 121-82-4 | RDX | ND | ND | UG/L | | 0/6 | 0.302 - 0.32 | 3.2E-01 | N/A | 6.1E-01 C | N/A | N/A | NO | DLBSL |
| | 479-45-8 | Tetryl | ND | ND | UG/L | | 0/6 | 0.302 - 0.32 | 3.2E-01 | N/A | 6.3E+00 N | N/A | N/A | NO | DLBSL |
| | 7429-90-5 | Aluminum | 3.2E+01 J | 1.4E+02 | UG/L | MR22-GW03-11D | 6/6 | 50 - 50 | 1.4E+02 | 1.4E+04 | 1.6E+03 N | N/A | N/A | NO | BSL |
| | **7440-36-0** | **Antimony** | **2.6E+00** | **1.5E+01** | **UG/L** | **MR22-GW02-11D** | **3/6** | **2.5 - 2.5** | **1.5E+01** | **3.9E+00** | **6.0E-01 N** | **6.0E+00** | **MCL** | **YES** | **ASL** |
| | 7440-38-2 | Arsenic | ND | ND | UG/L | | 0/6 | 2.5 - 2.5 | 2.5E+00 | 9.8E+00 | 4.5E-02 C | 1.0E+01 | MCL, 15A NCAC 2L | NO | BBK |
| | 7440-39-3 | Barium | 2.4E+01 | 4.8E+01 | UG/L | IR06-GW31-11D | 6/6 | 10 - 10 | 4.8E+01 | 3.6E+02 | 2.9E+02 N | 2.0E+03 | MCL | NO | BSL |
| | | | | | | | | | | | | 7.0E+02 | 15A NCAC 2L | | |
| | 7440-41-7 | Beryllium | ND | ND | UG/L | | 0/6 | 1.25 - 1.25 | 1.3E+00 | 8.7E-01 | 1.6E+00 N | 4.0E+00 | MCL | NO | DLBSL |
| | **7440-43-9** | **Cadmium** | **2.8E-01 J** | **6.1E+00** | **UG/L** | **IR06-GW03D-11D** | **2/6** | **1.25 - 1.25** | **6.1E+00** | **N/A** | **6.9E-01 N** | **5.0E+00** | **MCL** | **YES** | **ASL** |
| | | | | | | | | | | | | 2.0E+00 | 15A NCAC 2L | | |
| | 7440-70-2 | Calcium | 3.1E+04 | 7.3E+04 | UG/L | IR06-GW31-11D | 6/6 | 1250 - 1250 | 7.3E+04 | 1.8E+05 | N/A C | N/A | N/A | NO | NUT |
| | 7440-47-3 | Chromium | 5.5E-01 J | 5.5E-01 J | UG/L | MR22-GW03-11D | 1/6 | 2.5 - 2.5 | 5.5E-01 | 1.7E+01 | 3.1E-02 | 1.0E+02 | MCL | NO | BBK |
| | | | | | | | | | | | N | 1.0E+01 | 15A NCAC 2L | | |
| | 7440-48-4 | Cobalt | ND | ND | UG/L | | 0/6 | 3.12 - 3.12 | 3.1E+00 | 3.4E+00 | 4.7E-01 N | N/A | N/A | NO | DLBBK |
| | 7440-50-8 | Copper | ND | ND | UG/L | | 0/6 | 2.5 - 2.5 | 2.5E+00 | 6.6E+00 | 6.2E+01 | 1.3E+03 | MCL | NO | DLBSL |
| | | | | | | | | | | | N | 1.0E+03 | 15A NCAC 2L | | |
| | 7439-89-6 | Iron | 4.2E+01 | 7.5E+02 | UG/L | IR06-GW31-11D | 6/6 | 25 - 25 | 7.5E+02 | 1.6E+04 | 1.1E+03 N | 3.0E+02 | 15A NCAC 2L | NO | BSL |
| | 7439-92-1 | Lead | ND | ND | UG/L | | 0/6 | 0.75 - 0.75 | 7.5E-01 | 8.9E+00 | 1.5E+01 | 1.5E+01 | MCL, 15A NCAC 2L | NO | DLBSL |
| | 7439-95-4 | Magnesium | 1.3E+03 | 5.2E+03 J | UG/L | MR22-MW01-12A | 6/6 | 1250 - 1250 | 5.2E+03 | 1.4E+04 | N/A N | N/A | N/A | NO | NUT |
| | **7439-96-5** | **Manganese** | **2.2E+00 J** | **2.0E+02** | **UG/L** | **MR22-GW03-11D** | **6/6** | **3.75 - 3.75** | **2.0E+02** | **1.8E+02** | **3.2E+01 N** | **5.0E+01** | **15A NCAC 2L** | **YES** | **ASL** |
| | 7439-97-6 | Mercury | ND | ND | UG/L | | 0/6 | 0.2 - 0.2 | 2.0E-01 | N/A | 4.3E-01 | 2.0E+00 | MCL | NO | DLBSL |
| | | | | | | | | | | | N | 1.0E+00 | 15A NCAC 2L | | |

TABLE 2.4

**Occurrence, Distribution, and Selection of Chemicals of Potential Concern**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Medium: Groundwater |
| Exposure Medium: Groundwater |

| Exposure Point | CAS Number | Chemical | Minimum [1] Concentration Qualifier | Maximum [1] Concentration Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration [2] Used for Screening | Background [3] Value | Screening [4] Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for [5] Contaminant Deletion or Selection |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Groundwater | 7440-02-0 | Nickel | 9.0E-01 J | 9.3E-01 J | UG/L | MR22-GW03-11D | 2/6 | 2.5 - 2.5 | 9.3E-01 | 1.2E+01 | 3.0E+01 | 1.0E+02 | 15A NCAC 2L | NO | BSL |
| (cont'd) | 7440-09-7 | Potassium | 4.2E+02 J | 3.3E+03 | UG/L | IR06-GW03-11D | 6/6 | 1250 - 1250 | 3.3E+03 | 5.6E+03 | N/A N | N/A | N/A | NO | NUT |
| | 7782-49-2 | Selenium | 1.6E+00 J | 3.7E+00 | UG/L | IR06-GW03-11D | 4/6 | 2.5 - 2.5 | 3.7E+00 | N/A | 7.8E+00 | 5.0E+01 | MCL | NO | BSL |
| | | | | | | | | | | | N | 2.0E+01 | 15A NCAC 2L | | |
| | 7440-22-4 | Silver | ND | ND | UG/L | | 0/6 | 2.5 - 2.5 | 2.5E+00 | 7.2E-01 | 7.1E+00 | 2.0E+01 | 15A NCAC 2L | NO | DLBSL |
| | 7440-23-5 | Sodium | 3.1E+03 | 4.8E+03 | UG/L | MR22-GW03-11D | 6/6 | 1250 - 1250 | 4.8E+03 | 2.3E+04 | N/A N | N/A | N/A | NO | NUT |
| | 7440-28-0 | Thallium | ND | ND | UG/L | | 0/6 | 2 - 2 | 2.0E+00 | N/A | 1.6E-02 N | 2.0E+00 | MCL | YES | DLASL |
| | 7440-62-2 | Vanadium | 1.6E+00 J | 7.5E+00 | UG/L | IR06-GW26-11D | 2/6 | 3.12 - 3.12 | 7.5E+00 | 2.7E+01 | 7.8E+00 N | N/A | N/A | NO | BSL |
| | 7440-66-6 | Zinc | 1.8E+00 J | 2.3E+02 | UG/L | IR06-GW26-11D | 4/6 | 5 - 5 | 2.3E+02 | 4.1E+01 | 4.7E+02 N | 1.0E+03 | 15A NCAC 2L | NO | BSL |

[1] Minimum/Maximum detected concentration.

[2] Maximum concentration is used for screening. If chemical was not detected, the maximum detection limit is used for screening.

[3] Background values are the background threshold values (BTVs) shallow groundwater concentrations. Background values are from *Draft Expanded Groundwater Background Study Report, Marine Corps Base Camp Lejeune, Jacksonville, North Carolina* , CH2M Hill, September 2011.

[4] Oak Ridge National Laboratory (ORNL). May, 2012. Regional Screening Levels for Chemical Contaminants at Superfund Sites. http://epa-prgs.ornl.gov/chemicals/index.shtml. Adjusted (noncarcinogenic RSLs adjusted by dividing by 10) tap water RSLs.

RSL value for chromium(VI) used as surrogate for chromium.

RSL value for mercury (mercuric chloride) used as surrogate for mercury.

The tap water value of 15 ug/L for lead is the action level provided in the Drinking Water Regulations and Health Advisories.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Detection Limit Above Screening Level (DLASL), not quantitatively evaluated in HHRA

Deletion Reason: No Toxicity Information (NTX)

Essential Nutrient (NUT)

Below Screening Level (BSL)

Detection Limit Below Screening Level (DLBSL)

Below Background Value (BBK)

Detection Limit Below Background Screening Level (DLBBK)

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered

MCL = Maximum Contaminant Level from EPA's National Primary Drinking Water Standards

15A NCAC 2L = North Carolina Classifications and Groundwater Quality Standards, Amended January 2010.

J = Estimated Value

C = Carcinogenic

N = Noncarcinogenic

N/A = Not applicable/not available

ND = Not detected

UG/L = micrograms per liter

TABLE 2.5
**MCIEAST-MCB CAMLEJ, North Carolina**
*Site UXO-22 PA/SI*
*MCIEAST-MCB CAMLEJ, North Carolina*

| Scenario Timeframe: Future |
|---|
| Medium: Groundwater |
| Exposure Medium: Air |

| Exposure Point | CAS Number | Chemical | Minimum [1] Concentration Qualifier | Maximum [1] Concentration Qualifier | Units | Location of Maximum Concentration | Detection Frequency | Range of Detection Limits | Concentration [2] Used for Screening | Background [3] Value | Screening [4] Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for [5] Contaminant Deletion or Selection |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Surficial Aquifer - Water Vapors at Showerhead and Excavation Pit | **98-95-3** | **Nitrobenzene** | **3.1E-01 J** | **3.1E-01 J** | **UG/L** | **MR22-MW01-12A** | **1/6** | **0.302 - 0.32** | **3.1E-01** | **N/A** | **1.2E-01 C** | **N/A** | **N/A** | **YES** | **ASL** |
| | 88-72-2 | 2-Nitrotoluene | ND | ND | UG/L | | 0/6 | 0.302 - 0.32 | 3.2E-01 | N/A | 2.7E-01 C | N/A | N/A | YES | DLASL |

[1] Minimum/Maximum detected concentration.

[2] Maximum concentration is used for screening. If chemical was not detected, the maximum detection limit is used for screening.

[3] Background values are the background threshold values (BTVs) shallow groundwater concentrations. Background values are from *Draft Expanded Groundwater Background Study Report, Marine Corps Base Camp Lejeune, Jacksonville, North Carolina* , CH2M Hill, September 2011.

[4] Oak Ridge National Laboratory (ORNL). May, 2012. Regional Screening Levels for Chemical Contaminants at Superfund Sites. http://epa-prgs.ornl.gov/chemicals/index.shtml. Adjusted (noncarcinogenic RSLs adjusted by dividing by 10) tap water RSLs.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Detection Limit Above Screening Level (DLASL), not quantitatively evaluated in HHRA

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)
Detection Limit Below Screening Level (DLBSL)
Below Background Value (BBK)
Detection Limit Below Background Screening Level (DLBBK)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
MCL = Maximum Contaminant Level from EPA's National Primary Drinking Water Standards
15A NCAC 2L = North Carolina Classifications and Groundwater Quality Standards, Amended January 2010.
J = Estimated Value
C = Carcinogenic
N = Noncarcinogenic
N/A = Not applicable/not available
ND = Not detected
UG/L = micrograms per liter

TABLE 3.1.RME

**Medium-Specific Exposure Point Concentration Summary**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Current/Future |
| Medium: Surface Soil in the Ephemeral Drainage |
| Exposure Medium: Surface Soil in the Ephemeral Drainage |

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | Maximum Concentration (Qualifier) | | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Value | Units | Statistic | Rationale |
| Ravine | Arsenic | mg/kg | 7.7E+00 | N/A | 1.0E+01 | J | 1.0E+01 | mg/kg | Max | 1 |
| | Cadmium | mg/kg | 6.8E+00 | N/A | 1.0E+01 | J | 1.0E+01 | mg/kg | Max | 1 |
| | Copper | mg/kg | 2.4E+02 | N/A | 4.2E+02 | | 4.2E+02 | mg/kg | Max | 1 |
| | Iron | mg/kg | 9.9E+03 | N/A | 1.2E+04 | | 1.2E+04 | mg/kg | Max | 1 |
| | Lead | mg/kg | 3.4E+02 | N/A | 5.9E+02 | | 3.4E+02 | mg/kg | Mean | 2 |
| | Manganese | mg/kg | 2.5E+03 | N/A | 4.7E+03 | | 4.7E+03 | mg/kg | Max | 1 |
| | Mercury | mg/kg | 1.0E+01 | N/A | 2.0E+01 | J | 2.0E+01 | mg/kg | Max | 1 |
| | Thallium | mg/kg | 5.0E+00 | N/A | 9.6E+00 | J | 9.6E+00 | mg/kg | Max | 1 |
| | Zinc | mg/kg | 6.1E+03 | N/A | 1.2E+04 | | 1.2E+04 | mg/kg | Max | 1 |

**Notes:**

Options: Maximum Detected Concentration (Max); Mean Detected Concentration (Mean)

UCL Rationale:

(1) Only two sediment samples. Maximum detected concentration used as EPC.

(2) Mean lead concentration used for the lead model.

mg/kg = milligrams per kilogram

N/A = Not applicable, only 2 samples

J = Estimated

TABLE 3.2.RME

**Medium-Specific Exposure Point Concentration Summary**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe:Future<br>Medium: Subsurface Soil<br>Exposure Medium: Subsurface Soil |

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | | Maximum Concentration (Qualifier) | | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Value | Units | Statistic | Rationale |
| Subsurface Soil | | | | | | | | | | | |
| | Antimony | mg/kg | 1.4E+00 | 2.5E+00 | NP | 1.4E+01 | J | 2.5E+00 | mg/kg | 95% KM-t | 1, 2, 3 |
| | Chromium (hexavalent) | mg/kg | 4.5E+01 | 5.0E+02 | NP | 4.9E+02 | | 4.9E+02 | mg/kg | Max | 5 |
| | Cobalt | mg/kg | 8.2E-01 | 2.7E+00 | NP | 6.2E+00 | | 2.7E+00 | mg/kg | 97.5% KM | 1 |
| | Lead | mg/kg | 1.2E+02 | 5.8E+02 | NP | 2.8E+03 | | 1.2E+02 | mg/kg | Mean | 6 |
| | Manganese | mg/kg | 3.4E+01 | 1.1E+02 | NP | 3.6E+02 | | 1.1E+02 | mg/kg | 95% Cheb-m | 4 |
| | Thallium | mg/kg | N/A | N/A | | 2.4E-01 | J | 2.4E-01 | mg/kg | Max | 7 |

**Notes:**

ProUCL Version 4.1.00 used to determine distribution of data and calculate 95% UCL, following recommendations based on distribution and standard deviation in users guide (USEPA. May 2010. ProUCL, Version 4.1. Prepared by Lockheed Martin Environmental Services).

Options: 95% Kaplan-Meier (t) UCL (95% KM-t); 95% Kaplan-Meier BCA UCL (95% KM-BCA); 97.5% Kaplan-Meier (Chebyshev) (97.5% KM);
95% Approximate Gamma UCL (App. G); 95% Chebyshev (mean, std) UCL (95% Cheb-m); Maximum Detected Concentration (Max); Mean Detected Concentration (Mean)

UCL Rationale:

(1) Shapiro-Wilk W Test/Lilliefors test indicates data are log-normally distributed.

(2) Shapiro-Wilk W Test/Lilliefors indicates data are normally distributed.

(3) Test indicates data are gamma distributed.

(4) Distribution tests are inconclusive.

(5) Maximum detected concentration used because 95% UCL greater than maximum detected concentration.

(6) Mean lead concentration used for lead model.

(7) Maximum detected concentration used because constituent detected in only 1 sample.

G = Gamma

J = Estimated Value

mg/kg = milligrams per kilogram

NP = Non-Parametric

N/A = Not Applicable

TABLE 3.3.RME

**Medium-Specific Exposure Point Concentration Summary**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe:Future
Medium: Subsurface Soil
Exposure Medium: Air

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Value | Units | Statistic | Rationale |
| Emissions from Subsurface Soil | Chromium (hexavalent) | μg/m$^3$ | 3.3E-05 | 3.7E-04 | NP | 3.6E-04 | 3.6E-04 | μg/m$^3$ | Max | 1 |

**Notes:**

ProUCL Version 4.1.00 used to determine distribution of data and calculate 95% UCL, following recommendations
based on distribution and standard deviation in users guide (USEPA. May 2010. ProUCL, Version 4.1. Prepared by Lockheed Martin Environmental Services).
Options: Maximum Detected Concentration (Max)

UCL Rationale:
(1) Maximum detected concentration used because 95% UCL greater than maximum
detected concentration.

μg/m$^3$ = micrograms per cubic meter
NP = Non-Parametric

TABLE 3.4.RME

Medium-Specific Exposure Point Concentration Summary

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe:Future
Medium: Groundwater
Exposure Medium: Groundwater

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale |
| Surficial Aquifer - Tap Water | Nitrobenzene | ug/l | NA | N/A | 3.1E-01 J | 3.1E-01 | ug/l | Max | 2 |
| | 3-Nitrotoluene | ug/l | NA | N/A | 4.2E-01 J | 4.2E-01 | ug/l | Max | 2 |
| | Antimony | ug/l | 7.7E+00 | N/A | 1.5E+01 | 7.7E+00 | ug/l | Mean-N | 1 |
| | Cadmium | ug/l | 3.2E+00 | N/A | 6.1E+00 | 3.2E+00 | ug/l | Mean-N | 1 |
| | Manganese | ug/l | 4.5E+01 | N/A | 2.0E+02 | 4.5E+01 | ug/l | Mean-N | 1 |

Options: Mean-Normal (Mean-N); Maximum Detected Concentration (Max)

UCL Rationale:

(1) Following EPA Region 4 risk assessment guidance, average concentration used as EPC.

(2) Maximum detected concentration used because constituent detected in only 1 sample.

J = Estimated Value

ug/l = microgram per liter

N/A = Not Applicable

TABLE 3.5.RME

**Medium-Specific Exposure Point Concentration Summary**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe:Future
Medium: Groundwater
Exposure Medium: Air

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale |
| Surficial Aquifer - Water Vapors at Showerhead and Excavation Pit | Nitrobenzene | ug/l | N/A | N/A | 3.1E-01 J | 3.1E-01 | ug/l | Max | 1 |

Options: Maximum Detected Concentration (Max)

J = Estimated Value
ug/l = microgram per liter
N/A = Not Applicable

UCL Rationale:
(1) Maximum detected concentration used because constituent detected in only 1 sample.

TABLE 3.1.CTE

**Medium-Specific Exposure Point Concentration Summary**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Current/Future
Medium: Surface Soil in the Ephemeral Drainage
Exposure Medium: Surface Soil in the Ephemeral Drainage

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | Maximum Concentration (Qualifier) | | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Value | Units | Statistic | Rationale |
| Ravine | Arsenic | mg/kg | 7.7E+00 | N/A | 1.0E+01 | J | 7.7E+00 | mg/kg | Mean | 1 |
| | Cadmium | mg/kg | 6.8E+00 | N/A | 1.0E+01 | J | 6.8E+00 | mg/kg | Mean | 1 |
| | Copper | mg/kg | 2.4E+02 | N/A | 4.2E+02 | | 2.4E+02 | mg/kg | Mean | 1 |
| | Iron | mg/kg | 9.9E+03 | N/A | 1.2E+04 | | 9.9E+03 | mg/kg | Mean | 1 |
| | Lead | mg/kg | 3.4E+02 | N/A | 5.9E+02 | | 3.4E+02 | mg/kg | Mean | 2 |
| | Manganese | mg/kg | 2.5E+03 | N/A | 4.7E+03 | | 2.5E+03 | mg/kg | Mean | 1 |
| | Mercury | mg/kg | 1.0E+01 | N/A | 2.0E+01 | J | 1.0E+01 | mg/kg | Mean | 1 |
| | Thallium | mg/kg | 5.0E+00 | N/A | 9.6E+00 | J | 5.0E+00 | mg/kg | Mean | 1 |
| | Zinc | mg/kg | 6.1E+03 | N/A | 1.2E+04 | | 6.1E+03 | mg/kg | Mean | 1 |

**Notes:**

Options: Mean Detected Concentration (Mean)

UCL Rationale:

(1) Only two sediment samples. Mean detected concentration used as EPC.

(2) Mean lead concentration used for the lead model.

mg/kg = milligrams per kilogram

N/A = Not applicable, only 2 samples

J = Estimated

TABLE 3.2.CTE

**Medium-Specific Exposure Point Concentration Summary**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe:Future |
| Medium: Subsurface Soil |
| Exposure Medium: Subsurface Soil |

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | | Maximum Concentration (Qualifier) | | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Value | Units | Statistic | Rationale |
| Subsurface Soil | | | | | | | | | | | |
| | Antimony | mg/kg | 1.4E+00 | 2.5E+00 | NP | 1.4E+01 | J | 1.4E+00 | mg/kg | Mean-NP | 1, 2, 3 |
| | Chromium (hexavalent) | mg/kg | 4.5E+01 | 5.0E+02 | NP | 4.9E+02 | | 4.5E+01 | mg/kg | Mean-NP | 4 |
| | Cobalt | mg/kg | 8.2E-01 | 2.7E+00 | NP | 6.2E+00 | | 8.2E-01 | mg/kg | Mean-NP | 1 |
| | Lead | mg/kg | 1.2E+02 | 5.8E+02 | NP | 2.8E+03 | | 1.2E+02 | mg/kg | Mean-NP | 5 |
| | Manganese | mg/kg | 3.4E+01 | 1.1E+02 | NP | 3.6E+02 | | 3.4E+01 | mg/kg | Mean-NP | 4 |
| | Thallium | mg/kg | N/A | N/A | | 2.4E-01 | J | 2.4E-01 | mg/kg | Max | 6 |

**Notes:**

ProUCL Version 4.1.00 used to determine distribution of data and calculate 95% UCL, following recommendations based on distribution and standard deviation in users guide (USEPA. May 2010. ProUCL, Version 4.1. Prepared by Lockheed Martin Environmental Services).

Options: Mean-Nonparametric (Mean-NP); Mean-Normal (Mean-N); Maximum Detected Concentration (Max)

UCL Rationale:

(1) Shapiro-Wilk W Test/Lilliefors test indicates data are log-normally distributed.

(2) Shapiro-Wilk W Test/Lilliefors indicates data are normally distributed.

(3) Test indicates data are gamma distributed.

(4) Distribution tests are inconclusive.

(5) Mean lead concentration used for the lead model.

(6) Maximum detected concentration used because constituent detected in only 1 sample.

G = Gamma

J = Estimated Value

mg/kg = milligrams per kilogram

NP = Non-Parametric

N/A = Not Applicable

TABLE 3.3.CTE
Medium-Specific Exposure Point Concentration Summary
*Site UXO-22 PA/SI*
*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe:Future
Medium: Subsurface Soil
Exposure Medium: Air

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Value | Units | Statistic | Rationale |
| Emissions from Subsurface Soil | Chromium (hexavalent) | $\mu g/m^3$ | 3.3E-05 | 3.7E-04 | NP | 3.6E-04 | 3.3E-05 | $\mu g/m^3$ | Mean-NP | 1 |

**Notes:**
ProUCL Version 4.1.00 used to determine distribution of data and calculate 95% UCL, following recommendations
based on distribution and standard deviation in users guide (USEPA. May 2010. ProUCL, Version 4.1. Prepared by Lockheed Martin Environmental Services).
Options: Mean-Nonparametric (Mean-NP)

UCL Rationale:
(1) Distribution tests are inconclusive.

$\mu g/m^3$ = micrograms per cubic meter
NP = Non-Parametric

TABLE 3.4.CTE

**Medium-Specific Exposure Point Concentration Summary**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe:Future
Medium: Groundwater
Exposure Medium: Groundwater

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | Maximum Concentration (Qualifier) | | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Value | Units | Statistic | Rationale |
| Surficial Aquifer - Tap Water | Nitrobenzene | ug/l | N/A | N/A | 3.1E-01 | J | 3.1E-01 | ug/l | Max | 2 |
| | 3-Nitrotoluene | ug/l | N/A | N/A | 4.2E-01 | J | 4.2E-01 | ug/l | Max | 2 |
| | Antimony | ug/l | 7.7E+00 | N/A | 1.5E+01 | | 7.7E+00 | ug/l | Mean-N | 1 |
| | Cadmium | ug/l | 3.2E+00 | N/A | 6.1E+00 | | 3.2E+00 | ug/l | Mean-N | 1 |
| | Manganese | ug/l | 4.5E+01 | N/A | 2.0E+02 | | 4.5E+01 | ug/l | Mean-N | 1 |

Options: Mean-Normal (Mean-N); Maximum Detected Concentration (Max)

UCL Rationale:

(1) Following EPA Region 4 risk assessment guidance, average concentration used as EPC.

(2) Maximum detected concentration used because constituent detected in only 1 sample.

J = Estimated Value

ug/l = microgram per liter

N/A = Not Applicable

TABLE 3.5.CTME

**Medium-Specific Exposure Point Concentration Summary**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe:Future<br>Medium: Groundwater<br>Exposure Medium: Air |

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale |
| Surficial Aquifer - Water Vapors at Showerhead and Excavation Pit | Nitrobenzene | ug/l | N/A | N/A | 3.1E-01 J | 3.1E-01 | ug/l | Max | 1 |

Options: Maximum Detected Concentration (Max)

UCL Rationale:

(1) Maximum detected concentration used because constituent detected in only 1 sample.

J = Estimated Value

ug/l = microgram per liter

N/A = Not Applicable

TABLE 4.1.RME

**Values Used for Daily Intake Calculations – Reasonable Maximum Exposure**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Current/Future<br>Medium: Surface Soil in the Ephemeral Drainage<br>Exposure Medium: Surface Soil in the Ephemeral Drainage |

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion | Trespasser/Visitor | Adult | Ravine | CS | Chemical Concentration in Soil | See Table 3.1.RME | mg/kg | See Table 3.1.RME | Chronic Daily Intake (CDI) (mg/kg-day) = |
| | | | | IR-S | Ingestion Rate of Soil | 100 | mg/day | USEPA, 1991 | CS x IR-S x EF x ED x CF x 1/BW x 1/AT |
| | | | | EF | Exposure Frequency | 52 | days/year | (1) | |
| | | | | ED | Exposure Duration | 24 | years | USEPA, 1991 | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 8,760 | days | USEPA, 1989 | |
| | | Youth | Ravine | CS | Chemical Concentration in Soil | See Table 3.1.RME | mg/kg | See Table 3.1.RME | Chronic Daily Intake (CDI) (mg/kg-day) = |
| | | | | IR-S | Ingestion Rate of Soil | 100 | mg/day | USEPA, 1991 | CS x IR-S x EF x ED x CF x 1/BW x 1/AT |
| | | | | EF | Exposure Frequency | 52 | days/year | (1) | |
| | | | | ED | Exposure Duration | 10 | years | USEPA, 2000, (2) | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | BW | Body Weight | 45 | kg | USEPA, 2004 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 3,650 | days | USEPA, 1989 | |
| | | Child | Ravine | CS | Chemical Concentration in Soil | See Table 3.1.RME | mg/kg | See Table 3.1.RME | Chronic Daily Intake (CDI) (mg/kg-day) = |
| | | | | IR-S | Ingestion Rate of Soil | 200 | mg/day | USEPA, 1991 | CS x IR-S x EF x ED x CF x 1/BW x 1/AT |
| | | | | EF | Exposure Frequency | 52 | days/year | (1) | |
| | | | | ED | Exposure Duration | 6 | years | USEPA, 1991 | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | BW | Body Weight | 15 | kg | USEPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,190 | days | USEPA, 1989 | |
| Dermal | Trespasser/Visitor | Adult | Ravine | CS | Chemical Concentration in Soil | see Table 3.1.RME | mg/kg | see Table 3.1.RME | CDI (mg/kg-day) = |
| | | | | SA | Skin Surface Area Available for Contact | 5,700 | $cm^2$ | USEPA, 2004 | CS x SA x SSAF x DABS x CF1 x EF x |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.6 | $mg/cm^2$-day | USEPA, 2004 (4) | ED x 1/BW x 1/AT |
| | | | | DABS | Dermal Absorption Factor Solids | chem specific | -- | USEPA, 2004 | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | EF | Exposure Frequency | 52 | days/year | (1) | |
| | | | | ED | Exposure Duration | 24 | years | USEPA, 1991 | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 8,760 | days | USEPA, 1989 | |

TABLE 4.1.RME

**Values Used for Daily Intake Calculations – Reasonable Maximum Exposure**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Current/Future |
| Medium: Surface Soil in the Ephemeral Drainage |
| Exposure Medium: Surface Soil in the Ephemeral Drainage |

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Dermal (cont'd) | Trespasser/Visitor | Youth | Ravine | CS | Chemical Concentration in Soil | see Table 3.1.RME | mg/kg | see Table 3.1.RME | CDI (mg/kg-day) = |
| | | | | SA | Skin Surface Area Available for Contact | 4,200 | $cm^2$ | USEPA, 2004 (3) | CS x SA x SSAF x DABS x CF x EF x |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.6 | $mg/cm^2$-day | USEPA, 2004 (4) | ED x 1/BW x 1/AT |
| | | | | DABS | Dermal Absorption Factor Solids | chem specific | -- | USEPA, 2004 | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | EF | Exposure Frequency | 52 | days/year | (1) | |
| | | | | ED | Exposure Duration | 10 | years | USEPA, 2000, (2) | |
| | | | | BW | Body Weight | 45 | kg | USEPA, 2004 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 3,650 | days | USEPA, 1989 | |
| | | Child | Ravine | CS | Chemical Concentration in Soil | see Table 3.1.RME | mg/kg | see Table 3.1.RME | CDI (mg/kg-day) = |
| | | | | SA | Skin Surface Area Available for Contact | 2,800 | $cm^2$ | USEPA, 2004 | CS x SA x SSAF x DABS x CF x EF x |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.2 | $mg/cm^2$-day | USEPA, 2004 (5) | ED x 1/BW x 1/AT |
| | | | | DABS | Dermal Absorption Factor Solids | chem specific | -- | USEPA, 2004 | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | EF | Exposure Frequency | 52 | days/year | (2) | |
| | | | | ED | Exposure Duration | 6 | years | USEPA, 1991 | |
| | | | | BW | Body Weight | 15 | kg | USEPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,190 | days | USEPA, 1989 | |

Notes:

(1) Professional judgment assuming 1 day per week for 52 weeks per year.

(2) Adolescents from 7 to 16 years of age, per USEPA 2000.

(3) SA is the total of the head, hands, forearms and lower legs for the 7 through 16 year olds.

(4) Average adherence factor for pipe layers in wet soil.

(5) Average adherence factor for children in wet soil.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

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USEPA, 2000: Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment Bulletins. http://www.epa.gov/region4/superfund/programs/riskassess/healtbul.html#hhexp

USEPA, 2004: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

TABLE 4.2.RME
**Values Used for Daily Intake Calculations – Reasonable Maximum Exposure**
*Site UXO-22 PA/SI*
*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/Reference | Intake Equation/Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion | Resident | Adult | Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.RME | mg/kg | See Table 3.2.RME | Chronic Daily Intake (CDI) (mg/kg-day) = |
| | | | | IR-S | Ingestion Rate of Soil | 100 | mg/day | USEPA, 2000 | CS x IR-S x EF x ED x CF x 1/BW x 1/AT |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA, 2000 | |
| | | | | ED | Exposure Duration | 24 | years | USEPA, 2000 | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 8,760 | days | USEPA, 1989 | |
| | | Child | Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.RME | mg/kg | See Table 3.2.RME | Chronic Daily Intake (CDI) (mg/kg-day) = |
| | | | | IR-S | Ingestion Rate of Soil | 200 | mg/day | USEPA, 2000 | CS x IR-S x EF x ED x CF x 1/BW x 1/AT |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA, 2000 | |
| | | | | ED | Exposure Duration | 6 | years | USEPA, 2000 | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | BW | Body Weight | 15 | kg | USEPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,190 | days | USEPA, 1989 | |
| | | Child/Adult | Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.RME | mg/kg | See Table 3.2.RME | Carcinogenic |
| | | | | IR-Sa | Ingestion Rate of Soil-adult | 100 | mg/day | USEPA, 2000 | Chronic Daily Intake (CDI) (mg/kg-day) = |
| | | | | EDa | Exposure Duration adult | 24 | years | USEPA, 2000 | CS x IR-S x EF x CF x 1/AT |
| | | | | BWa | Body Weight adult | 70 | kg | USEPA, 2000 | |
| | | | | IR-Sc | Ingestion Rate of Soil-child | 200 | mg/day | USEPA, 2000 | |
| | | | | EDc | Exposure Duration child | 6 | years | USEPA, 2000 | IR-S = (EDc * IR-Sc/ BWc) + (EDa * IR-Sa/BWa) |
| | | | | BWc | Body Weight child | 15 | kg | USEPA, 2000 | |
| | | | | IR-S | Ingestion Rate of Soil-adjusted | 114.29 | mg-year/kg-day | - - | |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA, 1991 | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | Construction Worker | Adult | Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.RME | mg/kg | See Table 3.2.RME | CDI (mg/kg-day) = |
| | | | | IR-S | Ingestion Rate of Soil | 330 | mg/day | USEPA, 2002 | CS x IR-S x EF x ED x CF x 1/BW x 1/AT |
| | | | | EF | Exposure Frequency | 250 | days/year | USEPA, 2002 | |
| | | | | ED | Exposure Duration | 1 | years | USEPA, 2002 | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 2002 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 365 | days | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | Industrial Worker | Adult | Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.RME | mg/kg | See Table 3.2.RME | Chronic Daily Intake (CDI) (mg/kg-day) = |
| | | | | IR-S | Ingestion Rate of Soil | 100 | mg/day | USEPA, 2002 | CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT |
| | | | | EF | Exposure Frequency | 250 | days/year | USEPA, 2000 | |
| | | | | ED | Exposure Duration | 25 | years | USEPA, 2000 | |
| | | | | CF1 | Conversion Factor 1 | 0.000001 | kg/mg | - - | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 9125 | days | USEPA, 1989 | |

TABLE 4.2.RME

**Values Used for Daily Intake Calculations – Reasonable Maximum Exposure**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/Reference | Intake Equation/Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion (cont'd) | Trespasser/Visitor | Adult | Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.RME | mg/kg | See Table 3.2.RME | |
| | | | | IR-S | Ingestion Rate of Soil | 100 | mg/day | EPA, 1991 | Chronic Daily Intake (CDI) (mg/kg-day) = |
| | | | | EF | Exposure Frequency | 52 | days/year | (1) | CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT |
| | | | | ED | Exposure Duration | 24 | years | EPA, 1991 | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | BW | Body Weight | 70 | kg | EPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | EPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 8,760 | days | EPA, 1989 | |
| | | Youth | Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.RME | mg/kg | See Table 3.2.RME | CDI (mg/kg-day) = |
| | | | | IR-S | Ingestion Rate of Soil | 100 | mg/day | EPA, 1991 | CS x IR-S x EF x ED x CF x 1/BW x 1/AT |
| | | | | EF | Exposure Frequency | 52 | days/year | (1) | |
| | | | | ED | Exposure Duration | 10 | years | EPA, 2000, (2) | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | BW | Body Weight | 45 | kg | EPA, 2000 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | EPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 3,650 | days | EPA, 1989 | |
| | | Child | Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.RME | mg/kg | See Table 3.2.RME | Chronic Daily Intake (CDI) (mg/kg-day) = |
| | | | | IR-S | Ingestion Rate of Soil | 100 | mg/day | EPA, 1991 | CSed x IR-S x EF x ED x CF x 1/BW x 1/AT |
| | | | | EF | Exposure Frequency | 52 | days/year | (1) | |
| | | | | ED | Exposure Duration | 6 | years | USEPA, 1991 | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | BW | Body Weight | 15 | kg | USEPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,190 | days | USEPA, 1989 | |
| Dermal | Resident | Adult | Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.RME | mg/kg | See Table 3.2.RME | CDI (mg/kg-day) = |
| | | | | SA | Skin Subsurface Area Available for Contac | 5,700 | $cm^2$ | USEPA, 2004 | CS x SA x SSAF x DABS x CF x EF x |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.07 | $mg/cm^2$-day | USEPA, 2004 | ED x 1/BW x 1/AT |
| | | | | DABS | Dermal Absorption Factor Solids | chem specific | -- | USEPA, 2004 | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA, 2000 | |
| | | | | ED | Exposure Duration | 24 | years | USEPA, 2000 | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 8,760 | days | USEPA, 1989 | |
| | | Child | Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.RME | mg/kg | See Table 3.2.RME | CDI (mg/kg-day) = |
| | | | | SA | Skin Subsurface Area Available for Contac | 2,800 | $cm^2$ | USEPA, 2004 | CS x SA x SSAF x DABS x CF x EF x |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.2 | $mg/cm^2$-day | USEPA, 2004 | ED x 1/BW x 1/AT |
| | | | | DABS | Dermal Absorption Factor Solids | chem specific | -- | USEPA, 2004 | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA, 2000 | |
| | | | | ED | Exposure Duration | 6 | years | USEPA, 2000 | |
| | | | | BW | Body Weight | 15 | kg | USEPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,190 | days | USEPA, 1989 | |

TABLE 4.2.RME

**Values Used for Daily Intake Calculations – Reasonable Maximum Exposure**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Medium: Subsurface Soil |
| Exposure Medium: Subsurface Soil |

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/Reference | Intake Equation/Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Dermal | Resident | Child/Adult | Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.RME | mg/kg | See Table 3.2.RME | Carcinogenic CDI (mg/kg-day) = |
| (cont'd) | | | | SAc | Skin Subsurface Area child | 2,800 | $cm^2$ | USEPA, 2004 | CS x SA x DABS x CF x EF x 1/AT |
| | | | | SSAFc | Soil to Skin Adherence Factor child | 0.2 | $mg/cm^2$-day | USEPA, 2004 | |
| | | | | EDc | Exposure Duration child | 6 | years | USEPA, 2000 | SA = |
| | | | | BWc | Body Weight child | 15 | kg | USEPA, 1991 | ((EDc * SAc/BWc)*SSAFc) + ((EDa * SAa/BWa)*SSAFa) |
| | | | | SAa | Skin Subsurface Area adult | 5,700 | $cm^2$ | USEPA, 2004 | |
| | | | | SSAFa | Soil to Skin Adherence Factor-adult | 0.07 | $mg/cm^2$-day | USEPA, 2004 | |
| | | | | EDa | Exposure Duration adult | 24 | years | USEPA, 2000 | |
| | | | | BWa | Body Weight adult | 70 | kg | USEPA, 1991 | |
| | | | | SA | Skin Subsurface Area adjusted | 361 | $cm^2$-year/kg-day | --- | |
| | | | | DABS | Dermal Absorption Factor Solids | chem specific | -- | USEPA, 2004 | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA, 2000 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | Construction Worker | Adult | Subsurface Soil | CS | Chemical Concentration in Soi | See Table 3.2.RME | mg/kg | See Table 3.2.RME | CDI (mg/kg-day) = |
| | | | | SA | Skin Surface Area Available for Contact | 3,300 | $cm^2$ | USEPA, 2004 (3) | CS x SA x SSAF x DABS x CF x EF x |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.2 | $mg/cm^2$-day | USEPA, 2004 | ED x 1/BW x 1/AT |
| | | | | DABS | Dermal Absorption Factor Solids | chem specific | -- | USEPA, 2004 | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | EF | Exposure Frequency | 250 | days/years | Prof. Judgment | |
| | | | | ED | Exposure Duration | 1 | years | Prof. Judgment | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 365 | days | USEPA, 1989 | |
| | Industrial Worker | Adult | Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.RME | mg/kg | See Table 3.2.RME | CDI (mg/kg-day) = |
| | | | | SA | Skin Surface Area Available for Contact | 3,300 | $cm^2$ | EPA, 2004 | CS x SA x SSAF x DABS x CF x EF x |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.2 | $mg/cm^2$-day | EPA, 2004 | ED x 1/BW x 1/AT |
| | | | | DABS | Dermal Absorption Factor Solids | chem specific | -- | EPA, 2004 | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | EF | Exposure Frequency | 250 | days/year | EPA, 1991 | |
| | | | | ED | Exposure Duration | 25 | years | EPA, 1991 | |
| | | | | BW | Body Weight | 70 | kg | EPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | EPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 9,125 | days | EPA, 1989 | |

TABLE 4.2.RME

**Values Used for Daily Intake Calculations – Reasonable Maximum Exposure**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Medium: Subsurface Soil |
| Exposure Medium: Subsurface Soil |

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/Reference | Intake Equation/Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Dermal | Trespasser/Visitor | Adult | Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.RME | mg/kg | See Table 3.2.RME | CDI (mg/kg-day) = |
| (cont'd) | | | | SA | Skin Surface Area Available for Contact | 5,700 | $cm^2$ | EPA, 2004 | CS x SA x SSAF x DABS x CF1 x EF x |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.07 | $mg/cm^2$-day | EPA, 2004 | ED x 1/BW x 1/AT |
| | | | | DABS | Dermal Absorption Factor Solids | Chemical Specific | -- | EPA, 2004 | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | EF | Exposure Frequency | 52 | days/year | (1) | |
| | | | | ED | Exposure Duration | 24 | years | EPA, 1991 | |
| | | | | BW | Body Weight | 70 | kg | EPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | EPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 8,760 | days | EPA, 1989 | |
| | | Youth | Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.RME | mg/kg | See Table 3.2.RME | CDI (mg/kg-day) = |
| | | | | SA | Skin Surface Area Available for Contact | 4,200 | $cm^2$ | EPA, 2004, (4) | CS x SA x SSAF x DABS x CF1 x EF x |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.04 | $mg/cm^2$-day | EPA, 2004, (5) | ED x 1/BW x 1/AT |
| | | | | DABS | Dermal Absorption Factor Solids | Chemical Specific | -- | EPA, 2004 | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | EF | Exposure Frequency | 52 | days/year | (1) | |
| | | | | ED | Exposure Duration | 10 | years | EPA, 2000, (2) | |
| | | | | BW | Body Weight | 45 | kg | EPA, 2000 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | EPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 3,650 | days | EPA, 1989 | |
| | | Child | Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.RME | mg/kg | See Table 3.2.RME | CDI (mg/kg-day) = |
| | | | | SA | Skin Surface Area Available for Contact | 2,800 | $cm^2$ | EPA, 2004 | CS x SA x SSAF x DABS x CF x EF x |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.2 | $mg/cm^2$-day | EPA, 2004 | ED x 1/BW x 1/AT |
| | | | | DABS | Dermal Absorption Factor Solids | chem specific | -- | EPA, 2004 | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | EF | Exposure Frequency | 52 | days/year | (1) | |
| | | | | ED | Exposure Duration | 6 | years | EPA, 1991 | |
| | | | | BW | Body Weight | 15 | kg | EPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | EPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,190 | days | EPA, 1989 | |

**Notes:**

(1) Professional judgment assuming trespasser/visitor on site 1 day per week for 52 weeks.

(2) Adolescents from 7 to 16 years of age, per USEPA 2000.

(3) SA includes head, hands, forearms, and lower legs.

(4) The skin surface area includes the head, hands, forearms and lower legs for the 7 through 16 year olds.

(5) SSAF is the geometric mean weighted soil adherence for soccer players (teens, 13-15 years old) from EPA, 2004, Exhibit 3-3.

Sources:


USEPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

USEPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

USEPA, 2000: Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment Bulletins. http://www.epa.gov/region4/superfund/programs/riskassess/healtbul.html#hhexp

USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2004: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

TABLE 4.3.RME

**Values Used for Daily Intake Calculations – Reasonable Maximum Exposure**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Medium: Subsurface Soil |
| Exposure Medium: Air |

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation | Resident | Adult | Emissions from Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.RME | mg/kg | See Table 3.2.RME | Exposure Concentration (EC) ($mg/m^3$) = |
| | | | | CA | Chemical Concentration in Air | See Table 3.3.RME | $mg/m^3$ | See Table 3.3.RME | CA x ET x EF x ED x CF x 1/AT |
| | | | | PEF | Particulate Emission Factor | 1.36E+09 | $m^3/kg$ | USEPA, 2002 | |
| | | | | VF | Volatilization Factor for volatile constituents | Calculated | $m^3/kg$ | USEPA, 2002 | CA ($mg/m^3$) = CS (1/PEF + 1/VF) |
| | | | | ET | Exposure Time | 24 | hour/day | -- | |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA, 1991 | |
| | | | | ED | Exposure Duration | 24 | years | USEPA, 1991 | |
| | | | | CF | Conversion Factor 1 | 1/24 | day/hr | - - | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 8,760 | days | USEPA, 1989 | |
| | | Child | Emissions from Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.RME | mg/kg | See Table 3.2.RME | Exposure Concentration (EC) ($mg/m^3$) = |
| | | | | CA | Chemical Concentration in Air | See Table 3.3.RME | $mg/m^3$ | See Table 3.3.RME | CA x ET x EF x ED x CF x 1/AT |
| | | | | PEF | Particulate Emission Factor | 1.36E+09 | $m^3/kg$ | USEPA, 2002 | |
| | | | | VF | Volatilization Factor for volatile constituents | Calculated | $m^3/kg$ | USEPA, 2002 | CA ($mg/m^3$) = CS (1/PEF + 1/VF) |
| | | | | ET | Exposure Time | 24 | hour/day | -- | |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA, 1991 | |
| | | | | ED | Exposure Duration | 6 | years | USEPA, 1991 | |
| | | | | CF | Conversion Factor 1 | 1/24 | day/hr | - - | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,190 | days | USEPA, 1989 | |
| | | Child/Adult | Emissions from Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.RME | mg/kg | See Table 3.2.RME | Exposure Concentration (EC) ($mg/m^3$) = |
| | | | | CA | Chemical Concentration in Air | See Table 3.3.RME | $mg/m^3$ | See Table 3.3.RME | CA x ET x EF x ED x CF x 1/AT |
| | | | | PEF | Particulate Emission Factor | 1.36E+09 | $m^3/kg$ | USEPA, 2002 | CA ($mg/m^3$) = CS (1/PEF + 1/VF) |
| | | | | VF | Volatilization Factor for volatile constituents | Calculated | $m^3/kg$ | USEPA, 2002 | |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA, 1991 | |
| | | | | ED | Exposure Duration | 30 | years | USEPA, 2002 | |
| | | | | ET | Exposure Time | 24 | hr/day | USEPA, 2009 | |
| | | | | CF | Conversion Factor 1 | 1/24 | day/hr | - - | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |

TABLE 4.3.RME

**Values Used for Daily Intake Calculations – Reasonable Maximum Exposure**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Medium: Subsurface Soil |
| Exposure Medium: Air |

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation | Construction Worker | Adult | Emissions from Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.RME | mg/kg | See Table 3.2.RME | Exposure Concentration (EC) ($mg/m^3$) = |
| | | | | CA | Chemical Concentration in Air | See Table 3.3.RME | $mg/m^3$ | See Table 3.3.RME | CA x ET x EF x ED x CF x 1/AT |
| | | | | PEF | Particulate Emission Factor | 1.36E+09 | $m^3/kg$ | USEPA, 2002 | |
| | | | | VF | Volatilization Factor for volatile constituents | Calculated | $m^3/kg$ | USEPA, 2002 | CA ($mg/m^3$) = CS (1/PEF + 1/VF) |
| | | | | EF | Exposure Frequency | 250 | days/year | USEPA,1991 | |
| | | | | ED | Exposure Duration | 1 | years | USEPA, 2002 | |
| | | | | ET | Exposure Time | 8 | hour/day | USEPA, 1991 | |
| | | | | CF | Conversion Factor 1 | 1/24 | day/hr | - - | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 365 | days | USEPA, 1989 | |
| | Industrial Worker | Adult | Emissions from Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.RME | mg/kg | See Table 3.2.RME | Exposure Concentration (EC) ($mg/m^3$) = |
| | | | | CA | Chemical Concentration in Air | See Table 3.3.RME | $mg/m^3$ | See Table 3.3.RME | CA x ET x EF x ED x CF x 1/AT |
| | | | | PEF | Particulate Emission Factor | 1.36E+09 | $m^3/kg$ | USEPA, 2002 | |
| | | | | VF | Volatilization Factor for volatile constituents | Calculated | $m^3/kg$ | USEPA, 2002 | CA ($mg/m^3$) = CS (1/PEF + 1/VF) |
| | | | | ET | Exposure Time | 8 | hour/day | USEPA, 1991 | |
| | | | | EF | Exposure Frequency | 250 | days/year | USEPA, 1991 | |
| | | | | ED | Exposure Duration | 25 | years | USEPA, 1991 | |
| | | | | CF | Conversion Factor 1 | 1/24 | day/hr | - - | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 9,125 | days | USEPA, 1989 | |
| | Trespasser/Visitor | Adult | Emissions from Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.RME | mg/kg | See Table 3.2.RME | Exposure Concentration (EC) ($mg/m^3$) = |
| | | | | CA | Chemical Concentration in Air | See Table 3.3.RME | $mg/m^3$ | See Table 3.3.RME | CA x ET x EF x ED x CF x 1/AT |
| | | | | PEF | Particulate Emission Factor | 1.36E+09 | $m^3/kg$ | EPA, 2002 | |
| | | | | VF | Volatilization Factor for volatile constituents | calc | $m^3/kg$ | EPA, 2002 | CA ($mg/m^3$) = CS (1/PEF + 1/VF) |
| | | | | ET | Exposure Time | 2 | hour/day | (1) | |
| | | | | EF | Exposure Frequency | 52 | days/year | (2) | |
| | | | | ED | Exposure Duration | 24 | years | EPA, 1991 | |
| | | | | CF | Conversion Factor 1 | 1/24 | day/hr | - - | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | EPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 8,760 | days | EPA, 1989 | |

TABLE 4.3.RME

**Values Used for Daily Intake Calculations – Reasonable Maximum Exposure**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Medium: Subsurface Soil |
| Exposure Medium: Air |

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation (cont'd) | Trespasser/Visitor | Youth | Emissions from Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.RME | mg/kg | See Table 3.2.RME | Exposure Concentration (EC) ($mg/m^3$) = |
| | | | | CA | Chemical Concentration in Air | See Table 3.3.RME | $mg/m^3$ | See Table 3.3.RME | CA x ET x EF x ED x CF x 1/AT |
| | | | | PEF | Particulate Emission Factor | 1.36E+09 | $m^3/kg$ | EPA, 2002 | |
| | | | | VF | Volatilization Factor for volatile constituents | calc | $m^3/kg$ | EPA, 2002 | CA ($mg/m^3$) = CS (1/PEF + 1/VF) |
| | | | | ET | Exposure Time | 2 | hour/day | (1) | |
| | | | | EF | Exposure Frequency | 52 | days/year | (2) | |
| | | | | ED | Exposure Duration | 10 | years | EPA, 2000 | |
| | | | | CF | Conversion Factor 1 | 1/24 | day/hr | - - | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | EPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 3,650 | days | EPA, 1989 | |
| | | Child | Emissions from Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.RME | mg/kg | See Table 3.2.RME | Exposure Concentration (EC) ($mg/m^3$) = |
| | | | | CA | Chemical Concentration in Air | See Table 3.3.RME | $mg/m^3$ | See Table 3.3.RME | CA x ET x EF x ED x CF x 1/AT |
| | | | | PEF | Particulate Emission Factor | 1.36E+09 | $m^3/kg$ | EPA, 2002 | |
| | | | | VF | Volatilization Factor for volatile constituents | calc | $m^3/kg$ | EPA, 2002 | CA ($mg/m^3$) = CS (1/PEF + 1/VF) |
| | | | | ET | Exposure Time | 2 | hour/day | (1) | |
| | | | | EF | Exposure Frequency | 52 | days/year | (2) | |
| | | | | ED | Exposure Duration | 6 | years | EPA, 1991 | |
| | | | | CF | Conversion Factor 1 | 1/24 | day/hr | - - | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | EPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,190 | days | EPA, 1989 | |

(1) Professional judgment assuming 2 hours per day.

(2) Professional judgment assuming trespasser/visitor in industrial area of site 1 day per week for 52 weeks.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

USEPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

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USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

TABLE 4.4.RME

**Values Used for Daily Intake Calculations – Reasonable Maximum Exposure**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/Reference | Intake Equation/Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion | Resident | Adult | Surficial Aquifer - | CW | Chemical Concentration in Water | See Table 3.4.RME | µg/L | See Table 3.4.RME | Chronic Daily Intake (CDI) (mg/kg-day) = |
| | | | Tap Water | IR-W | Ingestion Rate of Water | 2 | liters/day | USEPA, 2000 | CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA, 2000 | |
| | | | | ED | Exposure Duration | 24 | years | USEPA, 2000 | |
| | | | | CF1 | Conversion Factor | 0.001 | mg/µg | - - | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 8,760 | days | USEPA, 1989 | |
| | | Child | Surficial Aquifer - | CW | Chemical Concentration in Water | See Table 3.4.RME | µg/L | See Table 3.4.RME | CDI (mg/kg-day) = |
| | | | Tap Water | IR-W | Ingestion Rate of Water | 1 | liters/day | USEPA, 2000 | CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA, 2000 | |
| | | | | ED | Exposure Duration | 6 | years | USEPA, 2000 | |
| | | | | CF1 | Conversion Factor | 0.001 | mg/µg | - - | |
| | | | | BW | Body Weight | 15 | kg | USEPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,190 | days | USEPA, 1989 | |
| | | Child/Adult | Surficial Aquifer - | CW | Chemical Concentration in Water | See Table 3.4.RME | µg/L | See Table 3.4.RME | CDI (mg/kg-day) = |
| | | | Tap Water | IR-W-A | Ingestion Rate of Water, Adult | 2 | liters/day | USEPA, 2000 | CW x IR-W-Adj x EF x CF1 x 1/AT |
| | | | | IR-W-C | Ingestion Rate of Water, Child | 1 | liters/day | USEPA, 2000 | |
| | | | | IR-W-Adj | Ingestion Rate of Water, Age-adjusted | 1.09 | liter-year/kg-day | calculated | IR-W-Adj (liter-year/kg-day) = |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA, 2000 | (ED-C x IR-W-C / BW-C) + |
| | | | | ED-A | Exposure Duration, Adult | 24 | years | USEPA, 2000 | (ED-A x IR-W-A / BW-A) |
| | | | | ED-C | Exposure Duration, Child | 6 | years | USEPA, 2000 | |
| | | | | CF1 | Conversion Factor | 0.001 | mg/µg | - - | |
| | | | | BW-A | Body Weight , Adult | 70 | kg | USEPA, 1991 | |
| | | | | BW-C | Body Weight, Child | 15 | kg | USEPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | Industrial Worker | Adult | Surficial Aquifer - | CW | Chemical Concentration in Water | See Table 3.4.RME | µg/L | See Table 3.4.RME | CDI (mg/kg-day) = |
| | | | Tap Water | IR-W | Ingestion Rate of Water | 1 | liters/day | USEPA, 2000 | CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT |
| | | | | EF | Exposure Frequency | 250 | days/year | USEPA, 2000 | |
| | | | | ED | Exposure Duration | 25 | years | USEPA, 2000 | |
| | | | | CF1 | Conversion Factor | 0.001 | mg/µg | - - | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 9,125 | days | USEPA, 1989 | |

TABLE 4.4.RME

**Values Used for Daily Intake Calculations – Reasonable Maximum Exposure**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/Reference | Intake Equation/Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Dermal | Resident | Adult | Surficial Aquifer - | CW | Chemical Concentration in Water | See Table 3.4.RME | µg/L | See Table 3.4.RME | CDI (mg/kg-day) = |
| | | | Tap Water | DAevent | Dermally Absorbed Dose per Event | calculated | $mg/cm^2$-event | calculated | DAevent x SA x EV x EF x ED x 1/BW x 1/AT |
| | | | | FA | Fraction absorbed water | chemical specific | dimensionless | USEPA, 2004 | |
| | | | | $K_p$ | Permeability Coefficient | chemical specific | cm/hr | USEPA, 2004 | Inorganics: DAevent (mg/cm2-event) = |
| | | | | $\tau$ | Lag Time | chemical specific | hr/event | USEPA, 2004 | Kp x CW x $t_{event}$ x CF2 x CF3 |
| | | | | t* | Time to Reach Steady-state | chemical specific | hours | USEPA, 2004 | |
| | | | | B | Ratio of Permeability of Stratum Corneum to Epidermis | chemical specific | dimensionless | USEPA, 2004 | Organics : |
| | | | | $t_{event}$ | Event Time | 0.58 | hr/event | USEPA, 2004 | tevent<t*: DAevent (mg/cm2-event) = |
| | | | | SA | Skin Surface Area Available for Contact | 18,000 | $cm^2$ | USEPA, 2004 | 2 x FA x Kp x CW x (sqrt((6 x $\tau$ x $t_{event}$)/$\pi$)) |
| | | | | EV | Event Frequency | 1 | events/day | USEPA, 2004 | x CF2 x CF3 |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA, 2004 | |
| | | | | ED | Exposure Duration | 24 | years | USEPA, 2004 | tevent>t*: DAevent (mg/cm2-event) = |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1991 | FA x Kp x CW x ( $t_{event}$/(1+B) + 2 x $\tau$ x |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | ((1 + 3B + 3B2)/(1+B)2)) x CF2 x CF3 |
| | | | | AT-N | Averaging Time (Non-Cancer) | 8,760 | days | USEPA, 1989 | |
| | | | | CF2 | Conversion Factor 2 | 0.001 | mg/µg | - - | |
| | | | | CF3 | Conversion Factor 3 | 0.001 | $L/cm^3$ | - - | |
| | | Child | Surficial Aquifer - | CW | Chemical Concentration in Water | See Table 3.4.RME | µg/L | See Table 3.4.RME | CDI (mg/kg-day) = |
| | | | Tap Water | DAevent | Dermally Absorbed Dose per Event | calculated | $mg/cm^2$-event | calculated | DAevent x SA x EV x EF x ED x 1/BW x 1/AT |
| | | | | FA | Fraction absorbed water | chemical specific | dimensionless | USEPA, 2004 | |
| | | | | $K_p$ | Permeability Coefficient | chemical specific | cm/hr | USEPA, 2004 | Inorganics: DAevent (mg/cm2-event) = |
| | | | | $\tau$ | Lag Time | chemical specific | hr/event | USEPA, 2004 | Kp x CW x $t_{event}$ x CF2 x CF3 |
| | | | | t* | Time to Reach Steady-state | chemical specific | hours | USEPA, 2004 | |
| | | | | B | Ratio of Permeability of Stratum Corneum to Epidermis | chemical specific | dimensionless | USEPA, 2004 | Organics : |
| | | | | $t_{event}$ | Event Time | 1.0 | hr/event | USEPA, 2004 | tevent<t*: DAevent (mg/cm2-event) = |
| | | | | SA | Skin Surface Area Available for Contact | 6,600 | $cm^2$ | USEPA, 2004 | 2 x FA x Kp x CW x (sqrt((6 x $\tau$ x $t_{event}$)/$\pi$)) |
| | | | | EV | Event Frequency | 1 | events/day | USEPA, 2004 | x CF2 x CF3 |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA, 2004 | |
| | | | | ED | Exposure Duration | 6 | years | USEPA, 2004 | tevent>t*: DAevent (mg/cm2-event) = |
| | | | | BW | Body Weight | 15 | kg | USEPA, 1991 | FA x Kp x CW x ( $t_{event}$/(1+B) + 2 x $\tau$ x |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | ((1 + 3B + 3B2)/(1+B)2)) x CF2 x CF3 |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,190 | days | USEPA, 1989 | |
| | | | | CF2 | Conversion Factor 2 | 0.001 | mg/µg | - - | |
| | | | | CF3 | Conversion Factor 3 | 0.001 | $L/cm^3$ | - - | |

TABLE 4.4.RME

**Values Used for Daily Intake Calculations – Reasonable Maximum Exposure**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Medium: Groundwater |
| Exposure Medium: Groundwater |

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/Reference | Intake Equation/Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Dermal (cont'd) | Resident | Child/Adult | Surficial Aquifer - | CW | Chemical Concentration in Water | See Table 3.4.RME | µg/L | See Table 3.4.RME | CDI (mg/kg-day) = DA-Adj x EF x 1/AT |
| | | | Tap Water | DAevent-A | Dermally Absorbed Dose per Event, Adult | calculated | mg/cm$^2$-event | calculated | |
| | | | | DAevent-C | Dermally Absorbed Dose per Event, Child | calculated | mg/cm$^2$-event | calculated | DA-Adj = (Daevent-A x SA-A x ED-A x 1/BW-A) |
| | | | | DA-Adj | Dermally Absorbed Dose, Age-adjusted | calculated | mg-year/event-kg | calculated | + (Daevent-C x SA-C x ED-C x 1/BW-C) |
| | | | | FA | Fraction absorbed water | chemical specific | dimensionless | USEPA, 2004 | |
| | | | | $K_p$ | Permeability Coefficient | chemical specific | cm/hr | USEPA, 2004 | Inorganics: DAevent (mg/cm2-event) = |
| | | | | $\tau$ | Lag Time | chemical specific | hr/event | USEPA, 2004 | Kp x CW x $t_{event}$ x CF2 x CF3 |
| | | | | t* | Time to Reach Steady-state | chemical specific | hours | USEPA, 2004 | |
| | | | | B | Ratio of Permeability of Stratum Corneum to Epidermis | chemical specific | dimensionless | USEPA, 2004 | Organics : |
| | | | | $t_{event}$-A | Event Time, Adult | 0.58 | hr/event | USEPA, 2004 | tevent<t*: DAevent (mg/cm2-event) = |
| | | | | $t_{event}$-C | Event Time, Child | 1.0 | hr/event | USEPA, 2004 | 2 x FA x Kp x CW x (sqrt((6 x $\tau$ x $t_{event}$)/$\pi$)) |
| | | | | SA-A | Skin Surface Area, Adult | 18,000 | cm$^2$ | USEPA, 2004 | x CF2 x CF3 |
| | | | | SA-C | Skin Surface Area, Child | 6,600 | cm$^2$ | USEPA, 2004 | |
| | | | | EV | Event Frequency | 1 | events/day | USEPA, 2004 | tevent>t*: DAevent (mg/cm2-event) = |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA, 2004 | FA x Kp x CW x ( $t_{event}$/(1+B) + 2 x $\tau$ x |
| | | | | ED-A | Exposure Duration, Adult | 24 | years | USEPA, 2004 | ((1 + 3B + 3B2)/(1+B)2)) x CF2 x CF3 |
| | | | | ED-C | Exposure Duration, Child | 6 | years | USEPA, 2004 | |
| | | | | BW-A | Body Weight, Adult | 70 | kg | USEPA, 1991 | |
| | | | | BW-C | Body Weight, Child | 15 | kg | USEPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | CF2 | Conversion Factor 2 | 0.001 | mg/µg | - - | |
| | | | | CF3 | Conversion Factor 3 | 0.001 | L/cm$^3$ | - - | |
| | Construction Worker | Adult | Surficial Aquifer - | CW | Chemical Concentration in Water | See Table 3.4.RME | µg/L | See Table 3.4.RME | CDI (mg/kg-day) = |
| | | | | DAevent | Dermally Absorbed Dose per Event | calculated | mg/cm$^2$-event | calculated | DAevent x SA x EV x EF x ED x 1/BW x 1/AT |
| | | | Water in Excavation | FA | Fraction absorbed water | chemical specific | dimensionless | USEPA, 2004 | |
| | | | Pit | $K_p$ | Permeability Coefficient | chemical specific | cm/hr | USEPA, 2004 | Inorganics: DAevent (mg/cm2-event) = |
| | | | | $\tau$ | Lag Time | chemical specific | hr/event | USEPA, 2004 | Kp x CW x $t_{event}$ x CF2 x CF3 |
| | | | | t* | Time to Reach Steady-state | chemical specific | hours | USEPA, 2004 | |
| | | | | B | Ratio of Permeability of Stratum Corneum to Epidermis | chemical specific | dimensionless | USEPA, 2004 | Organics : |
| | | | | $t_{event}$ | Event Time | 4 | hr/day | (1) | tevent<t*: DAevent (mg/cm2-event) = |
| | | | | SA | Skin Surface Area Available for Contact | 5,700 | cm$^2$ | USEPA, 2004, (2) | 2 x FA x Kp x CW x (sqrt((6 x $\tau$ x $t_{event}$)/$\pi$)) |
| | | | | EV | Event Frequency | 1 | events/day | USEPA, 2004 | x CF2 x CF3 |
| | | | | EF | Exposure Frequency | 125 | days/year | (3) | |
| | | | | ED | Exposure Duration | 1 | years | USEPA, 1991 | tevent>t*: DAevent (mg/cm2-event) = |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1991 | FA x Kp x CW x ( $t_{event}$/(1+B) + 2 x $\tau$ x |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | ((1 + 3B + 3B2)/(1+B)2)) x CF2 x CF3 |
| | | | | AT-N | Averaging Time (Non-Cancer) | 365 | days | USEPA, 1989 | |
| | | | | CF2 | Conversion Factor 2 | 0.001 | mg/µg | - - | |
| | | | | CF3 | Conversion Factor 3 | 0.001 | L/cm$^3$ | - - | |

**Notes:**

(1) Professional Judgment based on construction activities that would result in contact with groundwater would occur 4 hrs per day for the RME.

(2) Skin surface area in contact with groundwater assumed to be hands, forearms, lower legs, and feet.

(3) Assumed duration of construction project during which contact with groundwater would occur may be 1/2 a year.

Sources:


USEPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

USEPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

USEPA, 2000: Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment Bulletins. http://www.epa.gov/region4/superfund/programs/riskassess/healtbul.html

USEPA, 2004 . Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final). EPA/540/R/99/005. July 2004.

TABLE 4.5.RME

**Values Used for Daily Intake Calculations – Reasonable Maximum Exposure**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/Reference | Intake Equation/Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation | Resident | Adult | Surficial Aquifer - | CW | Chemical Concentration in Water | See Table 3.5.RME | µg/L | See Table 3.5.RME | Chronic Daily Intake (CDI) (mg/m3) = |
| | | | Water Vapors at Showerhead | CAa | Chemical Concentration in Air | Calculated | $mg/m^3$ | Calculated | CAa x ETa x EDa x EF x CF1 x 1/AT |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA, 1991 | |
| | | | | EDa | Exposure Duration | 24 | years | USEPA, 1991 | Use Foster & Chrostowski Shower model to |
| | | | | ETa | Exposure Time | 0.58 | hr/day | USEPA, 2004 | calculate CAa |
| | | | | CF1 | Conversion Factor 1 | 1/24 | day/hour | - - | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 8,760 | days | USEPA, 1989 | |
| | | Child | Surficial Aquifer - | CW | Chemical Concentration in Water | See Table 3.5.RME | µg/L | See Table 3.5.RME | Chronic Daily Intake (CDI) (mg/m3) = |
| | | | Water Vapors at Showerhead | CAc | Chemical Concentration in Air | Calculated | $mg/m^3$ | Calculated | $CA_c$ x $ET_c$ x $ED_c$ x EF x CF1 x 1/AT |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA, 1991 | |
| | | | | EDc | Exposure Duration | 6 | years | USEPA, 1991 | Use Foster & Chrostowski Shower model to |
| | | | | ETc | Exposure Time | 1 | hr/day | USEPA, 2004 | calculate Cac |
| | | | | CF1 | Conversion Factor 1 | 1/24 | day/hour | - - | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,190 | days | USEPA, 1989 | |
| | | Child/Adult | Surficial Aquifer - | CW | Chemical Concentration in Water | See Table 3.5.RME | µg/L | See Table 3.5.RME | Chronic Daily Intake (CDI) (mg/m3) = |
| | | | Water Vapors at Showerhead | CAa | Air Concentration for shower, Adult | Calculated | $mg/m^3$ | Calculated | (CAc x ETc x EDc + CAa x ETa x EDa) x EF x CF1 x 1/AT |
| | | | | CAc | Air Concentration for shower, child | Calculated | $mg/m^3$ | Calculated | |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA, 1991 | |
| | | | | EDa | Exposure Duration, Adult | 24 | years | USEPA, 1991 | Use Foster & Chrostowski Shower model to |
| | | | | EDc | Exposure Duration, Child | 6 | years | USEPA, 1991 | calculate CAa and CAc |
| | | | | ETa | Exposure Time | 0.58 | hr/day | USEPA, 2004 | |
| | | | | ETc | Exposure Time | 1 | hr/day | USEPA, 2004 | |
| | | | | CF1 | Conversion Factor 1 | 1/24 | day/hour | - - | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | Construction Worker | Adult | Surficial Aquifer - | CW | Chemical Concentration in Water | See Table 3.5.RME | µg/L | See Table 3.5.RME | Chronic Daily Intake (CDI) (mg/m3) = |
| | | | Water Vapors in Excavation Pit | CA | Chemical Concentration in Air | calculated | $mg/m^3$ | | CA x ET x EF x ED x CF1 x 1/AT |
| | | | | ET | Exposure Time | 4 | hr/day | (1) | |
| | | | | EF | Exposure Frequency | 125 | days/year | (2) | |
| | | | | ED | Exposure Duration | 1 | years | USEPA, 1991 | CA calculated using two-film model |
| | | | | CF1 | Conversion Factor 1 | 1/24 | day/hour | - - | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 365 | days | USEPA, 1989 | |

**Notes:**

(1) Professional Judgment based on construction activities that would result in contact with groundwater would occur 4 hrs per day for the RME.

(2) Assumed contact with groundwater during construction project would be 125 days/year.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

USEPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

USEPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

USEPA, 2004 . Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final). EPA/540/R/99/005. July 2004.

TABLE 4.1.CTE

**Values Used for Daily Intake Calculations – Central Tendency Exposure**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Current/Future<br>Medium: Surface Soil in the Ephemeral Drainage<br>Exposure Medium: Surface Soil in the Ephemeral Drainage |

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion | Trespasser/Visitor | Child | Ravine | CS | Chemical Concentration in Soil | See Table 3.1.RME | mg/kg | See Table 3.1.RME | Chronic Daily Intake (CDI) (mg/kg-day) = |
| | | | | IR-S | Ingestion Rate of Soil | 100 | mg/day | USEPA, 1991 | CS x IR-S x EF x ED x CF x 1/BW x 1/AT |
| | | | | EF | Exposure Frequency | 26 | days/year | (1) | |
| | | | | ED | Exposure Duration | 6 | years | USEPA, 1991 | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | BW | Body Weight | 15 | kg | USEPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,190 | days | USEPA, 1989 | |
| Dermal | Trespasser/Visitor | Child | Ravine | CS | Chemical Concentration in Soil | see Table 3.1.CTE | mg/kg | see Table 3.1.CTE | CDI (mg/kg-day) = |
| | | | | SA | Skin Surface Area Available for Contact | 2,800 | $cm^2$ | USEPA, 2004 | CS x SA x SSAF x DABS x CF1 x EF x |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.04 | $mg/cm^2$-day | USEPA, 2004 | ED x 1/BW x 1/AT |
| | | | | DABS | Dermal Absorption Factor Solids | chem specific | -- | USEPA, 2004 | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | EF | Exposure Frequency | 26 | days/year | (2) | |
| | | | | ED | Exposure Duration | 6 | years | USEPA, 1991 | |
| | | | | BW | Body Weight | 15 | kg | USEPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,190 | days | USEPA, 1989 | |

Notes:

(1) Professional judgment assuming 1/2 the RME exposure frequency.

Sources:


USEPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

USEPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

USEPA, 2004: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

TABLE 4.2.CTE

**Values Used for Daily Intake Calculations – Central Tendency Exposure**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion | Resident | Child | Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.CTE | mg/kg | See Table 3.2.CTE | Chronic Daily Intake (CDI) (mg/kg-day) = |
| | | | | IR-S | Ingestion Rate of Soil | 100 | mg/day | USEPA, 1993 | CS x IR-S x EF x ED x CF x 1/BW x 1/AT |
| | | | | EF | Exposure Frequency | 234 | days/year | USEPA, 1993 | |
| | | | | ED | Exposure Duration | 6 | years | USEPA, 1991 | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | BW | Body Weight | 15 | kg | USEPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,190 | days | USEPA, 1989 | |
| | | Child/Adult | Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.CTE | mg/kg | See Table 3.2.CTE | Carcinogenic |
| | | | | IR-Sa | Ingestion Rate of Soil-adult | 50 | mg/day | USEPA, 1993 | Chronic Daily Intake (CDI) (mg/kg-day) = |
| | | | | EDa | Exposure Duration adult | 9 | years | USEPA, 2004 | CS x IR-S x EF x CF x 1/AT |
| | | | | BWa | Body Weight adult | 70 | kg | USEPA, 1991 | |
| | | | | IR-Sc | Ingestion Rate of Soil-child | 100 | mg/day | USEPA, 1993 | |
| | | | | EDc | Exposure Duration child | 6 | years | USEPA, 1993 | IR-S = (EDc * IR-Sc/ BWc) + |
| | | | | BWc | Body Weight child | 15 | kg | USEPA, 1991 | (EDa * IR-Sa/BWa) |
| | | | | IR-S | Ingestion Rate of Soil-adjusted | 46.43 | mg-year/kg-day | - - | |
| | | | | EF | Exposure Frequency | 234 | days/year | USEPA, 1993 | |
| | | | | CF3 | Conversion Factor 3 | 0.000001 | kg/mg | - - | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | Trespasser/Visitor | Child | Subsurface Soil | CS | Chemical Concentration in Soil | see Table 3.2.CTE | mg/kg | see Table 3.2.CTE | Chronic Daily Intake (CDI) (mg/kg-day) = |
| | | | | IR-S | Ingestion Rate of Soil | 50 | mg/day | (1) | CSed x IR-Sed x EF x ED x CF x 1/BW x 1/AT |
| | | | | EF | Exposure Frequency | 26 | days/year | (2) | |
| | | | | ED | Exposure Duration | 6 | years | USEPA, 1991 | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | BW | Body Weight | 15 | kg | USEPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,190 | days | USEPA, 1989 | |

TABLE 4.2.CTE

**Values Used for Daily Intake Calculations – Central Tendency Exposure**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Dermal | Resident | Child | Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.CTE | mg/kg | See Table 3.2.CTE | CDI (mg/kg-day) = |
| | | | | SA | Skin Surface Area Available for Contact | 2,800 | $cm^2$ | USEPA, 2004 | CS x SA x SSAF x DABS x CF x EF x |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.04 | $mg/cm^2$-day | USEPA, 2004 | ED x 1/BW x 1/AT |
| | | | | DABS | Dermal Absorption Factor Solids | Chemical Specific | -- | USEPA, 2004 | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | EF | Exposure Frequency | 234 | days/year | USEPA, 1993 | |
| | | | | ED | Exposure Duration | 6 | years | USEPA, 1991 | |
| | | | | BW | Body Weight | 15 | kg | USEPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,190 | days | USEPA, 1989 | |
| | | Child/Adult | Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.CTE | mg/kg | See Table 3.2.CTE | Carcinogenic CDI (mg/kg-day) = |
| | | | | SAc | Skin Surface Area child | 2,800 | $cm^2$ | USEPA, 2004 | CS x SA x DABS x CF3 x EF x 1/AT |
| | | | | SSAFc | Soil to Skin Adherence Factor child | 0.04 | $mg/cm^2$-day | USEPA, 2004 | |
| | | | | EDc | Exposure Duration child | 6 | years | USEPA, 1991 | SA = |
| | | | | BWc | Body Weight child | 15 | kg | USEPA, 1991 | ((EDc * SAc/BWc)*SSAFc) + ((EDa * SAa/BWa)*SSAFa) |
| | | | | SAa | Skin Surface Area adult | 5,700 | $cm^2$ | USEPA, 2004 | |
| | | | | SSAFa | Soil to Skin Adherence Factor-adult | 0.01 | $mg/cm^2$-day | USEPA, 2004 | |
| | | | | EDa | Exposure Duration adult | 9 | years | USEPA, 2004 | |
| | | | | BWa | Body Weight adult | 70 | kg | USEPA, 1991 | |
| | | | | SA | Skin Surface Area adjusted | 52.13 | $cm^2$-year/kg-day | --- | |
| | | | | DABS | Dermal Absorption Factor Solids | Chemical Specific | -- | USEPA, 2004 | |
| | | | | CF3 | Conversion Factor 3 | 0.000001 | kg/mg | - - | |
| | | | | EF | Exposure Frequency | 234 | days/year | USEPA, 1993 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | Trespasser/Visitor | Child | Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.RME | mg/kg | See Table 3.2.RME | CDI (mg/kg-day) = |
| | | | | SA | Skin Surface Area Available for Contact | 2,800 | $cm^2$ | USEPA, 2004 | CS x SA x SSAF x DABS x CF x EF x |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.04 | $mg/cm^2$-day | USEPA, 2004 | ED x 1/BW x 1/AT |
| | | | | DABS | Dermal Absorption Factor Solids | chem specific | -- | USEPA, 2004 | |
| | | | | CF | Conversion Factor | 0.000001 | kg/mg | - - | |
| | | | | EF | Exposure Frequency | 26 | days/year | (2) | |
| | | | | ED | Exposure Duration | 6 | years | USEPA, 1991 | |
| | | | | BW | Body Weight | 15 | kg | USEPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,190 | days | USEPA, 1989 | |

Notes:

(1) Professional judgment assuming the 1/2 the RME soil ingestion rate .

(2) Professional judgment assuming 1/2 the RME exposure frequency.

Sources:


USEPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

USEPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

USEPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2004: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

TABLE 4.3.CTE

**Values Used for Daily Intake Calculations – Central Tendency Exposure**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Medium: Subsurface Soil |
| Exposure Medium: Air |

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation | Resident | Child | Emissions from Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.CTE | mg/kg | See Table 3.2.CTE | Exposure Concentration (EC) ($mg/m^3$) = |
| | | | | CA | Chemical Concentration in Air | See Table 3.3.CTE | $mg/m^3$ | See Table 3.3.CTE | CA x ET x EF x ED x CF x 1/AT |
| | | | | PEF | Particulate Emission Factor | 1.36E+09 | $m^3/kg$ | USEPA, 2002 | |
| | | | | VF | Volatilization Factor for volatile constituents | Calculated | $m^3/kg$ | USEPA, 2002 | CA ($mg/m^3$) = CS (1/PEF + 1/VF) |
| | | | | ET | Exposure Time | 24 | hour/day | -- | |
| | | | | EF | Exposure Frequency | 234 | days/year | USEPA, 1993 | |
| | | | | ED | Exposure Duration | 6 | years | USEPA, 1991 | |
| | | | | CF | Conversion Factor 1 | 1/24 | day/hr | - - | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,190 | days | USEPA, 1989 | |
| | | Child/Adult | Emissions from Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.CTE | mg/kg | See Table 3.2.CTE | Exposure Concentration (EC) ($mg/m^3$) = |
| | | | | CA | Chemical Concentration in Air | See Table 3.3.CTE | $mg/m^3$ | See Table 3.3.CTE | CA x ET x EF x ED x CF x 1/AT |
| | | | | PEF | Particulate Emission Factor | 1.36E+09 | $m^3/kg$ | USEPA, 2002 | CA ($mg/m^3$) = CS (1/PEF + 1/VF) |
| | | | | VF | Volatilization Factor for volatile constituents | Calculated | $m^3/kg$ | USEPA, 2002 | |
| | | | | EF | Exposure Frequency | 234 | days/year | USEPA, 1993 | |
| | | | | ED | Exposure Duration | 30 | years | USEPA, 2002 | |
| | | | | ET | Exposure Time | 24 | hr/day | USEPA, 2009 | |
| | | | | CF | Conversion Factor 1 | 1/24 | day/hr | - - | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | Trespasser/Visitor | Child | Emissions from Subsurface Soil | CS | Chemical Concentration in Soil | See Table 3.2.CTE | mg/kg | See Table 3.2.CTE | Exposure Concentration (EC) ($mg/m^3$) = |
| | | | | CA | Chemical Concentration in Air | See Table 3.3.CTE | $mg/m^3$ | See Table 3.3.CTE | CA x ET x EF x ED x CF x 1/AT |
| | | | | PEF | Particulate Emission Factor | 1.36E+09 | $m^3/kg$ | USEPA, 2002 | |
| | | | | VF | Volatilization Factor for volatile constituents | calc | $m^3/kg$ | USEPA, 2002 | CA ($mg/m^3$) = CS (1/PEF + 1/VF) |
| | | | | ET | Exposure Time | 2 | hour/day | (1) | |
| | | | | EF | Exposure Frequency | 26 | days/year | (2) | |
| | | | | ED | Exposure Duration | 6 | years | USEPA, 1991 | |
| | | | | CF | Conversion Factor 1 | 1/24 | day/hr | - - | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,190 | days | USEPA, 1989 | |

(1) Professional judgment assuming 2 hours per day.

(2) Professional judgment assuming trespasser/visitor in industrial area of site 1 day per week for 26 weeks.

Sources:


USEPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

USEPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

USEPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

TABLE 4.4.CTE

**Values Used for Daily Intake Calculations – Central Tendency Exposure**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Medium: Groundwater |
| Exposure Medium: Groundwater |

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion | Resident | Child | Tap Water | CW | Chemical Concentration in Water | See Table 3.4.CTE | μg/l | See Table 3.4.CTE | CDI (mg/kg-day) = |
| | | | | IR-W | Ingestion Rate of Water | 1 | liters/day | USEPA, 1997 | CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT |
| | | | | EF | Exposure Frequency | 234 | days/year | USEPA, 2003 | |
| | | | | ED | Exposure Duration | 6 | years | USEPA, 2004 | |
| | | | | CF1 | Conversion Factor 1 | 0.001 | mg/μg | - - | |
| | | | | BW | Body Weight | 15 | kg | USEPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,190 | days | USEPA, 1989 | |
| Dermal | Resident | Child | Tap Water | CW | Chemical Concentration in Water | See Table 3.4.CTE | μg/l | See Table 3.4.CTE | CDI (mg/kg-day) = |
| | | | | DAevent | Dermally Absorbed Dose per Event | Calculated | $mg/cm^2$-event | calculated | DAevent x SA x EV x EF x ED x 1/BW x 1/AT |
| | | | | FA | Fraction absorbed water | Chemical specific | dimensionless | USEPA, 2004 | |
| | | | | $K_p$ | Permeability Coefficient | Chemical specific | cm/hr | USEPA, 2004 | Inorganics: DAevent ($mg/cm^2$-event) = |
| | | | | $\tau$ | Lag Time | Chemical specific | hr/event | USEPA, 2004 | Kp x CW x $t_{event}$ x CF2 x CF3 |
| | | | | t* | Time to Reach Steady-state | Chemical specific | hours | USEPA, 2004 | |
| | | | | B | Ratio of Permeability of Stratum Corneum to Epidermis | Chemical specific | dimensionless | USEPA, 2004 | Organics : |
| | | | | $t_{event}$ | Event Time | 0.33 | hr/event | USEPA, 2004 | $t_{event} < t^*$: DAevent ($mg/cm^2$-event) = |
| | | | | SA | Skin Surface Area Available for Contact | 6,600 | $cm^2$ | USEPA, 2004 | 2 x FA x Kp x CW x (sqrt((6 x $\tau$ x $t_{event}$)/$\pi$)) |
| | | | | EV | Event Frequency | 1 | events/day | USEPA, 2004 | x CF2 x CF3 |
| | | | | EF | Exposure Frequency | 234 | days/year | USEPA, 1993 | |
| | | | | ED | Exposure Duration | 6 | years | USEPA, 1991 | $t_{event} > t^*$: DAevent ($mg/cm^2$-event) = |
| | | | | BW | Body Weight | 15 | kg | USEPA, 1991 | FA x Kp x CW x ( $t_{event}$/(1+B) + 2 x $\tau$ x |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | ((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF2 x CF3 |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,190 | days | USEPA, 1989 | |
| | | | | CF2 | Conversion Factor 2 | 0.001 | mg/μg | - - | |
| | | | | CF3 | Conversion Factor 3 | 0.001 | $l/cm^3$ | - - | |

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

USEPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

USEPA, 2003: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure, Draft.

USEPA, 2004: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

TABLE 4.5.CTE

**Values Used for Daily Intake Calculations – Central Tendency Exposure**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Medium: Groundwater |
| Exposure Medium: Air |

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation | Resident | Child | Water Vapors at Showerhead | CW | Chemical Concentration in Water | See Tables 3.5.CTE | µg/l | See Tables 3.5.CTE | Chronic Daily Intake (CDI) (mg/m3) = |
| | | | | CAc | Chemical Concentration in Air | Calculated | $mg/m^3$ | Calculated | $CA_c$ x $ET_c$ x $ED_c$ x EF x CF1 x 1/AT |
| | | | | EF | Exposure Frequency | 234 | days/year | USEPA, 1993 | |
| | | | | EDc | Exposure Duration | 6 | years | USEPA, 1991 | Use Foster & Chrostowski Shower model to |
| | | | | ETc | Exposure Time | 0.33 | hr/day | USEPA, 2004 | calculate Ca-a and Ca-c |
| | | | | CF1 | Conversion Factor 1 | 1/24 | day/hour | - - | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,190 | days | USEPA, 1989 | |

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

USEPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

USEPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2004 . Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final). EPA/540/R/99/005. July 2004.

TABLE 5.1.RME

**Non-Cancer Toxicity Data -- Oral/Dermal**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Chemical of Potential Concern | Chronic/ Subchronic | Oral RfD Value | Oral RfD Units | Oral to Dermal Adjustment Factor (1) | Adjusted Dermal RfD (2) | Units | Primary Target Organ | Combined Uncertainty/Modifying Factors | Sources of RfD: Target Organ | Dates of RfD: Target Organ (3) (MM/DD/YY) |
|---|---|---|---|---|---|---|---|---|---|---|
| Nitrobenzene | Chronic | 2.0E-03 | mg/kg-day | Generally > 50% | 2.0E-03 | mg/kg-day | Blood | 1000 | IRIS | 7/25/2012 |
| | Subchronic | 5.0E-03 | mg/kg-day | >50% | 5.0E-03 | mg/kg-day | Blood, adrenal, kidney, liver | 1000 | HEAST | 7/31/1997 |
| 3-Nitrotoluene | Chronic | 1.0E-04 | mg/kg-day | Generally > 50% | 1.0E-04 | mg/kg-day | Spleen | 10000 | PPRTV | 6/16/2009 |
| | Subchronic | 1.0E-01 | mg/kg-day | Generally > 50% | 1.0E-01 | mg/kg-day | Spleen | 1000 | HEAST | 7/31/1997 |
| Antimony | Chronic | 4.0E-04 | mg/kg-day | 15% | 6.0E-05 | mg/kg-day | Longevity, Blood | 1000 / 1 | IRIS | 7/25/2012 |
| | Subchronic | 4.0E-04 | mg/kg-day | 15% | 6.0E-05 | mg/kg-day | Whole Body, Blood | 1000 | HEAST | 7/31/1997 |
| Arsenic | Chronic | 3.0E-04 | mg/kg-day | 95% | 3.0E-04 | mg/kg-day | Skin, Vascular | 3/1 | IRIS | 7/25/2012 |
| | Subchronic | 3.0E-04 | mg/kg-day | 95% | 3.0E-04 | mg/kg-day | Skin | 3 | HEAST | 7/01/1997 |
| Cadmium (diet) | Chronic | 1.0E-03 | mg/kg-day | 2.5% | 2.5E-05 | mg/kg-day | Kidney | 10/1 | IRIS | 7/25/2012 |
| | Subchronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Cadmium (water) | Chronic | 5.0E-04 | mg/kg-day | 5% | 2.5E-05 | mg/kg-day | Kidney | 10/1 | IRIS | 7/25/2012 |
| | Subchronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Chromium (hexavalent) | Chronic | 3.0E-03 | mg/kg-day | 2.5% | 7.5E-05 | mg/kg-day | Not identified | 300/3 | IRIS | 7/25/2012 |
| | Subchronic | 2.0E-02 | mg/kg-day | 2.5% | 5.0E-04 | mg/kg-day | Not identified | 100 | HEAST | 7/01/1997 |
| Cobalt | Chronic | 3.0E-04 | mg/kg-day | 100% | 3.0E-04 | mg/kg-day | Thyroid | 3000 | PPRTV | 8/25/2008 |
| | Subchronic | 3.0E-03 | mg/kg-day | 100% | 3.0E-03 | mg/kg-day | Thyroid | 300 | PPRTV | 8/25/2008 |
| Copper | Chronic | 4.0E-02 | mg/kg-day | 100% | 4.0E-02 | mg/kg-day | Gastrointestinal | NA | HEAST (4) | 7/25/2012 |
| | Subchronic | 4.0E-02 | mg/kg-day | 100% | 4.0E-02 | mg/kg-day | Gastrointestinal | NA | HEAST (4) | 7/25/2012 |
| Iron | Chronic | 7.0E-01 | mg/kg-day | Generally > 50% | 7.0E-01 | mg/kg-day | Gastrointestinal | 1.5 | PPRTV | 9/11/2006 |
| | Subchronic | 7.0E-01 | mg/kg-day | Generally > 50% | 7.0E-01 | mg/kg-day | Gastrointestinal | 1.5 | PPRTV | 9/11/2006 |
| Manganese (non-diet) | Chronic | 2.4E-02 | mg/kg-day | 4% | 9.6E-04 | mg/kg-day | CNS | 1/1 | IRIS | 7/25/2012 |
| | Subchronic | 2.4E-02 | mg/kg-day | 4% | 9.6E-04 | mg/kg-day | CNS | 1 | HEAST | 7/01/1997 |
| Mercury (mercuric chloride) | Chronic | 3.0E-04 | mg/kg-day | 7% | 2.1E-05 | mg/kg-day | Immune System | 1000/1 | IRIS | 7/25/2012 |
| | Subchronic | 3.0E-03 | mg/kg-day | 7% | 2.1E-04 | mg/kg-day | Immune System | 100 | HEAST | 7/01/1997 |
| Thallium | Chronic | 1.0E-05 | mg/kg-day | 100% | 1.0E-05 | mg/kg-day | Hair | 3000 | PPRTV | 10/8/2010 |
| | Subchronic | 4.0E-05 | mg/kg-day | 100% | 4.0E-05 | mg/kg-day | Hair | 1000 | PPRTV | 10/8/2010 |
| Zinc | Chronic | 3.0E-01 | mg/kg-day | 100% | 3.0E-01 | mg/kg-day | Blood | 3 | IRIS | 7/25/2012 |
| | Subchronic | 3.0E-01 | mg/kg-day | 100% | 3.0E-01 | mg/kg-day | Blood | 3 | HEAST | 7/01/1997 |

TABLE 5.1.RME

Non-Cancer Toxicity Data -- Oral/Dermal

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Chemical of Potential Concern | Chronic/ Subchronic | Oral RfD Value | Oral RfD Units | Oral to Dermal Adjustment Factor (1) | Adjusted Dermal RfD (2) | Units | Primary Target Organ | Combined Uncertainty/Modifying Factors | Sources of RfD: Target Organ | Dates of RfD: Target Organ (3) (MM/DD/YY) |
|---|---|---|---|---|---|---|---|---|---|---|

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evolution Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). Final.
Section 4.2 and Exhibit 4-1. USEPA recommends that the oral RfD should not be adjusted to estimate the absorbed dose for compounds when the absorption efficiency is greater than 50%.
Constituents that do not have oral absorption efficiencies reported on this table were assumed to have an oral absorption efficiency of 100%.

(2) Adjusted Dermal RfD = RfD (oral) x Absorption Efficiency or $ABS_{GI}$

(3) For IRIS values, provide the date IRIS was searched.
For HEAST values, provide the date of HEAST.
For PPRTV values, provide the date of the article provided by National Center for Exposure Assessment.
For RSL values, the date of the RSL Table.

(4) As cited in Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites (USEPA, 2012).

Toxicity values for hexavalent chromium used for chromium.

Definitions:
CNS = Central Nervous System
HEAST= Health Effects Assessment Summary Tables
IRIS = Integrated Risk Information System
N/A = Not available/not applicable
PPRTV = Provisional Peer-Reviewed Toxicity Values

TABLE 5.2.RME

**Non-Cancer Toxicity Data -- Inhalation**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Chemical of Potential Concern | Chronic/ Subchronic | Value Inhalation RfC | Units | Primary Target Organ | Combined Uncertainty/Modifying Factors | Sources of RfC:RfD: Target Organ | Dates (1) (MM/DD/YY) |
|---|---|---|---|---|---|---|---|
| Nitrobenzene (2) | Chronic | 9.0E-03 | $mg/m^3$ | Respiratory System | 30 | IRIS | 7/25/2012 |
| | Subchronic | 2.0E-02 | $mg/m^3$ | Blood, Adrenal, Kidney, Liver | 1000 | HEAST | 71//1997 |
| Chromium (hexavalent) | Chronic | 1.0E-04 | $mg/m^3$ | Respiratory System | 300/1 | IRIS | 7/25/2012 |
| | Subchronic | N/A | N/A | N/A | N/A | N/A | N/A |

(1) For IRIS values, provide the date IRIS was searched.
For HEAST values, provide the date of HEAST.

(2) Adjustment Factor applied to subchronic Reference Dose (RfD) to calculate subchronic Inhalation Reference Concentration (RfC) = 70kg ÷ $20m^3$/day

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

N/A = Not Applicable or Not Available.

TABLE 6.1.RME

Cancer Toxicity Data -- Oral/Dermal

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Chemical of Potential Concern | Oral Cancer Slope Factor | Oral to Dermal Adjustment Factor (1) | Adjusted Dermal Cancer Slope Factor (2) | Units | EPA Carcinogen Group | Source | Date (MM/DD/YY) |
|---|---|---|---|---|---|---|---|
| Nitrobenzene | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 3-Nitrotoluene | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Antimony | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Arsenic | 1.5E+00 | 95% | 1.5E+00 | $(mg/kg\text{-}day)^{-1}$ | A | IRIS | 7/25/2012 |
| Cadmium (diet and water) | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Chromium (hexavalent) (3) | 5.0E-01 | 2.5% | 2.0E+01 | $(mg/kg\text{-}day)^{-1}$ | D | New Jersey | 7/25/2012 |
| Cobalt | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Copper | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Iron | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Manganese (non-diet) | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Mercury (mercuric chloride) | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Thallium | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Zinc | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. Section 4.2 and Exhibit 4-1. USEPA recommends that the oral slope factor should not be adjusted to estimate the absorbed dose for compounds when the absorption efficiency is greater than 50%. Constituents that do not have oral absorption efficiencies reported on this table were assumed to have an oral absorption efficiency of 100%.

(2) Adjusted based on RAGS Part E.

(3) This chemical operates with a mutagenic mode of action. Chemical-specific data are not available; therefore, default age-dependant adjustment factors (ADAF) will be applied to the slope factor as follows:

| AGE | AGE ADAF |
|---|---|
| 0-<2 | 10 |
| 2-<16 | 3 |
| 16-<30 | 1 |

Definitions:
N/A = Not Available, Not Applicable
IRIS = Integrated Risk Information System
NCEA = National Center for Environmental Assessment
Cal EPA = California EPA
New Jersey = New Jersey EPA

Group A chemicals (known human carcinogens) are agents for which there is sufficient evidence to support the causal association between exposure to the agents in humans a

Group D chemicals (not classifiable as to human carcinogenicity) are agents with inadequate human and animal evidence of carcinogenicity or for which no data are available.

TABLE 6.2.RME

**Cancer Toxicity Data -- Inhalation**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Chemical of Potential Concern | Unit Risk | Units | Weight of Evidence/ Cancer Guidance Description | Source | Date (MM/DD/YY) |
|---|---|---|---|---|---|
| Nitrobenzene | 4.0E-05 | $(\mu g/m^3)^{-1}$ | 1 | IRIS | 7/25/2012 |
| Chromium (hexavalent), (2) | 8.4E-02 | $(\mu g/m^3)^{-1}$ | A | IRIS | 7/25/2012 |

IRIS = Integrated Risk Information System

Weight of Evidence definitions:

(1) Likely to be carcinogenic to humans

Group A chemicals (known human carcinogens) are agents for which there is sufficient evidence to support the support the causal association between exposure to the agents in humans and cancer.

(2) This chemical operates with a mutagenic mode of action (USEPA 2005).

Chemical-specific data are not available; therefore, USEPA (2005) default age-dependant adjustment factors (ADAF) will be applied to the slope factor as follows:

| AGE | AGE ADAF |
|---|---|
| 0-<2 | 10 |
| 2-<16 | 3 |
| 16-<30 | 1 |

TABLE 7.1.RME

**CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS**

**REASONABLE MAXIMUM EXPOSURE**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Current/Future |
| Receptor Population: Trespasser/Visitor |
| Receptor Age: Adult |

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil in the Ephemeral Drainage | Surface Soil in the Ephemeral Drainage | Ravine | Ingestion | Arsenic | 1.0E+01 | mg/kg | 7.2E-07 | mg/kg-day | 1.5E+00 | mg/kg-day | 1.1E-06 | 2.1E-06 | mg/kg-day | 3.0E-04 | mg/kg-day | 7.0E-03 |
| | | | | Cadmium | 1.0E+01 | mg/kg | 7.0E-07 | mg/kg-day | N/A | | N/A | 2.0E-06 | mg/kg-day | 1.0E-03 | mg/kg-day | 2.0E-03 |
| | | | | Copper | 4.2E+02 | mg/kg | 2.9E-05 | mg/kg-day | N/A | | N/A | 8.6E-05 | mg/kg-day | 4.0E-02 | mg/kg-day | 2.1E-03 |
| | | | | Iron | 1.2E+04 | mg/kg | 8.3E-04 | mg/kg-day | N/A | | N/A | 2.4E-03 | mg/kg-day | 7.0E-01 | mg/kg-day | 3.5E-03 |
| | | | | Manganese | 4.7E+03 | mg/kg | 3.3E-04 | mg/kg-day | N/A | | N/A | 9.6E-04 | mg/kg-day | 2.4E-02 | mg/kg-day | 4.0E-02 |
| | | | | Mercury | 2.0E+01 | mg/kg | 1.4E-06 | mg/kg-day | N/A | | N/A | 4.0E-06 | mg/kg-day | 3.0E-04 | mg/kg-day | 1.3E-02 |
| | | | | Thallium | 9.6E+00 | mg/kg | 6.7E-07 | mg/kg-day | N/A | | N/A | 2.0E-06 | mg/kg-day | 1.0E-05 | mg/kg-day | 2.0E-01 |
| | | | | Zinc | 1.2E+04 | mg/kg | 8.1E-04 | mg/kg-day | N/A | | N/A | 2.4E-03 | mg/kg-day | 3.0E-01 | mg/kg-day | 7.9E-03 |
| | | | Exp. Route Total | | | | | | | | 1.1E-06 | | | | | 2.7E-01 |
| | | | Dermal Absorption[1] | Arsenic | 1.0E+01 | mg/kg | 7.4E-07 | mg/kg-day | 1.5E+00 | mg/kg-day | 1.1E-06 | 2.2E-06 | mg/kg-day | 3.0E-04 | mg/kg-day | 7.2E-03 |
| | | | | Cadmium | 1.0E+01 | mg/kg | 2.4E-08 | mg/kg-day | N/A | | N/A | 7.0E-08 | mg/kg-day | 2.5E-05 | mg/kg-day | 2.8E-03 |
| | | | | Copper | 4.2E+02 | mg/kg | 1.0E-06 | mg/kg-day | N/A | | N/A | 2.9E-06 | mg/kg-day | 4.0E-02 | mg/kg-day | 7.3E-05 |
| | | | | Iron | 1.2E+04 | mg/kg | 2.8E-05 | mg/kg-day | N/A | | N/A | 8.3E-05 | mg/kg-day | 7.0E-01 | mg/kg-day | 1.2E-04 |
| | | | | Manganese | 4.7E+03 | mg/kg | 1.1E-05 | mg/kg-day | N/A | | N/A | 3.3E-05 | mg/kg-day | 9.6E-04 | mg/kg-day | 3.4E-02 |
| | | | | Mercury | 2.0E+01 | mg/kg | 4.7E-08 | mg/kg-day | N/A | | N/A | 1.4E-07 | mg/kg-day | 2.1E-05 | mg/kg-day | 6.6E-03 |
| | | | | Thallium | 9.6E+00 | mg/kg | 2.3E-08 | mg/kg-day | N/A | | N/A | 6.7E-08 | mg/kg-day | 1.0E-05 | mg/kg-day | 6.7E-03 |
| | | | | Zinc | 1.2E+04 | mg/kg | 2.8E-05 | mg/kg-day | N/A | | N/A | 8.1E-05 | mg/kg-day | 3.0E-01 | mg/kg-day | 2.7E-04 |
| | | | Exp. Route Total | | | | | | | | 1.1E-06 | | | | | 5.8E-02 |
| | | Exposure Point Total | | | | | | | | | 2.2E-06 | | | | | 3.3E-01 |
| | Exposure Medium Total | | | | | | | | | | 2.2E-06 | | | | | 3.3E-01 |
| Sediment Total | | | | | | | | | | | 2.2E-06 | | | | | 3.3E-01 |
| | | | | | | | Total of Receptor Risks Across All Media | | | | 2.2E-06 | Total of Receptor Hazards Across All Media | | | | 3.3E-01 |

Notes:

N/A =Not available; Not applicable.

[1] Dermal absorption factors (DABS) used to calculated dermal absorption intake from solids are chemical specific.

DABS of 0.03 used for arsenic, DABS of 0.001 for all other inorganics.

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor
Receptor Age: Youth

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil in the Ephemeral Drainage | Surface Soil in the Ephemeral Drainage | Ravine | Ingestion | Arsenic | 1.0E+01 | mg/kg | 4.7E-07 | mg/kg-day | 1.5E+00 | mg/kg-day | 7.0E-07 | 3.3E-06 | mg/kg-day | 3.0E-04 | mg/kg-day | 1.1E-02 |
| | | | | Cadmium | 1.0E+01 | mg/kg | 4.5E-07 | mg/kg-day | N/A | | N/A | 3.2E-06 | mg/kg-day | 1.0E-03 | mg/kg-day | 3.2E-03 |
| | | | | Copper | 4.2E+02 | mg/kg | 1.9E-05 | mg/kg-day | N/A | | N/A | 1.3E-04 | mg/kg-day | 4.0E-02 | mg/kg-day | 3.3E-03 |
| | | | | Iron | 1.2E+04 | mg/kg | 5.4E-04 | mg/kg-day | N/A | | N/A | 3.8E-03 | mg/kg-day | 7.0E-01 | mg/kg-day | 5.4E-03 |
| | | | | Manganese | 4.7E+03 | mg/kg | 2.1E-04 | mg/kg-day | N/A | | N/A | 1.5E-03 | mg/kg-day | 2.4E-02 | mg/kg-day | 6.3E-02 |
| | | | | Mercury | 2.0E+01 | mg/kg | 9.0E-07 | mg/kg-day | N/A | | N/A | 6.3E-06 | mg/kg-day | 3.0E-04 | mg/kg-day | 2.1E-02 |
| | | | | Thallium | 9.6E+00 | mg/kg | 4.3E-07 | mg/kg-day | N/A | | N/A | 3.0E-06 | mg/kg-day | 1.0E-05 | mg/kg-day | 3.0E-01 |
| | | | | Zinc | 1.2E+04 | mg/kg | 5.2E-04 | mg/kg-day | N/A | | N/A | 3.7E-03 | mg/kg-day | 3.0E-01 | mg/kg-day | 1.2E-02 |
| | | | Exp. Route Total | | | | | | | | 7.0E-07 | | | | | 4.2E-01 |
| | | | Dermal Absorption[1] | Arsenic | 1.0E+01 | mg/kg | 3.5E-07 | mg/kg-day | 1.5E+00 | mg/kg-day | 5.3E-07 | 2.5E-06 | mg/kg-day | 3.0E-04 | mg/kg-day | 8.2E-03 |
| | | | | Cadmium | 1.0E+01 | mg/kg | 1.1E-08 | mg/kg-day | N/A | | N/A | 8.0E-08 | mg/kg-day | 2.5E-05 | mg/kg-day | 3.2E-03 |
| | | | | Copper | 4.2E+02 | mg/kg | 4.8E-07 | mg/kg-day | N/A | | N/A | 3.4E-06 | mg/kg-day | 4.0E-02 | mg/kg-day | 8.4E-05 |
| | | | | Iron | 1.2E+04 | mg/kg | 1.4E-05 | mg/kg-day | N/A | | N/A | 9.5E-05 | mg/kg-day | 7.0E-01 | mg/kg-day | 1.4E-04 |
| | | | | Manganese | 4.7E+03 | mg/kg | 5.4E-06 | mg/kg-day | N/A | | N/A | 3.8E-05 | mg/kg-day | 9.6E-04 | mg/kg-day | 3.9E-02 |
| | | | | Mercury | 2.0E+01 | mg/kg | 2.3E-08 | mg/kg-day | N/A | | N/A | 1.6E-07 | mg/kg-day | 2.1E-05 | mg/kg-day | 7.5E-03 |
| | | | | Thallium | 9.6E+00 | mg/kg | 1.1E-08 | mg/kg-day | N/A | | N/A | 7.7E-08 | mg/kg-day | 1.0E-05 | mg/kg-day | 7.7E-03 |
| | | | | Zinc | 1.2E+04 | mg/kg | 1.3E-05 | mg/kg-day | N/A | | N/A | 9.3E-05 | mg/kg-day | 3.0E-01 | mg/kg-day | 3.1E-04 |
| | | | Exp. Route Total | | | | | | | | 5.3E-07 | | | | | 6.7E-02 |
| | | Exposure Point Total | | | | | | | | | 1.2E-06 | | | | | 4.9E-01 |
| | Exposure Medium Total | | | | | | | | | | 1.2E-06 | | | | | 4.9E-01 |
| Sediment Total | | | | | | | | | | | 1.2E-06 | | | | | 4.9E-01 |
| | | | | | | | Total of Receptor Risks Across All Media | | | | 1.2E-06 | Total of Receptor Hazards Across All Media | | | | 4.9E-01 |

Notes:

N/A =Not available; Not applicable.

[1] Dermal absorption factors (DABS) used to calculated dermal absorption intake from solids are chemical specific.

DABS of 0.03 used for arsenic, DABS of 0.001 for all other inorganics.

TABLE 7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Current/Future |
| Receptor Population: Trespasser/Visitor |
| Receptor Age: Child |

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil in the Ephemeral Drainage | Surface Soil in the Ephemeral Drainage | Ravine | Ingestion | Arsenic | 1.0E+01 | mg/kg | 1.7E-06 | mg/kg-day | 1.5E+00 | mg/kg-day | 2.5E-06 | 2.0E-05 | mg/kg-day | 3.0E-04 | mg/kg-day | 6.5E-02 |
| | | | | Cadmium | 1.0E+01 | mg/kg | 1.6E-06 | mg/kg-day | N/A | | N/A | 1.9E-05 | mg/kg-day | 1.0E-03 | mg/kg-day | 1.9E-02 |
| | | | | Copper | 4.2E+02 | mg/kg | 6.9E-05 | mg/kg-day | N/A | | N/A | 8.0E-04 | mg/kg-day | 4.0E-02 | mg/kg-day | 2.0E-02 |
| | | | | Iron | 1.2E+04 | mg/kg | 1.9E-03 | mg/kg-day | N/A | | N/A | 2.3E-02 | mg/kg-day | 7.0E-01 | mg/kg-day | 3.2E-02 |
| | | | | Manganese | 4.7E+03 | mg/kg | 7.7E-04 | mg/kg-day | N/A | | N/A | 9.0E-03 | mg/kg-day | 2.4E-02 | mg/kg-day | 3.8E-01 |
| | | | | Mercury | 2.0E+01 | mg/kg | 3.2E-06 | mg/kg-day | N/A | | N/A | 3.8E-05 | mg/kg-day | 3.0E-04 | mg/kg-day | 1.3E-01 |
| | | | | Thallium | 9.6E+00 | mg/kg | 1.6E-06 | mg/kg-day | N/A | | N/A | 1.8E-05 | mg/kg-day | 1.0E-05 | mg/kg-day | 1.8E+00 |
| | | | | Zinc | 1.2E+04 | mg/kg | 1.9E-03 | mg/kg-day | N/A | | N/A | 2.2E-02 | mg/kg-day | 3.0E-01 | mg/kg-day | 7.3E-02 |
| | | | Exp. Route Total | | | | | | | | 2.5E-06 | | | | | 2.5E+00 |
| | | | Dermal Absorption[1] | Arsenic | 1.0E+01 | mg/kg | 1.4E-07 | mg/kg-day | 1.5E+00 | mg/kg-day | 2.1E-07 | 1.6E-06 | mg/kg-day | 3.0E-04 | mg/kg-day | 5.5E-03 |
| | | | | Cadmium | 1.0E+01 | mg/kg | 4.6E-09 | mg/kg-day | N/A | | N/A | 5.3E-08 | mg/kg-day | 2.5E-05 | mg/kg-day | 2.1E-03 |
| | | | | Copper | 4.2E+02 | mg/kg | 1.9E-07 | mg/kg-day | N/A | | N/A | 2.2E-06 | mg/kg-day | 4.0E-02 | mg/kg-day | 5.6E-05 |
| | | | | Iron | 1.2E+04 | mg/kg | 5.4E-06 | mg/kg-day | N/A | | N/A | 6.3E-05 | mg/kg-day | 7.0E-01 | mg/kg-day | 9.0E-05 |
| | | | | Manganese | 4.7E+03 | mg/kg | 2.2E-06 | mg/kg-day | N/A | | N/A | 2.5E-05 | mg/kg-day | 9.6E-04 | mg/kg-day | 2.6E-02 |
| | | | | Mercury | 2.0E+01 | mg/kg | 9.0E-09 | mg/kg-day | N/A | | N/A | 1.1E-07 | mg/kg-day | 2.1E-05 | mg/kg-day | 5.0E-03 |
| | | | | Thallium | 9.6E+00 | mg/kg | 4.4E-09 | mg/kg-day | N/A | | N/A | 5.1E-08 | mg/kg-day | 1.0E-05 | mg/kg-day | 5.1E-03 |
| | | | | Zinc | 1.2E+04 | mg/kg | 5.3E-06 | mg/kg-day | N/A | | N/A | 6.2E-05 | mg/kg-day | 3.0E-01 | mg/kg-day | 2.1E-04 |
| | | | Exp. Route Total | | | | | | | | 2.1E-07 | | | | | 4.4E-02 |
| | | Exposure Point Total | | | | | | | | | 2.7E-06 | | | | | 2.6E+00 |
| | Exposure Medium Total | | | | | | | | | | 2.7E-06 | | | | | 2.6E+00 |
| Sediment Total | | | | | | | | | | | 2.7E-06 | | | | | 2.6E+00 |
| | | | | | | | Total of Receptor Risks Across All Media | | | | 2.7E-06 | Total of Receptor Hazards Across All Media | | | | 2.6E+00 |

Notes:

N/A =Not available; Not applicable.

[1] Dermal absorption factors (DABS) used to calculated dermal absorption intake from solids are chemical specific.

DABS of 0.03 used for arsenic, DABS of 0.001 for all other inorganics.

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Ingestion | Antimony | 2.5E+00 | mg/kg | N/A | | N/A | | N/A | 3.4E-06 | mg/kg/day | 4.0E-04 | mg/kg-day | 8.6E-03 |
| | | | | Chromium (hexavalent) | 4.9E+02 | mg/kg | N/A | | N/A | | N/A | 6.7E-04 | mg/kg/day | 3.0E-03 | mg/kg-day | 2.2E-01 |
| | | | | Cobalt | 2.7E+00 | mg/kg | N/A | | N/A | | N/A | 3.7E-06 | mg/kg/day | 3.0E-04 | mg/kg-day | 1.2E-02 |
| | | | | Manganese | 1.1E+02 | mg/kg | N/A | | N/A | | N/A | 1.5E-04 | mg/kg/day | 2.4E-02 | mg/kg-day | 6.1E-03 |
| | | | | Thallium | 2.4E-01 | mg/kg | N/A | | N/A | | N/A | 3.3E-07 | mg/kg/day | 1.0E-05 | mg/kg-day | 3.3E-02 |
| | | | Exp. Route Total | | | | | | | | N/A | | | | | 2.8E-01 |
| | | | Dermal Absorption[1] | Antimony | 2.5E+00 | mg/kg | N/A | | N/A | | N/A | 1.4E-08 | mg/kg/day | 6.0E-05 | mg/kg-day | 2.3E-04 |
| | | | | Chromium (hexavalent) | 4.9E+02 | mg/kg | N/A | | N/A | | N/A | 2.7E-06 | mg/kg/day | 7.5E-05 | mg/kg-day | 3.6E-02 |
| | | | | Cobalt | 2.7E+00 | mg/kg | N/A | | N/A | | N/A | 1.5E-08 | mg/kg/day | 3.0E-04 | mg/kg-day | 4.9E-05 |
| | | | | Manganese | 1.1E+02 | mg/kg | N/A | | N/A | | N/A | 5.8E-07 | mg/kg/day | 9.6E-04 | mg/kg-day | 6.1E-04 |
| | | | | Thallium | 2.4E-01 | mg/kg | N/A | | N/A | | N/A | 1.3E-09 | mg/kg/day | 1.0E-05 | mg/kg-day | 1.3E-04 |
| | | | Exp. Route Total | | | | | | | | N/A | | | | | 3.7E-02 |
| | | Exposure Point Total | | | | | | | | | N/A | | | | | 3.2E-01 |
| | Exposure Medium Total | | | | | | | | | | N/A | | | | | 3.2E-01 |
| | Air | Emissions from Subsurface Soil | Inhalation | Chromium (hexavalent) | 3.6E-04 | $\mu g/m^3$ | N/A | | N/A | | N/A | 3.5E-07 | $mg/m^3$ | 1.0E-04 | $mg/m^3$ | 3.5E-03 |
| | | | Exp. Route Total | | | | | | | | N/A | | | | | 3.5E-03 |
| | | Exposure Point Total | | | | | | | | | N/A | | | | | 3.5E-03 |
| | Exposure Medium Total | | | | | | | | | | N/A | | | | | 3.5E-03 |
| Subsurface Soil Total | | | | | | | | | | | N/A | | | | | 3.2E-01 |
| Groundwater | Groundwater | Surficial Aquifer - Tap Water | Ingestion | Nitrobenzene | 3.1E-01 | µg/L | N/A | | N/A | | N/A | 8.4E-06 | mg/kg/day | 2.0E-03 | mg/kg/day | 4.2E-03 |
| | | | | 3-Nitrotoluene | 4.2E-01 | µg/L | N/A | | N/A | | N/A | 1.2E-05 | mg/kg/day | 1.0E-04 | mg/kg/day | 1.2E-01 |
| | | | | Antimony | 7.7E+00 | µg/L | N/A | | N/A | | N/A | 2.1E-04 | mg/kg/day | 4.0E-04 | mg/kg/day | 5.3E-01 |
| | | | | Cadmium | 3.2E+00 | µg/L | N/A | | N/A | | N/A | 8.7E-05 | mg/kg/day | 5.0E-04 | mg/kg/day | 1.7E-01 |
| | | | | Manganese | 4.5E+01 | µg/L | N/A | | N/A | | N/A | 1.2E-03 | mg/kg/day | 2.4E-02 | mg/kg/day | 5.2E-02 |
| | | | Exp. Route Total | | | | | | | | N/A | | | | | 8.7E-01 |
| | | | Dermal Absorption[2] | Nitrobenzene | 3.1E-01 | µg/L | N/A | | N/A | | N/A | 5.8E-07 | mg/kg-day | 2.0E-03 | mg/kg/day | 2.9E-04 |
| | | | | 3-Nitrotoluene | 4.2E-01 | µg/L | N/A | | N/A | | N/A | 1.7E-06 | mg/kg-day | 1.0E-04 | mg/kg/day | 1.7E-02 |
| | | | | Antimony | 7.7E+00 | µg/L | N/A | | N/A | | N/A | 1.1E-06 | mg/kg-day | 6.0E-05 | mg/kg/day | 1.8E-02 |
| | | | | Cadmium | 3.2E+00 | µg/L | N/A | | N/A | | N/A | 4.5E-07 | mg/kg-day | 2.5E-05 | mg/kg/day | 1.8E-02 |
| | | | | Manganese | 4.5E+01 | µg/L | N/A | | N/A | | N/A | 6.5E-06 | mg/kg-day | 9.6E-04 | mg/kg/day | 6.8E-03 |
| | | | Exp. Route Total | | | | | | | | N/A | | | | | 6.0E-02 |
| | | Exposure Point Total | | | | | | | | | N/A | | | | | 6.0E-02 |
| | Exposure Medium Total | | | | | | | | | | N/A | | | | | 9.3E-01 |

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Receptor Population: Resident |
| Receptor Age: Adult |

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Groundwater | Air | Surficial Aquifer - Showerhead | Inhalation[3] | Nitrobenzene | 3.1E-01 | µg/L | N/A | | N/A | | N/A | 1.4E-06 | $mg/m^3$ | 9.0E-03 | $mg/m^3$ | 1.6E-04 |
| | | | Exp. Route Total | | | | | | | | N/A | | | | | 1.6E-04 |
| | | Exposure Point Total | | | | | | | | | N/A | | | | | 1.6E-04 |
| | Exposure Medium Total | | | | | | | | | | N/A | | | | | 1.6E-04 |
| Groundwater Total | | | | | | | | | | | N/A | | | | | 9.3E-01 |
| | | | | | | | | | | Total of Receptor Risks Across All Media | N/A | | | | Total of Receptor Hazards Across All Media | 1.3E+00 |

N/A = Not available/not applicable

1. Dermal absorption factors (DABS) used to calculated dermal absorption intake from solids are chemical specific.
   DABS of 0.03 used for arsenic, DABS of 0.001 for all other inorganics.
2. $DA_{event}$ from groundwater calculated on Table 7.4.RME Supplement A.
3. Inhalation exposure for groundwater while showering calculated on Table 7.4.RME Supplement C.

TABLE 7.4.RME Supplement A

**Calculation of DAevent**

**Resident Adult - Groundwater**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Chemical of Potential Concern | Water Concentration (CW) (µg/L) | Permeability Coefficient (Kp) (cm/hr) | B (dimensionless) | Lag Time ($\tau_{event}$) (hr) | t* (hr) | Fraction Absorbed Water (FA) (dimensionless) | Duration of Event (tevent) (hr) | DAevent (mg/cm²-event) | Eq |
|---|---|---|---|---|---|---|---|---|---|
| Nitrobenzene[1] | 3.1E-01 | 5.1E-03 | 2.2E-02 | 5.1E-01 | 1.2E+00 | 1.0E+00 | 0.58 | 2.3E-09 | 2 |
| 3-Nitrotoluene[1] | 4.2E-01 | 9.8E-03 | 4.4E-02 | 6.2E-01 | 1.5E+00 | 1.0E+00 | 0.58 | 6.8E-09 | 2 |
| Antimony | 7.7E+00 | 1.0E-03 | N/A | N/A | N/A | N/A | 0.58 | 4.4E-09 | 1 |
| Cadmium | 3.2E+00 | 1.0E-03 | N/A | N/A | N/A | N/A | 0.58 | 1.8E-09 | 1 |
| Manganese | 4.5E+01 | 1.0E-03 | N/A | N/A | N/A | N/A | 0.58 | 2.6E-08 | 1 |

**Inorganics: $DA_{event}$ ($mg/cm^2$-event) =**
$K_p$ x CW x $t_{event}$ x 0.001 mg/µg x 0.001 $l/cm^3$ (eq 1)

**Organics: $DA_{event}$ ($mg/cm^2$-event) =**
If $t_{event} < t^*$, then $DA_{event}$ =
2 x FA x $K_p$ x CW x (sqrt((6 x $\tau_{event}$ x $t_{event}$)/$\pi$)) x 0.001 mg/µg x 0.001 $l/cm^3$ (eq 2)

If $t_{event} > t^*$, then $DA_{event}$ =
FA x $K_p$ x CW x ( $t_{event}$/(1+B) + 2 x $\tau_{event}$ x ((1 + 3xB + 3x$B^2$)/$(1+B)^2$) x 0.001 mg/µg x 0.001 $l/cm^3$ (eq 3)

Notes:
NA - Not applicable
Permeability constants from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.
B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).
t* - Time to reach steady-state
[1]Lag time and B calculated on Table 7.4.RME Supplement B
* Permeability constants calculated using Equation 3.8 (log $K_p$ = 2.80 + 0.66 log $K_{ow}$ - 0.0056 MW, where $r^2$ = 0.66) from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final)* . EPA/540/R/99/005.

B calculated using Equation A.1 (B = $K_p$ * $MW^{1/2}$/2.6) from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final). EPA/540/R/99/005.*

$\tau_{event}$ calculated using Equation A.4 ( $\tau_{event}$ = $l_{sc}^{2/6D}{}_{sc}$ = 0.105 × 10^[0.0056 MW]) from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final). EPA/540/R/99/005.*

Since B ≤ 0.6, then t* calculated using Equation A.4 (t* = 2.4 $\tau_{event}$) from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final). EPA/540/R/99/005.*

TABLE 7.4.RME Supplement B

Calculation of DAevent

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Chemical | MW | log Kow | Kow | log Kp[1] | Kp (cm/hr) | B[1] | log $D_{sc}/l_{sc}$[1] | $D_{sc}/l_{sc}$[1] | $l_{sc}$ (cm) | $D_{sc}$ ($cm^2$/hr) | $\tau_{event}$[1] (hr) | c[1] | b[1] | t*[1] (hr) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nitrobenzene | 1.23E+02 | 1.81E+00 | 6.46E+01 | -2.29E+00 | 5.08E-03 | 2.17E-02 | -3.49E+00 | 3.24E-04 | 1.00E-03 | 3.24E-07 | 5.14E-01 | 3.48E-01 | 3.17E-01 | 1.23E+00 |
| 3-Nitrotoluene | 1.37E+02 | 2.36E+00 | 2.29E+02 | -2.01E+00 | 9.78E-03 | 4.40E-02 | -3.57E+00 | 2.71E-04 | 1.00E-03 | 2.71E-07 | 6.15E-01 | 3.63E-01 | 3.31E-01 | 1.48E+00 |

1. Equations from Risk Assessment Guidance for Superfund Volume 1; Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment, EPA/540/R/99/005. July 2004.

MW and log Kow from Texas Commission on Environmental Quality (http://www.tceq.state.tx.us/remediation/trrp/trrppcls.html).

TABLE 7.4.RME Supplement C

**Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Chemical of Potential Concern | Exposure Point Concentration Cwo (µg/L) | Molecular weight (MW) (g/mole) | Henry's Law Constant (H) (atm-m$^3$/mole) | Kg (VOC) (cm/hr) | Kl (VOC) (cm/hr) | KL (cm/hr) | Kal (cm/hr) | Cwd (µg/L) | S (µg/m$^3$ -min) | Ca (mg/m$^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| Nitrobenzene | 3.1E-01 | 1.2E+02 | 2.4E-05 | 1.1E+03 | 1.2E+01 | 1.0E+00 | 1.4E+00 | 3.6E-03 | 3.0E-03 | 6.2E-05 |

| Variables | Units | Exposure Assumptions |
|---|---|---|
| Kg(VOC) = gas-film mass transfer coefficient | cm/hr | Solved by Eq 1 |
| Kl(VOC) = liquid-film mass transfer coefficient | cm/hr | Solved by Eq 2 |
| KL = overall mass transfer coefficient | cm/hr | Solved by Eq 3 |
| Kal = adjusted overall mass transfer coeff. | cm/hr | Solved by Eq 4 |
| Tl = Calibration temp. of water | K (20C +273) | 293 |
| Ts = Shower water temperature | k (45C) | 318 |
| Us = water viscosity at Ts | centipoise | 0.596 |
| Ul = water viscosity at Tl | cp | 1.002 |
| Cwd = conc. leaving droplets after time sdt | µg/l | Solved by Eq 5 |
| sdt = shower droplet drop time | sec | 0.5 |
| d = shower droplet diameter | mm | 1 |
| FR = shower water flow rate | l/min | 10 |
| SV = shower room air volume | m$^3$ | 12 |
| S = indoor VOC generation rate | µg/m$^3$-min | Solved by Eq 6 |
| Ds = duration of shower | min | 34.8 |
| Dt = total duration in shower room | min | 60 |
| R = air exchange rate | min$^{-1}$ | 0.0083 |
| Ca = indoor air concentration of VOCs | µg/m$^3$ | Solved by Eq 7 |

| | | | |
|---|---|---|---|
| Equation 1: | Kg(VOC) = | 3000 * (18 / MW)$^{0.5}$ | |
| Equation 2: | Kl(VOC) = | 20 * (44 / MW)$^{0.5}$ | |
| Equation 3: | KL = | ((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H)))$^{-1}$ | |
| Equation 4: | Kal = | (KL * (((Tl * Us) / (Ts * Ul))$^{-0.5}$)) | |
| Equation 5: | Cwd = | (Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d)))) | |
| Equation 6: | S = | (Cwd * FR / SV) | |
| Equation 7: | Ca = | If t>Ds | [(S / R ) * (Ds + (EXP(-R * Dt) / R) -(EXP(R *(Ds - Dt)) / R)] / Dt * 1/1000 |

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Receptor Population: Resident |
| Receptor Age: Child |

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Ingestion | Antimony | 2.5E+00 | mg/kg | N/A | | N/A | | N/A | 3.2E-05 | mg/kg/day | 4.0E-04 | mg/kg-day | 8.0E-02 |
| | | | | Chromium (hexavalent) | 4.9E+02 | mg/kg | N/A | | N/A | | N/A | 6.3E-03 | mg/kg/day | 3.0E-03 | mg/kg-day | 2.1E+00 |
| | | | | Cobalt | 2.7E+00 | mg/kg | N/A | | N/A | | N/A | 3.4E-05 | mg/kg/day | 3.0E-04 | mg/kg-day | 1.1E-01 |
| | | | | Manganese | 1.1E+02 | mg/kg | N/A | | N/A | | N/A | 1.4E-03 | mg/kg/day | 2.4E-02 | mg/kg-day | 5.7E-02 |
| | | | | Thallium | 2.4E-01 | mg/kg | N/A | | N/A | | N/A | 3.1E-06 | mg/kg/day | 1.0E-05 | mg/kg-day | 3.1E-01 |
| | | | Exp. Route Total | | | | | | | | N/A | | | | | 2.6E+00 |
| | | | Dermal Absorption[1] | Antimony | 2.5E+00 | mg/kg | N/A | | N/A | | N/A | 9.0E-08 | mg/kg/day | 6.0E-05 | mg/kg-day | 1.5E-03 |
| | | | | Chromium (hexavalent) | 4.9E+02 | mg/kg | N/A | | N/A | | N/A | 1.8E-05 | mg/kg/day | 7.5E-05 | mg/kg-day | 2.3E-01 |
| | | | | Cobalt | 2.7E+00 | mg/kg | N/A | | N/A | | N/A | 9.7E-08 | mg/kg/day | 3.0E-04 | mg/kg-day | 3.2E-04 |
| | | | | Manganese | 1.1E+02 | mg/kg | N/A | | N/A | | N/A | 3.8E-06 | mg/kg/day | 9.6E-04 | mg/kg-day | 4.0E-03 |
| | | | | Thallium | 2.4E-01 | mg/kg | N/A | | N/A | | N/A | 8.6E-09 | mg/kg/day | 1.0E-05 | mg/kg-day | 8.6E-04 |
| | | | Exp. Route Total | | | | | | | | N/A | | | | | 2.4E-01 |
| | | Exposure Point Total | | | | | | | | | N/A | | | | | 2.9E+00 |
| | Exposure Medium Total | | | | | | | | | | N/A | | | | | 2.9E+00 |
| | Air | Emissions from Subsurface Soil | Inhalation | Chromium (hexavalent) | 3.6E-04 | μg/m³ | N/A | | N/A | | N/A | 3.5E-07 | mg/m³ | 1.0E-04 | mg/m³ | 3.5E-03 |
| | | | Exp. Route Total | | | | | | | | N/A | | | | | 3.5E-03 |
| | | Exposure Point Total | | | | | | | | | N/A | | | | | 3.5E-03 |
| | Exposure Medium Total | | | | | | | | | | N/A | | | | | 3.5E-03 |
| Subsurface Soil Total | | | | | | | | | | | N/A | | | | | 2.9E+00 |
| Groundwater | Groundwater | Surficial Aquifer - Tap Water | Ingestion | Nitrobenzene | 3.1E-01 | μg/L | N/A | | N/A | | N/A | 2.0E-05 | mg/kg/day | 2.0E-03 | mg/kg/day | 9.8E-03 |
| | | | | 3-Nitrotoluene | 4.2E-01 | μg/L | N/A | | N/A | | N/A | 2.7E-05 | mg/kg/day | 1.0E-04 | mg/kg/day | 2.7E-01 |
| | | | | Antimony | 7.7E+00 | μg/L | N/A | | N/A | | N/A | 4.9E-04 | mg/kg/day | 4.0E-04 | mg/kg/day | 1.2E+00 |
| | | | | Cadmium | 3.2E+00 | μg/L | N/A | | N/A | | N/A | 2.0E-04 | mg/kg/day | 5.0E-04 | mg/kg/day | 4.1E-01 |
| | | | | Manganese | 4.5E+01 | μg/L | N/A | | N/A | | N/A | 2.9E-03 | mg/kg/day | 2.4E-02 | mg/kg/day | 1.2E-01 |
| | | | Exp. Route Total | | | | | | | | N/A | | | | | 2.0E+00 |
| | | | Dermal Absorption[2] | Nitrobenzene | 3.1E-01 | μg/L | N/A | | N/A | | N/A | 1.3E-06 | mg/kg-day | 2.0E-03 | mg/kg/day | 6.5E-04 |
| | | | | 3-Nitrotoluene | 4.2E-01 | μg/L | N/A | | N/A | | N/A | 3.8E-06 | mg/kg-day | 1.0E-04 | mg/kg/day | 3.8E-02 |
| | | | | Antimony | 7.7E+00 | μg/L | N/A | | N/A | | N/A | 3.2E-06 | mg/kg-day | 6.0E-05 | mg/kg/day | 5.4E-02 |
| | | | | Cadmium | 3.2E+00 | μg/L | N/A | | N/A | | N/A | 1.3E-06 | mg/kg-day | 2.5E-05 | mg/kg/day | 5.4E-02 |
| | | | | Manganese | 4.5E+01 | μg/L | N/A | | N/A | | N/A | 1.9E-05 | mg/kg-day | 9.6E-04 | mg/kg/day | 2.0E-02 |
| | | | Exp. Route Total | | | | | | | | N/A | | | | | 1.7E-01 |
| | | Exposure Point Total | | | | | | | | | N/A | | | | | 1.7E-01 |
| | Exposure Medium Total | | | | | | | | | | N/A | | | | | 2.2E+00 |

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Receptor Population: Resident |
| Receptor Age: Child |

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Groundwater | Air | Surficial Aquifer - Showerhead | Inhalation[3] | Nitrobenzene | 3.1E-01 | µg/L | N/A | | N/A | | N/A | 3.4E-06 | $mg/m^3$ | 9.0E-03 | $mg/m^3$ | 3.8E-04 |
| | | | Exp. Route Total | | | | | | | | N/A | | | | | 3.8E-04 |
| | | Exposure Point Total | | | | | | | | | N/A | | | | | 3.8E-04 |
| | Exposure Medium Total | | | | | | | | | | N/A | | | | | 3.8E-04 |
| Groundwater Total | | | | | | | | | | | N/A | | | | | 2.2E+00 |
| Total of Receptor Risks Across All Media | | | | | | | | | | | N/A | Total of Receptor Hazards Across All Media | | | | 5.1E+00 |

N/A = Not available/not applicable

1. Dermal absorption factors (DABS) used to calculated dermal absorption intake from solids are chemical specific.
   DABS of 0.03 used for arsenic, DABS of 0.001 for all other inorganics.
2. $DA_{event}$ from groundwater calculated on Table 7.5.RME Supplement A.
3. Inhalation exposure for groundwater while showering calculated on Table 7.5.RME Supplement B.

TABLE 7.5.RME Supplement A

**Calculation of DAevent**

**Resident Child - Groundwater**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Chemical of Potential Concern | Water Concentration (CW) (µg/L) | Permeability Coefficient (Kp) (cm/hr) | B (dimensionless) | Lag Time ($\tau_{event}$) (hr) | t* (hr) | Fraction Absorbed Water (FA) (dimensionless) | Duration of Event (tevent) (hr) | DAevent (mg/cm$^2$-event) | Eq |
|---|---|---|---|---|---|---|---|---|---|
| Nitrobenzene[1] | 3.1E-01 | 5.1E-03 | 2.2E-02 | 5.1E-01 | 1.2E+00 | 1.0E+00 | 1 | 3.1E-09 | 2 |
| 3-Nitrotoluene[1] | 4.2E-01 | 9.8E-03 | 4.4E-02 | 6.2E-01 | 1.5E+00 | 1.0E+00 | 1 | 8.9E-09 | 2 |
| Antimony | 7.7E+00 | 1.0E-03 | N/A | N/A | N/A | N/A | 1 | 7.7E-09 | 1 |
| Cadmium | 3.2E+00 | 1.0E-03 | N/A | N/A | N/A | N/A | 1 | 3.2E-09 | 1 |
| Manganese | 4.5E+01 | 1.0E-03 | N/A | N/A | N/A | N/A | 1 | 4.5E-08 | 1 |

**Inorganics: $DA_{event}$ (mg/cm$^2$-event) =**
$K_p$ x CW x $t_{event}$ x 0.001 mg/µg x 0.001 l/cm$^3$ (eq 1)

**Organics: $DA_{event}$ (mg/cm$^2$-event) =**
If $t_{event} < t^*$, then $DA_{event}$ =
2 x FA x $K_p$ x CW x (sqrt((6 x $\tau_{event}$ x $t_{event}$)/$\pi$)) x 0.001 mg/µg x 0.001 l/cm$^3$ (eq 2)

If $t_{event} > t^*$, then $DA_{event}$ =
FA x $K_p$ x CW x ( $t_{event}$/(1+B) + 2 x $\tau_{event}$ x ((1 + 3xB + 3xB$^2$)/(1+B)$^2$) x 0.001 mg/µg x 0.001 l/cm$^3$ (eq 3)

Notes:
NA - Not applicable
Permeability constants from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.
B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).
t* - Time to reach steady-state
[1]Lag time and B calculated on Table 7.4.RME Supplement B
* Permeability constants calculated using Equation 3.8 (log $K_p$ = 2.80 + 0.66 log $K_{ow}$ - 0.0056 MW, where $r^2$ = 0.66) from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final)* . EPA/540/R/99/005.

B calculated using Equation A.1 (B = $K_p$ * MW$^{1/2}$/2.6) from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final). EPA/540/R/99/005.*

$\tau_{event}$ calculated using Equation A.4 ( $\tau_{event} = l_{sc}^2/6D_{sc}$ = 0.105 × 10^[0.0056 MW]) from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final). EPA/540/R/99/005.*

Since B ≤ 0.6, then t* calculated using Equation A.4 (t* = 2.4 $\tau_{event}$) from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final). EPA/540/R/99/005.*

TABLE 7.5.RME Supplement B

**Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Chemical of Potential Concern | Exposure Point Concentration Cwo (µg/L) | Molecular weight (MW) (g/mole) | Henry's Law Constant (H) (atm-m$^3$/mole) | Kg (VOC) (cm/hr) | Kl (VOC) (cm/hr) | KL (cm/hr) | Kal (cm/hr) | Cwd (µg/L) | S (µg/m$^3$ -min) | Ca (mg/m$^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| Nitrobenzene | 3.1E-01 | 1.2E+02 | 2.4E-05 | 1.1E+03 | 1.2E+01 | 1.0E+00 | 1.4E+00 | 3.6E-03 | 3.0E-03 | 8.5E-05 |

| Variables | Units | Exposure Assumptions |
|---|---|---|
| Kg(VOC) = gas-film mass transfer coefficient | cm/hr | Solved by Eq 1 |
| Kl(VOC) = liquid-film mass transfer coefficient | cm/hr | Solved by Eq 2 |
| KL = overall mass transfer coefficient | cm/hr | Solved by Eq 3 |
| Kal = adjusted overall mass transfer coeff. | cm/hr | Solved by Eq 4 |
| Tl = Calibration temp. of water | K (20C +273) | 293 |
| Ts = Shower water temperature | k (45C) | 318 |
| Us = water viscosity at Ts | centipoise | 0.596 |
| Ul = water viscosity at Tl | cp | 1.002 |
| Cwd = conc. leaving droplets after time sdt | µg/l | Solved by Eq 5 |
| sdt = shower droplet drop time | sec | 0.5 |
| d = shower droplet diameter | mm | 1 |
| FR = shower water flow rate | l/min | 10 |
| SV = shower room air volume | m$^3$ | 12 |
| S = indoor VOC generation rate | µg/m$^3$-min | Solved by Eq 6 |
| Ds = duration of shower | min | 60 |
| Dt = total duration in shower room | min | 70 |
| R = air exchange rate | min$^{-1}$ | 0.0083 |
| Ca = indoor air concentration of VOCs | µg/m$^3$ | Solved by Eq 7 |

| | | | |
|---|---|---|---|
| Equation 1: | Kg(VOC) = | 3000 * (18 / MW)$^{0.5}$ | |
| Equation 2: | Kl(VOC) = | 20 * (44 / MW)$^{0.5}$ | |
| Equation 3: | KL = | ((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H)))$^{-1}$ | |
| Equation 4: | Kal = | (KL * (((Tl * Us) / (Ts * Ul))$^{-0.5}$)) | |
| Equation 5: | Cwd = | (Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d)))) | |
| Equation 6: | S = | (Cwd * FR / SV) | |
| Equation 7: | Ca = | If t>Ds | [(S / R ) * (Ds + (EXP(-R * Dt) / R) -(EXP(R *(Ds - Dt)) / R)] / Dt * 1/1000 |

TABLE 7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Receptor Population: Resident |
| Receptor Age: Child/Adult |

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Ingestion | Antimony | 2.5E+00 | mg/kg | 3.9E-06 | mg/kg-day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | Chromium (hexavalent)[2] | 4.9E+02 | mg/kg | | | 5.0E-01 | mg/kg/day | 1.6E-03 | N/A | | N/A | | N/A |
| | | | | Cobalt | 2.7E+00 | mg/kg | 4.2E-06 | mg/kg-day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | Manganese | 1.1E+02 | mg/kg | 1.7E-04 | mg/kg-day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | Thallium | 2.4E-01 | mg/kg | 3.8E-07 | mg/kg-day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | Exp. Route Total | | | | | | | | 1.6E-03 | | | | | N/A |
| | | | Dermal Absorption[1] | Antimony | 2.5E+00 | mg/kg | 1.2E-08 | mg/kg-day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | Chromium (hexavalent)[2] | 4.9E+02 | mg/kg | | | 2.0E+01 | mg/kg/day | 1.9E-04 | N/A | | N/A | | N/A |
| | | | | Cobalt | 2.7E+00 | mg/kg | 1.3E-08 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | Manganese | 1.1E+02 | mg/kg | 5.3E-07 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | Thallium | 2.4E-01 | mg/kg | 1.2E-09 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | Exp. Route Total | | | | | | | | 1.9E-04 | | | | | N/A |
| | | Exposure Point Total | | | | | | | | | 1.8E-03 | | | | | N/A |
| | Exposure Medium Total | | | | | | | | | | 1.8E-03 | | | | | N/A |
| | Air | Emissions from Subsurface Soil | Inhalation | Chromium (hexavalent)[2] | 3.6E-04 | $\mu g/m^3$ | | | 8.4E-02 | $(\mu g/m^3)^{-1}$ | 1.2E-06 | N/A | | N/A | | N/A |
| | | | Exp. Route Total | | | | | | | | 1.2E-06 | | | | | N/A |
| | | Exposure Point Total | | | | | | | | | 1.2E-06 | | | | | N/A |
| | Exposure Medium Total | | | | | | | | | | 1.2E-06 | | | | | N/A |
| Subsurface Soil Total | | | | | | | | | | | 1.8E-03 | | | | | N/A |
| Groundwater | Groundwater | Surficial Aquifer - Tap Water | Ingestion | Nitrobenzene | 3.1E-01 | µg/L | 4.6E-06 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | 3-Nitrotoluene | 4.2E-01 | µg/L | 6.3E-06 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | Antimony | 7.7E+00 | µg/L | 1.1E-04 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | Cadmium | 3.2E+00 | µg/L | 4.7E-05 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | Manganese | 4.5E+01 | µg/L | 6.8E-04 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | Exp. Route Total | | | | | | | | N/A | | | | | N/A |
| | | | Dermal Absorption[3] | Nitrobenzene | 3.1E-01 | µg/L | 3.1E-07 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | 3-Nitrotoluene | 4.2E-01 | µg/L | 9.0E-07 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | Antimony | 7.7E+00 | µg/L | 6.5E-07 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | Cadmium | 3.2E+00 | µg/L | 2.7E-07 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | Manganese | 4.5E+01 | µg/L | 3.9E-06 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | Exp. Route Total | | | | | | | | N/A | | | | | N/A |
| | | Exposure Point Total | | | | | | | | | N/A | | | | | N/A |
| | Exposure Medium Total | | | | | | | | | | N/A | | | | | N/A |

TABLE 7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Groundwater | Air | Surficial Aquifer - Showerhead | Inhalation[4] | Nitrobenzene | 3.1E-01 | µg/L | 7.8E-07 | $mg/m^3$ | 4.0E-05 | $(\mu g/m^3)^{-1}$ | 3.1E-08 | N/A | | N/A | | N/A |
| | | | Exp. Route Total | | | | | | | | 3.1E-08 | | | | | N/A |
| | | Exposure Point Total | | | | | | | | | 3.1E-08 | | | | | N/A |
| | Exposure Medium Total | | | | | | | | | | 3.1E-08 | | | | | N/A |
| Groundwater Total | | | | | | | | | | | 3.1E-08 | | | | | N/A |
| | | | | | | | | | Total of Receptor Risks Across All Media | | 1.8E-03 | Total of Receptor Hazards Across All Media | | | | N/A |

N/A = Not available/not applicable

1. Dermal absorption factors (DABS) used to calculated dermal absorption intake from solids are chemical specific.
   DABS of 0.03 used for arsenic, DABS of 0.001 for all other inorganics.
2. See Table 7.6.RME Supplement A for calculation of intake and cancer risk following MMOA method.
3. $DA_{event}$ for dermal exposure to groundwater calculated on Tables 7.4.RMSupplement A and 7.5.RME Supplement A
4. Inhalation exposure for groundwater while showering calculated on Tables 7.4.RME Supplement C and 7.5.RME Supplement B.

TABLE 7.6.RME Supplement A

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Receptor Population: Resident |
| Receptor Age: Adult/Child |

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Intake | | | | | CSF/Unit Risk | | | | | Cancer Risk |
| | | | | | Value | Units | Value | | | | Units | Value | | | | Units | |
| | | | | | | | 0-2 yrs | 2-6 yrs | 6-16 years | 16-30 yrs | | 0-2 yrs (ADAF=10) | 2-6 yrs (ADAF=3) | 6-16 yrs (ADAF=3) | 16-30 yrs (ADAF=1) | | |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Ingestion | Chromium (hexavalent) | 4.9E+02 | mg/kg | 1.8E-04 | 3.6E-04 | 9.6E-05 | 1.3E-04 | mg/kg/day | 5.0E+00 | 1.5E+00 | 1.5E+00 | 5.0E-01 | mg/kg/day | 1.6E-03 |
| | | | Dermal | Chromium (hexavalent) | 4.9E+02 | mg/kg | 5.0E-07 | 1.0E-06 | 3.8E-07 | 5.4E-07 | mg/kg/day | 2.0E+02 | 6.0E+01 | 6.0E+01 | 2.0E+01 | mg/kg/day | 1.9E-04 |
| | Air | Emissions from Subsurface Soil | Inhalation | Chromium (hexavalent) | 3.6E-04 | $\mu g/m^3$ | 4.1E-07 | 8.2E-07 | 2.1E-06 | 1.7E-06 | mg/kg/day | 8.4E-01 | 2.5E-01 | 2.5E-01 | 8.4E-02 | $(\mu g/m^3)^{-1}$ | 1.2E-06 |

Cancer risk = $(Intake_{0\text{-}2} \times CSF_{0\text{-}2}) + (Intake_{2\text{-}6} \times CSF_{2\text{-}6}) + (Intake_{6\text{-}16} \times CSF_{6\text{-}16}) + (Intake_{16\text{-}30} \times CSF_{16\text{-}30})$

TABLE 7.7.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Ingestion | Antimony | 2.5E+00 | mg/kg | 1.2E-07 | mg/kg/day | N/A | | N/A | 8.1E-06 | mg/kg/day | 4.0E-04 | mg/kg/day | 2.0E-02 |
| | | | | Chromium (hexavalent) | 4.9E+02 | mg/kg | 2.3E-05 | mg/kg/day | 5.0E-01 | mg/kg/day | 1.1E-05 | 1.6E-03 | mg/kg/day | 2.0E-02 | mg/kg/day | 7.9E-02 |
| | | | | Cobalt | 2.7E+00 | mg/kg | 1.2E-07 | mg/kg/day | N/A | | N/A | 8.7E-06 | mg/kg/day | 3.0E-03 | mg/kg/day | 2.9E-03 |
| | | | | Manganese | 1.1E+02 | mg/kg | 4.9E-06 | mg/kg/day | N/A | | N/A | 3.4E-04 | mg/kg/day | 2.4E-02 | mg/kg/day | 1.4E-02 |
| | | | | Thallium | 2.4E-01 | mg/kg | 1.1E-08 | mg/kg/day | N/A | | N/A | 7.7E-07 | mg/kg/day | 4.0E-05 | mg/kg/day | 1.9E-02 |
| | | | Exp. Route Total | | | | | | | | 1.1E-05 | | | | | 1.4E-01 |
| | | | Dermal Absorption[1] | Antimony | 2.5E+00 | mg/kg | 2.3E-10 | mg/kg/day | N/A | | N/A | 1.6E-08 | mg/kg/day | 6.0E-05 | mg/kg/day | 2.7E-04 |
| | | | | Chromium (hexavalent) | 4.9E+02 | mg/kg | 4.5E-08 | mg/kg/day | 2.0E+01 | mg/kg/day | 9.0E-07 | 3.2E-06 | mg/kg/day | 5.0E-04 | mg/kg/day | 6.3E-03 |
| | | | | Cobalt | 2.7E+00 | mg/kg | 2.5E-10 | mg/kg/day | N/A | | N/A | 1.7E-08 | mg/kg/day | 3.0E-03 | mg/kg/day | 5.8E-06 |
| | | | | Manganese | 1.1E+02 | mg/kg | 9.8E-09 | mg/kg/day | N/A | | N/A | 6.9E-07 | mg/kg/day | 9.6E-04 | mg/kg/day | 7.2E-04 |
| | | | | Thallium | 2.4E-01 | mg/kg | 2.2E-11 | mg/kg/day | N/A | | N/A | 1.5E-09 | mg/kg/day | 4.0E-05 | mg/kg/day | 3.9E-05 |
| | | | Exp. Route Total | | | | | | | | 9.0E-07 | | | | | 7.4E-03 |
| | | Total | | | | | | | | | 1.2E-05 | | | | | 1.4E-01 |
| | Exposure Medium Total | | | | | | | | | | 1.2E-05 | | | | | 1.4E-01 |
| | Air | Emissions from Subsurface Soil | Inhalation | Chromium (hexavalent) | 3.6E-04 | μg/m$^3$ | 1.2E-06 | μg/m$^3$ | 8.4E-02 | (μg/m$^3$)$^{-1}$ | 9.9E-08 | 2.0E-06 | mg/m$^3$ | 1.0E-04 | mg/m$^3$ | 2.0E-02 |
| | | | Exp. Route Total | | | | | | | | 9.9E-08 | | | | | 2.0E-02 |
| | | Exposure Point | | | | | | | | | 9.9E-08 | | | | | 2.0E-02 |
| | Exposure Medium Total | | | | | | | | | | 9.9E-08 | | | | | 2.0E-02 |
| Subsurface Soil Total | | | | | | | | | | | 1.2E-05 | | | | | 1.4E-01 |
| Groundwater | Groundwater | Surficial Aquifer - Water in Excavation Pit | Dermal | Nitrobenzene | 3.1E-01 | μg/L | 3.1E-09 | mg/kg-day | N/A | | N/A | 2.2E-07 | mg/kg/day | 5.0E-03 | mg/kg/day | 4.3E-05 |
| | | | | 3-Nitrotoluene | 4.2E-01 | μg/L | 8.4E-09 | mg/kg-day | N/A | | N/A | 5.9E-07 | mg/kg/day | 1.0E-01 | mg/kg/day | 5.9E-06 |
| | | | | Antimony | 7.7E+00 | μg/L | 1.2E-08 | mg/kg-day | N/A | | N/A | 8.6E-07 | mg/kg/day | 6.0E-05 | mg/kg/day | 1.4E-02 |
| | | | | Cadmium | 3.2E+00 | μg/L | 5.1E-09 | mg/kg-day | N/A | | N/A | 3.5E-07 | mg/kg/day | 2.5E-05 | mg/kg/day | 1.4E-02 |
| | | | | Manganese | 4.5E+01 | μg/L | 7.2E-08 | mg/kg-day | N/A | | N/A | 5.1E-06 | mg/kg/day | 9.6E-04 | mg/kg/day | 5.3E-03 |
| | | | Exp. Route Total | | | | | | | | 0.0E+00 | | | | | 3.4E-02 |
| | | Exposure Point | | | | | | | | | 0.0E+00 | | | | | 3.4E-02 |
| | | Surficial Aquifer - Water Vapors in Excavation Pit | Inhalation | Nitrobenzene | 3.1E-01 | μg/L | 2.3E-06 | μg/m$^3$ | 4.0E-05 | (μg/m$^3$)$^{-1}$ | 9.2E-11 | 1.6E-07 | mg/m$^3$ | 2.0E-02 | mg/m$^3$ | 8.0E-06 |
| | | | Exp. Route Total | | | | | | | | 9.2E-11 | | | | | 8.0E-06 |
| | | Exposure Point | | | | | | | | | 9.2E-11 | | | | | 8.0E-06 |
| | Exposure Medium Total | | | | | | | | | | 9.2E-11 | | | | | 3.4E-02 |
| Groundwater Total | | | | | | | | | | | 9.2E-11 | | | | | 3.4E-02 |
| | | | | | | | Total of Receptor Risks Across All Media | | | | 1.2E-05 | Total of Receptor Hazards Across All Media | | | | 1.8E-01 |

N/A = Not available/not applicable

1. Dermal absorption factors (DABS) used to calculated dermal absorption intake from solids are chemical specific.
DABS of 0.03 used for arsenic, DABS of 0.001 for all other inorganics.

$DA_{event}$ for dermal exposure to groundwater calculated on Table 7.7.RME Supplement A

Volatilization from groundwater in excavation pit calculated on Table 7.7.RME Supplement B.

TABLE 7.7.RME Supplement A

**Calculation of DAevent**

**Construction Worker - Groundwater**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Chemical of Potential Concern | Water Concentration (CW) (µg/L) | Permeability Coefficient (Kp) (cm/hr) | B (dimensionless) | Lag Time ($\tau_{event}$) (hr) | t* (hr) | Fraction Absorbed Water (FA) (dimensionless) | Duration of Event (tevent) (hr) | DAevent (mg/cm²-event) | Eq |
|---|---|---|---|---|---|---|---|---|---|
| Nitrobenzene[1] | 3.1E-01 | 5.1E-03 | 2.2E-02 | 5.1E-01 | 1.2E+00 | 1.0E+00 | 4 | 7.7E-09 | 3 |
| 3-Nitrotoluene[1] | 4.2E-01 | 9.8E-03 | 4.4E-02 | 6.2E-01 | 1.5E+00 | 1.0E+00 | 4 | 2.1E-08 | 3 |
| Antimony | 7.7E+00 | 1.0E-03 | N/A | N/A | N/A | N/A | 4 | 3.1E-08 | 1 |
| Cadmium | 3.2E+00 | 1.0E-03 | N/A | N/A | N/A | N/A | 4 | 1.3E-08 | 1 |
| Manganese | 4.5E+01 | 1.0E-03 | N/A | N/A | N/A | N/A | 4 | 1.8E-07 | 1 |

**Inorganics: $DA_{event}$ (mg/cm$^2$-event) =**
$K_p$ x CW x $t_{event}$ x 0.001 mg/µg x 0.001 l/cm$^3$ (eq 1)

**Organics: $DA_{event}$ (mg/cm$^2$-event) =**
If $t_{event}$<t*, then $DA_{event}$ =
2 x FA x $K_p$ x CW x (sqrt((6 x $\tau_{event}$ x $t_{event}$)/$\pi$)) x 0.001 mg/µg x 0.001 l/cm$^3$ (eq 2)

If $t_{event}$>t*, then $DA_{event}$ =
FA x $K_p$ x CW x ( $t_{event}$/(1+B) + 2 x $\tau_{event}$ x ((1 + 3xB + 3xB$^2$)/(1+B)$^2$) x 0.001 mg/µg x 0.001 l/cm$^3$ (eq 3)

Notes:
NA - Not applicable
Permeability constants from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.
B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).
t* - Time to reach steady-state
[1]Lag time and B calculated on Table 7.5.RME Supplement B
* Permeability constants calculated using Equation 3.8 (log $K_p$ = 2.80 + 0.66 log $K_{ow}$ - 0.0056 MW, where $r^2$ = 0.66) from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005.

B calculated using Equation A.1 (B = $K_p$ * MW$^{1/2}$/2.6) from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final). EPA/540/R/99/005.*

$\tau_{event}$ calculated using Equation A.4 ($\tau_{event}$ = $l_{sc}^{2/6D}{}_{sc}$ = 0.105 × 10^[0.0056 MW]) from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final). EPA/540/R/99/005.*

Since B ≤ 0.6, then t* calculated using Equation A.4 (t* = 2.4 $\tau_{event}$) from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final). EPA/540/R/99/005.*

TABLE 7.7.RME Supplement B

**Inhalation of Volatiles from Groundwater During Construction**

**Inhalation Exposure Concentrations Calculated Using a Two-Film Volatilization Model**

**Future Construction Worker Senario**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Chemical | Cw (µg/L) | MW (gram/mol) | KH (unitless) | kl (cm/hr) | kg (cm/hr) | Kv (cm/hr) | ER (mg/hr) | ERa (g/sec-m²) | Ca (µg/m³) | Ca (mg/m³) |
|---|---|---|---|---|---|---|---|---|---|---|
| Nitrobenzene | 3.1E-01 | 1.2E+02 | 1.2E+02 | 3.1E+00 | 1.9E+03 | 3.1E+00 | 9.6E-01 | 9.9E-11 | 2.8E-03 | 2.8E-06 |

Equations

| | | |
|---|---|---|
| Equation 1 | Kv= | $1/(1/k_l + 1/K_H*K_g)$ |
| Equation 2 | $k_g$ = | $700(18/MW)^{1/4}V$ |
| Equation 3 | $k_l$ = | $(32/MW)^{1/4}Ka'$ |
| Equation 4 | ER = | Kv * Cw * L/1000 $cm^3$ * mg/1000 µg |
| Equation 5 | ERa = | ER * g/1000 mg * hr/60 min * min/60 sec * 1/A |

| Variables | Units | Exposure Assumptions |
|---|---|---|
| Cw = groundwater concentration | (µg/L) | chem-specific |
| MW = molecular weight | (mol/gram) | chem-specific |
| $K_H$ - Henry's Law Constant | (unitless) | chem-specific |
| Kv = volatilization rate | (cm/hr) | Solved by Eq 1 |
| $k_g$ = gas phase transfer coefficient | (cm/hr) | Solved by Eq 2 |
| $k_l$ = liquid phase transfer coefficient | (cm/hr) | Solved by Eq 3 |
| V = wind speed | (m/s) | 4.4 |
| Ka' = aeration rate | (cm/hr) | 0.0633 |
| ER = emission rate | (mg/hr) | Solved by Eq 4 |
| A = area of excavation (based on utility ditch) | ($m^2$) | 2,700 |
| Era = area emission rate | (g/sec-$m^2$) | Solved by Eq 5 |
| Ca = air concentration | (mg/$m^3$) | Solved using SCREEN3 model |

Note: aeration rate based on aeration rate for small surface water body (0.1/day) multiplied by depth of water in excavation (1/2 ft)

MW and log Kow from Oak Ridge National Laboratory (ORNL). May 2012. [Online]. Available: http://epa-prgs.ornl.gov/chemicals/index.shtml

TABLE 7.8.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Ingestion | Antimony | 2.5E+00 | mg/kg | 8.7E-07 | mg/kg-day | N/A | | N/A | 2.4E-06 | mg/kg-day | 4.0E-04 | mg/kg-day | 6.1E-03 |
| | | | | Chromium (hexavalent) | 4.9E+02 | mg/kg | 1.7E-04 | mg/kg-day | 5.0E-01 | mg/kg/day | 8.6E-05 | 4.8E-04 | mg/kg-day | 3.0E-03 | mg/kg-day | 1.6E-01 |
| | | | | Cobalt | 2.7E+00 | mg/kg | 9.4E-07 | mg/kg-day | N/A | | N/A | 2.6E-06 | mg/kg-day | 3.0E-04 | mg/kg-day | 8.8E-03 |
| | | | | Manganese | 1.1E+02 | mg/kg | 3.7E-05 | mg/kg-day | N/A | | N/A | 1.0E-04 | mg/kg-day | 2.4E-02 | mg/kg-day | 4.3E-03 |
| | | | | Thallium | 2.4E-01 | mg/kg | 8.4E-08 | mg/kg-day | N/A | | N/A | 2.3E-07 | mg/kg-day | 1.0E-05 | mg/kg-day | 2.3E-02 |
| | | | Exp. Route Total | | | | | | | | 8.6E-05 | | | | | 2.0E-01 |
| | | | Dermal Absorption[1] | Antimony | 2.5E+00 | mg/kg | 5.8E-09 | mg/kg/day | N/A | | N/A | 1.6E-08 | mg/kg/day | 6.0E-05 | mg/kg/day | 2.7E-04 |
| | | | | Chromium (hexavalent) | 4.9E+02 | mg/kg | 1.1E-06 | mg/kg/day | 2.0E+01 | mg/kg/day | 2.3E-05 | 3.2E-06 | mg/kg/day | 7.5E-05 | mg/kg/day | 4.2E-02 |
| | | | | Cobalt | 2.7E+00 | mg/kg | 6.2E-09 | mg/kg/day | N/A | | N/A | 1.7E-08 | mg/kg/day | 3.0E-04 | mg/kg/day | 5.8E-05 |
| | | | | Manganese | 1.1E+02 | mg/kg | 2.5E-07 | mg/kg/day | N/A | | N/A | 6.9E-07 | mg/kg/day | 9.6E-04 | mg/kg/day | 7.2E-04 |
| | | | | Thallium | 2.4E-01 | mg/kg | 5.5E-10 | mg/kg/day | N/A | | N/A | 1.5E-09 | mg/kg/day | 1.0E-05 | mg/kg/day | 1.5E-04 |
| | | | Exp. Route Total | | | | | | | | 2.3E-05 | | | | | 4.3E-02 |
| | | Exposure Point Total | | | | | | | | | 1.1E-04 | | | | | 2.5E-01 |
| | Exposure Medium Total | | | | | | | | | | 1.1E-04 | | | | | 2.5E-01 |
| | Air | Emissions from Subsurface Soil | Inhalation | Chromium (hexavalent) | 3.6E-04 | μg/m$^3$ | 2.9E-05 | μg/m$^3$ | 8.4E-02 | (μg/m$^3$)$^{-1}$ | 2.5E-06 | 8.2E-08 | mg/m$^3$ | 1.0E-04 | mg/m$^3$ | 8.2E-04 |
| | | | Exp. Route Total | | | | | | | | 2.5E-06 | | | | | 8.2E-04 |
| | | Exposure Point Total | | | | | | | | | 2.5E-06 | | | | | 8.2E-04 |
| | Exposure Medium Total | | | | | | | | | | 2.5E-06 | | | | | 8.2E-04 |
| Subsurface Soil Total | | | | | | | | | | | 1.1E-04 | | | | | 2.5E-01 |
| Groundwater | Groundwater | Surficial Aquifer - Tap Water | Ingestion | Nitrobenzene | 3.1E-01 | μg/L | 1.1E-06 | mg/kg-day | N/A | | N/A | 3.0E-06 | mg/kg/day | 2.0E-03 | mg/kg/day | 1.5E-03 |
| | | | | 3-Nitrotoluene | 4.2E-01 | μg/L | 1.5E-06 | mg/kg-day | N/A | | N/A | 4.1E-06 | mg/kg/day | 1.0E-04 | mg/kg/day | 4.1E-02 |
| | | | | Antimony | 7.7E+00 | μg/L | 2.7E-05 | mg/kg-day | N/A | | N/A | 7.5E-05 | mg/kg/day | 4.0E-04 | mg/kg/day | 1.9E-01 |
| | | | | Cadmium | 3.2E+00 | μg/L | 1.1E-05 | mg/kg-day | N/A | | N/A | 3.1E-05 | mg/kg/day | 5.0E-04 | mg/kg/day | 6.2E-02 |
| | | | | Manganese | 4.5E+01 | μg/L | 1.6E-04 | mg/kg-day | N/A | | N/A | 4.5E-04 | mg/kg/day | 2.4E-02 | mg/kg/day | 1.9E-02 |
| | | | Exp. Route Total | | | | | | | | N/A | | | | | 3.1E-01 |
| | | Exposure Point Total | | | | | | | | | N/A | | | | | 3.1E-01 |
| | Exposure Medium Total | | | | | | | | | | N/A | | | | | 3.1E-01 |
| Groundwater Total | | | | | | | | | | | N/A | | | | | 3.1E-01 |
| | | | | | | | | | | Total of Receptor Risks Across All Media | 1.1E-04 | | | | Total of Receptor Hazards Across All Media | 5.6E-01 |

N/A = Not available/not applicable

1. Dermal absorption factors (DABS) used to calculated dermal absorption intake from solids are chemical specific.
DABS of 0.03 used for arsenic, DABS of 0.001 for all other inorganics.

TABLE 7.9.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Receptor Population: Trespasser/Visitor |
| Receptor Age: Adult |

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil in the Ephemeral Drainage | Surface Soil in the Ephemeral Drainage | Ravine | Ingestion | Arsenic | 1.0E+01 | mg/kg | 7.2E-07 | mg/kg-day | 1.5E+00 | mg/kg-day | 1.1E-06 | 2.1E-06 | mg/kg-day | 3.0E-04 | mg/kg-day | 7.0E-03 |
| | | | | Cadmium | 1.0E+01 | mg/kg | 7.0E-07 | mg/kg-day | N/A | | N/A | 2.0E-06 | mg/kg-day | 1.0E-03 | mg/kg-day | 2.0E-03 |
| | | | | Copper | 4.2E+02 | mg/kg | 2.9E-05 | mg/kg-day | N/A | | N/A | 8.6E-05 | mg/kg-day | 4.0E-02 | mg/kg-day | 2.1E-03 |
| | | | | Iron | 1.2E+04 | mg/kg | 8.3E-04 | mg/kg-day | N/A | | N/A | 2.4E-03 | mg/kg-day | 7.0E-01 | mg/kg-day | 3.5E-03 |
| | | | | Manganese | 4.7E+03 | mg/kg | 3.3E-04 | mg/kg-day | N/A | | N/A | 9.6E-04 | mg/kg-day | 2.4E-02 | mg/kg-day | 4.0E-02 |
| | | | | Mercury | 2.0E+01 | mg/kg | 1.4E-06 | mg/kg-day | N/A | | N/A | 4.0E-06 | mg/kg-day | 3.0E-04 | mg/kg-day | 1.3E-02 |
| | | | | Thallium | 9.6E+00 | mg/kg | 6.7E-07 | mg/kg-day | N/A | | N/A | 2.0E-06 | mg/kg-day | 1.0E-05 | mg/kg-day | 2.0E-01 |
| | | | | Zinc | 1.2E+04 | mg/kg | 8.1E-04 | mg/kg-day | N/A | | N/A | 2.4E-03 | mg/kg-day | 3.0E-01 | mg/kg-day | 7.9E-03 |
| | | | Exp. Route Total | | | | | | | | 1.1E-06 | | | | | 2.7E-01 |
| | | | Dermal Absorption[1] | Arsenic | 1.0E+01 | mg/kg | 7.4E-07 | mg/kg-day | 1.5E+00 | mg/kg-day | 1.1E-06 | 2.2E-06 | mg/kg-day | 3.0E-04 | mg/kg-day | 7.2E-03 |
| | | | | Cadmium | 1.0E+01 | mg/kg | 2.4E-08 | mg/kg-day | N/A | | N/A | 7.0E-08 | mg/kg-day | 2.5E-05 | mg/kg-day | 2.8E-03 |
| | | | | Copper | 4.2E+02 | mg/kg | 1.0E-06 | mg/kg-day | N/A | | N/A | 2.9E-06 | mg/kg-day | 4.0E-02 | mg/kg-day | 7.3E-05 |
| | | | | Iron | 1.2E+04 | mg/kg | 2.8E-05 | mg/kg-day | N/A | | N/A | 8.3E-05 | mg/kg-day | 7.0E-01 | mg/kg-day | 1.2E-04 |
| | | | | Manganese | 4.7E+03 | mg/kg | 1.1E-05 | mg/kg-day | N/A | | N/A | 3.3E-05 | mg/kg-day | 9.6E-04 | mg/kg-day | 3.4E-02 |
| | | | | Mercury | 2.0E+01 | mg/kg | 4.7E-08 | mg/kg-day | N/A | | N/A | 1.4E-07 | mg/kg-day | 2.1E-05 | mg/kg-day | 6.6E-03 |
| | | | | Thallium | 9.6E+00 | mg/kg | 2.3E-08 | mg/kg-day | N/A | | N/A | 6.7E-08 | mg/kg-day | 1.0E-05 | mg/kg-day | 6.7E-03 |
| | | | | Zinc | 1.2E+04 | mg/kg | 2.8E-05 | mg/kg-day | N/A | | N/A | 8.1E-05 | mg/kg-day | 3.0E-01 | mg/kg-day | 2.7E-04 |
| | | | Exp. Route Total | | | | | | | | 1.1E-06 | | | | | 5.8E-02 |
| | | Exposure Point | | | | | | | | | 2.2E-06 | | | | | 3.3E-01 |
| | Exposure Medium Total | | | | | | | | | | 2.2E-06 | | | | | 3.3E-01 |
| Sediment Total | | | | | | | | | | | 2.2E-06 | | | | | 3.3E-01 |

TABLE 7.9.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Receptor Population: Trespasser/Visitor |
| Receptor Age: Adult |

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Ingestion | Antimony | 2.5E+00 | mg/kg | 1.7E-07 | mg/kg-day | N/A | | N/A | 5.1E-07 | mg/kg-day | 4.0E-04 | mg/kg-day | 1.3E-03 |
| | | | | Chromium (hexavalent) | 4.9E+02 | mg/kg | 3.4E-05 | mg/kg-day | 5.0E-01 | mg/kg-day | 1.7E-05 | 1.0E-04 | mg/kg-day | 3.0E-03 | mg/kg-day | 3.3E-02 |
| | | | | Cobalt | 2.7E+00 | mg/kg | 1.9E-07 | mg/kg-day | N/A | | N/A | 5.5E-07 | mg/kg-day | 3.0E-04 | mg/kg-day | 1.8E-03 |
| | | | | Manganese | 1.1E+02 | mg/kg | 7.4E-06 | mg/kg-day | N/A | | N/A | 2.2E-05 | mg/kg-day | 2.4E-02 | mg/kg-day | 9.0E-04 |
| | | | | Thallium | 2.4E-01 | mg/kg | 1.7E-08 | mg/kg-day | N/A | | N/A | 4.9E-08 | mg/kg-day | 1.0E-05 | mg/kg-day | 4.9E-03 |
| | | | Exp. Route Total | | | | | | | | 1.7E-05 | | | | | 4.2E-02 |
| | | | Dermal Absorption[1] | Antimony | 2.5E+00 | mg/kg | 7.0E-10 | mg/kg-day | N/A | | N/A | 1.8E-08 | mg/kg-day | 6.0E-05 | mg/kg-day | 2.9E-04 |
| | | | | Chromium (hexavalent) | 4.9E+02 | mg/kg | 1.4E-07 | mg/kg-day | 2.0E+01 | mg/kg-day | 2.7E-06 | 3.4E-06 | mg/kg-day | 7.5E-05 | mg/kg-day | 4.6E-02 |
| | | | | Cobalt | 2.7E+00 | mg/kg | 7.5E-10 | mg/kg-day | N/A | | N/A | 1.9E-08 | mg/kg-day | 3.0E-04 | mg/kg-day | 6.3E-05 |
| | | | | Manganese | 1.1E+02 | mg/kg | 3.0E-08 | mg/kg-day | N/A | | N/A | 7.5E-07 | mg/kg-day | 9.6E-04 | mg/kg-day | 7.8E-04 |
| | | | | Thallium | 2.4E-01 | mg/kg | 6.7E-11 | mg/kg-day | N/A | | N/A | 1.7E-09 | mg/kg-day | 1.0E-05 | mg/kg-day | 1.7E-04 |
| | | | Exp. Route Total | | | | | | | | 2.7E-06 | | | | | 4.7E-02 |
| | | Exposure Point | | | | | | | | | 2.0E-05 | | | | | 8.9E-02 |
| | Exposure Medium Total | | | | | | | | | | 2.0E-05 | | | | | 8.9E-02 |
| | Air | Emissions from Subsurface Soil | Inhalation | Chromium (hexavalent) | 3.6E-04 | μg/m$^3$ | 1.5E-06 | μg/m$^3$ | 8.4E-02 | (μg/m$^3$)$^{-1}$ | 1.2E-07 | 4.3E-09 | mg/m$^3$ | 1.0E-04 | mg/m$^3$ | 4.3E-05 |
| | | | Exp. Route Total | | | | | | | | 1.2E-07 | | | | | 4.3E-05 |
| | | Exposure Point | | | | | | | | | 1.2E-07 | | | | | 4.3E-05 |
| | Exposure Medium Total | | | | | | | | | | 1.2E-07 | | | | | 4.3E-05 |
| Subsurface Soil Total | | | | | | | | | | | 2.0E-05 | | | | | 8.9E-02 |
| | | | | | | | Total of Receptor Risks Across All Media | | | | 2.2E-05 | Total of Receptor Hazards Across All Media | | | | 4.2E-01 |

Notes:

N/A =Not available; Not applicable.

[1] Dermal absorption factors (DABS) used to calculated dermal absorption intake from solids are chemical specific.

DABS of 0.03 used for arsenic, DABS of 0.001 for all other inorganics.

TABLE 7.10.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Receptor Population: Trespasser/Visitor |
| Receptor Age: Youth |

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil in the Ephemeral Drainage | Surface Soil in the Ephemeral Drainage | Ravine | Ingestion | Arsenic | 1.0E+01 | mg/kg | 4.7E-07 | mg/kg-day | 1.5E+00 | mg/kg-day | 7.0E-07 | 3.3E-06 | mg/kg-day | 3.0E-04 | mg/kg-day | 1.1E-02 |
| | | | | Cadmium | 1.0E+01 | mg/kg | 4.5E-07 | mg/kg-day | N/A | | N/A | 3.2E-06 | mg/kg-day | 1.0E-03 | mg/kg-day | 3.2E-03 |
| | | | | Copper | 4.2E+02 | mg/kg | 1.9E-05 | mg/kg-day | N/A | | N/A | 1.3E-04 | mg/kg-day | 4.0E-02 | mg/kg-day | 3.3E-03 |
| | | | | Iron | 1.2E+04 | mg/kg | 5.4E-04 | mg/kg-day | N/A | | N/A | 3.8E-03 | mg/kg-day | 7.0E-01 | mg/kg-day | 5.4E-03 |
| | | | | Manganese | 4.7E+03 | mg/kg | 2.1E-04 | mg/kg-day | N/A | | N/A | 1.5E-03 | mg/kg-day | 2.4E-02 | mg/kg-day | 6.3E-02 |
| | | | | Mercury | 2.0E+01 | mg/kg | 9.0E-07 | mg/kg-day | N/A | | N/A | 6.3E-06 | mg/kg-day | 3.0E-04 | mg/kg-day | 2.1E-02 |
| | | | | Thallium | 9.6E+00 | mg/kg | 4.3E-07 | mg/kg-day | N/A | | N/A | 3.0E-06 | mg/kg-day | 1.0E-05 | mg/kg-day | 3.0E-01 |
| | | | | Zinc | 1.2E+04 | mg/kg | 5.2E-04 | mg/kg-day | N/A | | N/A | 3.7E-03 | mg/kg-day | 3.0E-01 | mg/kg-day | 1.2E-02 |
| | | | Exp. Route Total | | | | | | | | 7.0E-07 | | | | | 4.2E-01 |
| | | | Dermal Absorption[1] | Arsenic | 1.0E+01 | mg/kg | 3.5E-07 | mg/kg-day | 1.5E+00 | mg/kg-day | 5.3E-07 | 2.5E-06 | mg/kg-day | 3.0E-04 | mg/kg-day | 8.2E-03 |
| | | | | Cadmium | 1.0E+01 | mg/kg | 1.1E-08 | mg/kg-day | N/A | | N/A | 8.0E-08 | mg/kg-day | 2.5E-05 | mg/kg-day | 3.2E-03 |
| | | | | Copper | 4.2E+02 | mg/kg | 4.8E-07 | mg/kg-day | N/A | | N/A | 3.4E-06 | mg/kg-day | 4.0E-02 | mg/kg-day | 8.4E-05 |
| | | | | Iron | 1.2E+04 | mg/kg | 1.4E-05 | mg/kg-day | N/A | | N/A | 9.5E-05 | mg/kg-day | 7.0E-01 | mg/kg-day | 1.4E-04 |
| | | | | Manganese | 4.7E+03 | mg/kg | 5.4E-06 | mg/kg-day | N/A | | N/A | 3.8E-05 | mg/kg-day | 9.6E-04 | mg/kg-day | 3.9E-02 |
| | | | | Mercury | 2.0E+01 | mg/kg | 2.3E-08 | mg/kg-day | N/A | | N/A | 1.6E-07 | mg/kg-day | 2.1E-05 | mg/kg-day | 7.5E-03 |
| | | | | Thallium | 9.6E+00 | mg/kg | 1.1E-08 | mg/kg-day | N/A | | N/A | 7.7E-08 | mg/kg-day | 1.0E-05 | mg/kg-day | 7.7E-03 |
| | | | | Zinc | 1.2E+04 | mg/kg | 1.3E-05 | mg/kg-day | N/A | | N/A | 9.3E-05 | mg/kg-day | 3.0E-01 | mg/kg-day | 3.1E-04 |
| | | | Exp. Route Total | | | | | | | | 5.3E-07 | | | | | 6.7E-02 |
| | | Exposure Point | | | | | | | | | 1.2E-06 | | | | | 4.9E-01 |
| | Exposure Medium Total | | | | | | | | | | 1.2E-06 | | | | | 4.9E-01 |
| Sediment Total | | | | | | | | | | | 1.2E-06 | | | | | 4.9E-01 |

TABLE 7.10.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Receptor Population: Trespasser/Visitor |
| Receptor Age: Youth |

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Ingestion | Antimony | 2.5E+00 | mg/kg | 1.1E-07 | mg/kg-day | N/A | | N/A | 7.9E-07 | mg/kg-day | 4.0E-04 | mg/kg-day | 2.0E-03 |
| | | | | Chromium (hexavalent) | 4.9E+02 | mg/kg | 2.2E-05 | mg/kg-day | 5.0E-01 | mg/kg-day | 1.1E-05 | 1.6E-04 | mg/kg-day | 3.0E-03 | mg/kg-day | 5.2E-02 |
| | | | | Cobalt | 2.7E+00 | mg/kg | 1.2E-07 | mg/kg-day | N/A | | N/A | 8.5E-07 | mg/kg-day | 3.0E-04 | mg/kg-day | 2.8E-03 |
| | | | | Manganese | 1.1E+02 | mg/kg | 4.8E-06 | mg/kg-day | N/A | | N/A | 3.4E-05 | mg/kg-day | 2.4E-02 | mg/kg-day | 1.4E-03 |
| | | | | Thallium | 2.4E-01 | mg/kg | 1.1E-08 | mg/kg-day | N/A | | N/A | 7.6E-08 | mg/kg-day | 1.0E-05 | mg/kg-day | 7.6E-03 |
| | | | Exp. Route Total | | | | | | | | 1.1E-05 | | | | | 6.6E-02 |
| | | | Dermal Absorption[1] | Antimony | 2.5E+00 | mg/kg | 1.9E-10 | mg/kg-day | N/A | | N/A | 1.3E-09 | mg/kg-day | 6.0E-05 | mg/kg-day | 2.2E-05 |
| | | | | Chromium (hexavalent) | 4.9E+02 | mg/kg | 3.7E-08 | mg/kg-day | 2.0E+01 | mg/kg-day | 7.4E-07 | 2.6E-07 | mg/kg-day | 7.5E-05 | mg/kg-day | 3.5E-03 |
| | | | | Cobalt | 2.7E+00 | mg/kg | 2.0E-10 | mg/kg-day | N/A | | N/A | 1.4E-09 | mg/kg-day | 3.0E-04 | mg/kg-day | 4.8E-06 |
| | | | | Manganese | 1.1E+02 | mg/kg | 8.1E-09 | mg/kg-day | N/A | | N/A | 5.7E-08 | mg/kg-day | 9.6E-04 | mg/kg-day | 5.9E-05 |
| | | | | Thallium | 2.4E-01 | mg/kg | 1.8E-11 | mg/kg-day | N/A | | N/A | 1.3E-10 | mg/kg-day | 1.0E-05 | mg/kg-day | 1.3E-05 |
| | | | Exp. Route Total | | | | | | | | 7.4E-07 | | | | | 3.6E-03 |
| | | Exposure Point | | | | | | | | | 1.2E-05 | | | | | 6.9E-02 |
| | Exposure Medium Total | | | | | | | | | | 1.2E-05 | | | | | 6.9E-02 |
| | Air | Emissions from Subsurface Soil | Inhalation | Chromium (hexavalent) | 3.6E-04 | $\mu g/m^3$ | 6.1E-07 | $\mu g/m^3$ | 8.4E-02 | $(\mu g/m^3)^{-1}$ | 5.1E-08 | 4.3E-09 | $mg/m^3$ | 1.0E-04 | $mg/m^3$ | 4.3E-05 |
| | | | Exp. Route Total | | | | | | | | 5.1E-08 | | | | | 4.3E-05 |
| | | Exposure Point | | | | | | | | | 5.1E-08 | | | | | 4.3E-05 |
| | Exposure Medium Total | | | | | | | | | | 5.1E-08 | | | | | 4.3E-05 |
| Subsurface Soil Total | | | | | | | | | | | 1.2E-05 | | | | | 6.9E-02 |
| | | | | | | | Total of Receptor Risks Across All Media | | | | 1.3E-05 | Total of Receptor Hazards Across All Media | | | | 5.6E-01 |

Notes:

N/A =Not available; Not applicable.

[1] Dermal absorption factors (DABS) used to calculated dermal absorption intake from solids are chemical specific.

DABS of 0.03 used for arsenic, DABS of 0.001 for all other inorganics.

TABLE 7.11.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Receptor Population: Trespasser/Visitor |
| Receptor Age: Child |

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil in the Ephemeral Drainage | Surface Soil in the Ephemeral Drainage | Ravine | Ingestion | Arsenic | 1.0E+01 | mg/kg | 1.7E-06 | mg/kg-day | 1.5E+00 | mg/kg-day | 2.5E-06 | 2.0E-05 | mg/kg-day | 3.0E-04 | mg/kg-day | 6.5E-02 |
| | | | | Cadmium | 1.0E+01 | mg/kg | 1.6E-06 | mg/kg-day | N/A | | N/A | 1.9E-05 | mg/kg-day | 1.0E-03 | mg/kg-day | 1.9E-02 |
| | | | | Copper | 4.2E+02 | mg/kg | 6.9E-05 | mg/kg-day | N/A | | N/A | 8.0E-04 | mg/kg-day | 4.0E-02 | mg/kg-day | 2.0E-02 |
| | | | | Iron | 1.2E+04 | mg/kg | 1.9E-03 | mg/kg-day | N/A | | N/A | 2.3E-02 | mg/kg-day | 7.0E-01 | mg/kg-day | 3.2E-02 |
| | | | | Manganese | 4.7E+03 | mg/kg | 7.7E-04 | mg/kg-day | N/A | | N/A | 9.0E-03 | mg/kg-day | 2.4E-02 | mg/kg-day | 3.8E-01 |
| | | | | Mercury | 2.0E+01 | mg/kg | 3.2E-06 | mg/kg-day | N/A | | N/A | 3.8E-05 | mg/kg-day | 3.0E-04 | mg/kg-day | 1.3E-01 |
| | | | | Thallium | 9.6E+00 | mg/kg | 1.6E-06 | mg/kg-day | N/A | | N/A | 1.8E-05 | mg/kg-day | 1.0E-05 | mg/kg-day | 1.8E+00 |
| | | | | Zinc | 1.2E+04 | mg/kg | 1.9E-03 | mg/kg-day | N/A | | N/A | 2.2E-02 | mg/kg-day | 3.0E-01 | mg/kg-day | 7.3E-02 |
| | | | Exp. Route Total | | | | | | | | 2.5E-06 | | | | | 2.5E+00 |
| | | | Dermal Absorption[1] | Arsenic | 1.0E+01 | mg/kg | 1.4E-07 | mg/kg-day | 1.5E+00 | mg/kg-day | 2.1E-07 | 1.6E-06 | mg/kg-day | 3.0E-04 | mg/kg-day | 5.5E-03 |
| | | | | Cadmium | 1.0E+01 | mg/kg | 4.6E-09 | mg/kg-day | N/A | | N/A | 5.3E-08 | mg/kg-day | 2.5E-05 | mg/kg-day | 2.1E-03 |
| | | | | Copper | 4.2E+02 | mg/kg | 1.9E-07 | mg/kg-day | N/A | | N/A | 2.2E-06 | mg/kg-day | 4.0E-02 | mg/kg-day | 5.6E-05 |
| | | | | Iron | 1.2E+04 | mg/kg | 5.4E-06 | mg/kg-day | N/A | | N/A | 6.3E-05 | mg/kg-day | 7.0E-01 | mg/kg-day | 9.0E-05 |
| | | | | Manganese | 4.7E+03 | mg/kg | 2.2E-06 | mg/kg-day | N/A | | N/A | 2.5E-05 | mg/kg-day | 9.6E-04 | mg/kg-day | 2.6E-02 |
| | | | | Mercury | 2.0E+01 | mg/kg | 9.0E-09 | mg/kg-day | N/A | | N/A | 1.1E-07 | mg/kg-day | 2.1E-05 | mg/kg-day | 5.0E-03 |
| | | | | Thallium | 9.6E+00 | mg/kg | 4.4E-09 | mg/kg-day | N/A | | N/A | 5.1E-08 | mg/kg-day | 1.0E-05 | mg/kg-day | 5.1E-03 |
| | | | | Zinc | 1.2E+04 | mg/kg | 5.3E-06 | mg/kg-day | N/A | | N/A | 6.2E-05 | mg/kg-day | 3.0E-01 | mg/kg-day | 2.1E-04 |
| | | | Exp. Route Total | | | | | | | | 2.1E-07 | | | | | 4.4E-02 |
| | | Exposure Point | | | | | | | | | 2.7E-06 | | | | | 2.6E+00 |
| | Exposure Medium Total | | | | | | | | | | 2.7E-06 | | | | | 2.6E+00 |
| Sediment Total | | | | | | | | | | | 2.7E-06 | | | | | 2.6E+00 |

TABLE 7.11.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Receptor Population: Trespasser/Visitor |
| Receptor Age: Child |

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Ingestion | Antimony | 2.5E+00 | mg/kg | 2.0E-07 | mg/kg-day | N/A | | N/A | 2.4E-06 | mg/kg-day | 4.0E-04 | mg/kg-day | 5.9E-03 |
| | | | | Chromium (hexavalent) | 4.9E+02 | mg/kg | 4.0E-05 | mg/kg-day | 5.0E-01 | mg/kg-day | 2.0E-05 | 4.7E-04 | mg/kg-day | 3.0E-03 | mg/kg-day | 1.6E-01 |
| | | | | Cobalt | 2.7E+00 | mg/kg | 2.2E-07 | mg/kg-day | N/A | | N/A | 2.6E-06 | mg/kg-day | 3.0E-04 | mg/kg-day | 8.5E-03 |
| | | | | Manganese | 1.1E+02 | mg/kg | 8.7E-06 | mg/kg-day | N/A | | N/A | 1.0E-04 | mg/kg-day | 2.4E-02 | mg/kg-day | 4.2E-03 |
| | | | | Thallium | 2.4E-01 | mg/kg | 2.0E-08 | mg/kg-day | N/A | | N/A | 2.3E-07 | mg/kg-day | 1.0E-05 | mg/kg-day | 2.3E-02 |
| | | | Exp. Route Total | | | | | | | | 2.0E-05 | | | | | 2.0E-01 |
| | | | Dermal Absorption[1] | Antimony | 2.5E+00 | mg/kg | 1.1E-09 | mg/kg-day | N/A | | N/A | 1.3E-08 | mg/kg-day | 6.0E-05 | mg/kg-day | 2.2E-04 |
| | | | | Chromium (hexavalent) | 4.9E+02 | mg/kg | 2.2E-07 | mg/kg-day | 2.0E+01 | mg/kg-day | 4.5E-06 | 2.6E-06 | mg/kg-day | 7.5E-05 | mg/kg-day | 3.5E-02 |
| | | | | Cobalt | 2.7E+00 | mg/kg | 1.2E-09 | mg/kg-day | N/A | | N/A | 1.4E-08 | mg/kg-day | 3.0E-04 | mg/kg-day | 4.8E-05 |
| | | | | Manganese | 1.1E+02 | mg/kg | 4.9E-08 | mg/kg-day | N/A | | N/A | 5.7E-07 | mg/kg-day | 9.6E-04 | mg/kg-day | 5.9E-04 |
| | | | | Thallium | 2.4E-01 | mg/kg | 1.1E-10 | mg/kg-day | N/A | | N/A | 1.3E-09 | mg/kg-day | 1.0E-05 | mg/kg-day | 1.3E-04 |
| | | | Exp. Route Total | | | | | | | | 4.5E-06 | | | | | 3.6E-02 |
| | | Exposure Point | | | | | | | | | 2.4E-05 | | | | | 2.3E-01 |
| | Exposure Medium Total | | | | | | | | | | 2.4E-05 | | | | | 2.3E-01 |
| | Air | Emissions from Subsurface Soil | Inhalation | Chromium (hexavalent) | 3.6E-04 | $\mu g/m^3$ | 3.7E-07 | $\mu g/m^3$ | 8.4E-02 | $(\mu g/m^3)^{-1}$ | 3.1E-08 | 4.3E-09 | $mg/m^3$ | 1.0E-04 | $mg/m^3$ | 4.3E-05 |
| | | | Exp. Route Total | | | | | | | | 3.1E-08 | | | | | 4.3E-05 |
| | | Exposure Point | | | | | | | | | 3.1E-08 | | | | | 4.3E-05 |
| | Exposure Medium Total | | | | | | | | | | 3.1E-08 | | | | | 4.3E-05 |
| Subsurface Soil Total | | | | | | | | | | | 2.4E-05 | | | | | 2.3E-01 |
| | | | | | | | Total of Receptor Risks Across All Media | | | | 2.7E-05 | Total of Receptor Hazards Across All Media | | | | 2.8E+00 |

Notes:

N/A =Not available; Not applicable.

[1] Dermal absorption factors (DABS) used to calculated dermal absorption intake from solids are chemical specific.

DABS of 0.03 used for arsenic, DABS of 0.001 for all other inorganics.

TABLE 7.1.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Current/Future |
| Receptor Population: Trespasser/Visitor |
| Receptor Age: Child |

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil in the Ephemeral Drainage | Surface Soil in the Ephemeral Drainage | Ravine | Ingestion | Arsenic | 7.7E+00 | mg/kg | 3.1E-07 | mg/kg-day | 1.5E+00 | mg/kg-day | 4.7E-07 | 3.7E-06 | mg/kg-day | 3.0E-04 | mg/kg-day | 1.2E-02 |
| | | | | Cadmium | 6.8E+00 | mg/kg | 2.7E-07 | mg/kg-day | N/A | | N/A | 3.2E-06 | mg/kg-day | 1.0E-03 | mg/kg-day | 3.2E-03 |
| | | | | Copper | 2.4E+02 | mg/kg | 9.8E-06 | mg/kg-day | N/A | | N/A | 1.1E-04 | mg/kg-day | 4.0E-02 | mg/kg-day | 2.9E-03 |
| | | | | Iron | 9.9E+03 | mg/kg | 4.0E-04 | mg/kg-day | N/A | | N/A | 4.7E-03 | mg/kg-day | 7.0E-01 | mg/kg-day | 6.7E-03 |
| | | | | Manganese | 2.5E+03 | mg/kg | 1.0E-04 | mg/kg-day | N/A | | N/A | 1.2E-03 | mg/kg-day | 2.4E-02 | mg/kg-day | 4.9E-02 |
| | | | | Mercury | 1.0E+01 | mg/kg | 4.2E-07 | mg/kg-day | N/A | | N/A | 4.9E-06 | mg/kg-day | 3.0E-04 | mg/kg-day | 1.6E-02 |
| | | | | Thallium | 5.0E+00 | mg/kg | 2.0E-07 | mg/kg-day | N/A | | N/A | 2.4E-06 | mg/kg-day | 1.0E-05 | mg/kg-day | 2.4E-01 |
| | | | | Zinc | 6.1E+03 | mg/kg | 2.5E-04 | mg/kg-day | N/A | | N/A | 2.9E-03 | mg/kg-day | 3.0E-01 | mg/kg-day | 9.6E-03 |
| | | | Exp. Route Total | | | | | | | | 4.7E-07 | | | | | 3.4E-01 |
| | | | Dermal Absorption[1] | Arsenic | 7.7E+00 | mg/kg | 1.1E-08 | mg/kg-day | 1.5E+00 | mg/kg-day | 1.6E-08 | 1.2E-07 | mg/kg-day | 3.0E-04 | mg/kg-day | 4.1E-04 |
| | | | | Cadmium | 6.8E+00 | mg/kg | 3.1E-10 | mg/kg-day | N/A | | N/A | 3.6E-09 | mg/kg-day | 2.5E-05 | mg/kg-day | 1.4E-04 |
| | | | | Copper | 2.4E+02 | mg/kg | 1.1E-08 | mg/kg-day | N/A | | N/A | 1.3E-07 | mg/kg-day | 4.0E-02 | mg/kg-day | 3.2E-06 |
| | | | | Iron | 9.9E+03 | mg/kg | 4.5E-07 | mg/kg-day | N/A | | N/A | 5.3E-06 | mg/kg-day | 7.0E-01 | mg/kg-day | 7.5E-06 |
| | | | | Manganese | 2.5E+03 | mg/kg | 1.1E-07 | mg/kg-day | N/A | | N/A | 1.3E-06 | mg/kg-day | 9.6E-04 | mg/kg-day | 1.4E-03 |
| | | | | Mercury | 1.0E+01 | mg/kg | 4.7E-10 | mg/kg-day | N/A | | N/A | 5.5E-09 | mg/kg-day | 2.1E-05 | mg/kg-day | 2.6E-04 |
| | | | | Thallium | 5.0E+00 | mg/kg | 2.3E-10 | mg/kg-day | N/A | | N/A | 2.7E-09 | mg/kg-day | 1.0E-05 | mg/kg-day | 2.7E-04 |
| | | | | Zinc | 6.1E+03 | mg/kg | 2.8E-07 | mg/kg-day | N/A | | N/A | 3.2E-06 | mg/kg-day | 3.0E-01 | mg/kg-day | 1.1E-05 |
| | | | Exp. Route Total | | | | | | | | 1.6E-08 | | | | | 2.5E-03 |
| | | Exposure Point Total | | | | | | | | | 4.9E-07 | | | | | 3.4E-01 |
| | Exposure Medium Total | | | | | | | | | | 4.9E-07 | | | | | 3.4E-01 |
| Sediment Total | | | | | | | | | | | 4.9E-07 | | | | | 3.4E-01 |
| | | | | | | | Total of Receptor Risks Across All Media | | | | 4.9E-07 | Total of Receptor Hazards Across All Media | | | | 3.4E-01 |

Notes:

N/A =Not available; Not applicable.

[1] Dermal absorption factors (DABS) used to calculated dermal absorption intake from solids are chemical specific.

DABS of 0.03 used for arsenic, DABS of 0.001 for all other inorganics.

TABLE 7.2.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Ingestion | Antimony | 1.4E+00 | mg/kg | N/A | | N/A | | N/A | 6.0E-06 | mg/kg/day | 4.0E-04 | mg/kg-day | 1.5E-02 |
| | | | | Chromium (hexavalent) | 4.5E+01 | mg/kg | N/A | | N/A | | N/A | 1.9E-04 | mg/kg/day | 3.0E-03 | mg/kg-day | 6.4E-02 |
| | | | | Cobalt | 8.2E-01 | mg/kg | N/A | | N/A | | N/A | 3.5E-06 | mg/kg/day | 3.0E-04 | mg/kg-day | 1.2E-02 |
| | | | | Manganese | 3.4E+01 | mg/kg | N/A | | N/A | | N/A | 1.5E-04 | mg/kg/day | 2.4E-02 | mg/kg-day | 6.1E-03 |
| | | | | Thallium | 2.4E-01 | mg/kg | N/A | | N/A | | N/A | 1.0E-06 | mg/kg/day | 1.0E-05 | mg/kg-day | 1.0E-01 |
| | | | Exp. Route Total | | | | | | | | N/A | | | | | 2.0E-01 |
| | | | Dermal Absorption[1] | Antimony | 1.4E+00 | mg/kg | N/A | | N/A | | N/A | 6.7E-09 | mg/kg/day | 6.0E-05 | mg/kg-day | 1.1E-04 |
| | | | | Chromium (hexavalent) | 4.5E+01 | mg/kg | N/A | | N/A | | N/A | 2.2E-07 | mg/kg/day | 7.5E-05 | mg/kg-day | 2.9E-03 |
| | | | | Cobalt | 8.2E-01 | mg/kg | N/A | | N/A | | N/A | 3.9E-09 | mg/kg/day | 3.0E-04 | mg/kg-day | 1.3E-05 |
| | | | | Manganese | 3.4E+01 | mg/kg | N/A | | N/A | | N/A | 1.6E-07 | mg/kg/day | 1.4E-01 | mg/kg-day | 1.2E-06 |
| | | | | Thallium | 2.4E-01 | mg/kg | N/A | | N/A | | N/A | 1.1E-09 | mg/kg/day | 1.0E-05 | mg/kg-day | 1.1E-04 |
| | | | Exp. Route Total | | | | | | | | N/A | | | | | 3.1E-03 |
| | | Exposure Point Total | | | | | | | | | N/A | | | | | 2.0E-01 |
| | Exposure Medium Total | | | | | | | | | | N/A | | | | | 2.0E-01 |
| | Air | Emissions from Subsurface Soil | Inhalation | Chromium (hexavalent) | 3.3E-05 | $\mu g/m^3$ | N/A | | N/A | | N/A | 2.1E-08 | $mg/m^3$ | 1.0E-04 | $mg/m^3$ | 2.1E-04 |
| | | | Exp. Route Total | | | | | | | | N/A | | | | | 2.1E-04 |
| | | Exposure Point Total | | | | | | | | | N/A | | | | | 2.1E-04 |
| | Exposure Medium Total | | | | | | | | | | N/A | | | | | 2.1E-04 |
| Subsurface Soil Total | | | | | | | | | | | N/A | | | | | 2.0E-01 |
| Groundwater | Groundwater | Surficial Aquifer - Tap Water | Ingestion | Nitrobenzene | 3.1E-01 | µg/L | N/A | | N/A | | N/A | 1.3E-05 | mg/kg/day | 2.0E-03 | mg/kg/day | 6.5E-03 |
| | | | | 3-Nitrotoluene | 4.2E-01 | µg/L | N/A | | N/A | | N/A | 1.8E-05 | mg/kg/day | 1.0E-04 | mg/kg/day | 1.8E-01 |
| | | | | Antimony | 7.7E+00 | µg/L | N/A | | N/A | | N/A | 3.3E-04 | mg/kg/day | 4.0E-04 | mg/kg/day | 8.2E-01 |
| | | | | Cadmium | 3.2E+00 | µg/L | N/A | | N/A | | N/A | 1.4E-04 | mg/kg/day | 5.0E-04 | mg/kg/day | 2.7E-01 |
| | | | | Manganese | 4.5E+01 | µg/L | N/A | | N/A | | N/A | 1.9E-03 | mg/kg/day | 2.4E-02 | mg/kg/day | 8.1E-02 |
| | | | Exp. Route Total | | | | | | | | N/A | | | | | 1.4E+00 |
| | | | Dermal Absorption[2] | Nitrobenzene | 3.1E-01 | µg/L | N/A | | N/A | | N/A | 5.0E-07 | mg/kg-day | 2.0E-03 | mg/kg/day | 2.5E-04 |
| | | | | 3-Nitrotoluene | 4.2E-01 | µg/L | N/A | | N/A | | N/A | 1.9E-06 | mg/kg-day | 1.0E-04 | mg/kg/day | 1.9E-02 |
| | | | | Antimony | 4.8E+00 | µg/L | N/A | | N/A | | N/A | 7.1E-07 | mg/kg-day | 6.0E-05 | mg/kg/day | 1.2E-02 |
| | | | | Cadmium | 1.4E+00 | µg/L | N/A | | N/A | | N/A | 3.0E-07 | mg/kg-day | 2.5E-05 | mg/kg/day | 1.2E-02 |
| | | | | Manganese | 4.5E+01 | µg/L | N/A | | N/A | | N/A | 4.2E-06 | mg/kg-day | 9.6E-04 | mg/kg/day | 4.4E-03 |
| | | | Exp. Route Total | | | | | | | | N/A | | | | | 4.7E-02 |
| | | Exposure Point Total | | | | | | | | | N/A | | | | | 4.7E-02 |
| | Exposure Medium Total | | | | | | | | | | N/A | | | | | 1.4E+00 |

TABLE 7.2.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURE
*Site UXO-22 PA/SI*
*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Receptor Population: Resident |
| Receptor Age: Child |

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Groundwater | Air | Surficial Aquifer - Showerhead | Inhalation[3] | Nitrobenzene | 3.1E-01 | µg/L | N/A | | N/A | | N/A | 3.2E-07 | $mg/m^3$ | 9.0E-03 | $mg/m^3$ | 3.6E-05 |
| | | | Exp. Route Total | | | | | | | | N/A | | | | | 3.6E-05 |
| | | Exposure Point Total | | | | | | | | | N/A | | | | | 3.6E-05 |
| | Exposure Medium Total | | | | | | | | | | N/A | | | | | 3.6E-05 |
| Groundwater Total | | | | | | | | | | | N/A | | | | | 1.4E+00 |
| | | | | | | | | | Total of Receptor Risks Across All Media | | N/A | | | Total of Receptor Hazards Across All Media | | 1.6E+00 |

N/A = Not available/not applicable

1. Dermal absorption factors (DABS) used to calculated dermal absorption intake from solids are chemical specific.
   DABS of 0.03 used for arsenic, DABS of 0.001 for all other inorganics.
2. $DA_{event}$ from groundwater calculated on Table 7.2.CTE Supplement A.
3. Inhalation exposure for groundwater while showering calculated on Table 7.2.CTE Supplement B.

TABLE 7.2.CTE Supplement A

**Calculation of DAevent**

**Resident Child - Groundwater**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Chemical of Potential Concern | Water Concentration (CW) (µg/L) | Permeability Coefficient (Kp) (cm/hr) | B (dimensionless) | Lag Time ($\tau_{event}$) (hr) | t* (hr) | Fraction Absorbed Water (FA) (dimensionless) | Duration of Event (tevent) (hr) | DAevent (mg/cm$^2$-event) | Eq |
|---|---|---|---|---|---|---|---|---|---|
| Nitrobenzene[1] | 3.1E-01 | 5.1E-03 | 2.2E-02 | 5.1E-01 | 1.2E+00 | 1.0E+00 | 0.33 | 1.8E-09 | 2 |
| 3-Nitrotoluene[1] | 4.2E-01 | 9.8E-03 | 4.4E-02 | 6.2E-01 | 1.5E+00 | 1.0E+00 | 0.33 | 6.6E-09 | 2 |
| Antimony | 7.7E+00 | 1.0E-03 | N/A | N/A | N/A | N/A | 0.33 | 2.5E-09 | 1 |
| Cadmium | 3.2E+00 | 1.0E-03 | N/A | N/A | N/A | N/A | 0.33 | 1.0E-09 | 1 |
| Manganese | 4.5E+01 | 1.0E-03 | N/A | N/A | N/A | N/A | 0.33 | 1.5E-08 | 1 |

**Inorganics: $DA_{event}$ (mg/cm$^2$-event) =**
$K_p$ x CW x $t_{event}$ x 0.001 mg/µg x 0.001 l/cm$^3$ (eq 1)

**Organics: $DA_{event}$ (mg/cm$^2$-event) =**
If $t_{event} < t^*$, then $DA_{event}$ =
2 x FA x $K_p$ x CW x (sqrt((6 x $\tau_{event}$ x $t_{event}$)/$\pi$)) x 0.001 mg/µg x 0.001 l/cm$^3$ (eq 2)

If $t_{event} > t^*$, then $DA_{event}$ =
FA x $K_p$ x CW x ( $t_{event}$/(1+B) + 2 x $\tau_{event}$ x ((1 + 3xB + 3xB$^2$)/(1+B)$^2$) x 0.001 mg/µg x 0.001 l/cm$^3$ (eq 3)

Notes:
NA - Not applicable
Permeability constants from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.
B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).
t* - Time to reach steady-state
[1]Lag time and B calculated on Table 7.4.RME Supplement B
* Permeability constants calculated using Equation 3.8 (log $K_p$ = 2.80 + 0.66 log $K_{ow}$ - 0.0056 MW, where $r^2$ = 0.66) from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final)* . EPA/540/R/99/005.

B calculated using Equation A.1 (B = $K_p$ * MW$^{1/2}$/2.6) from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final). EPA/540/R/99/005.*

$\tau_{event}$ calculated using Equation A.4 ( $\tau_{event}$ = $l_{sc}^{2/6D}{}_{sc}$ = 0.105 × 10^[0.0056 MW]) from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final). EPA/540/R/99/005.*

Since B ≤ 0.6, then t* calculated using Equation A.4 (t* = 2.4 $\tau_{event}$) from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final). EPA/540/R/99/005.*

TABLE 7.2.CTE Supplement B

**Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Chemical of Potential Concern | Exposure Point Concentration Cwo (µg/L) | Molecular weight (MW) (g/mole) | Henry's Law Constant (H) (atm-$m^3$/mole) | Kg (VOC) (cm/hr) | Kl (VOC) (cm/hr) | KL (cm/hr) | Kal (cm/hr) | Cwd (µg/L) | S (µg/$m^3$ -min) | Ca (mg/$m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| Nitrobenzene | 3.1E-01 | 1.2E+02 | 2.4E-05 | 1.1E+03 | 1.2E+01 | 1.0E+00 | 1.4E+00 | 3.6E-03 | 3.0E-03 | 3.6E-05 |

| Variables | Units | Exposure Assumptions |
|---|---|---|
| Kg(VOC) = gas-film mass transfer coefficient | cm/hr | Solved by Eq 1 |
| Kl(VOC) = liquid-film mass transfer coefficient | cm/hr | Solved by Eq 2 |
| KL = overall mass transfer coefficient | cm/hr | Solved by Eq 3 |
| Kal = adjusted overall mass transfer coeff. | cm/hr | Solved by Eq 4 |
| Tl = Calibration temp. of water | K (20C +273) | 293 |
| Ts = Shower water temperature | k (45C) | 318 |
| Us = water viscosity at Ts | centipoise | 0.596 |
| Ul = water viscosity at Tl | cp | 1.002 |
| Cwd = conc. leaving droplets after time sdt | µg/l | Solved by Eq 5 |
| sdt = shower droplet drop time | sec | 0.5 |
| d = shower droplet diameter | mm | 1 |
| FR = shower water flow rate | l/min | 10 |
| SV = shower room air volume | $m^3$ | 12 |
| S = indoor VOC generation rate | µg/$m^3$-min | Solved by Eq 6 |
| Ds = duration of shower | min | 20 |
| Dt = total duration in shower room | min | 30 |
| R = air exchange rate | $min^{-1}$ | 0.0083 |
| Ca = indoor air concentration of VOCs | µg/$m^3$ | Solved by Eq 7 |

| | | | |
|---|---|---|---|
| Equation 1: | Kg(VOC) = | $3000 * (18 / MW)^{0.5}$ | |
| Equation 2: | Kl(VOC) = | $20 * (44 / MW)^{0.5}$ | |
| Equation 3: | KL = | $((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H)))^{-1}$ | |
| Equation 4: | Kal = | $(KL * (((Tl * Us) / (Ts * Ul))^{-0.5}))$ | |
| Equation 5: | Cwd = | (Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d)))) | |
| Equation 6: | S = | (Cwd * FR / SV) | |
| Equation 7: | Ca = | If t>Ds | [(S / R ) * (Ds + (EXP(-R * Dt) / R) -(EXP(R *(Ds - Dt)) / R)] / Dt * 1/1000 |

TABLE 7.3.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Receptor Population: Resident |
| Receptor Age: Child/Adult |

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Ingestion | Antimony | 1.4E+00 | mg/kg | 5.9E-07 | mg/kg-day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | Chromium (hexavalent)[2] | 4.5E+01 | mg/kg | | | 5.0E-01 | mg/kg/day | 4.8E-05 | N/A | | N/A | | N/A |
| | | | | Cobalt | 8.2E-01 | mg/kg | 3.5E-07 | mg/kg-day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | Manganese | 3.4E+01 | mg/kg | 1.5E-05 | mg/kg-day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | Thallium | 2.4E-01 | mg/kg | 1.0E-07 | mg/kg-day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | Exp. Route Total | | | | | | | | 4.8E-05 | | | | | N/A |
| | | | Dermal Absorption[1] | Antimony | 1.4E+00 | mg/kg | 6.7E-10 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | Chromium (hexavalent)[2] | 4.5E+01 | mg/kg | | | 2.0E+01 | mg/kg/day | 2.2E-06 | N/A | | N/A | | N/A |
| | | | | Cobalt | 8.2E-01 | mg/kg | 3.9E-10 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | Manganese | 3.4E+01 | mg/kg | 1.6E-08 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | Thallium | 2.4E-01 | mg/kg | 1.1E-10 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | Exp. Route Total | | | | | | | | 2.2E-06 | | | | | N/A |
| | | Exposure Point Total | | | | | | | | | 5.0E-05 | | | | | N/A |
| | Exposure Medium Total | | | | | | | | | | 5.0E-05 | | | | | N/A |
| | Air | Emissions from Subsurface Soil | Inhalation | Chromium (hexavalent)[2] | 3.3E-05 | $\mu g/m^3$ | | | 8.4E-02 | $(\mu g/m^3)^{-1}$ | 6.3E-08 | N/A | | N/A | | N/A |
| | | | Exp. Route Total | | | | | | | | 6.3E-08 | | | | | N/A |
| | | Exposure Point Total | | | | | | | | | 6.3E-08 | | | | | N/A |
| | Exposure Medium Total | | | | | | | | | | 6.3E-08 | | | | | N/A |
| Subsurface Soil Total | | | | | | | | | | | 5.0E-05 | | | | | N/A |
| Groundwater | Groundwater | Surficial Aquifer - Tap Water | Ingestion | Nitrobenzene | 3.1E-01 | µg/L | 1.6E-06 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | 3-Nitrotoluene | 4.2E-01 | µg/L | 2.2E-06 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | Antimony | 7.7E+00 | µg/L | 4.1E-05 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | Cadmium | 3.2E+00 | µg/L | 1.7E-05 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | Manganese | 4.5E+01 | µg/L | 2.4E-04 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | Exp. Route Total | | | | | | | | N/A | | | | | N/A |
| | | | Dermal Absorption[3] | Nitrobenzene | 3.1E-01 | µg/L | 1.3E-07 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | 3-Nitrotoluene | 4.2E-01 | µg/L | 4.1E-07 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | Antimony | 4.8E+00 | µg/L | 1.3E-07 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | Cadmium | 1.4E+00 | µg/L | 4.5E-08 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | | Manganese | 4.5E+01 | µg/L | 1.0E-06 | mg/kg/day | N/A | | N/A | N/A | | N/A | | N/A |
| | | | Exp. Route Total | | | | | | | | N/A | | | | | N/A |
| | | Exposure Point Total | | | | | | | | | N/A | | | | | N/A |
| | Exposure Medium Total | | | | | | | | | | N/A | | | | | N/A |

TABLE 7.3.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Receptor Population: Resident |
| Receptor Age: Child/Adult |

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Groundwater | Air | Surficial Aquifer - Showerhead | Inhalation[4] | Nitrobenzene | 3.1E-01 | µg/L | 5.5E-08 | $mg/m^3$ | 4.0E-05 | $(\mu g/m^3)^{-1}$ | 2.2E-09 | N/A | | N/A | | N/A |
| | | | Exp. Route Total | | | | | | | | 2.2E-09 | | | | | N/A |
| | | Exposure Point Total | | | | | | | | | 2.2E-09 | | | | | N/A |
| | Exposure Medium Total | | | | | | | | | | 2.2E-09 | | | | | N/A |
| Groundwater Total | | | | | | | | | | | 2.2E-09 | | | | | N/A |
| | | | | | | | Total of Receptor Risks Across All Media | | | | 5.0E-05 | Total of Receptor Hazards Across All Media | | | | N/A |

N/A = Not available/not applicable

1. Dermal absorption factors (DABS) used to calculated dermal absorption intake from solids are chemical specific.
   DABS of 0.03 used for arsenic, DABS of 0.001 for all other inorganics.
2. See Table 7.3.CTE Supplement A for calculation of intake and cancer risk following MMOA method.
3. $DA_{event}$ for dermal exposure to groundwater calculated on Tables 7.2.CTE Supplement A and 7.3.CTE Supplement B.
4. Inhalation exposure for groundwater while showering calculated on Tables 7.2.CTE Supplement B and 7.3.CTE Supplement C.

TABLE 7.3.RME Supplement A

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Receptor Population: Resident |
| Receptor Age: Adult/Child |

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Intake | | | | | CSF/Unit Risk | | | | | Cancer Risk |
| | | | | | Value | Units | Value | | | | Units | Value | | | | Units | |
| | | | | | | | 0-2 yrs | 2-6 yrs | 6-16 years | 16-30 yrs | | 0-2 yrs (ADAF=10) | 2-6 yrs (ADAF=3) | 6-16 yrs (ADAF=3) | 16-30 yrs (ADAF=1) | | |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Ingestion | Chromium (hexavalent) | 4.5E+01 | mg/kg | 5.5E-06 | 1.1E-05 | 2.7E-06 | | mg/kg/day | 5.0E+00 | 1.5E+00 | 1.5E+00 | 5.0E-01 | mg/kg/day | 4.8E-05 |
| | | | Dermal | Chromium (hexavalent) | 4.5E+01 | mg/kg | 6.2E-09 | 1.2E-08 | 3.0E-09 | | mg/kg/day | 2.0E+02 | 6.0E+01 | 6.0E+01 | 2.0E+01 | mg/kg/day | 2.2E-06 |
| | Air | Emissions from Subsurface Soil | Inhalation | Chromium (hexavalent) | 3.3E-05 | $\mu g/m^3$ | 2.5E-08 | 5.1E-08 | 1.1E-07 | | mg/kg/day | 8.4E-01 | 2.5E-01 | 2.5E-01 | 8.4E-02 | $(\mu g/m^3)^{-1}$ | 6.3E-08 |

Cancer risk = $(Intake_{0-2} \times CSF_{0-2}) + (Intake_{2-6} \times CSF_{2-6}) + (Intake_{6-16} \times CSF_{6-16}) + (Intake_{16-30} \times CSF_{16-30})$

TABLE 7.3.CTE Supplement B

**Calculation of DAevent**

**Resident Adult - Groundwater**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Chemical of Potential Concern | Water Concentration (CW) (µg/L) | Permeability Coefficient (Kp) (cm/hr) | B (dimensionless) | Lag Time ($\tau_{event}$) (hr) | t* (hr) | Fraction Absorbed Water (FA) (dimensionless) | Duration of Event (tevent) (hr) | DAevent ($mg/cm^2$-event) | Eq |
|---|---|---|---|---|---|---|---|---|---|
| Nitrobenzene[1] | 3.1E-01 | 5.1E-03 | 2.2E-02 | 5.1E-01 | 1.2E+00 | 1.0E+00 | 0.25 | 1.5E-09 | 2 |
| 3-Nitrotoluene[1] | 4.2E-01 | 9.8E-03 | 4.4E-02 | 6.2E-01 | 1.5E+00 | 1.0E+00 | 0.25 | 4.5E-09 | 2 |
| Antimony | 4.8E+00 | 1.0E-03 | N/A | N/A | N/A | N/A | 0.25 | 1.2E-09 | 1 |
| Cadmium | 1.4E+00 | 1.0E-03 | N/A | N/A | N/A | N/A | 0.25 | 3.5E-10 | 1 |
| Manganese | 4.5E+01 | 1.0E-03 | N/A | N/A | N/A | N/A | 0.25 | 1.1E-08 | 1 |

**Inorganics: $DA_{event}$ ($mg/cm^2$-event) =**
$K_p$ x CW x $t_{event}$ x 0.001 mg/µg x 0.001 $l/cm^3$ (eq 1)

**Organics: $DA_{event}$ ($mg/cm^2$-event) =**
If $t_{event}$<t*, then $DA_{event}$ =
2 x FA x $K_p$ x CW x (sqrt((6 x $\tau_{event}$ x $t_{event}$)/$\pi$)) x 0.001 mg/µg x 0.001 $l/cm^3$ (eq 2)

If $t_{event}$>t*, then $DA_{event}$ =
FA x $K_p$ x CW x ( $t_{event}$/(1+B) + 2 x $\tau_{event}$ x ((1 + 3xB + 3x$B^2$)/$(1+B)^2$) x 0.001 mg/µg x 0.001 $l/cm^3$ (eq 3)

Notes:
NA - Not applicable
Permeability constants from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.
B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).
t* - Time to reach steady-state
[1]Lag time and B calculated on Table 7.4.RME Supplement B
* Permeability constants calculated using Equation 3.8 (log $K_p$ = 2.80 + 0.66 log $K_{ow}$ - 0.0056 MW, where $r^2$ = 0.66) from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final*. EPA/540/R/99/005.

B calculated using Equation A.1 (B = $K_p$ * $MW^{1/2}$/2.6) from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final). EPA/540/R/99/005.*

$\tau_{event}$ calculated using Equation A.4 ($\tau_{event}$ = $l_{sc}^{2/6D}{}_{sc}$ = 0.105 × 10^[0.0056 MW]) from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final). EPA/540/R/99/005.*

Since B ≤ 0.6, then t* calculated using Equation A.4 (t* = 2.4 $\tau_{event}$) from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final). EPA/540/R/99/005.*

TABLE 7.3.CTE Supplement C

**Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| Chemical of Potential Concern | Exposure Point Concentration Cwo (µg/L) | Molecular weight (MW) (g/mole) | Henry's Law Constant (H) (atm-m$^3$/mole) | Kg (VOC) (cm/hr) | Kl (VOC) (cm/hr) | KL (cm/hr) | Kal (cm/hr) | Cwd (µg/L) | S (µg/m$^3$ -min) | Ca (mg/m$^3$) |
|---|---|---|---|---|---|---|---|---|---|---|
| Nitrobenzene | 3.1E-01 | 1.2E+02 | 2.4E-05 | 1.1E+03 | 1.2E+01 | 1.0E+00 | 1.4E+00 | 3.6E-03 | 3.0E-03 | 3.2E-05 |

| Variables | Units | Exposure Assumptions |
|---|---|---|
| Kg(VOC) = gas-film mass transfer coefficient | cm/hr | Solved by Eq 1 |
| Kl(VOC) = liquid-film mass transfer coefficient | cm/hr | Solved by Eq 2 |
| KL = overall mass transfer coefficient | cm/hr | Solved by Eq 3 |
| Kal = adjusted overall mass transfer coeff. | cm/hr | Solved by Eq 4 |
| Tl = Calibration temp. of water | K (20C +273) | 293 |
| Ts = Shower water temperature | k (45C) | 318 |
| Us = water viscosity at Ts | centipoise | 0.596 |
| Ul = water viscosity at Tl | cp | 1.002 |
| Cwd = conc. leaving droplets after time sdt | µg/l | Solved by Eq 5 |
| sdt = shower droplet drop time | sec | 0.5 |
| d = shower droplet diameter | mm | 1 |
| FR = shower water flow rate | l/min | 10 |
| SV = shower room air volume | m$^3$ | 12 |
| S = indoor VOC generation rate | µg/m$^3$-min | Solved by Eq 6 |
| Ds = duration of shower | min | 15 |
| Dt = total duration in shower room | min | 40 |
| R = air exchange rate | min$^{-1}$ | 0.0083 |
| Ca = indoor air concentration of VOCs | µg/m$^3$ | Solved by Eq 7 |

| | | |
|---|---|---|
| Equation 1: | Kg(VOC) = | $3000 * (18 / MW)^{0.5}$ |
| Equation 2: | Kl(VOC) = | $20 * (44 / MW)^{0.5}$ |
| Equation 3: | KL = | $((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H)))^{-1}$ |
| Equation 4: | Kal = | $(KL * (((Tl * Us) / (Ts * Ul))^{-0.5}))$ |
| Equation 5: | Cwd = | (Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d)))) |
| Equation 6: | S = | (Cwd * FR / SV) |
| Equation 7: | Ca = | If t>Ds [(S / R ) * (Ds + (EXP(-R * Dt) / R) -(EXP(R *(Ds - Dt)) / R)] / Dt * 1/1000 |

TABLE 7.4.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Receptor Population: Trespasser/Visitor |
| Receptor Age: Child |

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil in the Ephemeral Drainage | Surface Soil in the Ephemeral Drainage | Ravine | Ingestion | Arsenic | 7.7E+00 | mg/kg | 3.1E-07 | mg/kg-day | 1.5E+00 | mg/kg-day | 4.7E-07 | 3.7E-06 | mg/kg-day | 3.0E-04 | mg/kg-day | 1.2E-02 |
| | | | | Cadmium | 6.8E+00 | mg/kg | 2.7E-07 | mg/kg-day | N/A | | N/A | 3.2E-06 | mg/kg-day | 1.0E-03 | mg/kg-day | 3.2E-03 |
| | | | | Copper | 2.4E+02 | mg/kg | 9.8E-06 | mg/kg-day | N/A | | N/A | 1.1E-04 | mg/kg-day | 4.0E-02 | mg/kg-day | 2.9E-03 |
| | | | | Iron | 9.9E+03 | mg/kg | 4.0E-04 | mg/kg-day | N/A | | N/A | 4.7E-03 | mg/kg-day | 7.0E-01 | mg/kg-day | 6.7E-03 |
| | | | | Manganese | 2.5E+03 | mg/kg | 1.0E-04 | mg/kg-day | N/A | | N/A | 1.2E-03 | mg/kg-day | 2.4E-02 | mg/kg-day | 4.9E-02 |
| | | | | Mercury | 1.0E+01 | mg/kg | 4.2E-07 | mg/kg-day | N/A | | N/A | 4.9E-06 | mg/kg-day | 3.0E-04 | mg/kg-day | 1.6E-02 |
| | | | | Thallium | 5.0E+00 | mg/kg | 2.0E-07 | mg/kg-day | N/A | | N/A | 2.4E-06 | mg/kg-day | 1.0E-05 | mg/kg-day | 2.4E-01 |
| | | | | Zinc | 6.1E+03 | mg/kg | 2.5E-04 | mg/kg-day | N/A | | N/A | 2.9E-03 | mg/kg-day | 3.0E-01 | mg/kg-day | 9.6E-03 |
| | | | Exp. Route Total | | | | | | | | 4.7E-07 | | | | | 3.4E-01 |
| | | | Dermal Absorption[1] | Arsenic | 7.7E+00 | mg/kg | 5.3E-08 | mg/kg-day | 1.5E+00 | mg/kg-day | 7.9E-08 | 6.2E-07 | mg/kg-day | 3.0E-04 | mg/kg-day | 2.1E-03 |
| | | | | Cadmium | 6.8E+00 | mg/kg | 1.5E-09 | mg/kg-day | N/A | | N/A | 1.8E-08 | mg/kg-day | 2.5E-05 | mg/kg-day | 7.2E-04 |
| | | | | Copper | 2.4E+02 | mg/kg | 5.5E-08 | mg/kg-day | N/A | | N/A | 6.4E-07 | mg/kg-day | 4.0E-02 | mg/kg-day | 1.6E-05 |
| | | | | Iron | 9.9E+03 | mg/kg | 2.3E-06 | mg/kg-day | N/A | | N/A | 2.6E-05 | mg/kg-day | 7.0E-01 | mg/kg-day | 3.8E-05 |
| | | | | Manganese | 2.5E+03 | mg/kg | 5.7E-07 | mg/kg-day | N/A | | N/A | 6.6E-06 | mg/kg-day | 9.6E-04 | mg/kg-day | 6.9E-03 |
| | | | | Mercury | 1.0E+01 | mg/kg | 2.4E-09 | mg/kg-day | N/A | | N/A | 2.7E-08 | mg/kg-day | 2.1E-05 | mg/kg-day | 1.3E-03 |
| | | | | Thallium | 5.0E+00 | mg/kg | 1.1E-09 | mg/kg-day | N/A | | N/A | 1.3E-08 | mg/kg-day | 1.0E-05 | mg/kg-day | 1.3E-03 |
| | | | | Zinc | 6.1E+03 | mg/kg | 1.4E-06 | mg/kg-day | N/A | | N/A | 1.6E-05 | mg/kg-day | 3.0E-01 | mg/kg-day | 5.4E-05 |
| | | | Exp. Route Total | | | | | | | | 7.9E-08 | | | | | 1.2E-02 |
| | | Exposure Point | | | | | | | | | 5.5E-07 | | | | | 3.5E-01 |
| | Exposure Medium Total | | | | | | | | | | 5.5E-07 | | | | | 3.5E-01 |
| Sediment Total | | | | | | | | | | | 5.5E-07 | | | | | 3.5E-01 |

TABLE 7.4.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Receptor Population: Trespasser/Visitor |
| Receptor Age: Child |

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Ingestion | Antimony | 1.4E+00 | mg/kg | 2.8E-08 | mg/kg-day | N/A | | N/A | 3.3E-07 | mg/kg-day | 4.0E-04 | mg/kg-day | 8.3E-04 |
| | | | | Chromium (hexavalent) | 4.5E+01 | mg/kg | 9.2E-07 | mg/kg-day | 5.0E-01 | mg/kg-day | 4.6E-07 | 1.1E-05 | mg/kg-day | 3.0E-03 | mg/kg-day | 3.6E-03 |
| | | | | Cobalt | 8.2E-01 | mg/kg | 1.7E-08 | mg/kg-day | N/A | | N/A | 1.9E-07 | mg/kg-day | 3.0E-04 | mg/kg-day | 6.5E-04 |
| | | | | Manganese | 3.4E+01 | mg/kg | 7.0E-07 | mg/kg-day | N/A | | N/A | 8.1E-06 | mg/kg-day | 2.4E-02 | mg/kg-day | 3.4E-04 |
| | | | | Thallium | 2.4E-01 | mg/kg | 4.9E-09 | mg/kg-day | N/A | | N/A | 5.7E-08 | mg/kg-day | 1.0E-05 | mg/kg-day | 5.7E-03 |
| | | | Exp. Route Total | | | | | | | | 4.6E-07 | | | | | 1.1E-02 |
| | | | Dermal Absorption[1] | Antimony | 1.4E+00 | mg/kg | 6.4E-11 | mg/kg-day | N/A | | N/A | 7.4E-10 | mg/kg-day | 6.0E-05 | mg/kg-day | 1.2E-05 |
| | | | | Chromium (hexavalent) | 4.5E+01 | mg/kg | 2.1E-09 | mg/kg-day | 2.0E+01 | mg/kg-day | 4.1E-08 | 2.4E-08 | mg/kg-day | 7.5E-05 | mg/kg-day | 3.2E-04 |
| | | | | Cobalt | 8.2E-01 | mg/kg | 3.7E-11 | mg/kg-day | N/A | | N/A | 4.4E-10 | mg/kg-day | 3.0E-04 | mg/kg-day | 1.5E-06 |
| | | | | Manganese | 3.4E+01 | mg/kg | 1.6E-09 | mg/kg-day | N/A | | N/A | 1.8E-08 | mg/kg-day | 9.6E-04 | mg/kg-day | 1.9E-05 |
| | | | | Thallium | 2.4E-01 | mg/kg | 1.1E-11 | mg/kg-day | N/A | | N/A | 1.3E-10 | mg/kg-day | 1.0E-05 | mg/kg-day | 1.3E-05 |
| | | | Exp. Route Total | | | | | | | | 4.1E-08 | | | | | 3.7E-04 |
| | | Exposure Point | | | | | | | | | 5.0E-07 | | | | | 1.1E-02 |
| | Exposure Medium Total | | | | | | | | | | 5.0E-07 | | | | | 1.1E-02 |
| Groundwater | Air | Emissions from Subsurface Soil | Inhalation | Chromium (hexavalent) | 3.3E-05 | $\mu g/m^3$ | 1.7E-08 | $\mu g/m^3$ | 8.4E-02 | $(\mu g/m^3)^{-1}$ | 1.4E-09 | 2.0E-10 | $mg/m^3$ | 1.0E-04 | $mg/m^3$ | 2.0E-06 |
| | | | Exp. Route Total | | | | | | | | 1.4E-09 | | | | | 2.0E-06 |
| | | Exposure Point Total | | | | | | | | | 1.4E-09 | | | | | 2.0E-06 |
| | Exposure Medium Total | | | | | | | | | | 1.4E-09 | | | | | 2.0E-06 |
| Subsurface Soil Total | | | | | | | | | | | 5.0E-07 | | | | | 1.1E-02 |
| | | | | | | | Total of Receptor Risks Across All Media | | | | 1.1E-06 | Total of Receptor Hazards Across All Media | | | | 3.6E-01 |

Notes:

N/A =Not available; Not applicable.

[1] Dermal absorption factors (DABS) used to calculated dermal absorption intake from solids are chemical specific.

DABS of 0.03 used for arsenic, DABS of 0.001 for all other inorganics.

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil in the Ephemeral Drainage | Surface Soil in the Ephemeral Drainage | Ravine | Arsenic | 1E-06 | N/A | 1E-06 | 2E-06 | Skin, Vascular | 7E-03 | N/A | 7E-03 | 1E-02 |
| | | | Cadmium | N/A | N/A | N/A | N/A | Kidney | 2E-03 | N/A | 3E-03 | 5E-03 |
| | | | Copper | N/A | N/A | N/A | N/A | GI System | 2E-03 | N/A | 7E-05 | 2E-03 |
| | | | Iron | N/A | N/A | N/A | N/A | GI System | 3E-03 | N/A | 1E-04 | 4E-03 |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | 4E-02 | N/A | 3E-02 | 7E-02 |
| | | | Mercury | N/A | N/A | N/A | N/A | Immune System | 1E-02 | N/A | 7E-03 | 2E-02 |
| | | | Thallium | N/A | N/A | N/A | N/A | Hair | 2E-01 | N/A | 7E-03 | 2E-01 |
| | | | Zinc | N/A | N/A | N/A | N/A | Blood | 8E-03 | N/A | 3E-04 | 8E-03 |
| | | | Chemical Total | 1E-06 | N/A | 1E-06 | 2E-06 | | 3E-01 | N/A | 6E-02 | 3E-01 |
| | | Exposure Point Total | | | | | 2E-06 | | | | | 3E-01 |
| | Exposure Medium Total | | | | | | 2E-06 | | | | | 3E-01 |
| Medium Total | | | | | | | 2E-06 | | | | | 3E-01 |
| Receptor Total | | | | | | | 2E-06 | | | | Receptor HI Total | 3E-01 |

HI = Hazard Index

N/A = Not available/not applicable

CNS = Central Nervous System

GI = Gastrointestinal

| | |
|---|---|
| Total Skin HI Across All Media = | 1E-02 |
| Total Vascular HI Across All Media = | 1E-02 |
| Total Kidney HI Across All Media= | 5E-03 |
| Total GI System HI Across All Media = | 6E-03 |
| Total CNS HI Across All Media = | 7E-02 |
| Total Immune System HI Across All Media = | 2E-02 |
| Total Hair HI Across All Media = | 2E-01 |
| Total Blood HI Across All Media = | 8E-03 |

TABLE 9.2.RME

**SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs**

**REASONABLE MAXIMUM EXPOSURE**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor
Receptor Age: Youth

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil in the Ephemeral Drainage | Surface Soil in the Ephemeral Drainage | Ravine | Arsenic | 7E-07 | N/A | 5E-07 | 1E-06 | Skin, Vascular | 1E-02 | N/A | 8E-03 | 2E-02 |
| | | | Cadmium | N/A | N/A | N/A | N/A | Kidney | 3E-03 | N/A | 3E-03 | 6E-03 |
| | | | Copper | N/A | N/A | N/A | N/A | GI System | 3E-03 | N/A | 8E-05 | 3E-03 |
| | | | Iron | N/A | N/A | N/A | N/A | GI System | 5E-03 | N/A | 1E-04 | 6E-03 |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | 6E-02 | N/A | 4E-02 | 1E-01 |
| | | | Mercury | N/A | N/A | N/A | N/A | Immune System | 2E-02 | N/A | 8E-03 | 3E-02 |
| | | | Thallium | N/A | N/A | N/A | N/A | Hair | 3E-01 | N/A | 8E-03 | 3E-01 |
| | | | Zinc | N/A | N/A | N/A | N/A | Blood | 1E-02 | N/A | 3E-04 | 1E-02 |
| | | | Chemical Total | 7E-07 | N/A | 5E-07 | 1E-06 | | 4E-01 | N/A | 7E-02 | 5E-01 |
| | | Exposure Point Total | | | | | 1E-06 | | | | | 5E-01 |
| | Exposure Medium Total | | | | | | 1E-06 | | | | | 5E-01 |
| Medium Total | | | | | | | 1E-06 | | | | | 5E-01 |
| Receptor Total | | | | | | | 1E-06 | | | | Receptor HI Total | 5E-01 |

HI = Hazard Index
N/A = Not available/not applicable
CNS = Central Nervous System
GI = Gastrointestinal

| | |
|---|---|
| Total Skin HI Across All Media = | 2E-02 |
| Total Vascular HI Across All Media = | 2E-02 |
| Total Kidney HI Across All Media= | 6E-03 |
| Total GI System HI Across All Media = | 9E-03 |
| Total CNS HI Across All Media = | 1E-01 |
| Total Immune System HI Across All Media = | 3E-02 |
| Total Hair HI Across All Media = | 3E-01 |
| Total Blood HI Across All Media = | 1E-02 |

TABLE 9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Current/Future |
| Receptor Population: Trespasser/Visitor |
| Receptor Age: Child |

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil in the Ephemeral Drainage | Surface Soil in the Ephemeral Drainage | Ravine | Arsenic | 3E-06 | N/A | 2E-07 | 3E-06 | Skin, Vascular | 7E-02 | N/A | 5E-03 | 7E-02 |
| | | | Cadmium | N/A | N/A | N/A | N/A | Kidney | 2E-02 | N/A | 2E-03 | 2E-02 |
| | | | Copper | N/A | N/A | N/A | N/A | GI System | 2E-02 | N/A | 6E-05 | 2E-02 |
| | | | Iron | N/A | N/A | N/A | N/A | GI System | 3E-02 | N/A | 9E-05 | 3E-02 |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | 4E-01 | N/A | 3E-02 | 4E-01 |
| | | | Mercury | N/A | N/A | N/A | N/A | Immune System | 1E-01 | N/A | 5E-03 | 1E-01 |
| | | | Thallium | N/A | N/A | N/A | N/A | Hair | 2E+00 | N/A | 5E-03 | 2E+00 |
| | | | Zinc | N/A | N/A | N/A | N/A | Blood | 7E-02 | N/A | 2E-04 | 7E-02 |
| | | | Chemical Total | 3E-06 | N/A | 2E-07 | 3E-06 | | 3E+00 | N/A | 4E-02 | 3E+00 |
| | | Exposure Point Total | | | | | 3E-06 | | | | | 3E+00 |
| | Exposure Medium Total | | | | | | 3E-06 | | | | | 3E+00 |
| Medium Total | | | | | | | 3E-06 | | | | | 3E+00 |
| Receptor Total | | | | | | | 3E-06 | Receptor HI Total | | | | 3E+00 |

HI = Hazard Index

N/A = Not available/not applicable

CNS = Central Nervous System

GI = Gastrointestinal

| | |
|---|---|
| Total Skin HI Across All Media = | 7E-02 |
| Total Vascular HI Across All Media = | 7E-02 |
| Total Kidney HI Across All Media= | 2E-02 |
| Total GI System HI Across All Media = | 5E-02 |
| Total CNS HI Across All Media = | 4E-01 |
| Total Immune System HI Across All Media = | 1E-01 |
| Total Hair HI Across All Media = | **2E+00** |
| Total Blood HI Across All Media = | 7E-02 |

TABLE 9.4.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Antimony | N/A | N/A | N/A | N/A | Longevity, Blood | 9E-03 | N/A | 2E-04 | 9E-03 |
| | | | Chromium (hexavalent) | N/A | N/A | N/A | N/A | Not identified | 2E-01 | N/A | 4E-02 | 3E-01 |
| | | | Cobalt | N/A | N/A | N/A | N/A | Thyroid | 1E-02 | N/A | 5E-05 | 1E-02 |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | 6E-03 | N/A | 6E-04 | 7E-03 |
| | | | Thallium | N/A | N/A | N/A | N/A | Hair | 3E-02 | N/A | 1E-04 | 3E-02 |
| | | | Chemical Total | N/A | N/A | N/A | N/A | | 3E-01 | N/A | 4E-02 | 3E-01 |
| | | Exposure Point Total | | | | | N/A | | | | | 3E-01 |
| | Exposure Medium Total | | | | | | N/A | | | | | 3E-01 |
| | Air | Emissions from Subsurface Soil | Chromium (hexavalent) | N/A | N/A | N/A | N/A | Respiratory System | N/A | 3E-03 | N/A | 3E-03 |
| | | | Chemical Total | N/A | N/A | N/A | N/A | | N/A | 3E-03 | N/A | 3E-03 |
| | | Exposure Point Total | | | | | N/A | | | | | 3E-03 |
| | Exposure Medium Total | | | | | | N/A | | | | | 3E-03 |
| Medium Total | | | | | | | N/A | | | | | 3E-01 |
| Groundwater | Groundwater | Surficial Aquifer - Tap Water | Nitrobenzene | N/A | N/A | N/A | N/A | Blood | 4E-03 | N/A | 3E-04 | 4E-03 |
| | | | 3-Nitrotoluene | N/A | N/A | N/A | N/A | Spleen | 1E-01 | N/A | 2E-02 | 1E-01 |
| | | | Antimony | N/A | N/A | N/A | N/A | Longevity, Blood | 5E-01 | N/A | 2E-02 | 5E-01 |
| | | | Cadmium | N/A | N/A | N/A | N/A | Kidney | 2E-01 | N/A | 2E-02 | 2E-01 |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | 5E-02 | N/A | 7E-03 | 6E-02 |
| | | | Chemical Total | N/A | N/A | N/A | N/A | | 9E-01 | N/A | 6E-02 | 9E-01 |
| | | Exposure Point Total | | | | | N/A | | | | | 9E-01 |
| | Exposure Medium Total | | | | | | N/A | | | | | 9E-01 |
| | Air | Surficial Aquifer - Water Vapors at Showerhead | Nitrobenzene | N/A | N/A | N/A | N/A | Respiratory System | N/A | 2E-04 | N/A | 2E-04 |
| | | | Chemical Total | N/A | N/A | N/A | N/A | | N/A | 2E-04 | N/A | 2E-04 |
| | | Exposure Point Total | | | | | N/A | | | | | 2E-04 |
| | Exposure Medium Total | | | | | | N/A | | | | | 2E-04 |
| Medium Total | | | | | | | N/A | | | | | 9E-01 |
| Receptor Total | | | | | | | N/A | | | | Receptor HI Total | 1E+00 |

TABLE 9.4.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Receptor Population: Resident |
| Receptor Age: Adult |

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |

| | |
|---|---|
| Total Longevity HI Across All Media = | 6E-01 |
| Total Blood HI Across All Media = | 6E-01 |
| Total Thyroid HI Across All Media = | 1E-02 |
| Total CNS HI Across All Media = | 7E-02 |
| Total Hair HI Across All Media = | 3E-02 |
| Total Respiratory System HI Across All Media = | 4E-03 |
| Total Spleen HI Across All Media = | 1E-01 |
| Total Kidney HI Across All Media = | 2E-01 |

HI = Hazard Index

N/A = Not available/not applicable

CNS = Central Nervous System

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Antimony | N/A | N/A | N/A | N/A | Longevity, Blood | 8E-02 | N/A | 1E-03 | 8E-02 |
| | | | Chromium (hexavalent) | N/A | N/A | N/A | N/A | Not identified | 2E+00 | N/A | 2E-01 | 2E+00 |
| | | | Cobalt | N/A | N/A | N/A | N/A | Thyroid | 1E-01 | N/A | 3E-04 | 1E-01 |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | 6E-02 | N/A | 4E-03 | 6E-02 |
| | | | Thallium | N/A | N/A | N/A | N/A | Hair | 3E-01 | N/A | 9E-04 | 3E-01 |
| | | | Chemical Total | N/A | N/A | N/A | N/A | | 3E+00 | N/A | 2E-01 | 3E+00 |
| | | Exposure Point Total | | | | | N/A | | | | | 3E+00 |
| | Exposure Medium Total | | | | | | N/A | | | | | 3E+00 |
| | Air | Emissions from Subsurface Soil | Chromium (hexavalent) | N/A | N/A | N/A | N/A | Respiratory System | N/A | 3E-03 | N/A | 3E-03 |
| | | | Chemical Total | N/A | N/A | N/A | N/A | | N/A | 3E-03 | N/A | 3E-03 |
| | | Exposure Point Total | | | | | N/A | | | | | 3E-03 |
| | Exposure Medium Total | | | | | | N/A | | | | | 3E-03 |
| Medium Total | | | | | | | N/A | | | | | 3E+00 |
| Groundwater | Groundwater | Surficial Aquifer - Tap Water | Nitrobenzene | N/A | N/A | N/A | N/A | Blood | 1E-02 | N/A | 6E-04 | 1E-02 |
| | | | 3-Nitrotoluene | N/A | N/A | N/A | N/A | Spleen | 3E-01 | N/A | 4E-02 | 3E-01 |
| | | | Antimony | N/A | N/A | N/A | N/A | Longevity, Blood | 1E+00 | N/A | 5E-02 | 1E+00 |
| | | | Cadmium | N/A | N/A | N/A | N/A | Kidney | 4E-01 | N/A | 5E-02 | 5E-01 |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | 1E-01 | N/A | 2E-02 | 1E-01 |
| | | | Chemical Total | N/A | N/A | N/A | N/A | | 2E+00 | N/A | 2E-01 | 2E+00 |
| | | Exposure Point Total | | | | | N/A | | | | | 2E+00 |
| | Exposure Medium Total | | | | | | N/A | | | | | 2E+00 |
| | Air | Surficial Aquifer - Water Vapors at Showerhead | Nitrobenzene | N/A | N/A | N/A | N/A | Respiratory System | N/A | 4E-04 | N/A | 4E-04 |
| | | | Chemical Total | N/A | N/A | N/A | N/A | | N/A | 4E-04 | N/A | 4E-04 |
| | | Exposure Point Total | | | | | N/A | | | | | 4E-04 |
| | Exposure Medium Total | | | | | | N/A | | | | | 4E-04 |
| Medium Total | | | | | | | N/A | | | | | 2E+00 |
| Receptor Total | | | | | | | N/A | | | | Receptor HI Total | 5E+00 |

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Receptor Population: Resident |
| Receptor Age: Child |

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |

HI = Hazard Index

N/A = Not available/not applicable

CNS = Central Nervous System

| | |
|---|---|
| Total Longevity HI Across All Media = | 1E+00 |
| Total Blood HI Across All Media = | 1E+00 |
| Total Thyroid HI Across All Media = | 1E-01 |
| Total CNS HI Across All Media = | 2E-01 |
| Total Hair HI Across All Media = | 3E-01 |
| Total Respiratory System HI Across All Media = | 4E-03 |
| Total Spleen HI Across All Media = | 3E-01 |
| Total Kidney HI Across All Media = | 5E-01 |

TABLE 9.6.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Receptor Population: Resident |
| Receptor Age: Child/Adult |

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Antimony | N/A | N/A | N/A | N/A | Longevity, Blood | N/A | N/A | N/A | N/A |
| | | | Chromium (hexavalent) | 2E-03 | N/A | 2E-04 | 2E-03 | Not identified | N/A | N/A | N/A | N/A |
| | | | Cobalt | N/A | N/A | N/A | N/A | Thyroid | N/A | N/A | N/A | N/A |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | N/A | N/A | N/A | N/A |
| | | | Thallium | N/A | N/A | N/A | N/A | Hair | N/A | N/A | N/A | N/A |
| | | | Chemical Total | 2E-03 | N/A | 2E-04 | 2E-03 | | N/A | N/A | N/A | N/A |
| | | Exposure Point Total | | | | | 2E-03 | | | | | N/A |
| | Exposure Medium Total | | | | | | 2E-03 | | | | | N/A |
| | Air | Emissions from Subsurface Soil | Chromium (hexavalent) | N/A | 1E-06 | N/A | 1E-06 | Respiratory System | N/A | N/A | N/A | N/A |
| | | | Chemical Total | N/A | 1E-06 | N/A | 1E-06 | | N/A | N/A | N/A | N/A |
| | | Exposure Point Total | | | | | 1E-06 | | | | | N/A |
| | Exposure Medium Total | | | | | | 1E-06 | | | | | N/A |
| Medium Total | | | | | | | 2E-03 | | | | | N/A |
| Groundwater | Groundwater | Surficial Aquifer - Tap Water | Nitrobenzene | N/A | N/A | N/A | N/A | Blood | N/A | N/A | N/A | N/A |
| | | | 3-Nitrotoluene | N/A | N/A | N/A | N/A | Spleen | N/A | N/A | N/A | N/A |
| | | | Antimony | N/A | N/A | N/A | N/A | Longevity, Blood | N/A | N/A | N/A | N/A |
| | | | Cadmium | N/A | N/A | N/A | N/A | Kidney | N/A | N/A | N/A | N/A |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | N/A | N/A | N/A | N/A |
| | | | Chemical Total | N/A | N/A | N/A | N/A | | N/A | N/A | N/A | N/A |
| | | Exposure Point Total | | | | | N/A | | | | | N/A |
| | Exposure Medium Total | | | | | | N/A | | | | | N/A |
| | Air | Surficial Aquifer - Water Vapors at Showerhead | Nitrobenzene | N/A | 3E-08 | N/A | 3E-08 | Respiratory System | N/A | N/A | N/A | N/A |
| | | | Chemical Total | N/A | 3E-08 | N/A | 3E-08 | | N/A | N/A | N/A | N/A |
| | | Exposure Point Total | | | | | 3E-08 | | | | | N/A |
| | Exposure Medium Total | | | | | | 3E-08 | | | | | N/A |
| Medium Total | | | | | | | 3E-08 | | | | | N/A |
| Receptor Total | | | | | | | 2E-03 | | | | Receptor HI Total | N/A |

HI = Hazard Index

N/A = Not available/not applicable

CNS = Central Nervous System

TABLE 9.7.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Antimony | N/A | N/A | N/A | N/A | Whole Body, Blood | 2E-02 | N/A | 3E-04 | 2E-02 |
| | | | Chromium (hexavalent) | 1E-05 | N/A | 9E-07 | 1E-05 | Not identified | 8E-02 | N/A | 6E-03 | 9E-02 |
| | | | Cobalt | N/A | N/A | N/A | N/A | Thyroid | 3E-03 | N/A | 6E-06 | 3E-03 |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | 1E-02 | N/A | 7E-04 | 2E-02 |
| | | | Thallium | N/A | N/A | N/A | N/A | Hair | 2E-02 | N/A | 4E-05 | 2E-02 |
| | | | Chemical Total | 1E-05 | N/A | 9E-07 | 1E-05 | | 1E-01 | N/A | 7E-03 | 1E-01 |
| | | Exposure Point Total | | | | | 1E-05 | | | | | 1E-01 |
| | Exposure Medium Total | | | | | | 1E-05 | | | | | 1E-01 |
| | Air | Emissions from Subsurface Soil | Chromium (hexavalent) | N/A | 1E-07 | N/A | 1E-07 | Respiratory System | N/A | 2E-02 | N/A | 2E-02 |
| | | | Chemical Total | N/A | 1E-07 | N/A | 1E-07 | | N/A | 2E-02 | N/A | 2E-02 |
| | | Exposure Point Total | | | | | 1E-07 | | | | | 2E-02 |
| | Exposure Medium Total | | | | | | 1E-07 | | | | | 2E-02 |
| Medium Total | | | | | | | 1E-05 | | | | | 2E-01 |
| Groundwater | Groundwater | Surficial Aquifer - Tap Water | Nitrobenzene | N/A | N/A | N/A | N/A | Blood, Adrenal, Kidney, Liver | N/A | N/A | 4E-05 | 4E-05 |
| | | | 3-Nitrotoluene | N/A | N/A | N/A | N/A | Spleen | N/A | N/A | 6E-06 | 6E-06 |
| | | | Antimony | N/A | N/A | N/A | N/A | Whole Body, Blood | N/A | N/A | 1E-02 | 1E-02 |
| | | | Cadmium | N/A | N/A | N/A | N/A | Kidney | N/A | N/A | 1E-02 | 1E-02 |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | N/A | N/A | 5E-03 | 5E-03 |
| | | | Chemical Total | N/A | N/A | N/A | N/A | | N/A | N/A | 3E-02 | 3E-02 |
| | | Exposure Point Total | | | | | N/A | | | | | 3E-02 |
| | Exposure Medium Total | | | | | | N/A | | | | | 3E-02 |
| | Air | Surficial Aquifer - Water Vapors in Excavation Pit | Nitrobenzene | N/A | 9E-11 | N/A | 9E-11 | Blood, Adrenal, Kidney, Liver | N/A | 8E-06 | N/A | 8E-06 |
| | | | Chemical Total | N/A | 9E-11 | N/A | 9E-11 | | N/A | 8E-06 | N/A | 8E-06 |
| | | Exposure Point Total | | | | | 9E-11 | | | | | 8E-06 |
| | Exposure Medium Total | | | | | | 9E-11 | | | | | 8E-06 |
| Medium Total | | | | | | | 9E-11 | | | | | 3E-02 |
| Receptor Total | | | | | | | 1E-05 | | | | Receptor HI Total | 2E-01 |

TABLE 9.7.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Receptor Population: Construction Worker |
| Receptor Age: Adult |

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |

HI = Hazard Index

N/A = Not available/not applicable

CNS = Central Nervous System

| | |
|---|---|
| Total Whole Body HI Across All Media = | 3E-02 |
| Total Blood HI Across All Media = | 3E-02 |
| Total Thyroid HI Across All Media = | 3E-03 |
| Total CNS HI Across All Media = | 2E-02 |
| Total Hair HI Across All Media = | 2E-02 |
| Total Respiratory System HI Across All Media = | 2E-02 |
| Total Spleen HI Across All Media = | 6E-06 |
| Total Kidney HI Across All Media = | 1E-02 |
| Total Adrenal HI Across All Media = | 5E-05 |
| Total Liver HI Across All Media = | 5E-05 |

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Antimony | N/A | N/A | N/A | N/A | Longevity, Blood | 6E-03 | N/A | 3E-04 | 6E-03 |
| | | | Chromium (hexavalent) | 9E-05 | N/A | 2E-05 | 1E-04 | Not identified | 2E-01 | N/A | 4E-02 | 2E-01 |
| | | | Cobalt | N/A | N/A | N/A | N/A | Thyroid | 9E-03 | N/A | 6E-05 | 9E-03 |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | 4E-03 | N/A | 7E-04 | 5E-03 |
| | | | Thallium | N/A | N/A | N/A | N/A | Hair | 2E-02 | N/A | 2E-04 | 2E-02 |
| | | | Chemical Total | 9E-05 | N/A | 2E-05 | 1E-04 | | 2E-01 | N/A | 4E-02 | 2E-01 |
| | | Exposure Point Total | | | | | 1E-04 | | | | | 2E-01 |
| | Exposure Medium Total | | | | | | 1E-04 | | | | | 2E-01 |
| | Air | Emissions from Subsurface Soil | Chromium (hexavalent) | N/A | 2E-06 | N/A | 2E-06 | Respiratory System | N/A | 8E-04 | N/A | 8E-04 |
| | | | Chemical Total | N/A | 2E-06 | N/A | 2E-06 | | N/A | 8E-04 | N/A | 8E-04 |
| | | Exposure Point Total | | | | | 2E-06 | | | | | 8E-04 |
| | Exposure Medium Total | | | | | | 2E-06 | | | | | 8E-04 |
| Medium Total | | | | | | | 1E-04 | | | | | 2E-01 |
| Groundwater | Groundwater | Surficial Aquifer - Tap Water | Nitrobenzene | N/A | N/A | N/A | N/A | Blood | 1E-03 | N/A | N/A | 1E-03 |
| | | | 3-Nitrotoluene | N/A | N/A | N/A | N/A | Spleen | 4E-02 | N/A | N/A | 4E-02 |
| | | | Antimony | N/A | N/A | N/A | N/A | Longevity, Blood | 2E-01 | N/A | N/A | 2E-01 |
| | | | Cadmium | N/A | N/A | N/A | N/A | Kidney | 6E-02 | N/A | N/A | 6E-02 |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | 2E-02 | N/A | N/A | 2E-02 |
| | | | Chemical Total | N/A | N/A | N/A | N/A | | 3E-01 | N/A | N/A | 3E-01 |
| | | Exposure Point Total | | | | | N/A | | | | | 3E-01 |
| | Exposure Medium Total | | | | | | N/A | | | | | 3E-01 |
| Medium Total | | | | | | | N/A | | | | | 3E-01 |
| Receptor Total | | | | | | | 1E-04 | | | | Receptor HI Total | 6E-01 |

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Receptor Population: Industrial Worker |
| Receptor Age: Adult |

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |

HI = Hazard Index

N/A = Not available/not applicable

CNS = Central Nervous System

| | |
|---|---|
| Total Longevity HI Across All Media = | 2E-01 |
| Total Blood HI Across All Media = | 2E-01 |
| Total Thyroid HI Across All Media = | 9E-03 |
| Total CNS HI Across All Media = | 2E-02 |
| Total Hair HI Across All Media = | 2E-02 |
| Total Respiratory System HI Across All Media = | 8E-04 |
| Total Spleen HI Across All Media = | 4E-02 |
| Total Kidney HI Across All Media = | 6E-02 |

TABLE 9.9.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk Ingestion | Carcinogenic Risk Inhalation | Carcinogenic Risk Dermal | Carcinogenic Risk Exposure Routes Total | Non-Carcinogenic Hazard Quotient Primary Target Organ(s) | Non-Carcinogenic Hazard Quotient Ingestion | Non-Carcinogenic Hazard Quotient Inhalation | Non-Carcinogenic Hazard Quotient Dermal | Non-Carcinogenic Hazard Quotient Exposure Routes Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Surface Soil in the Ephemeral Drainage | Surface Soil in the Ephemeral Drainage | Ravine | Arsenic | 1E-06 | N/A | 1E-06 | 2E-06 | Skin, Vascular | 7E-03 | N/A | 7E-03 | 1E-02 |
| | | | Cadmium | N/A | N/A | N/A | N/A | Kidney | 2E-03 | N/A | 3E-03 | 5E-03 |
| | | | Copper | N/A | N/A | N/A | N/A | GI System | 2E-03 | N/A | 7E-05 | 2E-03 |
| | | | Iron | N/A | N/A | N/A | N/A | GI System | 3E-03 | N/A | 1E-04 | 4E-03 |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | 4E-02 | N/A | 3E-02 | 7E-02 |
| | | | Mercury | N/A | N/A | N/A | N/A | Immune System | 1E-02 | N/A | 7E-03 | 2E-02 |
| | | | Thallium | N/A | N/A | N/A | N/A | Hair | 2E-01 | N/A | 7E-03 | 2E-01 |
| | | | Zinc | N/A | N/A | N/A | N/A | Blood | 8E-03 | N/A | 3E-04 | 8E-03 |
| | | | Chemical Total | 1E-06 | N/A | 1E-06 | 2E-06 | | 3E-01 | N/A | 6E-02 | 3E-01 |
| | | Exposure Point Total | | | | | 2E-06 | | | | | 3E-01 |
| | Exposure Medium Total | | | | | | 2E-06 | | | | | 3E-01 |
| Medium Total | | | | | | | 2E-06 | | | | | 3E-01 |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Antimony | N/A | N/A | N/A | N/A | Longevity, Blood | 1E-03 | N/A | 3E-04 | 2E-03 |
| | | | Chromium (hexavalent) | 2E-05 | N/A | 3E-06 | 2E-05 | N/A | 3E-02 | N/A | 5E-02 | 8E-02 |
| | | | Cobalt | N/A | N/A | N/A | N/A | Thyroid | 2E-03 | N/A | 6E-05 | 2E-03 |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | 9E-04 | N/A | 8E-04 | 2E-03 |
| | | | Thallium | N/A | N/A | N/A | N/A | Hair | 5E-03 | N/A | 2E-04 | 5E-03 |
| | | | Chemical Total | 2E-05 | N/A | 3E-06 | 2E-05 | | 4E-02 | N/A | 5E-02 | 9E-02 |
| | | Exposure Point Total | | | | | 2E-05 | | | | | 9E-02 |
| | Exposure Medium Total | | | | | | 2E-05 | | | | | 9E-02 |
| | Air | Emissions from Subsurface Soil | Chromium (hexavalent) | N/A | 1E-07 | N/A | 1E-07 | Respiratory System | N/A | 4E-05 | N/A | 4E-05 |
| | | | Chemical Total | N/A | 1E-07 | N/A | 1E-07 | | N/A | 4E-05 | N/A | 4E-05 |
| | | Exposure Point Total | | | | | 1E-07 | | | | | 4E-05 |
| | Exposure Medium Total | | | | | | 1E-07 | | | | | 4E-05 |
| Medium Total | | | | | | | 2E-05 | | | | | 9E-02 |
| Receptor Total | | | | | | | 2E-05 | | | | Receptor HI Total | 4E-01 |

HI = Hazard Index
N/A = Not available/not applicable
CNS = Central Nervous System
GI = Gastrointestinal

| | |
|---|---|
| Total Skin HI Across All Media = | 1E-02 |
| Total Vascular HI Across All Media = | 1E-02 |
| Total Kidney HI Across All Media= | 5E-03 |
| Total GI System HI Across All Media = | 6E-03 |
| Total CNS HI Across All Media = | 8E-02 |
| Total Immune System HI Across All Media = | 2E-02 |
| Total Hair HI Across All Media = | 2E-01 |
| Total Blood HI Across All Media = | 1E-02 |
| Total Respiratory System HI Across All Media = | 4E-05 |
| Total Longevity HI Across All Media = | 2E-03 |
| Total Thyroid HI Across All Media = | 2E-03 |

TABLE 9.10.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Receptor Population: Trespasser/Visitor
Receptor Age: Youth

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil in the Ephemeral Drainage | Surface Soil in the Ephemeral Drainage | Ravine | Arsenic | 7E-07 | N/A | 5E-07 | 1E-06 | Skin, Vascular | 1E-02 | N/A | 8E-03 | 2E-02 |
| | | | Cadmium | N/A | N/A | N/A | N/A | Kidney | 3E-03 | N/A | 3E-03 | 6E-03 |
| | | | Copper | N/A | N/A | N/A | N/A | GI System | 3E-03 | N/A | 8E-05 | 3E-03 |
| | | | Iron | N/A | N/A | N/A | N/A | GI System | 5E-03 | N/A | 1E-04 | 6E-03 |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | 6E-02 | N/A | 4E-02 | 1E-01 |
| | | | Mercury | N/A | N/A | N/A | N/A | Immune System | 2E-02 | N/A | 8E-03 | 3E-02 |
| | | | Thallium | N/A | N/A | N/A | N/A | Hair | 3E-01 | N/A | 8E-03 | 3E-01 |
| | | | Zinc | N/A | N/A | N/A | N/A | Blood | 1E-02 | N/A | 3E-04 | 1E-02 |
| | | | Chemical Total | 7E-07 | N/A | 5E-07 | 1E-06 | | 4E-01 | N/A | 7E-02 | 5E-01 |
| | | Exposure Point Total | | | | | 1E-06 | | | | | 5E-01 |
| | Exposure Medium Total | | | | | | 1E-06 | | | | | 5E-01 |
| Medium Total | | | | | | | 1E-06 | | | | | 5E-01 |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Antimony | N/A | N/A | N/A | N/A | Longevity, Blood | 2E-03 | N/A | 2E-05 | 2E-03 |
| | | | Chromium (hexavalent) | 1E-05 | N/A | 7E-07 | 1E-05 | N/A | 5E-02 | N/A | 3E-03 | 6E-02 |
| | | | Cobalt | N/A | N/A | N/A | N/A | Thyroid | 3E-03 | N/A | 5E-06 | 3E-03 |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | 1E-03 | N/A | 6E-05 | 1E-03 |
| | | | Thallium | N/A | N/A | N/A | N/A | Hair | 8E-03 | N/A | 1E-05 | 8E-03 |
| | | | Chemical Total | 1E-05 | N/A | 7E-07 | 1E-05 | | 7E-02 | N/A | 4E-03 | 7E-02 |
| | | Exposure Point Total | | | | | 1E-05 | | | | | 7E-02 |
| | Exposure Medium Total | | | | | | 1E-05 | | | | | 7E-02 |
| | Air | Emissions from Subsurface Soil | Chromium (hexavalent) | N/A | 5E-08 | N/A | 5E-08 | Respiratory System | N/A | 4E-05 | N/A | 4E-05 |
| | | | Chemical Total | N/A | 5E-08 | N/A | 5E-08 | | N/A | 4E-05 | N/A | 4E-05 |
| | | Exposure Point Total | | | | | 5E-08 | | | | | 4E-05 |
| | Exposure Medium Total | | | | | | 5E-08 | | | | | 4E-05 |
| Medium Total | | | | | | | 1E-05 | | | | | 7E-02 |
| Receptor Total | | | | | | | 1E-05 | | | | Receptor HI Total | 6E-01 |

HI = Hazard Index
N/A = Not available/not applicable
CNS = Central Nervous System
GI = Gastrointestinal

| | |
|---|---|
| Total Skin HI Across All Media = | 2E-02 |
| Total Vascular HI Across All Media = | 2E-02 |
| Total Kidney HI Across All Media= | 6E-03 |
| Total GI System HI Across All Media = | 9E-03 |
| Total CNS HI Across All Media = | 1E-01 |
| Total Immune System HI Across All Media = | 3E-02 |
| Total Hair HI Across All Media = | 3E-01 |
| Total Blood HI Across All Media = | 1E-02 |
| Total Respiratory System HI Across All Media = | 4E-05 |
| Total Longevity HI Across All Media = | 2E-03 |
| Total Thyroid HI Across All Media = | 3E-03 |

TABLE 9.11.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Receptor Population: Trespasser/Visitor
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil in the Ephemeral Drainage | Surface Soil in the Ephemeral Drainage | Ravine | Arsenic | 3E-06 | N/A | 2E-07 | 3E-06 | Skin, Vascular | 7E-02 | N/A | 5E-03 | 7E-02 |
| | | | Cadmium | N/A | N/A | N/A | N/A | Kidney | 2E-02 | N/A | 2E-03 | 2E-02 |
| | | | Copper | N/A | N/A | N/A | N/A | GI System | 2E-02 | N/A | 6E-05 | 2E-02 |
| | | | Iron | N/A | N/A | N/A | N/A | GI System | 3E-02 | N/A | 9E-05 | 3E-02 |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | 4E-01 | N/A | 3E-02 | 4E-01 |
| | | | Mercury | N/A | N/A | N/A | N/A | Immune System | 1E-01 | N/A | 5E-03 | 1E-01 |
| | | | Thallium | N/A | N/A | N/A | N/A | Hair | 2E+00 | N/A | 5E-03 | 2E+00 |
| | | | Zinc | N/A | N/A | N/A | N/A | Blood | 7E-02 | N/A | 2E-04 | 7E-02 |
| | | | Chemical Total | 3E-06 | N/A | 2E-07 | 3E-06 | | 3E+00 | N/A | 4E-02 | 3E+00 |
| | | Exposure Point Total | | | | | 3E-06 | | | | | 3E+00 |
| | Exposure Medium Total | | | | | | 3E-06 | | | | | 3E+00 |
| Medium Total | | | | | | | 3E-06 | | | | | 3E+00 |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Antimony | N/A | N/A | N/A | N/A | Longevity, Blood | 6E-03 | N/A | 2E-04 | 6E-03 |
| | | | Chromium (hexavalent) | 2E-05 | N/A | 4E-06 | 2E-05 | N/A | 2E-01 | N/A | 3E-02 | 2E-01 |
| | | | Cobalt | N/A | N/A | N/A | N/A | Thyroid | 9E-03 | N/A | 5E-05 | 9E-03 |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | 4E-03 | N/A | 6E-04 | 5E-03 |
| | | | Thallium | N/A | N/A | N/A | N/A | Hair | 2E-02 | N/A | 1E-04 | 2E-02 |
| | | | Chemical Total | 2E-05 | N/A | 4E-06 | 2E-05 | | 2E-01 | N/A | 4E-02 | 2E-01 |
| | | Exposure Point Total | | | | | 2E-05 | | | | | 2E-01 |
| | Exposure Medium Total | | | | | | 2E-05 | | | | | 2E-01 |
| | Air | Emissions from Subsurface Soil | Chromium (hexavalent) | N/A | 3E-08 | N/A | 3E-08 | Respiratory System | N/A | 4E-05 | N/A | 4E-05 |
| | | | Chemical Total | N/A | 3E-08 | N/A | 3E-08 | | N/A | 4E-05 | N/A | 4E-05 |
| | | Exposure Point Total | | | | | 3E-08 | | | | | 4E-05 |
| | Exposure Medium Total | | | | | | 3E-08 | | | | | 4E-05 |
| Medium Total | | | | | | | 2E-05 | | | | | 2E-01 |
| Receptor Total | | | | | | | 3E-05 | | | | Receptor HI Total | 3E+00 |

TABLE 9.11.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Receptor Population: Trespasser/Visitor
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |

HI = Hazard Index
N/A = Not available/not applicable
CNS = Central Nervous System
GI = Gastrointestinal

| | |
|---|---|
| Total Skin HI Across All Media = | 7E-02 |
| Total Vascular HI Across All Media = | 7E-02 |
| Total Kidney HI Across All Media= | 2E-02 |
| Total GI System HI Across All Media = | 5E-02 |
| Total CNS HI Across All Media = | 4E-01 |
| Total Immune System HI Across All Media = | 1E-01 |
| Total Hair HI Across All Media = | **2E+00** |
| Total Blood HI Across All Media = | 8E-02 |
| Total Respiratory System HI Across All Media = | 4E-05 |
| Total Longevity HI Across All Media = | 6E-03 |
| Total Thyroid HI Across All Media = | 9E-03 |

TABLE 9.1.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil in the Ephemeral Drainage | Surface Soil in the Ephemeral Drainage | Ravine | Arsenic | 5E-07 | N/A | 2E-08 | 5E-07 | Skin, Vascular | 1E-02 | N/A | 4E-04 | 1E-02 |
| | | | Cadmium | N/A | N/A | N/A | N/A | Kidney | 3E-03 | N/A | 1E-04 | 3E-03 |
| | | | Copper | N/A | N/A | N/A | N/A | GI System | 3E-03 | N/A | 3E-06 | 3E-03 |
| | | | Iron | N/A | N/A | N/A | N/A | GI System | 7E-03 | N/A | 8E-06 | 7E-03 |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | 5E-02 | N/A | 1E-03 | 5E-02 |
| | | | Mercury | N/A | N/A | N/A | N/A | Immune System | 2E-02 | N/A | 3E-04 | 2E-02 |
| | | | Thallium | N/A | N/A | N/A | N/A | Hair | 2E-01 | N/A | 3E-04 | 2E-01 |
| | | | Zinc | N/A | N/A | N/A | N/A | Blood | 1E-02 | N/A | 1E-05 | 1E-02 |
| | | | Chemical Total | 5E-07 | N/A | 2E-08 | 5E-07 | | 3E-01 | N/A | 2E-03 | 3E-01 |
| | | Exposure Point Total | | | | | 5E-07 | | | | | 3E-01 |
| | Exposure Medium Total | | | | | | 5E-07 | | | | | 3E-01 |
| Medium Total | | | | | | | 5E-07 | | | | | 3E-01 |
| Receptor Total | | | | | | | 5E-07 | | | | Receptor HI Total | 3E-01 |

HI = Hazard Index

N/A = Not available/not applicable

CNS = Central Nervous System

GI = Gastrointestinal

| | |
|---|---|
| Total Skin HI Across All Media = | 1E-02 |
| Total Vascular HI Across All Media = | 1E-02 |
| Total Kidney HI Across All Media= | 3E-03 |
| Total GI System HI Across All Media = | 1E-02 |
| Total CNS HI Across All Media = | 5E-02 |
| Total Immune System HI Across All Media = | 2E-02 |
| Total Hair HI Across All Media = | 2E-01 |
| Total Blood HI Across All Media = | 1E-02 |

TABLE 9.2.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Antimony | N/A | N/A | N/A | N/A | Longevity, Blood | 1E-02 | N/A | 1E-04 | 2E-02 |
| | | | Chromium (hexavalent) | N/A | N/A | N/A | N/A | Not identified | 6E-02 | N/A | 3E-03 | 7E-02 |
| | | | Cobalt | N/A | N/A | N/A | N/A | Thyroid | 1E-02 | N/A | 1E-05 | 1E-02 |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | 6E-03 | N/A | 1E-06 | 6E-03 |
| | | | Thallium | N/A | N/A | N/A | N/A | Hair | 1E-01 | N/A | 1E-04 | 1E-01 |
| | | | Chemical Total | N/A | N/A | N/A | N/A | | 2E-01 | N/A | 3E-03 | 2E-01 |
| | | Exposure Point Total | | | | | N/A | | | | | 2E-01 |
| | Exposure Medium Total | | | | | | N/A | | | | | 2E-01 |
| | Air | Emissions from Subsurface Soil | Chromium (hexavalent) | N/A | N/A | N/A | N/A | Respiratory System | N/A | 2E-04 | N/A | 2E-04 |
| | | | Chemical Total | N/A | N/A | N/A | N/A | | N/A | 2E-04 | N/A | 2E-04 |
| | | Exposure Point Total | | | | | N/A | | | | | 2E-04 |
| | Exposure Medium Total | | | | | | N/A | | | | | 2E-04 |
| Medium Total | | | | | | | N/A | | | | | 2E-01 |
| Groundwater | Groundwater | Surficial Aquifer - Tap Water | Nitrobenzene | N/A | N/A | N/A | N/A | Blood | 7E-03 | N/A | 2E-04 | 7E-03 |
| | | | 3-Nitrotoluene | N/A | N/A | N/A | N/A | Spleen | 2E-01 | N/A | 2E-02 | 2E-01 |
| | | | Antimony | N/A | N/A | N/A | N/A | Longevity, Blood | 8E-01 | N/A | 1E-02 | 8E-01 |
| | | | Cadmium | N/A | N/A | N/A | N/A | Kidney | 3E-01 | N/A | 1E-02 | 3E-01 |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | 8E-02 | N/A | 4E-03 | 9E-02 |
| | | | Chemical Total | N/A | N/A | N/A | N/A | | 1E+00 | N/A | 5E-02 | 1E+00 |
| | | Exposure Point Total | | | | | N/A | | | | | 1E+00 |
| | Exposure Medium Total | | | | | | N/A | | | | | 1E+00 |
| | Air | Surficial Aquifer - Water Vapors at Showerhead | Nitrobenzene | N/A | N/A | N/A | N/A | Respiratory System | N/A | 4E-05 | N/A | 4E-05 |
| | | | Chemical Total | N/A | N/A | N/A | N/A | | N/A | 4E-05 | N/A | 4E-05 |
| | | Exposure Point Total | | | | | N/A | | | | | 4E-05 |
| | Exposure Medium Total | | | | | | N/A | | | | | 4E-05 |
| Medium Total | | | | | | | N/A | | | | | 1E+00 |
| Receptor Total | | | | | | | N/A | | | | Receptor HI Total | 2E+00 |

TABLE 9.2.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |

HI = Hazard Index

N/A = Not available/not applicable

CNS = Central Nervous System

| | |
|---|---|
| Total Longevity HI Across All Media = | 8E-01 |
| Total Blood HI Across All Media = | 9E-01 |
| Total Thyroid HI Across All Media = | 1E-02 |
| Total CNS HI Across All Media = | 9E-02 |
| Total Hair HI Across All Media = | 1E-01 |
| Total Respiratory System HI Across All Media = | 2E-04 |
| Total Spleen HI Across All Media = | 2E-01 |
| Total Kidney HI Across All Media = | 3E-01 |

TABLE 9.3.CTE

**SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs**

**CENTRAL TENDENCY EXPOSURE**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Antimony | N/A | N/A | N/A | N/A | Longevity, Blood | N/A | N/A | N/A | N/A |
| | | | Chromium (hexavalent) | 5E-05 | N/A | 2E-06 | 5E-05 | Not identified | N/A | N/A | N/A | N/A |
| | | | Cobalt | N/A | N/A | N/A | N/A | Thyroid | N/A | N/A | N/A | N/A |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | N/A | N/A | N/A | N/A |
| | | | Thallium | N/A | N/A | N/A | N/A | Hair | N/A | N/A | N/A | N/A |
| | | | Chemical Total | 5E-05 | N/A | 2E-06 | 5E-05 | | N/A | N/A | N/A | N/A |
| | | Exposure Point Total | | | | | 5E-05 | | | | | N/A |
| | Exposure Medium Total | | | | | | 5E-05 | | | | | N/A |
| | Air | Emissions from Subsurface Soil | Chromium (hexavalent) | N/A | 6E-08 | N/A | 6E-08 | Respiratory System | N/A | N/A | N/A | N/A |
| | | | Chemical Total | N/A | 6E-08 | N/A | 6E-08 | | N/A | N/A | N/A | N/A |
| | | Exposure Point Total | | | | | 6E-08 | | | | | N/A |
| | Exposure Medium Total | | | | | | 6E-08 | | | | | N/A |
| Medium Total | | | | | | | 5E-05 | | | | | N/A |
| Groundwater | Groundwater | Surficial Aquifer - Tap Water | Nitrobenzene | N/A | N/A | N/A | N/A | Blood | N/A | N/A | N/A | N/A |
| | | | 3-Nitrotoluene | N/A | N/A | N/A | N/A | Spleen | N/A | N/A | N/A | N/A |
| | | | Antimony | N/A | N/A | N/A | N/A | Longevity, Blood | N/A | N/A | N/A | N/A |
| | | | Cadmium | N/A | N/A | N/A | N/A | Kidney | N/A | N/A | N/A | N/A |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | N/A | N/A | N/A | N/A |
| | | | Chemical Total | N/A | N/A | N/A | N/A | | N/A | N/A | N/A | N/A |
| | | Exposure Point Total | | | | | N/A | | | | | N/A |
| | Exposure Medium Total | | | | | | N/A | | | | | N/A |
| | Air | Surficial Aquifer - Water Vapors at Showerhead | Nitrobenzene | N/A | 2E-09 | N/A | 2E-09 | Respiratory System | N/A | N/A | N/A | N/A |
| | | | Chemical Total | N/A | 2E-09 | N/A | 2E-09 | | N/A | N/A | N/A | N/A |
| | | Exposure Point Total | | | | | 2E-09 | | | | | N/A |
| | Exposure Medium Total | | | | | | 2E-09 | | | | | N/A |
| Medium Total | | | | | | | 2E-09 | | | | | N/A |
| Receptor Total | | | | | | | 5E-05 | | | | Receptor HI Total | N/A |

HI = Hazard Index

N/A = Not available/not applicable

CNS = Central Nervous System

TABLE 9.4.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Receptor Population: Trespasser/Visitor
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil in the Ephemeral Drainage | Surface Soil in the Ephemeral Drainage | Ravine | Arsenic | 5E-07 | N/A | 8E-08 | 6E-07 | Skin, Vascular | 1E-02 | N/A | 2E-03 | 1E-02 |
| | | | Cadmium | N/A | N/A | N/A | N/A | Kidney | 3E-03 | N/A | 7E-04 | 4E-03 |
| | | | Copper | N/A | N/A | N/A | N/A | GI System | 3E-03 | N/A | 2E-05 | 3E-03 |
| | | | Iron | N/A | N/A | N/A | N/A | GI System | 7E-03 | N/A | 4E-05 | 7E-03 |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | 5E-02 | N/A | 7E-03 | 6E-02 |
| | | | Mercury | N/A | N/A | N/A | N/A | Immune System | 2E-02 | N/A | 1E-03 | 2E-02 |
| | | | Thallium | N/A | N/A | N/A | N/A | Hair | 2E-01 | N/A | 1E-03 | 2E-01 |
| | | | Zinc | N/A | N/A | N/A | N/A | Blood | 1E-02 | N/A | 5E-05 | 1E-02 |
| | | | Chemical Total | 5E-07 | N/A | 8E-08 | 6E-07 | | 3E-01 | N/A | 1E-02 | 4E-01 |
| | | Exposure Point Total | | | | | 6E-07 | | | | | 4E-01 |
| | Exposure Medium Total | | | | | | 6E-07 | | | | | 4E-01 |
| Medium Total | | | | | | | 6E-07 | | | | | 4E-01 |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Antimony | N/A | N/A | N/A | N/A | Longevity, Blood | 8E-04 | N/A | 1E-05 | 8E-04 |
| | | | Chromium (hexavalent) | 5E-07 | N/A | 4E-08 | 5E-07 | N/A | 4E-03 | N/A | 3E-04 | 4E-03 |
| | | | Cobalt | N/A | N/A | N/A | N/A | Thyroid | 6E-04 | N/A | 1E-06 | 7E-04 |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | 3E-04 | N/A | 2E-05 | 4E-04 |
| | | | Thallium | N/A | N/A | N/A | N/A | Hair | 6E-03 | N/A | 1E-05 | 6E-03 |
| | | | Chemical Total | 5E-07 | N/A | 4E-08 | 5E-07 | | 1E-02 | N/A | 4E-04 | 1E-02 |
| | | Exposure Point Total | | | | | 5E-07 | | | | | 1E-02 |
| | Exposure Medium Total | | | | | | 5E-07 | | | | | 1E-02 |
| | Air | Emissions from Subsurface Soil | Chromium (hexavalent) | N/A | 1E-09 | N/A | 1E-09 | Respiratory System | N/A | 2E-06 | N/A | 2E-06 |
| | | | Chemical Total | N/A | 1E-09 | N/A | 1E-09 | | N/A | 2E-06 | N/A | 2E-06 |
| | | Exposure Point Total | | | | | 1E-09 | | | | | 2E-06 |
| | Exposure Medium Total | | | | | | 1E-09 | | | | | 2E-06 |
| Medium Total | | | | | | | 5E-07 | | | | | 1E-02 |
| Receptor Total | | | | | | | 1E-06 | | | | Receptor HI Total | 4E-01 |

HI = Hazard Index
N/A = Not available/not applicable
CNS = Central Nervous System
GI = Gastrointestinal

| | |
|---|---|
| Total Skin HI Across All Media = | 1E-02 |
| Total Vascular HI Across All Media = | 1E-02 |
| Total Kidney HI Across All Media= | 4E-03 |
| Total GI System HI Across All Media = | 1E-02 |
| Total CNS HI Across All Media = | 6E-02 |
| Total Immune System HI Across All Media = | 2E-02 |
| Total Hair HI Across All Media = | 2E-01 |
| Total Blood HI Across All Media = | 1E-02 |
| Total Respiratory System HI Across All Media = | 2E-06 |
| Total Longevity HI Across All Media = | 8E-04 |
| Total Thyroid HI Across All Media = | 7E-04 |

TABLE 10.1.RME

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Current/Future
Receptor Population: Trespasser/Visitor
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil in the Ephemeral Drainage | Surface Soil in the Ephemeral Drainage | Ravine | Copper | N/A | N/A | N/A | N/A | GI System | 6E-01 | N/A | 2E-03 | 6E-01 |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | 4E-01 | N/A | 3E-02 | 4E-01 |
| | | | Thallium | N/A | N/A | N/A | N/A | Hair | 2E+00 | N/A | 5E-03 | 2E+00 |
| | | | Chemical Total | N/A | N/A | N/A | N/A | | 3E+00 | N/A | 3E-02 | 3E+00 |
| | | Exposure Point Total | | | | | N/A | | | | | 3E+00 |
| | Exposure Medium Total | | | | | | N/A | | | | | 3E+00 |
| Medium Total | | | | | | | N/A | | | | | 3E+00 |
| Receptor Total | | | | | | | N/A | | | | Receptor HI Total | 3E+00 |

HI = Hazard Index

N/A = Not available/not applicable

CNS = Central Nervous System

GI = Gastrointestinal

| | |
|---|---|
| Total GI System HI Across All Media = | 6E-01 |
| Total CNS HI Across All Media = | 4E-01 |
| Total Hair HI Across All Media = | 2E+00 |

TABLE 10.2.RME

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Chromium (hexavalent) | N/A | N/A | N/A | N/A | N/A | 2E+00 | N/A | 2E-01 | 2E+00 |
| | | | Thallium | N/A | N/A | N/A | N/A | Hair | 3E-01 | N/A | 9E-04 | 3E-01 |
| | | | Chemical Total | N/A | N/A | N/A | N/A | | 2E+00 | N/A | 2E-01 | 3E+00 |
| | | Exposure Point Total | | | | | N/A | | | | | 3E+00 |
| | Exposure Medium Total | | | | | | N/A | | | | | 3E+00 |
| Medium Total | | | | | | | N/A | | | | | 3E+00 |
| Groundwater | Groundwater | Surficial Aquifer - Tap Water | 3-Nitrotoluene | N/A | N/A | N/A | N/A | Spleen | 3E-01 | N/A | 4E-02 | 3E-01 |
| | | | Antimony | N/A | N/A | N/A | N/A | Longevity, Blood | 1E+00 | N/A | 5E-02 | 1E+00 |
| | | | Cadmium | N/A | N/A | N/A | N/A | Kidney | 4E-01 | N/A | 5E-02 | 5E-01 |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | 1E-01 | N/A | 2E-02 | 1E-01 |
| | | | Chemical Total | N/A | N/A | N/A | N/A | | 2E+00 | N/A | 2E-01 | 2E+00 |
| | | Exposure Point Total | | | | | N/A | | | | | 2E+00 |
| | Exposure Medium Total | | | | | | N/A | | | | | 2E+00 |
| Medium Total | | | | | | | N/A | | | | | 2E+00 |
| Receptor Total | | | | | | | N/A | | | | Receptor HI Total | 5E+00 |

HI = Hazard Index
N/A = Not available/not applicable
CNS = Central Nervous System
GI = Gastrointestinal

| | |
|---|---|
| Total Longevity HI Across All Media = | 1E+00 |
| Total Blood HI Across All Media = | 1E+00 |
| Total CNS HI Across All Media = | 1E-01 |
| Total Hair HI Across All Media = | 3E-01 |
| Total Spleen HI Across All Media = | 3E-01 |
| Total Kidney HI Across All Media = | 5E-01 |

TABLE 10.3.RME

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Chromium (hexavalent) | 2E-03 | N/A | 2E-04 | 2E-03 | N/A | N/A | N/A | N/A | N/A |
| | | | Chemical Total | 2E-03 | N/A | 2E-04 | 2E-03 | | N/A | N/A | N/A | N/A |
| | | Exposure Point Total | | | | | 2E-03 | | | | | N/A |
| | Exposure Medium Total | | | | | | 2E-03 | | | | | N/A |
| | Air | Emissions from Subsurface Soil | Chromium (hexavalent) | N/A | 1E-06 | N/A | 1E-06 | Respiratory System | N/A | N/A | N/A | N/A |
| | | | Chemical Total | N/A | 1E-06 | N/A | 1E-06 | | N/A | N/A | N/A | N/A |
| | | Exposure Point Total | | | | | 1E-06 | | | | | N/A |
| | Exposure Medium Total | | | | | | 1E-06 | | | | | N/A |
| Medium Total | | | | | | | 2E-03 | | | | | N/A |
| Receptor Total | | | | | | | 2E-03 | | | | Receptor HI Total | N/A |

HI = Hazard Index

N/A = Not available/not applicable

CNS = Central Nervous System

GI = Gastrointestinal

TABLE 10.4.RME

**RISK SUMMARY**

**REASONABLE MAXIMUM EXPOSURE**

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scenario Timeframe: Future
Receptor Population: Trespasser/Visitor
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil in the Ephemeral | Surface Soil in the Ephemeral Drainage | Ravine | Arsenic | 3E-06 | N/A | 2E-07 | 3E-06 | Skin, Vascular | 7E-02 | N/A | 5E-03 | 7E-02 |
| | | | Manganese | N/A | N/A | N/A | N/A | CNS | 4E-01 | N/A | 3E-02 | 4E-01 |
| | | | Thallium | N/A | N/A | N/A | N/A | Hair | 2E+00 | N/A | 5E-03 | 2E+00 |
| | | | Chemical Total | 3E-06 | N/A | 2E-07 | 3E-06 | | 2E+00 | N/A | 4E-02 | 2E+00 |
| | | Exposure Point Total | | | | | 3E-06 | | | | | 2E+00 |
| | Exposure Medium Total | | | | | | 3E-06 | | | | | 2E+00 |
| Medium Total | | | | | | | 3E-06 | | | | | 2E+00 |
| Subsurface Soil | Subsurface Soil | Subsurface Soil | Chromium (hexavalent) | 2E-05 | N/A | 4E-06 | 2E-05 | N/A | 2E-01 | N/A | 3E-02 | 2E-01 |
| | | | Chemical Total | 2E-05 | N/A | 4E-06 | 2E-05 | | 2E-01 | N/A | 3E-02 | 2E-01 |
| | | Exposure Point Total | | | | | 2E-05 | | | | | 2E-01 |
| | Exposure Medium Total | | | | | | 2E-05 | | | | | 2E-01 |
| Medium Total | | | | | | | 2E-05 | | | | | 2E-01 |
| Receptor Total | | | | | | | 3E-05 | | | | Receptor HI Total | 2E+00 |

HI = Hazard Index
N/A = Not available/not applicable
CNS = Central Nervous System

| | |
|---|---|
| Total Skin HI Across All Media = | 7E-02 |
| Total Vascular HI Across All Media = | 7E-02 |
| Total CNS HI Across All Media = | 4E-01 |
| Total Hair HI Across All Media = | 2E+00 |

TABLE 10.1.CTE

RISK SUMMARY

CENTRAL TENDENCY EXPOSURE

*Site UXO-22 PA/SI*

*MCIEAST-MCB CAMLEJ, North Carolina*

| |
|---|
| Scenario Timeframe: Future |
| Receptor Population: Resident |
| Receptor Age: Child |

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Groundwater | Groundwater | Surficial Aquifer - Tap Water | 3-Nitrotoluene | N/A | N/A | N/A | N/A | Spleen | 2E-01 | N/A | 2E-02 | 2E-01 |
| | | | Antimony | N/A | N/A | N/A | N/A | Longevity, Blood | 8E-01 | N/A | 1E-02 | 8E-01 |
| | | | Cadmium | N/A | N/A | N/A | N/A | Kidney | 3E-01 | N/A | 1E-02 | 3E-01 |
| | | | Chemical Total | N/A | N/A | N/A | N/A | | 1E+00 | N/A | 4E-02 | 1E+00 |
| | | Exposure Point Total | | | | | N/A | | | | | 1E+00 |
| | Exposure Medium Total | | | | | | N/A | | | | | 1E+00 |
| Medium Total | | | | | | | N/A | | | | | 1E+00 |
| Receptor Total | | | | | | | N/A | | | | Receptor HI Total | 1E+00 |

HI = Hazard Index

N/A = Not available/not applicable

| | |
|---|---|
| Total Longevity HI Across All Media = | 8E-01 |
| Total Blood HI Across All Media = | 8E-01 |
| Total Spleen HI Across All Media = | 2E-01 |
| Total Kidney HI Across All Media = | 3E-01 |

# Appendix F
# Ecological Risk Screening Tables

| StationID | IR06-TP01 | IR06-TP01 | IR06-TP06 | IR06-TP08 | IR06-TP09 | IR06-TP10 | IR06-TP12 |
|---|---|---|---|---|---|---|---|
| SampleID | IR06-TP01-N-4-5-11A | IR06-TP01-S-4-5-11A | IR06-TP06-N-2-3-11A | IR06-TP08-N-3-4-11A | IR06-TP09-2-3-11A | IR06-TP10-4-5-11A | IR06-TP12-N-2-3-11A |
| SampleDate | 1/19/2011 | 1/19/2011 | 1/20/2011 | 1/21/2011 | 1/21/2011 | 1/24/2011 | 1/24/2011 |
| AnalyteName | | | | | | | |
| **SVOA(UG/KG)** | | | | | | | |
| 2,4-Dinitrotoluene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U |
| 2,6-Dinitrotoluene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U |
| Nitrobenzene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U |
| **EXPLO(UG/KG)** | | | | | | | |
| 1,3,5-Trinitrobenzene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U |
| 1,3-Dinitrobenzene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U |
| 2,4,6-Trinitrotoluene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U |
| 2-Amino-4,6-dinitrotoluene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U |
| 2-Nitrotoluene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U |
| 3-Nitrotoluene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U |
| 4-Amino-2,6-dinitrotoluene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U |
| 4-Nitrotoluene | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U |
| HMX | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U |
| Nitroglycerin | 410 U | 450 U | 490 U | 470 U | 410 U | 490 U | 460 U |
| Perchlorate | 0.45 U | 0.44 U | 0.49 U | 0.47 U | 0.45 U | 0.48 U | 0.48 U |
| PETN | 410 U | 450 U | 490 U | 470 U | 410 U | 490 U | 460 U |
| RDX | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U |
| Tetryl | 51 U | 56 U | 61 U | 59 U | 51 U | 62 U | 57 U |
| **METAL(MG/KG)** | | | | | | | |
| Aluminum | **4180** | **3660** | **5140** | **8840** | **3940** | **1530** | **3700** |
| Antimony | **5.3 J** | **13.5 J** | 0.43 UJ | 0.43 U | **7.1** | 0.35 U | 0.45 U |
| Arsenic | **2.7** | **7** | **0.27 J** | 0.45 U | **3.4** | 0.35 U | 0.45 U |
| Barium | **11.2** | **10.6** | **3** | **8.3** | **117** | **1.8** | **3.6** |
| Beryllium | **0.04 J** | **0.04 J** | **0.02 J** | **0.05 J** | **0.08 J** | **0.01 J** | **0.01 J** |
| Cadmium | **0.14 J** | **0.09 J** | 0.26 U | **0.03 J** | **2.7** | **0.01 J** | **0.02 J** |
| Calcium | **51400** | **19800** | **109** | **33.5** | **2200** | **35.2** | **188** |
| Chromium (hexavalent) | **0.84 J** | 0.43 UJ | 0.95 UJ | 0.44 U | **490** | 0.46 U | **0.88** |
| Chromium | **6.2** | **6.4** | **4** | **8.2** | **596** | **2.8** | **2.8** |
| Cobalt | **6.2** | **0.49 J** | **0.1 J** | **0.62 J** | **4.8 J** | **0.09 J** | **0.64 J** |
| Copper | **5.1** | **4.2** | **0.31 J** | **0.71 J** | **180** | **0.75 J** | 0.89 U |
| Iron | **2110** | **6330** | **358** | **1060** | **22000** | **413** | **878** |
| Lead | **17.9** | **23.6** | **3.5** | **4.6** | **2800** | **6.4** | **4.4** |
| Magnesium | **734** | **1160** | **75.8** | **228** | **164** | **47.7** | **66** |
| Manganese | **64.3** | **21.6** | **1.6** | **4.1** | **360** | **1.9** | **6** |
| Mercury | **0.01 J** | **0.03** | **0.02 J** | 0.018 U | **0.03 J** | **0.08** | **0.03 J** |
| Nickel | **8.3** | **7.8** | **1.1 J** | **3.5** | **14.7** | **0.46 J** | **1.5 J** |
| Potassium | **182** | **142** | **84.7 J** | **232** | **90.5** | **50.6 J** | **62.7 J** |
| Selenium | 0.54 U | 0.71 U | 0.6 U | 0.6 U | 1.1 U | 0.49 U | 0.62 U |
| Silver | **0.02 J** | **0.1 J** | 0.34 U | 0.34 U | **0.9 J** | 0.28 U | 0.36 U |
| Sodium | **71.8 J** | **56.7 J** | 43 U | **23.8 J** | **41.2 J** | **17.4 J** | 45 U |
| Thallium | **0.24 J** | 0.51 U | 0.43 U | 0.43 U | 0.8 U | 0.35 U | 0.45 U |
| Vanadium | **5.7** | **4.3** | **2.8** | **7.7** | **4.4** | **1.6 J** | **3.4** |
| Zinc | **44.9** | **35.2** | 0.92 U | 2.9 U | **537** | **42.2** | **7.5** |

| StationID | IR06-TP2 | IR06-TP3 | IR06-TP4 | IR06-TP4 | IR06-TP7 | MR22-IS01 | UXO22-TP01 |
|---|---|---|---|---|---|---|---|
| SampleID | IR06-TP02-W-4-5-11A | IR06-TP03-N-3-4-11A | IR06-TP04D-N-3-4-11A | IR06-TP04-N-3-4-11A | IR06-TP07-S-3-4-11A | MR22-IS01-3-5-11D | UXO22-TP-S-NE |
| SampleDate | 1/18/2011 | 1/21/2011 | 1/19/2011 | 1/19/2011 | 1/20/2011 | 12/16/2011 | 10/7/2010 |
| AnalyteName | | | | | | | |
| **SVOA(UG/KG)** | | | | | | | |
| 2,4-Dinitrotoluene | 65 U | 57 U | 55 U | 57 U | 61 U | 200 U | 96.8 U |
| 2,6-Dinitrotoluene | 65 U | 57 U | 55 U | 57 U | 61 U | 200 U | 96.8 U |
| Nitrobenzene | 65 U | 57 U | 55 U | 57 U | 61 U | 200 U | 96.8 U |
| **EXPLO(UG/KG)** | | | | | | | |
| 1,3,5-Trinitrobenzene | 65 U | 57 U | 55 U | 57 U | 61 U | 200 U | 96.8 U |
| 1,3-Dinitrobenzene | 65 U | 57 U | 55 U | 57 U | 61 U | 200 U | 96.8 U |
| 2,4,6-Trinitrotoluene | 65 U | 57 U | 55 U | 57 U | 61 U | 200 U | **159 J** |
| 2-Amino-4,6-dinitrotoluene | 65 U | 57 U | 55 U | 57 U | 61 U | 200 U | 96.8 U |
| 2-Nitrotoluene | 65 U | 57 U | 55 U | 57 U | 61 U | 200 U | 96.8 U |
| 3-Nitrotoluene | 65 U | 57 U | 55 U | 57 U | 61 U | 200 U | 96.8 U |
| 4-Amino-2,6-dinitrotoluene | 65 U | 57 U | 55 U | 57 U | 61 U | 200 U | 96.8 U |
| 4-Nitrotoluene | 65 U | 57 U | 55 U | 57 U | 61 U | 200 U | 96.8 U |
| HMX | 65 U | 57 U | 55 U | 57 U | 61 U | 200 U | **73.2 J** |
| Nitroglycerin | 520 U | 460 U | 440 U | 460 U | 490 U | 500 U | 161 U |
| Perchlorate | 0.5 U | 0.45 U | 0.48 U | 0.47 U | 0.49 U | 12.5 U | 2.54 U |
| PETN | 520 U | 460 U | 440 U | 460 U | 490 U | 500 U | 161 U |
| RDX | 65 U | 57 U | 55 U | 57 U | 61 U | 200 U | **67 J** |
| Tetryl | 65 U | 57 U | 55 U | 57 U | 61 U | 200 U | 96.8 U |
| **METAL(MG/KG)** | | | | | | | |
| Aluminum | **1990** | **3140** | **3900** | **3570** | **3120** | **3090** | **1570** |
| Antimony | 0.48 UJ | 0.46 U | 0.4 UJ | 0.42 UJ | 0.45 UJ | 0.5 UJ | 0.487 UJ |
| Arsenic | **0.08 J** | 0.46 U | **0.18 J** | **0.3 J** | **0.1 J** | **2** | 0.365 U |
| Barium | **2.2** | **3** | **6** | **5.6** | **3.2** | **4.37** | **6.2** |
| Beryllium | **0.01 J** | **0.01 J** | **0.02 J** | **0.02 J** | **0.02 J** | 0.125 U | 0.122 U |
| Cadmium | **0.38 J** | **0.03 J** | **0.04 J** | **0.08 J** | 0.27 U | 0.125 U | **1.1** |
| Calcium | **146** | **36.3** | **2190** | **3880** | 30.4 U | 125 U | **581** |
| Chromium (hexavalent) | **0.43 J** | **0.49 J** | **0.51 J** | 0.42 UJ | **1.7 J** | NS | NS |
| Chromium | **2.8** | **3.1** | **3.8** | **4.4** | **3.1** | **4.78 J** | **2.36** |
| Cobalt | 0.39 U | **0.14 J** | **0.22 J** | **0.23 J** | **0.13 J** | **1.04** | 0.608 U |
| Copper | **9.6** | **0.5 J** | **2.2** | **5.2** | **0.27 J** | **0.951** | **12.3** |
| Iron | **2740** | **314** | **839** | **2390** | **403** | **2400** | **992** |
| Lead | **31.7** | **2.8** | **16** | **17.4** | **2.2** | **3.08** | **21.5** |
| Magnesium | **59.5** | **65.6** | **106** | **146** | **80.4** | **129 J** | 183 U |
| Manganese | **13.9** | **2.9** | **5** | **6.5** | **2.3** | **12.1** | **8.31** |
| Mercury | **0.23** | **0.008 J** | **0.02 J** | **0.07 J** | **0.02 J** | 0.0364 U | **0.0379 J** |
| Nickel | **0.48 J** | **0.8 J** | **2.5 J** | **2.1 J** | **1.2 J** | **1.83** | **1.1 J** |
| Potassium | **62.5 J** | **62.5 J** | **75.3 J** | **89.7** | **96.5** | **198 J** | 183 U |
| Selenium | 0.68 U | 0.64 U | 0.56 U | **0.39 J** | 0.63 U | **0.298 J** | **0.338 J** |
| Silver | **0.09 J** | 0.37 U | 0.32 U | **0.04 J** | 0.36 U | 0.125 U | 0.122 U |
| Sodium | 48 U | 46 U | 40 U | 42 U | 45 U | 188 U | 183 U |
| Thallium | 0.48 U | 0.46 U | 0.4 U | 0.42 U | 0.45 U | 0.25 U | 0.243 U |
| Vanadium | **2.9** | **2.8** | **3.3** | **3.6** | **2.7** | **8.23** | **1.41** |
| Zinc | **92.1** | 3.3 U | **57.1 J** | **183 J** | **5.3** | **3.56** | **47** |

| StationID | UXO22-TP01 | UXO22-TP01 | UXO22-TP01 | UXO22-TP01 |
|---|---|---|---|---|
| SampleID | UXO22-TP-S-NE-D | UXO22-TP-S-NW | UXO22-TP-S-SE | UXO22-TP-S-SW |
| SampleDate | 10/7/2010 | 10/7/2010 | 10/7/2010 | 10/7/2010 |
| AnalyteName | | | | |
| **SVOA(UG/KG)** | | | | |
| 2,4-Dinitrotoluene | 98.4 U | **34.6 J** | 98.4 U | 93.8 U |
| 2,6-Dinitrotoluene | 98.4 U | **45.7 J** | 98.4 U | 93.8 U |
| Nitrobenzene | 98.4 U | 98.4 U | 98.4 U | 93.8 U |
| **EXPLO(UG/KG)** | | | | |
| 1,3,5-Trinitrobenzene | 98.4 U | 98.4 U | 98.4 U | 93.8 U |
| 1,3-Dinitrobenzene | **63 J** | **35.5 J** | 98.4 U | 93.8 U |
| 2,4,6-Trinitrotoluene | **132 J** | 98.4 U | **60.9 J** | **46.4 J** |
| 2-Amino-4,6-dinitrotoluene | 98.4 U | 98.4 U | 98.4 U | 93.8 U |
| 2-Nitrotoluene | 98.4 U | 98.4 U | 98.4 U | 93.8 U |
| 3-Nitrotoluene | 98.4 U | 98.4 U | 98.4 U | 93.8 U |
| 4-Amino-2,6-dinitrotoluene | 98.4 U | 98.4 U | 98.4 U | 93.8 U |
| 4-Nitrotoluene | 98.4 U | 98.4 U | 98.4 U | 93.8 U |
| HMX | **54.3 J** | 98.4 U | 98.4 U | 93.8 U |
| Nitroglycerin | 164 U | 164 U | 164 U | 156 U |
| Perchlorate | 2.25 U | 2.7 U | 2.31 U | 2.58 U |
| PETN | **123 J** | 164 U | 164 U | 156 U |
| RDX | **331 J** | 98.4 U | 98.4 U | **277 J** |
| Tetryl | 98.4 U | 98.4 U | 98.4 U | 93.8 U |
| **METAL(MG/KG)** | | | | |
| Aluminum | **1670** | **3330** | **1480** | **2340** |
| Antimony | 0.447 UJ | 0.522 UJ | 0.465 UJ | **0.791 J** |
| Arsenic | 0.335 U | **0.256 J** | 0.348 U | 0.379 U |
| Barium | **6.99** | **10** | **3.61** | **5.98** |
| Beryllium | 0.112 U | 0.131 U | 0.116 U | 0.126 U |
| Cadmium | **1.81** | **0.759** | 0.29 U | **0.622** |
| Calcium | **466** | **1140** | **125 J** | **501** |
| Chromium (hexavalent) | NS | NS | NS | NS |
| Chromium | **2.52** | **11.4** | **2.05** | **2.99** |
| Cobalt | 0.559 U | 0.653 U | 0.581 U | 0.632 U |
| Copper | **11.8** | **10.1** | **1.34** | **5.5** |
| Iron | **542** | **1140** | **201** | **430** |
| Lead | **18.6** | **25.3** | **8.71** | **12.8** |
| Magnesium | 168 U | 196 U | 174 U | 189 U |
| Manganese | **9.97** | **13.3** | **2.57** | **10.3** |
| Mercury | **0.0436** | **0.027 J** | **0.0198 J** | **0.0333 J** |
| Nickel | **1.14** | **1.47** | **0.527 J** | **3.36** |
| Potassium | 168 U | 196 U | 174 U | 189 U |
| Selenium | **0.251 J** | **0.381 J** | **0.244 J** | **0.347 J** |
| Silver | 0.112 U | 0.131 U | 0.116 U | 0.126 U |
| Sodium | 168 U | 196 U | 174 U | 189 U |
| Thallium | 0.224 U | 0.261 U | 0.232 U | 0.253 U |
| Vanadium | **1.44** | **2.47** | **1.29** | **1.74** |
| Zinc | **52.6** | **231** | **12** | **65.7** |

| StationID | IR06-GW26 | IR06-GW31 | IR06-MW03 | IR06-MW03 | MR22-MW01 | MR22-MW01 | MR22-MW02 | MR22-MW03 |
|---|---|---|---|---|---|---|---|---|
| SampleID | IR06-GW26-11D | IR06-GW31-11D | IR06-GW03-11D | IR06-GW03D-11D | MR22-MW01-12A | MR22-MW01D-12A | MR22-GW02-11D | MR22-GW03-11D |
| SampleDate | 12/12/2011 | 12/16/2011 | 12/16/2011 | 12/16/2011 | 2/7/2012 | 2/7/2012 | 12/19/2011 | 12/14/2011 |
| AnalyteName | | | | | | | | |
| **SVOA(UG/L)** | | | | | | | | |
| 2,4-Dinitrotoluene | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.157 U | 0.16 U | 0.16 U | 0.157 U |
| 2,6-Dinitrotoluene | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.157 U | 0.16 U | 0.16 U | 0.157 U |
| Nitrobenzene | 0.151 U | 0.157 U | 0.16 U | 0.154 U | **0.306 J** | **0.304 J** | 0.16 U | 0.157 U |
| **EXPLO(UG/L)** | | | | | | | | |
| 1,3,5-Trinitrobenzene | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.157 UJ | 0.16 UJ | 0.16 U | **0.583 J** |
| 1,3-Dinitrobenzene | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.157 U | 0.16 U | 0.16 U | 0.157 U |
| 2,4,6-Trinitrotoluene | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.157 U | 0.16 U | 0.16 U | 0.157 U |
| 2-Amino-4,6-dinitrotoluene | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.339 U | 0.245 U | 0.16 U | 0.157 U |
| 2-Nitrotoluene | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.157 U | 0.16 U | 0.16 U | 0.157 U |
| 3-Nitrotoluene | 0.35 U | 0.157 U | 0.16 U | 0.154 U | **0.372 J** | **0.421 J** | 0.16 U | 0.551 U |
| 4-Amino-2,6-dinitrotoluene | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.157 U | 0.16 U | 0.16 U | 0.157 U |
| 4-Nitrotoluene | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.157 U | 0.16 U | 0.16 U | 0.157 U |
| HMX | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.157 U | 0.16 U | 0.16 U | 0.157 U |
| Nitroglycerin | 0.377 U | 0.392 U | 0.4 U | 0.385 U | 0.392 U | 0.4 U | 0.4 U | 0.392 U |
| Perchlorate | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | **0.554 J** | 1 U |
| PETN | 0.377 U | 0.392 U | 0.4 U | 0.385 U | 0.392 U | 0.4 U | 0.4 U | 0.392 U |
| RDX | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.157 U | 0.16 U | 0.16 U | 0.157 U |
| Tetryl | 0.151 U | 0.157 U | 0.16 U | 0.154 U | 0.157 U | 0.16 U | 0.16 U | 0.157 U |
| **METAL(UG/L)** | | | | | | | | |
| Aluminum | **141** | **31.8 J** | **87.8** | **84.2** | **35.1 J** | **40.2 J** | **73.5** | **142** |
| Antimony | **5.3** | 2 U | **2.55** | **2.6** | 2 U | 2 U | **15.1** | 2 U |
| Arsenic | 1.5 U | 1.5 U | 1.5 U | 1.5 U | 1.5 U | 1.5 U | 1.5 U | 1.5 U |
| Barium | **28.8** | **48.3** | **37.2** | **36.8** | **23.6** | **23.1** | **26.9** | **26.1** |
| Beryllium | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| Cadmium | **0.282 J** | 0.5 U | **6.06** | **6.08** | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| Calcium | **60800** | **72800** | **41300** | **40100** | **31200** | **30000** | **49500** | **43100** |
| Chromium | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | **0.546 J** |
| Cobalt | 2.5 U | 2.5 U | 2.5 U | 2.5 U | 2.5 U | 2.5 U | 2.5 U | 2.5 U |
| Copper | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U | 2 U |
| Iron | **604** | **750** | **41.6** | **41.2** | **127** | **127** | **51** | **405** |
| Lead | 0.75 U | 0.75 U | 0.75 U | 0.75 U | 0.75 U | 0.75 U | 0.75 U | 0.75 U |
| Magnesium | **2210** | **2530** | **2310** | **2270** | **5190 J** | **4920 J** | **2710** | **1340** |
| Manganese | **2.18 J** | **17.1** | **3.95** | **4.01** | **24.7** | **24.4** | **26.9** | **198** |
| Mercury | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U |
| Nickel | 1.5 U | 1.5 U | 1.5 U | 1.5 U | **0.895 J** | **0.892 J** | 1.5 U | **0.93 J** |
| Potassium | **420 J** | **2810** | **3280** | **3240** | **1080 J** | **1050 J** | **2080** | **510 J** |
| Selenium | **1.57 J** | **3.27** | **3.73** | **3.6** | 1.25 U | 1.25 U | **2.35 J** | 1.25 U |
| Silver | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| Sodium | **3210** | **3470** | **4700** | **4640** | **4340 J** | **4120 J** | **3060** | **4840** |
| Thallium | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U |
| Vanadium | **7.49** | 2.5 U | 2.5 U | 2.5 U | 2.5 U | 2.5 U | 2.5 U | **1.6 J** |
| Zinc | **225** | **1.88 J** | **164** | **163** | **1.73 J** | **1.82 J** | 2.5 U | 2.5 U |
| **FMETAL(UG/L)** | | | | | | | | |
| Aluminum, Dissolved | NS | NS | **34.7 J** | **35.7 J** | **23.9 J** | **24.7 J** | NS | NS |
| Antimony, Dissolved | NS | NS | **2.65** | **2.5 J** | 2 U | 2 U | NS | NS |
| Arsenic, Dissolved | NS | NS | 1.5 U | 1.5 U | 1.5 U | 1.5 U | NS | NS |
| Barium, Dissolved | NS | NS | **35.6** | **35.8** | **22.2** | **24.9** | NS | NS |
| Beryllium, Dissolved | NS | NS | 0.5 U | 0.5 U | 0.5 U | 0.5 U | NS | NS |
| Cadmium, Dissolved | NS | NS | **5.86** | **5.81** | 0.5 U | 0.5 U | NS | NS |

| StationID | IR06-GW26 | IR06-GW31 | IR06-MW03 | IR06-MW03 | MR22-MW01 | MR22-MW01 | MR22-MW02 | MR22-MW03 |
|---|---|---|---|---|---|---|---|---|
| SampleID | IR06-GW26-11D | IR06-GW31-11D | IR06-GW03-11D | IR06-GW03D-11D | MR22-MW01-12A | MR22-MW01D-12A | MR22-GW02-11D | MR22-GW03-11D |
| SampleDate | 12/12/2011 | 12/16/2011 | 12/16/2011 | 12/16/2011 | 2/7/2012 | 2/7/2012 | 12/19/2011 | 12/14/2011 |
| AnalyteName | | | | | | | | |
| SVOA(UG/L) | | | | | | | | |
| Calcium, Dissolved | NS | NS | **39200** | **39400** | **29600** | **34100** | NS | NS |
| Chromium, Dissolved | NS | NS | 1 U | 1 U | 1 U | 1 U | NS | NS |
| Cobalt, Dissolved | NS | NS | 2.5 U | 2.5 U | 2.5 U | 2.5 U | NS | NS |
| Copper, Dissolved | NS | NS | 2 U | **2.07 J** | 2 U | 2 U | NS | NS |
| Iron, Dissolved | NS | NS | **13.6 J** | **17.4 J** | **136** | **133** | NS | NS |
| Lead, Dissolved | NS | NS | 0.75 U | 0.75 U | 0.75 U | 0.75 U | NS | NS |
| Magnesium, Dissolved | NS | NS | **2200** | **2210** | **4930 J** | **5560 J** | NS | NS |
| Manganese, Dissolved | NS | NS | **3.91** | **4.35** | **23.3** | **27** | NS | NS |
| Mercury, Dissolved | NS | NS | 0.2 U | 0.2 U | 0.2 U | 0.2 U | NS | NS |
| Nickel, Dissolved | NS | NS | 1.5 U | **1.45 J** | **0.977 J** | **0.931 J** | NS | NS |
| Potassium, Dissolved | NS | NS | **3140** | **3170** | **1040 J** | **1180 J** | NS | NS |
| Selenium, Dissolved | NS | NS | **3.61** | **3.34** | 1.25 U | 1.25 U | NS | NS |
| Silver, Dissolved | NS | NS | 0.5 U | 0.5 U | 0.5 U | 0.5 U | NS | NS |
| Sodium, Dissolved | NS | NS | **4450** | **4440** | **4090 J** | **4550 J** | NS | NS |
| Thallium, Dissolved | NS | NS | 1 U | 1 U | 1 U | 1 U | NS | NS |
| Vanadium, Dissolved | NS | NS | 2.5 U | 2.5 U | 2.5 U | 2.5 U | NS | NS |
| Zinc, Dissolved | NS | NS | **159** | **160** | 2.5 U | 2.5 U | NS | NS |
| WCHEM() | | | | | | | | |
| Hardness (MG/L) | NS | **188** | **99** | **104** | NS | NS | **129** | NS |

| StationID | MR22-SD01 | MR22-SD02 | MR22-SD02 |
|---|---|---|---|
| **SampleID** | **MR22-SD01-12A** | **MR22-SD02-12A** | **MR22-SD02D-12A** |
| **SampleDate** | **3/19/2012** | **3/19/2012** | **3/19/2012** |
| **AnalyteName** | | | |
| **SVOA(UG/KG)** | | | |
| 2,4-Dinitrotoluene | 174 U | 182 U | 167 U |
| 2,6-Dinitrotoluene | 174 U | 182 U | 167 U |
| Nitrobenzene | 174 U | 182 U | **137 J** |
| **EXPLO(UG/KG)** | | | |
| 1,3,5-Trinitrobenzene | 174 U | 182 U | 167 U |
| 1,3-Dinitrobenzene | 174 U | 182 U | 167 U |
| 2,4,6-Trinitrotoluene | 174 U | 182 U | 167 U |
| 2-Amino-4,6-dinitrotoluene | 174 U | 182 U | 167 U |
| 2-Nitrotoluene | 174 U | 182 U | **370** |
| 3-Nitrotoluene | 174 U | 182 U | 167 U |
| 4-Amino-2,6-dinitrotoluene | 174 UJ | 182 U | **98.8 J** |
| 4-Nitrotoluene | 174 U | 182 U | 167 U |
| HMX | 174 U | 182 U | 167 U |
| Nitroglycerin | 435 U | 455 U | 417 U |
| Perchlorate | 15.2 U | 13.8 U | 21 U |
| PETN | 435 U | 455 U | 417 U |
| RDX | 174 U | 182 U | 167 U |
| Tetryl | 174 U | 182 UJ | 167 UJ |
| **METAL(MG/KG)** | | | |
| Aluminum | **3500** | **5950** | **6080** |
| Antimony | **2.48 J** | **1.71 J** | **1.74 J** |
| Arsenic | **10.3 J** | **5.15** | **4.75** |
| Barium | **42.9** | **93** | **90.7** |
| Beryllium | **0.142 J** | **0.347 J** | **0.35 J** |
| Cadmium | **10 J** | **3.5 J** | **3.5 J** |
| Calcium | **1570** | **5360** | **5210** |
| Chromium | **14.1 J** | **10.2 J** | **10.4 J** |
| Cobalt | **1.99** | **2.24** | **2.22 J** |
| Copper | **421** | **61.5** | **62.4** |
| Iron | **11900** | **7940** | **6410** |
| Lead | **594** | **95.9** | **95** |
| Magnesium | **144 J** | **335 J** | **346 J** |
| Manganese | **4740** | **254** | **259** |
| Mercury | **19.8 J** | **0.798 J** | **0.881 J** |
| Nickel | **12 J** | **7.69** | **7.66** |
| Potassium | **153 J** | **413 J** | **459 J** |
| Selenium | 7.78 U | **1.36** | **1.45 J** |
| Silver | 3.11 U | 0.266 U | 0.418 U |
| Sodium | 233 U | 399 U | 627 U |
| Thallium | **9.59 J** | **0.432 J** | 0.837 U |
| Vanadium | **18.8 J** | **12.6** | **12.8** |
| Zinc | **11600** | **502** | **453** |
| **WCHEM()** | | | |
| Total organic carbon (TOC) (MG/KG) | **45200 N** | **110000 N** | **111000 N** |
| **GRAINSIZE(PCT)** | | | |
| Coarse Sand (%) | **0.9** | **0.8** | **0.9** |
| Fine Sand (%) | **81.5** | **79.1** | **68.1** |
| Fines (%) | **11.2** | **16.8** | **27.9** |
| Gravel (%) | **1.2** | **0.5** | **0.4** |
| Medium Sand (%) | **5.2** | **2.8** | **2.7** |
| Sand (%) | **87.6** | **82.7** | **71.7** |
| **GRAINSIZE(PCT/P)** | | | |
| GS03 Sieve 3" (75 mm) | **100** | **100** | **100** |
| GS05 Sieve 2" (50 mm) | **100** | **100** | **100** |
| GS06 Sieve 1.5" (37.5 mm) | **100** | **100** | **100** |
| GS07 Sieve 1" (25.0 mm) | **100** | **100** | **100** |
| GS08 Sieve 0.75" (19.0 mm) | **100** | **100** | **100** |
| GS10 Sieve 0.375" (9.5 mm) | **100** | **100** | **100** |

| StationID | MR22-SD01 | MR22-SD02 | MR22-SD02 |
| --- | --- | --- | --- |
| **SampleID** | **MR22-SD01-12A** | **MR22-SD02-12A** | **MR22-SD02D-12A** |
| **SampleDate** | **3/19/2012** | **3/19/2012** | **3/19/2012** |
| **AnalyteName** | | | |
| Sieve No. 004 (4.75 mm) | **98.8** | **99.5** | **99.6** |
| Sieve No. 010 (2.00 mm) | **97.9** | **98.7** | **98.7** |
| Sieve No. 020 (850 um) | **96.5** | **97.8** | **97.7** |
| Sieve No. 040 (425 um) | **92.7** | **95.9** | **96** |
| Sieve No. 060 (250 um) | **78.3** | **86.6** | **88.2** |
| Sieve No. 080 (180 um) | **48.2** | **59.7** | **65.6** |
| Sieve No. 100 (150 um) | **26.1** | **35.6** | **45** |
| Sieve No. 200 (75 um) | **11.2** | **16.8** | **27.9** |

**CHECKLIST FOR ECOLOGICAL ASSESSMENTS/SAMPLING**

**I. SITE LOCATION**

1. Site Name **Camp Lejeune Site UXO-22**
US EPA ID Number ____________________
Location **Camp Lejeune**
County **Onslow** City **Jacksonville** State **North Carolina**

2. Latitude **34°41' 24" N** Longitude **77°19'41" W**

3. Attach site maps, including a topographical map, a diagram which illustrates the layout of the facility (e.g., site boundaries, structures, etc.), and maps showing all habitat areas identified in Section III of the checklist. Also, include maps which illustrate known and suspected release areas, sampling locations and any other important features, if available.

**II. SITE CHARACTERIZATION**

1. Indicate the approximate area of the site (i.e., acres or sq. ft.) **75 acres**

2. Is this the first site visit? □ Yes ■ No
If no, attach trip report of previous site visit(s), if available.

Dates(s) of previous site visit(s) **CH2M HILL conducts annual LTM at Sites 6 and 82, and conducted the Site 6 Chlorobenzene Supplemental Investigation in 2011**

3. Are aerial or other site photographs available? ■ Yes □ No
If yes, please attach any available photo(s) to the site map to the report. **See attached**

4. Provide an approximate breakdown of the land uses on the site:

| | | |
|---|---|---|
| _____% Heavy Industrial | **40** % Light Industrial | _____% Urban |
| _____% Residential | _____% Rural | _____% Agricultural[b] |
| _____% Recreational[a] | **60** % Undisturbed | __% Other[c] |

[a]For recreational areas, please describe the use of the area (e.g., park, playing field, etc).
____________________

[b]For agricultural areas, please list the crops and/or livestock which are present.
____________________

[c]For areas designated as "other," please describe the use of the area.

5. Provide an approximate breakdown of the land uses in the area surrounding the site. Indicate the radius (in miles) of the area described: **approximately ½ mile radius**

| | | |
|---|---|---|
| _____% Heavy Industrial | __45_% Light Industrial | ___% Urban |
| ___% Residential | _____% Rural | _____% Agricultural[b] |
| _5__% Recreational[a] | _50__% Undisturbed | _____% Other [c] |

[a]For recreational areas, please describe the use of the area (e.g., park, playing field, golf course, etc).
**Paved hiking/recreational trail outside of site boundary, paved trails run parallel to Holcomb Blvd and Piney Green Road.**

[b]For agricultural areas, please list the crops and/or livestock which are present.
_______________________________________________

[c]For areas designated as "other," please describe the use of the area.
_______________________________________________
_______________________________________________

6. Has any movement of soil taken place at the site? ■ **Yes**
If yes, indicate the likely source of the disturbance, (e.g., erosion, agricultural, mining, industrial activities, removals, etc.) degree of disturbance, and estimate when these events occurred. ____**Test pit excavation and trenching activities began in 1993 with additional excavations in 1997, 2001, 2009, and 2011.**

7. Do any sensitive environmental areas exist adjacent to or in proximity to the site, (e.g. Federal and State parks, National and State monuments, wetlands)? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information. See Table 1 for a list of contacts.* **Yes, wetlands occur approximately 400 feet from the site on the west side of Holcomb Boulevard, approximately 250 feet north of the site boundary, and 2,000 feet south of the site boundary.**

Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map. **Site map with GIS wetland layer**

8. What type of facility is located at the site?

☐ Chemical ☐ Manufacturing ☐ Mixing

☐ Waste Disposal ■ Other (specify)
**DRMO storage lots, subcontractor field trailers, water treatment plant, railroad tracks**

9. Identify the contaminants of potential concern (COPCs) at the site. If known, include the maximum contaminant levels. Please indicate the source of data cited (e.g., RFI, confirmatory sampling, etc).
**Explosives residues and metals were detected in subsurface soil and groundwater samples during the 2012 PA/SI investigation.**

10. Check any potential routes of off-site migration of contaminants observed at the site:

☐ Swales ☐ Depressions ■ Drainage Ditches

■ Runoff ☐ Windblown Particulates ■ Vehicular Traffic

☐ Other (specify):

11. Indicate the approximate depth to groundwater (in feet below ground surface [(bgs)].
**5-15 ft bgs**

12. Indicate the direction of groundwater flow (e.g., north, southeast, etc.)
**North towards Wallace Creek**

13. Is the direction of surface runoff apparent from site observations? ■ Yes ☐ No
If yes, to which of the following does the surface runoff discharge? Indicate all that apply.

■ Surface water ■ Groundwater ☐ Sewer

☐ Collection Impoundment

14. Is there a navigable water body or tributary to a navigable water body?
☐ Yes ■ No

15. Is there a water body anywhere on or in the vicinity of the site? If yes, also complete Section III.B.1: Aquatic Habitat Checklist -- Non-Flowing Systems and/or Section III.B.2: Aquatic Habitat Checklist -- Flowing Systems.

■ **Yes** (approx. distance **Wallace Creek is 1,000 feet north of the site boundary, and an ephemeral drainage that discharges into Wallace Creek is present in the northwest corner of the site boundary)**

16. Is there evidence of flooding? ☐ Yes ■ No
*Wetlands and flood plains are not always obvious. Do not answer "no" without confirming information.* If yes, complete Section III.C: Wetland Habitat Checklist.

17. If a field guide was used to aid any of the identifications, please provide a reference. Also, estimate the time spent identifying fauna. (Use a blank sheet if additional space is needed for text.)

18. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site? ☐ Yes ■ No
If yes, you are required to verify this information with the U.S. Fish and Wildlife Service or other appropriate agencies (see Table 1 for a list of contacts). If species' identities are known, please list them next.

19. Record weather conditions at the site at the time of the site visit when information for completion of this checklist was prepared:

DATE ___**3/19/2012**____

__78__Temperature (°F)

Wind (direction/speed):
**South at 10-15 mph**

Cloud Cover:
**Scattered clouds**

Normal daily high temperature (°C/°F): **68**°F

Precipitation (rain, snow): **None**

20. Describe reasonable and likely future land and/or water use(s) at the site.
**Continued use as DRMO storage lot.**

21. Describe the historical uses of the site. Include information on chemical releases that may have occurred as a result of previous land uses. For each chemical release, provide information on the form of the chemical released (i.e., solid, liquid, vapor) and the known or suspected causes or mechanism of the release (i.e., spills, leaks, material disposal, dumping, explosion, etc.).

**Historically, these areas of re-worked earth at Site UXO-22 were used for disposal and storage of wastes and supplies, including pesticides, transformers containing polychlorinated biphenyls (PCBs), solvents, electrolytes, waste oils, and undocumented discarded military munitions (DMM).**

22. Identify the media (e.g., soil [surface or subsurface], surface water, air, groundwater) which are known or suspected to contain COCs.
**Potentially subsurface soil, groundwater, sediment, and surface water.**

## II.A. SUMMARY OF OBSERVATIONS AND SITE SETTING

Include information on significant source areas and migration pathways that are likely to constitute complete exposure pathways.

**Overland runoff to surface water, leaching from soil to groundwater, and groundwater discharge to surface water are the migration pathways that are anticipated to result in complete ecological exposure pathways.**

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## III. HABITAT EVALUATION

### III.A Terrestrial Habitat Checklist

### III.A.1 Wooded

Are any wooded areas on or adjacent to the site? ■ Yes □ No

If yes, indicate the wooded area on the attached site map and answer the following questions. If more than one wooded area is present on or adjacent to the site, make additional copies of the following questions and fill out for each individual wooded area. Distinguish between wooded areas by using names or other designations, and clearly identify each area on the site map.

If no, proceed to Section III.A.2: Shrub/Scrub

**Wooded Area Questions**

■ On-site ■ Off-site

Name or Designation:_______________________________________________

1. Estimate the approximate size of the wooded area (**60**% of the site)
   Please identify what information was used to determine the wooded area of the site (e.g., direct observation, photos, etc). **Direct observations and aerial photos**

2. Indicate the dominant type of vegetation in the wooded area. Provide photographs, if available.

   - □ Evergreen
   - □ Deciduous
   - ■ Mixed

   Dominant plant species, if known:_ **Loblolly pine (*Pinus taeda*)**_

3. Estimate the vegetation density of the wooded area.

   - □ Dense (i.e., greater than 75% vegetation)
   - ■ Moderate (i.e., 25% to 75% vegetation)
   - □ Sparse (i.e., less than 25% vegetation)

4. Indicate the predominant size of the trees at the site. Use diameter at breast height.

   - □ 0-6 inches
   - ■ 6-12 inches
   - □ >12 inches
   - □ No single size range is predominant

5. Specify type of understory present, if known. Provide a photograph, if available.
**<u>Understory is mostly herbaceous with some shrubs and vines.</u>**

## III.A.2 Shrub/Scrub

Are any shrub/scrub areas on or adjacent to the site? □ Yes ■ No

If yes, indicate the shrub/scrub area on the attached site map and answer the following questions. If more than one shrub/scrub area is present on or adjacent to the site, make additional copies of the following questions and fill out for each individual shrub/scrub area. Distinguish between shrub/scrub areas, using names or other designations, and clearly identify each area on the site map.

If no, proceed to Section III.A.3: Open Field

## III.A.3 Open Field

Are any open field areas on or adjacent to the site? ■ Yes □ No

If yes, indicate the open field area on the attached site map and answer the following questions. If more than one open field area is present on or adjacent to the site, make additional copies of the following questions and fill out for each individual open field area. Distinguish between open field areas, using names or other designations, and clearly identify each area on the site map.

If no, proceed to Section III.A.4: Miscellaneous

### Open Field Area Questions

■ On-site □ Off-site

Name or Designation: **<u>Inside DRMO lot</u>**

1. Estimate the approximate size of the open field area (**<u>15</u>**% of the site). Please identify what information was used to determine the open field area of the site. **<u>Site map and site visits</u>**

2. Indicate the dominant type of vegetation present, if known.
**<u>Short grasses and shrubs up to 2 feet high</u>**

3. Estimate the vegetation density of the shrub/scrub area.
   - □ Dense (i.e., greater than 75% vegetation)
   - □ Moderate (i.e., 25% to 75% vegetation)
   - ■ Sparse (i.e., less than 25% vegetation)

4. Indicate the approximate average height of the dominant plant:
**<u>Grasses to 6 inches and shrubs to 2 feet</u>**

**III.A.4 Miscellaneous**

Are other types of terrestrial habitats present at the site, other than woods, scrub/shrub and open field? □ Yes ■ No

If yes, indicate the area on the attached site map and answer the following questions. If more than one of these areas are present on or adjacent to the site, make additional copies of the following questions and fill out for each individual area. Distinguish between areas by using names or other designations. Clearly identify each area on the site map.

If no, proceed to Section III.B: Aquatic Habitats.

**III.B Aquatic Habitats**

*Note: Aquatic systems are often associated with wetland habitats. Please refer to Section III.C, Wetland Habitat Checklist.*

**III.B.1 Non-Flowing Systems**

Are any non-flowing aquatic features (such as ponds or lakes) located at or adjacent to the site?

□ Yes ■ No

If yes, indicate the aquatic feature on the attached site map and answer the following questions regarding the non-flowing aquatic features. If more than one non-flowing aquatic feature is present on or adjacent to the site, make additional copies of the following questions and fill out for each individual aquatic feature. Distinguish between aquatic features by using names or other designations. Clearly identify each area on the site map.

If no, proceed to Section III.B.2: Flowing Systems

**III.B.2 Flowing Systems**

*Note: Aquatic systems are often associated with wetland habitats. Please refer to Section III.C, Wetland Habitat Checklist.*

Are any flowing aquatic features (such as streams or rivers) located at or adjacent to the site?

■ Yes □ No

If yes, indicate the system on the attached site map and answer the following questions regarding the flowing system. If more than one flowing system is present on or adjacent to the site, make additional copies of the following questions and complete one set for each individual aquatic feature. Distinguish between flowing systems by using names or other designation. Clearly identify each area on the site map

If no, proceed to Section III.C: Wetlands Habitats.

## Flowing Aquatic Systems Questions

☐ On-site ■ Off-site

Name or Designation: **Wallace Creek north of UXO-22**

1. Indicate the type of flowing aquatic feature present.

   - ☐ River
   - ■ Stream/Creek/Brook
   - ☐ Intermittent stream
   - ☐ Artificially created (ditch, etc.)
   - ☐ Channeling
   - ☐ Other (specify)

2. For natural systems, are there any indicators of physical alteration (e.g., channeling, debris, etc.)?
   ☐ Yes ■ No
   If yes, please describe the indicators observed.

3. Indicate the general composition of the bottom substrate.

| | | |
|---|---|---|
| ☐ Bedrock | ■ Sand (coarse) | ☐ Concrete |
| ☐ Boulder (>10 in.) | ☐ Silt (fine) | ☐ Debris |
| ☐ Cobble (2.5 - 10 in.) | ☐ Clay (slick) | ☐ Detritus |
| ☐ Gravel (0.1 - 2.5 in.) | ☐ Muck (fine/black) | ☐ Marl (Shells) |

   ☐ Other (please specify):____________________________________

4. Describe the condition of the bank (e.g., height, slope, extent of vegetative cover).
   **Steep in some areas**

5. Is the system influenced by tides? ☐ Yes ■ No
   What information was used to make this determination?

6. Is the flow intermittent? ☐ Yes ■ No
   If yes, please note the information used to make this determination.

7. Is there a discharge from the site to the water body? ■ Yes ☐ No
   If yes, describe the origin of each discharge and its migration path.
   **Groundwater and surface water runoff during storm events**.

8. Indicate the discharge point of the water body. Specify name of the discharge, if known.
   __**Wallace Creek discharges into the New River**

9. Identify any field measurements and observations of water quality that were made. Provide the measurement and the units of measure in the appropriate space below:

NA Width (ft.)

NA Depth (average)

NA Velocity (specify units):______________

NA Temperature (depth of water where the reading was taken)_____

NA pH

NA Dissolved oxygen

NA Salinity

NA Turbidity (clear, slightly turbid, turbid, opaque)
(Secchi disk depth_____)

NA Other (specify)

10. Describe observed color and area of coloration. **None observed during site investigation**

11. Is any aquatic vegetation present? ☐ Yes ■ No
If yes, please identify the type of vegetation present, if known.

☐ Emergent ☐ Submergent ☐ Floating

12. Mark the flowing water system on the attached site map.

**13.** What observations were made at the water body regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc? **None observed during site investigation**

## III.C Wetland Habitats

Are any wetland[1] areas such as marshes or swamps on or adjacent to the site?

■ Yes ☐ No

If yes, indicate the wetland area on the attached site map and answer the following questions regarding the wetland area. If more than one wetland area is present on or adjacent to the site, make additional copies of the following questions and fill out one for each individual wetland area. Distinguish between wetland areas by using names or other designations (such as location). Clearly identify each area on the site map. Also, obtain and attach a National Wetlands Inventory Map (or maps) to illustrate each wetland area.

Identify the sources of the observations and information (e.g., National Wetland Inventory, Federal or State Agency, USGS topographic maps) used to make the determination whether or not wetland areas are present. **Site map with GIS planning and jurisdictional wetland overlay**

If no wetland areas are present, proceed to Section III.D: Sensitive Environments and Receptors.

### Wetland Area Questions

☐ On-site ■ Off-site

Name or Designation: **Wetlands located approximately 400 feet west of the site, 250 feet north of site, and 2,000 feet south of site**

1. Indicate the approximate area of the wetland (acres or ft.$^2$) **70 acres**

2. Identify the type(s) of vegetation present in the wetland.

   - ☐ Submergent (i.e., underwater) vegetation
   - ☐ Emergent (i.e., rooted in the water, but rising above it) vegetation
   - ☐ Floating vegetation
   - ☐ Scrub/shrub
   - ■ Wooded
   - ☐ Other (Please describe):________________________________

3. Provide a general description of the vegetation present in and around the wetland (height, color, etc). Provide a photograph of the known or suspected wetlands, if available.

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[1]Wetlands are defined in 40 CFR §232.2 as " Areas inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Examples of typical wetlands plants include: cattails, cordgrass, willows and cypress trees. National wetland inventory maps may be available at http:\\nwi.fws.gov. Additional information on wetland delineation criteria is also available from the Army Corps of Engineers.

**Wooded areas consisting of mixed hardwood and pine with shrubby understory containing palmettos**

4. Estimate the vegetation density of the wetland area.

   - ❑ Dense (i.e., greater than 75% vegetation)
   - ■ Moderate (i.e., 25% to 75% vegetation)
   - ❑ Sparse (i.e., less than 25% vegetation)

5. Is standing water present? ☐ Yes ■ No
   If yes, is the water primarily: ☐ Fresh ■ Brackish
   Indicate the approximate area of the standing water (ft.$^2$) **unknown**
   Indicate the approximate depth of the standing water, if known (ft. or in.) **unknown**

6. Identify any field measurements and observations of water quality that were made. Provide the measurement and the units of measure in the appropriate space below:

   NA Area

   NA Depth (average)

   NA Temperature (depth of water where the reading was taken)_____

   NA pH

   NA Dissolved oxygen

   NA Salinity

   NA Turbidity (clear, slightly turbid, turbid, opaque)
   (Secchi disk depth_____)

   NA Other (specify)

7. Describe observed color and area of coloration.
   **None observed**

8. If known, indicate the source of the water in the wetland.

   - ■ Stream/River/Creek/Lake/Pond
   - ❑ Flooding
   - ❑ Groundwater
   - ❑ Surface runoff

9. Is there a discharge from the site to the wetland? ■ Yes ☐ No
   If yes, please describe: **Groundwater potentially discharges to the wetlands surrounding Wallace Creek**

**Wetland Area Questions (Continued)**

10. Is there a discharge from the wetland? ■ Yes ☐ No

If yes, to what water body is discharge released?

- ☐ Marine (Name:________________________)
- ■ Surface stream/River (Name: **Wallace Creek**________________)
- ☐ Lake/Pond (Name:________________________)
- ☐ Groundwater
- ☐ Not sure

11. Does the area show evidence of flooding? ■ Yes ☐ No

If yes, indicate which of the following are present (mark all that apply).

- ☐ Standing water
- ■ Water-saturated soils
- ☐ Water marks
- ☐ Buttressing
- ☐ Debris lines
- ☐ Mud cracks
- ☐ Other (Please describe):________________________________

11. If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.

13. Mark the observed wetland area(s) on the attached site map.

## III.D Sensitive Environments and Receptors

1. Do any other potentially sensitive environmental areas[2] exist adjacent to or within one-half mile of the site? If yes, list these areas and provide the source(s) of information used to identify sensitive areas. *Do not answer "no" without confirmation from the U.S. Fish and Wildlife Service and other appropriate agencies. See Table 1 for a list of contacts.*
   **Yes, Wetlands occur approximately 400 feet west of site, 250 ft north of site, and 2,000 ft south of site.**

2. Are any areas on or near (i.e., within one-half mile) the site owned or used by local tribes? If yes, describe.
   **No**

3. Does the site serve or potentially serve as a habitat, foraging area or refuge by rare, threatened, endangered, candidate and/or proposed species (plants or animals), or any otherwise protected species? If yes, identify species. *This information should be obtained from the U.S. Fish and Wildlife Service and other appropriate agencies. See Table 1 for a list of contacts.*
   **No**

4. Is the site potentially used as a breeding, roosting or feeding area by migratory bird species? If yes, identify which species.
   **Unknown**

5. Is the site used by any ecologically[3], recreationally or commercially important species? If yes, explain.
   **No**

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[3] Areas that provide unique and often protected habitat for wildlife species. These areas are typically used during critical life stages such as breeding, hatching, rearing of young and overwintering. Refer to Table 2 at the end of this document for examples of sensitive environments.

[3] Ecologically important species include populations of species which provide a critical (i.e., not replaceable) food resource for higher organisms. These species' functions would not be replaced by more tolerant species or perform a critical ecological function (such as organic matter decomposition) and will not be replaced by other species. Ecologically important species include pest and opportunistic species that populate an area if they serve as a food source for other species, but do not include domesticated animals (e.g., pets and livestock) or plants/animals whose existence is maintained by continuous human interventions (e.g., fish hatcheries, agricultural crops, etc).

## IV. EXPOSURE PATHWAY EVALUATION

1. Do existing data provide sufficient information on the nature, rate and extent of contamination at the site?

■ Yes
❑ No
❑ Uncertain

Please provide an explanation for your answer. **Data were collected from each medium across the site, providing representative samples for the area of concern.**

2. Do existing data provide sufficient information on the nature, rate and extent of contamination in offsite affected areas?

■ Yes
❑ No
❑ Uncertain
❑ No offsite contamination

Please provide an explanation for your answer **Data collected from within the site indicates offsite migration has occurred. Sediment sample collected from an ephemeral drainage off the northwest corner of the site had high metals concentrations. Extent of transport off the site has not been determined.**

3. Do existing data address potential migration pathways of contaminants at the site?

■ Yes
❑ No
❑ Uncertain

Please provide an explanation for your answer. **Data were collected based on potential migration pathways (i.e. overland flow, leaching, and groundwater transport).**

4. Do existing data address potential migration pathways of contaminants in offsite affected areas?

❑ Yes
❑ No
❑ Uncertain
■ No offsite contamination

Please provide an explanation for your answer **Concentrations of COPCs in groundwater and sediment are not expected to be high enough to cause any discernable impact to Wallace Creek and the New River. However, overland flow from the site to downgradient wetlands is a concern.**

5. Are there visible indications of stressed habitats or receptors on or near (i.e., within one-half mile) the site that may be the result of a chemical release? If yes, explain. Attach photographs if available. **No**

6. Is the location of the contamination such that receptors might be reasonably expected to come into contact with it? For soil, this means contamination in the soil 0 to 1 foot below ground surface (bgs). If yes, explain.
**Yes, COPCs were detected in sediment samples from the drainage.**

7. Are receptors located in or using habitats where chemicals exist in air, soil, sediment or surface water? If yes, explain.
**None were observed during the site investigation. However, the forested areas and open field provide suitable terrestrial habitat for receptors.**

8. Could chemicals reach receptors via groundwater? Can chemicals leach or dissolve to groundwater? Are chemicals mobile in groundwater? Does groundwater discharge into receptor habitats? If yes, explain.
**Shallow groundwater at the site flows north toward Wallace Creek. The low level concentrations will likely dilute and attenuate upon discharging to Wallace Creek and the New River to the extent that aquatic receptors would not be at risk.**

9. Could chemicals reach receptors through runoff or erosion? Answer the following questions.

What is the approximate distance from the contaminated area to the nearest watercourse?

- ❑ 0 feet (i.e., contamination has reached a watercourse)
- ❑ 1-10 feet
- ❑ 11-20 feet
- ❑ 21-50 feet
- ❑ 51-100 feet
- ❑ 101-200 feet
- ❑ > 200 feet
- ■ > 500 feet
- ❑ > 1000 feet

What is the slope of the ground in the contaminated area?

- ■ 0-10%
- ❑ 10-30%
- ❑ > 30%

What is the approximate amount of ground and canopy vegetative cover in the contaminated area?

- ■ < 25%
- ❑ 25-75%
- ❑ > 75%

Is there visible evidence of erosion (e.g., a rill or gully) in or near the contaminated area?

- ❑ Yes
- ■ No
- ❑ Do not know

Do any structures, pavement or natural drainage features direct run-on flow (i.e., surface flows originating upstream or uphill from the area of concern) into the contaminated area?

- ❑ Yes
- ❑ No
- ■ Do not know

10. Could chemicals reach receptors through the dispersion of contaminants in air (e.g., volatilization, vapors, fugitive dust)? If yes, explain.
 **No**

11. Could chemicals reach receptors through migration of non-aqueous phase liquids (NAPLs)? Is a NAPL present at the site that might be migrating towards receptors or habitats? Could NAPL discharge contact receptors or their habitat?
 **No**