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FEASIBILITY STUDY REPORT FOR MUNITIONS REMOVAL AT OPERABLE UNIT 5 (OU5
SITE 15 BLUE 10 ORDNANCE DISPOSAL AREA NAS CECIL FIELD FL
7/1/2012
TETRA TECH

# Comprehensive Long-term Environmental Action Navy

CONTRACT NUMBER N62470-08-D-1001

Rev. 4
07/12

# Feasibility Study Report for Munitions Removal

## at Operable Unit 5, Site 15 Blue 10 Ordnance Disposal Area

## Naval Air Station Cecil Field Jacksonville, Florida

## Contract Task Order JM09

## July 2012


Naval Facilities Engineering Command
NAVFAC SOUTHEAST
NAS Jacksonville
Jacksonville, Florida 32212-0030

TETRA TECH

# FINAL
# FEASIBILITY STUDY REPORT
# FOR MUNITIONS REMOVAL
# AT
# OPERABLE UNIT 5, SITE 15 - BLUE 10 ORDNANCE DISPOSAL AREA

**FOR**

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**

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

**Submitted to:**
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**CONTRACT NUMBER N62470-08-D-1001**
**CONTRACT TASK ORDER JM09**

**JULY 2012**


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NAVFAC

This document, which describes the Feasibility Study Report for Munitions Removal for Operable Unit 5, Site 15, Naval Air Station Cecil Field, Jacksonville, Florida, was prepared under the direction of a Florida-registered professional engineer. The work and professional opinions rendered in this report were conducted or developed in accordance with commonly accepted procedures consistent with applicable standards of practice.

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# ACRONYMS

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|---|---|
| ABB-ES | ABB Environmental Services, Inc |
| ARAR | Applicable or relevant and appropriate requirement |
| ATFE | Alcohol, Tobacco, Firearms, and Explosives |
| AWQC | Ambient Water Quality Criterion |
| BaPEq | Benzo(a)pyrene equivalent |
| BCT | BRAC Cleanup Team |
| bgs | Below ground surface |
| BIP | Blow-In-Place |
| BRAC | Base Realignment and Closure |
| CAMU | Corrective Action Management Unit |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR | Code of Federal Regulations |
| CKD | Cement kiln dust |
| CLEAN | Comprehensive Long-Term Environmental Action Navy |
| CO | Commanding Officer |
| $CO_2e$ | Carbon dioxide equivalent |
| COC | Chemical of concern |
| COPC | Chemical of Potential Concern |
| CSF | Cancer Slope Factor |
| CSM | Conceptual Site Model |
| CTO | Contract Task Order |
| CWA | Clean Water Act |
| DDE | Dichlorodiphenyldichloroethylene |
| DDESB | Department of Defense Explosive Safety Board |
| DGM | Digital geophysical mapping |
| DMM | Discarded military munitions |
| DoD | Department of Defense |
| DOT | Department of Transportation |
| EM | Engineer Manual |
| EOD | Explosive Ordnance Disposal |
| EP | Engineer Pamphlet |
| ER | Engineer Regulation |
| ESA | Endangered Species Act |

| | |
|---|---|
| ESS | Explosives Safety Submission |
| FAC | Florida Administrative Code |
| FCREPA | Florida Committee on Rare and Endangered Plants and Animals |
| FDEP | Florida Department of Environmental Protection |
| FEMA | Federal Emergency Management Agency |
| FFA | Federal Facility Agreement |
| FS | Feasibility Study |
| FWC | Florida Fish and Wildlife Conservation Commission |
| GAC | Granular activated carbon |
| GCTL | Groundwater cleanup target level |
| GHG | Greenhouse gas |
| GPS | Global positioning system |
| GRA | General response action |
| HA | Hazard Assessment |
| HE | High explosive |
| HLA | Harding Lawson Associates |
| IAS | Initial Assessment Study |
| IGD | Interim Guidance Document |
| IR | Installation Restoration |
| JEDC | Jacksonville Economic Development Commission |
| LDR | Land Disposal Restriction |
| LUC | Land use control |
| MC | Munitions constituents |
| MCL | Maximum Contaminant Level |
| MD | Munitions Debris |
| MDAS | Material documented as safe |
| MDEH | Material documented as an explosive hazard |
| MEC | Munitions and explosives of concern |
| MGFD | Maximum greatest fragmentation distance |
| mg/kg | Milligrams per kilogram |
| mm | Millimeter |
| MMBTU | Million British Thermal Unit |
| MPPEH | Material potentially presenting an explosive hazard |
| NACIP | Navy Assessment and Control of Installation Pollutants |
| NAS | Naval Air Station |
| NAVFAC | Naval Facilities Engineering Command |

| | |
|---|---|
| NAVSEA | Naval Sea Systems Command |
| NAVSEAINST | Naval Sea Systems Command Instruction |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| NERP | Navy Environmental Restoration Program |
| NEW | Net Explosive Weight |
| NGVD | National Geodetic Vertical Datum |
| NOSSA | Naval Ordnance Safety and Security Activity |
| NOx | Nitrogen oxides |
| NPL | National Priorities List |
| NPW | Net present worth |
| O&M | Operation and maintenance |
| OE | Ordnance and explosives |
| OP | Operations Pamphlet |
| OPNAVINST | Office of Chief of Naval Operations Instruction |
| OSHA | Occupational Safety and Health Administration |
| OU | Operable Unit |
| PA | Preliminary Assessment |
| PAH | Polynuclear aromatic hydrocarbon |
| PC | Portland cement |
| PCDD | Polychlorinated dibenzo-p-dioxin |
| PCDF | Polychlorinated dibenzofuran |
| $PM_{10}$ | Particulate matter (10 microns or less) |
| PMO | Program Management Office |
| PPE | Personal protective equipment |
| QA | Quality Assurance |
| QC | Quality Control |
| RAO | Remedial Action Objective |
| RCRA | Resource Conservation and Recovery Act |
| RDX | Cyclotrimethylenenitramine |
| RD | Remedial Design |
| RfD | Reference Dose |
| RFI | RCRA Facility Investigation |
| RI | Remedial Investigation |
| ROD | Record of Decision |
| SCTL | Soil Cleanup Target Level |
| SE | Southeast |

| | |
|---|---|
| SI | Site Inspection |
| SOx | Sulfur oxides |
| SPLP | Synthetic Precipitation Leaching Procedure |
| SSC | Species of Special Concern |
| TBC | To be considered |
| TCLP | Toxicity Characteristic Leaching Procedure |
| Tetra Tech | Tetra Tech, Inc. |
| TNT | Trinitrotoluene |
| TP | Target practice |
| TP | Technical Paper |
| TRPH | Total recoverable petroleum hydrocarbon |
| TSDF | Treatment, storage, and disposal facility |
| TSP | Triple super phosphate |
| UCL | Upper confidence limit |
| µg/kg | Micrograms per kilogram |
| µg/L | Micrograms per liter |
| UHC | Underlying hazardous constituent |
| USACE | United States Army Corps of Engineers |
| USC | United States Code |
| USEPA | United States Environmental Protection Agency |
| USFWS | United States Fish and Wildlife Service |
| UTS | Universal Treatment Standard |
| UXO | Unexploded ordnance |
| $yd^3$ | Cubic yard |
| YWWA | Yellow Water Weapons Area |

# EXECUTIVE SUMMARY

## E.1 PURPOSE OF THE REPORT

The purpose of this Feasibility Study (FS) Report is to develop and evaluate options to remove munitions and explosives of concern (MEC)/material potentially presenting an explosive hazard (MPPEH) and munitions-related debris from Operable Unit (OU) 5, Site 15, Blue 10 Ordnance Disposal Area, at Naval Air Station (NAS) Cecil Field in Jacksonville, Florida.

## E.2 SITE DESCRIPTION AND HISTORY

Site 15, Blue 10 Ordnance Disposal Area, is located in the southwestern section of the Yellow Water Weapons Area (YWWA) of NAS Cecil Field. Site 15 covers approximately 85 acres, some areas of the site are heavily forested and relatively flat. NAS Cecil Field is subject to the Base Realignment and Closure Law of 1993 (BRAC). Since the closure of NAS Cecil Field in September 1999, most of the facility has been transferred to the Jacksonville Port Authority (now Jacksonville Aviation Authority) and City of Jacksonville. According to the reuse plan, the facility would have multiple uses, including a natural resources corridor in the Site 15 area, but would be used primarily for aviation-related activities.

Site 15 was originally used as a 55-acre skeet and trap range from the early 1940s to the mid-1950s. Munitions used at these ranges (skeet and lead shot) would not be expected to penetrate the ground surface. Subsequently, ordnance was disposed of at Site 15 from the mid-1960s through 1977, expanding the overall site footprint to 85 acres. Disposal consisted of burning of ordnance materials in a large metal burn chamber and static firing of rockets, so theoretical penetration depths do not apply. The majority of ordnance disposed of at the site was burned and included small arms munitions up to 20 millimeters (mm) in size, parachute and distress flares, Mark IV signal cartridges, rocket igniters, cartridge-activated devices, and 2.75-inch and 5-inch rockets. Rocket propellant also was reportedly placed on the ground and ignited in the area of the burn chamber. Rockets were disposed of by static firing of both 2.75-inch and 5-inch rockets from a firing pad located south of the burn chamber. An estimated 2.5 tons of ordnance were disposed of at the site each month; overall, an estimated 350 tons of ordnance were disposed of while the site was in operation. There is no known burial of ordnance at Site 15.

Five wetland areas, covering a combined area of approximately 4.6 acres, have been delineated at Site 15. Several forest burning events have taken place in the southwestern portion of the site. The latest burning event in this area took place in the spring of 1999.

## E.3 SUMMARY OF INVESTIGATION FINDINGS

Several environmental investigations were performed at Site 15 under the Navy's Installation Restoration (IR) Program conducted under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as administered by the Federal Facility Agreement (FFA) signed by the United States Environmental Protection Agency (USEPA), Navy, and Florida Department of Environmental Protection (FDEP). Investigation began with an Initial Assessment Study (IAS) performed in 1985 and included a Remedial Investigation (RI) conducted in 1994 and 1995 and numerous rounds of supplemental sampling performed from 1996 through 2005. These investigations showed that soil contained several chemicals of concern (COCs) at concentrations that could result in unacceptable human health risks under the planned recreational use of Site 15. MEC is also present at Site 15 as a result of various testing, training, and disposal activities related to military munitions that have taken place; note that MEC was not addressed in the described RI.

A Record of Decision (ROD) for OU 5, Site 15, was signed in June 2008 documenting selection of a remedy to address chemical contamination at Site 15. Remedial activities were conducted in 2008 and 2009 and included soil excavation, on-site solidification/stabilization, and off-site treatment and disposal of chemically contaminated soil to allow low-intensity recreational reuse of the site. Therefore, excavated soil that exceeded the toxicity characteristic leaching procedure (TCLP) lead concentration was treated by onsite solidification/stabilization to meet toxicity characteristic criteria for disposal as non-hazardous waste. Once the soil met these criteria, all excavated soil was disposed of offsite as non-hazardous waste. For safety purposes, a munitions survey was first conducted during remedial activities at Site 15, only in and around the soil excavation areas; MEC and munitions debris (MD) were found and removed from excavation areas before the contaminated soil was excavated. Note that the MD terminology in effect at the time of the remediation has since been replaced with the term material documented as safe (MDAS), which would be used in this report. Based on the occurrence of MEC and munitions-related debris in the surveyed areas, it was determined that MEC and MPPEH were likely present in areas that were not surveyed as part of the remedial action for the chemically contaminated soil.

A Land Use Control (LUC) Remedial Design (RD), prepared in 2009, provides specifications to limit land use to low-intensity recreational activities consistent with the property's proposed reuse as a natural resource corridor. Chemical contamination at Site 15 has been addressed through the remedy described above; the extent of arsenic, lead, polynuclear aromatic hydrocarbon (PAH), and total recoverable petroleum hydrocarbon (TRPH) contaminated soil was delineated and excavated to meet permitted land use (low-intensity recreational activities) requirements. Note, lead was found to be at concentrations greater than the Recreational Use Pickup Value at depths of 0 to 1 foot bgs only, which was removed from the site.

An MEC RI was conducted by Tetra Tech, Inc. (Tetra Tech) (Tetra Tech, 2011b) to determine whether surface and shallow subsurface (note that for munitions work, surface means the ground surface and subsurface means below the ground surface) MEC and/or MPPEH were present in areas of Site 15 that had not been previously surveyed during the 2008/2009 contaminated soil removal effort, and to determine whether surface and shallow subsurface MEC and/or MPPEH were present in areas that were most likely to have MEC and MPPEH (within and adjacent to the former ordnance disposal area, the former skeet and trap range area, and along access roads to the ordnance disposal area). Both the ground surface and shallow subsurface (0 to 1 foot bgs) were investigated using detector-aided survey techniques only; no intrusive investigation was conducted although subsurface anomalies were identified. Thirteen MPPEH items (most suspected to be MDAS) were identified during the 2010 MEC RI.

A Supplemental MEC RI was conducted by Tetra Tech (Tetra Tech, 2011c) to address a data gap identified during the 2010 MEC RI for the shallow subsurface by intrusively investigating and determining the source of shallow subsurface anomalies detected during the MEC RI outside of areas already known to have contained MEC items (former ordnance disposal area). The areas investigated included: bike path/asphalt access road; high-density areas outside of the ordnance disposal area; and, the MEC RI grid boundaries. A statistically determined 132 subsurface anomalies identified during the 2010 MEC RI UXO detector-aided surface survey were randomly acquired during the 2011 Supplemental MEC RI along transects in each of the three data gap areas. Only one of the 132 hand digs resulted in a munitions-related find: a small caliber bullet located along the eastern investigation boundary which was certified as MDAS; non-munitions metal was responsible for other anomalies. In addition, MPPEH items remaining on site after being identified during the 2010 MEC RI were revisited, inspected, certified, and removed from the site. From the 2010 MEC RI and 2011 Supplemental MEC RI combined, a total of nine items were certified as MDAS items. The remaining six of the MPPEH items were certified as non-munitions-related scrap or electrical parts.

## E.4 REMEDIAL ACTION OBJECTIVES

The Remedial Action Objectives (RAOs) identified for the Site 15 FS for munitions removal are as follows:

**RAO No. 1:** Prevent and/or minimize the direct contact threat associated with MEC/MPPEH remaining on the ground surface and in the shallow subsurface.

**RAO No. 2:** Make Site 15 safe for the specified land use.

**RAO No. 3:** Minimize the impact of site activities to wetlands, threatened and endangered species, and other natural resources at Site 15.

## E.5 REMEDIAL ALTERNATIVES

The following remedial alternatives were developed for Site 15:

- Alternative 1: No Action

- Alternatives 2A, 2B, and 2C: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal
  - Alternative 2A: Off-Site Hazardous Soil Disposal
  - Alternative 2B: On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal
  - Alternative 2C: Mechanical Excavation and Manual Investigation and Removal

- Alternatives 3A, 3B, and 3C: All Surface and Shallow Subsurface MEC and Anomaly Removal
  - Alternative 3A: Off-Site Hazardous Soil Disposal
  - Alternative 3B: On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal
  - Alternative 3C: Mechanical Excavation and Manual Investigation and Removal

- Alternatives 4A, 4B, and 4C: All Surface and Shallow Subsurface MEC Removal
  - Alternative 4A: Off-Site Hazardous Soil Disposal
  - Alternative 4B: On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal
  - Alternative 4C: Mechanical Excavation and Manual Investigation and Removal

## E.6 DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

The remedial alternatives were analyzed in detail using seven of the nine criteria provided in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and CERCLA. These seven criteria are as follows:

- Overall Protection of Human Health and the Environment
- Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) and To-Be-Considered (TBC) guidance criteria
- Long-Term Effectiveness and Permanence
- Reduction of Contaminant Toxicity, Mobility, or Volume through Treatment
- Short-Term Effectiveness
- Implementability
- Cost

Two other criteria, State and Community Acceptance, were not evaluated in this report. They will be evaluated after regulatory and public comments are available.

## E.7 COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

The remedial alternatives were compared to each other using the same criteria used for detailed analysis. The following is a summary of these comparisons:

- **Overall Protection of Human Health and Environment.** Alternative 1 would not be protective of human health and the environment because the explosive hazards at Site 15 would not be removed or mitigated. For Alternative 1, the MEC Hazard Assessment (HA) hazard level for the former ordnance disposal area would be 1 indicating that this area has the highest potential for explosive hazard conditions and the hazard level for the remainder of the operational area would be 3, indicating a moderate potential for explosive hazard conditions. Alternatives 2A, 2B, 2C, 3A, 3B, 3C, 4A, 4B, and 4C would provide protection to human health and the environment. Ground surface and shallow subsurface (up to 1 foot bgs) removals within the former ordnance disposal area and shallow subsurface anomaly removal along access roads, bike paths, and walking trails under Alternatives 2A, 2B, and 2C would remove explosive hazards present on the ground surface and in the shallow subsurface from the most accessible and most used areas of the site, thereby reducing the risk of exposure by human and ecological receptors. Along with those areas described under Alternatives

2A, 2B, and 2C, shallow subsurface (up to 1 foot bgs) anomaly removal within the remainder of the operational area would be conducted under Alternatives 3A, 3B, and 3C. All ground surface and shallow subsurface, to a maximum of 1 foot bgs, munitions and metallic non-munitions items would be removed within the entire operational area under Alternatives 4A, 4B, and 4C, making these alternatives the most protective. The MEC HA hazard levels would be the same after completion of Alternatives 2A, 2B, 2C, 3A, 3B, 3C, 4A, 4B, and 4C. The MEC HA hazard levels for both the former ordnance disposal area and the remainder of the operational area would be 4 for these alternatives, indicating a low potential for explosive hazard conditions to exist after remedial activities have been conducted. Ground surface inspections would be conducted annually and visual and detector-aided surveys and removals would be conducted every five years under Alternatives 2A, 2B, 2C, 3A, 3B, and 3C, thereby addressing residual explosive risks that would remain at the site. Application of LUCs proposed for all Alternatives would be protective of human health and the environment by reducing the risk of exposure and direct contact to MEC/MPPEH located at this site.

Additionally, under Alternatives 2A, 2B, 3A, and 3B, excavated soil from within the former ordnance disposal area, which may be hazardous (TCLP lead), would be disposed off-site or treated on-site prior to off-site disposal and would reduce any residual chemical hazards that may be present in this area of the site. Soil would be excavated within the entire operational area under Alternatives 4A and 4B, and hazardous soil (TCLP lead) would either be disposed off-site or treated on-site prior to off-site disposal, thereby reducing the residual chemical hazard over a larger area. Under Alternatives 2C, 3C, and 4C, excavated soil will be manually investigated and MEC/MPPEH/debris would be manually removed and the soil would then then be replaced in the original excavations, which is protective based on the specified land use. Overall, Alternatives 4A, 4B, and 4C would be ranked higher than Alternatives 2A, 2B, 2C, 3A, 3B, and 3C because a larger area would be investigated and cleared. Alternatives 3A, 3B, and 3C would rank marginally higher than Alternatives 2A, 2B, and 2C because shallow subsurface anomaly investigation and removal would be conducted over a larger area. All alternatives are protective of human health and the environment.

- **Compliance with ARARs and TBCs.** The conduct of all of the alternatives would comply with all applicable ARARs and TBCs.

- **Long-Term Effectiveness and Permanence.** Alternative 1 would have no long-term effectiveness and permanence because there would be no activities to remove MEC/MPPEH and no LUCs. Alternatives 2A, 2B, 2C, 3A, 3B, 3C, 4A, 4B, and 4C would provide long-term effectiveness and permanence through a combination of ground surface and shallow subsurface (up to 1 foot bgs) removals of munitions-related items. Surface and shallow subsurface (up to 1 foot bgs) removal would be conducted within the former ordnance disposal area for Alternatives 2A, 2B, 2C, 3A, 3B, and 3C. Shallow subsurface anomalies (up to 1 foot bgs) would also be investigated and removed along access ways, roads, and biking trails under Alternatives 2A, 2B, and 2C and from within the remainder of the operational area under Alternatives 3A, 3B, and 3C. Alternatives 2A, 2B, 2C, 3A, 3B, and 3C would also provide long-term effectiveness and permanence through the performance of annual ground surface inspections and visual and detector-aided surveys and removals every five years. These inspections and additional removals would be conducted in response to the presence and possible migration of MEC/MPPEH items at the site, and would reduce risk of exposure for receptors to residual MEC hazards that may remain on-site. Under Alternatives 4A, 4B, and 4C, ground surface and shallow subsurface (to 1 foot bgs) munitions items would be removed within the entire operational area. Therefore, Alternatives 4A, 4B, and 4C would be most effective at removing munitions items from the site, followed by Alternatives 3A, 3B, and 3C and then Alternatives 2A, 2B, and 2C. All munitions removals would be permanent. Additionally, LUCs would provide long-term effectiveness and permanence.

Also, hazardous soil (TCLP lead) excavated under Alternatives 2A, 2B, 3A, 3B, 4A, and 4B would be disposed off-site or treated on-site prior to off-site disposal, permanently reducing any residual chemical hazards because hazardous soil would be removed from Site 15 or treated in place on-site prior to removal from the site. Soil would be excavated to 1 foot bgs from within the former ordnance disposal area under Alternatives 2A, 2B, 3A, and 3B, thereby being equally as effective. Soil would be excavated to 1 foot bgs within the entire operational area under Alternatives 4A, and 4B, thereby removing more hazardous soil from Site 15 than Alternatives 2A, 2B, 3A, and 3B. Under Alternatives 2C, 3C, and 4C, excavated soil would be manually investigated and MEC/MPPEH/debris would be manually removed, the soil would then be replaced in the original excavations.

- **Reduction of Contaminant Toxicity, Mobility, or Volume through Treatment.** No contaminants of potential concern (COPCs) remain at Site 15 in excess of established site-specific soil cleanup target levels to permit recreational use of the site. Chemical contamination at Site 15 has been addressed through previous remedial activities and the extent of arsenic, lead, PAH, and TRPH contaminated soil was delineated and excavated to meet permitted land use (low-intensity recreational activities) requirements. Therefore, toxicity and mobility of chemical contaminants are not a concern at this site. Nevertheless, potentially hazardous soil (TCLP lead) would be excavated and either disposed off-site or treated on-site prior to off-site disposal under Alternatives 2A, 2B, 3A, 3B, 4A, and 4B. If disposed off-site, hazardous soil would be permanently removed from the site, if treated on-site, the mobility of lead would be permanently and irreversibly reduced before sending off-site for disposal. Because the same area would be excavated under Alternatives 2A, 2B, 3A, and 3B, the same volume of hazardous soil would be disposed and/or treated under these alternatives. More soil would be excavated under Alternatives 4A and 4B; thereby more hazardous soil would be disposed and/or treated. Under Alternative 2C, 3C, and 4C, excavated soil would be manually investigated and MEC/MPPEH/debris would be manually removed, the soil would then be replaced in the original excavations. Soil will not be disposed off-site or treated on-site under Alternatives 2C, 3C, and 4C. By conducting any of these remedial activities, the volume of munitions-related items located at Site 15 would be permanently reduced.

Furthermore, any metallic non-munitions items removed from Site 15 would also be sent to an off-site metals recycler for disposal. Because Alternatives 4A, 4B, and 4C cover more area and more soil would be cleared, it is assumed that more munitions and non-munitions items would be removed from the site under Alternatives 4A, 4B, and 4C than under Alternatives 2A, 2B, 2C, 3A, 3B, and 3C. Alternative 1 would not achieve reduction of volume of munitions-related items nor would it remove or treat any hazardous soil.

- **Short-Term Effectiveness.** Implementation of Alternative 1 would not result in risks to site workers or adversely impact the surrounding community or environment because no remedial activities would be performed. Alternatives 2A, 2B, 2C, 3A, 3B, 3C, 4A, 4B, and 4C would reduce human and ecological receptor risks in the short term because risks to site receptors would be reduced as soon as the first removal was completed. Implementation of Alternatives 2A, 2B, 2C, 3A, 3B, 3C, 4A, 4B, and 4C may result in exposing site workers to explosive hazards during remedial activities, particularly during detonations of MEC/material documented as an explosive hazard (MDEH), should any occur, with the most exposure occurring under Alternatives 4A, 4B, and 4C and the least exposure occurring under Alternatives 2A, 2B, and 2C. However, the risk of exposure for all alternatives would be effectively controlled by compliance with Occupational Safety and Health Administration (OSHA) and other explosive safety procedures. Dust suppression and control measures would be implemented during excavation under all alternatives to minimize the emission of hazardous soil particulates (TCLP lead) during on-site remedial activities. Erosion control measures implemented under all alternatives would minimize the migration of potentially hazardous soil into nearby streams.

  Site surveys would be conducted prior to remedial activities under all alternatives (with the exception of Alternative 1) to determine if any endangered, threatened, or Species of Special Concern (SSC) are present at Site 15, thereby reducing any impact to these species. Wetland areas would not be excluded from the removal action areas and it is assumed that under Alternatives 4A, 4B, and 4C remedial activities would impact wetlands areas. It is assumed that there would be minimal, if any, impact to wetlands under Alternatives 2A, 2B, 2C, 3A, 3B, and 3C. Activities would be conducted to mitigate damage to wetlands during excavations under all alternatives, as applicable. The wetlands would be restored and the site revegetated following completion of any remedial action. Although the loss would be temporary, it would be years before original conditions would be restored. Additionally, trees would be clear cut and all vegetation would be removed from the entire operational area under Alternatives 4A, 4B, and 4C, adversely impacting the environmental and ecological habitat at Site 15 and making the site temporarily unsuitable for its intended land use (low-intensity recreational activities).

All alternatives, with the exception of Alternative 1, would have a slight adverse impact on the surrounding community or environment should MEC/MDEH detonations take place. All alternatives would also have short-term impact on the community as a result of the transport of metallic items for off-site disposal and metal recycling. Alternatives 2A, 2B, 3A, and 3B would require less off-site transport of soil than Alternatives 4A and 4B, and would have less of an impact on the community. Alternatives 2A, 3A, and 4A involve the transportation and off-site disposal of hazardous soil (TCLP lead). Under Alternatives 2B, 3B, and 4B, soil would be stabilized in place on-site prior to off-site disposal of non-hazardous soil. Under Alternatives 2C, 3C, and 4C excavated soil would be manually investigated to remove MEC/MPPEH/debris, the soil would then be replaced in the original excavations; therefore, the C options would not present a risk to transportation workers, the community, and the environment because no soil would be transported off-site. Short-term risks for all alternatives would be properly mitigated by application of engineering controls and adherence to OSHA requirements.

Alternative 4A would have the highest GHG emissions followed by Alternatives 3A, 2A, 3B, 2B, 4B, 4C, and 3C with Alternative 2C having the lowest GHG emissions. Alternative 4B would have the highest $NO_x$ emissions followed by Alternatives 4A, 3A, 2A, 3B, 2B, 4C, and 3C with Alternative 2C having the lowest $NO_x$ emissions. Alternative 4B would have the highest $SO_x$ emissions followed by Alternatives 4A, 3B, 2A, 3A, 2B, 4C, and 3C, with Alternative 2C having the lowest $SO_x$ emissions. Alternative 4A would have the highest $PM_{10}$ emissions followed by Alternatives 4B, 3A, 2A, 3B, 2B, 4C, and 3C, with Alternative 2C having the lowest $PM_{10}$ emissions. Alternative 4B would have the highest energy consumptions followed by Alternatives 4A, 3B, 2B, 3A, 2A, 4C, and 3C with Alternative 2C having the lowest energy consumption. Alternatives 4A and 4B would have the same and the highest water usage, followed by 4C, then Alternatives 2B and 3B, which would have with the same water usage, and Alternatives 2A, 3A, 2C, and 3C which would have the same water usage and the lowest water usage. The highest risk of fatality and injury for all of the A options is residual handling operations. The highest risk for all of the B and C options is transportation of personnel. Overall Alternatives 4 options would have the highest sustainability impact while Alternatives 3 options and 2 options would have lower impacts with Alternative 2C having the lowest overall impacts.

- **Implementability.** Alternative 1 would be easiest to implement because there would be no action taken. All other alternatives would be implemented in phases. The difference between the alternatives is the area(s) to be investigated, the amount of shallow subsurface (up to 1 foot bgs) investigation and removal that would take place, and how the excavated soil will be handled. These alternatives would be ranked in the following decreasing order of ease of implementability: 2C, 3C, 2A, 3A, 4C, 2B, 3B, 4A, and 4B. Should MEC/MDEH be identified on site under any of the alternatives, treatment of these items would be more difficult to implement than if only MDAS and metallic debris are found on site during the remedial activities. The approximate time frames for implementation and completion would be longest for Alternatives 4A, 4B, and 4C and the shortest for the initial inspection and removal to be conducted under Alternatives 2A, 2B, and 2C, with the timeframe for the initial inspection and removal to be completed in between for Alternatives 3A, 3B, and 3C. However, annual and five-year inspections and removals would be conducted under Alternatives 2A, 2B, 2C, 3A, 3B, and 3C; therefore, the overall timeframe would be longer for these alternatives than Alternatives 4A, 4B, and 4C, which do not include annual and five-year inspections and removals. Implementation of LUCs, including installation of signage and administration of a public education program under all alternatives could readily be accomplished.

- **Cost.** The capital and operation and maintenance (O&M) costs and net present worth (NPW) of the remedial alternatives were estimated to be as follows:

| Alternative | Capital | NPW of Annual Costs | NPW |
|---|---|---|---|
| 1 | 0 | 0 | 0 |
| 2A | $ 5,749,000 | $ 37,000 | $ 5,786,000 |
| 2B | $ 4,971,000 | $ 37,000 | $ 5,008,000 |
| 2C | $ 2,004,000 | $ 37,000 | $ 2,041,000 |
| 3A | $ 6,610,000 | $ 37,000 | $ 6,647,000 |
| 3B | $ 5,833,000 | $ 37,000 | $ 5,869,000 |

| Alternative | Capital | NPW of Annual Costs | NPW |
|---|---|---|---|
| 3C | $ 2,866,000 | $ 37,000 | $ 2,903,000 |
| 4A | $ 18,120,000 | $59,000 | $ 18,179,000 |
| 4B | $ 17,110,000 | $59,000 | $ 17,168,000 |
| 4C | $ 7,257,000 | $59,000 | $ 7,315,000 |

The above cost figures have been rounded to the nearest $1,000 to reflect the preliminary nature of these estimates. A detailed breakdown of cost estimates is provided in Appendix C.

**TABLE ES-1**

**SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES**
**OU 5, SITE 15**
**ALL ALTERNATIVES**
**FEASIBILITY STUDY REPORT FOR MUNITIONS REMOVAL**
**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**


| Evaluation Criteria | Alternative 1: No Action | Alternative 2A: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal (Off-Site Hazardous Soil Disposal) | Alternative 2B: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal (On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal) | Alternative 2C: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal (Mechanical Excavation and Manual Investigation and Removal) | Alternative 3A: All Surface and Shallow Subsurface MEC and Anomaly Removal (Off-Site Hazardous Soil Disposal) | Alternative 3B: All Surface and Shallow Subsurface MEC and Anomaly Removal (On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal) | Alternative 3C: All Surface and Shallow Subsurface MEC and Anomaly Removal (Mechanical Excavation and Manual Investigation and Removal) | Alternative 4A: All Surface and Shallow Subsurface MEC Removal (Off-Site Hazardous Soil Disposal) | Alternative 4B: All Surface and Shallow Subsurface MEC Removal (On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal) | Alternative 4C: All Surface and Shallow Subsurface MEC Removal (Mechanical Excavation and Manual Investigation and Removal) |
|---|---|---|---|---|---|---|---|---|---|---|
| Overall Protection of Human Health and Environment | Not protective. | Protective. | Similar to 2A. | Similar to 2A. | Slightly more protective than Alternatives 2A, 2B, and 2C. | Similar to 3A. | Similar to 3A. | More protective than Alternatives 2A, 2B, 2C and 3A, 3B, and 3C. | Similar to 4A. | Similar to 4A. |
| ***MEC HA*** | Subunit 1 score = 865, Hazard Level 1, high potential for explosive hazard conditions. Subunit 2 score = 605, Hazard Level 3, moderate potential for explosive hazard conditions. | Subunit 1 score = 470, Hazard Level 4, low potential for explosive hazard conditions. Subunit 2 score = 335, Hazard Level 4, low potential for explosive hazard conditions. | Same as 2A. | Same as 2A. | Subunit 1 score = 470, Hazard Level 4, low potential for explosive hazard conditions. Subunit 2 score = 335, Hazard Level 4, low potential for explosive hazard conditions. | Same as 3A. | Same as 3A. | Subunit 1 score = 470, Hazard Level 4, low potential for explosive hazard conditions. Subunit 2 score = 335, Hazard Level 4, low potential for explosive hazard conditions. | Same as 4A. | Same as 4A. |
| Compliance with ARARs and TBCs | | | | | | | | | | |
| Chemical-Specific | Not applicable. | Not applicable. | Not applicable. | Not applicable. | Not applicable. | Not applicable. | Not applicable. | Not applicable. | Not applicable. | Not applicable. |
| Location-Specific | Would comply. | Would comply. | Would comply. | Would comply. | Would comply. | Would comply. | Would comply. | Would comply. | Would comply. | Would comply. |
| Action-Specific | Not applicable. | Would comply. | Would comply. | Would comply. | Would comply. | Would comply. | Would comply. | Would comply. | Would comply. | Would comply. |

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JACKSONVILLE, FLORIDA


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|---|---|---|---|---|---|---|---|---|---|---|
| Long-Term Effectiveness and Permanence | Not effective, munitions items would remain on site. | Effective, would provide long-term effectiveness through the performance of an initial surface and shallow subsurface anomaly removal and annual surface removals. Hazardous soil would be disposed off-site. LUCs are considered reliable and effective to reduce risks to site receptors. | Similar to Alternative 2A, except that hazardous soil would be treated on-site prior to off-site disposal. | Similar to Alternative 2A, except that excavated soil would be manually investigated for munitions items and then returned to the original excavation. | More effective than Alternatives 2A, 2B, and 2C, would provide long-term effectiveness through the performance of an initial surface and shallow subsurface anomaly removal (over larger area than Alternatives 2A, 2B, and 2C) and annual surface removals. The same amount of hazardous soil would be disposed off-site as would be in Alternative 2A. LUCs are considered reliable and effective to reduce risks to site receptors. | Similar to Alternative 3A, except that hazardous soil would be treated on-site prior to off-site disposal. | Similar to Alternative 3A, except that excavated soil would be manually investigated for munitions items and then returned to the original excavation. | More effective than Alternatives 2A, 2B, and 2C, and 3A, 3B, and 3C, would provide long-term effectiveness through the performance surface and shallow subsurface removal within the entire operational area. More hazardous soil would be disposed off-site as would be in Alternatives 2A and 3A. | Similar to Alternative 4A, except that hazardous soil would be treated on-site prior to off-site disposal. | Similar to Alternative 4A, except that excavated soil would be would be manually investigated for munitions items and then returned to the original excavation. |

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|---|---|---|---|---|---|---|---|---|---|---|
| Reduction of Contaminant Toxicity, Mobility, or Volume through Treatment | None. | Would reduce the volume of munitions items through removal. Would reduce the volume of hazardous soil on-site through off-site disposal, exact volume(s) to be determined during remedial design. | Similar to Alternative 2A, except that hazardous soil would be treated on-site prior to disposal. | Similar to Alternative 2A, except that excavated soil would be manually investigated for munitions items and then returned to the original excavation. | Amount of munitions items removed would be slightly higher than Alternatives 2A, 2B, and 2C and the volume of hazardous soil removed would be the same as Alternative 2A. | Similar to Alternative 3A, except that hazardous soil would be treated on-site prior to off-site disposal. | Similar to Alternative 3A, except that excavated soil would be manually investigated for munitions items and then returned to the original excavation. | Amount of munitions items removed and volume of hazardous soil removed would be more than Alternatives 2A, 2B, and 2C and 3A, 3B, and 3C. | Similar to Alternative 4A, except that hazardous soil would be treated on-site prior to off-site disposal. | Similar to Alternative 4A, except that excavated soil would be manually investigated for munitions items and then returned to the original excavation. |
| Short-Term Effectiveness | No relevant issues to address. | Would be effective at reducing amount of munitions items on site. Minimum potential for short-term risks to site workers, which would be mitigated through compliance with health and safety procedures. Minimum potential for short-term risks to the community during | Would be effective, similar to Alternative 2A but less short-term risk to the community because non-hazardous soil would be transported off-site rather than hazardous soil. | Would be effective, similar to Alternative 2A but less short-term risk to the community because no soil would be transported off-site. | Similar to Alternative 2A. | Similar to Alternative 2B. | Similar to Alternative 2C. | Would be effective at reducing the amount of munitions items on site. There is a greater potential for short-term risks to site workers under this alternative than the other alternatives because a larger area is being investigated, these risks would be mitigated | Would be effective, similar to Alternative 4A but less short-term risk to the community because non-hazardous soil would be transported off-site rather than hazardous. | Would be effective, similar to Alternative 4A but less short-term risk to the community because no soil would be transported off-site. |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | MEC detonations and transport of metallic items and hazardous soil off-site. Adverse impacts to wetlands should be minimal, if any. | | | | | | through compliance with health and safety procedures. There is a greater potential for short-term risks to the community under this alternative than the other alternatives during MEC detonations and transport of metallic items and hazardous soil off-site because more munitions items will be found and more hazardous soil will be transported off-site. Wetlands would be adversely impacted. The entire removal area would be clear cut prior to excavation adversely impacting the | | |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | environmental and ecological habitat as well as rendering the site temporarily unsuitable for its intended land use. | | |
| Implementability | Nothing to implement. | Somewhat more difficult to implement than 2C. | Somewhat more difficult to implement than Alternative 2A and 2C. | Easiest to implement. | More difficult to implement than Alternatives 2C, 3C, and 2A. | Somewhat more difficult to implement than Alternative 3A and more difficult to implement than Alternatives 3C, 2A, 2B & 2C. | Somewhat more difficult to implement than Alternative 2C. | More difficult to implement than Alternatives 4C, 2A, 2B, & 2C and 3A, 3B, & 3C. | Most difficult to implement. | More difficult to implement than Alternatives 2C and 3C. |
| Costs [1]:<br>Capital<br>NPW of O&M<br>NPW | <br>$0<br>$0<br>$0 | <br>$ 5,749,000<br>$ 37,000<br>$ 5,786,000 | <br>$ 4,971,000<br>$ 37,000<br>$ 5,008,000 | <br>$ 2,004,000<br>$ 37,000<br>$ 2,041,000 | <br>$ 6,610,000<br>$ 37,000<br>$ 6,647,000 | <br>$ 5,833,000<br>$ 37,000<br>$ 5,869,000 | <br>$ 2,866,000<br>$ 37,000<br>$ 2,903,000 | <br>$ 18,120,000<br>$59,000<br>$ 18,179,000 | <br>$ 17,110,000<br>$59,000<br>$ 17,168,000 | <br>$ 7,257,000<br>$59,000<br>$ 7,315,000 |

1 The above cost figures have been rounded to the nearest $1,000 to reflect the preliminary nature of these estimates.

# 1.0 INTRODUCTION

## 1.1 PURPOSE AND ORGANIZATION OF REPORT

### 1.1.1 Purpose

This Feasibility Study (FS) Report for the Operable Unit (OU) 5, Site 15 – Blue 10 Ordnance Disposal Area at the Naval Air Station (NAS) Cecil Field in Jacksonville, Florida, was prepared for Base Realignment and Closure (BRAC) Program Management Office (PMO) Southeast (SE) by Tetra Tech, Inc. (Tetra Tech) and funded by Naval Facilities Engineering Command (NAVFAC) under Contract Task Order (CTO) JM09 of the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract Number N62470-08-D-1001. The document was prepared to fulfill the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and is consistent with United States Environmental Protection Agency (USEPA) Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (1988), and the Navy Environmental Restoration Program (NERP) Manual (Navy, 2006). This FS Report describes the formulation and evaluation of remedial alternatives to remove munitions and explosives of concern (MEC)/material potentially presenting an explosive hazard (MPPEH) and munitions-related debris from Site 15. The FS establishes Remedial Action Objectives (RAOs) and cleanup goals; screens remedial technologies; and assembles, evaluates, and compares remedial alternatives. The FS is based on data collected during the Remedial Investigation, OU 5, Sites 14 and 15 (ABB Environmental Services, Inc. [ABB-ES], 1997), Remedial Action Completion Report – Soil Removal Action for OU 5, Site 15 (AGVIQ-CH2MHill, 2009), Preliminary Assessment/Site Inspection Report for Past Use of Munitions and Explosives of Concern for Blue Ordnance Disposal Area (Site 15) (CH2MHill, 2007); Record of Decision for OU 5, Site 15 (Tetra Tech, 2008b); Land Use Control Remedial Design, OU 5, Site 15 (Tetra Tech, 2009), Remedial Action Completion Report for OU5, Site 15 (Tetra Tech, 2011a), MEC Remedial Investigation Report for Munitions Response Program at OU 5, Site 15 (Tetra Tech, 2011b), Remedial Investigation Report for Munitions Response Program, Supplemental Remedial Investigation, OU 5, Site 15 (Tetra Tech, 2011c) and other guidance and site-specific documents related to other environmental investigations and previous removal actions (see reference section).

The purpose of the FS process is to gather and evaluate information sufficient to select an appropriate remedy for a site, based on an informed risk management decision-making process. Within an FS report, the results of previous investigations are used to develop and evaluate potential remedial alternatives that will reduce risks to human health and the environment that have been identified at the site. The alternatives should provide cost-effective methods to mitigate the identified risks, and the range of alternatives should be adequate so that decisions can be reached between the Navy and regulators regarding the selected response action.

The Navy will select a preferred remedial alternative, with the concurrence of the USEPA and Florida Department of Environmental Protection (FDEP).

### 1.1.2 Document Organization

This FS Report has been organized with the intent of meeting the general format requirements specified in the Remedial Investigation (RI)/FS Guidance Document (USEPA, 1988). This report contains the following five sections:

- Section 1.0, Introduction, summarizes the purpose of the report, provides site background information, summarizes the findings of the previous investigations, and provides the report outline.

- Section 2.0, Remedial Action Objectives and General Response Actions, presents the RAOs, identifies Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBC) criteria, and develops General Response Actions (GRAs).

- Section 3.0, Screening of Remediation Technologies and Process Options, provides a two-tiered screening of potentially applicable remediation technologies, and identifies the technologies that were assembled into remedial alternatives.

- Section 4.0, Assembly and Detailed Analysis of Remedial Alternatives, assembles the remedial technologies retained from the Section 3.0 screening process into multiple remedial alternatives, describes these alternatives, and performs a detailed analysis of these alternatives in accordance with seven of the nine CERCLA criteria.

- Section 5.0, Comparative Analysis of Remedial Alternatives, compares the remedial alternatives to one another on a criterion-by-criterion basis, for each of the seven CERCLA analysis criteria used in Section 4.

Appendix A presents site-specific background information; sustainability evaluations performed for each remedial alternative are provided in Appendix B; and Appendix C contains the cost estimates for each alternative.

## 1.2 SITE BACKGROUND

The following paragraphs provide background information about NAS Cecil Field and Site 15. Figure 1-1 provides the general location map, which shows the NAS Cecil Field Main Base and the Yellow Water Weapons Area (YWWA), and Figure 1-2 shows the general site arrangement of Site 15. A conceptual site model (CSM) of the site is presented on Figure 1-3.

### 1.2.1 Description and History of NAS Cecil Field

NAS Cecil Field (USEPA ID No. FL5 170 022 474) is located 14 miles southwest of Jacksonville, Florida. The majority of Cecil Field is located within Duval County, and the southernmost part of the facility is located in Clay County. NAS Cecil Field was established in 1941 and provided facilities, services, and material support for the operation and maintenance of naval weapons, aircraft, and other units of the operation forces as designated by the Chief of Naval Operations. NAS Cecil Field was placed on the National Priorities List (NPL) by the USEPA in December 1989. The Navy, USEPA, and FDEP signed a Federal Facilities Agreement (FFA) for NAS Cecil Field in 1990. Pursuant to the FFA, the Navy has conducted several investigations and response actions under CERCLA authority.

NAS Cecil Field is subject to the BRAC Law of 1993. Since the closure of NAS Cecil Field in September 1999, most of the facility has been transferred to the Jacksonville Port Authority (now Jacksonville Aviation Authority) and City of Jacksonville. According to the Jacksonville Economic Development Commission (JEDC) Reuse Plan, the facility will have multiple uses, but will be used primarily for aviation-related activities. The JEDC provided for future use of the facility to include a wildlife corridor. Site 15 land use as a wildlife corridor that would allow low-intensity recreational use has already been established. Low-intensity recreational use is limited to paved bike and walking paths.

### 1.2.2 Description and History of Site 15

Site 15 - Blue 10 Ordnance Disposal Area (Figure 1-2), is located in the southwestern section of the former YWWA of NAS Cecil Field. The site is relatively flat. Site 15 was originally used as a 55-acre skeet and trap range of 1,000 feet by 2,400 feet in size, from the early 1940s to the mid-1950s. Munitions used at these ranges (skeet and lead shot) would not be expected to penetrate the ground surface.

Ordnance was disposed of at Site 15 from the mid-1960s through 1977, and the resulting footprint expanded the site to 85 acres. Disposal consisted of burning ordnance materials in a large metal burn chamber and static firing of rockets, so theoretical penetration depths do not apply. The majority of ordnance disposed at the site was burned and included small arms munitions up to 20 millimeters (mm) in size, parachute and distress flares, Mark IV signal cartridges, rocket igniters, cartridge-activated devices, and 2.75-inch and 5-inch rockets. Rocket propellant also was reportedly placed on the ground and ignited in the area of the burn chamber. Rocket motors were disposed of by static firing of both 2.75-inch and 5-inch rockets from a firing pad located south of the burn chamber. An estimated 2.5 tons of ordnance were disposed at the site each month; overall, an estimated 350 tons of ordnance were disposed of while the site was in operation. There is no known burial of ordnance at Site 15.

In the 1980s, environmental investigations were initiated that included soil, groundwater, sediment, and surface water sampling. These investigations showed that Site 15 soil was contaminated with polynuclear aromatic hydrocarbons (PAHs), metals (arsenic and lead), and total recoverable petroleum hydrocarbons (TRPH). A Record of Decision (ROD) to address the chemical contamination was signed in 2008, and remedial action was conducted in 2008 and 2009 to remove contaminated soil from 17 excavation areas with concentrations of contaminants in excess of cleanup goals (Figure 1-4 presents these areas). Chemical contamination at Site 15 has been addressed through the remedy (Tetra Tech, 2009). The extent of arsenic, lead, PAH, and TRPH contaminated soil was delineated and excavated to meet permitted land use (low-intensity recreational activities) requirements (Tetra Tech, 2009). However, soil remaining at the site may contain levels of lead that may exceed toxicity characteristic leaching procedure (TCLP) limits.

Because historical activities at Site 15 included munitions operations, a munitions survey was first conducted for safety purposes in and around the planned soil excavation areas to address any MEC hazards. MEC and material documented as safe (MDAS) were located during the pre-excavation munitions survey and were removed from excavation areas before soil excavation operations commenced.

### 1.2.3 Site Characteristics

The following section provides information presented in documents prepared to support previous site investigations, including climate, topography, geology, soil and vegetation types, hydrology, hydrogeology, cultural and natural resources, and threatened, endangered, and protected species.

#### 1.2.3.1 Climate

The climate in Jacksonville, Florida, is humid subtropical. From 1971 through 2000, the mean annual rainfall was approximately 52 inches, and the mean annual temperature was 68 degrees Fahrenheit. Most of the annual rainfall occurs in the late spring/early summer, and winters are generally mild and dry.

#### 1.2.3.2 Site Topography

Overall, Site 15 is flat (ABB-ES, 1997) and much of the area is swampy throughout the year, with some sections under water for parts of the year. Land surface elevations range from approximately 72 to 80 feet National Geodetic Vertical Datum (NGVD) at Site 15.

#### 1.2.3.3 Site Geology

Site 15 is underlain by undifferentiated fine-grained sand, and lenses and stringers of silty or clayey material may be encountered intermittently. The stringers are generally less than 1 inch thick and are not continuous. Lithological descriptions recorded during monitoring well installation at OU 5 indicate that sand is present at each of the monitoring well locations from ground surface to the total depth, a maximum of 14 feet below ground surface (bgs) (ABB-ES, 1997).

Cross sections showing Site 15 lithology were not generated during the RI for chemical contamination, nor prepared as part of the MEC RI because of the homogenous lithology and shallow depth to groundwater, also because MEC RI and Supplemental RI activities were non-intrusive or limited to shallow soils.

#### 1.2.3.4 Site Soil and Vegetation Types

Three soil types cover Site 15 in nearly equal percentages, the Olustee Fine Sand, Leon Fine Sand, and Ridgeland Fine Sand. Each of the three soil types is described as a nearly level poorly drained soil found in broad flatwood areas. Natural vegetation on these soil types consists predominantly of oak, pine, and saw palmetto. Depth to groundwater is very shallow in these soil types, and permeability through the upper 6 inches is moderate to rapid.

Several forest fires have occurred in an area of stressed vegetation, referred to as the forest burn area, in the southwestern portion of the site. Several slash pines are partially burned in this area. Controlled burns were commonly undertaken in this area to manage understory growth in the planted pine forest. The latest controlled burning event took place in spring 1999 (AGVIQ-CH2MHill, 2009).

Before remedial activities to remove contaminated soil, which necessitated vegetation clearance over a large portion of the site, the entire area was heavily forested. Currently, outside of the area where vegetation was removed as part of the 2008/2009 remedial action, the site remains heavily forested, primarily with slash pine and understory vegetation. The site also includes low shrub and brushland vegetation, particularly in areas where vegetation was removed in 2008. Areas previously excavated for contaminated soil removal are readily visible as sandy areas with no vegetation, due to backfill with clean sandy soil. Some minor stands of trees remain between the areas cleared of vegetation. Trees are also sparser in the areas where controlled forest burns were formerly conducted.

#### 1.2.3.5 Site Hydrology

Surface drainage is limited because only two drainage pathways (ditches) intersect the general area of the site and they are located outside the area of concern for the site. Flow through the drainage ditches is intermittent, depending on rainfall, and ultimately the ditches drain into Yellow Water Creek located southwest of Site 15.

#### 1.2.3.6 Regional and Site Hydrogeology

The three water-bearing systems present beneath Site 15, in descending order, are the surficial aquifer system, intermediate aquifer and confining units, and Floridan Aquifer system. Only the surficial aquifer was investigated at Site 15 during the RI for chemical contamination. It was surmised that any releases to groundwater at the site would be most pronounced in the surficial aquifer, which is composed predominantly of sand from the ground surface to an approximate depth of 66 feet bgs. The water table is unconfined beneath the site and ranges between 1 and 4 feet bgs during the year, depending on rainfall events.

#### 1.2.3.7 Endangered and Special Status Species

The gopher tortoise, considered threatened by the Florida Committee on Rare and Endangered Plants and Animals (FCREPA), was identified at Site 15. As part of the Site 15 remedial action for soil contamination, gopher tortoise burrows were identified in the planned soil excavation areas and the gopher tortoises were relocated to an area west of the main area cleared of vegetation (AGVIQ-CH2MHill, 2009). In addition, the indigo snake is considered a special status species (protected as threatened under the Endangered Species Act and by the State of Florida), and a protection plan was put in place by NAS Cecil Field.

#### 1.2.3.8 Wetlands

Six wetland areas are present that cover a combined area of approximately 4.6 acres (Tetra Tech, 2006; Tetra Tech, 2008a) (see Figure 1-2).

#### 1.2.3.9 Cultural and Natural Resources

No existing cultural resources were identified for Site 15. As presented in the ROD, the JEDC Reuse Plan provides for future use of Site 15 as a wildlife corridor that would allow for low-intensity recreational use, and the remedy for Site 15 was selected to allow for the planned future use (Tetra Tech, 2008b).

### 1.2.4 Site Investigations

Several environmental investigations, primarily focusing on chemical contamination, were performed at Site 15 as part of the Navy's Installation Restoration (IR) Program conducted under CERCLA, as administered by the FFA and signed by the USEPA, Navy, and FDEP. Extensive investigations of Site 15 were conducted, beginning in 1985 and continuing through the preparation of the Amended FS (Tetra Tech, 2008a). During this period, 853 soil samples, 13 sediment samples, 7 surface water samples, 40 groundwater samples, and 15 ecological samples were collected and analyzed. Several MEC investigations have also been conducted (see Appendix A-1 further information on previous investigations).

The following provides a chronological list of the investigations conducted at Site 15:

- 1985 - An Initial Assessment Study (IAS) was prepared for NAS Cecil Field by Envirodyne Engineers under the Navy Assessment and Control of Installation Pollutants (NACIP) program, which was eventually replaced by the Navy's IR Program. The IAS consisted of the following: (1) records search, (2) on-site survey, (3) confirmation study ranking, (4) site ranking, and (5) confirmation study recommendations.

- 1988 - A Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) was conducted at NAS Cecil Field by Harding Lawson Associates (HLA) (1988). The goals of the RFI were to verify the existence of suspected hazardous constituents at various waste disposal sites, to delineate the boundaries of potentially contaminated sites, to investigate the surficial aquifer and potable water supply wells, and to investigate selected surface areas for possible contamination.

- 1993 - As part of the Basewide Ecological Assessment, one soil sample was collected at Site 15 (HLA, 1998).

- August 1994 to April 1995 - As part of the OU 5 RI (ABB-ES, 1997) a field screening program consisting of an unexploded ordnance (UXO) survey, surface and subsurface soil screening, and installation of piezometers was completed. The UXO survey was completed at the site prior to the sampling activities. No UXO was found; however, several pieces of metal shell casings and similar items were located and removed. The soil screening program was designed to delineate the nature and extent of PAH, lead, trinitrotoluene (TNT), and TRPH contamination in surface soil using on-site and off-site data analysis. Four temporary piezometers were installed to determine the direction of groundwater flow in the surficial aquifer. Evaluation of water level data collected on three separate occasions indicated that groundwater flow is to the southwest toward Yellow Water Creek. A groundwater screening program was not implemented at Site 15 because the chemicals of concern (COCs) were known to be relatively immobile when sorbed to site soil. However, eight monitoring wells, which would be used during the confirmatory sampling event, were installed at locations selected based on water level data.

- July and August 1995 - As part of the OU 5 RI, ABB-ES performed confirmatory sampling and analysis for surface and subsurface soil at Site 15 to refine the nature and extent of contamination in soil, determined during the previous screening process. Confirmatory groundwater samples were also collected from the eight Site 15 monitoring wells. In addition, a confirmatory surface water and sediment sampling program was completed to assess potential contaminant migration through groundwater-surface water interaction, surface runoff, and/or soil erosion, and to aid in assessment of potential human health and ecological risks.

- June 1996 - Soil toxicity testing to evaluate ecological risk was performed. Six soil samples, including a reference sample, were collected for whole-soil toxicity testing. Two additional soil samples were collected for definitive (dilution series) toxicity testing.

- February 1997 - To support the RI, 38 additional surface soil samples from 17 screening locations across the site were submitted for sieve and lead analysis. The objective of this additional sampling effort was to determine if it was feasible to separate lead shot and lead shot fragments from soil; if the remaining lead shot was responsible for high lead concentrations or if concentrations were due to lead leached into the soil; if lead concentrations were localized vertically at the ground surface; and if the soil would be considered as characteristically hazardous if excavated under RCRA.

- May 1997 - Another sampling event for surface and subsurface soils involved the collection of 14 surface soil samples analyzed for lead, nine surface soil samples analyzed for antimony and arsenic, and eight subsurface soil samples analyzed for PAHs. During this event, four sediment and surface water samples were also collected. Surface water samples were analyzed for lead; sediment samples were analyzed for lead, PAHs, and TRPHs. These were the last data included in the OU 5 RI Report (ABB-ES, 1997).

- December 1997 - An additional sampling event was conducted that included the collection of nine soil samples from four locations.

- April/June 1999 - A supplemental sampling event for surface soil and sediment was conducted in April and June 1999 to further determine the limits of lead and PAH contamination in surface soil to avoid having to extrapolate analytical data to verify delineation of these contaminants. This sampling event involved the collection of surface soil samples from 130 new locations. A total of 78 samples were collected for lead analysis, and 60 samples were collected for PAH analysis. Eight of the 130 surface soil locations were analyzed for PAHs and lead. During this sampling round, six sediment samples were also collected and analyzed for PAHs and lead.

- February 2000 - A supplemental sampling event to obtain data to develop site-specific leachability values for PAHs at Site 15 was conducted. Five surface soil samples were collected from 0 to 1 foot bgs for PAHs and Synthetic Precipitation Leaching Procedure (SPLP) analysis.

- April 2000 - Groundwater samples were collected from the eight existing wells at the site and analyzed for PAHs, nitroaromatics, arsenic, antimony, and lead.

- June 2001 - A supplemental sampling event was conducted to support an ecological study. Soil samples were collected from locations with a range of previous lead detections for subsequent invertebrate sampling. Thirty-one surface soil samples were collected from the first 3 inches of mineral soil and the overlying duff (decaying organic matter) and analyzed for lead. Based on results of this sampling, 15 invertebrate samples were collected and analyzed for lead. This investigation was conducted to generate ecologically based remediation goals for PAHs and lead in surface soil at the site. The results of this sampling event are presented in the Development of Ecologically Based Remediation Goals for Lead and PAHs in Soil (Tetra Tech, 2001).

- May 2003 - A supplemental sampling event was conducted to delineate the vertical extent of PAH and lead contamination and to delineate the horizontal extent of arsenic contamination.

- June to August 2003 - Another supplemental sampling event was conducted to delineate the vertical extent of TRPH and lead contamination and to delineate the horizontal extent of arsenic contamination in soil. This investigation included the installation of six new monitoring wells and collection of groundwater samples from the new wells and one previously existing well. The new monitoring wells were installed at locations where soil contaminant concentrations exceeded FDEP Soil Cleanup Target Levels (SCTLs) for leachability, based on groundwater criteria. The results of this investigation were used to eliminate groundwater as a medium of concern, as identified in the Groundwater Technical Memorandum for No Further Action and in the addendum to this report, entitled Supplement to Groundwater Technical Memorandum for No Further Action, which specifically addresses potential arsenic contamination identified in one well due to a change in the regulatory criteria subsequent to this sampling effort (Tetra Tech, 2006).

- October 2003 - A wetland delineation study (Tetra Tech, 2003) was performed to identify areas meeting the USEPA and United States Army Corps of Engineers (USACE) definition of wetlands under Section 404 of the Clean Water Act [33 United States Code (USC) 1344]. The delineation also identified areas meeting the definition of wetlands used by the FDEP and St. Johns River Water Management District under Chapter 62-340, FAC. Six areas were identified within Site 15 as meeting the USEPA and USACE delineation criteria (see Figure 1-2). These areas were designated as Wetlands A, B, C, D, E, and F. These six areas also meet the FDEP and St. Johns River Water Management District delineation criteria. All are non-tidal, freshwater wetlands. Wetlands A, B, C, D, and E were classified as “adjacent” wetlands, subject to regulation under Section 404 of the Clean Water Act (CWA). Wetland F was classified as an “isolated” wetland not under Section 404 jurisdiction. The study showed that the three larger wetlands (A, C, and D) appear to be of natural origin, providing a good habitat for terrestrial wildlife and offering substantial aesthetic and scientific value as natural features. As such, it was recommended that efforts be made to minimize disturbance of these three wetlands during any remediation at Site 15 and that they be restored following such remediation. The study also showed that three smaller wetlands (B, E, and F) appear to be of man-made origin and are of lower significance with respect to wetland values and functions.

Although these smaller are still subject to federal and/or state regulation, extraordinary efforts to minimize their disturbance or to restore them were not recommended.

- Late 2003 to early 2004 - A Geostatistical Assessment Report (Newfields, 2004) was prepared for soil data to develop more accurate estimates of the areas and volumes requiring remediation based on human health and ecological criteria. This report was used to identify and delineate the following areas:
  - Areas where concentrations of lead in soil were greater than the 6,500 milligrams per kilogram (mg/kg) acute human health toxicity screening criterion.
  - Areas to be excavated so that the mean soil lead concentration of any 2-acre parcel was less than the 2,512 mg/kg mammalian ecological screening criterion.
  - Areas to be excavated so that the site-wide 95-percent upper confidence limit (UCL) of the mean concentration of benzo(a)pyrene equivalents (BaPEqs) in post-excavation soil was less than the 2,250 micrograms per kilogram (µg/kg) human health toxicity screening criterion.
  - Areas where concentrations of BaPEqs in soil were greater than 6,750 µg/kg, or three times the human health toxicity screening criterion.

  Based on the above criteria, the geostatistical assessment determined that the areas to be excavated for lead totaled 1.84 acres and those to be excavated for BaPEqs totaled 5.33 acres, with no overlap. Assuming a 1-foot excavation depth, the total excavation volume was estimated as approximately 11,600 yards cubed ($yd^3$). The assessment also concluded that Site 15 had been thoroughly sampled for both lead and BaPEqs, and that available data more than adequately characterized surficial soil at the site. Because of this and also because excavated soil would be replaced with clean fill, confirmation (post-excavation) sampling was not warranted.

- January 2005 - Supplemental sampling was performed. The first objective of this sampling was to investigate the potential for dioxins [polychlorinated dibenzo-p-dioxin (PCDD)/polychlorinated dibenzofuran (PCDF)] to be present in soil immediately beyond the proposed excavation area around the burn chamber and static rocket stand. The second objective of this sampling was to investigate the potential for perchlorate to be present in groundwater of the same area. During this investigation, two surface soil samples were collected and analyzed for dioxin, and two groundwater samples were collected from existing monitoring wells and analyzed for perchlorate. Analytical results for these samples showed no exceedances.

- August 2006 – Two monitoring wells, which had been abandoned, were reinstalled and sampled to investigate exceedances of cyclotrimethylenenitramine (RDX) and 4,4'-dichlorodiphenyldichloroethylene (DDE) FDEP Groundwater Cleanup Target Levels (GCTLs) detected in samples collected in 1995 (Tetra Tech, 2006). RDX and 4,4'-DDE concentrations were less than analytical detection limits [0.07 micrograms per liter (μg/L) for RDX, 0.02 μg/L for 4,4'-DDE] at both locations.

- November 2005 to February 2007 - Three rounds of additional groundwater sampling were performed in the vicinity of a monitoring well where a filtered arsenic concentration of 13.7 μg/L had been detected in July 2003. At that time, this concentration was less than the arsenic federal Maximum Contaminant Level (MCL) and FDEP GCTL, but these criteria were subsequently revised from 50 to 10 μg/L, prompting further investigation. After several rounds of sampling, the unfiltered arsenic concentration at this location was less than the analytical detection limit of 2.8 μg/L.

- 2007, MEC Preliminary Assessment (PA)/Site Inspection (SI) (CH2MHill, 2007) - Findings of the PA/SI indicated that there was potential for contact with MEC during the planned excavation and removal of contaminated soil (2008/2009 remedial activities). Phase I of this investigation consisted of an MEC search of the surface (note that for munitions work, surface means the ground surface), and a geophysical detection and mapping of the subsurface (note that for munitions work, subsurface means below the ground surface). Phase II of this investigation required intrusive actions for reacquisition of subsurface digital geophysical mapping (DGM)-characterized anomalies. Both Phase I and II included the identification, disposition, and or storage of MEC, discarded military munitions (DMM), UXO, and or MPPEH.

- 2008/2009, Remedial Action Activities (AGVIQ-CH2MHill, 2009) - Remedial activities were conducted in 2008 and 2009 in accordance with the 2008 ROD and included contaminated soil excavation in 17 areas (as shown in Appendix A-1), with concentrations in excess of cleanup goals, on-site solidification/stabilization of lead-contaminated soil, and off-site treatment and disposal of contaminated soil to allow low-intensity recreational reuse of the site (AGVIQ-CH2MHill, 2009). Chemical contamination at Site 15 has been addressed through the remedy (Tetra Tech, 2009), the extent of arsenic, lead, PAH, and TRPH contaminated soil was delineated and excavated to meet permitted land use (low-intensity recreational activities) requirements. However, soil remaining at the site may contain levels of lead that exceed TCLP limits (estimated to be areas where lead concentrations greater than 700 mg/kg, as shown on figures in Appendix A-2). Note, lead was found to be at concentrations greater than the Recreational Use Pickup Value at depths of 0 to 1 foot bgs only, which was removed from the site. The burn chamber, firing pad, and several concrete building foundations (remnants of buildings that supported skeet range and trap range activities), located in the area surrounding the burn chamber and firing pad, were also removed in 2008. Because historical activities at Site 15 included munitions operations, and based on the findings of an MEC PA/SI conducted in 2007, MEC removal was determined to be necessary before the 2008/2009 soil remedial action could proceed. MEC and MDAS [formerly called munitions debris (MD)] were located during a munitions survey and were removed from the excavation areas before soil excavation operations commenced (results are presented in Appendix A-3).

- 2010 - An MEC RI was conducted by Tetra Tech (Tetra Tech, 2011b) to delineate the extent of potential munitions related items still present at the ground surface and to delineate the extent of magnetic anomalies in the shallow subsurface to a depth of 1 foot bgs at Site 15. The RI was conducted to determine whether surface MEC and/or MPPEH were present in areas of Site 15 that had not been previously surveyed during the 2008/2009 contaminated soil removal effort, and to determine whether MEC and/or MPPEH were present at the ground surface in areas most likely to have MEC and MPPEH (within and adjacent to the former Ordnance Disposal Area, the former skeet and trap range area, and along access roads to the Ordnance Disposal Area). Results are presented in Appendix A-3.

- 2011 – A Supplemental MEC RI was conducted by Tetra Tech (Tetra Tech, 2011c) to address a data gap for the shallow subsurface by intrusively investigating and determining the source of shallow subsurface anomalies (0 to 1 foot bgs) detected during the MEC RI outside of areas already known to have contained MEC items (former Ordnance Disposal Area). The areas investigated included: bike path/asphalt access road; high-density areas outside of the Ordnance Disposal Area; and MEC RI grid boundaries. Results are presented in Appendix A-3.

## 1.3 SUMMARY OF FINDINGS OF PREVIOUS INVESTIGATIONS

### 1.3.1 Previous Investigations

As previously discussed, in the 1980s, environmental investigations were initiated that included soil, groundwater, sediment, and surface water sampling. Following an RI, which focused only on chemical contamination, PAHs, metals (arsenic and lead), and TRPH soil contamination were identified that required remediation, a ROD for OU 5, Site 15, was signed in June 2008 documenting selection of a remedy to address these chemical contaminants (Tetra Tech, 2008b). This RI and ROD did not address MEC. The areas of contamination at Site 15 were associated with the Ordnance Disposal Area and old skeet and trap range. Chemical contamination was found associated with these sources as well as with forest burn areas. Remedial activities were conducted in 2008 and 2009 in accordance with the ROD and included contaminated soil excavation (from 1.0 to up to 2.0 feet bgs) in 17 areas (A through Q), with concentrations in excess of cleanup goals, on-site solidification/stabilization of lead-contaminated soil, and off-site treatment and disposal of contaminated soil to allow low-intensity recreational reuse of the site (AGVIQ-CH2MHill, 2009). Chemical contamination at Site 15 has been addressed through the remedy (Tetra Tech, 2009). The chemical contamination investigation had included munitions chemicals of concern, except for nitroglycerin. Although nitroglycerin (propellant) was not investigated, soil in the potential area of concern was removed in the 2008/2009 soil removal effort from the area where propellants were expected near the former burn chamber (reportedly, rocket propellant was placed on the ground, ignited, and presumed to be consumed). Until their removal in 2008, the ordnance burn chamber and static rocket firing pad located in the north-central portion of the site were the only structures related to historical activities that remained at the site. The burn chamber was a rounded, steel, tank-like container approximately 10 feet in length and 4 feet in height. The static rocket-firing pad was an L-shaped concrete structure approximately 10 feet long by 4 feet wide by 6 feet high. The burn chamber and firing pad were removed in 2008 as part of remedial activities. Several concrete building foundations (remnants of buildings that supported skeet and trap range activities), located in the area surrounding the burn chamber and firing pad, were also removed in 2008.

Because historical activities at Site 15 included munitions operations, and based on the findings of an MEC PA/SI conducted in 2007, MEC removal was determined to be necessary before the 2008/2009 soil remedial action could proceed. MEC and MDAS (referred to as MD in the PA/SI Report) were located during a munitions survey and were removed from the soil excavation areas before soil excavation operations commenced. To support the effort as part of the removal action, tree and vegetation clearance were conducted in portions of the site prior to soil excavation. The MEC related activities included a GPS-surveyed subdivision of Site 15 into 100-foot by 100-foot grid cells, vegetation removal, MEC surface clearance, DGM with EM61-MK2 time-domain metal detection and DGM target anomaly identification, manual and mechanically-aided intrusive investigation of DGM target anomalies, and demolition of MEC items found in 114 grids (22 acres). The MEC/MPPEH clearance included 100-percent surface clearance and anomaly investigation, but only of the select grids where contaminated soil was to be excavated.

The table below provides a summary of the MEC items identified and removed during the 2008/2009 clearance activities. All of the MEC items were encountered in and around the former Ordnance Disposal Area. Additionally, numerous MDAS items were encountered that were located in and around the

Ordnance Disposal Area, in the former skeet and trap range area, and along access roads to the Ordnance Disposal Area.

**MEC Items Identified During the 2008/2009 Soil Removal Action**

| Grid | MEC items found | Surface or Subsurface |
|---|---|---|
| A2J8 | One 20mm Target Practice (TP) Projectile Full Up | Subsurface |
| A3H3 | One 20mm TP Projectile Full Up | Surface |
| A3H4 | One M204 Practice Mine Fuze | Subsurface |
| A3I3 | Six M204 Practice Mine Fuzes | Subsurface |
| A3J3 | Two M204 Practice Mine Fuzes | Subsurface |
| B2A7 | Two M204 Practice Mine Fuzes and one M112 Photoflash Cartridge | Subsurface |
| B2A8 | One M208 20mm TP | Surface |
| B2A9 | Two 20mm TP Projectiles Full Up | Subsurface |
| B2C0 | Three M204 Practice Mine Fuzes | Subsurface |
| B2C6 | One 20mm Projectile High Explosive (HE) | Subsurface |
| B3A1 | One Aircraft Launched Flare | Surface |
| B3B1 | Two Mk4 Spotting Charges | Subsurface |
| B3B2 | One M204 Practice Mine Fuze | Subsurface |
| B3B3 | Two M204 Practice Mine Fuzes | Subsurface |
| B3C1 | One BLU – 26/B Submunition Inert Bomblet | Subsurface |
| B3D3 | One M204 Practice Mine Fuze | Subsurface |

In April and May 2010, an MEC RI was conducted practicing UXO avoidance (Tetra Tech, 2011b). Site 15 was divided into 100-foot grids building outwards from the grid system used previously during 2008 and 2009 soil removal activities. Both the ground surface and shallow subsurface (0 to 1 foot bgs) were investigated using detector-aided survey techniques only; no intrusive investigation was conducted although subsurface anomalies could be identified. As the detector-aided survey along each transect was completed, the number of subsurface anomalies was counted and recorded by the field team; each transect was color coded (blue, green, yellow, red) based on the number of subsurface anomalies detected along it. The specific location of each subsurface anomaly comprising the count was not surveyed during the 2010 investigation. A summary of the MPPEH items (anticipated at that time to be MDAS) found on the ground surface during the 2010 MEC RI and the number of subsurface anomalies found along each transect was presented in the MEC RI Report (Tetra Tech, 2011b). The MEC RI, coupled with findings of MPPEH (including MEC) removed from the surface/subsurface during the 2008/2009 remedial activities, concluded that Site 15 contained MPPEH in the vicinity of the former Ordnance Disposal Area.

Based on the detector-aided survey performed during the MEC RI, the density of surface MEC/MPPEH was characterized as low over the majority of the surface of the site. Thirteen MPPEH items (most suspected to be MDAS) were identified during the 2010 MEC RI. These items were located, inspected, identified, certified, and properly disposed of during the Supplemental RI.

A Supplemental MEC RI was conducted in 2011 (Tetra Tech, 2011c) to address data gaps for the shallow subsurface by intrusively investigating and determining the sources of shallow subsurface anomalies (0 to 1 foot bgs) detected during the 2010 MEC RI outside of areas already known to have contained MEC items (former Ordnance Disposal Area). Three remaining subsurface data gap areas were investigated during the Supplemental RI: the bike path/asphalt access road; the high density anomaly area outside the Ordnance Disposal Area, and the MEC RI grid boundary. The former Ordnance Disposal Area and the area within approximately 200 feet of the disposal area were not included in the Supplemental MEC RI because it is already known that these are areas of concern for recreational users at the site.

Based on the color designation (blue, green, yellow, red) signifying the number of subsurface anomalies identified during the 2010 MEC RI UXO detector-aided surface survey, a statistically determined varying number of subsurface anomalies were randomly acquired during the Supplemental MEC RI, along 100-foot spaced transects in each of the three data gap areas. Anomalies were excavated using hand tools with the following frequency: no anomalies were excavated along blue transects, one anomaly was excavated along green transects, two anomalies were excavated along yellow transects, and three anomalies were excavated along red transects. The Site 15 Supplemental MEC RI included the evaluation of 103 transects, each 100 feet in length, and the excavation of 132 target subsurface anomaly locations. Only one of the 132 hand digs resulted in a munitions-related find: a small caliber bullet located along the eastern investigation boundary, which was certified as MDAS; non-munitions metal was responsible for other anomalies. In addition, MPPEH items remaining on site, after being identified during the 2010 MEC RI, were revisited, inspected, certified, and removed from the site. From the 2010 MEC RI and 2011 Supplemental MEC RI combined, a total of nine items were certified as MDAS items. The remaining six of the MPPEH items were certified as non-munitions-related scrap or electrical parts. Appendix A-3 presents the results.

No MEC/material documented as an explosive hazard (MDEH) were found at Site 15 during the 2010 MEC RI or the 2011 Supplemental MEC RI; however, a full clearance of the surface and subsurface of all grids was not conducted. Because of the documented removal of MEC from the site in the past, there is potential for MEC/MPPEH to exist at Site 15 on the ground surface and in the subsurface. Because no

MEC/MDEH were encountered in the high-density anomaly areas outside of the Ordnance Disposal Area, no burial pits or trench areas are suspected. At the 2010/2011 MEC RI grid boundary, because only a single small caliber small arms bullet was identified, the site boundary has been adequately defined, as statistically supported. Although to date MEC has not been encountered, the Bike Path/Asphalt Access Road remains of interest because of the potential for high public foot traffic there.

The primary area of concern remains the former Ordnance Disposal Area. The results of the Supplemental MEC RI were consistent with the CSM, which indicated that munitions items on the ground surface and in the subsurface would be primarily in and around the former Ordnance Disposal Area and decrease in density toward the site boundary. Based on the 2008/2009 removal action and results of the 2011 Supplemental MEC RI intrusive investigation, the source of the subsurface anomalies appears to be primarily non-munitions related scrap metal, possibly MDAS; MEC items are expected to be present near the former Ordnance Disposal Area, albeit at low density. The primary exposure pathway at this site is direct contact with items on the ground surface, and to a lesser extent the shallow subsurface (0 – 1 foot bgs), based on the permissible low-intensity land use activities.

Recommendations from the MEC RI and Supplemental MEC RI for Site 15 are to proceed to an FS, taking into consideration two areas of concern: the former Ordnance Disposal Area, which has a high potential for one or more MEC items to be present at the ground surface and shallow subsurface; and the remaining area of the site, which includes access roads serving as high traffic areas for human receptors.

### 1.3.2 Nature and Extent of Contamination

A ROD for OU5, Site 15 was signed in June 2008 for selection of a remedy for chemical contamination at Site 15 (Tetra Tech, 2008), and included land use controls (LUCs) and soil excavation. Chemical contamination at Site 15 has been addressed through this remedy, the extent of arsenic, lead, PAH, and TRPH contaminated soil was delineated, site-specific recreational cleanup goals were established, and soil was excavated to meet permitted land use (low-intensity recreational activities) requirements. However, soil remaining at the site may contain levels of lead that exceed TCLP limits (Appendix A-2) and PAH levels that may exceed residential SCTLs (see Appendix A-2 for figures from the Amended FS).

For this FS, there is the potential for MEC/MPPEH to be present at the site as a result of ordnance disposal activities. To date, the density of MEC, MPPEH, and munitions-related items and debris has been highest at the former Ordnance Disposal Area and decreases with distance from the former Ordnance Disposal Area.

### 1.3.3 Contaminant Fate and Transport

Chemical contamination at Site 15 has been addressed for the intended land use. Munitions-related items, debris, and/or MEC/MPPEH present at this site are not expected to migrate significantly.

### 1.3.4 Human Health Risk

A qualitative hazard/risk assessment was performed as part of the Supplemental MEC RI to assess the current explosive hazards to human receptors at Site 15, in accordance with Munitions and Explosives of Concern Hazard Assessment Methodology (USEPA, 2010). The MEC Hazard Assessment (HA) was based on the 2011 Supplemental MEC RI and historical information obtained from the 2010 MEC RI and prior 2008 and 2009 MEC activities in support of contaminated soil removal and remedial action. A qualitative assessment was not completed for MC because chemical contamination at Site 15 was addressed during the remedial action performed in 2008 and 2009. The results of the MEC HA prepared as part of the Supplemental MEC RI, as well as MEC HAs prepared for each of the FS alternatives, are presented in Appendix A-4. Results of the alternative specific MEC HAs prepared as part of the FS are presented in Section 4.0.

#### 1.3.4.1 Baseline Input Factors

Site 15 has two distinct areas: the former Ordnance Disposal Area, and the remainder of the site (particularly areas around access roads, which are high traffic areas for human receptors). Therefore, the site was divided into two subunits to perform the MEC HAs, as allowed by the USEPA guidance (2010).

**Subunit 1** - the former Ordnance Disposal Area and the immediate vicinity around the former Ordnance Disposal Area (a buffer of approximately 200 feet), where MEC/MPPEH are assumed to remain on the ground surface and in the subsurface, based on the findings from the 2008/2009 soil removal action. The area of this subunit (approximately 9 acres) excludes grids that underwent removal of MEC/MPPEH: approximately 11 acres where 100 percent surface clearance, subsurface anomaly clearance to 2 feet bgs, and soil removal occurred during the 2008/2009 remedial action. Figures 4-1 through 4-3 depict the excluded areas, which are shaded grey.

**Subunit 2** – The remainder of the site, including the former skeet range and areas along access roads leading to the former Ordnance Disposal Area where MDAS and munitions-related scrap are expected to be located on the ground surface and shallow subsurface (less than 1 foot bgs). The area of this subunit (approximately 30 acres) excludes grids that underwent removal of MEC/MPPEH: approximately 13 acres where 100 percent surface clearance, subsurface anomaly clearance to 2 feet bgs, and soil removal occurred during the 2008/2009 remedial action. Figures 4-1 through 4-3 depict the excluded areas, which are shaded grey.

The site-specific scoring drivers include the following input factors.

- The location and relative quantity of MEC/MDAS found on the ground surface and subsurface (0 to 3.5 feet bgs, based on 2008/2009 soil removal activities) in relation to human receptors.
  - Subunit 1 is approximated by an Open Burn/Open Detonation Area (relatively higher potential amount of MEC remaining on the surface and in the subsurface).
  - Subunit 2 is approximated by a Safety Buffer Area (relatively lower amount of MEC remaining on the surface and subsurface).

- Based on the Explosives Safety Submission (ESS) prepared as part of the Supplemental MEC RI, the item with the Maximum Greatest Fragmentation Distance (MGFD) is the 20mm projectile HE, M56A4.

- Unrestricted public accessibility to the site and the specified current and expected future land use of the site, which includes only low-intensity activities.
  - The recreational user is expected to have a maximum potential intrusive depth of 0.0 to 0.5 feet, which overlaps with the minimum expected depth of MEC, based on historical findings of MEC/MDAS items on the ground surface and in the shallow subsurface.
  - Public contact time with the site is estimated to be very low: approximately 400 hours annually based on the specified current and future land use.

- No full remedial action or clearance has occurred in either subunit and the initial assessment is of the current baseline conditions, as of the completion of the Supplemental MEC RI.

- It is possible for MEC to migrate to the surface via erosional forces as a result of heavy rain or the continued use of unpaved trails and paths throughout the site.

#### 1.3.4.2 Baseline Scoring

The MEC HA output is a score and a hazard level used to evaluate current site conditions relative to expected changes in the site that would result from remedial actions, as presented in Section 4.0. The MEC HA Hazard Levels and associated scoring ranges are listed in the table below.

**MEC HA Hazard Levels and Score Ranges**

| Hazard Level | Maximum MEC HA Score | Minimum MEC HA Score |
|---|---|---|
| 1 | 1000 | 840 |
| 2 | 835 | 725 |
| 3 | 720 | 530 |
| 4 | 525 | 125 |

The MEC HA score for the baseline conditions in Subunit 1 is 865, which corresponds to a relative Hazard Level of 1, indicating that the former Ordnance Disposal Area has the highest potential for explosive hazard conditions. This hazard assessment is based on the historical use of the former Ordnance Disposal Area, the potential for MEC to be located on the ground surface and in the subsurface, and the potential for human receptors, with full access to the site, to be exposed to MEC. Hazard Level 1 is representative of a site that has not undergone a remedial action. Note: this score will remain the same for the No Action alternative because no remediation would be completed at the site.

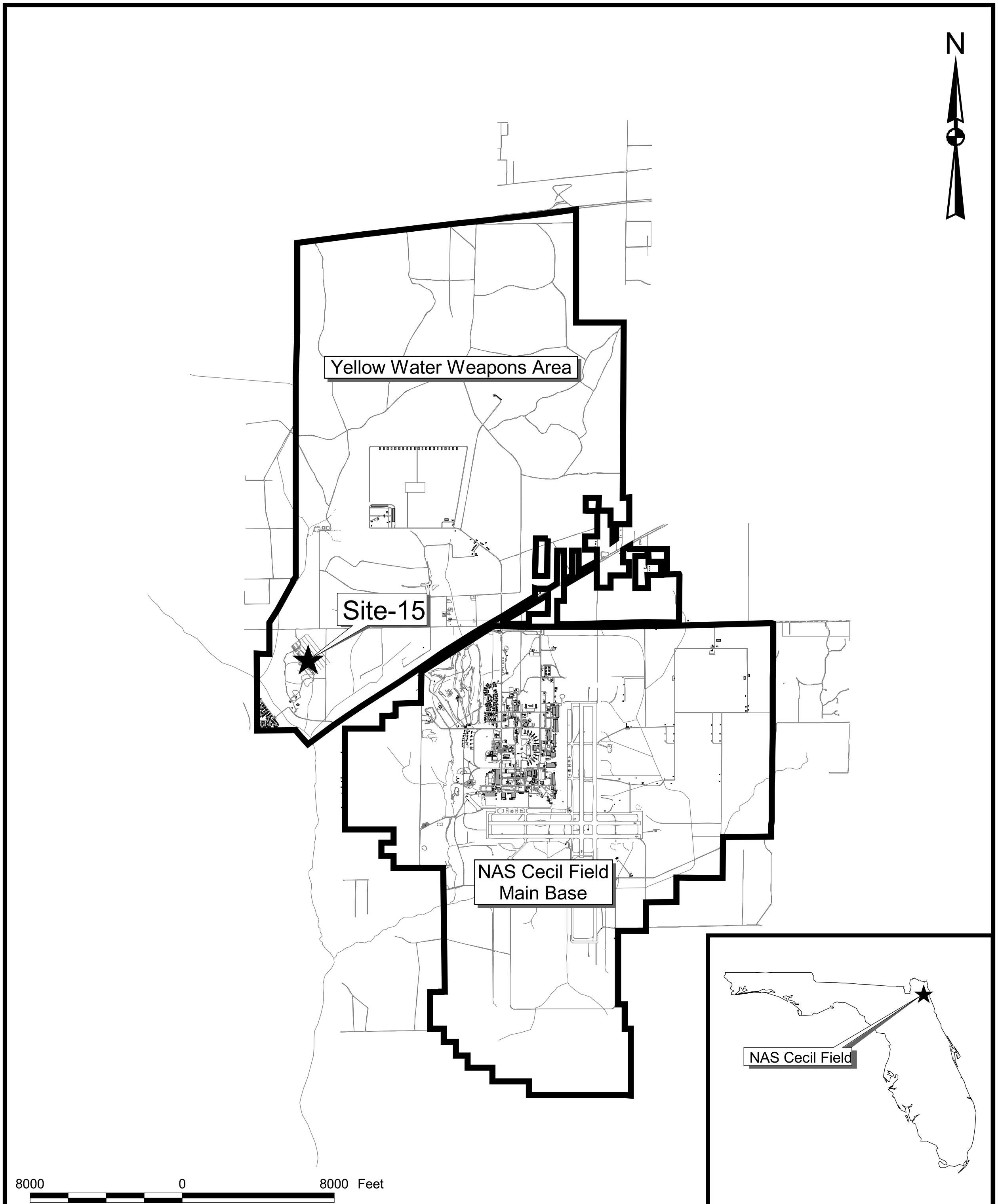
The MEC HA score for the baseline conditions in Subunit 2 is 605, which corresponds to a relative Hazard Level of 3, indicating that the area outside the former Ordnance Disposal Area has a moderate potential for explosive hazard conditions. This hazard assessment is based on the historical use of this area as a skeet range and possible kickout or surface disposal area, and the low probability that MEC/MPPEH are present in this area, which reduces the potential for human receptors to be exposed to MEC/MPPEH. However, because a full surface clearance has not been performed, there is still a possibility that MEC/MPPEH are present in this area. Note: this score will remain the same for the No Action alternative because no remediation would be completed at the site.

### 1.3.5 Ecological Risk

For this FS, the presence of MEC/MPPEH at the site is of concern. The MEC HA, as presented in section 1.3.4, is sufficient to address both human and ecological receptors.

### 1.3.6 Conclusions

No chemicals of potential concern (COPCs) remain at Site 15 in excess of established site-specific soil cleanup target levels to permit low-intensity recreational use of the site. MEC/MPPEH potentially present on the surface and most likely in the subsurface, are a concern for this FS.




| DRAWN BY | DATE | CONTRACT NUMBER |
|---|---|---|
| MJJ | 27Jul11 | 2267 |
| CHECKED BY | DATE | APPROVED BY / DATE |
| EIL | | L. Klink |
| COST/SCHEDULE-AREA | | APPROVED BY / DATE |
| SCALE | | DRAWING NO. / REV |
| AS NOTED | | FIGURE 1-1 / 0 |

GENERAL LOCATION MAP
OPERABLE UNIT 5, SITE 15
FEASIBILITY STUDY REPORT FOR MUNITIONS REMOVAL
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

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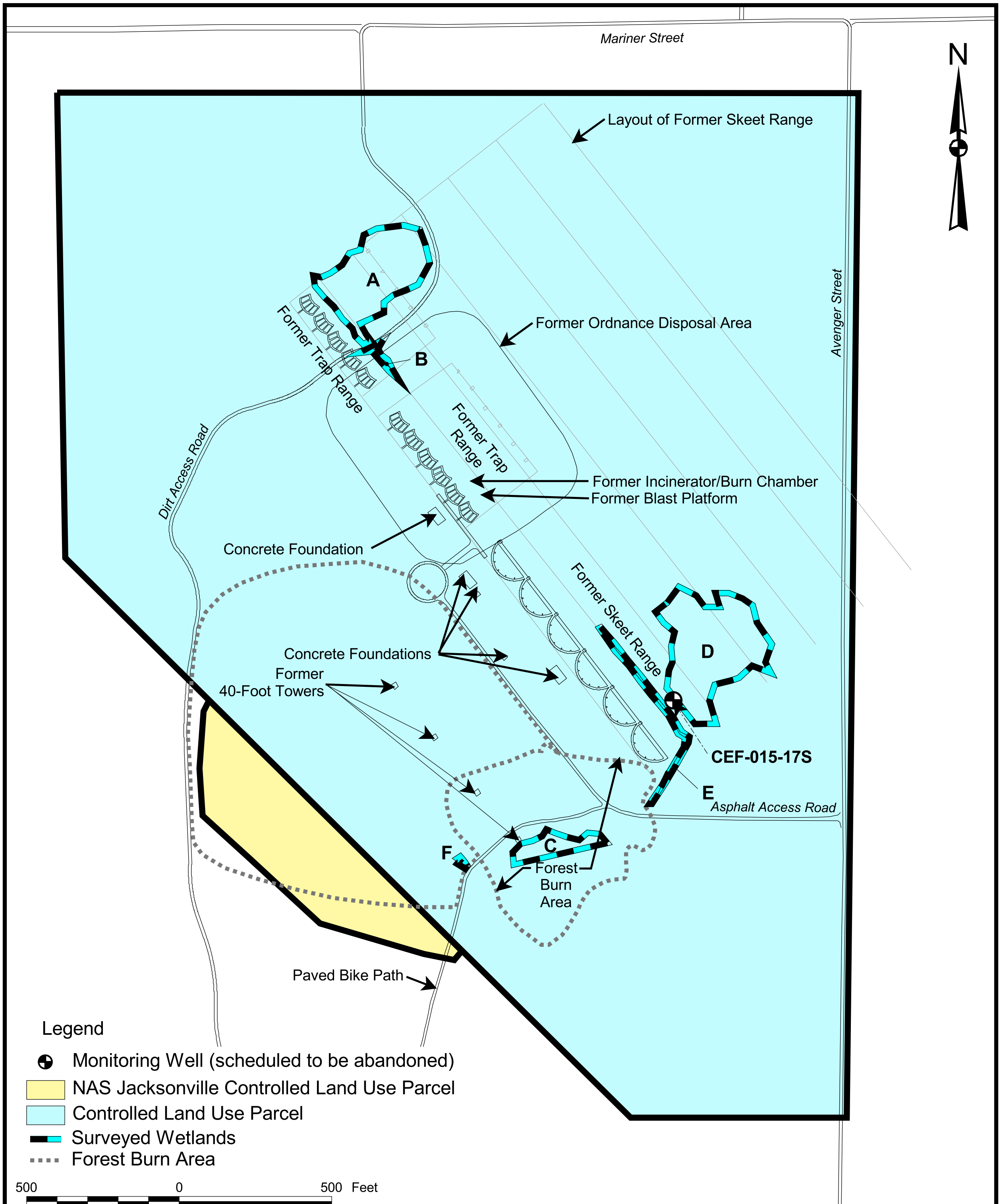


| DRAWN BY MJJ | DATE 20Jan10 | GENERAL SITE ARRANGEMENT | CONTRACT NUMBER 2267 | |
|---|---|---|---|---|
| CHECKED BY EIL | DATE | OPERABLE UNIT 5, SITE 15 | APPROVED BY L. Klink | DATE |
| COST/SCHEDULE-AREA | | FEASIBILITY STUDY REPORT FOR MUNITIONS REMOVAL | APPROVED BY | DATE |
| SCALE AS NOTED | | NAVAL AIR STATION CECIL FIELD<br>JACKSONVILLE, FLORIDA | DRAWING NO. FIGURE 1-2 | REV 0 |

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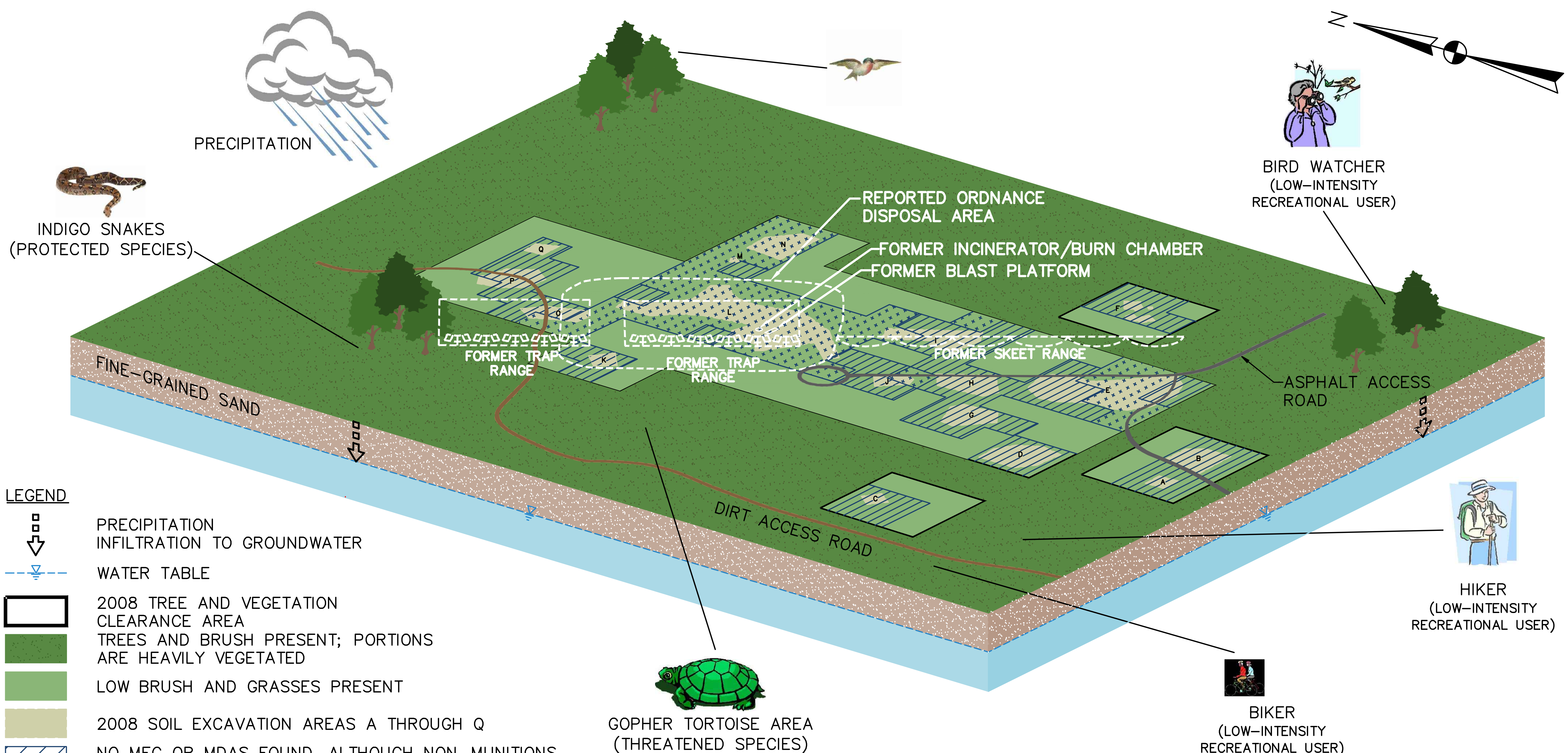


LEGEND

PRECIPITATION INFILTRATION TO GROUNDWATER

WATER TABLE

2008 TREE AND VEGETATION CLEARANCE AREA

TREES AND BRUSH PRESENT; PORTIONS ARE HEAVILY VEGETATED

LOW BRUSH AND GRASSES PRESENT

2008 SOIL EXCAVATION AREAS A THROUGH Q

NO MEC OR MDAS FOUND, ALTHOUGH NON-MUNITIONS DEBRIS MAY HAVE BEEN PRESENT

MEC AND/OR MDAS FOUND

NOTES:

1.) MEC OR MDAS ARE MOST LIKELY STILL PRESENT IN AREAS NOT INCLUDED IN THE 2008 MUNITIONS CLEARANCE WITHIN AND ADJACENT TO THE ORDNANCE DISPOSAL AREA, ALONG ACCESS ROADS TO THE ORDNANCE DISPOSAL AREA, AND IN THE AREA USED AS FORMER SKEET AND TRAP RANGES.

2.) CURRENT ALLOWED LAND USE INCLUDES LOW-INTENSITY RECREATIONAL USE.

| | | | |
|---|---|---|---|
| DRAWN BY CK / DATE 2/16/10 | NAVFAC | CONCEPTUAL SITE MODEL<br>FEASIBILITY REPORT FOR MUNITIONS REMOVAL<br>OPERABLE UNIT 5, SITE 15<br>NAVAL AIR STATION CECIL FIELD<br>JACKSONVILLE, FLORIDA | CONTRACT NO. 2267 |
| CHECKED BY / DATE | | | OWNER NO. |
| REVISED BY / DATE | | | APPROVED BY L. KLINK / DATE 8-2-10 |
| SCALE NOT TO SCALE | | | DRAWING NO. FIGURE 1-3 / REV. 0 |

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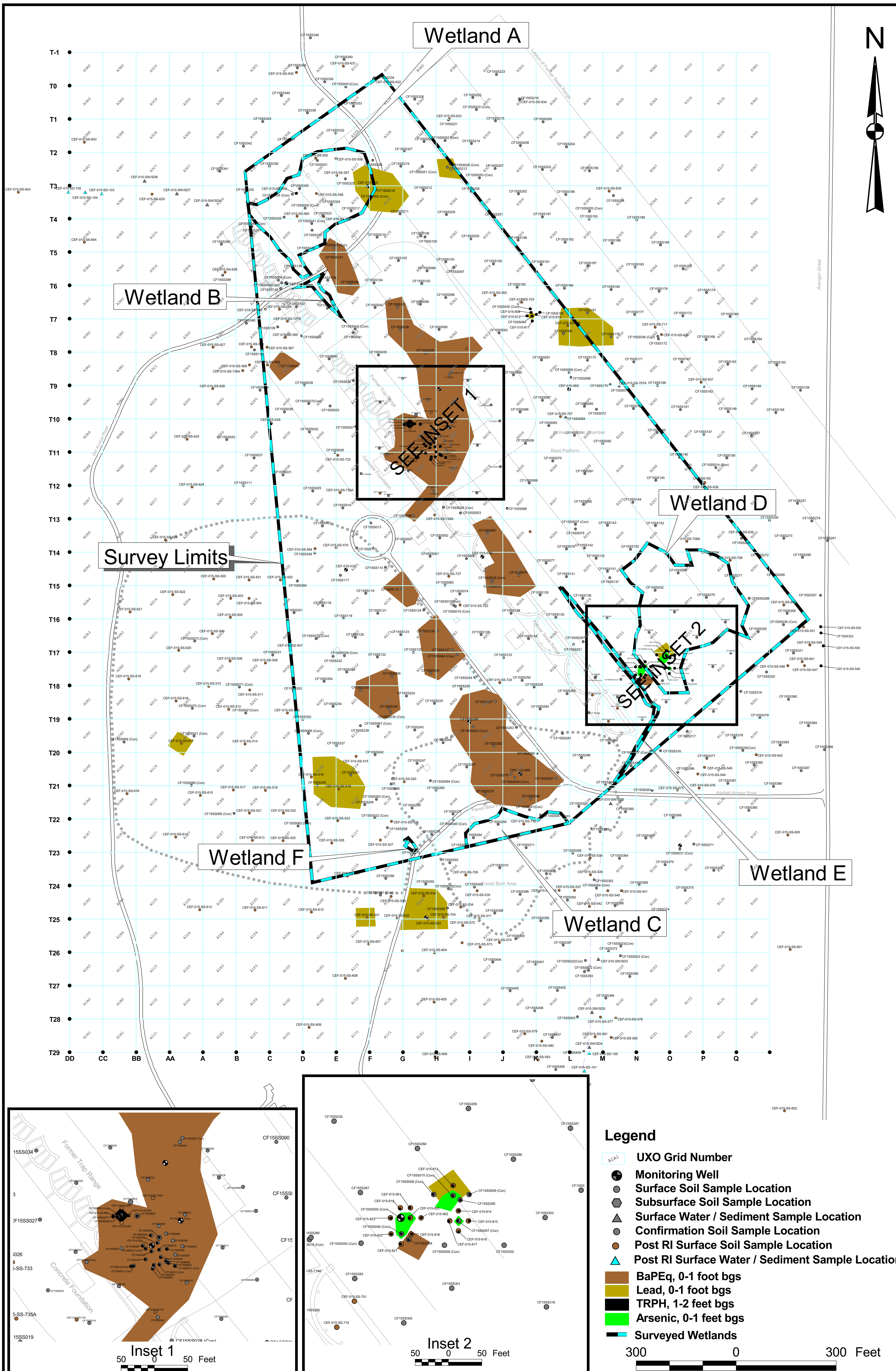


| | | | |
|---|---|---|---|
| DRAWN BY MJJ | DATE 14Sept11 | 2008 SOIL EXCAVATION AREAS<br>OPERABLE UNIT 5, SITE 15<br>FEASIBILITY STUDY REPORT FOR MUNITIONS REMOVAL<br>NAVAL AIR STATION CECIL FIELD<br>JACKSONVILLE, FLORIDA | CONTRACT NUMBER 2267 |
| CHECKED BY EIL | DATE | | APPROVED BY L. Klink — DATE |
| COST/SCHEDULE-AREA | | | APPROVED BY — DATE |
| SCALE AS NOTED | | NAVFAC | DRAWING NO. FIGURE 1-4 — REV 0 |

# 2.0 REMEDIAL ACTION OBJECTIVES AND GENERAL RESPONSE ACTIONS

This section develops RAOs and GRAs, and presents remediation goals for removal of munitions-related items. The regulatory requirements and guidance (e.g., ARARs) that may potentially govern remedial activities are presented in this section. In addition, this section presents the materials of concern identified in Section 1.0 and the conceptual pathways through which these materials may affect human health and the environment.

## 2.1 MEDIA AND CONTAMINANTS OF CONCERN

No chemical COPCs remain at Site 15 in excess of established site-specific soil cleanup target levels to permit low-intensity recreational use of the site. MEC/MPPEH potentially present at the site are a concern, and the exposure pathway for potential human and ecological receptors is direct contact with munitions-related items in site media. Exposure to MEC does not mean that an incident or injury will occur since a receptor would have to disturb the MEC item (e.g., apply heat, friction, or shock to the item) in order to be exposed to actual explosive hazards.

## 2.2 REMEDIAL ACTION OBJECTIVES AND APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS/TO BE CONSIDEREDS

RAOs are medium-specific goals that define the objective of conducting remedial actions to protect human health and the environment. The RAOs specify the materials of concern, potential exposure routes and receptors, and acceptable residual risk that will remain at the site.

The development of remediation goals takes into consideration location-specific and action-specific ARARs and TBCs at this site. There are no chemical-specific ARARs and TBCs because no COPCs remain at this site in excess of established site-specific soil cleanup target levels to permit low-intensity recreational use of the site.

The remedial action selected must reduce risks to and be protective of human health and the environment, maintain that protection over time, and comply with federal and state ARARs/TBCs. Clearance activities have been conducted at Site 15 that have reduced risks to human health and the environment. However, MEC/MPPEH items potentially remain on site. Therefore, to manage the risk to site receptors from munitions-related items and MEC/MPPEH, remedial action alternatives were evaluated and are described in the remaining sections of this FS.

### 2.2.1 Statement of Remedial Action Objectives

To protect the public from potential current and future health risks, as well as to protect the environment, the following RAOs have been developed for Site 15.

**RAO No. 1:** Prevent and/or minimize the direct contact threat associated with MEC/MPPEH remaining on the ground surface and in the shallow subsurface.

**RAO No. 2:** Make Site 15 safe for the specified land use.

**RAO No. 3:** Minimize the impact of site activities to wetlands, threatened and endangered species, and other natural resources at Site 15.

### 2.2.2 Applicable or Relevant and Appropriate Requirements and To Be Considered Criteria

ARARs consist of the following:

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

Per 40 Code of Federal Regulations (CFR) 300.400(g)(3), TBCs are non-promulgated, non-enforceable guidelines or criteria that may be useful for developing a remedial action or are necessary for determining what is protective to human health and/or the environment. Examples of TBCs include USEPA Drinking Water Health Advisories, Reference Doses (RfDs) and Cancer Slope Factors (CSFs).

According to 40 CFR 300.430(f)(1)(i)(A), overall protection of human health and the environment and compliance with ARARs are threshold requirements that each remedial alternative must meet to be eligible for selection.

#### 2.2.2.1 Definitions

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) of 40 CFR 300.5 provides the following definitions for ARARs:

- Applicable Requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site.

- Relevant and Appropriate Requirements are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law, although not "applicable" to a hazardous substance, pollutant, contaminant, or remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.

Per 40 CFR 300.400(g)(3), other advisories, criteria, or guidance are to be considered for a particular release. The TBC category consists of advisories, criteria, or guidance developed by USEPA, other federal agencies, or states that may be useful in developing CERCLA remedies.

Under CERCLA Section 121(d)(4), USEPA may waive compliance with an ARAR if one of the following conditions can be demonstrated:

- The remedial action selected is only part of a total remedial action that will attain the ARAR level or standard of control upon completion.

- Compliance with the requirement will result in greater risk to human health and the environment than other alternatives.

- Compliance with the requirement is technically impracticable from an engineering perspective.

- The remedial action selected will attain a standard of performance that is equivalent to that required by the ARAR through the use of another method or approach.

- With respect to a state requirement, the state has not consistently applied the ARAR in similar circumstances at other remedial actions within the state.

- Compliance with the ARAR will not provide a balance between protecting public health, welfare, and the environment at the facility with the availability of Superfund money for response at other facilities (fund-balancing). This condition only applies to Superfund-financed actions.

USEPA in various guidance documents and the NCP has divided ARARs into three categories to facilitate identification. Chemical-specific and location-specific ARARs are identified early in the process, generally during the RI; and action-specific ARARs are normally identified during the FS in the detailed analysis of alternatives. These three types of ARARs are defined as follows:

- Chemical-Specific: Health- or risk-based numerical values or methodologies that establish concentration or discharge limits for particular contaminants. Examples include MCLs and CWA Ambient Water Quality Criteria (AWQC).

- Location-Specific: Restrict actions or contaminant concentrations in certain environmentally sensitive areas. Examples of these areas regulated under various federal laws include floodplains, wetlands, and locations where endangered species or historically significant cultural resources are present.

- Action-Specific: Technology- or activity-based requirements, limitations on actions, or conditions involving special substances. Examples of action-specific ARARs include: RCRA regulations for generation, characterization, and management of hazardous wastes; and CWA effluent limitations and pre-treatment standards for wastewater discharges.

The following section discusses location- and action-specific ARARs and TBCs for this site.

#### 2.2.2.2 Chemical-Specific ARARs and TBCs

Chemical contamination at Site 15 has been addressed for the intended land use; therefore, there are no chemical-specific ARARs or TBCs for this site.

#### 2.2.2.3 Location-Specific ARARs and TBCs

Federal and Florida laws and regulations are potential location-specific ARARs/TBCs for any remedial action at Site 15. Potential location-specific ARARs/TBCs include federal and Florida regulations, as well as regulations for the protection of fish and wildlife and their habitat, protection of wetlands, and protection of threatened and endangered species.

Table 2-1 presents federal and Florida location-specific ARARs and TBCs for this FS.

#### 2.2.2.4 Action-Specific ARARs and TBCs

Potential action-specific ARARs/TBCs include federal and Florida regulations; hazardous waste generation, storage, disposal, and transportation regulations, including specific regulations for MEC-related wastes and solid waste regulations.

Action-specific ARARs/TBCs include the management of MEC as a potential explosive hazard. Munitions that would otherwise be classified as hazardous wastes can be managed in accordance with the substantive requirements of the Resource Conservation and Recovery Act and the Florida hazardous waste management regulations when treated wholly on site.

Table 2-2 presents federal and Florida action-specific ARARs and TBCs for this FS.

## 2.3 GENERAL RESPONSE ACTIONS

GRAs are broadly defined remedial approaches that may be used (by themselves or in combination with one or more of the others) to attain the RAOs.

GRAs describe categories of actions that could be implemented to satisfy or address a component of the RAOs for the site. Remedial action alternatives are formed using GRAs singly or in combination to meet the RAOs. The remedial action alternatives, composed of GRAs, will be capable of achieving the RAOs at the site.

The following GRAs will be considered at Site 15:

- No Action
- Land Use Controls
- Detection
- Removal
- Treatment
- Disposal

**TABLE 2-1**

**LOCATION-SPECIFIC ARARs AND TBCs [(1)]**
**OU 5, SITE 15 FEASIBILITY STUDY FOR MUNITIONS REMOVAL**
**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**


| Location Characteristics | Requirement | Prerequisite | Citation |
|---|---|---|---|
| Presence of wetlands | Requires Federal agencies to evaluate action to minimize the destruction, loss or degradation of wetlands and to preserve and enhance beneficial values of wetlands. | Actions that involve potential impacts to, or take place within, wetlands – **To Be Considered** | Executive Order 11990 – *Protection of Wetlands*<br>Section 1.(a) |
| ***Aquatic Resources*** | | | |
| Location encompassing aquatic ecosystem as defined in 40 C.F.R. 230.3(c) | No discharge of dredged or fill material into an aquatic ecosystem is permitted if there is a practicable alternative that would have less adverse impact. | Action that involves the discharge of dredged or fill material into waters of the United States, including jurisdictional wetlands – **Relevant and Appropriate** | 40 C.F.R. 230.10(a) |
| | No discharge of dredged or fill material shall be permitted unless appropriate and practicable steps in accordance with 40 C.F.R. 230.70 *et seq.* have been taken that will minimize potential adverse impacts of the discharge on the aquatic ecosystem. | | 40 C.F.R. 230.10(d) |
| | Must comply with the substantive requirements of the NWP 38 General Conditions, as appropriate, any regional or case-specific conditions recommended by the Corps District Engineer, after consultation.<br>*Note:* Despite that consultation may be considered an administrative requirement, it should be performed to ensure activities are in compliance with substantive provisions of the permit. | On-site CERCLA action conducted by Federal agency that involves the discharge of dredged or fill material into waters of the United States, including jurisdictional wetlands – **Relevant and Appropriate** | Nation Wide Permit (38) Cleanup of Hazardous and Toxic Waste<br>33 C.F.R. 323.3(b) |

**TABLE 2-1**

**LOCATION-SPECIFIC ARARs AND TBCs (1)**
**OU 5, SITE 15 FEASIBILITY STUDY FOR MUNITIONS REMOVAL**
**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**


| Location Characteristics | Requirement | Prerequisite | Citation |
|---|---|---|---|
| ***Threatened and Endangered Species*** | | | |
| Presence of Threatened and Endangered Wildlife listed in 50 C.F.R. 17.11(h) –or critical habitat of such species | Federal agency shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary of Interior, after consultation as appropriate with affected States, to be critical, unless such agency has been granted an exemption for such action by the Committee pursuant to subsection (h) of this section.<br><br>*Note:* Despite that consultation may be considered an administrative requirement, it should be performed to ensure activities are in compliance with substantive provisions of the Endangered Species Act and regulations. | Agency action that may jeopardize listed wildlife species, or destroy or adversely modify critical habitat – **Applicable** | 16 U.S.C. 1536 (a)(2)<br>–or Section 7(a)(2) of *the Endangered Species Act of 1973* |
| Presence of Threatened and Endangered Wildlife listed in 50 C.F.R. 17.11(h) | It is unlawful to take threatened or endangered wildlife in the United States.<br>No person may take any gopher tortoise except as provided in 50 C.F.R. 17.42(a)(2)(i) and (ii).<br><br>*Note:* Under 50 C.F.R. 10.12 *Definitions* the term *Take* means to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect. | Action that may jeopardize listed wildlife species – **Applicable** | 50 C.F.R. 17.21(c)<br>50 C.F.R. 17.31(a)<br>50 C.F.R. 17.42(a)(2) |

**TABLE 2-1**

**LOCATION-SPECIFIC ARARs AND TBCs [(1)]**
**OU 5, SITE 15 FEASIBILITY STUDY FOR MUNITIONS REMOVAL**
**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**


| Location Characteristics | Requirement | Prerequisite | Citation |
|---|---|---|---|
| Presence of State-Listed Threatened and Endangered Wildlife | No person shall take, posses, or sell any threatened species included in this subsection or parts thereof or their nests or eggs except as authorized by Commission rule or by permit from the Commission.<br><br>The gopher tortoise (*gopherus polyphemus*) shall be afforded the protective provisions specified in this subparagraph. No person shall take, attempt to take, pursue, hunt, harass, capture, possess, sell or transport any gopher tortoise or parts thereof or their eggs, or molest, damage, or destroy gopher tortoise burrows, except as authorized by Commission permit or when complying with Commission approved guidelines for specific actions which may impact gopher tortoises and their burrows. | Action that may jeopardize state-listed wildlife species - **Applicable** | 68A-27.003(2)<br>68A-27-003(2)(d)(3) |
| Presence of Migratory Birds | No person may take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, barter, any migratory bird, or the parts, nests, or eggs of such bird except as may be permitted under the terms of a valid permit issued pursuant to the provisions of this part and part 13 of the chapter, or as permitted by regulations in this part, or part 20 of this subchapter (the hunting regulations).<br><br>*Note*: Take means to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect. | Action that may jeopardize migratory birds - **Applicable** | 50 CFR 21.11<br>50 CFR 10.13 |

**TABLE 2-1**

**LOCATION-SPECIFIC ARARs AND TBCs (1)**
**OU 5, SITE 15 FEASIBILITY STUDY FOR MUNITIONS REMOVAL**
**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**


1 Location-specific ARARs and TBCs apply to all alternatives presented in this feasibility study.

ARAR = Applicable *or* Relevant and Appropriate Requirement.
TBC = To Be Considered.
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act.
C.F.R. = Code of Federal Regulation.
NWP = Nationwide Permit.
U.S.C = United States Code.

TABLE 2-2

ACTION-SPECIFIC ARARs and TBCs
OU 5, SITE 15 FEASIBILITY STUDY FOR MUNITIONS REMOVAL
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA


| Action | Requirement | Prerequisite | Citation | Alternatives [1] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2A | 2B | 2C | 3A | 3B | 3C | 4A | 4B | 4C |
| ***General Construction Standards — All Land-disturbing Activities (i.e., excavation, clearing, grading, etc.)*** | | | | | | | | | | | | |
| Control of storm water runoff from soil disturbing activities | Must comply with the substantive provisions in the “Generic Permit for Stormwater Discharge from Large and Small Construction Activities,” document number 62-621.300(4)(a), issued by the FDEP and effective February 17, 2009. Requires development storm water pollution prevention plan and implementation of best management practices and erosion and sedimentation controls for stormwater runoff to ensure protection of the surface waters of the state.<br><br>*Note*: Plan would be part of CERCLA document such as Remedial or Removal Action Work Plan. | Stormwater discharges from large and small construction activities to surface waters of the State as defined in Section 403.031, F.S. – **Applicable** | F.A.C. 62-621.300(4)(a)<br><br>*Generic Permit for Stormwater Discharge from Large and Small Construction Activities* | X | X | X | X | X | X | X | X | X |
| | No discharge from a stormwater discharge facility shall cause or contribute to a violation of water quality standards in waters of the state. | Construction activity (e.,g,, alteration of land contours or land clearing) that results in creation *of stormwater management system* as defined in F.A.C. 62-25.020(15) – **Applicable** | F.A.C. 62-25.025<br><br>*Regulation of Stormwater Discharge* | X | X | X | X | X | X | X | X | X |
| | Erosion and sediment control best management practices shall be used as necessary during construction activity to retain sediment on site.<br><br>These practices shall be designed by an engineer or other competent professional experienced in the fields of soil conservation or sediment control according to specific site conditions and shall be shown or noted on the plans of the stormwater management system.<br><br>*Note*: Plan would be part of CERCLA document such as Remedial or Removal Action Work Plan. | | F.A.C. 62-25.025 (7) | X | X | X | X | X | X | X | X | X |

| Action | Requirement | Prerequisite | Citation | Alternatives (1) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2A | 2B | 2C | 3A | 3B | 3C | 4A | 4B | 4C |
| Control of Fugitive Dust | No person shall cause, let, permit, suffer or allow the emissions of unconfined particulate matter from any activity, including vehicular movement; transportation of materials; construction, alteration, demolition or wrecking; or industrially related activities such as loading, unloading, storing or handling; without taking reasonable precautions to prevent such emissions. | Land disturbing activity that has potential for unconfined emissions of particulate matter – **Applicable** | F.A.C. 62-296.320(4)(c)<br><br>*General Pollutant Emission Limiting Standards* | X | X | X | X | X | X | X | X | X |
| ***Waste Characterization – Primary Waste (e.g., excavated soils/sediments, munitions and debris) and Secondary Wastes (e.g., contaminated PPE or treatment residuals)*** | | | | | | | | | | | | |
| Characterization of ***solid waste*** (all primary and secondary wastes) | Must determine if solid waste is a hazardous waste using the following method:<br>• Should first determine if waste is excluded from regulation under 40 C.F.R. 261.4; and<br>Must then determine if waste is listed as a hazardous waste under subpart D 40 C.F.R. Part 261. | Generation of solid waste as defined in 40 C.F.R. 261.2 – **Applicable** | 40 C.F.R. 262.11(a) and (b)<br><br>F.A.C. 62-730.160 | X | X | X | X | X | X | X | X | X |
| | Must determine whether the waste is (characteristic waste) identified in subpart C of 40 C.F.R. part 261by either:<br>(1) Testing the waste according to the methods set forth in subpart C of 40 C.F.R. part 261, or according to an equivalent method approved by the Administrator under 40 C.F.R. 260.21; or<br>(2) Applying knowledge of the hazard characteristic of the waste in light of the materials or the processes used. | Generation of solid waste which is not excluded under 40 C.F.R. 261.4(a) – **Applicable** | 40 C.F.R. 262.11(c)<br><br>F.A.C. 62-730.160 | X | X | X | X | X | X | X | X | X |
| | Must refer to Parts 261, 262, 264, 265, 266, 268, and 273 of Chapter 40 for possible exclusions or restrictions pertaining to management of the specific waste. | Generation of solid waste which is determined to be hazardous waste – **Applicable** | 40 C.F.R. 262.11(d)<br><br>F.A.C. 62-730.160 | X | X | X | X | X | X | X | X | X |
| Characterization of ***hazardous waste*** (all primary and secondary wastes) | Must obtain a detailed chemical and physical analysis on a representative sample of the waste(s), which at a minimum contains all the information that must be known to treat, store, or dispose of the waste in accordance with pertinent sections of 40 C.F.R. 264 and 268. | Generation of RCRA hazardous waste for storage, treatment or disposal – **Applicable** | 40 C.F.R. 264.13(a)(1)<br><br>F.A.C. 62-730.180(1) | X | X | X | X | X | X | X | X | X |

| Action | Requirement | Prerequisite | Citation | Alternatives (1) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2A | 2B | 2C | 3A | 3B | 3C | 4A | 4B | 4C |
| Determinations for management of hazardous waste | Must determine each EPA Hazardous Waste Number (waste code) applicable to the waste in order to determine the applicable treatment standards under 40 C.F.R. 268 et seq.<br><br>Note: This determination may be made concurrently with the hazardous waste determination required in Sec. 262.11 of this chapter. | Generation of hazardous waste for storage, treatment or disposal – **Applicable** | 40 C.F.R. 268.9(a)<br><br>F.A.C. 62-730.183 | X | X | X | X | X | X | X | X | X |
| | Must determine the underlying hazardous constituents [as defined in 40 C.F.R. 268.2(i)] in the characteristic waste. | Generation of RCRA characteristic hazardous waste (and is not D001 non –wastewaters treated by CMBST, RORGS, or POLYM of Section 268.42 Table 1) for storage, treatment or disposal – **Applicable** | 40 C.F.R. 268.9(a)<br><br>F.A.C. 62-730.183 | X | X | X | X | X | X | X | X | X |
| Determinations for management of hazardous waste | Must determine if the hazardous waste meets the treatment standards in 40 C.F.R. 268.40, 268.45, or 268.49 by testing in accordance with prescribed methods <u>or</u> use of generator knowledge of waste.<br>Note: This determination can be made concurrently with the hazardous waste determination required in 40 C.F.R. 262.11. | Generation of hazardous waste for storage, treatment or disposal – **Applicable** | 40 C.F.R. 268.7(a)<br><br>F.A.C. 62-730.183 | X | X | X | X | X | X | X | X | X |
| | Must comply with the special requirements of 40 C.F.R. 268.9 in addition to any applicable requirements in C.F.R. 268.7. | Generation of waste or soil that displays a hazardous characteristic of ignitability, corrosivity, reactivity, or toxicity for storage, treatment or disposal – **Applicable** | 40 C.F.R. 268.7(a)<br><br>F.A.C. 62-730.183 | X | X | X | X | X | X | X | X | X |
| ***Waste Storage – Primary Waste (e.g., excavated soils/sediments, munitions and debris) and Secondary Wastes (e.g., contaminated PPE or treatment residuals)*** | | | | | | | | | | | | |
| Temporary storage of solid waste munitions | Are subject to regulation under 40 CFR Parts 260 through 279, unless all of the conditions provided in subparagraphs (i) thru (vii) | Waste non-chemical military munitions in storage that exhibit a hazardous waste characteristic **– Applicable** | 40 CFR 266.205(a)<br><br>F.A.C 62-730.181 | X | X | X | X | X | X | X | X | X |

| Action | Requirement | Prerequisite | Citation | Alternatives [1] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2A | 2B | 2C | 3A | 3B | 3C | 4A | 4B | 4C |
| Temporary on–site storage of hazardous waste in containers | A generator may accumulate hazardous waste at the facility provided that:<br>• waste is placed in containers that comply with 40 C.F.R. 265.171 –173; and<br>• the date upon which accumulation begins is clearly marked and visible for inspection on each container;<br>• container is marked with the words "hazardous waste"; or | Accumulation of RCRA hazardous waste on site as defined in 40 C.F.R. 260.10 **– Applicable** | 40 C.F.R. 262.34(a);<br>40 C.F.R. 262.34(a)(1)(i);<br>40 C.F.R. 262.34(a)(2) and (3)<br>F.A.C. 62-730.160 | X | X | X | X | X | X | X | X | X |
| | • container may be marked with other words that identify the contents. | Accumulation of 55 gal. or less of RCRA hazardous waste or one quart of acutely hazardous waste listed in 261.33(e) at or near any point of generation – **Applicable** | 40 C.F.R. 262.34(c)(1)<br>F.A.C. 62-730.160 | X | X | X | X | X | X | X | X | X |
| Use and management of hazardous waste in containers | If container is not in good condition (e.g. severe rusting, structural defects) or if it begins to leak, must transfer waste from this container to a container that is in good condition. | Storage of RCRA hazardous waste in containers **–Applicable** | 40 C.F.R. 265.171<br>F.A.C. 62-730.180(2) | X | X | X | X | X | X | X | X | X |
| | Must use container made or lined with materials compatible with waste to be stored so that the ability of the container to contain is not impaired. | | 40 C.F.R. 265.172<br>F.A.C. 62-730.180(2) | X | X | X | X | X | X | X | X | X |
| | Containers must be closed during storage, except when necessary to add/remove waste.<br>Container must not opened, handled and stored in a manner that may rupture the container or cause it to leak. | | 40 C.F.R. 265.173(a) and (b)<br>F.A.C. 62-730.180(2) | X | X | X | X | X | X | X | X | X |
| Storage of hazardous waste in container area | Area must have a containment system designed and operated in accordance with 40 C.F.R. 264.175(b) | Storage of RCRA hazardous waste in containers ***with free liquids*** **– Applicable** | 40 C.F.R. 264.175(a)<br>F.A.C. 62-730.180(1) | X | X | X | X | X | X | X | X | X |
| | Area must be sloped or otherwise designed and operated to drain liquid resulting from precipitation, or<br>Containers must be elevated or otherwise protected from contact with accumulated liquid. | Storage of RCRA–hazardous waste in containers that ***do not contain free liquids*** (other than F020, F021, F022, F023,F026 and F027) **– Applicable** | 40 C.F.R. 264.175(c)(1) and (2)<br>F.A.C. 62-730.180(1) | X | X | X | X | X | X | X | X | X |

| Action | Requirement | Prerequisite | Citation | Alternatives (1) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2A | 2B | 2C | 3A | 3B | 3C | 4A | 4B | 4C |
| Closure performance standard for RCRA container storage unit | Must close the facility (e.g., container storage unit) in a manner that:<br>• Minimizes the need for further maintenance;<br>• Controls minimizes or eliminates to the extent necessary to protect human health and the environment, post – closure escape of hazardous waste, hazardous constituents, leachate, contaminated run – off, or hazardous waste decomposition products to the ground or surface waters or the atmosphere; and<br>Complies with the closure requirements of subpart, but not limited to, the requirements of 40 C.F.R. 264.178 for containers. | Storage of RCRA hazardous waste in containers **– Applicable** | 40 C.F.R. 264.111<br><br>F.A.C. 62-730.180(1) | X | X | X | X | X | X | X | X | X |
| Closure of RCRA container storage unit | At closure, all hazardous waste and hazardous waste residues must be removed from the containment system. Remaining containers, liners, bases, and soils containing or contaminated with hazardous waste and hazardous waste residues must be decontaminated or removed.<br><br>[Comment: At closure, as throughout the operating period, unless the owner or operator can demonstrate in accordance with 40 C.F.R. 261.3(d) of this chapter that the solid waste removed from the containment system is not a hazardous waste, the owner or operator becomes a generator of hazardous waste and must manage it in accordance with all applicable requirements of parts 262 through 266 of this chapter]. | Storage of RCRA hazardous waste in containers in a unit with a containment system **– Applicable** | 40 C.F.R. 264.178<br><br>F.A.C. 62-730.180(1) | X | X | X | X | X | X | X | X | X |

| Action | Requirement | Prerequisite | Citation | Alternatives (1) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2A | 2B | 2C | 3A | 3B | 3C | 4A | 4B | 4C |
| Temporary on –site storage of remediation waste in staging pile (e.g., excavated soils) | Must be located within the contiguous property under the control of the owner/operator where the wastes are to be managed in the staging pile originated.<br><br>For purposes of this section, storage includes mixing, sizing, blending or other similar physical operations so long as intended to prepare the wastes for subsequent management or treatment. | Accumulation of ***solid non–flowing hazardous remediation waste*** (or remediation waste otherwise subject to land disposal restrictions) as defined in 40 C.F.R. 260.10 **– Applicable** | 40 C.F.R. 264.554(a)(1)<br><br>F.A.C. 62-730.180(1) | X | X | -- | X | X | -- | X | X | -- |
| Performance criteria for staging pile | Staging pile must:<br>• facilitate a reliable, effective and protective remedy;<br>• must be designed to prevent or minimize releases of hazardous wastes and constituents into the environment, and minimize or adequately control cross–media transfer as necessary to protect human health and the environment (e.g. use of liners, covers, run–off/run–on controls). | Storage of remediation waste in a staging pile **– Applicable** | 40 C.F.R. 264.554(d)(1)(i) and (ii)<br><br>F.A.C. 62-730.180(1) | X | X | -- | X | X | -- | X | X | -- |
| Operation of a staging pile | Must not operate for more than 2 years, except when an operating term extension under 40 C.F.R. 264.554(i) is granted.<br>*Note:* Must measure the 2-year limit (or other operating term specified) from first time remediation waste placed in staging pile | Storage of remediation waste in a staging pile **– Applicable** | 40 C.F.R. 264.554(d)(1)(iii)<br><br>F.A.C. 62-730.180(1) | X | X | -- | X | X | -- | X | X | -- |
| | Must not use staging pile longer than the length of time designated by EPA in appropriate decision document. | | 40 C.F.R. 264.554(h)<br>F.A.C. 62-730.180(1) | X | X | -- | X | X | -- | X | X | -- |

| Action | Requirement | Prerequisite | Citation | Alternatives (1) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2A | 2B | 2C | 3A | 3B | 3C | 4A | 4B | 4C |
| Design criteria for staging pile | In setting standards and design criteria must consider the following factors:<br>• Length of time pile will be in operation;<br>• Volumes of waste you intend to store in the pile;<br>• Physical and chemical characteristics of the wastes to be stored in the unit;<br>• Potential for releases from the unit;<br>• Hydrogeological and other relevant environmental conditions at the facility that may influence the migration of any potential releases; and<br>• Potential for human and environmental exposure to potential releases from the unit. | Storage of remediation waste in a staging pile **– Applicable** | 40 C.F.R. 264.554(d)(2)(i)–(vi)<br><br>F.A.C. 62-730.180(1) | X | X | -- | X | X | -- | X | X | -- |
| Operation of a staging pile | Must not place ignitable or reactive remediation waste in a staging pile unless the remediation waste has been treated, rendered, or mixed before placed in the staging pile so that:<br>• the remediation waste no longer meets the definition of ignitable or reactive under 40 C.F.R. 261.21 or 40 C.F.R. 261.23; and<br>• you have complied with 40 C.F.R. 264.17(b); or<br>Must manage the remediation waste to protect it from exposure to any material or condition that may cause it to ignite or react | Storage of ignitable or reactive remediation waste in staging pile – **Applicable**. | 40 C.F.R. 264.554(e)<br><br>40 C.F.R. 264.554(e)(1)(i)<br><br>40 C.F.R. 264.554(e)(1)(ii)<br><br>40 C.F.R. 264.554(e)(2)<br><br>F.A.C. 62-730.180(1) | X | X | -- | X | X | -- | X | X | -- |
| Operation of a staging pile | Must not place in the same staging pile unless you have complied with 40 C.F.R. 264.17(b). | Storage of "incompatible" remediation waste (as defined in 40 C.F.R. 260.10) in staging pile – **Applicable** | 40 C.F.R. 264.554(f)(1)<br><br>F.A.C. 62-730.180(1) | X | X | -- | X | X | -- | X | X | -- |
| Operation of a staging pile | Must separate the incompatible waste or materials, or protect them from one another by using a dike, berm, wall or other device. | Staging pile of remediation waste stored nearby to incompatible wastes or materials in containers, other piles, open tanks or land disposal units –**Applicable** | 40 C.F.R. 264.554(f)(2)<br><br>F.A.C. 62-730.180(1) | X | X | -- | X | X | -- | X | X | -- |

| Action | Requirement | Prerequisite | Citation | Alternatives [1] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2A | 2B | 2C | 3A | 3B | 3C | 4A | 4B | 4C |
| | Must not pile remediation waste on same base where incompatible wastes or materials were previously piled unless you have sufficiently decontaminated the base to comply with 40 C.F.R. 264.17(b). | | 40 C.F.R. 264.554(f)(3)<br><br>F.A.C. 62-730.180(1) | X | X | -- | X | X | -- | X | X | -- |
| Closure of staging pile of remediation waste | Must be closed within 180 days after the operating term by removing or decontaminating all remediation waste, contaminated containment system components, and structures and equipment contaminated with waste and leachate.<br><br>Must decontaminate contaminated sub –soils in a manner that EPA determines will protect human and the environment. | Storage of remediation waste in staging pile in previously contaminated area – **Applicable** | 40 C.F.R. 264.554(j)(1) and (2)<br><br>F.A.C. 62-730.180(1) | X | X | -- | X | X | -- | X | X | -- |
| | Must be closed within 180 days after the operating term according to 40 C.F.R. 264.258(a) and 264.111 or 265.258(a) and 265.111. | Storage of remediation waste in staging pile in uncontaminated area – **Applicable** | 40 C.F.R. 264.554(k)<br>F.A.C. 62-730.180(1) | X | X | -- | X | X | -- | X | X | -- |
| Storage and processing of non-hazardous waste | No person shall store, process, or dispose of solid waste except as authorized at a permitted solid waste management facility or a facility exempt from permitting under this chapter.<br>No person shall store, process, or dispose of solid waste in a manner or location that causes air quality standards to be violated or water quality standards or criteria of receiving waters to be violated. | Management and storage of solid waste – **Applicable** | F.A.C. 62 701.300(1)(a) and (b) | X | X | X | X | X | X | X | X | X |
| ***Waste Treatment and Disposal – Primary Waste (e.g., excavated soils/sediments, munitions and debris) and Secondary Wastes (e.g., contaminated PPE or treatment residuals)*** | | | | | | | | | | | | |
| Treatment and Disposal of waste military munitions | The treatment and disposal of hazardous waste military munitions are subject to the applicable technical standards in 40 CFR parts 260 through 270.<br>*Note:* Substantive requirements for treatment and disposal of remediation wastes considered RCRA hazardous waste listed below. | Waste non-chemical military munitions that exhibit a hazardous waste characteristic or are listed as hazardous waste under 40 CFR part 261 **– Applicable** | 40 CFR 266.206<br><br>F.A.C. 62-730.181 | X | X | X | X | X | X | X | X | X |
| | Emergency detonations or thermal treatment of certain hazardous waste (military munitions). | Treatment of non-chemical military munitions - **Applicable** | F.A.C. 62.730.320 | X | X | X | X | X | X | X | X | X |

| Action | Requirement | Prerequisite | Citation | Alternatives (1) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2A | 2B | 2C | 3A | 3B | 3C | 4A | 4B | 4C |
| | Treatment of waste non-chemical military munitions on-site. | Treatment of non-chemical military munitions - **Applicable** | 40 CFR 266.202 | X | X | X | X | X | X | X | X | X |
| Disposal of RCRA hazardous waste in a land-based unit | May be land disposed if it meets the requirements in the table "Treatment Standards for Hazardous Waste" at 40 C.F.R. 268.40 before land disposal. | Land disposal, as defined in 40 C.F.R. 268.2, of restricted RCRA waste – **Applicable** | 40 C.F.R. 268.40(a)<br><br>F.A.C. 62-730.183 | X<br>(off-site) | X | -- | X<br>(off-site) | X | -- | X<br>(off-site) | X | -- |
| | All underlying hazardous constituents [as defined in 40 C.F.R. 268.2(i)] must meet the Universal Treatment Standards, found in 40 C.F.R. 268.48 Table UTS prior to land disposal | Land disposal of restricted RCRA characteristic wastes (D001 –D043) that are not managed in a wastewater treatment system that is regulated under the CWA, that is CWA equivalent, or that is injected into a Class I nonhazardous injection well – **Applicable** | 40 C.F.R. 268.40(e)<br><br>F.A.C. 62-730.183 | X<br>(off-site) | X | -- | X<br>(off-site) | X | -- | X<br>(off-site) | X | -- |
| Disposal of RCRA –*hazardous waste soil* in a land–based unit | Must be treated according to the alternative treatment standards of 40 C.F.R. 268.49(c) <u>or</u> according to the UTSs specified in 40 C.F.R. 268.48 applicable to the listed and/or characteristic waste contaminating the soil prior to land disposal | Land disposal, as defined in 40 C.F.R. 268.2, of restricted hazardous soils – **Applicable** | 40 C.F.R. 268.49(b)<br><br>F.A.C. 62-730.183 | X<br>(off-site) | X | -- | X<br>(off-site) | X | -- | X<br>(off-site) | X | -- |
| Treatment of RCRA *hazardous waste soil* on–site | Prior to land disposal, all "constituents subject to treatment" as defined in 40 C.F.R. 268.49(d) must be treated as follows: | Treatment of restricted hazardous waste soils – **Applicable** | 40 C.F.R. 268.49(c)(1) | -- | X | -- | -- | X | -- | -- | X | -- |
| | **For non –metals** (except carbon disulfide, cyclohexanone, and methanol), treatment must achieve a 90 percent reduction in total constituent concentrations, except as provided in 40 CFR 268.49(c)(1)(C) | | 40 C.F.R. 268.49(c)(1)(A) | -- | X | -- | -- | X | -- | -- | X | -- |
| | **For metals** and carbon disulfide, cyclohexanone, and methanol), treatment must achieve a 90 percent reduction in total constituent concentrations as measured in leachate from the treated media (tested according to TCLP) <u>or</u> 90 percent reduction in total constituent concentrations (when a metal removal technology is used), except as provided in 40 C.F.R. 268.49(c)(1)(C) | | 40 C.F.R. 268.49(c)(1)(B) | -- | X | -- | -- | X | -- | -- | X | -- |

| Action | Requirement | Prerequisite | Citation | Alternatives (1) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2A | 2B | 2C | 3A | 3B | 3C | 4A | 4B | 4C |
| | When treatment of any constituent subject to treatment to a 90 percent reduction standard would result in a concentration less than 10 times the Universal Treatment Standard for that constituent, treatment to achieve constituent concentrations less than 10 times the universal treatment standard is not required. [Universal Treatment Standards are identified in 40 CFR 268.48 Table UTS] | | 40 C.F.R. 268.49(c)(1)(C) | -- | X | -- | -- | X | -- | -- | X | -- |
| Treatment of RCRA *hazardous waste soil* on–site | In addition to the treatment requirement required by paragraph (c)(1) of this section, soils must be treated to eliminate these characteristics | Soils that exhibit the characteristic of ignitability, corrosivity or reactivity intended for land disposal – **Applicable** | 40 C.F.R. 268.49(c)(2) | -- | X | -- | -- | X | -- | -- | X | -- |
| | Provides methods on how to demonstrate compliance with the alternative treatment standards for contaminated soils that will be land disposed. | On –site treatment of restricted hazardous waste soils following alternative soil treatment of 40 C.F.R. 268.49(c) – **To Be Considered** | *Guidance on Demonstrating Compliance with the LDR Alternative Soil Treatment Standards* [EPA 530 –R – 02 –003, July 2002] | -- | X | -- | -- | X | -- | -- | X | -- |
| Disposal of RCRA hazardous waste in a land-based unit | To determine whether a hazardous waste identified in this section exceeds the applicable treatment standards of 40 C.F.R. 268.40, the initial generator must test a sample of the waste extract or the entire waste, depending on whether the treatment standards are expressed as concentration in the waste extract or waste, or the generator may use knowledge of the waste.<br><br>If the waste contains constituents (including UHCs in the characteristic wastes) in excess of the applicable UTS levels in 40 C.F.R. 268.48, the waste is prohibited from land disposal, and all requirements of part 268 are applicable, except as otherwise specified. | Land disposal of RCRA toxicity characteristic wastes (D004 –D011) that are newly identified (i.e., wastes, soil, or debris identified by the TCLP but not the Extraction Procedure) – **Applicable** | 40 C.F.R. 268.34(f)<br><br>F.A.C. 62-730.183 | X | X | -- | X | X | -- | X | X | -- |

| Action | Requirement | Prerequisite | Citation | Alternatives [1] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2A | 2B | 2C | 3A | 3B | 3C | 4A | 4B | 4C |
| Disposal of RCRA *hazardous waste debris* in a land–based unit (i.e., landfill) | Must be treated prior to land disposal as provided in 40 C.F.R. 268.45(a)(1)–(5) unless EPA determines under 40 C.F.R. 261.3(f)(2) that the debris no longer contaminated with hazardous waste <u>or</u> the debris is treated to the waste –specific treatment standard provided in 40 C.F.R. 268.40 for the waste contaminating the debris. | Land disposal, as defined in 40 C.F.R. 268.2, of restricted RCRA–hazardous debris – **Applicable** | 40 C.F.R. 268.45(a)<br><br>F.A.C. 62-730.183 | X | X | X | X | X | X | X | X | X |
| Disposal of *treated hazardous debris* | Debris treated by one of the specified extraction or destruction technologies on Table 1 of 40 CFR 268.45 and which no longer exhibits a characteristic is not a hazardous waste and need not be managed in RCRA Subtitle C facility<br>Hazardous debris contaminated with listed waste that is treated by immobilization technology must be managed in a RCRA Subtitle C facility. | Treated debris contaminated with RCRA listed or characteristic waste – **Applicable** | 40 C.F.R. 268.45(c) | X | X | X | X | X | X | X | X | X |
| Treatment of hazardous waste in Misc. Treatment Unit with air emissions (e.g., Air Sparging, ERH System) | Unit must be located, designed, constructed, operated and maintained, and closed in a manner that will ensure protection of human health and the environment. | Treatment of RCRA hazardous waste in miscellaneous units, except as provided in 40 C.F.R. 264.1– **Relevant and Appropriate** | 40 C.F.R. 264.601 | -- | X | -- | -- | X | -- | -- | X | -- |
| | Protection of human health and the environment includes, but is not limited to: prevention of any release that may have adverse effects on human health or the environment due to migration of waste constituents in the air, considering the factors listed in 40 CFR 264.601(c)(1) thru (7). | | 40 C.F.R. 264.601(c) | -- | X | -- | -- | X | -- | -- | X | -- |
| ***Waste Transportation – Primary and Secondary Wastes*** | | | | | | | | | | | | |
| Transportation of hazardous waste *on–site* | The generator manifesting requirements of 40 C.F.R. 262.20–262.32(b) do not apply. Generator or transporter must comply with the requirements set forth in 40 C.F.R. 263.30 and 263.31 in the event of a discharge of hazardous waste on a private or public right–of–way. | Transportation of hazardous wastes on a public or private right–of–way within or along the border of contiguous property under the control of the same person, even if such contiguous property is divided by a public or private right–of–way – **Applicable** | 40 C.F.R. 262.20(f)<br><br>F.A.C. 62-730.160 | X | X | X | X | X | X | X | X | X |

| Action | Requirement | Prerequisite | Citation | Alternatives (1) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2A | 2B | 2C | 3A | 3B | 3C | 4A | 4B | 4C |
| Transportation of hazardous waste *off–site* | Must comply with the generator standards of Part 262 including 40 C.F.R. 262.20–23 for manifesting, Sect. 262.30 for packaging, Sect. 262.31 for labeling, Sect. 262.32 for marking, Sect. 262.33 for placarding, | Preparation and initiation of shipment of hazardous waste off–site –**Applicable** | 40 C.F.R. 262.10(h);<br>F.A.C. 62-730.160 | X | X | -- | X | X | -- | X | X | -- |
| Transportation of *hazardous materials* | Shall be subject to and must comply with all applicable provisions of the HMTA and HMR at 49 C.F.R. 171–180 related to marking, labeling, placarding, packaging, emergency response, etc. | Any person who, under contract with a department or agency of the federal government, transports "in commerce," or causes to be transported or shipped, a hazardous material – **Applicable** | 49 C.F.R. 171.1(c) | X | X | X | X | X | X | X | X | X |
| Transportation of *solid waste military munitions* | Waste non-chemical military munitions that exhibit a hazardous waste characteristic or are listed as hazardous waste under 40 CFR part 261 are subject to regulation under 40 CFR parts 260 through 270 unless all of the conditions specified in paragraph (a)(1)(i)-(iv) are met. | Waste non-chemical military munitions that exhibit a hazardous waste characteristic or are listed as hazardous waste under 40 C.F.R. part 261 **– Applicable** | 40 C.F.R. 266.203(a)(1)<br><br>F.A.C 62-730.181 | X | X | X | X | X | X | X | X | X |
| | The conditional exemption in 40 CFR 266.203(a)(1) from regulation as hazardous waste shall only apply to the transportation of non-chemical waste military munitions. It does not affect the regulatory status of the waste military munitions as hazardous wastes with regard to storage, treatment, or disposal. | | 40 C.F.R. 266.203(a)(3)<br><br>F.A.C 62-730.181 | X | X | X | X | X | X | X | X | X |
| Transportation of samples (i.e. contaminated soils and wastewaters) | Are not subject to any requirements of 40 C.F.R. Parts 261 through 268 or 270 when:<br>• the sample is being transported to a laboratory for the purpose of testing; or<br>• the sample is being transported back to the sample collector after testing<br>• the sample is being stored by sample collector before transport to a lab for testing | Samples of solid waste or a sample of water, soil for purpose of conducting testing to determine its characteristics or composition – **Applicable** | 40 C.F.R. 261.4(d)(1)(i)–(iii)<br><br>F.A.C. 62-730.030 | X | X | X | X | X | X | X | X | X |

**TABLE 2-2**

**ACTION-SPECIFIC ARARs and TBCs**
**OU 5, SITE 15 FEASIBILITY STUDY FOR MUNITIONS REMOVAL**
**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**


| Action | Requirement | Prerequisite | Citation | Alternatives (1) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2A | 2B | 2C | 3A | 3B | 3C | 4A | 4B | 4C |
| | In order to qualify for the exemption in paragraphs (d)(1)(i) and (ii), a sample collector shipping samples to a laboratory must:<br>• Comply with U.S. DOT, U.S. Postal Service, or any other applicable shipping requirements<br>• Assure that the information provided in (1) thru (5) of this section accompanies the sample.<br>• Package the sample so that it does not leak, spill, or vaporize from its packaging. | | 40 C.F.R. 261.4(d)(2)(i)(A) and (B)<br><br>F.A.C. 62-730.030 | X | X | X | X | X | X | X | X | X |

1 Alternatives 2A, 2B, and 2C: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal
√ Alternative 2A: Off-Site Hazardous Soil Disposal
√ Alternative 2B: On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal
√ Alternative 2C: Mechanical Excavation and Manual Investigation and Removal
Alternatives 3A, 3B, and 3C: All Surface and Shallow Subsurface MEC and Anomaly Removal
√ Alternative 3A: Off-Site Hazardous Soil Disposal
√ Alternative 3B: On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal
√ Alternative 3C: Mechanical Excavation and Manual Investigation and Removal
Alternatives 4A, 4B, and 4C: All Surface and Shallow Subsurface MEC Removal
√ Alternative 4A: Off-Site Hazardous Soil Disposal
√ Alternative 4B: On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal
√ Alternative 4C: Mechanical Excavation and Manual Investigation and Removal

ARAR = Applicable *or* Relevant and Appropriate Requirement.
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act.
C.F.R. = Code of Federal Regulations.
CWA = Clean Water Act.
DOT = Department of Transportation.
EPA = Environmental Protection Agency.
F.A.C. = Florida Administrative Code, Chapters as specified.
F.S. = Florida Statutes.
HMR = Hazardous Materials Regulations.
HMTA = Hazardous Materials Transportation Act.
LDR = Land Disposal Restrictions.
PPE = Personal Protection Equipment.
RCRA = Resource Conservation and Recovery Act.
TCLP = Toxicity Characteristic Leaching Procedure.
UST = Universal Treatment Standard.

# 3.0 SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS

This section identifies, screens, and evaluates the potential technologies and process options that may be applicable to the remedial alternatives for Site 15. The primary objective of this phase of the FS is to develop an appropriate set of remedial technologies and process options to be used for developing the remedial alternatives.

The basis for technology identification and screening began in Section 2.0 with the following:

- Identification of ARARs
- Development of RAOs
- Identification of GRAs

A technology screening evaluation is performed in this section with the completion of the following analytical steps:

- Identification and screening of remedial technologies and process options
- Evaluation and selection of representative process options

A variety of technologies and process options are identified for each GRA (see Table 3-1), and are evaluated to determine if they could achieve the RAOs identified in Section 2.2. The selection of technologies and process options for initial screening is based on the Guidance for Conducting RI/FSs under CERCLA (USEPA, 1988). The screening is first conducted at a preliminary level to focus on relevant technologies and process options; then, the screening is conducted at a more detailed level, based on certain evaluation criteria. Finally, technologies and process options retained through the detailed screening process are used to develop remedial alternatives. The screening criteria are:

<u>Effectiveness</u>

The effectiveness evaluation is focused on the following elements:

- Potential effectiveness of process options in handling MEC/MPPEH present at the site and in meeting the RAOs.

- Potential impacts to human health and the environment during the implementation phases.

- Reliability and proven effectiveness of process options with respect to the materials of concern and the site-specific conditions.

Implementability

The implementability evaluation includes both the technical and institutional (administrative) feasibility of implementing each technology or process option. This initial technology screening eliminates technology types or process options that are clearly ineffective or unworkable at the site. The institutional aspects considered include the following:

- Potential for obtaining regulatory approval.
- Availability of necessary equipment and skilled workers to implement the technology.
- Availability of treatment, storage, and disposal services.
- Time required for implementation.
- Ability to achieve the RAOs within a reasonable timeframe.

Cost

For the screening cost evaluation, a qualitative cost analysis is presented to indicate whether costs are prohibitive or if other process options within the same technology type would be comparably effective and implementable but less costly. Preliminary cost estimates for the remedial technologies retained in the screening step are presented in Section 4.

## 3.1 PRELIMINARY SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS

This section identifies and screens remediation technologies and process options based on implementability with respect to site-specific conditions and materials of concern. Table 3-1 summarizes the results of this preliminary screening process. It presents the GRAs, identifies the technologies and process options, and provides a brief description of each process option followed by comments about the results of the screening process.

As indicated in Table 3-1, several process options (soil cover, capping, remotely operated removal equipment, disassembly or render safe procedures, flash furnaces, and contained detonation chambers) are eliminated as a result of the initial screening process. The technologies and process options retained for more detailed screening include:

<table>
<tr><th>General Response Action</th><th>Technology</th><th>Process Options</th></tr>
<tr><td>No Action</td><td>None</td><td>Not applicable</td></tr>
<tr><td rowspan="3">Land Use Controls</td><td>Engineering Controls</td><td>Physical Controls/Signage</td></tr>
<tr><td>Institutional Controls</td><td>Already Established Low-Intensity Recreational Land Use</td></tr>
<tr><td>Institutional Controls</td><td>Public Education Program</td></tr>
<tr><td rowspan="2">Detection</td><td>Visual Observation</td><td>Visual Observation and Identification of MEC/MPPEH Items on the Ground Surface</td></tr>
<tr><td>Instrument-Aided Detection</td><td>Use of Hand-Held, Man Portable Magnetometer/Ferrous Metal Detectors (analog and digital)</td></tr>
<tr><td rowspan="4">Removal</td><td>Ground Surface Removal</td><td>Manual Removal of Ground Surface Items</td></tr>
<tr><td>Subsurface Removal [up to 1 foot bgs]</td><td>Manual Excavation and Removal of Shallow Subsurface Anomalies</td></tr>
<tr><td>Subsurface Removal [up to 1 foot bgs]</td><td>Mechanized Excavation and Mechanized Removal of Shallow Subsurface Anomalies</td></tr>
<tr><td>Subsurface Removal [up to 1 foot bgs]</td><td>Mechanized Excavation and Manual Inspection and Removal of Shallow Subsurface Anomalies</td></tr>
<tr><td rowspan="5">Treatment</td><td rowspan="3">MEC/MDEH</td><td>Blow-In-Place</td></tr>
<tr><td>Consolidate and Blow</td></tr>
<tr><td>MEC Residual Processing</td></tr>
<tr><td>MDAS</td><td>Shredding, Cutting, and Use of Other Manual Procedures for Demilitarization</td></tr>
<tr><td>Soil</td><td>Chemical Fixation/ Solidification</td></tr>
<tr><td rowspan="3">Disposal</td><td>MDAS and Non-Munitions-Related Scrap</td><td>Transport of MDAS and Non-Munitions-Related Scrap for Off Site Disposal</td></tr>
<tr><td rowspan="2">Soil</td><td>Off-Site Landfilling</td></tr>
<tr><td>On-Site Beneficial Reuse</td></tr>
</table>

## 3.2 DETAILED SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS

### 3.2.1 No Action

No Action consists of maintaining the status quo at a site. As required under CERCLA regulations, the No Action alternative is carried through the FS to provide a baseline for comparison with other alternatives and their effectiveness in mitigating risks posed by site contaminants.

Effectiveness

No Action would not be effective in meeting the RAOs. No Action would not be effective in preventing and/or reducing the potential for site receptors to come in direct contact with MEC/MPPEH potentially remaining at Site 15 because no MEC/MPPEH removal would take place.

Implementability

There would be no implementability concerns because No Action would not require any implementation.

Cost

Because there is no action, there are no associated costs.

Conclusion

No Action is retained because of CERCLA requirements, although it would not be effective.

### 3.2.2 Land Use Controls

Institutional LUCs, consisting of administrative and legal mechanisms have already been established for Site 15 (see Figure 1-2 for Site 15 controlled land use parcels). These LUCs allow for low-intensity recreational uses including activities such as hiking, biking, horseback riding, birding, and hunting. Medium- (picnicking and camping) and high-intensity (children's playgrounds and contact sports) recreational, residential, and commercial/industrial uses are not permitted. No man-made attractions can be provided that would entice people, particularly small children, to frequently visit the site, which is consistent with the property's proposed reuse as a wildlife corridor that would allow for low-intensity recreational use. LUCs also prohibit excavation of soil from Site 15 without prior written approval from the Navy, USEPA, and FDEP. Chemical contamination at Site 15 has been addressed through the remedy

(Tetra Tech, 2009); the extent of arsenic, lead, PAH, and TRPH contaminated soil was delineated and excavated to meet permitted land use (low-intensity recreational activities) requirements described above.

Physical controls (e.g., fencing, signage, security guards, etc.) would be designated as engineering controls. Caution and UXO hazard warning signs are recommended to be posted along access roads, bike trails, and walking/hiking trails where munitions-related items may be present.

A public education program would be designated as an institutional control. A public educational program would be warranted to warn the visiting public (hikers or campers) of the potential presence of munitions items, the importance of not disturbing (yet reporting) suspect items observed within the project site, and the importance of not conducting intrusive activities. The public education program may include periodic public safety awareness meetings and distribution of educational media to local police, fire departments, and libraries, where they will be available to the public.

Additional site-specific LUCs would be formulated by amending the current LUC remedial design (RD) (Tetra Tech, 2009) that was prepared in accordance with the Navy's LUC Principles (Department of Defense [DoD], 2003). LUCs would typically also include the performance of regular site inspections to verify continued implementation. Depending upon the site-specific conditions, LUCs can be used alone or in conjunction with other remedial actions.

Effectiveness

Site use restrictions would be effective for reducing human and ecological exposure to MEC/MPPEH potentially present through the implementation of deed restrictions already established at Site 15. UXO support would also be required during any ground disturbing activities at Site 15. The effectiveness of these measures would be dependent on adequate enforcement of the administrative controls. Physical restrictions such as signage could also be effectively used to caution the visiting public at the site. The public education program would provide effective risk management by educating the public of the potential explosive hazards at the site.

Implementability

Control of the site has been transferred from the Navy to the JEDC. The area has been redeveloped for low-intensity recreational use and usage limitations have been established. The installation of signage and administration of a public education program would be easily implemented once remedial activities are complete.

Cost

Site use restrictions, installation of signage, and public education programs are generally inexpensive, although long-term administration, enforcement, and maintenance would be required if LUCs are applied long-term.

Conclusion

LUCs, including site land use restrictions (already established), installation of signage, and implementation of public education programs, are retained for use in combination with other GRAs for the development of remedial alternatives.

### 3.2.3 Detection

Detection of munitions-related items would be conducted through visual and detector-aided surveys. Surveys would be conducted to identify munitions related items on the ground surface (note that for munitions work, surface means the ground surface and references to surface in this FS mean the ground surface) and anomalies in the subsurface (up to 1 foot bgs) (note that for munitions work, subsurface means below the ground surface and references to subsurface in this FS mean below the ground surface) before any removal and clearance activities could begin. Analog and digital geophysical instruments (hand-held, man portable, magnetometer/ferrous metal detectors) would be used to detect anomalies.

Once a munitions-related item is identified, the UXO Team Leader would make a determination as to whether the item is MEC or MPPEH. If the item is MEC and not safe to move, it would be left in place and prepared for MEC Blow-In-Place (BIP) treatment (see Section 3.2.5.1). If the item is deemed MEC and safe to move, it could be transported to a staging area to await MEC treatment (see Section 3.2.5.1). MPPEH items would be segregated into material documented as an explosive hazard (MDEH) and MDAS. MDEH items could be transported to a staging area to await treatment using MEC treatment procedures, or, if determined that the item was not safe to move, it would be left in place and prepared for BIP treatment. MDAS would then be segregated into those items requiring demilitarization or venting, and those items that are munitions-related scrap. MDAS would be inspected and certified prior to transport off site to an approved metal recycler (see Section 3.2.6.1).

Effectiveness

MEC/MPPEH and MDAS items have previously been identified at Site 15; however, the entire Site 15 area has not been walked/surveyed and additional MEC/MPPEH and MDAS items may be present in areas that have not previously been surveyed and cleared. Therefore, a visual survey will be conducted to identify munitions-related items on the surface and detector-aided surveys will be conducted to identify surface munitions-related items that may not be visible, (e.g., items that may be covered by brush and other vegetation present at the site) and shallow subsurface soil (to 1 foot bgs) anomalies. Conduction of visual and detector-aided surveys are the industry standard for locating munitions-related items.

Implementability

Visual and detector-aided surveys could be easily implemented. The equipment is readily available and little site preparation is necessary other than brush cutting. The length of time for completion of this phase of a remedial action would be dependent on the number of UXO Technicians available to complete the surveys and the size of the area to be surveyed. These detection methods would not adversely affect the ecological habitat, as disturbance to the area would be minimal.

Cost

In general, the costs to conduct visual and detector-aided surveys would be low; however, such costs could become high if surveying is to be implemented on an annual basis.

Conclusion

Detection is retained for use in combination with other GRAs for the development of remedial alternatives.

### 3.2.4 Removal

Process options for surface and shallow subsurface removal of munitions-related items would include manual removal of ground surface items, manual excavation (hand digs) and removal of shallow subsurface anomalies (up to 1 foot bgs), and mechanized excavation and mechanical or manual clearance of shallow subsurface anomalies (up to 1 foot bgs). Note that metallic non-munitions debris encountered while conducting these remedial activities would also be removed from the site and transported off-site for disposal to an approved commercial metal recycler.

#### 3.2.4.1 Manual Removal of Ground Surface Items

The following types of munitions-related items identified on the ground surface would be manually removed: MEC categorized as safe to move, MDEH categorized as safe to move, MDAS, and other metallic non-munitions related items. Once items are "removed," they would be moved and combined with other MEC, MDEH, MDAS, or non-munitions items, as appropriate, treated as necessary, and transported off-site for disposal. The removal effort would be carried out by UXO teams. Each team would consist of six UXO personnel; these teams would break into groups to complete the work. Should items be identified as MEC that are not safe to move, these items would be treated in place before being handled.

Effectiveness

This removal method would be very effective and could provide valuable data about items collected from the surface. This method would focus on recovering each item one at a time. It is also the removal method least likely to expose MEC/MPPEH to inadvertent movement, jarring, or impact that could lead to unplanned detonation.

Implementability

Manual removal could be implemented in almost any terrain and climate and would be limited only by the number of UXO personnel available. This is currently one of the most widely used methods for removal of MEC/MPPEH. Depending on the items identified, equipment required to conduct the surface removals would be minimal.

Manual removal can be very difficult and time-consuming and requires a high degree of direct MEC/MPPEH exposure for workers. Manual-removal is a labor-intensive operation that must be performed by UXO Technicians.

A staging area would need to be established for items that have been removed and are awaiting treatment and disposal.

Cost

Costs for hand removal would be moderate depending on the quantity of munitions and non-munitions related items identified and how many UXO Technicians are available to conduct the removals.

Conclusion

Manual removal is retained because of its effectiveness and ease of implementation. Manual removal will be considered for use in combination with other GRAs and technologies for the development of remedial alternatives.

#### 3.2.4.2 Manual Excavation and Removal of Shallow Subsurface Anomalies

Manual excavation is the industry standard for investigation and removal of subsurface anomalies. Without intrusive investigation, the identity of anomalies is unknown. This method involves using manual tools (e.g., shovels, picks, trowels, etc.) to excavate selected items using only human power to do the work. Excavations using manual procedures would be conducted at each anomaly location identified during the detection phase of the remedial activity until the sidewalls and bottom of each small excavation (up to a maximum of 1 foot bgs and 2 feet diameter) were clear of anomalies. Each excavation would be conducted by an intrusive dig team. Each intrusive “dig team” would consist of qualified UXO personnel.

As described previously, once a munitions-related item is excavated, the UXO Team Leader would make a determination as to whether the item is MEC or MPPEH. If the item is MEC and not safe to move, it would be left in place and prepared for MEC BIP treatment. If the item is deemed MEC and safe to move, it could be transported to a staging area to await MEC treatment. MPPEH items would be segregated by whether they were determined to be MDEH and either safe or not safe to move, or MDAS and transported to a staging area to await treatment and disposal.

Effectiveness

This removal method would be very effective, and could provide valuable data about items identified in the subsurface. This method focuses on recovering each item/anomaly one at a time, and the results of each excavation are verified in real-time. It is also the removal method least likely to expose MEC/MPPEH to inadvertent movement, jarring, or impact that could lead to unplanned detonation. Manual excavation should not be considered over large areas of soil where mechanical excavation would be more effective and safer for site personnel in terms of exposure.

Implementability

Manual excavation could be implemented in almost any terrain and climate, and is the only viable removal method in very rough terrain (e.g., steep, reduced access, etc.). This method is currently the most widely used for removal of munitions-related items, and all firms and personnel in the MEC industry have developed effective methods for this removal technology. Equipment required to conduct the excavations is minimal and consists of manual tools.

Manual excavation can be very difficult and time-consuming and requires a high degree of direct MEC/MPPEH exposure for workers. Manual excavation is a labor-intensive operation that must be performed by UXO Technicians.

A staging area would need to be established for items that have been removed and are awaiting treatment and disposal.

Cost

Costs for manual excavation would be moderate and would depend on the number of anomalies identified for excavation, and how many UXO Technicians are available to conduct the excavations.

Conclusion

Manual excavation is retained because of its effectiveness and ease of implementation. Manual excavation will be considered for use in combination with other GRAs and technologies for the development of remedial alternatives.

#### 3.2.4.3 Mechanized Excavation and Mechanized Removal of Shallow Subsurface Anomalies

Armored excavation equipment is commonly available excavating equipment that has been armored to protect the operator and equipment from unexpected detonation while performing dig and MEC removal operations. Unlike smaller equipment, which may be used to excavate single anomalies, this equipment is heavier, larger, and designed for high-volume earth moving activities. The armor for this equipment can range from complicated cab-replacement with armor made from certified armor plating to simple placement of thick Plexiglas over the front of a vehicle. Materials, thickness, placement of the armor, and the necessity of using armored excavation equipment are determined by the types of hazards expected.

Once the proper equipment is armored, the excavation can begin and can follow different processes, as described in this section and Section 3.2.4.4. This first process includes actual excavation and loading of the soil generally onto either conveyors or transport trucks to move to the screening area where MEC/MPPEH and non-munitions related items would be mechanically removed under the direction of UXO Technicians and soil would be returned to the excavation if non-hazardous or treated and disposed of off-site to comply with LDRs if hazardous. Once screened, the same equipment can be used to return the soil to its original location (non-hazardous soil only), to other transportation vehicles, or to off-site disposal. For backfill, the equipment does not have to be armored since the explosive hazard was removed during the screening phase.

Under this process, once the soil has been excavated, it can be processed through a series of screening devices and conveyors to produce segregated soils of different grain sizes. Screen grid sizes are selected to trap different sized item(s) at various points in the process, and to allow non-MEC material (soils) to move through the system with minimal handling. These different sized soils are known as “waste streams” and can be either clean or contaminated, based on the type of processing being done. There are many manufacturers of soils screens as well as various types, such as shakers and trammels. Shakers are generally square in shape and physically shake the soil loose, trammels are long round tubes that rotate to loosen and divide the soils into waste streams. Within the process stream, the use of conveyors to move and help control the large volume of soil is necessary for a successful screening operation. Another item that can be used with the conveyor belt to assist in locating MEC during this operation is a magnetic separator to help remove the ferrous items from the soil streams. The magnetic separator is placed at the end of the conveyor to direct the ferrous items away from the soil piles. Observation of these activities is generally conducted from one or more protected positions.

As described previously, once a munitions-related item is excavated, the UXO Team Leader would make a determination as to whether the item is MEC or MPPEH. MDAS would be transported to a staging area to await disposal. If the item is MEC and not safe to move, it will be detonated within the working grid where it is discovered. If the item is deemed MEC and safe to move, it could be transported to a predetermined detonation area to await MEC treatment. MPPEH items would be segregated by whether they were determined to be MDEH and either safe or not safe to move, or MDAS, and if safe to move, similarly transported to the detonation area to await treatment.

Effectiveness

Mechanical excavation is most applicable to large areas and high anomaly areas. Effectiveness for mechanical excavation is equivalent to or better than manual excavation methods, particularly for conditions requiring significant earth moving, and where soils are hazardous, thus minimizing worker exposure. Large amounts of soil can be excavated and transported to a screening area, thereby clearing large and deep areas. It should be noted that Site 15 soil throughput/processing rates are lower than if excavating soil only, as the UXO team will need to visually and manually survey all of the screened soil and address MEC/MPPEH and non-munitions items screened out. This method would not be good for small areas, or areas with minimal buried items.

Further, soil screening technologies have proved effective in soil processing for MEC and other materials. The strength of this method is the ability of the equipment to excavate the soils faster and with less labor than manual means. Effectiveness of these systems can be degraded by cohesive soils and excessive root mass.

Implementability

Special armor may have to be designed/developed for a piece of equipment, impacting schedule. This method would not be good for small areas or areas with minimal buried items. It is a time consuming and management heavy task that requires skilled equipment operators and extra time for equipment maintenance. This method also requires some experience in earth moving for the removal to be performed correctly. This method would not be effective for removal of munitions of high fragmentation such that the safety arc is greater than the reach of the excavator. Detonations resulting from these larger type munitions can severely damage or destroy expensive components. Mechanical soil screening processes are some of the most easily implemented technologies available for soil treatment.

Overall this method is complex and requires skilled operators and management personnel familiar with earth moving operations. This is a high maintenance activity and requires considerable time and cost for refueling, cleaning, and general maintenance. A protected location for quality and safety personnel to observe operations is also necessary.

A processing and staging area would need to be established for excavated soil, MEC/MPPEH items, and non-munitions related debris that have been removed and are awaiting treatment and disposal.

Cost

The relative cost is high. Equipment rental, as well as maintenance cost, is high compared with the other manual methods. However, for areas with high MEC/debris density, the overall cost can be lower than the cost of extended man hours for a manual excavation and removal. Another advantage of mechanical excavation is improved safety afforded by the armored equipment on heavily impacted ranges.

Conclusion

Mechanized excavation and removal is retained because of its effectiveness. Mechanized excavation and removal will be considered for use in combination with other GRAs and technologies for the development of remedial alternatives.

#### 3.2.4.4 Mechanized Excavation and Manual Inspection Removal of Shallow Subsurface Anomalies

Armored excavation equipment is commonly available excavating equipment that has been armored to protect the operator and equipment from unexpected detonation while performing dig and MEC removal operations. Unlike smaller equipment, which may be used to excavate single anomalies, this equipment is heavier, larger, and designed for high-volume earth moving activities. The armor for this equipment can range from complicated cab-replacement with armor made from certified armor plating to simple placement of thick Plexiglas over the front of a vehicle. Materials, thickness, placement of the armor, and the necessity of using armored excavation equipment are determined by the types of hazards expected.

Once the proper equipment is armored, the excavation can begin and can follow different processes, as described in this section and in Section 3.2.4.3. This second process occurs directly at the excavation area and does not involve mechanical removal, truck transport, or use of containers. Soil would be directly laid by the excavator on the ground surface adjacent to a given excavation area (no more than 100 by 100 foot grid). Once soil has been excavated, approximately 1 cubic yard of soil (and debris) will be spread by the excavator on the ground surface adjacent to a given grid. The excavated material will then be manually investigated by UXO Technicians for MEC/MPPEH and non-munitions related items using visual and detector-aided surveys. UXO Technicians will perform a 100-percent detector-aided surface survey of all of the spread soil. All MEC/MPPEH items and non-munitions related debris identified will be manually removed. Alternatively, the soils may be screened at the location of the excavation within the working grid using a small hand held non-mechanical soil screen/sieve. Upon completion of each excavation area, or at the end of each day, the cleared soil will be backfilled into the original excavation grid area. The process will continue for each excavation grid area.

As described previously, once a munitions-related item is excavated, the UXO Team Leader would make a determination as to whether the item is MEC or MPPEH. MDAS would be transported to a staging area to await disposal. If the item is MEC and not safe to move, it will be detonated within the working grid where it is discovered. If the item is deemed MEC and safe to move, it could be transported to a predetermined detonation area to await MEC treatment. MPPEH items would be segregated by whether they were determined to be MDEH and either safe or not safe to move, or MDAS, and if safe to move, similarly transported to the detonation area to await treatment.

Effectiveness

Mechanical excavation is most applicable to large areas and high anomaly areas. Effectiveness for mechanical excavation is equivalent to or better than manual excavation methods, particularly for conditions requiring significant earth moving, and where soils are hazardous, thus minimizing worker exposure. Large amounts of soil can be excavated and then manually investigated within or adjacent to the grid excavation area, thereby clearing large and deep areas. It should be noted that Site 15 soil throughput/processing rates are lower than if excavating soil only, as the UXO team will need to visually and manually survey and screen all of the excavated soil. This method would not be good for small areas, or areas with minimal buried items.

The strength of this method is the ability of the equipment to excavate the soils faster and with less labor than manual means. Effectiveness of these systems can be degraded by cohesive soils and excessive root mass.

Implementability

Special armor may have to be designed/developed for a piece of equipment, impacting schedule. This method would not be good for small areas or areas with minimal buried items. It is a time consuming and management heavy task that requires skilled equipment operators and extra time for equipment maintenance. This method also requires some experience in earth moving for the removal to be performed correctly. This method would not be effective for removal of munitions of high fragmentation such that the safety arc is greater than the reach of the excavator. Detonations resulting from these larger type munitions can severely damage or destroy expensive components. Manual inspection and removal techniques are some of the most easily implemented technologies available.

Overall this method is complex and requires skilled operators and management personnel familiar with earth moving operations. This is a high maintenance activity and requires considerable time and cost for refueling, cleaning, and general maintenance. A protected location for quality and safety personnel to observe operations is also necessary.

A staging area would need to be established for MEC/MPPEH items and non-munitions related debris that have been removed and are awaiting treatment and disposal.

Cost

The relative cost is high. Equipment rental, as well as maintenance cost, is high compared with the other manual excavation methods. However, for areas with high MEC/debris density, the overall cost can be lower than the cost of extended man hours for a manual excavation. Another advantage of mechanical excavation is improved safety afforded by the armored equipment on heavily impacted ranges.

Conclusion

Mechanized excavation with manual inspection and removal is retained because of its effectiveness. Mechanized excavation with manual inspection and removal will be considered for use in combination with other GRAs and technologies for the development of remedial alternatives.

### 3.2.5 Treatment

The technologies considered under this GRA are MEC/MDEH treatment, treatment of MDAS and munitions-related scrap, and soil treatment (should soil be determined to be hazardous (TCLP lead) upon excavation). Process options evaluated include:

- BIP
- Consolidate and blow
- MEC residual processing
- Treatment of MDAS
- Soil treatment

As described previously, once a munitions-related item is identified during the detection phase of a remedial action at the site, the UXO Team Leader would make the final determination if the item is MEC or MPPEH, and subsequently if it is MDEH, MDAS, or munitions-related scrap.

#### 3.2.5.1 MEC/MDEH Treatment

If identified at Site 15, MEC/MDEH would need to be treated during remedial activities. Based on the results of the previous removal actions conducted at this site, and the history of munitions used, it is anticipated that MEC/MDEH will be identified at Site 15. Note that prior to on-site treatment via detonation, an emergency detonation permit would need to be obtained per F.A.C 32.730.320.

**Blow-In-Place**

BIP is the destruction of MEC/MDEH by detonating the item without moving it from the location where it is found. Normally, this is accomplished by placing an explosive charge alongside the item. Individual MEC/MDEH items are evaluated using this approach, which requires direct exposure of personnel to each individual item. BIP operations would be conducted by UXO Technicians. After MEC/MDEH treatment, 100 percent of all recovered items would be re-inspected to determine if they are free of explosive hazards and able to be classified as MDAS.

Effectiveness

BIP operations are highly effective, items are disposed of individually, and confirmation is done immediately after disposal operations. This treatment option does not require the movement of MEC/MDEH. This reduces personnel exposure and contributes to worker safety. However, each MEC/MDEH item must be separately evaluated, which increases the exposure of personnel to danger areas. These operations require a higher ratio of donor/priming explosives for each item (as compared with consolidated disposal operations). These operations also present the possibility of repeated public exposure to demolition operations. Waste streams generated from BIP operations may also fall under further regulatory guidance for treatment and/or final disposition.

Implementability

BIP would be relatively easy to implement when site conditions/environment and location permit. BIP operations are suitable for singular or low-volume MEC/MDEH items located in areas capable of accommodating high-order detonations and providing the associated safety distances. These operations often allow application of certain engineering controls (e.g., shot temping, barriers, and employment of On-Site Ordnance Demolition Containers), which may result in reduced safety distance requirements.

These types of operations require less general area security, signage, and access controls than other treatment operations (consolidate and blow) but does require a permit prior to detonate. Scrap and residue collection may also be required after demolition.

Little equipment is necessary for this treatment option other than that associated with demolition materials and equipment. Application of engineering controls would require items such as manual shovels or mechanized handling equipment for earth moving, sand bags, or specific controls such as On-Site Ordnance Demolition Containers. Donor/priming explosives would need to be purchased for demolitions. This would require permits and a storage area for purchased explosives if these items are to be stored on-site, although it is not anticipated that explosives will be stored on site during Site 15 remedial activities. There would also be many issues to be considered related to the transportation of explosives to the site, and once on site, to the detonation location of the MEC/MDEH item(s) at the site.

This option may adversely impact wetland areas known to exist at Site 15, depending on where MEC/MDEH items are located since MEC/MDEH items would be detonated at the location where they are found.

Cost

Costs associated with BIP operations are low compared to other treatment operations. The man-hours associated with this treatment option are approximately the same as other treatment options, depending on the number of items that require BIP. Demolition materials and equipment make up most of the cost of BIP operations; little expense is associated with equipment. However, costs will increase with the number of demolitions.

Conclusion

BIP is retained for use in combination with other GRAs and technologies for the development of remedial alternatives for any MEC/MDEH item that cannot safely be moved from the location where found.

**Consolidate and Blow**

Consolidate and blow operations are defined as the collection, configuration, and subsequent destruction of MEC/MDEH by explosive detonation. This process can be used "in grid" (i.e., within a current working sector), or at an established demolition location, but can only be employed for munitions that have been inspected and deemed safe to move. Consolidate and blow operations would be conducted by UXO Technicians. After MEC/MDEH treatment, 100 percent of all recovered items would be re-inspected to determine if they are free of explosive hazards and able to be classified as MDAS. Additionally, the emergency detonation permit requires the collection of samples after each detonation.

Effectiveness

Consolidate and blow operations are very effective and are suitable for limited operations involving large numbers of stable MEC/MDEH items. This option requires fewer planned explosions than BIP to affect disposal of the MEC/MDEH items. Additionally, in many cases, MEC/MDEH items that are being destroyed can serve as donor explosives for other munitions that are harder to destroy, thereby requiring fewer explosives. More time is required to assemble the shots than would be necessary to address individual MEC/MDEH items such as with BIP. This increases personnel exposure, and movement and configuration of MEC/MDEH for consolidation operations requires a greater number of personnel to remain in proximity/contact with MEC/MDEH for a greater period of time.

There is also greater risk of kick-outs as the quantity of munitions in each respective shot increases, which results in a larger area affected by kick-outs where scrap and residual collection would be required. This increases the difficulty in locating all kick-outs after demolition operations cease. In addition, the larger shot size would increase security/control requirements. Furthermore, waste streams generated from consolidate and blow operations could fall under further regulatory guidance for treatment and/or final disposition.

Implementability

Specific requirements regarding surrounding features (e.g., buildings, roads, etc.) and area size must be addressed prior to implementing this MEC treatment option, also the special tools and equipment required for implementation are limited. Larger detonations also increase the coordination concern with other agencies (e.g., Federal Aviation Administration) and a permit is required prior to detonation.

Additionally, there may be special requirements for protective packaging and transportation of MEC/MDEH to the consolidation area. If vehicles are needed, they may be required to meet Department of Transportation (DOT) and other agency requirements for transport of ammunitions and explosives. Planning for consolidate and blow operations must take into account the possibility that MEC/MDEH may have to be temporarily stored if an interruption or suspension of work takes place during the remedial activity. Consolidate and blow operations also require increases in both occurrence and complexity of site communications. In addition, emergency fire support requirements increase as the site increases in size in order to ensure adequate coverage in the event of a fire. An area(s) at Site 15 would need to be identified for the consolidation and detonation area.

<u>Cost</u>

Costs associated with consolidate and blow operations are moderate compared with other treatment operations. The man-hours associated with this treatment option are approximately the same as other treatment options; however, there may be additional equipment/vehicle requirements in order to transport MEC/MDEH/munitions. Security, signage, and access control costs would also increase as demolition and safety areas increase.

<u>Conclusion</u>

Consolidate and blow is retained for use in combination with other GRAs and technologies for the development of remedial alternatives for MEC/MDEH items identified that are safe to move.

**<u>MEC Residual Processing</u>**

MEC/MDEH treatment activities leave behind residue ranging from packaging materials to metal scrap from munitions. Metallic scrap can (and often must) be recycled in accordance with DoD regulations. This scrap must have all hazardous materials (including explosives and other munitions constituents [MC]) removed prior to releasing it to commercial facilities. MEC/MDEH items may need to undergo one or more residual treatment processes to meet the requirements for being classified as free of explosives. It is not expected that any explosives will remain after MEC/MDEH has been treated.

Residual treatment processes include:

- Chemical decontamination (information provided for reference)
- Flashing furnaces (information provided for reference)
- Shredding, cutting, and other manual procedures (included under MDAS treatment, Section 3.2.5.2)

**Chemical Decontamination**

Chemical decontamination is still in development and three of the more studied methods include: supercritical water oxidation, photocatalysis, and molten salt oxidation.

Effectiveness

Compared to other MEC residual processing methods, the effectiveness of chemical decontamination is low to medium. Most of these methods are still in some stage of development or testing.

Implementability

Compared to other MEC residual processing methods, chemical decontamination is not easily implemented because of added equipment, facilities, skilled labor, and possible hazardous material requirements.

Cost

Relative costs are medium to high when compared with other MEC residue treatment options.

Conclusion

Chemical decontamination is not retained for use in the development of remedial alternatives because of its low to medium effectiveness, ease of implementability, and relatively high cost.

**Flashing Furnaces**

The purpose of flashing furnaces is to thermally remove minor explosives residue from metallic scrap. These types of systems are also known by terms such as deactivation chambers, deactivation furnaces, and incinerators.

Effectiveness

Compared to other MEC residual processing methods, the effectiveness is high. Flashing furnaces are highly effective in removing minor residue from metal scrap. This is one of the best methods available for obtaining the highest level decontamination standards.

Implementability

Flashing furnaces require additional facilities and equipment, but not as much as other technologies such as blast chambers. These systems also produce hazardous waste streams that require further disposition. Therefore, compared to other MEC residual processing methods, the use of flash furnaces is not easily implemented.

Cost

Flashing furnaces present relatively high costs among residue treatment options.

Conclusion

Flashing furnaces are not retained for use in the development of remedial alternatives because of medium ease of implementability and relatively high cost.

#### 3.2.5.2 MDAS Treatment

**Shredding/Cutting and Use of Other Manual Procedures**

These technologies are intended to deform and/or demilitarize munitions-related items, the technology described can be used with any type of munitions item. The use of this technology results in unusable remnants.

Effectiveness

Compared to other MEC residual processing methods, the effectiveness is moderate. However, if an explosive hazard and/or MC are present, these methods offer no integral means of eliminating these hazards from scrap and residue; therefore, additional processes and equipment may be required.

Manual procedures would be very effective for demilitarizing MDAS. Should treatment be required, a 100 percent inspection of the demilitarized scrap would be conducted after treatment to ensure no resemblance to military munitions. Once this has been completed, the scrap could be transported to a qualified off-site recycler and recycled. Commercial metal recyclers can also be used in some cases to conduct the shredding/cutting.

Implementability

Compared to other MEC residual processing methods and MDAS treatment methods, shredding/cutting and the use of other manual procedures is relatively easy to implement, depending on the equipment required/used. No explosives or chemicals are required for this technology and no secondary waste streams are produced.

Cost

The purchase or rental of equipment to be used during demilitarization would be inexpensive. However, the cost of some shredding/cutting equipment may be high as compared with other equipment. Therefore, costs will depend on the type of equipment used for this technology. Commercial metal recyclers can also be used in some cases to conduct the shredding/cutting, which may involve lower costs than renting or buying shredding/crushing equipment.

Conclusion

This technology is retained for use in the development of remedial alternatives.

#### 3.2.5.3 In-Situ Treatment – On Site Stabilization

Chemical fixation/solidification and solidification/stabilization involves mixing chemical agents with contaminated soil to immobilize organic and inorganic contaminants. Contaminants are physically bound or enclosed within a stabilized mass (solidification), or chemical reactions are induced between the stabilizing agent and contaminants to reduce their mobility (chemical fixation). Binding and hardening material ties up the free water in the soil matrix. Potential chemical agents include Portland cement, cement kiln dust (CKD) lime, thermoplastic binders (e.g., asphalt), sorbents such as granular activated carbon (GAC), clays, zeolites, and anhydrous sodium silicate, Maectite® reagents, or Free Flow Technology reagents. In the case of asphalt emulsion-based encapsulation (Encapco Technologies, LLC), the treated soil is typically used as structural fill or road base material. It is assumed that a portion of the excavated soil at Site 15 may not meet TCLP regulatory limits (TCLP lead) and/or non-hazardous disposal requirements, if this is the case, and depending on the remedial alternative chosen, soil may be treated on site to enable disposal (Subtitle D landfill after treatment).

Effectiveness

Chemical fixation/solidification is typically quite effective for the immobilization of inorganic chemicals. Therefore, it would be effective for immobilizing the lead in soil with potentially elevated lead concentrations at Site 15. The major advantage to this process is that excavated soil at Site 15, which may be classified as hazardous as a result of TCLP lead concentrations, would be rendered non-hazardous because the chemical solidification/stabilization process would prevent lead from leaching from the stabilized soil matrix. Therefore, disposal at a hazardous (RCRA Subtitle C) treatment, storage, and disposal facility (TSDF) would not be necessary. Although most traditional chemical fixation/solidification processes result in a significant increase in volume, more innovative processes could reduce the total volume of soil. For example, the Maectite® chemical fixation process forms tight geochemically stable synthetic mineral crystals within the waste matrix, which also offers the added advantage of being able to immobilize organic contaminants in addition to inorganics (especially lead), as demonstrated by various TCLP test results. However, waste streams generated from some fixation operations may also fall under further regulatory guidance for treatment and/or final disposition.

Implementability

Chemical fixation/solidification is relatively easily implemented. This technology is well demonstrated and can be applied to the most common site and waste types, requires conventional materials handling equipment, and is available competitively from a number of vendors. Most reagents and additives are also widely available and relatively inexpensive industrial commodities. It is assumed that the same technology (Free Flow Technologies Reagent) used during previous remedial activities at Site 15 (2008/2009 remedial activities; AGVIQ-CH2MHill, 2009) would be used during these remedial activities, depending on which remedial alternative is chosen. Additionally, if the soil was originally hazardous, based on exceeding TCLP standards for lead, an additional requirement would be for the treated product to meet the lead Universal Treatment Standard (UTS) of 0.75 mg/L if it is to be used off site as a recycled product, or alternative LDR treatment standards, if being disposed in an appropriate landfill. Excavated and screened soil from locations that are hazardous (TCLP lead) will need to be stored as Staging Piles in Corrective Action Management Units (CAMUs) to allow for storage and treatment prior to off-site disposal.

Treatability studies were conducted during the 2008/2009 soil removal action (AGVIQ-CH2MHill, 2009) to determine and verify such design parameters as pretreatment needs, volume of stabilized soil generated, types and amounts of stabilizing agents, water-to-stabilizer mixing ratios, mixing times, treatment processes involved, and anticipated effectiveness for lead stabilization in the soil matrix. The results of this treatability study will be used to implement chemical fixation/solidification during the MEC remedial action. If a different technology is chosen as the treatment method, additional treatability studies would need to be conducted.

The solidification/stabilization treatability studies performed during previous remedial activities at Site 15 to select an appropriate treatment method for stabilizing the lead in soils included the following:

- Laboratory Lead S/S Treatability Study using Portland Cement (PC) and Triple Super Phosphate (TSP)
- Field Bench Scale Test using PC
- Bench Scale Laboratory Test using Free Flow Technologies Reagent

Based on treatability testing results, the reagent FF-100-40L (Free Flow Technologies Reagent) was selected to treat excavated soil with lead concentrations exceeding the TCLP regulatory criterion. Use of the reagent reliably stabilized the lead and reduced TCLP-lead concentrations in soil to acceptable levels with a lower mix ratio (5 to 6 percent) in comparison to PC (15 to 20 percent). A Soil Treatment Plan was developed and submitted to FDEP, the plan provided proposed treatment procedures using reagent FF-100-40L (Free Flow Technologies), as well as procedures for confirmation sampling to confirm the treatment's efficiency. FDEP approved the Soil Treatment Plan, which is included in the Remedial Action Completion Report, Soil Removal (AGVIQ-CH2MHill, 2009). A similar plan would need to be developed for these remedial activities if this treatment option is selected.

Cost

Costs for chemical stabilization processes vary widely according to materials or reagents used, their availability, project size, and chemical nature of contaminants.

Conclusion

Chemical stabilization is retained for consideration for the treatment of soil with elevated lead concentrations.

### 3.2.6 Disposal

The technologies considered under this GRA are off-site disposal of MDAS and other munitions related scrap, off-site soil disposal/landfilling, and on site beneficial use. It is assumed that hazardous items will be managed on-site according to 90-day accumulation regulations and removed from the site in less than 90 days. However, if necessary, long-term (more than 90 days) storage of hazardous items prior to off-site disposal will be managed in accordance with 40 CFR 264.553 Temporary Units.

#### 3.2.6.1 Off-Site Disposal of MDAS and Other Munitions-Related Scrap

MDAS items requiring treatment/demilitarization (those items resembling military munitions) or venting may be treated/demilitarized on site using manual procedures as described previously, or containerized and transported to an approved commercial metal recycler for treatment and demilitarization. Certified MDAS, other munitions related scrap, and any metallic non-munitions debris would be transported off-site for disposal to an approved commercial metal recycler. An "End Use" certification would be generated confirming that the material has been recycled.

Effectiveness

The disposal method is highly effective. The use of off-site commercial metal recyclers is the industry standard for disposal of MDAS.

Implementability

Off-site disposal at a recycler is easily implemented, although a recycler that accepts munitions-related scrap would need to be located. Special consideration would need to be given to safety issues and associated liabilities when considering and choosing a commercial metal recycler. Particular attention is required during the classification of items, MDAS certification, and documentation of quality assurance (QA)/quality control (QC) procedures associated with the remedial activities. Certification of any scrap leaving the site will require careful inspection by qualified personnel (UXO Technician).

An area would also need to be found for staging and storage of MDAS until the commercial metal recycler could pick up the items.

Cost

The costs would be relatively low to moderate; some commercial metals recycling companies will purchase and/or accept MDAS and munitions-related scrap at little to no cost.

Conclusion

This technology is retained for use in the development of remedial alternatives because of its effectiveness, ease of implementation, and relative cost.

#### 3.2.6.2 Off-Site Landfilling

Off-site landfilling would consist of transporting excavated soil for burial at an off-site TSDF. Non-hazardous excavated soil will be backfilled into the excavations on site. Excavated soil that may be characterized as RCRA hazardous waste would have to be disposed in a RCRA Subtitle C hazardous waste landfill or treated on-site prior to off-site disposal at a RCRA Subtitle D landfill. Based on the concentration of lead remaining on site (Tetra Tech, 2008a, figures provided in Appendix A-2), it is assumed that some of the excavated soil may be hazardous. Further, it should be noted, that disposal of any soil containing lead with TCLP levels exceeding hazardous criteria would require pre-treatment to meet land disposal restrictions prior to landfilling

Effectiveness

Off-site landfilling of hazardous soil does not permanently or irreversibly reduce contaminant concentrations. Although the CERCLA preference for treatment relegates landfilling to a less preferable option, this technology can be an effective disposal option for nonhazardous soil and soil characterized as a RCRA hazardous waste. Off-site landfills are only permitted to operate if they meet certain requirements of design and operation governing foundation, liner, leak detection, leachate collection and treatment, daily cover, post-closure inspections and monitoring, etc., which ensure the effectiveness of these facilities. The requirements of a RCRA hazardous (Subtitle C) landfill are typically more stringent than those of a RCRA non-hazardous (Subtitle D) solid waste landfill.

Implementability

Off-site landfilling would be easily implementable. Facilities and services are available. Disposal at a landfill may require certain pre-treatment, which may include the removal of free liquids but, because it is anticipated that soil will not be excavated to the water table, no associated water should be present and this requirement should be easy to meet. In addition, a waste profile would have to be prepared indicating contaminant concentrations and their leachability. Disposal of soil containing lead with TCLP levels exceeding hazardous criteria would require pre-treatment to meet land disposal restrictions prior to landfilling. If treatment achieves UTS levels, disposal of this treated soil in a RCRA Subtitle D landfill would be permissible. If not, the treated soil would need to be disposed in a RCRA Subtitle C landfill.

Cost

Cost of off-site landfilling would be moderate to high, depending on volume and whether or not soil is determined to nonhazardous or hazardous. Furthermore, soil would need to be imported to backfill the excavations if soil is transported off site for disposal and there would be additional costs associated with the purchase and transport of fill.

Conclusion

Off-site landfilling is retained in combination with other process options for the development of remedial alternatives.

#### 3.2.6.3 On-Site Beneficial Reuse

Non-hazardous excavated soil will be backfilled into the excavations on site. If excavated soil is characterized as RCRA hazardous waste, it would be transported off-site for disposal.

Effectiveness

This would be very effective in areas where non-hazardous soil is present. Topsoil may need to be imported for revegetation purposes.

Implementability

This would be easily implementable, as all of the excavation/soil moving equipment would be on site and readily available to backfill the excavations as soon as munitions removal is complete.

Cost

Costs would be minimal and would only be associated with the time it would take to backfill the excavation with soil. There would also be a cost if it was determined that topsoil would need to be imported to cover the treated soil (for revegetation purposes).

Conclusion

On site beneficial use is retained in combination with other process options for the development of remedial alternatives.

## 3.3 SELECTION OF REPRESENTATIVE TECHNOLOGIES AND PROCESS OPTIONS

The technologies and process options, under the GRAs as noted, were retained for use in combination with other GRAs and technologies for the development of remedial alternatives. The exception is No Action, which will be retained as a stand-alone alternative.

The next step was to select representative process options from each technology to assemble an adequate variety of alternatives, and evaluate the alternatives in sufficient detail to aid in the final selection process. The alternatives are presented in Section 4.

## TABLE 3-1

## PRELIMINARY SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS
## OU 5, SITE 15
## ALL ALTERNATIVES
## FEASIBILITY STUDY REPORT FOR MUNITIONS REMOVAL
## NAVAL AIR STATION CECIL FIELD
## JACKSONVILLE, FLORIDA


| Technology | Process Options | Description | Screening Comment |
|---|---|---|---|
| No Action | Not Applicable | No activities would be conducted at the site. | Retain. Required by law, retain for baseline comparison to other technologies. |
| Containment | Soil Cover | Permeable barrier used to prevent contact with underlying MEC/MPPEH. | Eliminate. Terrain in former operational area is uneven. Previous areas of the site have already been cleared of MEC/MPPEH, covering areas surrounding previously cleared areas would be inefficient and awkward. |
| | Capping (clay, synthetic membrane, asphalt, or multimedia cap) | Low-permeability barriers to minimize exposure to and migration of MEC/MPPEH. | Eliminate. Installing a cap requires clearing, and prevention of woody vegetation from re-establishing over the cap. Also, previous areas of the site have already been cleared of MEC/MPPEH, capping areas surrounding previously cleared areas would be inefficient and awkward. |
| Land Use Controls | Engineering Controls - Active Controls (Physical Barriers/ Security Guards) | Fencing, markers, and warning signs to restrict site access. | Retain. Retain markers and warning signs along public access ways where munitions-related items may be encountered. |
| | Institutional Controls - Passive Controls (Restrictions on land use type) | Land use controls already established for Site 15. | Retain. Land use controls have already been established for Site 15. |
| | Institutional Controls – Passive Controls (Public Education Program) | Public education program for visiting public and local authorities | Retain. Would education potential receptors of hazards that may be present at Site 15. |

| Technology | Process Options | Description | Screening Comment |
|---|---|---|---|
| Detection | Visual Observation | Visually locate and identify MEC/MPPEH and MDAS items on the ground surface. | Retain. Visual observation is retained to identify MEC/MPPEH and MDAS items on the ground surface. |
| | Hand-held/man portable magnetometer/ferrous metal detectors | UXO Technicians will carry ferrous metal detectors during surveying. | Retain. UXO Technicians would walk the site carrying metal detectors to identify ground surface items and shallow subsurface anomalies. |
| | Towed/cart-mounted magnetometer/ferrous metal detectors | Detector is mounted and UXO Technician will push/pull detector across site. | Eliminate. Due to site conditions (vegetation/wooded areas and soft sediment) it would be difficult to pull carts, etc., across the site for coverage. |
| Ground Surface Removal | Manual Removal | Remove MEC/MPPEH and MDAS items identified on the ground surface. | Retain. Manual removal is retained to remove MEC/MPPEH and MDAS items. |
| Subsurface Removal | Manual Excavation | Utilization of manual tools and procedures to investigate and remove individual anomalies. | Retain. Manual excavation is retained to investigate and remove shallow subsurface anomalies (to 1 foot bgs). |
| | Mechanized Excavation and Mechanized Removal | Use of armored common construction/excavation equipment for high-volume earth moving. Use of mechanical soil screening equipment to remove munitions items from mechanically excavated soil. | Retain. Mechanized excavation and mechanical soil screening is retained for clearance of shallow subsurface anomalies (to 1 foot bgs). |
| | Mechanized Excavation and Manual Inspection and Removal | Use of armored common construction/excavation equipment for high-volume earth moving. Use of manual tools and procedures to inspect and remove munitions items from mechanically excavated soil. | Retain. Manual inspection and removal of shallow subsurface anomalies is retained for use with mechanically excavated soil. |

## TABLE 3-1

## PRELIMINARY SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS
## OU 5, SITE 15
## ALL ALTERNATIVES
## FEASIBILITY STUDY REPORT FOR MUNITIONS REMOVAL
## NAVAL AIR STATION CECIL FIELD
## JACKSONVILLE, FLORIDA


| Technology | Process Options | Description | Screening Comment |
|---|---|---|---|
| | Remotely Operated Removal Equipment | Use of remotely operated equipment for clearance and removal activities. | Eliminate: The K40 [(1)] distance for the site does not warrant the use of remotely operated removal equipment. |
| Treatment MEC/MDEH | Blow-in-Place | Detonation of explosive materials without moving the item from the location where it was found. | Retain. Addresses MEC/MDEH items which cannot safely be moved from the location they are found. |
| | Consolidate and Blow | The collection, configuration, and subsequent destruction by explosive detonation of MEC/MDEH. | Retain. Address MEC/MDEH items that can be safely moved from the location they are found. Munitions will be collected, moved, and detonated in a designated disposal area. |
| | Contained Detonation Chambers | Involves detonation in chamber, vessel, or facility designated and constructed chamber for the purpose of containing blast and fragments from MEC/MDEH detonation. | Eliminate. It is not expected that many MEC/MDEH items, if any, will need to be detonated. Would be costly and not easily implemented. |
| | Flash Furnaces | Thermal treatment of MEC items in constructed thermal treatment unit. | Eliminate. It is not expected that many MEC/MDEH items, if any, will need to be detonated. Would be costly and not easily implemented. |
| | Disassembly or Render Safe Procedures | These procedures enable the neutralization and/or disarming of munitions to occur. Additional disposal procedures are generally required along with this process option. Must be conducted by military EOD. | Eliminate. Hazardous to personnel performing procedures. Procedures are manpower intensive and specialized tools and equipment are required. Difficult to implement. |

**PRELIMINARY SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS**
**OU 5, SITE 15**
**ALL ALTERNATIVES**
**FEASIBILITY STUDY REPORT FOR MUNITIONS REMOVAL**
**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**



| Technology | Process Options | Description | Screening Comment |
|---|---|---|---|
| | MEC Residual Processing | Should BIP or consolidate and blow be conducted, these activities may leave behind residue ranging from packaging materials to metal scrap from munitions. This scrap must have all hazardous materials (including MC) removed prior to releasing it to commercial facilities for disposal. | Retain. Should MEC/MDEH be identified on-site, residual processing may need to take place. |
| Treatment<br>MDAS | Shredding, Cutting, and Use of Other Manual Procedures | Use of manual tools to demilitarize MDAS items. | Retain. May be necessary to demilitarize/treat MDAS items to make them "not recognizable" as munitions items. |
| Treatment<br>In-Situ | Chemical Fixation/ Solidification/Stabilization | Mixing of chemical agents to bind, solidify, and reduce contaminant mobility. | Retain. May be used in conjunction with other remedial technologies to render excavated lead contaminated soil non-hazardous. |
| Disposal of MDAS, Munitions-Related Scrap, and Metallic Non-Munitions Debris | Off-Site Disposal | Treatment of MDAS and other munitions-related scrap and disposal of certified MDAS, munitions-related scrap and other metallic non-munitions debris at a permitted off-site facility. | Retain. Off-site disposal of certified MDAS, munitions-related scrap, and other metallic non-munitions debris is retained for use with surface removal and subsurface excavation options. |

**TABLE 3-1**

**PRELIMINARY SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS**
**OU 5, SITE 15**
**ALL ALTERNATIVES**
**FEASIBILITY STUDY REPORT FOR MUNITIONS REMOVAL**
**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**


| Technology | Process Options | Description | Screening Comment |
|---|---|---|---|
| Disposal (soil) | Off-Site Landfilling | Disposal of excavated soil in a permitted RCRA C or RCRA D facility. | Retain. Landfilling to be used in conjunction with other remedial technologies. |
| | On-Site Beneficial Reuse | Reuse of excavated soil as fill material. | Retain. Possible process option to be used in conjunction with other technologies. |

1. The K40 distance is figured using the equation ($D=40W^{1/3}$) for the net explosive weight (NEW) of the maximum greatest fragmentation distance (MGFD) for a specific munitions response site/area (MRS/RA). The K40 distance for Site 15 is calculated on the calculation sheets printed by the fragmentation database as presented in Supplemental MEC RI ESS.

bgs - below ground surface
ESS – Explosives Safety Submission
MDAS - Material documented as safe
MEC - Munitions and explosives of concern
RCRA - Resource Conservation and Recovery Act
UXO - Unexploded ordnance

EOD - Explosive ordnance disposal
MC - Munitions constituents
MDEH - Material documented as an explosive hazard
MPPEH - Material potentially presenting an explosive hazard
RI - Remedial Investigation

# 4.0 ASSEMBLY AND DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

This section presents an evaluation of each remedial alternative with respect to the criteria of the NCP (40 CFR Part 300). These criteria and their relative importance are described in the following subsections.

## 4.1 DEVELOPMENT OF REMEDIAL ALTERNATIVES

As outlined in Sections 2.2 and 2.3, RAOs and GRAs for the site were developed to: 1) prevent and/or reduce the direct contact threat associated with MEC/MPPEH remaining on the ground surface and in the shallow subsurface; 2) make Site 15 safe for the specified land use; and 3) to minimize the impact of site activities to wetlands, threatened and endangered species, and other natural resources at Site 15. This section presents the development and detailed analysis of the remedial alternatives to achieve the RAOs. Each alternative was developed from the technologies that were retained from the screening process presented in Section 3. The alternatives incorporate a variety of technologies. From the technologies retained from the preliminary screening summarized in Table 3-1, the following potential remedial alternatives were developed to mitigate the potential risk to site receptors at Site 15 from MEC/MPPEH:

- Alternative 1: No Action
- Alternatives 2A, 2B, and 2C: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal
  - Alternative 2A: Off-Site Hazardous Soil Disposal
  - Alternative 2B: On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal
  - Alternative 2C: Mechanical Excavation and Manual Investigation and Removal

- Alternatives 3A, 3B, and 3C: All Surface and Shallow Subsurface MEC and Anomaly Removal
  - Alternative 3A: Off-Site Hazardous Soil Disposal
  - Alternative 3B: On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal
  - Alternative 3C: Mechanical Excavation and Manual Investigation and Removal

- Alternatives 4A, 4B, and 4C: All Surface and Shallow Subsurface MEC Removal
  - Alternative 4A: Off-Site Hazardous Soil Disposal
  - Alternative 4B: On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal
  - Alternative 4C: Mechanical Excavation and Manual Investigation and Removal

### 4.1.1 Evaluation Criteria

In accordance with the NCP (40 CFR Part 300.430), the following nine criteria are used for the evaluation of remedial alternatives:

- Overall Protection of Human Health and the Environment
- Compliance with ARARs
- Long-Term Effectiveness and Permanence
- Reduction of Toxicity, Mobility, or Volume through Treatment
- Short-Term Effectiveness
- Implementability
- Cost
- State Acceptance
- Community Acceptance

The last two evaluation criteria, State Acceptance and Community Acceptance, are not formally addressed in this FS.

#### 4.1.1.1 Overall Protection of Human Health and the Environment

Alternatives must be assessed for adequate protection of human health and the environment, in both the short and long term, from unacceptable risks posed by hazards or contaminants present at the site by eliminating, reducing, or controlling exposure to these hazards. Overall protection draws on the assessments of the other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

#### 4.1.1.2 Compliance with ARARs

Alternatives must be assessed to determine whether they attain ARARs under federal environmental laws and state environmental or facility siting laws. CERCLA Section 121(d), specifies in part, that remedial actions for cleanup of hazardous substances must comply with requirements and standards under federal or more stringent state environmental laws and regulations that are applicable or relevant and appropriate (i.e., ARARs) to the hazardous substances or particular circumstances at a site, or a waiver must be obtained [see also 40 CFR 300.430(f)(1)(ii)(B)]. ARARs include only federal and state environmental or facility siting laws/regulations and do not include occupational safety or worker protection requirements.

In addition, per 40 CFR 300.405(g)(3), other advisories, criteria, or guidance may be considered in determining remedies (TBC guidance category).

#### 4.1.1.3 Long-Term Effectiveness and Permanence

Alternatives must be assessed for the long-term effectiveness and permanence they offer, along with the degree of certainty that the alternative would prove successful. Factors to be considered include the following:

- Magnitude of Residual Risk - Risk posed by residual materials at the conclusion of remedial activities. The characteristics of residuals should be considered to the degree that they remain hazardous, taking into account their volume and mobility.

- Adequacy and Reliability of Controls - Controls such as containment systems and LUCs that are necessary to manage residual materials and untreated waste must be shown to be reliable. In assessing controls, the following must be considered: the uncertainties associated with land disposal for providing long-term protection from residuals; the potential need to replace technical components of the alternative; and potential exposure pathways and risks posed if the remedial action needs replacement.

#### 4.1.1.4 Reduction of Toxicity, Mobility, or Volume through Treatment

The degree to which the alternative employs recycling or treatment that reduces the toxicity, mobility, or volume is to be assessed, including how treatment is used to address the principal threats posed by the site. Chemical contamination is not a concern at this site; therefore, toxicity is not a concern. Factors to be considered, as appropriate, include the following:

- The treatment or recycling processes the alternative employs and the materials that these processes would treat.

- The amount of hazardous substances, pollutants, or contaminants that would be destroyed, treated, or recycled.

- The degree of expected reduction in mobility or volume of waste as a result of treatment or recycling, and the amount of reduction(s) that is occurring.

- The degree to which the treatment is irreversible.

- The type and quantity of residuals that would remain following treatment considering the persistence and mobility of such substances.

- The degree to which treatment reduces the inherent hazards posed by the principal threats at the site.

#### 4.1.1.5 Short-Term Effectiveness

The short-term impacts of the alternatives are to be assessed considering the following:

- Short-term risks that might be posed to the community during implementation.

- Potential impacts on workers during the remedial action and the effectiveness and reliability of protective measures.

- Potential environmental impacts of the remedial action and the effectiveness and reliability of mitigative measures during implementation.

- Time until protection is achieved.

Although not a CERCLA-criterion, the sustainability of each alternative is also evaluated per Navy policy. Sustainability factors are similar to those evaluated as part of the Short-Term Effectiveness criterion, so they are discussed in this section. Sustainability evaluations provide insight into elements of a remedy that have the greatest impact on the environmental footprint. Other factors that are considered include emissions of criteria air pollutants, water usage, and energy consumption. Sensitivity analysis of such factors can help provide an optimal design that minimizes the overall environmental footprint of the remedial action. Sustainability evaluations were performed for each remedial alternative and are provided in Appendix B.

#### 4.1.1.6 Implementability

The ease or difficulty of implementing the alternatives is to be assessed by considering the following types of factors, as appropriate:

- Technical feasibility, including technical difficulties and unknowns associated with the construction and operation of a technology, reliability of the technology, ease of undertaking additional remedial actions, and ability to monitor the effectiveness of the remedy.

- Administrative feasibility, including activities to be coordinated with other offices and agencies, and the ability and time required to obtain any necessary approvals and permits from other agencies (for off-site actions).

- Availability of services and materials, including the availability of adequate off-site treatment capacity, storage capacity, and disposal capacity and services; availability of necessary equipment and specialists and provisions to ensure necessary additional resources; availability of services and materials; and availability of prospective technologies.

#### 4.1.1.7 Cost

Capital costs, including both direct and indirect costs, and annual operations and maintenance (O&M) costs are provided. A net present value of the capital and O&M costs is also provided. Typically, the cost estimate accuracy range is plus 50 percent to minus 30 percent.

### 4.1.2 Relative Importance of Criteria

Among the nine criteria, the threshold criteria are considered to be:

- Overall Protection of Human Health and the Environment
- Compliance with ARARs (excluding those that may be waived)

The threshold criteria must be satisfied for an alternative to be eligible for selection.

Among the remaining criteria, the following five criteria are considered to be the primary balancing criteria:

- Long-Term Effectiveness and Permanence
- Reduction of Contaminant Toxicity, Mobility, or Volume through Treatment
- Short-Term Effectiveness
- Implementability
- Cost

The balancing criteria are used to weigh the relative merits of the alternatives.

The remaining two of the nine criteria (State Acceptance and Community Acceptance) are considered to be modifying criteria that must be considered during remedy selection. The state's concerns that must be assessed include the state's position and key concerns related to the preferred alternative and other alternatives, and state comments on ARARs or the proposed use of waivers. These last two criteria would be evaluated after the FS has been reviewed by USEPA and FDEP. Therefore, this document addresses only seven of the nine criteria.

### 4.1.3 Selection of Remedy

The selection of a remedy is a two-step process. The first step consists of identification of a preferred alternative. The preferred alternative must meet the following criteria:

- Protection of human health and the environment.
- Compliance with ARARs unless a waiver is justified.
- Cost effectiveness in protecting human health and environment and in complying with ARARs.
- Utilization of permanent solutions and alternate treatment technologies or resource recovery technologies to the maximum extent practicable.

The second step consists of the review of the public comments and determination of whether or not the preferred alternative continues to be the most appropriate remedial action for the site, in consultation with USEPA and FDEP.

## 4.2 ASSEMBLY AND DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

The detailed descriptions and evaluation of the remedial alternatives developed for MEC at Site 15 are presented in Sections 4.2.1 through 4.2.4.

Alternative 1 was developed and analyzed to serve as a baseline for comparison to the other alternatives, as required by CERCLA and the NCP. Alternatives 2 A, B and C, 3 A, B, and C, and 4 A, B, and C were developed to allow for different variations of removal of ground surface and/or shallow subsurface munitions-related items at Site 15. A description and detailed analysis of these alternatives are presented in the following sections.

### 4.2.1 Alternative 1: No Action

#### 4.2.1.1 Description

The No Action alternative maintains the site as is. This alternative would not be effective in preventing and/or reducing the potential for site receptors to come in direct contact with MEC/MPPEH items remaining on the surface and in the shallow subsurface, because no MEC/MPPEH removal would take place. This alternative is retained to provide a baseline for comparison to other alternatives. It should be noted that the government would respond to any MEC discovery at this site regardless of whether the site is designated for "No Action."

#### 4.2.1.2 Detailed Analysis

Overall Protection of Human Health and the Environment

Alternative 1 would not provide protection of human health and the environment. There could be unacceptable risks to human health and the environment from direct exposure to MEC/MPPEH. The MEC HA score for No Action would be the same as the baseline score presented in Section 1.3.4 because no remediation would be completed at Site 15. The baseline MEC HA score for Subunit 1, the former ordnance disposal area, is 865 which corresponds to a Hazard Level of 1 indicating that this area has the highest potential for explosive hazard conditions. The baseline MEC HA score for Subunit 2, the remainder of the operational area, is 605 which corresponds to a relative Hazard Level of 3, indicating a moderate potential for explosive hazard conditions. The MEC HA is presented in Appendix A-4.

Compliance with ARARs and TBCs

Alternative 1 would comply with some location specific ARARs or TBCs listed in Tables 2-1 and 2-2 because no action would be taken. Chemical contamination at Site 15 has been addressed, no COPCs remain at this site in excess of established site-specific soil cleanup target levels to permit low-intensity recreational use of the site; therefore, there are no chemical-specific ARARs or TBCs for this site.

Long-Term Effectiveness and Permanence

Alternative 1 would have little long-term effectiveness and permanence because exposure to MEC/MPPEH would continue, and there would be no LUCs to post/construct warning signs and no Public Education Program.

Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative 1 would not reduce the volume of MEC/MPPEH present at this site because no remedial activities would occur. No COPCs remain at Site 15 in excess of established site-specific soil cleanup target levels to permit low-intensity recreational use of the site. Chemical contamination at Site 15 has been addressed through remedial activities described previously, the extent of arsenic, lead, PAH, and TRPH contaminated soil was delineated and excavated to meet permitted land use (low-intensity recreational activities) requirements. Therefore, toxicity and mobility of chemical contaminants are not a concern at this site.

Short-Term Effectiveness

Because no action would occur, implementation of Alternative 1 would not have any short-term adverse impact from cleanup activities to the local community or the environment. Alternative 1 would not adversely impact wetlands and other natural resources located at the site because no action would occur. However, munitions-related items that may be present at Site 15 would remain on-site, and their presence may adversely impact the wetlands and other natural resources over time.

Implementability

Because no action would occur, Alternative 1 would be readily implementable. The technical feasibility criteria, including constructability, operability, and reliability, are not applicable. Implementability of additional administrative measures is not applicable because no such measures would be taken.

Cost

There is no cost associated with the No Action alternative.

### 4.2.2 Alternatives 2A, 2B, and 2C: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal

#### 4.2.2.1 Description

The following activities would be associated with the implementation of Alternatives 2A, 2B, and 2C, remedial activities would not be conducted in areas previously remediated (gray areas of Figure 4-1):

1. Site surveys would be conducted prior to beginning remedial activities to determine if any endangered, threatened, or Florida Species of Special Concern (SSC) are present. Should any endangered, threatened, or Florida Species of Special concern; including the Indigo Snake, be identified, its location will be recorded via global positioning system (GPS) for future reference. Should an Indigo Snake be identified within a designated mechanical excavation area, the snake would be relocated outside of the excavation area. Surveys would also include a gopher tortoise survey that would be conducted within the remedial action area boundaries in order to identify potentially occupied (active and inactive) gopher tortoise burrows. The burrow locations, if found, would be recorded via GPS for future reference, and would be relocated outside the remedial action area.

2. Wetlands have been identified at Site 15; previously surveyed boundaries are shown on Figure 4-1. An inspection/survey would be conducted to verify these boundaries. If any boundaries/locations of these wetlands areas have changed, they would be recorded via GPS for future reference.

3. The former ordnance disposal area would be subdivided into already established 100 by 100 foot grids as shown in blue on Figure 4-1.
   - 39 pre-established 100 x 100 foot grids

4. Transects would be prepared, on either side of access ways shown in orange on Figure 4-1 within the operational areas, for a total of width of 10 feet on each side of the access ways.
   - Approximately 1,800 linear feet

5. Brush cutting and clearance activities would be conducted, as necessary, to prepare the site.
   - Within grids at the former ordnance disposal area, vegetation would be cut flush to the ground surface prior to excavation.

   - Tree/vegetation removal, to the ground surface, was conducted in 34 of the 39 grids during the 2008/2009 soil remedial activities; assume minimal brush cutting (using hand tools and brush hog) necessary in these grids for these remedial activities (figures showing 2008/2009 tree removal grids are presented in Appendix A-5).
     -- Large trees and vegetation would be cut to the ground surface in five of the 39 grids before remedial activities can begin (figures showing grids where tree removal would be conducted are presented in Appendix A-5).

- Along transects, brush would not be cut to shorter than 6 inches above the ground surface and only trees less than 2 inches in diameter would be cut.
  - -- 1,800 linear feet, 10 feet on each side of access way = 36,000 square feet (brush cutting activities assumed to be minimal in these areas).

- It is assumed that vegetation clearance in wetland areas would not be required for Alternatives 2A, 2B, and 2C. However, if it becomes necessary to enter wetland areas, vegetation would be cut, as necessary, with a weed trimmer. Vegetation would not be uprooted and no herbicides would be used. No power type equipment or other vehicular machines would be permitted in wetland areas.

6. Visual and detector-aided (hand-held magnetometer) surveys of the ground surface of all grids and transects would be conducted to locate surface munitions-related items within the removal action area. Digital geophysical surveys, using electro-magnetic systems, would be conducted within the former ordnance disposal area to determine the locations of anomalies.
   - Within the former ordnance disposal area (blue areas shown on Figure 4-1), confirm the proposed excavation area (mechanical excavation) versus proposed intrusive anomaly investigation area (hand digs). If more than 60 shallow subsurface anomalies are identified within a given grid during the detector-aided surface survey, mechanized excavation would be conducted in the grid. If less than 60 shallow subsurface anomalies are identified in a given grid, the locations where the shallow subsurface anomalies are detected would be marked during surveying for manual intrusive anomaly investigation.

   - The locations where shallow subsurface anomalies are detected in transects (orange areas shown on Figure 4-1) along access ways would be marked during surveying for manual intrusive anomaly investigation.

7. Manually remove and treat munitions-related items (including MEC, MDEH, and MDAS) from the ground surface within the entire remedial action area (both transects and grids), and remove metallic non-munitions debris.
   - Ground Surface - Estimate four MEC/MDEH items and approximately 30 drums MDAS (see item #11 for subsurface).

   - Ground Surface - Estimate approximately 1,000 pounds non-munitions debris (see items #9 and #11 for subsurface).

- No soil will be removed with the MEC/MDEH and non-munitions debris, any soil clinging to the items will be removed and returned to the ground surface where the item was removed.

- The location of all MEC/MDEH items would be recorded using GPS. All items would be given a unique identification number, and all information and observations would be recorded on an MEC Tracking Log. No MEC/MDEH item would be moved until a positive identification is made. Depending on the density of MDAS and other munitions-related scrap items identified, it may be impractical to record individual item locations and identity via GPS. Therefore, “areas” of MDAS and munitions-related scrap items may be recorded if the density of such items is so great that it would be impractical to record individual locations. In such cases, the number(s) and type(s) of items would be qualitatively described.

8. Intrusively investigate each shallow subsurface anomaly marked along all transects and grids (if grids are identified in item #6 for intrusive anomaly investigation), using manual tools and techniques, to a maximum depth of 1 foot bgs. Soil will be placed on the ground adjacent to the intrusive investigation location, once the source of the anomaly is determined and the excavation reaches a depth of 1 foot bgs, the soil will be returned to the excavation.
   - Estimate 200 intrusive digs

9. Remove and treat munitions-related items (including MEC, MDEH, and MDAS), as necessary, from anomaly intrusive investigation locations, and remove metallic non-munitions debris.
   - Subsurface - Estimate 100 pounds non-munitions debris (see item #7 for surface)
   - No soil will be removed with the MEC, MDEH, MDAS, or non-munitions debris, any soil clinging to the items will be removed and returned to the intrusive investigation location where the item was removed.

10. Mechanical excavation, using a shielded excavator, of all soil from each grid within the former ordnance disposal area as determined in item #6, to a maximum depth of 1 foot bgs (blue areas shown on Figure 4-1).
   - 39, 100 x 100 x 1 foot grids, approximately 390,000 cubic feet.

   - See item #12 below for handling of excavated hazardous soil, a portion of the soil excavated may be hazardous (TCLP lead). Excavated non-hazardous soil would be returned to the excavation after munitions-related items are removed from the soil.

- All soil will be managed within/directly adjacent to the excavation grid. Excavations will be backfilled on the day the grid is excavated.

- Construct a decontamination pad. Some of the excavated soil may have elevated lead concentrations.

- Assume health and safety would require personal protective equipment (PPE), wetting to suppress dust, and air monitoring.

11. Remove and treat munitions-related items from excavated soil (including MEC, MDEH, and MDAS), as necessary, and remove metallic non-munitions debris.
    - Subsurface - Estimate 10 MEC/MPPEH items and 30 drums MDAS (see item #7 for surface).

    - Subsurface - Estimate 10,000 pounds non-munitions related debris (see item #7 for surface).

    - No soil will be removed with the MEC/MPPEH, MDAS or non-munitions debris, any soil clinging to the items will be removed. If from a grid with nonhazardous soil, the soil will be returned to the excavation and if from a grid with hazardous soil the soil will be handled as described in Item #12.

    - The location of all MEC/MDEH items would be recorded using GPS. All items would be given a unique identification number, and all information and observations would be recorded on an MEC Tracking Log. No MEC/MDEH item would be moved until a positive identification is made. Depending on the density of MDAS and other munitions-related scrap items identified, it may be impractical to record individual item locations and identity via GPS. Therefore, “areas” of MDAS and munitions-related scrap items may be recorded if the density of such items is so great that it would be impractical to record individual locations. In such cases, the number(s) and type(s) of items would be qualitatively described.

12. Mechanically excavated soil would be handled as hazardous (TCLP lead) or non-hazardous, based on existing sampling data which adequately characterized the soil at Site 15 to 1 foot bgs (figures showing assumed hazardous and non-hazardous soil areas, per alternative, are presented in Appendix A-2).

    - Based on previous sampling data, assume soil from 21 of the 39 mechanically excavated grids is non-hazardous and can be backfilled to the excavation(s) after cleared of munitions, without further handling (210,000 cubic feet = 7,778 cubic yards = 11,667 tons).

- **<u>Alternative 2A:</u>** Assume soil from 18 of the 39 mechanically excavated grids has elevated lead concentrations, is hazardous, and would be transported off site for disposal, assumption is based on previous sampling and remediation data (180,000 cubic feet = 6,667 cubic yards = 10,000 tons). Sampling would be conducted for disposal purposes. Excavated and screened soil from locations that are likely to be hazardous (TCLP lead) will be stored on-site within the excavation grids as staging piles in CAMUs prior to off-site disposal. Clean fill will be imported to backfill into the excavations. Disposal of any soil containing lead with TCLP levels exceeding hazardous criteria would require pre-treatment to meet land disposal restrictions prior to landfilling. If treatment achieves UTS levels, disposal of this treated soil in a RCRA Subtitle D landfill would be permissible. If not, the treated soil would need to be disposed in a RCRA Subtitle C landfill.

- **<u>Alternative 2B:</u>** Assume soil from 18 of the 39 mechanically excavated grids has elevated lead concentrations, is hazardous, and would be stabilized in-place on site, assumption is based on previous sampling and remediation data (180,000 cubic feet = 6,667 cubic yards = 10,000 tons). Composite samples would be collected and analyzed for TCLP lead. Once post-treatment soil TCLP lead concentrations are less than 5 mg/L and meet the alternative LDR treatment standards, treatment would stop and soil would be transported off-site for disposal. Treated soil can be disposed off-site at a RCRA Subtitle D landfill. Clean fill will be imported to backfill into the excavations. If needed, excavated, screened, and treated soil from locations likely to be hazardous (TCLP lead) would be staged as staging piles in CAMUs prior to off-site disposal.

- **<u>Alternative 2C:</u>** Under this alternative, all mechanically excavated soil will be laid by the excavator on the ground surface adjacent to a given excavation area (no more than 100 by 100 foot grid), Once soil has been excavated, approximately 1 cubic yard of soil (and debris) will be spread by the excavator on the ground surface. The excavated material will then be manually investigated by UXO Technicians and munitions/non-munitions related items will be manually removed from the soil. Soil would be backfilled into the excavation(s) after manual inspection and removal is complete. Assume no clean fill needed.

13. If MEC is identified in either the surface or shallow subsurface within 25 feet of the edge of the investigation area (grids or transects), as applicable, 1) step-out in 25-foot increments in all directions to form a new 25 by 25 foot grid or, 2) step-out in a 25-foot long transect along the access way. Step-outs would not be conducted into areas cleared during previous removal actions. Conduct visual and detector-aided (hand-held magnetometer) surveys of the ground surface in step out grid/transect.

Manually remove and treat surface munitions-related items (including MEC, MDEH, and MDAS), as necessary, and remove metallic non-munitions debris. Mark locations where shallow subsurface anomalies are detected and intrusively investigate each shallow subsurface anomaly to a maximum depth of 1 foot bgs. Manually remove and treat munitions-related items (including MEC, MDEH, and MDAS), as necessary, and remove metallic non-munitions debris. No soil will be removed with the MEC, MDEH, MDAS or non-munitions debris, any soil clinging to the items will be removed and returned to the intrusive investigation location where the item was removed. Continue to step-out, as necessary, until no MEC items are located within 25 feet of the edge of the investigation area.

- Assume four grids of step-outs, surface survey, and intrusive anomaly investigation
- Assume 100 intrusive digs (all hand digs, no shielded excavator)
- Assume 100 pounds non-munitions related debris

14. A determination would be made by the UXO Team Leader as to whether detected munitions-related items are MEC or MPPEH. If an item is MEC and not safe to move, it would be left in place and prepared for MEC BIP treatment. If an item is deemed MEC and safe to move, it could be transported to a staging area to await MEC treatment, on a daily basis. MPPEH items would be further differentiated as either MDEH or MDAS. MDEH items could be transported to a staging area to await MEC treatment procedures, or if determined unsafe to move, would be left in place and prepared for BIP treatment. MDAS would be further classified as either requiring demilitarization or venting, or as being munitions-related scrap. MDAS would be inspected and certified prior to transport off site to an approved metal recycler.

    - Assume six on-site detonations (for MEC/MDEH), explosives would be ordered and used as needed, explosives would not be stored on site.

    - Per F.A.C. 62-730.320, an Emergency Detonation Permit is required prior to any on-site detonations. Per permit requirements, a sample will be collected from the ground surface after any detonation.

    - Onsite treatment/demilitarization of MDAS items resembling military munitions or in need of venting would be conducted, as necessary. Items could also be containerized and transported off-site to an approved commercial metal recycler for treatment/demilitarization.
        -- Assume 50 items would need demilitarization

15. 100 percent of all recovered items, after MEC/MDEH treatment, would be re-inspected to determine if they are free of explosive hazards and are able to be classified as MDAS.
    - Segregate and containerize munitions-related items and non-munitions debris for off-site disposal.
        -- Assume 60 drums MDAS total and 11,200 pounds total non-munitions debris collected during Alternatives 2A and 2B remedial activities.
    - Transport of certified MDAS and any metallic non-munitions debris to an approved off-site commercial metal recycler for disposal. Obtain an “End Use” certification confirming that material has been recycled.

16. If MEC/MPPEH items are identified at Site 15, explosive substances (MC) could be present and confirmatory sampling may need to be conducted after the munitions items are removed from the site to confirm the absence or presence of potential chemical contaminants (MC only).

17. Site Restoration activities, including revegetation of the excavation area, would be conducted.

**Post-Remediation Activities (Alternatives 2A and 2B)**

18. Visual inspections would be conducted annually along access roads, bike paths, and walking trails within the remedial action area. Inspections would generally look for signs of erosion, disturbance, new paths, signs still up, no digging, and to confirm land use as low-intensity recreational use (i.e., verify that non-permitted medium-intensity recreational such picnicking and camping and high-intensity recreational such as children’s playgrounds and contact sports such as baseball, football, and soccer are not taking place) to verify that there are no violations of LUCs. A more inclusive MEC walkover of the site, including visual and detector-aided surface inspections, would be conducted every 5 years, as part of the 5 year review requirement, within the remedial action area by an UXO Technician. Surface removal of metallic munitions and non-munitions debris would also be conducted, as necessary, by a UXO Technician. The need for annual inspections would be evaluated after five annual inspections and would be reduced to one inspection every 5 years if no MEC/MDEH are identified; 5 year inspections would be ended after one 5 year inspection with no MEC/MDEH identified.

19. Application of LUCs at Site 15 would include:
    - LUCs already in place that allow for low-intensity recreational uses including activities such as hiking, biking, horseback riding, birding, and hunting. Medium- (picnicking and camping) and high-intensity (children’s playgrounds and contact sports) recreational, residential, and

commercial/industrial uses are not permitted. No man-made attractions can be provided that would entice people, particularly small children, to frequently visit the site, which is consistent with the property's proposed reuse as a wildlife corridor that would allow for low-intensity recreational use. LUCs already in place also prohibit excavation of soil from Site 15 without prior written approval from the Navy, USEPA, and FDEP.

- Caution/UXO Hazard Warning signs would be posted along access roads, bike paths, and walking trails where munitions-related items may be present.

- A Public Educational Program is warranted to warn the visiting public (hikers or hunters) of the potential presence of ordnance, the importance of not disturbing (yet reporting) suspect items observed within the project site, and the importance of not conducting intrusive activities. The Public Education Program may include periodic public safety awareness meetings and distribution of educational media to local police, fire departments, and libraries, where they would be available to the public.

#### 4.2.2.2 Detailed Analysis

Overall Protection of Human Health and the Environment

Alternatives 2A, 2B, and 2C would be protective of human health and the environment.

Surface and shallow subsurface removal of munitions-related items in the former ordnance disposal area and along access ways would reduce the risk of exposure and direct contact in the area of assumed highest density of munitions (former ordnance disposal area) and high use areas (access ways) for both human and ecological receptors. The most likely exposure would occur through contact with MEC via handling/removing or walking overtop of items. Although less likely, exposure to MEC items in the shallow subsurface is possible for both human and ecological receptors. A site receptor would have to disturb a munitions-related item to be exposed to explosive hazards; therefore, by actively removing these items, the risks would be reduced and this alternative would be protective of both human health and the environment. Based on the specified land use, the recreational user is expected to have a maximum potential intrusive depth of 0.0 to 0.5 feet bgs. Under these alternatives, munitions items would be removed to 1 foot bgs (expected vertical depth for exposure plus a buffer of an additional six inches because of potential erosion and other changes to the ground), thereby satisfying RAO 2 – make Site 15 safe for the specified land use. Surface inspections of access roads, bike paths, and walking trails would be repeated on an annual basis and visual and detector-aided surveys and removal would be conducted every 5 years. This would ensure that munitions-related risks at the site are being reevaluated regularly, and mitigated if present. Note that the frequency of inspections would be evaluated regularly and would be reduced and ended once conditions, as described in the alternatives' descriptions, are met.

The MEC HA score for Alternatives 2A, 2B, and 2C for Subunit 1 (Subunits described in Section 1.3.4) is 470, which corresponds to a relative Hazard Level of 4, indicating a low potential for explosive hazard conditions to exist in the former ordnance disposal area after the remedial activities described for Alternatives 2A, 2B, and 2C have been conducted. The MEC HA score for Alternatives 2A, 2B, and 2C in Subunit 2 is 335, which corresponds to a relative Hazard Level of 4, indicating that the area outside of the former ordnance disposal area has a low potential for explosive hazard conditions once remedial activities have been conducted. The MEC HA is presented in Appendix A-4.

Application of LUCs would be protective of human health and the environment by reducing the risk of exposure and direct contact to MEC/MPPEH located at this site. LUCs already established include restrictions to prevent residential use. Additional LUCs include the installation of signs and a public education program.

Additionally, in Alternatives 2A and 2B, soil excavated during the munitions removal that may be hazardous would be disposed off-site or treated on-site prior to off-site disposal further reducing any residual chemical hazards that may be present at the site.

<u>Compliance with ARARs and TBCs</u>

The conduct of Alternatives 2A, 2B, and 2C would comply with all applicable ARARs and TBCs as listed in Tables 2-1 and 2-2. Table 4-1 provides a list of guidance that would also be evaluated and used, as applicable, during the remedial action. Chemical contamination at Site 15 has been addressed, no COPCs remain at this site in excess of established site-specific soil cleanup target levels to permit low-intensity recreational use of the site; therefore, there are no chemical-specific ARARs or TBCs for this site.

<u>Long-Term Effectiveness and Permanence</u>

Alternatives 2A, 2B, and 2C would provide long-term effectiveness and permanence because all munitions-related and metallic non-munitions items would be removed from the former ordnance disposal area to a depth of 1 foot bgs, and all shallow subsurface anomalies (to a depth of 1 foot bgs) would be investigated and removed if found to be munitions related, from areas along access ways that would be frequented by site receptors. Alternatives 2A, 2B, and 2C would also provide long-term effectiveness and permanence through the performance of annual surface inspections along access roads, bike paths, and walking trails and five-year inspections and removals within the remedial action area. These inspections and additional removals, as necessary, would be conducted in response to the presence and possible migration of MEC/MPPEH items at the site, and would reduce risk of exposure for receptors to residual MEC hazards that may remain on-site. The removal frequency would be evaluated periodically and reduced, if appropriate. Furthermore, the engineering and administrative controls proposed as LUCs in this alternative are considered reliable and would be effective at reducing the risk of exposure and direct contact for both human and ecological receptors. Engineering controls, such as signs, would need to be monitored and periodically repaired and/or replaced. The Public Education Program would also provide long-term effectiveness by informing the general public, including local police and fire departments, of the possible presence of munitions at Site 15. Additionally, under Alternatives 2A and 2B, soil excavated during the munitions removal that may be hazardous (TCLP lead) would be disposed off-site or treated on-site prior to off-site disposal, reducing any residual chemical hazards.

Reduction of Toxicity, Mobility, or Volume through Treatment

No COPCs remain at Site 15 in excess of established site-specific soil cleanup target levels to permit low-intensity recreational use of the site. Chemical contamination at Site 15 has been addressed through remedial activities described previously, the extent of arsenic, lead, PAH, and TRPH contaminated soil was delineated and excavated to meet permitted land use (low-intensity recreational activities) requirements. Therefore, toxicity and mobility of chemical contaminants are not a concern at this site. Nevertheless, by disposing of excavated hazardous soil (TCLP lead) off-site in Alternative 2A, potential contamination would be permanently removed from the site. The treatment of hazardous soil (TCLP lead) in Alternative 2B would permanently and irreversibly reduce the mobility of lead before sending off-site for disposal. Volumes of soil to be disposed and/or treated would be determined and verified during the remedial design. There would be no disposal or treatment of hazardous soil in Alternative 2C. By conducting these remedial activities, under all Alternative 2 options, the volume of munitions-related items located at Site 15 would be permanently reduced. Additionally, any metallic non-munitions items removed from Site 15 would also be sent to an off-site metals recycler for disposal.

Short-Term Effectiveness

Alternatives 2A, 2B, and 2C would reduce human health and ecological risks in the short term because risks to site receptors would be reduced as soon as the first munitions item was removed from the site. Exposure of workers to explosive hazards may occur during remedial activities; these hazards would be minimized by compliance with the requirements of the Occupational Safety and Health Administration (OSHA) and other explosives safety guidance, including wearing of appropriate personal protective equipment (PPE) and adherence to site-specific health and safety procedures. However, if MEC/MPPEH items are identified at the site and detonations occur, these detonations could impact the surrounding community. Implementation of LUCs would not adversely impact the surrounding community or the environment.

The mechanical excavation method is most applicable and effective in high MEC concentration areas (former ordnance disposal area). Large amounts of soil can be excavated, thereby clearing large areas effectively and efficiently. Dust suppression and control measures would be implemented during excavation to minimize the emission of hazardous soil particulates (TCLP lead) during on-site remedial activities. Workers on site would be adequately protected if suitable health and safety procedures are followed. Erosion control measures would minimize the migration of potentially hazardous soil into nearby streams.

Under Alternative 2A, transportation of hazardous soil to an off-site TSDF would be conducted in suitable containers and by reputable transporters. In the unlikely event a traffic accident released hazardous soil to the environment, the soil being transported would not pose an immediate hazard to the community because of the non-volatile nature and relatively low solubility of the lead present in the soil. However, should such an event occur, measures to prevent washing away of the soil by storm events would be warranted.

Site surveys would be conducted prior to remedial activities to determine if any endangered, threatened, or SSC are present at Site 15, thereby reducing any impact to these species. Relocation of gopher tortoise habitats would also reduce adverse impacts to the site ecological system during excavation.

Wetland areas would be identified prior to the beginning of remedial activities to ensure that any impact would be minimized. Wetlands are not excluded from remedial activities; however, it is assumed that remedial activities conducted under Alternatives 2A, 2B, and 2C would not impact wetlands, unless step-outs into wetland areas were determined to be necessary. If wetlands were adversely impacted during intrusive anomaly investigation or MEC/MDEH detonations on site, the wetlands would be restored following completion of the remedial action. Although the loss would be temporary, it would be years before original conditions would be fully restored.

Sustainability evaluations were performed for these remedial alternatives to evaluate greenhouse gas (GHG) emissions, nitrogen oxides ($NO_x$) emissions, sulfur oxides ($SO_x$) emissions, particulate matter

(10 microns or less) ($PM_{10}$) emissions, energy use, and water consumption. These evaluations are provided in Appendix B.

- GHG emissions: GHG emissions would be approximately 1,042 metric tons of carbon dioxide equivalent ($CO_2e$) for Alternative 2A, for Alternative 2B GHG emissions would be approximately 930 metric tons of $CO_2e$, and for Alternative 2C GHG emissions would be approximately 48 metric tons of $CO_2e$. The category contributing the most GHG for Alternative 2A is residual handling due to the amount of soil that is disposed as hazardous waste and the distance that the waste needs to travel for proper disposal, for Alternative 2B is the production of materials where the production of the chemical that is used as the stabilizing material for the on–site treatment for the soil contributes the most, and for Alternative 2C is equipment use where the use of the dozer contributes the most.

- $NO_x$ emissions: $NO_x$ emissions for Alternative 2A are 1.3 metric tons, 7.73 x $10^{-1}$ metric tons for Alternative 2B, and 1.2 x $10^{-1}$ metric tons for Alternative 2C. The category that contributes the most to $NO_x$ emissions is residual handling due to the amount of soil that is disposed as hazardous waste and the distance that the waste needs to travel for proper disposal for Alternative 2A, residual handling operations contributes the most for Alternative 2B, and equipment use where the use of the dozer contributes the most for Alternative 2C.

- $SO_x$ emissions: $SO_x$ emissions for Alternative 2A are 5.19 x $10^{-1}$ metric tons, 4.83 x $10^{-1}$ metric tons for Alternative 2B, and 4.8 x $10^{-2}$ for Alternative 2C. The category contributing the most to $SO_x$ emissions for Alternatives 2A and 2B is residual handling operations; for Alternative 2C it is equipment use and miscellaneous sector contributions.

- $PM_{10}$ emissions: For Alternative 2A, $PM_{10}$ emissions are 2.1 metric tons, 1.91 metric tons for Alternative 2B and 1.7 x $10^{-2}$ for Alternative 2C. The category contributing the most to $PM_{10}$ emissions for Alternatives 2A and 2B is residual handling operations and for Alternative 2C equipment use and miscellaneous contributes the most.

- Energy use: The total amount of energy used for Alternative 2A is 31,443 million British thermal unit (MMBTU), for Alternative 2B is 33,036 MMBTU and for Alternative 2C is 1,190 MMBTU. For all alternatives, the category contributing the most to energy use is production of materials where the production of borrow soil contributes the most for Alternatives 2A and 2B and where the production of fertilizer, used for revegetation contributes the most for Alternative 2C.

- Water consumption: The total amount of water used during Alternative 2A is 3.02 x $10^3$ gallons, during Alternative 2B is 4.02 x $10^3$ gallons, and during Alternative 2C is 3.02 x $10^3$ gallons. The category that consumes the most water for all alternatives is production of materials which can be attributed to the consumption of water to produce fertilizer for the revegetation activities.

- The highest risk of fatality and injury is residual handling operations for Alternative 2A. For Alternatives 2B and 2C the highest risk of fatality and injury is transportation of personnel.

Implementability

These remedial alternatives would occur in phases, as described in Section 4.2.2.1. The performance of these activities would require a high degree of coordination between field personnel, the Navy, and other parties involved in the remedial activity. The visual and detector-aided surveys could be easily implemented and the length of time for completion would depend on the number of UXO personnel available to complete the surveys.

Surface inspection and manual removal are easily implemented and can be implemented in almost any terrain and climate. Manual removal is a very labor-intensive operation, and manual anomaly subsurface excavation and removal is significantly more labor-intensive than surface removal. Manual removal and excavation can be very difficult and time-consuming (depending on the number of UXO personnel available), and would require a high degree of direct MEC/MPPEH exposure for workers should MEC/MPPEH be identified at Site 15. Equipment utilized during this phase (manual tools) would be easy to obtain and relatively inexpensive.

The use of manual tools for treatment/demilitarization of munitions items would be easily implementable, depending on the type of equipment used. Additionally, a commercial metal recycler that accepts munitions-related scrap would need to be located. Furthermore, special consideration would need to be given to safety issues and associated liabilities when considering and choosing a commercial metal recycler. Particular attention would be required during classification of items, MDAS certification, and in the documentation QA/QC procedures associated with the remedial activities. Certification of MDAS and munitions-related scrap leaving the site would require careful inspection by qualified personnel (UXO Technician). An area would also need to be found for staging and storage of MDAS and munitions-related scrap items until the commercial metal recycler could pick up the items.

Mechanical excavation would be more difficult to implement. The basic equipment (e.g., excavator or backhoe) could be easily obtained, is typical in the construction industry and is readily available from several sources; however, special armor would have to be designed/developed for the equipment that would be used during this excavation. The use of armored equipment would be more protective of workers than manual removal and excavation because there would not be as much direct MEC/MPPEH exposure.

Treatment/stabilization is a well established technology used to treat waste materials to reduce contaminant solubility and mobility. Results of the treatability study conducted as part of the 2008/2009 remedial activities would be used to implement Alternative 2B, a bench scale treatability study would be conducted prior to treatment to verify the treatment process. If a different treatment technology is used, a new treatability study would need to be conducted. For Alternatives 2A and 2B, suitable TSDFs are available for the ultimate disposal of excavated soil and would need to be identified at nearby locations. Under Alternative 2C, excavated soil will be replaced in the original excavations after manual investigation and MEC/MPPEH/debris removal.

Should MEC/MPPEH be identified at Site 15, the treatment of these items would not be easily implemented. Permits would be required prior to performing any detonation and prior to obtaining donor/priming explosives. An area for staging and storage of explosives for detonation would be required, and higher general area security, signage, and access controls would be required than if treatment were not necessary. If MEC are moved, there would be special requirements for protective packaging and transportation of MEC to the consolidation area for treatment. Should items be located within wetland areas that cannot be moved, the detonations could adversely impact wetlands areas known to exist at Site 15.

Implementation of LUCs at this site could readily be accomplished. The administrative aspects of the LUCs for this property are currently under the control of the Navy.

<u>Cost</u>

Cost estimates for Alternatives 2A, 2B, and 2C, as described in Section 4.2.2.1 are presented below. Alternatives 2A, 2B, and 2C include the same cost assumptions for the site surveys (wetlands and gopher tortoise), vegetation clearance, visual and detector aided surveys of the ground surface, surface munitions clearance, and intrusive anomaly investigations (hand digs). Digital geophysical surveys, using electro-magnetic systems, to be conducted within the former ordnance disposal area to determine the location of anomalies are not included in the cost estimate as the costs to conduct this survey would be offset by the reduction in the amount of soil to be excavated. Costs for Alternatives 2A, 2B, and 2C assume that all grids within the former ordnance disposal area (39, 100 x 100 foot grids) will be excavated. Further, costs for Alternative 2A assume that 18 of the 39 grids contain hazardous soil (TCLP lead) that will be sent off site for disposal at a RCRA Subtitle C landfill. Alternative 2B assumes that soil from the 18 grids that contain hazardous soil will be treated on-site and then transported off-site for disposal at a RCRA Subtitle D landfill. Alternatives 2A and 2B assume that backfill will be needed. Alternative 2C assumes that excavated soil will be replaced in the original excavations after manual inspection and MEC/MPPEH/debris removal and no backfill will be needed. For costing, Alternatives 2A, 2B, and 2C assume the same types and amounts of munitions items will be treated and disposed off-site, the same site restoration activities will be conducted, and that five annual inspections and one 5-year inspection and removal will be necessary. Also, if MEC/MPPEH items are identified at Site 15, MC confirmatory sampling may need to be conducted, these costs are not included in the cost estimates for Alternatives 2A, 2B, and 2C. Costs for the same LUCs are included for Alternatives 2A, 2B and 2C.

The estimated costs for Alternative 2A are as follows:

| | |
|---|---|
| Capital Cost: | $ 5,749,000 |
| 30-Year Net Present Worth (NPW) of Annual Costs: | $ 37,000 |
| 30-Year NPW: | $ 5,786,000 |

The estimated costs for Alternative 2B are as follows:

| | |
|---|---|
| Capital Cost: | $ 4,971,000 |
| 30-Year NPW of Annual Costs: | $ 37,000 |
| 30-Year NPW: | $ 5,008,000 |

The estimated costs for Alternative 2C are as follows:

| | |
|---|---|
| Capital Cost: | $ 2,004,000 |
| 30-Year NPW of Annual Costs: | $ 37,000 |
| 30-Year NPW: | $ 2,041,000 |

The above cost figures have been rounded to the nearest $1,000 to reflect the preliminary nature of these estimates. A detailed breakdown of estimated costs for this alternative is provided in Appendix C.

### 4.2.3 Alternatives 3A, 3B, and 3C: All Surface and Shallow Subsurface MEC and Anomaly Removal

#### 4.2.3.1 Description

The following activities would be associated with the implementation of Alternatives 3A, 3B, and 3C, remedial activities would not be conducted in areas previously remediated (gray areas of Figure 4-2):

1. Site surveys would be conducted prior to beginning remedial activities to determine if any endangered, threatened, or SSC are present. Should any endangered, threatened, or Florida SSC; including the Indigo Snake, be identified, its location will be recorded via GPS for future reference. Should an Indigo Snake be identified within a designated mechanical excavation area, the snake would be relocated outside of the excavation area. Surveys would also include a gopher tortoise survey, which would be conducted within the remedial action area boundaries in order to identify potentially occupied (active and inactive) gopher tortoise burrows. The burrow locations, if found, would be recorded via GPS for future reference, and would be relocated outside of the remedial action area.

2. Wetlands have been identified at Site 15; previously surveyed boundaries are shown on Figure 4-2. An inspection/survey would be conducted to verify these boundaries. If any boundaries/locations of these wetlands areas have changed, they would be recorded via GPS for future reference.

3. The remediation area would be subdivided into already established 100 by 100 foot grids as shown in blue and orange on Figure 4-2.
    - 169 pre-established 100 x 100 foot grids

4. Brush cutting and clearance activities would be conducted, as necessary, to prepare the site.
    - Within the 39 grids at the former ordnance disposal area (blue areas on Figure 4-2), vegetation would be cut flush to the ground surface prior to excavation.
        - -- Tree/vegetation removal, to the ground surface, was conducted in 34 of the 39 grids during the 2008/2009 soil remedial activities; therefore, assume minimal brush cutting (using hand tools and brush hog) necessary in these grids for these remedial activities (Figures showing 2008/2009 tree removal grids are presented in Appendix A-5).

-- Large trees and vegetation would be cut to the ground surface in five of the 39 grids before remedial activities can begin (figures showing grids where tree removal would be conducted are presented in Appendix A-5).

- Within the remainder of the operational area (orange areas on Figure 4-2), brush would not be cut to shorter than 6 inches above the ground surface and only trees less than 2 inches in diameter would be cut.

- It is assumed that vegetation clearance in wetland areas would not be required for Alternatives 3A, 3B, and 3C. However, if it becomes necessary to enter wetland areas, vegetation would be cut, as necessary, with a weed trimmer. Vegetation would not be uprooted and no herbicides would be used. No power type equipment or other vehicular machines would be permitted in wetland areas.

5. Visual and detector-aided (hand-held magnetometer) surveys of the ground surface of all grids would be conducted to locate surface munitions-related items within the removal action area. Digital geophysical surveys, using electro-magnetic systems, would be conducted within the former ordnance disposal area to determine the location of anomalies
   - Within the former ordnance disposal area (blue areas shown on Figure 4-2) confirm proposed excavation area versus proposed intrusive anomaly investigation area (hand digs). If more than 60 shallow subsurface anomalies are identified within a given grid, mechanized excavation would be conducted in the grid. If less than 60 shallow subsurface anomalies are identified in a given grid, the locations where the shallow subsurface anomalies are detected would be marked during surveying for manual intrusive anomaly investigation.

   - The locations where shallow subsurface anomalies are detected in the outer operational area (orange areas shown on Figure 4-2) would be marked during surveying for manual intrusive anomaly investigation.

6. Manually remove and treat munitions-related items (including MEC, MDEH, and MDAS) from the ground surface within the entire remedial action area, including wetland areas, as necessary (caution would be exercised when entering these areas), and remove metallic non-munitions debris.
   - Ground Surface - Estimate five MEC/MDEH items and approximately 34 drums MDAS (see items #8 and #10 for subsurface).

- Ground Surface - Estimate approximately 2,000 pounds non-munitions debris (see items #8 and #10 for subsurface).

- No soil will be removed with the MEC/MDEH and non-munitions debris, any soil clinging to the items will be removed and returned to the ground surface where the item was removed.

- The location of all MEC/MDEH items would be recorded using GPS. All items would be given a unique identification number, and all information and observations would be recorded on an MEC Tracking Log. No MEC/MDEH item would be moved until a positive identification is made. Depending on the density of MDAS and other munitions-related scrap items identified, it may be impractical to record individual item locations and identity via GPS. Therefore, “areas” of MDAS and munitions-related scrap items may be recorded if the density of such items is so great that it would be impractical to record individual locations. In such cases, the number(s) and type(s) of items would be qualitatively described.

7. Intrusively investigate each shallow subsurface anomaly using manual tools and techniques, to a maximum depth of 1 foot bgs (orange areas shown on Figure 4-2 and grids within the blue area if any are identified in item #5). Soil will be placed on the ground adjacent to the intrusive investigation location, once the source of the anomaly is determined and the excavation reaches a depth of 1 foot bgs, the soil will be returned to the excavation.
   - Estimate 30 intrusive digs per grid.

8. Remove and treat munitions-related items (including MEC, MDEH, and MDAS), as necessary, from anomaly intrusive investigation locations, and remove metallic non-munitions debris.
   - Subsurface - Estimate two drums MDAS and 1,000 pounds non-munitions debris (see item #6 for surface).

   - No soil will be removed with the MEC, MDEH, MDAS, or non-munitions debris any soil clinging to the items will be removed and returned to the intrusive investigation location where the item was removed.

9. Mechanical excavation, using a shielded excavator, of all soil of each grid within the former ordnance disposal area, as determined in item #5, to a maximum depth of 1 foot bgs (blue areas shown on Figure 4-2).
   - 39, 100 x 100 x 1 foot grids, approximately 390,000 cubic feet.

- See item #11 below for handling of excavated hazardous soil, a portion of the soil excavated may be hazardous (TCLP lead). Excavated non-hazardous soil would be returned to the excavation after munitions-related items are removed from the soil.

- All soil will be managed within/directly adjacent to the excavation grid. Excavations will be backfilled on the day the grid is excavated.

- Construct a decontamination pad. Some of the excavated soil may have elevated lead concentrations.

- Assume health and safety would require PPE, wetting to suppress dust, and air monitoring.

10. Remove and treat munitions-related items from excavated soil (including MEC, MDEH, and MDAS), as necessary, and remove metallic non-munitions debris.
    - Subsurface - Estimate 10 MEC/MPPEH items and 30 drums MDAS (see item #6 for surface).

    - Subsurface - Estimate 10,000 pounds non-munitions related debris (see item #6 for surface).

    - No soil will be removed with the MEC/MPPEH, MDAS or non-munitions debris, any soil clinging to the items will be removed. If from a grid with nonhazardous soil, the soil will be returned to the excavation and if from a grid with hazardous soil the soil will be handled as described in item #11.

    - The location of all MEC/MDEH items would be recorded using GPS. All items would be given a unique identification number, and all information and observations would be recorded on an MEC Tracking Log. No MEC/MDEH item would be moved until a positive identification is made. Depending on the density of MDAS and other munitions-related scrap items identified, it may be impractical to record individual item's locations and identity via GPS. Therefore, "areas" of MDAS and munitions-related scrap items may be recorded if the density of such items is so great that it would be impractical to record individual locations. In such cases, the number(s) and type(s) of items would be qualitatively described.

11. Mechanically excavated soil would be handled as hazardous (TCLP lead) or non-hazardous, based on existing sampling data which adequately characterized the soil at Site 15 to 1 foot bgs (figures showing assumed hazardous and non-hazardous soil areas, per alternative, are presented in Appendix A-2).

- Based on previous sampling data, assume soil from 21 of the 39 mechanically excavated grids is non-hazardous and can be backfilled in the excavation(s) after being cleared of munitions, without further handling (210,000 cubic feet = 7,778 cubic yards = 11,667 tons).

- **Alternative 3A:** Assume soil from 18 of the 39 mechanically excavated grids has elevated lead concentrations, is hazardous, and would be transported off site for disposal, assumption based on previous sampling and remediation data (180,000 cubic feet = 6,667 cubic yards = 10,000 tons). Sampling would be conducted for disposal purposes. Excavated and screened soil from locations that are likely to be hazardous (TCLP lead) will be stored on-site within the excavation grids as staging piles in CAMUs prior to off-site disposal. Clean fill will be imported to backfill into the excavations. Disposal of any soil containing lead with TCLP levels exceeding hazardous criteria would require pre-treatment to meet land disposal restrictions prior to landfilling. If treatment achieves UTS levels, disposal of this treated soil in a RCRA Subtitle D landfill would be permissible. If not, the treated soil would need to be disposed in a RCRA Subtitle C landfill.

- **Alternative 3B:** Assume soil from 18 of the 39 mechanically excavated grids has elevated lead concentrations, is hazardous, and would be stabilized in-place on site, assumption is based on previous sampling and remediation data (180,000 cubic feet = 6,667 cubic yards = 10,000 tons). Composite samples would be collected and analyzed for TCLP lead. Once post-treatment soil TCLP lead concentrations are less than 5 mg/L and meet the alternative LDR treatment standards, treatment would stop and soil would be transported off-site for disposal. Treated soil could be disposed off-site at a RCRA Subtitle D landfill. Clean fill will be imported to backfill into the excavations. If needed, excavated, screened, and treated soil from locations likely to be hazardous (TCLP lead) would be staged as staging piles in CAMUs prior to off-site disposal.

- **Alternative 3C:** Under this alternative, all mechanically excavated soil will be laid by the excavator on the ground surface adjacent to a given excavation area (no more than 100 by 100 foot grid), Once soil has been excavated, approximately 1 cubic yard of soil (and debris) will be spread by the excavator on the ground surface. The excavated material will then be manually investigated by UXO Technicians and munitions/non-munitions related items will be manually removed from the soil. Soil would be backfilled into the excavation(s) after manual inspection and removal is complete. Assume no clean fill needed.

12. If MEC is identified in either the surface or shallow subsurface within 25 feet of the edge of the investigation area, step-out in 25-foot increments in all directions to form a new 25 by 25 foot grid.

Step-outs would not be conducted into areas cleared during previous removal actions. Conduct visual and detector-aided (hand-held magnetometer) surveys of the ground surface in step out grid. Manually remove and treat surface munitions-related items (including MEC, MDEH, and MDAS), as necessary, and remove metallic non-munitions debris. Mark locations where shallow subsurface anomalies are detected and intrusively investigate each shallow subsurface anomaly to a maximum depth of 1 foot bgs. Manually remove and treat munitions-related items (including MEC, MDEH, and MDAS), as necessary, and remove metallic non-munitions debris. No soil will be removed with the MEC, MDEH, MDAS, or non-munitions debris, any soil clinging to the items will be removed and returned to the intrusive investigation location where the item was removed. Continue to step-out, as necessary, until no MEC items are located within 25 feet of the edge of the investigation area.

- Assume four grids of step-outs, surface survey, and intrusive anomaly investigation
- Assume 100 intrusive digs (all hand digs, no shielded excavator)
- Assume 100 pounds non-munitions related debris

13. A determination would be made by the UXO Team Leader as to whether detected munitions-related items are MEC or MPPEH. If an item is MEC and not safe to move, it would be left in place and prepared for MEC BIP treatment. If an item is deemed MEC and safe to move, it could be transported to a staging area to await MEC treatment, on a daily basis. MPPEH items would be further differentiated as either MDEH or MDAS. MDEH items could be transported to a staging area to await MEC treatment procedures, or if determined unsafe to move, would be left in place and prepared for BIP treatment. MDAS would be further classified as either requiring demilitarization or venting, or as being munitions-related scrap. MDAS would be inspected and certified prior to transport off site to an approved metal recycler.

    - Assume six on-site detonations (for MEC/MDEH), explosives would be ordered and used as needed, explosives would not be stored on site.

    - Per F.A.C 62-730.320, an Emergency Detonation Permit is required prior to any on-site detonations. Per permit requirements, a sample will be collected from the ground surface after any detonation.

    - Onsite treatment/demilitarization of MDAS items resembling military munitions or in need of venting would be conducted, as necessary. Items could also be containerized and transported off-site to an approved commercial metal recycler for treatment/demilitarization.

        -- Assume 50 items would need demilitarization

14. 100 percent of all recovered items, after MEC/MDEH treatment, would be re-inspected to determine if they are free of explosive hazards and are able to be classified as MDAS.
    - Segregate and containerize munitions-related items and non-munitions debris for off-site disposal.
        -- Assume 66 drums MDAS total and 13,100 pounds total non-munitions debris collected during Alternatives 3A, 3B, and 3C remedial activities.

    - Transport of certified MDAS and any metallic non-munitions debris to an approved off-site commercial metal recycler for disposal. Obtain an “End Use” certification confirming that material has been recycled.

15. If MEC/MPPEH items are identified at Site 15, explosive substances (MC) could be present and confirmatory sampling may need to be conducted after the munitions items are removed from the site to confirm the absence or presence of potential chemical contaminants (MC only).

16. Site Restoration activities including revegetation of excavation areas would be conducted.

**<u>Post-Remediation Activities (Alternatives 3A and 3B)</u>**

17. Visual inspections would be conducted annually along access roads, bike paths, and walking trails within the remedial action area. Inspections would generally involve looking for signs of erosion, disturbance, new paths, signs still up, no digging, and to confirm land use as low-intensity recreational use (i.e., verify that non-permitted medium-intensity recreations such as picnicking and camping and high-intensity recreational such as children’s playgrounds and contact sports such as baseball, football, and soccer are not taking place) to verify that there are no violations of LUCs. A more inclusive MEC walkover of the site, including visual and detector-aided surface inspections, would be conducted every 5 years, as part of the 5 year review requirement, within the remedial action area by an UXO Technician. Surface removal of metallic munitions and non-munitions debris would also be conducted, as necessary, by a UXO Technician. The need for annual inspections would be evaluated after five annual inspections and would be reduced to every 5 years if no MEC/MDEH are identified; 5 year inspections would be ended after one 5 year inspection with no MEC/MDEH identified.

18. Application of LUCs at Site 15 would include:
    - LUCs already in place that allow for low-intensity recreational uses including activities such as hiking, biking, horseback riding, birding, and hunting. Medium- (picnicking and camping) and

high-intensity (children's playgrounds and contact sports) recreational, residential, and commercial/industrial uses are not permitted. No man-made attractions can be provided that would entice people, particularly small children, to frequently visit the site, which is consistent with the property's proposed reuse as a wildlife corridor that would allow for low-intensity recreational use. LUCs already in place also prohibit excavation of soil from Site 15 without prior written approval from the Navy, USEPA, and FDEP.

- Caution/UXO Hazard Warning signs would be posted along access roads, bike paths, and walking trails where munitions-related items may be present.

- A Public Educational Program is warranted to warn the visiting public (hikers or hunters) of the potential presence of ordnance, the importance of not disturbing (yet reporting) suspect items observed within the project site, and the importance of not conducting intrusive activities. The Public Education Program may include periodic public safety awareness meetings and distribution of educational media to local police, fire departments, and libraries, where they would be available to the public.

#### 4.2.3.2 Detailed Analysis

Overall Protection of Human Health and the Environment

Alternatives 3A, 3B, and 3C would be protective of human health and the environment.

Surface and shallow subsurface removal of munitions-related items within the former ordnance area and anomaly shallow subsurface removal within the rest of the operational area would reduce the risk of exposure and direct contact for both human and ecological receptors. The most likely exposure would occur through contact with MEC via handling/removing or walking overtop of items. Although less likely, exposure to MEC items in the shallow subsurface is possible for both human and ecological receptors. A site receptor would have to disturb a munitions-related item to be exposed to explosive hazards; therefore, by actively removing these items, the risks would be reduced and this alternative would be protective of both human health and the environment. Based on the specified land use, the recreational user is expected to have a maximum potential intrusive depth of 0.0 to 0.5 feet bgs. Under these alternatives, munitions items would be removed to 1 foot bgs (expected vertical depth for exposure plus a buffer of an additional six inches because of potential erosion and other changes to the ground), thereby satisfying RAO 2 – make Site 15 safe for the specified land use. Surface inspection of access roads, bike paths, and walking trails would be repeated on an annual basis and visual and detector-aided surveys and removal would be conducted every five years. This would ensure that risks are being reevaluated regularly, and mitigated if present. Note that the frequency of inspections would be evaluated regularly and would be reduced and eliminated once conditions, as described in the alternative descriptions, are met.

The MEC HA score for Alternatives 3A, 3B, and 3C for Subunit 1 (Subunit 1 described in Section 1.3.4) is 470, which corresponds to a relative Hazard Level of 4, indicating a low potential for explosive hazard conditions to exist in the former ordnance disposal area after the remedial activities described for Alternatives 3A, 3B, and 3C have been conducted. The MEC HA score for Alternatives 3A, 3B, and 3C in Subunit 2 is 335, which corresponds to a relative Hazard Level of 4, indicating that the area outside the former ordnance disposal area has a low potential for explosive hazard conditions once remedial activities have been conducted. The MEC HA is presented in Appendix A-4.

Application of LUCs would also be protective of human health and the environment by reducing the risk of exposure and direct contact to MEC/MPPEH located at this site. LUCs already established include restrictions to prevent residential use. Additional LUCs include the installation of signs and a public education program.

Additionally, under Alternatives 3A and 3B, soil excavated during the munitions removal, which may be hazardous, would be disposed off-site or treated on-site prior to off-site disposal, further reducing any residual chemical hazards that may be present at the site.

Compliance with ARARs and TBCs

Alternatives 3A, 3B, and 3C would comply with all applicable ARARs and TBCs as listed in Tables 2-1 and 2-2. Table 4-1 provides a list of guidances that would also be evaluated and used, as applicable, during the remedial action. Chemical contamination at Site 15 has been addressed, no COPCs remain at this site in excess of established site-specific soil cleanup target levels to permit low-intensity recreational use of the site; therefore, there are no chemical-specific ARARs or TBCs for this site.

Long-Term Effectiveness and Permanence

Alternatives 3A, 3B, and 3C would provide long-term effectiveness and permanence because all munitions-related and metallic non-munitions items would be removed from the former ordnance disposal area to a depth of 1 foot bgs and all shallow subsurface anomalies (to 1 foot bgs) would be investigated and removed if found to be munitions related, from within the remainder of the operational area.

Alternatives 3A, 3B, and 3C would also provide long-term effectiveness and permanence through the performance of annual surface inspections along access roads, bike paths, and walking trails and five-year inspections and removals within the remedial action area. These inspections and additional removals, as necessary, would be conducted in response to the presence and possible migration of MEC/MPPEH items at the site, and would reduce risk of exposure for receptors to residual MEC hazards that may remain on-site. The removal frequency would be evaluated periodically and could be reduced if appropriate. Furthermore, the engineering and administrative controls proposed as LUCs in this alternative are considered reliable and would be effective to reduce the risk of exposure and direct contact for both human and ecological receptors. Engineering controls, such as signs, would need to be monitored and periodically repaired and/or replaced. The Public Education Program would also provide long-term effectiveness by informing the general public, including local police and fire departments, of the possible presence of munitions at Site 15. Additionally, under Alternatives 3A and 3B, soil excavated during the munitions removal that may be hazardous (TCLP lead) would be disposed off-site or treated on-site prior to off-site disposal to reduce any residual chemical hazards.

Reduction of Toxicity, Mobility, or Volume through Treatment

No COPCs remain at Site 15 in excess of established site-specific soil cleanup target levels to permit low-intensity recreational use of the site. Chemical contamination has been addressed through remedial activities described previously. The extent of arsenic, lead, PAH, and TRPH contaminated soil was delineated and excavated to meet permitted land use (low-intensity recreational activities) requirements. Therefore, toxicity and mobility of chemical contaminants are not a concern at this site. Nevertheless, by disposing of excavated hazardous soil (TCLP lead) off-site in Alternative 3A, potential contamination would be permanently removed from the site. The treatment of hazardous soil (TCLP lead) in Alternative 3B would permanently and irreversibly reduce the mobility of lead before sending off-site for disposal. Volumes of soil to be disposed and/or treated would be determined and verified during the remedial design. There would be no disposal or treatment of hazardous soil in Alternative 3C. By conducting these remedial activities, under all Alternative 3 options, the volume of munitions-related items located at Site 15 would be permanently reduced. Additionally, any metallic non-munitions items removed from Site 15 would also be sent to an off-site metals recycler for disposal.

Short-Term Effectiveness

Alternatives 3A, 3B, and 3C would reduce human health and ecological risks in the short term because risks to site receptors would be reduced as soon as the first munitions item was removed from the site. Exposure of workers to explosive hazards may be present during remedial activities, but would be minimized by compliance with the requirements of OSHA and other explosives safety guidance, including wearing of appropriate PPE and adherence to site-specific health and safety procedures. However, if MEC/MPPEH items are identified at the site and detonations occur, these detonations could impact the surrounding community. Implementation of LUCs would not adversely impact the surrounding community or the environment.

The mechanical excavation method is most applicable and effective in high MEC concentration areas (former ordnance disposal area). Large amounts of soil can be excavated, thereby clearing large areas effectively and efficiently. Dust suppression and control measures would be implemented during excavation to minimize the emission of hazardous soil particulates (TCLP lead) during on-site remedial activities. Workers on site would be adequately protected if suitable health and safety procedures are followed. Erosion control measures would minimize the migration of potentially hazardous soil into nearby streams.

Under Alternative 3A, transportation of hazardous soil to an off-site TSDF would be conducted in suitable containers and by reputable transporters. In the unlikely event of a traffic accident releasing hazardous soil to the environment, transported soil would not pose an immediate hazard to the community because of the non-volatile nature and relatively low solubility of the lead present in the soil. However, should such an event occur, measures to prevent washing away of the soil by storm events would be warranted.

Site surveys would be conducted prior to remedial activities to determine if any endangered, threatened, or SSC are present at Site 15, thereby reducing any impact to these species. Relocation of gopher tortoise habitats would also reduce adverse impacts to the site ecological system during excavation.

Wetland areas would be identified prior to the beginning of remedial activities to ensure that any impact would be minimized. Wetlands are not excluded from remedial activities; however, it is assumed that remedial activities conducted under Alternatives 3A, 3B, and 3C would only slightly impact wetland areas if anomalies were identified in these areas. If wetlands are adversely impacted during intrusive anomaly investigation or MEC/MDEH detonations on site, the wetlands would be restored following completion of the remedial action. Although the loss would be temporary, it would be years before the original conditions would be restored.

Sustainability evaluations were performed for these remedial alternatives to evaluate GHG emissions, $NO_x$ emissions, $SO_x$ emissions, $PM_{10}$ emissions, energy use, and water consumption. These evaluations are provided in Appendix B.

- GHG emissions: For Alternative 3A, GHG emissions would be approximately 1,063 metric tons of $CO_2e$, for Alternative 3B GHG emissions would be approximately 956 metric tons of $CO_2e$, and for Alternative 3C GHG emissions would be approximately 69 metric tons of $CO_2e$. The category contributing the most to GHG for Alternative 3B is the production of materials where the production of the chemical used as the stabilizing material for the soil on-site treatment contributes the most. The category contributing the most to GHG for Alternative 3A is residual handling due to the large amount of hazardous materials that need to be disposed and the distance travelled in order to reach a hazardous waste facility. The category contributing the most to GHG for Alternative 3C is transportation of personnel.

- $NO_x$ emissions: $NO_x$ emissions for Alternative 3A are 1.3 metric tons, 1.1 metric tons for Alternative 3B, and $1.3 \times 10^{-1}$ metric tons for Alternative 3C. The category that contributes the most to $NO_x$ emissions for Alternative 3B is residual handling operations. The category that contributes the most to $NO_x$ emissions for Alternative 3A is residual handling due to the large amount of hazardous waste materials that require proper disposal. The category that contributes the most to $NO_x$ emissions for Alternative 3C is equipment use where the use of the dozer contributes the most.

- $SO_x$ emissions: $SO_x$ emissions for Alternative 3A are $5.1 \times 10^{-1}$ metric tons, $5.8 \times 10^{-1}$ metric tons for Alternative 3B, and $4.94 \times 10^{-2}$ metric tons for Alternative 3C. The category contributing the most to $SO_x$ emissions for Alternative 3A is residual handling due to the distance between the waste facility and the base, and also due to the large amount of soil that needs to be disposed of, for Alternative 3B it is residual handling operations that contribute the most, and for Alternative 3C it is equipment use and miscellaneous sector contributions.

- $PM_{10}$ emissions: For Alternative 3A, $PM_{10}$ emissions are 2.1 metric tons, for Alternative 3B $PM_{10}$ emissions are 1.95 metric tons, and for Alternative 3C $PM_{10}$ emissions are $3.2 \times 10^{-2}$ metric tons. The category contributing the most to $PM_{10}$ emissions for Alternative 3A is residual handling due to the large amount of hazardous waste materials that require proper disposal, for Alternative 3B it is residual handling operations, and for Alternative 3C it is residual handling operations.

- Energy use: The total amount of energy used for Alternative 3A is 31,694 MMBTU, 34,241 MMBTU for Alternative 3B, and 1,450 MMBTU for Alternative 3C. For all alternatives, the category contributing the most to energy use is production of materials where the production of borrow soil contributes the most to the total amount of energy consumed during Alternatives 3A and 3B, and where production of fertilizer contributes the most to the total amount of energy consumed during Alternative 3C .

- Water consumption: The total amount of water used during Alternative 3A is $3.02 \times 10^3$ gallons, $4.02 \times 10^3$ gallons during Alternative 3B, and $3.02 \times 10^3$ gallons during Alternative 3C. The category that consumes the most water for all alternatives is production of materials attributed to the consumption of water to produce fertilizer for the revegetation activities.

- The highest risk of fatality and injury for Alternative 3A is residual handling operations. For 3B and 3C the highest risk is from transportation of personnel.

Implementability

These remedial alternatives would occur in phases as described in Section 4.2.3.1. The performance of these activities would require a high degree of coordination between field personnel, the Navy, and other parties involved in the remedial activity. The visual and detector-aided surveys could be easily implemented and the length of time for completion would depend on the number of UXO personnel available to complete the surveys.

Surface inspection and manual removal are easily implemented and can be implemented in almost any terrain and climate. Manual removal is a very labor-intensive operation, and manual anomaly subsurface excavation and removal is significantly more labor-intensive than surface removal. Manual removal and excavation can be very difficult and time-consuming (depending on the number of UXO personnel available), and would require a high degree of direct MEC/MPPEH exposure for workers should MEC/MPPEH be identified at Site 15. Equipment utilized during this phase (manual tools) would be easy to obtain and relatively inexpensive.

The use of manual tools for treatment/demilitarization of munitions items would be easily implementable, depending on the type of equipment used. Additionally, a commercial metal recycler that accepts munitions-related scrap would need to be located. Furthermore, special consideration would need to be given to safety issues and associated liabilities when considering and choosing a commercial metal recycler. Particular attention would be required during classification of items, MDAS certification, and in the documentation of QA/QC procedures associated with the remedial activities. Certification of MDAS and munitions-related scrap leaving the site would require careful inspection by qualified personnel (UXO Technician). An area would also need to be found for staging and storage of MDAS and munitions-related scrap items until the commercial metal recycler could pick up the items.

Mechanical excavation would be more difficult to implement. The basic equipment (e.g., excavator or backhoe) would be easily obtained, is typical in the construction industry, and is readily available from several sources; however, special armor would have to be designed/developed for the equipment to be used during this excavation. The use of armored equipment would be more protective of workers than manual removal and excavation because there would not be as much direct MEC/MPPEH exposure.

Treatment/stabilization is a well established technology used to treat waste materials to reduce contaminant solubility and mobility. Results of the treatability study conducted as part of the 2008/2009 remedial activities would be used to implement Alternative 3B, a bench scale treatability study would be conducted prior to treatment to verify the treatment process. If a different treatment technology is used, a new treatability study would need to be conducted. For Alternatives 3A and 3B, suitable TSDFs are available for the ultimate disposal of excavated soil and would need to be identified at nearby locations. Under Alternative 3C, excavated soil will be replaced in the original excavations after manual investigation and MEC/MPPEH/debris removal.

Should MEC/MPPEH be identified at Site 15, the treatment of these items would not be easily implemented. Permits would be required prior to performing any detonation and prior to obtaining donor/priming explosives. An area for staging and storage of explosives for detonation would be required, and higher general area security, signage, and access controls would be required than if treatment were not necessary. If MEC are moved, there would be special requirements for protective packaging and transportation of MEC to the consolidation area for treatment. Should items be located within wetland areas that cannot be moved, the detonations could adversely impact wetland areas known to exist at Site 15.

Implementation of LUCs at this site could readily be accomplished. The administrative aspects of the LUCs for this property are currently under the control of the Navy.

<u>Cost</u>

Cost estimates for Alternatives 3A, 3B, and 3C, as described in Section 4.2.3.1 are presented below. Alternatives 3A, 3B, and 3C include the same cost assumptions for the site surveys (wetlands and gopher tortoise), vegetation clearance, visual and detector aided surveys of the ground surface, surface munitions clearance, and intrusive anomaly investigations (hand digs). Digital geophysical surveys, using electro-magnetic systems, to be conducted within the former ordnance disposal area to determine the location of anomalies are not included in the cost estimate as the costs to conduct this survey would be offset by the reduction in the amount of soil to be excavated. Costs for Alternatives 3A, 3B, and 3C assume that all grids within the former ordnance disposal area (39, 100 x 100 foot grids) will be excavated. Further, costs for Alternative 3A assume that 18 of the 39 grids contain hazardous soil (TCLP lead) that will be sent off site for disposal at a RCRA Subtitle C landfill. Alternative 3B assumes that soil from the 18 grids that contain hazardous soil will be treated on-site and then transported off-site for disposal at a RCRA Subtitle D landfill. Alternatives 3A and 3B assume backfill will be needed. Alternative 3C assumes that excavated soil will be replaced in the original excavations after manual investigation and MEC/MPPEH/debris removal and no backfill will be needed. For costing, Alternatives 3A, 3B, and 3C assume the same types and amounts of munitions items will be treated and disposed off-site, the same site restoration activities will be conducted, and that five annual inspections and one 5-year inspection and removal will be necessary. Also, if MEC/MPPEH items are identified at Site 15, MC confirmatory sampling may need to be conducted, these costs are not included in the cost estimates for Alternatives 3A, 3B, and 3C. Costs for the same LUCs are included for Alternatives 3A, 3B, and 3C.

The estimated costs for Alternative 3A are as follows:

| | |
|---|---|
| Capital Cost: | $ 6,610,000 |
| 30-Year NPW of Annual Costs: | $ 37,000 |
| 30-Year NPW: | $ 6,647,000 |

The estimated costs for Alternative 3B are as follows:

| | |
|---|---|
| Capital Cost: | $ 5,833,000 |
| 30-Year NPW of Annual Costs: | $ 37,000 |
| 30-Year NPW: | $ 5,869,000 |

The estimated costs for Alternative 3C are as follows:

| | |
|---|---|
| Capital Cost: | $ 2,866,000 |
| 30-Year NPW of Annual Costs: | $ 37,000 |
| 30-Year NPW: | $ 2,903,000 |

The above cost figures have been rounded to the nearest $1,000 to reflect the preliminary nature of these estimates. A detailed breakdown of estimated costs for this alternative is provided in Appendix C.

### 4.2.4 Alternatives 4A, 4B, and 4C: All Surface and Shallow Subsurface MEC Removal

#### 4.2.4.1 Description

The following activities would be associated with the implementation of Alternatives 4A, 4B, and 4C, remedial activities would not be conducted in areas previously remediated (gray areas of Figure 4-3):

1. Site surveys would be conducted prior to beginning remedial activities to determine if any endangered, threatened, or SSC are present. Should any endangered, threatened, or Florida SSC; including the Indigo Snake, be identified, its location will be recorded via GPS for future reference. Should an Indigo Snake be identified within a designated mechanical excavation area, the snake would be relocated outside of the excavation area. Surveys would also include a gopher tortoise survey that would be conducted within the remedial action area boundaries in order to identify potentially occupied (active and inactive) gopher tortoise burrows. The burrow locations, if found, would be recorded via GPS for future reference, and relocated outside of the remedial action area.

2. Wetlands have been identified at Site 15; previously surveyed boundaries are shown on Figure 4-3. An inspection/survey would be conducted to verify these boundaries. If the boundaries/locations of these wetland areas have changed, they would be recorded via GPS for future reference.

3. The remedial area would be subdivided in already established 100 by 100 foot grids as shown in yellow on Figure 4-3.
   - 169 pre-established 100 x 100 foot grids

4. Brush cutting and clearance activities would be conducted, as necessary, to prepare the site.
   - Within grids, vegetation would be cut flush to the ground surface prior to excavation.
     - -- Tree/vegetation removal, to the ground surface, was conducted in 80 of the 169 grids during the 2008/2009 soil remedial activities, assume minimal brush cutting (using hand tools and a brush hog) necessary in these grids for these remedial activities (figures showing 2008/2009 tree removal grids are presented in Appendix A-5).

     - -- Large trees and vegetation would be cut to the ground surface in 89 of the 169 grids before remedial activities can begin (figures showing grids where tree removal would be conducted are presented in Appendix A-5).

-- Note, wetlands are located within the excavation areas shown on Figure 4-3, and would be restored once remedial activities are complete.

5. Visual and detector-aided (hand-held magnetometer) surveys of the ground surface of all grids would be conducted to locate surface munitions-related items within the removal action area.

6. Manually remove and treat munitions-related items (including MEC, MDEH, and MDAS) from the ground surface within the entire remedial area, including wetland areas (caution would be exercised when entering these areas), and remove metallic non-munitions debris.
   - Ground Surface - Estimate five MEC/MDEH items and approximately 34 drums MDAS (see item #8 for subsurface)

   - Ground Surface - Estimate approximately 2,000 pounds non-munitions debris (see item #8 for subsurface).

   - No soil will be removed with the MEC, MDEH, MDAS and non-munitions debris, any soil clinging to the items will be removed and returned to the ground surface where the item was removed.

   - The location of all MEC/MDEH items would be recorded using GPS. All items would be given a unique identification number, and all information and observations would be recorded on an MEC Tracking Log. No MEC/MDEH item would be moved until a positive identification is made. Depending on the density of MDAS and other munitions-related scrap items identified, it may be impractical to record individual item locations and identity via GPS. Therefore, “areas” of MDAS and munitions-related scrap items may be recorded if the density of such items is so great that it would be impractical to record individual locations. In such cases, the number(s) and type(s) of items would be qualitatively described.

7. Mechanical excavation, using a shielded excavator, of all soil of each grid within the remedial area to a maximum depth of 1 foot bgs (yellow areas shown on Figure 4-3).
   - 169, 100 x 100 x 1 foot grids, approximately 1,690,000 cubic feet

   - See item #9 below for handling of excavated hazardous soil, a portion of the soil excavated may be hazardous (TCLP lead). Excavated non-hazardous soil would be returned to the excavation after munitions-related items are removed from the soil.

- All soil will be managed within/directly adjacent to the excavation grid. Excavations, by grid, will be backfilled on the day the grid is excavated.

- Construct a decontamination pad. Some of the excavated soil may have elevated lead concentrations.

- Assume health and safety would require PPE, wetting to suppress dust, and air monitoring.

8. Remove and treat munitions-related items from excavated soil (including MEC, MDEH, and MDAS), as necessary, and remove metallic non-munitions debris.
   - Subsurface - Estimate 10 MEC/MPPEH items and 30 drums MDAS (see item #6 for surface).

   - Subsurface - Estimate 10,000 pounds non-munitions related debris (see item #6 for surface).

   - No soil will be removed with the MEC, MDEH, MDAS, or non-munitions debris, any soil clinging to the items will be removed. If from a grid with nonhazardous soil, the soil will be returned to the excavation and if from a grid with hazardous soil the soil will be handled as described in Item #9.

   - The location of all MEC/MDEH items would be recorded using GPS. Items would be given a unique identification number, and information and observations would be recorded in an MEC Tracking Log. No MEC/MDEH item would be moved until a positive identification is made. Depending on the density of MDAS and other munitions-related scrap items identified, it may be impractical to record individual item locations and identity via GPS. Therefore, “areas” of MDAS and munitions-related scrap items may be recorded if the density of such items is so great that it would be impractical to record individual locations. In such cases, the number(s) and type(s) of items would be qualitatively described.

9. Mechanically excavated soil would be handled as hazardous (TCLP lead) or non-hazardous, based on existing sampling data which adequately characterized the soil at Site 15 to 1 foot bgs (figures showing assumed hazardous and non-hazardous soil areas, per alternative, are presented in Appendix A-2).

   - Based on previous sampling data, assume soil from 105 of the 169 mechanically grids is non-hazardous and can be backfilled to the excavation(s) after being cleared of munitions, without further handling (1,050,000 cubic feet = 38,889 cubic yards = 68,334 tons)

- **Alternative 4A:** Assume soil from 64 of the 169 mechanically excavated grids has elevated lead concentrations, is hazardous, and would be transported off site for disposal, assumption is based on previous sampling and remediation data (640,000 cubic feet = 23,704 cubic yards = 35,556 tons). Sampling would be conducted for disposal purposes. Excavated and screened soil from locations that are likely to be hazardous (TCLP lead) will be stored on-site within the excavation grids as staging piles in CAMUs prior to off-site disposal. Clean fill will be imported to backfill into the excavations. Disposal of any soil containing lead with TCLP levels exceeding hazardous criteria would require pre-treatment to meet land disposal restrictions prior to landfilling. If treatment achieves UTS levels, disposal of this treated soil in a RCRA Subtitle D landfill would be permissible. If not, the treated soil would need to be disposed in a RCRA Subtitle C landfill.

- **Alternative 4B:** Assume soil from 64 of the 169 mechanically excavated grids has elevated lead concentrations, is hazardous, and would be stabilized in-place on site, assumption is based on previous sampling and remediation data (640,000 cubic feet = 23,704 cubic yards = 35,556 tons). Composite samples would be collected and analyzed for TCLP lead. Once post-treatment soil TCLP lead concentrations are less than 5 mg/L and meet the alternative LDR treatment standards, treatment would stop and soil would be transported off-site for disposal. Treated soil could be disposed off-site at a RCRA Subtitle D landfill. Clean fill will be imported to backfill into the excavations. If needed, excavated, screened, and treated soil from locations likely to be hazardous (TCLP lead) would be staged as staging piles in CAMUS prior to off-site disposal.

- **Alternative 4C:** Under this alternative, all mechanically excavated soil will be laid by the excavator on the ground surface adjacent to a given excavation area (no more than 100 by 100 foot grid), Once soil has been excavated, approximately 1 cubic yard of soil (and debris) will be spread by the excavator on the ground surface. The excavated material will then be manually investigated by UXO Technicians and munitions/non-munitions related items will be manually removed from the soil. Soil would be backfilled into the excavation(s) after manual inspection and removal is complete. Assume no clean fill needed.

10. If MEC is identified in either the surface or shallow subsurface within 25 feet of the edge of the investigation area, step-out in 25-foot increments in all directions to form a new 25 by 25 foot grid. Step-outs would not be conducted into areas cleared during previous removal actions. Conduct visual and detector-aided (hand-held magnetometer) surveys of the ground surface in the step out grid. Manually remove and treat surface munitions-related items (including MEC, MDEH, and MDAS) as necessary, and remove metallic non-munitions debris. Mark locations where shallow subsurface

anomalies are detected and intrusively investigate each shallow subsurface anomaly to a maximum depth of 1 foot bgs. Manually remove munitions-related items (including MEC, MDEH, and MDAS), as necessary, and remove metallic non-munitions debris. No soil will be removed with the MEC, MDEH, MDAS, or non-munitions debris, any soil clinging to the items will be removed and returned to the intrusive investigation location where the item was removed. Continue to step-out until no MEC items are located within 25 feet of the edge of the investigation area.

- Assume four grids of step-outs, surface survey, and intrusive anomaly investigation
- Assume 100 intrusive digs (all hand digs, no shielded excavator)
- Assume 100 pounds non-munitions related debris

11. A determination would be made by the UXO Team Leader as to whether detected munitions-related items are MEC or MPPEH. If an item is MEC and not safe to move, it would be left in place and prepared for MEC BIP treatment. If an item is deemed MEC and safe to move, it could be transported to a staging area to await MEC treatment, on a daily basis. MPPEH items would be further differentiated as either MDEH or MDAS. MDEH items could be transported to a staging area to await MEC treatment procedures, or if determined unsafe to move, would be left in place and prepared for BIP treatment. MDAS would be further classified as either requiring demilitarization or venting, or as being munitions-related scrap. MDAS would be inspected and certified prior to transport off site to an approved metal recycler.
    - Assume six on-site detonations (for MEC/MDEH), explosives would be ordered and used as needed, no storage on site.

    - Per F.A.C 62-730.320, an Emergency Detonation Permit is required prior to any on-site detonations. Per permit requirements, a sample will be collected from the ground surface after any detonation.

    - Onsite treatment/demilitarization of MDAS items resembling military munitions or in need of venting would be conducted, as necessary. Items could also be containerized and transported off-site to an approved commercial metal recycler for treatment/demilitarization.
        - -- Assume 50 items would need demilitarization

12. 100 percent of all recovered items, after MEC/MDEH treatment, would be re-inspected to determine if they are free of explosive hazards and are able to be classified as MDAS.
    - Segregate and containerize munitions-related items and non-munitions debris for off-site disposal.

-- Assume 64 drums of MDAS total and 12,100 pounds total non-munitions debris collected during Alternatives 4A and 4B remedial activities.

- Transport of certified MDAS and any metallic non-munitions debris to an approved off-site commercial metal recycler for disposal. Obtain an “End Use” certification confirming that material has been recycled.

13. If MEC/MPPEH items are identified at Site 15, explosive substances (MC) could be present and confirmatory sampling may need to be conducted after the munitions items are removed from the site to confirm the absence or presence of potential chemical contaminants (MC only).

14. Site Restoration activities including revegetation and wetlands restoration would be conducted. It is anticipated that a maximum of 2 acres of wetlands would need to be restored.

**Post-Remediation Activities (Alternatives 4A and 4B)**

15. Application of LUCs at Site 15 would include:
    - LUCs are already in place that allow for low-intensity recreational uses including activities such as hiking, biking, horseback riding, birding, and hunting. Medium- (picnicking and camping) and high-intensity (children’s playgrounds and contact sports) recreational, residential, and commercial/industrial uses are not permitted. No man-made attractions can be provided that would entice people, particularly small children, to frequently visit the site, which is consistent with the property’s proposed reuse as a wildlife corridor that would allow for low-intensity recreational use. LUCs already in place also prohibit excavation of soil from Site 15 without prior written approval from the Navy, USEPA, and FDEP.

    - Caution/UXO Hazard Warning signs would be posted along access roads, bike paths, and walking trails where munitions-related items may be present.

    - A Public Educational Program is warranted to warn the visiting public (hikers or hunters) of the potential presence of ordnance, the importance of not disturbing (yet reporting) suspect items observed within the project site, and the importance of not conducting intrusive activities. The Public Education Program may include periodic public safety awareness meetings and distribution of educational media to local police, fire departments, and libraries, where they would be available to the public.

#### 4.2.4.2 Detailed Analysis

Overall Protection of Human Health and the Environment

Alternatives 4A, 4B, and 4C would be protective of human health and the environment.

Surface and shallow subsurface removal of munitions-related items from the entire operational area would reduce the risk of exposure and direct contact for both human and ecological receptors. The most likely exposure for site receptors would be contact with MEC via handling/removing or walking overtop of items. A site receptor would have to disturb a munitions-related item to be exposed to explosive hazards. Therefore, by actively removing these items, the risks would be essentially eliminated because all metallic items (both munitions and non-munitions related) would be removed from the surface and subsurface to 1 foot bgs from the entire operational area. Based on the specified land use, the recreational user is expected to have a maximum potential intrusive depth of 0.0 to 0.5 feet bgs. Under these alternatives, munitions items would be removed to 1 foot bgs (expected vertical depth for exposure plus a buffer of an additional six inches because of potential erosion and other changes to the ground), thereby satisfying RAO 2 – make Site 15 safe for the specified land use.

The MEC HA score for Alternatives 4A, 4B, and 4C for Subunit 1 (Subunits explained in Section 1.3.4) is 470, which corresponds to a relative Hazard Level of 4, indicating a low potential for explosive hazard conditions to exist in the former ordnance disposal area after remedial activities described for Alternatives 4A, 4B, and 4C have been conducted. The MEC HA score for Alternatives 4A, 4B, and 4C in Subunit 2 is 335, which corresponds to a relative Hazard Level of 4, indicating that the area outside the former ordnance disposal area has a low potential for explosive hazard conditions once remedial activities have been conducted.

Application of LUCs would also be protective of human health and the environment by reducing the risk of exposure and direct contact to MEC/MPPEH located at this site. LUCs already established include restrictions to prevent residential use. Additional LUCs include the installation of signs and a public education program.

Additionally, under Alternatives 4A and 4B, soil excavated during the munitions removal that may be hazardous would be disposed off-site or treated on-site prior to disposal, further reducing any residual chemical hazards that may be present at the site.

Compliance with ARARs and TBCs

Alternatives 4A, 4B, and 4C would comply with all applicable ARARs and TBCs, as listed in Tables 2-1 and 2-2. Table 4-1 provides a list of guidance, which would also be evaluated and used, as applicable, during the remedial action. Chemical contamination at Site 15 has been addressed, no COPCs remain at this site in excess of established site-specific soil cleanup target levels to permit low-intensity recreational use of the site; therefore, there are no chemical-specific ARARs or TBCs for this site.

Long-Term Effectiveness and Permanence

Alternatives 4A, 4B, and 4C would provide long-term effectiveness and permanence because all munitions-related and metallic non-munitions items would be removed, to 1 foot bgs, from the entire operational area. Furthermore, the engineering and administrative controls proposed as LUCs in this alternative are considered reliable and would be effective to reduce the risk of exposure and direct contact for both human and ecological receptors. Engineering controls, such as signs, would need to be monitored and periodically repaired and/or replaced. The Public Education Program would also provide long-term effectiveness by informing the general public, including local police and fire departments, of the possible presence of munitions at Site 15. Additionally, under Alternatives 4A and 4B, soil excavated during the munitions removal that may be hazardous (TCLP lead) would be disposed off-site or treated on-site prior to off-site disposal to reduce any residual chemical hazards.

Reduction of Toxicity, Mobility, or Volume through Treatment

No COPCs remain at Site 15 in excess of established site-specific soil cleanup target levels to permit low-intensity recreational use of the site. Chemical contamination at Site 15 has been addressed through remedial activities described previously. The extent of arsenic, lead, PAH, and TRPH contaminated soil was delineated and excavated to meet permitted land use (low-intensity recreational activities) requirements. Therefore, toxicity and mobility of chemical contaminants are not a concern at this site. Nevertheless, by disposing of excavated hazardous soil (TCLP lead) off-site in Alternative 4A, potential contamination would be permanently removed from the site. The treatment of hazardous soil (TCLP lead) in Alternative 4B would permanently and irreversibly reduce the mobility of lead before sending off-site for disposal. Volumes of soil to be disposed and/or treated would be determined and verified during the remedial design. There would be no disposal or treatment of hazardous soil under Alternative 4C. By conducting these remedial activities, under all Alternative 4 options, the volume of munitions-related items located at Site 15 would be permanently reduced. Additionally, any metallic non-munitions items removed from Site 15 would also be sent to an off-site metals recycler for disposal.

Short-Term Effectiveness

Alternatives 4A, 4B, and 4C would reduce human health and ecological risks in the short term because risks to site receptors would be reduced as soon as the first munitions item was removed from the site. Exposure of workers to explosive hazards may be present during remedial activities, but would be minimized by compliance with the requirements of OSHA and other explosives safety guidance, including wearing appropriate PPE and adherence to site-specific health and safety procedures. However, if MEC/MPPEH items are identified at the site and detonations occur, these detonations could impact the surrounding community. Implementation of LUCs would not adversely impact the surrounding community or the environment.

The mechanical excavation method is most applicable and effective in high MEC concentration areas (former ordnance disposal area). This method would be used throughout the entire operational area and large amounts of soil can be excavated, thereby clearing this large area effectively and efficiently. Dust suppression and control measures would be implemented during excavation to minimize the emission of hazardous soil particulates (TCLP lead) during on-site remedial activities. Workers on site would be adequately protected if suitable health and safety procedures are followed. Erosion control measures would minimize the migration of potentially hazardous soil into nearby streams.

Under Alternative 4A, transportation of hazardous soil to an off-site TSDF would be conducted in suitable containers and by reputable transporters. In the unlikely event of a traffic accident releasing hazardous soil to the environment, transported soil would not pose an immediate hazard to the community because of the non-volatile nature and relatively low solubility of the lead present in the soil. However, should such an event occur, measures to prevent washing away of the soil by storm events would be warranted.

Site surveys would be conducted prior to remedial activities to determine if any endangered, threatened, or SSC are present at Site 15, thereby reducing any impact to these species. Relocation of gopher tortoise habitats would also reduce adverse impacts to the site ecological system during excavation.

Wetland areas would be identified prior to the beginning of remedial activities to ensure that any impact would be minimized. Wetlands are not excluded from remedial activities, and it is assumed that these areas (a maximum of 2 acres) would be adversely impacted. Additionally, because excavation of the entire operational area would be conducted, all trees and vegetation would be cut and removed from the site further adversely impacting the environmental and ecological habitat and making the site temporarily unsuitable for its intended land use (low-intensity recreational activities). The wetlands would be restored and the site revegetated following completion of the remedial action. Although the loss would be temporary, it would be years before original conditions would be restored. Additionally, trees would be clear cut and all vegetation would be removed from the entire operational area under Alternatives 4A, 4B, and 4C, adversely impacting the environmental and ecological habitat at Site 15 and making the site temporarily unsuitable for its intended land use (low-intensity recreational activities).

Sustainability evaluations were performed for these remedial alternatives to evaluate GHG emissions, $NO_x$ emissions, $SO_x$ emissions, $PM_{10}$ emissions, energy use, and water consumption. These evaluations are provided in Appendix B.

- GHG emissions: For Alternative 4A, GHG emissions would be approximately 3,695 metric tons of $CO_2e$, for Alternative 4B GHG emissions would be approximately 6,790 metric tons of $CO_2e$, and for Alternative 4C GHG emissions would be approximately 177 metric tons. The category contributing the most GHG for Alternative 4B is transportation of equipment and materials. The category contributing the most GHG for Alternative 4A is residual handling due to the amount of hazardous waste that needs to be properly disposed. The category contributing the most GHG for Alternative 3C is production of materials which can be attributed to the production of fertilizer that would be used for revegetation purposes.

- $NO_x$ emissions: $NO_x$ emissions for Alternative 4A are 4.6 metric tons, 5.22 metric tons for Alternative 4B, and $5.26 \times 10^{-1}$ metric tons for Alternative 4C. The category that contributes the most $NO_x$ emissions for Alternative 4B is residual handling operations. The category that contributes the most $NO_x$ emissions for Alternative 4A is residual handling due to the amount of hazardous waste that needs to be properly disposed. The category that contributes the most $NO_x$ emissions for Alternative 4C is equipment use where the use of the dozer contributes the most to this category.

- $SO_x$ emissions: $SO_x$ emissions for Alternative 4A are 1.8 metric tons, 2.1 metric tons for Alternative 4B, and $1.55 \times 10^{-1}$ metric tons for Alternative 4C. The category contributing the most $SO_x$ emissions for Alternative 4A is residual handling due to the amount of hazardous waste that needs to be properly disposed, for Alternative 4B it is residual handling operations, and for Alternative 4C it is production of material which can be attributed to the production of mulch used for revegetation purposes.

- $PM_{10}$ emissions: For Alternative 4A, $PM_{10}$ emissions are 7.3 metric tons, for Alternative 4B $PM_{10}$ emissions are 7.01 metric tons, and for Alternative 4C $PM_{10}$ emissions are $7.1 \times 10^{-2}$ metric tons. The category contributing the most to $PM_{10}$ emissions for Alternative 4A is residual handling due to the large amount of soil that need to be disposed in a hazardous waste facility, for Alternative 4B it is residual handling operations that contributes the most to this category, and for Alternative 4C it is equipment use and miscellaneous uses contributing the most to this category.

- Energy use: The total amount of energy used for Alternative 4A is 113,017 MMBTU, 167,613 MMBTU for Alternative 4B, and 5,621 MMBTU for Alternative 4C. For all alternatives, the category contributing the most to energy use is production of materials where the production of borrow soil contributes the most to the energy consumption for Alternatives 4A and 4B, and where production of fertilizer used for revegetation contributes the most to energy consumption for Alternative 4C.

- Water consumption: The total amount of water used during Alternative 4A is $14.55 \times 10^3$ gallons, $14.55 \times 10^3$ gallons during Alternative 4B, and $13.55 \times 10^3$ gallons during Alternative 4C. The category that consumes the most water for all alternatives is production of materials which can be attributed to the consumption of water to produce fertilizer for the revegetation activities.

- The highest risk of fatality and injury for Alternative 4A is residual handling operations. For 4B and 4C the highest risk is from transportation of personnel.

Implementability

These remedial alternatives would occur in phases, as described in Section 4.2.4.1. The performance of these activities would require a high degree of coordination between field personnel, the Navy, and other parties involved in the remedial activity. The visual and detector-aided surveys could be easily implemented and the length of time for completion would depend on the number of UXO personnel available to complete the surveys.

Surface inspection and manual removal of surface items are easily implemented and can be implemented in almost any terrain and climate. Manual removal can be a very labor-intensive operation, can be very difficult and time-consuming, and also requires a high degree of direct MEC/MPPEH exposure for workers should MEC/MPPEH be identified on the surface at Site 15. Equipment utilized during this phase would be easy to obtain (manual tools) and relatively inexpensive.

The use of manual tools for treatment/demilitarization of munitions items, if necessary, would be easily implementable, depending on the type of equipment used. Additionally, a commercial metal recycler that accepts munitions-related scrap would need to be located. Furthermore, special consideration would need to be given to safety issues and associated liabilities when considering and choosing a commercial metal recycler. Particular attention would be required during classification of items, MDAS certification, and in the documentation of QA/QC procedures associated with the remedial activities. Certification of MDAS and munitions-related scrap leaving the site would require careful inspection by qualified personnel (UXO Technician). An area would also need to be found for staging and storage of MDAS and munitions-related scrap items until the commercial metal recycler could pick up the items.

Mechanical excavation would be more difficult to implement. The basic equipment (e.g., excavator or backhoe) would be easily obtained, is typical in the construction industry, and is readily available from several sources; however, special armor would have to be designed/developed for the equipment to be used during excavation. The use of armored equipment would be more protective of workers than manual removal because there would not be as much direct MEC/MPPEH exposure. The use of mechanical equipment would be very disturbing to wetlands during excavation operations.

Treatment/stabilization is a well established technology used to treat waste materials to reduce contaminant solubility and mobility. Results of the treatability study conducted as part of the 2008/2009 remedial activities would be used to implement Alternative 4B, a bench scale treatability study would be conducted prior to treatment to verify the treatment process. If a different treatment technology is used, a new treatability study would need to be conducted. For Alternatives 4A and 4B, suitable TSDFs are available for the ultimate disposal of excavated soil and would need to be identified at nearby locations. In Alternative 4C, excavated soil will be replaced in the original excavations after manual investigation and MEC/MPPEH/debris removal.

Should MEC/MPPEH be identified at Site 15, the treatment of these items would not be easily implemented. Permits would be required prior to performing any detonation and prior to obtaining donor/priming explosives. An area for staging and storage of explosives for detonation would be required, and higher general area security, signage, and access controls would be required than if treatment were not necessary. If MEC are moved, there would be special requirements for protective packaging and transportation of MEC to the consolidation area for treatment. Should items be located within wetlands that cannot be moved, the detonations could adversely impact wetland areas known to exist at Site 15.

Implementation of LUCs at this site could readily be accomplished. The administrative aspects of the LUCs for this property are currently under the control of the Navy.

Cost

Cost estimates for Alternatives 4A, 4B, and 4C, as described in Section 4.2.4.1 are presented below. Alternatives 4A, 4B, and 4C include the same cost assumptions for the site surveys (wetlands and gopher tortoise), vegetation clearance, visual and detector aided surveys of the ground surface, and surface munitions clearance. Costs for Alternatives 4A, 4B, and 4C assume that all grids within the remedial action area (169, 100 x 100 foot grids) will be excavated. Further, costs for Alternative 4A assume that 64 of the 169 grids contain hazardous soil (TCLP lead) that will be sent off site for disposal at a RCRA Subtitle C landfill. Alternative 4B assumes that soil from the 64 grids that contain hazardous soil will be treated on-site and then transported off-site for disposal at a RCRA Subtitle D landfill. Alternatives 4A and 4B assume that backfill will be needed. Alternative 4C assumes that excavated soil will be replaced in the original excavations after manual investigation and MEC/MPPEH/debris removal and no backfill will be needed. For costing, Alternatives 4A, 4B, and 4C assume the same types and amounts of munitions items will be treated and disposed off-site and that the same site restoration activities will be conducted. Also, if MEC/MPPEH items are identified at Site 15, MC confirmatory sampling may need to be conducted, these costs are not included in the cost estimates for Alternatives 4A, 4B, and 4C. Costs for the same LUCs are included for Alternatives 4A, 4B, and 4C

The estimated costs for Alternative 4A:

| | |
|---|---|
| Capital Cost: | $ 18,120,000 |
| 30-Year NPW of Annual Costs: | $ 59,000 |
| 30-Year NPW: | $ 18,179,000 |

The estimated costs for Alternative 4B:

| | |
|---|---|
| Capital Cost: | $ 17,110,000 |
| 30-Year NPW of Annual Costs: | $ 59,000 |
| 30-Year NPW: | $ 17,168,000 |

The estimated costs for Alternative 4C:

| | |
|---|---|
| Capital Cost: | $ 7,257,000 |
| 30-Year NPW of Annual Costs: | $ 59,000 |
| 30-Year NPW: | $ 7,315,000 |

The above cost figures have been rounded to the nearest $1,000 to reflect the preliminary nature of these estimates. A detailed breakdown of estimated costs for this alternative is provided in Appendix C.

TABLE 4-1

GUIDANCE TO BE USED IN REMEDIAL ACTION
OU 5, SITE 15
ALL ALTERNATIVES
FEASIBILITY STUDY REPORT FOR MUNITIONS REMOVAL
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA


| Requirement/ Criteria | Citation [1] | Brief Description | Consideration in the Remedial Action Process |
|---|---|---|---|
| **Federal** | | | |
| Transportation | ATFE P 5400.1 | Bureau of Alcohol, Tobacco, Firearms and Explosives, vehicle bomb explosion hazard and evacuation distance table. | These standards would be applicable if explosives/MEC/MPPEH are transported. |
| MEC/UXO Management | DoD 4160-21-M-1, Revision 1 | Defense Demilitarization Manual, its purpose is to set for DoD demilitarization policy, prescribe uniform procedures for assigning demilitarization codes to DoD property, and direct methods for completing demilitarization. | Applicable to work conducted at munitions sites where MEC/MPPEH may be present. |
| MEC/UXO Management | DoD 4160.21-M | Defense Material Disposition Manual | Applicable to work conducted at munitions sites where MEC/MPPEH may be present. |
| MEC/UXO Management | DoD 6055.9-STD | Ammunitions and Explosives Safety Standards<br>DoD standard issued under the DDESB that established policies and procedures necessary to provide protection to personnel as a result of DoD ammunitions, explosives, or chemical agents and contamination of real property currently or formerly owned, leased, or used by DoD. | Applicable to work conducted at munitions sites where MEC/MPPEH may be present. |
| MEC/UXO Management | DoD Instruction 4140.62 | Material Potentially Presenting an Explosive Hazard | Applicable to work conducted at munitions sites where MEC/MPPEH may be present. |

**GUIDANCE TO BE USED IN REMEDIAL ACTION**
**OU 5, SITE 15**
**ALL ALTERNATIVES**
**FEASIBILITY STUDY REPORT FOR MUNITIONS REMOVAL**
**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**



| Requirement/ Criteria | Citation [1] | Brief Description | Consideration in the Remedial Action Process |
|---|---|---|---|
| MEC/UXO Management | DoD 4715.11 | Environmental and Explosives Safety Management on Department of Defense, Active and Inactive Ranges Within the United States | Applicable to work conducted at munitions sites where MEC/MPPEH may be present. |
| MEC/UXO Management | DDESB TP 16 | Methodologies for Calculating Primary Fragment Characteristics | May be applicable depending on types of munitions suspected at site. |
| MEC/UXO Management | DDESB TP 18 | Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel | Applicable to work conducted at munitions sites where MEC/MPPEH may be present. |
| MEC/UXO Management | NAVSEA OP 5 Volume 1 | Ammunition and Explosives Safety Ashore: Safety Regulations for Handling, Storing, Production, Renovation, and Shipping | Applicable to work conducted at munitions sites where MEC/MPPEH may be present. |
| MEC/UXO Management | NAVSEA OP 2165 | Navy Transportation Safety Handbook for Ammunition, Explosives, and Related Hazardous Materials | Applicable if explosives/MEC/MPPEH are transported. |
| MEC/UXO Management | NAVSEA OP 2239 | Motor Vehicle Driver's Handbook, Ammunition, Explosives, and Related Hazardous Materials | Applicable if explosives/MEC/MPPEH are transported. |
| MEC/UXO Management | NAVSEA OP 4570.1 | Demilitarization and Disposal of Excess, Surplus, and Foreign Excess Ammunition, Explosives and Other Dangerous Articles and Inert Ordnance Material | Applicable to work conducted at munitions sites where MEC/MPPEH may be present. |
| MEC/UXO Management | NAVSEA OP 8020.9 | Non-Nuclear Ordnance and Explosives Handling Qualification and Certification Program | Applicable to work conducted at munitions sites where MEC/MPPEH may be present. |

TABLE 4-1

**GUIDANCE TO BE USED IN REMEDIAL ACTION**
**OU 5, SITE 15**
**ALL ALTERNATIVES**
**FEASIBILITY STUDY REPORT FOR MUNITIONS REMOVAL**
**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**


| Requirement/ Criteria | Citation [1] | Brief Description | Consideration in the Remedial Action Process |
|---|---|---|---|
| MEC/UXO Management | NAVSEAINST 8020.1H | DoD Ammunition and Explosive Hazard Classification Procedures Joint Technical Bulletin | Applicable if MEC/MPPEH are identified at Site 15. |
| MEC/UXO Management | NOSSA Instruction 8020.15B | Explosive Safety Review, Oversight and Verification of Munitions Responses | May apply to work conducted during the remedial activity. |
| MEC/UXO Management | EM 1110-1-4009 | Engineering and Design – Ordnance and Explosives Response, manual provides personnel with procedures to be used to perform engineering and design activities for all phases of the Military Munitions Response Program | Applicable to work conducted during the remedial activity. |
| MEC/UXO Management | OE Guidance Memoranda, December, 2000 | Interim Final Management Principles for Implementing Response Action at Closed, Transferring, and Transferred Ranges | Applicable to work conducted at munitions sites. |
| MEC/UXO Management | OE Guidance Memoranda, January, 1994 | Application of the Hazardous Waste Operations and Emergency Response Regulation to Ordnance and Explosives Sites | Applicable to work conducted at munitions sites. |
| MEC/UXO Management | OE Guidance Memoranda, May, 1997 | Coordination with the Ordnance and Explosives Center of Expertise (OE CX) | Applicable to work conducted at munitions sites. |
| MEC/UXO Management | OPNAVINST 5090.1 | Environmental and Natural Resources Protection Manual (Navy) | Potential guidance for operations that may impact environmental and natural resources. |
| MEC/UXO Management | OPNAVINST 5102.1C | Mishap Investigation and Reporting | May apply to work conducted during the remedial activity. |

| Requirement/ Criteria | Citation [1] | Brief Description | Consideration in the Remedial Action Process |
|---|---|---|---|
| MEC/UXO Management | OPNAVINST 5530.13 | Department of the Navy Physical Security Instruction for Sensitive Conventional Arms, Ammunition, and Explosives | Applicable to work conducted at munitions sites. |
| MEC/UXO Management | OPNAVINST 8026.2 | Assignment for the Responsibility and Management of the Navy Munitions Disposition Program | Potentially applicable if MEC/MPPEH identified on site. |
| MEC/UXO Management | OPNAVINST 8026.2A | Navy Munitions Disposition Policy | Potentially applicable if MEC/MPPEH identified on site. |
| MEC/UXO Management | OPNAVINST 8027.1 | Inter-service Responsibilities for Explosive Ordnance Disposal | Potentially applicable if MEC/MPPEH identified on site. |
| MEC/UXO Management | OPNAVINST 8027.6E | Naval Responsibilities for Explosive Ordnance Disposal | Potentially applicable if MEC/MPPEH identified on site. |
| MEC/UXO Management | OPNAVINST 8070.1B | Responsibilities for Technical Escort of Dangerous Materials | Potentially applicable if dangerous materials are acquired or are transported from the site. |
| MEC/UXO Management | SWO60-AA-MMA-010 | Demolition Materials | Potentially applicable if demolition materials are acquired or are transported from the site. |
| MEC/UXO Management | EP 385-1-95b | Explosives Safety Submission | Applicable for intrusive work done at munitions response site. |
| MEC/UXO Management | EP 75-1-2 | Munitions and Explosives of Concern Support During Hazardous, Toxic, and Radioactive Waste and Construction Activities | Applicable to work conducted at munitions sites. |
| MEC/UXO Management | EP 1110-1-18 | Ordnance and Explosive Response | Potentially applicable to work conducted at munitions sites. |

| Requirement/ Criteria | Citation [1] | Brief Description | Consideration in the Remedial Action Process |
|---|---|---|---|
| MEC/UXO Management | EP 1110-1-24 | Establishing and Maintaining Institutional Controls for Ordnance and Explosives Projects | Applicable to work conducted at munitions sites. |
| MEC/UXO Management | ER 1110-1-8153 | Engineering and Design Ordnance Explosives Response | Applicable to work conducted at munitions sites. |
| MEC/UXO Management | IGD 98-04 | USACE Huntsville Interim Guidance: Reportable Material at Ordnance Explosives Response Sites | Applicable to work conducted at munitions sites. |
| MEC/UXO Management | USACE DID OE-025.01 | Personnel/Work Standards; U.S. Army Engineering and Support Center | Applicable to work conducted at munitions sites. |
| MEC/UXO Management | USACE, 2003 | Ordnance and Explosives Digital Geophysical Mapping Guidance – Operational Procedures and Quality Manual | Applicable to work conducted at munitions sites where geophysical applications are used. |
| MEC/UXO Management | USEPA, 2003 | EPA Guidelines for Munitions Response | Applicable to work conducted at munitions sites. |
| MEC/UXO Management | 27 CFR 55 | Commerce in Explosives, contains regulations related to manufactures and dealers of explosives and the acquisition and disposition of explosives | Applicable if donor explosives are purchased. |

1. The most updated and recent guidance will be reviewed and followed at the time of the removal action.

<u>Notes:</u>

| | |
|---|---|
| ATFE | Alcohol, Tobacco, Firearms, and Explosives. |
| CFR | Code of Federal Regulations. |
| DDESB | Department of Defense Explosives Safety Board. |
| DoD | Department of Defense. |
| NAVSEA | Naval Sea Systems Command. |
| NAVSEAINST | Naval Sea Systems Command Instruction. |
| NOSSA | Naval Ordnance Safety and Security Activity. |
| OE | Ordnance and Explosives. |

TABLE 4-1

GUIDANCE TO BE USED IN REMEDIAL ACTION
OU 5, SITE 15
ALL ALTERNATIVES
FEASIBILITY STUDY REPORT FOR MUNITIONS REMOVAL
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA


| | | | |
|---|---|---|---|
| EM | Engineer Manual. | OP | Operations Pamphlet. |
| EP | Engineer Pamphlet. | OPNAVINST | Office of the Chief of Naval Operations Instruction. |
| ER | Engineer Regulation. | TP | Technical Paper. |
| IGD | Interim Guidance Document. | USACE | United States Army Corps of Engineers. |
| MEC | Munitions and Explosives of Concern. | USEPA | United States Environmental Protection Agency. |
| MPPEH | Material Potentially Presenting an Explosive Hazard. | UXO | Unexploded Ordnance. |

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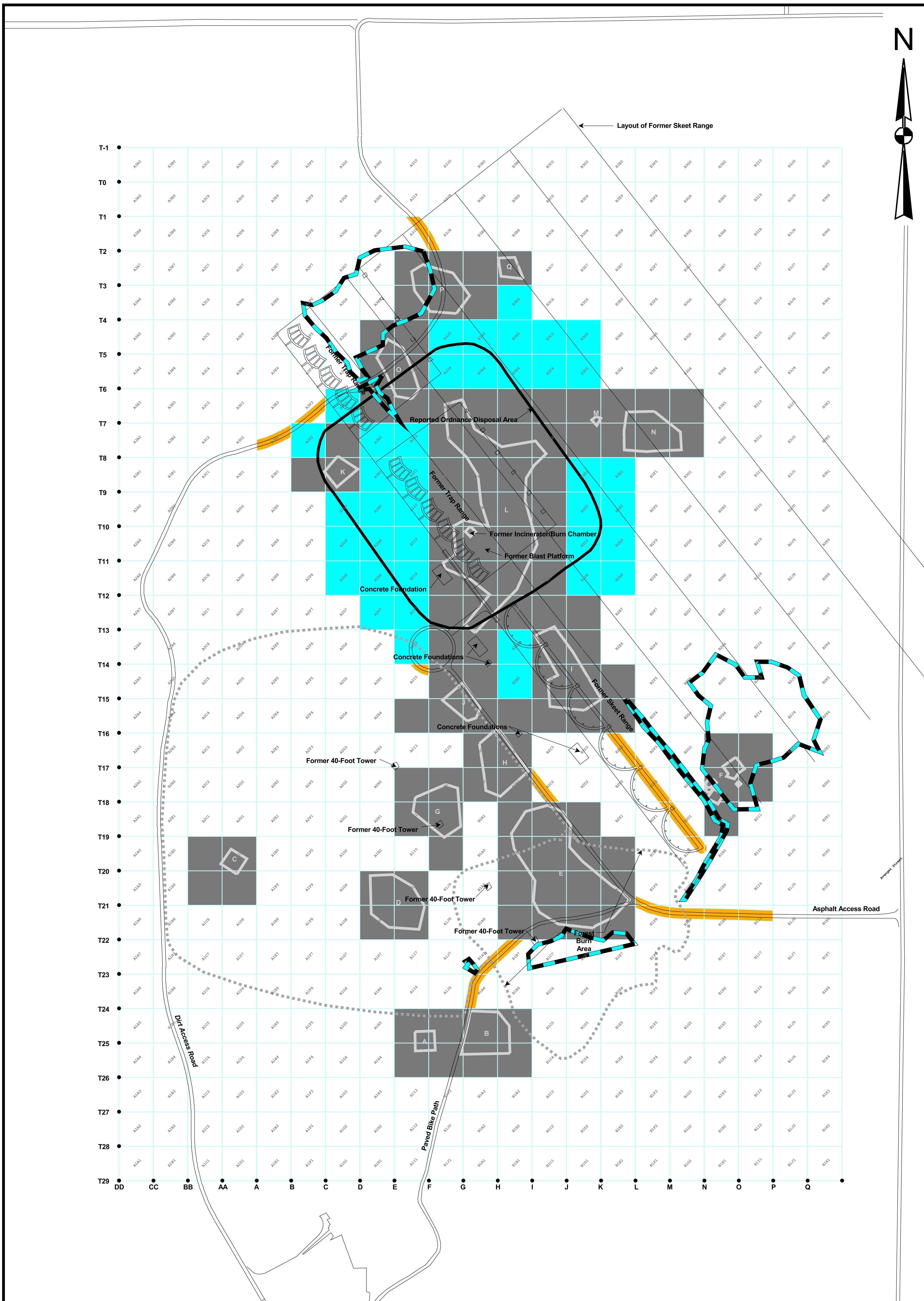


## Legend

- UXO Grid Number
- 2008 Soil Excavated Area (A through Q)
- 2008 Munitions Surface and Subsurface Clearance Area
- Surface and shallow subsurface clearance (to 1 foot bgs)
- Surface clearance, 10 feet on either side of accessway, and shallow subsurface anomaly clearance (to 1 foot bgs)
- Surveyed Wetlands

**Note: Difference between Alternatives A, B and C options is the handling of excavated soil.**

300 0 300 Feet

| | | |
|---|---|---|
| DRAWN BY MJJ | DATE 26Jul11 | CONTRACT NUMBER 2267 |
| CHECKED BY EIL | DATE | APPROVED BY L. Klink — DATE |
| COST/SCHEDULE-AREA | | APPROVED BY — DATE |
| SCALE AS NOTED | | DRAWING NO. FIGURE 4-1 — REV 0 |

NAVFAC

ALTERNATIVES 2A, 2B, AND 2C
OPERABLE UNIT 5, SITE 15
FEASIBILITY STUDY REPORT FOR MUNITIONS REMOVAL
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

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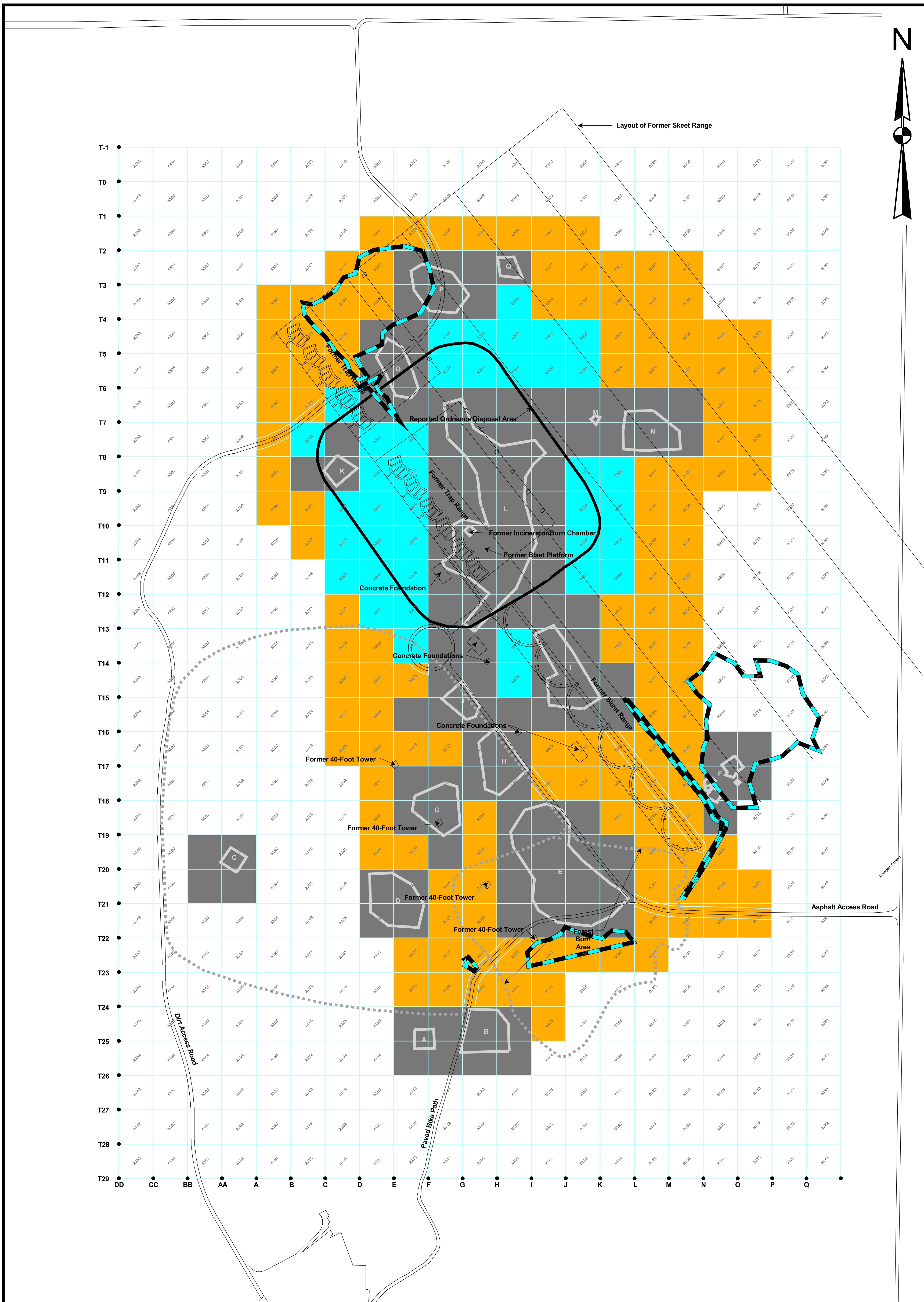


## Legend

- UXO Grid Number
- 2008 Soil Excavated Area (A through Q)
- 2008 Munitions Surface and Subsurface Clearance Area
- Surface and shallow subsurface clearance (to 1 foot bgs)
- Surface and shallow subsurface anomaly clearance (to 1 foot bgs)
- Surveyed Wetlands

Note: Difference between Alternatives A, B and C options is the handling of excavated soil.

300 0 300 Feet

| | | |
|---|---|---|
| DRAWN BY MJJ | DATE 26Jul11 | |
| CHECKED BY EIL | DATE | |
| COST/SCHEDULE-AREA | | |
| SCALE AS NOTED | | |

NAVFAC

ALTERNATIVES 3A, 3B, AND 3C
OPERABLE UNIT 5, SITE 15
FEASIBILITY STUDY REPORT FOR MUNITIONS REMOVAL
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

| | |
|---|---|
| CONTRACT NUMBER 2267 | |
| APPROVED BY L. Klink | DATE |
| APPROVED BY | DATE |
| DRAWING NO. FIGURE 4-2 | REV 0 |

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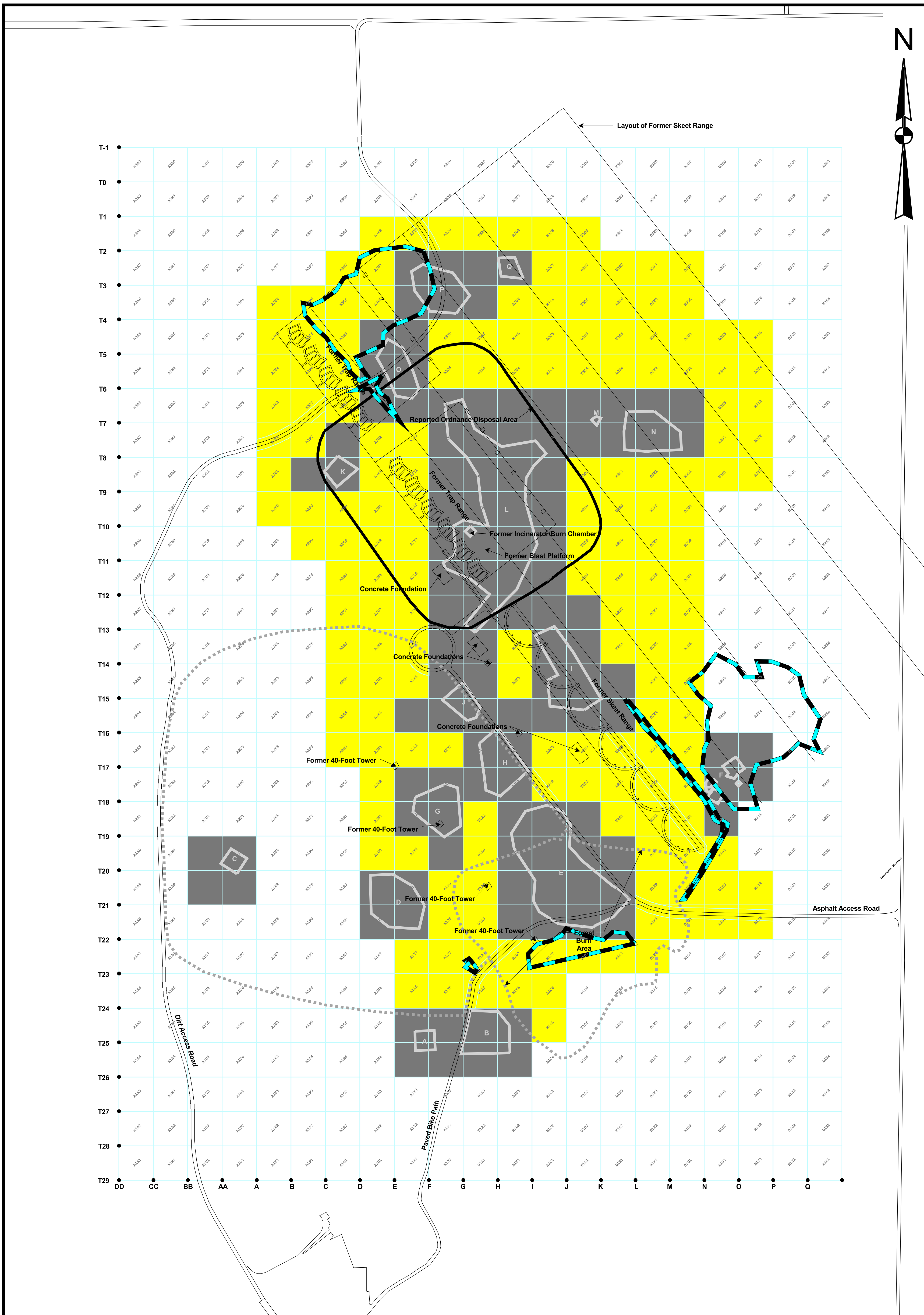


## Legend

- UXO Grid Number
- 2008 Soil Excavated Area (A through Q)
- 2008 Munitions Surface and Subsurface Clearance Area
- Surface and shallow subsurface clearance to 1 foot bgs
- Surveyed Wetlands

**Note: Difference between Alternatives A, B and C options is the handling of excavated soil.**

300 0 300 Feet

| DRAWN BY MJJ | DATE 26Jul11 | ALTERNATIVES 4A, 4B, AND 4C<br>OPERABLE UNIT 5, SITE 15<br>FEASIBILITY STUDY REPORT FOR MUNITIONS REMOVAL<br>NAVAL AIR STATION CECIL FIELD<br>JACKSONVILLE, FLORIDA | CONTRACT NUMBER 2267 | |
|---|---|---|---|---|
| CHECKED BY EIL | DATE | | APPROVED BY L. Klink | DATE |
| COST/SCHEDULE-AREA | | | APPROVED BY | DATE |
| SCALE AS NOTED | | NAVFAC | DRAWING NO. FIGURE 4-3 | REV 0 |

# 5.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

This section compares the remedial alternatives presented in Section 4.0 of this FS. The criteria for comparison are identical to those used for the detailed analysis of individual alternatives.

## 5.1 COMPARISON OF REMEDIAL ALTERNATIVES BY CRITERIA

The following remedial alternatives for OU 5 Site 15 are compared in this section:

- Alternative 1: No Action
- Alternatives 2A, 2B, and 2C: Areas of Concern Select Surface and Shallow Subsurface MEC and Anomaly Removal
  - Alternative 2A: Off-Site Hazardous Soil Disposal
  - Alternative 2B: On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal
  - Alternative 2C: Mechanical Excavation and Manual Investigation and Removal

- Alternatives 3A, 3B, and 3C: All Surface and Shallow Subsurface MEC and Anomaly Removal
  - Alternative 3A: Off-Site Hazardous Soil Disposal
  - Alternative 3B: On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal
  - Alternative 3C: Mechanical Excavation and Manual Investigation and Removal

- Alternatives 4A, 4B, and 4C : All Surface and Shallow Subsurface MEC Removal
  - Alternative 4A: Off-Site Hazardous Soil Disposal
  - Alternative 4B: On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal
  - Alternative 4C: Mechanical Excavation and Manual Investigation and Removal

### 5.1.1 Overall Protection of Human Health and the Environment

Alternative 1 would not be protective of human health and the environment because the explosive hazards at Site 15 would not be removed or mitigated. For Alternative 1, the MEC HA hazard level for the former ordnance disposal area would be 1 indicating that this area has the highest potential for explosive hazard conditions and the hazard level for the remainder of the operational area would be 3, indicating a moderate potential for explosive hazard conditions.

Alternatives 2A, 2B, 2C, 3A, 3B, 3C, 4A, 4B, and 4C would provide protection to human health and the environment. Surface and shallow subsurface MEC and anomaly removals within the former ordnance disposal area and along access roads, bike paths, and walking trails for Alternatives 2A, 2B, and 2C would remove explosive hazards present on the ground surface and in the shallow subsurface (to 1 foot bgs) in the most accessible and most used areas of the site, thereby reducing the risk of exposure by human and ecological receptors. Along with those areas described for Alternatives 2A, 2B, and 2C, shallow subsurface anomaly removal within the remainder of the operational area would also be conducted under Alternatives 3A, 3B, and 3C. Alternatives 4A, 4B, and 4C would be the most protective regarding human health because all ground surface and subsurface (up to 1 foot bgs) metallic munitions items would be removed within the entire operational area. The MEC HA hazard levels are the same for Alternatives 2A, 2B, 2C, 3A, 3B, 3C, and 4A, 4B, and 4C. The MEC HA hazard levels for both the former ordnance disposal area and the remainder of the operational area would be 4 for these alternatives, indicating a low potential for explosive hazard conditions to exist after remedial activities have been conducted. Surface inspections would be conducted annually under Alternatives 2A, 2B, and 2C, and 3A, 3B, and 3C along access roads, bike paths, and walking trails, and 5 year inspections and removals would be conducted within the remedial action area thereby addressing residual explosive risks that may remain at the site.

The same LUCs are proposed for all of the alternatives. LUCs are already in place to provide protection of human health by restricting the area from residential use, additional LUCs would include installing signs, and administration of a public education program.

Additionally, under Alternatives 2 A&B and 3 A&B, soil excavated to 1 foot bgs within the former disposal area during the munitions removal, which may be hazardous (TCLP lead), would be disposed off-site or treated on-site prior to off-site disposal and would reduce any residual chemical hazards that may be present in this area of the site. Soil would be excavated, to a maximum of 1 foot bgs, within the entire operational area under Alternatives 4 A and 4B, and hazardous soil (TCLP lead) would either be disposed off-site or treated on-site prior to off-site disposal, thereby reducing the residual chemical hazard over a larger area. Under all alternative’s C options excavated soil will be manually investigated and MEC/MPPEH/debris would be manually removed, then the soil will be replaced in the original excavations, which is protective based on the specified land use.

### 5.1.2 Compliance with ARARs and TBCs

The conduct of all of the alternatives would comply with all applicable ARARs and TBCs, as listed in Tables 2-1 and 2-2. Table 4-1 provides a list of guidance that would also be evaluated and used during the remedial action, as applicable.

### 5.1.3 Long-Term Effectiveness and Permanence

Alternative 1 would have no long-term effectiveness and permanence because there would be no activities to remove MEC/MPPEH and no LUCs.

Alternatives 2A, 2B, 2C, 3A, 3B, 3C, and 4A, 4B, and 4C would provide long-term effectiveness and permanence through a combination of ground surface and subsurface (up to 1 foot bgs) removals of munitions-related items. Surface and shallow subsurface (up to 1 foot bgs) excavation and removal would be conducted within the former ordnance disposal area for Alternatives 2A, 2B, 2C, and 3A, 3B, and 3C. Surface and shallow subsurface anomalies (up to 1 foot bgs) would be investigated and removed along access ways, roads, and biking trails under Alternatives 2A, 2B, and 2C and also within the remainder of the operational area under Alternatives 3A, 3B, and 3C. Alternatives 2A, 2B, and 2C and 3A, 3B, and 3C would also provide long-term effectiveness and permanence through the performance of annual surface inspections along access roads, bike paths, and walking trails and 5 year inspections and removals within the remedial action area. These inspections and additional removals would be conducted in response to the presence and possible migration of MEC/MPPEH items at the site, and would reduce risk of exposure for receptors to residual MEC hazards that may remain on-site. Under Alternatives 4A, 4B, and 4C, all surface and shallow subsurface (to 1 foot bgs) munitions items would be removed within the entire operational area. Therefore, Alternatives 4A, 4B, and 4C may remove the most munitions items from the site, followed by Alternatives 3A, 3B, and 3C, and then Alternatives 2A, 2B, and 2C. All munitions removals would be permanent.

Additionally, the same LUCs are proposed for all of the alternatives. LUCs are already in place to provide protection of human health by restricting the area from residential use; additional. Additional LUCs would include installing signs and the administration of a public education program.

Also, soil excavated under all Alternative's A and B options that may be hazardous (TCLP lead) would be disposed off-site or treated on-site prior to off-site disposal, permanently reducing any residual chemical hazards. Soil would be excavated to 1 foot bgs from the former ordnance disposal area under Alternatives 2A, 2B, 3A, and 3B, thereby being equally effective. Soil would be excavated to 1 foot bgs within the entire operational area for Alternatives 4A and 4B, removing potentially more hazardous soil from the site than the other alternatives. In Alternative 2C, 3C, and 4C, once the excavated soil has been manually investigated and MEC/MPPEH/debris removed, the soil will be replaced in the original excavations.

### 5.1.4 Reduction of Toxicity, Mobility, or Volume through Treatment

No COPCs remain at Site 15 in excess of established site-specific soil cleanup target levels to permit low-intensity recreational use of the site. Chemical contamination at Site 15 has been addressed through previous remedial activities and the extent of arsenic, lead, PAH, and TRPH contaminated soil was delineated and excavated to meet permitted land use (low-intensity recreational activities) requirements. Therefore, toxicity and mobility of chemical contaminants are not a concern at this site. Nevertheless, potentially hazardous soil (TCLP lead) would be excavated and either disposed off-site or treated on-site prior to off-site disposal in Alternatives 2A, 2B, 3A, 3B, 4A, and 4B. Once disposed off-site, this contamination would be permanently removed from the site. If treated on-site, the mobility of lead would be permanently and irreversibly reduced prior to off-site disposal. Volumes of soil to be disposed and/or treated would be determined and verified during the remedial design. Because the same area would be excavated during Alternatives 2A and 2B and 3A and 3B, the same volume of hazardous soil would be disposed and/or treated under these alternatives. More soil would be excavated under Alternatives 4A and 4B, thereby more hazardous soil would be disposed and/or treated. Soil will not be disposed off-site or treated on-site under Alternatives 2C, 3C, and 4C.

By conducting these remedial activities, the volume of munitions-related items located at Site 15 would be permanently reduced. Furthermore, any metallic non-munitions items removed from Site 15 would also be sent to an off-site metals recycler for disposal. Because Alternatives 4A, 4B, and 4C cover more area and more soil would be excavated, more munitions and non-munitions items may be removed from the site under Alternatives 4A, 4B, and 4C, followed by Alternatives 3A, 3B, and 3C, with the least amount of removal conducted under Alternatives 2A, 2B, and 2C.

Alternative 1 would not achieve reduction of volume of munitions-related items nor would it remove or treat any hazardous soil.

### 5.1.5 Short-Term Effectiveness

Implementation of Alternative 1 would not result in risks to site workers or adversely impact the surrounding community or environment because no remedial activities would be performed. Because no actions would be implemented in Alternative 1, there would be no impacts on sustainability factors.

Alternatives 2A, 2B, 2C, 3A, 3B, 3C, 4A, 4B, and 4C would reduce human and ecological receptor risks in the short term because risks to site receptors would be reduced as soon as the first removal action was completed.

Implementation of Alternatives 2A, 2B, 2C, 3A, 3B, 3C, 4A, 4B, and 4C may result in exposing site workers to explosive hazards during remedial activities, particularly during detonations of MEC/MDEH, should any occur. It is assumed that the most munitions items would be removed under Alternatives 4A, 4B, and 4C, therefore, conditions would be the most hazardous to workers under Alternatives 4A, 4B, and 4C and the least hazardous under Alternatives 2A, 2B, and 2C under which the least amount of munitions items would be removed. Hazardous exposure under Alternatives 3A, 3B, and 3C would be in between 2A, 2B, and 2C and 4A, 4B, and 4C. However, the risk of exposure for all alternatives would be effectively controlled by compliance with OSHA and other explosive safety procedures. Dust suppression and control measures would be implemented during excavation under all alternatives to minimize the emission of hazardous soil particulates (TCLP lead) during on-site remedial activities. Erosion control measures implemented under all alternatives would minimize the migration of potentially hazardous soil into nearby streams.

Site surveys would be conducted prior to remedial activities under all alternatives (with the exception of Alternative 1) to determine if any endangered, threatened, or SSC are present at Site 15, thereby reducing any impact to these species. Wetland areas would not be excluded from the removal action areas and it is assumed that under Alternatives 4A, 4B, and 4C, remedial activities would impact wetlands areas. It is assumed that there would be minimal, if any, impact to wetlands under Alternatives 2A, 2B, 2C, 3A, 3B, and 3C. Activities would be conducted to mitigate damage to wetlands during excavations under all alternatives, as applicable. The wetlands would be restored and the site revegetated following completion of any remedial action. Although the loss would be temporary, it would be years before original conditions would be restored. Additionally, trees would be clear cut and all vegetation would be removed from the entire operational area under Alternatives 4A, 4B, and 4C, adversely impacting the environmental and ecological habitat at Site 15 and making the site temporarily unsuitable for its intended land use (low-intensity recreational activities).

All alternatives, with the exception of Alternative 1, would have a slight adverse impact on the surrounding community or environment should MEC/MDEH detonations take place. All alternatives would also have short-term impact on the community as a result of the transport of metallic items for off-site disposal and metal recycling.

Alternatives 2A and 2B and 3A and 3B would require less off-site transport of soil than Alternatives 4A and 4B and would have less impact on the community, as a result. Alternatives 2A, 2B, 2C, 3A, 3B, and 3C would involve less soil excavation and less movement of hazardous soil than Alternatives 4A, 4B, and 4C, and would likely pose less short-term risk. Alternatives 2A, 3A, and 4A involve the transportation and off-site disposal of hazardous soil (TCLP lead), while under Alternatives 2B, 3B, and 4B, the hazardous soil would be stabilized on-site prior to off-site disposal. Short-term risks for all alternatives, except Alternative 1, would be properly mitigated by application of engineering controls and adherence to OSHA requirements.

Alternative 4A would have the highest GHG emissions followed by Alternatives 3A, 2A, 3B, 2B, 4B, 4C, and 3C with Alternative 2C having the lowest GHG emissions. Alternative 4B would have the highest $NO_x$ emissions followed by Alternatives 4A, 3A, 2A, 3B, 2B, 4C, and 3C with Alternative 2C having the lowest $NO_x$ emissions. Alternative 4B would have the highest $SO_x$ emissions followed by Alternatives 4A, 3B, 2A, 3A, 2B, 4C, and 3C, with Alternative 2C having the lowest $SO_x$ emissions. Alternative 4A would have the highest $PM_{10}$ emissions followed by Alternatives 4B, 3A, 2A, 3B, 2B, 4C, and 3C, with Alternative 2C having the lowest $PM_{10}$ emissions. Alternative 4B would have the highest energy consumptions followed by Alternatives 4A, 3B, 2B, 3A, 2A, 4C, and 3C with Alternative 2C having the lowest energy consumption. Alternatives 4A and 4B would have the same and the highest water usage, followed by 4C, then Alternatives 2B and 3B, which would have with the same water usage, and Alternatives 2A, 3A, 2C, and 3C which would have the same water usage and the lowest water usage. The highest risk of fatality and injury for all of the A options is residual handling operations. The highest risk for all of the B and C options is transportation of personnel. Overall Alternatives the Alternative 4 options would have the highest sustainability impact while Alternative 3 options and Alternative 2 options would have lower impacts with Alternative 2C having the lowest overall impacts.

### 5.1.6 Implementability

Alternative 1 would be easiest to implement because there would be no action taken.

All other alternatives would be implemented in phases. The difference between the alternatives is the area(s) to be investigated, the amount of subsurface investigation and removal that would take place, and how the excavated soil would be handled. These alternatives would be ranked in the following decreasing order of ease of implementability: Alternative 2C, Alternative 3C, Alternative 2A, Alternative 3A, Alternative 4C, Alternative 2B, Alternative 3B, Alternative 4A, and Alternative 4B.

Should MEC/MDEH be identified on site under any of the alternatives, treatment of these items would be more difficult to implement than if only MDAS and metallic debris are found on site during the remedial activities.

The approximate time frames for implementation and completion would be longest for Alternatives 4A, 4B, and 4C, and shortest for the initial inspection and removal under Alternatives 2A, 2B, 2C, with the timeframe for Alternatives 3A, 3B, and 3C, in between for the initial inspection and removal. However, annual and 5 year inspections and removals would be conducted under Alternatives 2A, 2B, 2C, 3A, 3B, and 3C; therefore, the overall timeframe would be longer for these alternatives than Alternatives 4A, 4B, and 4C, which do not include annual inspections and removals.

Implementation of LUCs, including installation of signage and administration of a public education program under all alternatives could readily be accomplished.

### 5.1.7 Cost

The capital and O&M costs and NPW of the alternatives are as follows.

| Alternative | Capital | NPW of Annual Costs | NPW |
|---|---|---|---|
| 1 | 0 | 0 | 0 |
| 2A | $ 5,749,000 | $ 37,000 | $ 5,786,000 |
| 2B | $ 4,971000 | $ 37,000 | $ 5,008,000 |
| 2C | $ 2,004,000 | $ 37,000 | $ 2,041,000 |
| 3A | $ 6,610,000 | $ 37,000 | $ 6,647,000 |
| 3B | $ 5,833,000 | $ 37,000 | $ 5,869,000 |
| 3C | $ 2,866,000 | $ 37,000 | $ 2,903,000 |
| 4A | $ 18,120,000 | $59,000 | $ 18,179,000 |
| 4B | $ 17,110,000 | $59,000 | $ 17,168,000 |
| 4C | $ 7,257,000 | $59,000 | $ 7,315,000 |

The above cost figures have been rounded to the nearest $1,000 to reflect the preliminary nature of these estimates. Detailed cost estimates are provided in Appendix C.

## 5.2 SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

Table 5-1 summarizes the comparative analysis of the remedial alternatives.

**TABLE 5-1**

**SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES**
**OU 5, SITE 15**
**ALL ALTERNATIVES**
**FEASIBILITY STUDY REPORT FOR MUNITIONS REMOVAL**
**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**


| **Evaluation Criteria** | **Alternative 1: No Action** | **Alternative 2A: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal (Off-Site Hazardous Soil Disposal)** | **Alternative 2B: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal (On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal)** | **Alternative 2C: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal (Mechanical Excavation and Manual Investigation and Removal)** | **Alternative 3A: All Surface and Shallow Subsurface MEC and Anomaly Removal (Off-Site Hazardous Soil Disposal)** | **Alternative 3B: All Surface and Shallow Subsurface MEC and Anomaly Removal (On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal)** | **Alternative 3C: All Surface and Shallow Subsurface MEC and Anomaly Removal (Mechanical Excavation and Manual Investigation and Removal)** | **Alternative 4A: All Surface and Shallow Subsurface MEC Removal (Off-Site Hazardous Soil Disposal)** | **Alternative 4B: All Surface and Shallow Subsurface MEC Removal (On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal)** | **Alternative 4C: All Surface and Shallow Subsurface MEC Removal (Mechanical Excavation and Manual Investigation and Removal)** |
|---|---|---|---|---|---|---|---|---|---|---|
| Overall Protection of Human Health and Environment | Not protective. | Protective. | Similar to 2A. | Similar to 2A. | Slightly more protective than Alternatives 2A, 2B, and 2C. | Similar to 3A. | Similar to 3A. | More protective than Alternatives 2A, 2B, 2C and 3A, 3B, and 3C. | Similar to 4A. | Similar to 4A. |
| ***MEC HA*** | Subunit 1 score = 865, Hazard Level 1, high potential for explosive hazard conditions. Subunit 2 score = 605, Hazard Level 3, moderate potential for explosive hazard conditions. | Subunit 1 score = 470, Hazard Level 4, low potential for explosive hazard conditions. Subunit 2 score = 335, Hazard Level 4, low potential for explosive hazard conditions. | Same as 2A. | Same as 2A. | Subunit 1 score = 470, Hazard Level 4, low potential for explosive hazard conditions. Subunit 2 score = 335, Hazard Level 4, low potential for explosive hazard conditions. | Same as 3A. | Same as 3A. | Subunit 1 score = 470, Hazard Level 4, low potential for explosive hazard conditions. Subunit 2 score = 335, Hazard Level 4, low potential for explosive hazard conditions. | Same as 4A. | Same as 4A. |
| Compliance with ARARs and TBCs | | | | | | | | | | |
| Chemical-Specific | Not applicable. | Not applicable. | Not applicable. | Not applicable. | Not applicable. | Not applicable. | Not applicable. | Not applicable. | Not applicable. | Not applicable. |
| Location-Specific | Would comply. | Would comply. | Would comply. | Would comply. | Would comply. | Would comply. | Would comply. | Would comply. | Would comply. | Would comply. |
| Action-Specific | Not applicable. | Would comply. | Would comply. | Would comply. | Would comply. | Would comply. | Would comply. | Would comply. | Would comply. | Would comply. |

**TABLE 5-1**

**SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES**
**OU 5, SITE 15**
**ALL ALTERNATIVES**
**FEASIBILITY STUDY REPORT FOR MUNITIONS REMOVAL**
**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**


| Evaluation Criteria | Alternative 1: No Action | Alternative 2A: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal (Off-Site Hazardous Soil Disposal) | Alternative 2B: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal (On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal) | Alternative 2C: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal (Mechanical Excavation and Manual Investigation and Removal) | Alternative 3A: All Surface and Shallow Subsurface MEC and Anomaly Removal (Off-Site Hazardous Soil Disposal) | Alternative 3B: All Surface and Shallow Subsurface MEC and Anomaly Removal (On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal) | Alternative 3C: All Surface and Shallow Subsurface MEC and Anomaly Removal (Mechanical Excavation and Manual Investigation and Removal) | Alternative 4A: All Surface and Shallow Subsurface MEC Removal (Off-Site Hazardous Soil Disposal) | Alternative 4B: All Surface and Shallow Subsurface MEC Removal (On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal) | Alternative 4C: All Surface and Shallow Subsurface MEC Removal (Mechanical Excavation and Manual Investigation and Removal) |
|---|---|---|---|---|---|---|---|---|---|---|
| Long-Term Effectiveness and Permanence | Not effective, munitions items would remain on site. | Effective, would provide long-term effectiveness through the performance of an initial surface and shallow subsurface anomaly removal and annual surface removals. Hazardous soil would be disposed off-site. LUCs are considered reliable and effective to reduce risks to site receptors. | Similar to Alternative 2A, except that hazardous soil would be treated on-site prior to off-site disposal. | Similar to Alternative 2A, except that excavated soil would be manually investigated for munitions items and then returned to the original excavation. | More effective than Alternatives 2A, 2B, and 2C, would provide long-term effectiveness through the performance of an initial surface and shallow subsurface anomaly removal (over larger area than Alternatives 2A, 2B, and 2C) and annual surface removals. The same amount of hazardous soil would be disposed off-site as would be in Alternative 2A. LUCs are considered reliable and effective to reduce risks to site receptors. | Similar to Alternative 3A, except that hazardous soil would be treated on-site prior to off-site disposal. | Similar to Alternative 3A, except that excavated soil would be manually investigated for munitions items and then returned to the original excavation. | More effective than Alternatives 2A, 2B, and 2C, and 3A, 3B, and 3C, would provide long-term effectiveness through the performance surface and shallow subsurface removal within the entire operational area. More hazardous soil would be disposed off-site as would be in Alternatives 2A and 3A. | Similar to Alternative 4A, except that hazardous soil would be treated on-site prior to off-site disposal. | Similar to Alternative 4A, except that excavated soil would be would be manually investigated for munitions items and then returned to the original excavation. |

TABLE 5-1

SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES
OU 5, SITE 15
ALL ALTERNATIVES
FEASIBILITY STUDY REPORT FOR MUNITIONS REMOVAL
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA


| Evaluation Criteria | Alternative 1: No Action | Alternative 2A: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal (Off-Site Hazardous Soil Disposal) | Alternative 2B: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal (On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal) | Alternative 2C: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal (Mechanical Excavation and Manual Investigation and Removal) | Alternative 3A: All Surface and Shallow Subsurface MEC and Anomaly Removal (Off-Site Hazardous Soil Disposal) | Alternative 3B: All Surface and Shallow Subsurface MEC and Anomaly Removal (On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal) | Alternative 3C: All Surface and Shallow Subsurface MEC and Anomaly Removal (Mechanical Excavation and Manual Investigation and Removal) | Alternative 4A: All Surface and Shallow Subsurface MEC Removal (Off-Site Hazardous Soil Disposal) | Alternative 4B: All Surface and Shallow Subsurface MEC Removal (On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal) | Alternative 4C: All Surface and Shallow Subsurface MEC Removal (Mechanical Excavation and Manual Investigation and Removal) |
|---|---|---|---|---|---|---|---|---|---|---|
| Reduction of Contaminant Toxicity, Mobility, or Volume through Treatment | None. | Would reduce the volume of munitions items through removal. Would reduce the volume of hazardous soil on-site through off-site disposal, exact volume(s) to be determined during remedial design. | Similar to Alternative 2A, except that hazardous soil would be treated on-site prior to disposal. | Similar to Alternative 2A, except that excavated soil would be manually investigated for munitions items and then returned to the original excavation. | Amount of munitions items removed would be slightly higher than Alternatives 2A, 2B, and 2C and the volume of hazardous soil removed would be the same as Alternative 2A. | Similar to Alternative 3A, except that hazardous soil would be treated on-site prior to off-site disposal. | Similar to Alternative 3A, except that excavated soil would be manually investigated for munitions items and then returned to the original excavation. | Amount of munitions items removed and volume of hazardous soil removed would be more than Alternatives 2A, 2B, and 2C and 3A, 3B, and 3C. | Similar to Alternative 4A, except that hazardous soil would be treated on-site prior to off-site disposal. | Similar to Alternative 4A, except that excavated soil would be manually investigated for munitions items and then returned to the original excavation. |
| Short-Term Effectiveness | No relevant issues to address. | Would be effective at reducing amount of munitions items on site. Minimum potential for short-term risks to site workers, which would be mitigated through compliance with health and safety procedures. Minimum potential for short-term risks to the community during | Would be effective, similar to Alternative 2A but less short-term risk to the community because non-hazardous soil would be transported off-site rather than hazardous soil. | Would be effective, similar to Alternative 2A but less short-term risk to the community because no soil would be transported off-site. | Similar to Alternative 2A. | Similar to Alternative 2B. | Similar to Alternative 2C. | Would be effective at reducing the amount of munitions items on site. There is a greater potential for short-term risks to site workers under this alternative than the other alternatives because a larger area is being investigated, these risks would be mitigated | Would be effective, similar to Alternative 4A but less short-term risk to the community because non-hazardous soil would be transported off-site rather than hazardous. | Would be effective, similar to Alternative 4A but less short-term risk to the community because no soil would be transported off-site. |

TABLE 5-1

SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES
OU 5, SITE 15
ALL ALTERNATIVES
FEASIBILITY STUDY REPORT FOR MUNITIONS REMOVAL
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA


| Evaluation Criteria | Alternative 1: No Action | Alternative 2A: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal (Off-Site Hazardous Soil Disposal) | Alternative 2B: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal (On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal) | Alternative 2C: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal (Mechanical Excavation and Manual Investigation and Removal) | Alternative 3A: All Surface and Shallow Subsurface MEC and Anomaly Removal (Off-Site Hazardous Soil Disposal) | Alternative 3B: All Surface and Shallow Subsurface MEC and Anomaly Removal (On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal) | Alternative 3C: All Surface and Shallow Subsurface MEC and Anomaly Removal (Mechanical Excavation and Manual Investigation and Removal) | Alternative 4A: All Surface and Shallow Subsurface MEC Removal (Off-Site Hazardous Soil Disposal) | Alternative 4B: All Surface and Shallow Subsurface MEC Removal (On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal) | Alternative 4C: All Surface and Shallow Subsurface MEC Removal (Mechanical Excavation and Manual Investigation and Removal) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | MEC detonations and transport of metallic items and hazardous soil off-site. Adverse impacts to wetlands should be minimal, if any. | | | | | | through compliance with health and safety procedures. There is a greater potential for short-term risks to the community under this alternative than the other alternatives during MEC detonations and transport of metallic items and hazardous soil off-site because more munitions items will be found and more hazardous soil will be transported off-site. Wetlands would be adversely impacted. The entire removal area would be clear cut prior to excavation adversely impacting the | | |

TABLE 5-1

SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES
OU 5, SITE 15
ALL ALTERNATIVES
FEASIBILITY STUDY REPORT FOR MUNITIONS REMOVAL
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA


| Evaluation Criteria | Alternative 1: No Action | Alternative 2A: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal (Off-Site Hazardous Soil Disposal) | Alternative 2B: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal (On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal) | Alternative 2C: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal (Mechanical Excavation and Manual Investigation and Removal) | Alternative 3A: All Surface and Shallow Subsurface MEC and Anomaly Removal (Off-Site Hazardous Soil Disposal) | Alternative 3B: All Surface and Shallow Subsurface MEC and Anomaly Removal (On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal) | Alternative 3C: All Surface and Shallow Subsurface MEC and Anomaly Removal (Mechanical Excavation and Manual Investigation and Removal) | Alternative 4A: All Surface and Shallow Subsurface MEC Removal (Off-Site Hazardous Soil Disposal) | Alternative 4B: All Surface and Shallow Subsurface MEC Removal (On-Site Hazardous Soil Treatment and Off-Site Non-Hazardous Soil Disposal) | Alternative 4C: All Surface and Shallow Subsurface MEC Removal (Mechanical Excavation and Manual Investigation and Removal) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | environmental and ecological habitat as well as rendering the site temporarily unsuitable for its intended land use. | | |
| Implementability | Nothing to implement. | Somewhat more difficult to implement than 2C. | Somewhat more difficult to implement than Alternative 2A and 2C. | Easiest to implement. | More difficult to implement than Alternatives 2C, 3C, and 2A. | Somewhat more difficult to implement than Alternative 3A and more difficult to implement than Alternatives 3C, 2A, 2B & 2C. | Somewhat more difficult to implement than Alternative 2C. | More difficult to implement than Alternatives 4C, 2A, 2B, & 2C and 3A, 3B, & 3C. | Most difficult to implement. | More difficult to implement than Alternatives 2C and 3C. |
| Costs [1]:<br>Capital<br>NPW of O&M<br>NPW | <br>$0<br>$0<br>$0 | <br>$ 5,749,000<br>$ 37,000<br>$ 5,786,000 | <br>$ 4,971,000<br>$ 37,000<br>$ 5,008,000 | <br>$ 2,004,000<br>$ 37,000<br>$ 2,041,000 | <br>$ 6,610,000<br>$ 37,000<br>$ 6,647,000 | <br>$ 5,833,000<br>$ 37,000<br>$ 5,869,000 | <br>$ 2,866,000<br>$ 37,000<br>$ 2,903,000 | <br>$ 18,120,000<br>$59,000<br>$ 18,179,000 | <br>$ 17,110,000<br>$59,000<br>$ 17,168,000 | <br>$ 7,257,000<br>$59,000<br>$ 7,315,000 |

1 The above cost figures have been rounded to the nearest $1,000 to reflect the preliminary nature of these estimates.

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# APPENDIX A

# BACKGROUND INFORMATION

# A-1 CHEMICAL BACKGROUND INFORMATION

## SUPPLEMENTAL HISTORICAL DATA – CHEMICAL CONTAMINATION

The following provides information that was used to develop the conceptual site model and support the data quality objectives for the munitions and explosives of concern (MEC) Remedial Investigation (RI) at conducted in 2010/2011 at Site 15. The evaluation was used to support that only MEC investigation is necessary for the remedial investigation; investigation of MC is not required at this time because sufficient investigation and remediation of chemical contaminants at Site 15 have been conducted.

The remedial action which addressed soil was conducted in 2008 and 2009 and included removal of soil contaminated with polycyclic aromatic hydrocarbons (PAHs), metals, and total recoverable petroleum hydrocarbons (TRPH) from 17 excavation areas (A to Q). Based on the findings of a MEC Preliminary Assessment/Site Inspection (PA/SI) conducted in 2007 (CH2MHill, 2007) MEC removal was necessary before soil excavation activities for the remedial action could proceed. As part of the remedial action, tree and vegetation clearance and clearance for MEC were conducted in portions of the site prior to soil excavation.

Various investigations of chemical contamination were conducted and the results were presented in the RI Report (ABB-ES, October 1997). The areas of contamination at Site 15 are associated with the ordnance disposal area and old skeet and trap ranges. Chemical contamination was found associated with these sources as well as forest burn activities. Contaminants of Concern (COCs) were identified and the extent of contamination determined. The Record of Decision (ROD) (Tetra Tech, 2008) specified removal of contamination soil to meet current land use and to prevent unacceptable ecological exposure.

Soil sampling location figures supporting this evaluation are attached (Figures 1 through 4) and show the extent of the comprehensive chemical investigation at Site 15. PAHs and lead contamination, respectively, are likely the result of clay pigeons/forest burn and lead shot from the skeet and trap operations. The extent of lead and PAH contaminated soil was delineated and contaminated soil excavated to meet current land use requirements. Similarly, the extent of TRPH contaminated soil has been delineated and excavated to meet current land use. Environmental investigations show that other organic compounds, dioxins, perchlorate, nitroaromatics, and other Target Analyte List (TAL) metals are not COCs. Although nitroglycerin (propellant) has not been investigated, soil in the area where propellant would be expected (reportedly rocket propellant was reportedly placed on the ground, ignited, and presumed to be consumed) in the area of the burn chamber was removed during the 2008/2009 soil removal effort. Groundwater concentrations were not at levels of concern, although note that one monitoring well remains on site to further assess arsenic, this monitoring well is scheduled to be abandoned prior to the beginning of any MEC remedial activties.

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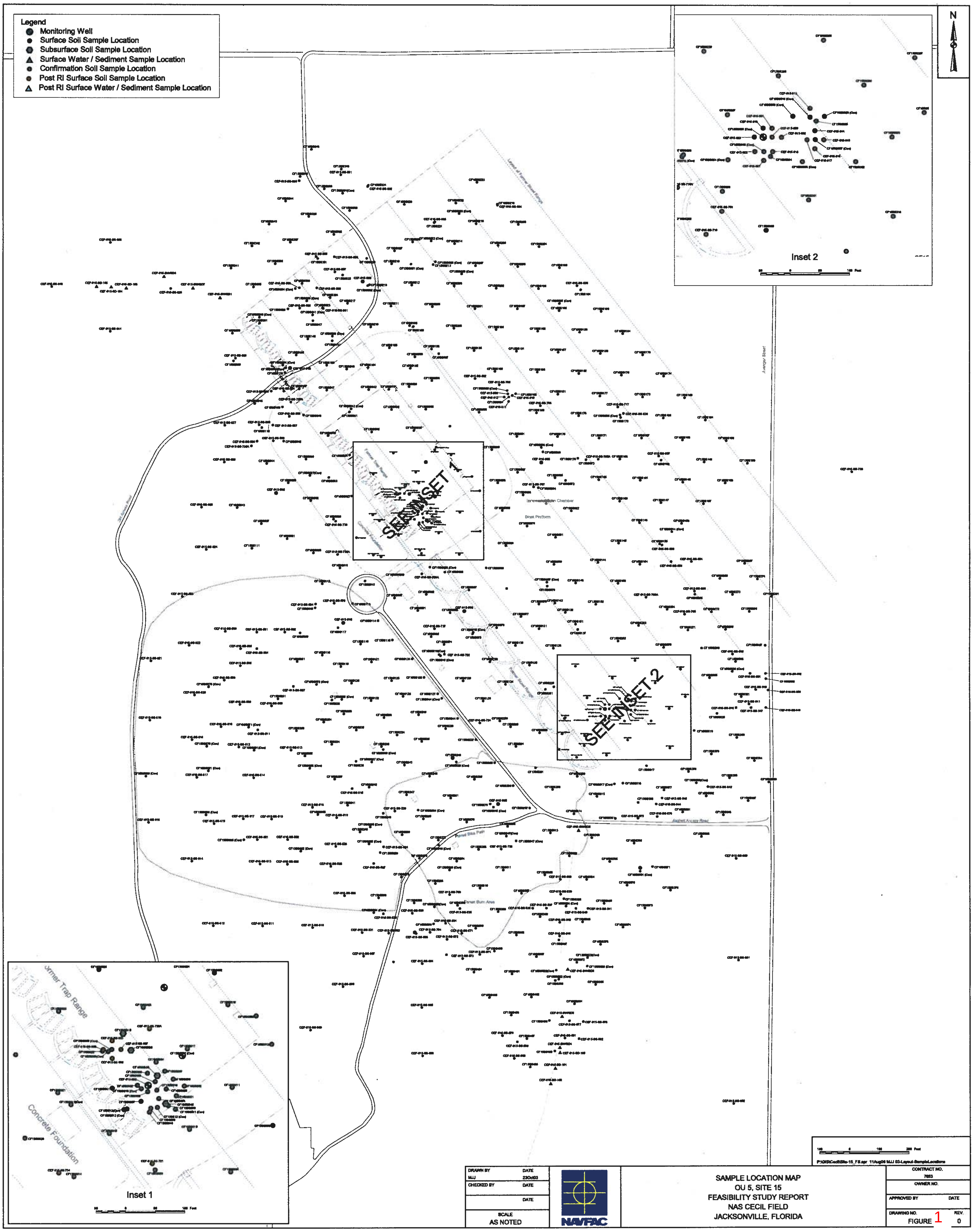
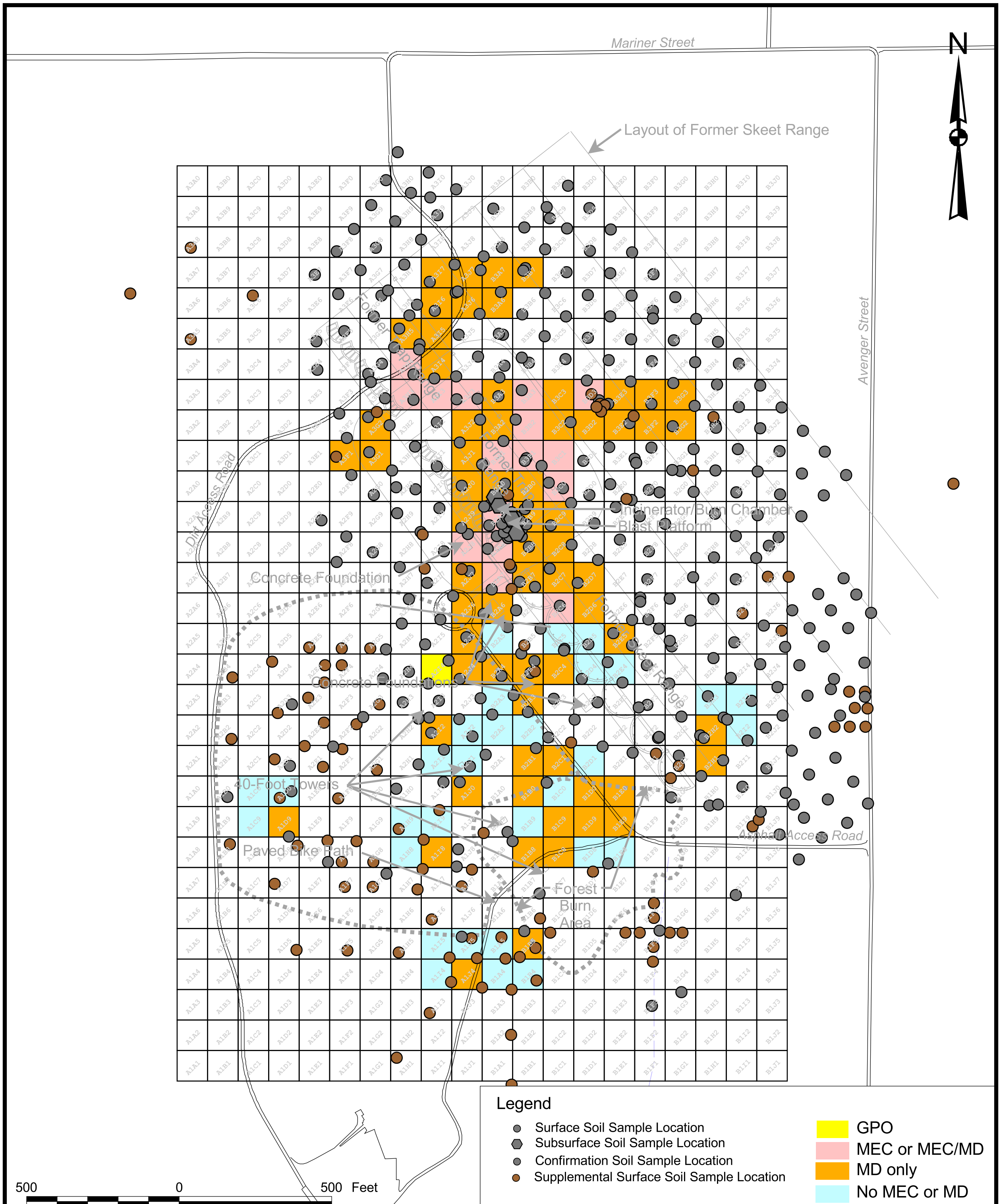
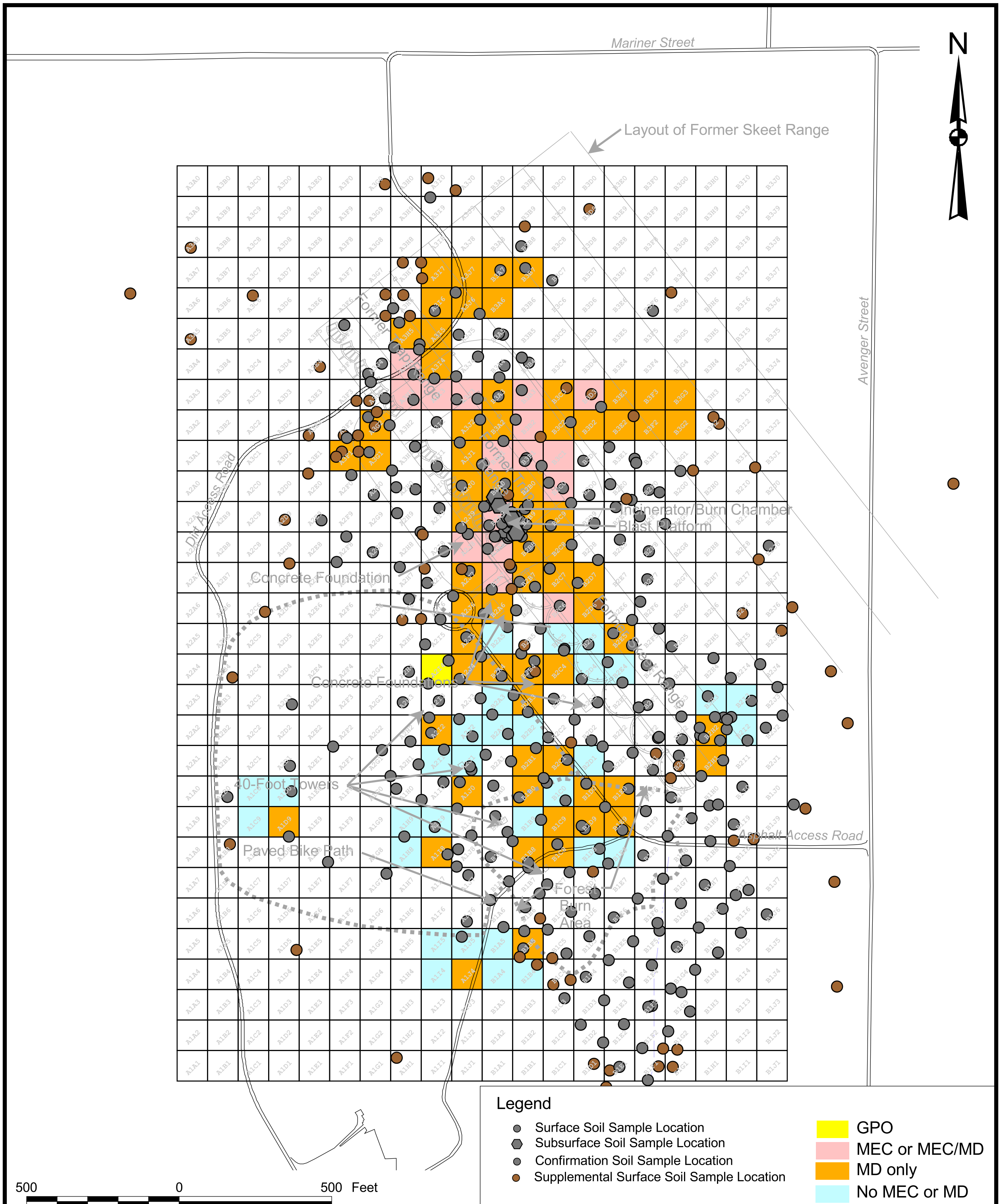


Legend
Monitoring Well
Surface Soil Sample Location
Subsurface Soil Sample Location
Surface Water / Sediment Sample Location
Confirmation Soil Sample Location
Post RI Surface Soil Sample Location
Post RI Surface Water / Sediment Sample Location
N
SEE INSET 1
SEE INSET 2
Inset 1
Inset 2
Concrete Foundation
DRAWN BY
MJJ
DATE
23Oct03
CHECKED BY
DATE
DATE
SCALE
AS NOTED
NAVFAC
SAMPLE LOCATION MAP
OU 5, SITE 15
FEASIBILITY STUDY REPORT
NAS CECIL FIELD
JACKSONVILLE, FLORIDA
CONTRACT NO.
7053
OWNER NO.
APPROVED BY
DATE
DRAWING NO.
FIGURE 1
REV.
0



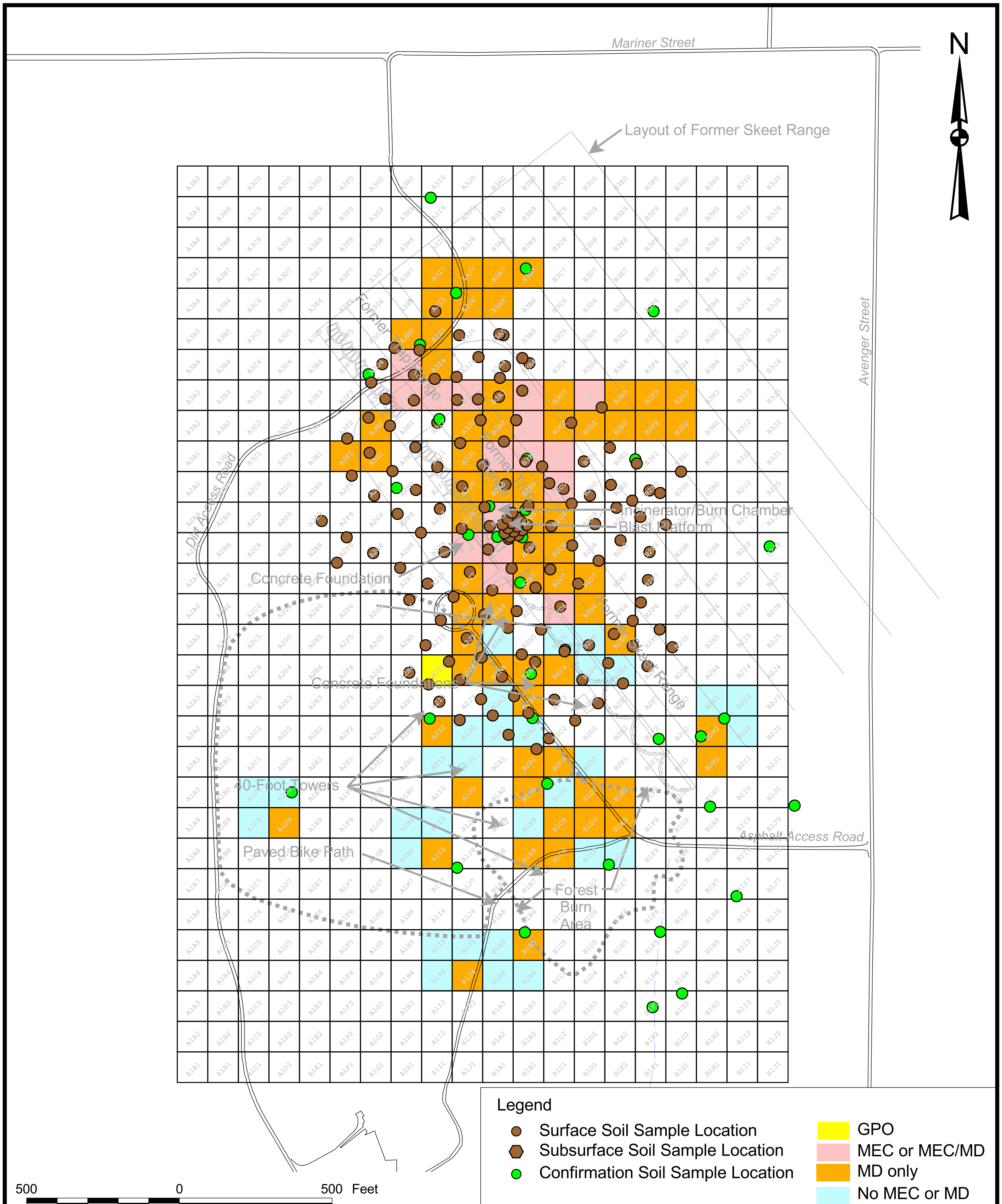

| DRAWN BY | DATE | | SUPPLEMENTAL SURFACE SOIL/SEDIMENT SAMPLING LOCATIONS SELECTED FOR LEAD ANALYSIS OU 5, SITE 15 NAS CECIL FIELD JACKSONVILLE, FLORIDA | CONTRACT NUMBER 2267 | |
|---|---|---|---|---|---|
| MJJ | 31Oct09 | NAVFAC | | APPROVED BY | DATE |
| CHECKED BY | DATE | | | APPROVED BY | DATE |
| COST/SCHEDULE-AREA | | | | DRAWING NO. FIGURE 2 | REV 0 |
| SCALE AS NOTED | | | | | |

P:\GIS\NAS_CecilField\Site-15_20100120.apr 16Mar10 MJJ 10-Layout-PostLead_Samples




| DRAWN BY MJJ | DATE 31Oct09 | | SUPPLEMENTAL SURFACE SOIL/SEDIMENT SAMPLING LOCATIONS SELECTED FOR PAH ANALYSIS OU 5, SITE 15 NAS CECIL FIELD JACKSONVILLE, FLORIDA | CONTRACT NUMBER 2267 | |
|---|---|---|---|---|---|
| CHECKED BY | DATE | NAVFAC | | APPROVED BY | DATE |
| COST/SCHEDULE-AREA | | | | APPROVED BY | DATE |
| SCALE AS NOTED | | | | DRAWING NO. FIGURE 3 | REV 0 |

P:\GIS\NAS_CecilField\Site-15_20100120.apr 16Mar10 MJJ 09-Layout-PostPAH_Samples




| DRAWN BY | DATE | | RI SAMPLING LOCATIONS SELECTED FOR TNT SCREENING & CONFIRMATORY SAMPLING OU 5, SITE 15 NAS CECIL FIELD JACKSONVILLE, FLORIDA | CONTRACT NUMBER 2267 | |
|---|---|---|---|---|---|
| MJJ | 31Oct09 | NAVFAC | | APPROVED BY | DATE |
| CHECKED BY | DATE | | | APPROVED BY | DATE |
| COST/SCHEDULE-AREA | | | | DRAWING NO. FIGURE 4 | REV 0 |
| SCALE AS NOTED | | | | | |

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# A-2 LEAD AND BaPEq BACKGROUND INFORMATION

## Section 1.0 from the Amended Feasibility Study Report (Tetra Tech, 2008)

# 1.0 INTRODUCTION

### 1.1 PURPOSE AND SCOPE OF REPORT

This Amended Feasibility Study (FS) Report for Operable Unit (OU) 5, Site 15 at Naval Air Station (NAS) Cecil Field in Jacksonville, Florida, has been prepared by Tetra Tech NUS, Inc. (TtNUS) for Naval Facilities Engineering Command Southeast (NAVFAC SE) under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Program, Contract Number N62467-94-D-0888, Contract Task Order (CTO) 0039. This report describes the formulation and evaluation of remedial action alternatives for soil at Site 15, the Blue 10 Ordnance Disposal Area.

This FS was conducted to establish Remedial Action Objectives (RAOs) and remedial pickup levels, to screen remedial technologies, and to assemble, evaluate, and compare remedial alternatives. The FS focuses on soil contamination at Site 15 identified during pre-Remedial Investigation (RI) sampling, the RI, and subsequent supplemental sampling.

This Amended FS provides revisions to the Final FS for OU 5, Site 15, submitted in April 2007. Revisions were required because pre-excavation sampling at the site resulted in updated estimates of the amount of lead-contaminated soil that would require disposal as hazardous waste. Based on these revised estimates and the associated increased costs, an alternative evaluating on-site solidification/stabilization of lead-contaminated soil prior to off-site disposal was added to the alternatives originally evaluated.

### 1.2 SITE BACKGROUND

Figure 1-1 provides a site location map. Figure 1-2 is an aerial photograph that shows features in the vicinity of the site. Figure 1-3 provides the general arrangement of the site.

#### 1.2.1 <u>Site Description</u>

Site 15 is located in the southwestern section of the Yellow Water Weapons Area (YWWA) portion of NAS Cecil Field (Figure 1-1). The area of investigation is approximately 85 acres with elevations ranging from approximately 72 to 79 feet above mean sea level [referenced to the National Geodetic Vertical Datum (NGVD)]. The site is heavily forested, primarily with slash pine and understory vegetation and includes a paved access road, oriented northwest to southeast (Figure 1-2). Several forest fires have occurred in the area designated as the "forest burn area" on Figure 1-3, which is located in the southwestern portion of the site.

The ordnance burn chamber and static rocket firing pad are the only structures currently at the site. The burn chamber is a rounded, steel, tank-like container approximately 10 feet in length and 4 feet in height. The chamber has a burn stack that rises approximately 3 feet above the body of the chamber. Access is gained to the chamber through a 2-foot by 2-foot hinged door. When full, the burn chamber can accommodate 1.5 cubic yards ($yd^3$) of material. The static rocket firing pad is an L-shaped concrete structure approximately 10 feet long by 4 feet wide by 6 feet high. Steel firing rods are seated in the concrete at 45-degree angles. Several concrete building foundations, remnants of buildings that supported skeet range activities, are located in the area surrounding the burn chamber and firing pad.

An area of stressed vegetation, referred to as the forest burn area, is present in the southwestern portion of the site, approximately 900 feet southwest of the burn chamber and firing pad. Several slash pines are partially burned in this area. Controlled burns (burning of low-level vegetation in and around the trunks of slash pines) were commonly undertaken in this area to control understory growth in the planted pine forests. This is an area where elevated polynuclear aromatic hydrocarbon (PAH) concentrations were detected.

The primary drainage feature is a drainage ditch located south of the ordnance disposal area that drains the southern part of the site into a low-lying, swampy area and eventually into Yellow Water Creek. The northern part of the site drains overland into a swamp, which drains into Caldwell Branch (located approximately 1,000 feet west of the site) and eventually into Yellow Water Creek. Drainage features are not distinct in the central portion of the site. The majority of Site 15 remains dry throughout the year; however, the central area of the site may contain 2 to 4 inches of standing water during portions of the year. Site 15 was originally defined as an approximately 10-acre area around the burn chamber and firing pad. However, evaluation of surface soil screening data indicated PAH and lead contamination over a larger area, and the size of the site was increased to approximately 85 acres. The site boundaries were extending radially around the burn chamber and firing pad, to the south to include the forest burn area, and to the north and west to include the areas of the former trap and skeet ranges. The trap and skeet ranges were included because it was interpreted that lead shot from shooting activities was the main source of lead contamination. The forest burn area was included because combustion products of wood may produce organic residue similar to other organic burning reactions. This area is heavily planted with slash pines and typically supports a 4- to 6-inch cover of duff (pine straw and other forest detritus) over the land surface. The primary residuals produced from wood and forest floor duff and litter burning would be PAHs.

### 1.2.2 Site History

From the early 1940s to the mid-1950s, the site was used as a skeet range. The former skeet range was approximately 1,000 feet by 2,400 feet in size, with the long axis of the range parallel to and east of the access road to the burn chamber.

Ordnance was disposed at Site 15 from the mid-1960s through 1977, and disposal activities consisted of burning of ordnance materials in a large metal chamber and static firing of rockets (Envirodyne Engineers, 1985). The majority of ordnance disposed at the site was burned and included small arms munitions up to 20 millimeters in size, parachute and distress flares, Mark IV signal cartridges, rocket igniters, cartridge activated devices (CADs), and 2.75-inch and 5-inch rockets. Rocket propellant also was reportedly placed on the ground and ignited in the area of the burn chamber. Rockets were disposed by static firing of both 2.75-inch and 5-inch rockets from a firing pad located south of the burn chamber. An estimated 2.5 tons of ordnance was disposed at the site each month; overall, an estimated 350 tons of ordnance were disposed during site operations.

Review of aerial photographs from 1952, prior to the initiation of ordnance disposal on Site 15, shows an active skeet range facility at the site. The area covered by the skeet range appears relatively large, approximately 50 acres in size, and is centered over the area in which the burn chamber and firing pad were constructed. Photographs taken in 1960 show the lineaments of the skeet range; however, the range did not appear to be active at that time. Photographs taken in 1980 no longer show any indication that a skeet range had once occupied the area. The site appears mostly forested in photographs taken in 1980, with a 3-acre open area immediately north of Site 15. No visual evidence of ordnance disposal was apparent at that time, which supports the historical documentation. Forest burning has continued in the southwestern corner of Site 15. The latest burning event took place in the spring of 1999.

### 1.2.3 Site Characteristics

The following sections discuss the site-specific physical characteristics of Site 15, including surface hydrology, soil characteristics, and groundwater.

#### 1.2.3.1 Surface Hydrology

Drainage at Site 15 is limited because only two drainage pathways intersect the general area of the site. The primary pathway is a relatively short drainage ditch, 500 feet in length, that drains the south-central section of the site. It appears to be a natural drainage conduit that begins in a shallow depression 3 to 4 feet in depth and 10 to 12 feet in width. The shallow depression is located adjacent to and south of the paved road in the south-central portion of the site and drains into Yellow Water Creek. Flow through the drainage ditch is intermittent and the rate of flow depends on rainfall and could be fed by groundwater at certain times of the year. The second drainage pathway is a drainage ditch that flows past the northwestern perimeter of the site. This drainage ditch is relatively shallow, 8 to 10 inches in depth, and approximately 2 to 3 feet wide. Flow through the drainage ditch is also intermittent, and the rate of flow depends on rainfall. This drainage ditch drains southwest into Caldwell Branch and ultimately into Yellow Water Creek.

#### 1.2.3.2 Soil

Three soil types cover Site 15 in nearly equal percentages, the Olustee Fine Sand, Leon Fine Sand, and Ridgeland Fine Sand. Each of the three soil types is described as a nearly level, poorly drained soil found in broad flatwood areas. Natural vegetation associated with these soil types consists predominantly of oak, pine, and saw palmetto. Depth to groundwater ranges from less than 10 inches below ground surface (bgs) for 2 to 4 months of the year to 10 to 40 inches bgs during the remainder of the year. Permeability through the upper 6 inches of each soil type is moderate to rapid (USDA, 1978).

#### 1.2.3.3 Groundwater

Three water-bearing systems are present beneath Site 15, including, in descending order, the surficial aquifer system, the intermediate aquifer and confining units, and the Floridan Aquifer system. Only the surficial aquifer was investigated at Site 15 because the other two aquifers, the intermediate and Floridan, are much deeper and overlaid by confining formations that shield them from typical environmental impacts.

The surficial aquifer at Site 15 is composed predominantly of sand from the ground surface to an approximate depth of 66 feet bgs. The water table is unconfined beneath the site and may range between 1 and 4 feet bgs during the year depending on rainfall events. The maximum total depth of monitoring wells installed in the surficial aquifer at Site 15 was approximately 14 feet bgs. Sand was reported from the ground surface to the total depth of each of the monitoring wells.

### 1.2.4 <u>Site Investigations</u>

Several environmental investigations were performed at Site 15 as part of the Navy's Installation Restoration (IR) Program conducted under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as administered by the Federal Facility Agreement (FFA) signed by the United States Environmental Protection Agency (U.S. EPA), Navy, and Florida Department of Environmental Protection (FDEP). Extensive investigations of Site 15 were conducted beginning in 1985 and continuing through the preparation of this FS. During this period, 853 soil samples, 13 sediment samples, 7 surface water samples, 40 groundwater samples, and 15 ecological samples were collected and analyzed. Figure 1-5 shows all sample locations. Figure 1-6 shows the PAH sampling locations selected during the RI screening and confirmatory sampling of surface soil, subsurface soil, and sediment. Figure 1-7 shows the lead sampling locations selected during the RI screening and confirmatory sampling of surface soil, subsurface soil, and sediment. Figures 1-8 and 1-9 show the trinitrotoluene (TNT) and total recoverable petroleum hydrocarbon (TRPH) sampling locations selected during the RI screening of surface soils. Figures 1-10, 1-11, 1-12, and 1-13 show supplemental sample locations for PAH, lead, arsenic, and TRPH analyses, respectively, with respect to the historical sample locations for the same analyses during the RI. Figures 1-14 and 1-15 show isoconcentration contours for PAHs in terms of benzo(a)pyrene equivalents (BaPEqs) and lead based on all surface soil samples collected during screening, confirmatory, and supplemental programs. Figure 1-16 shows monitoring well locations and groundwater sampling results for arsenic during the RI and subsequent sampling at Site 15.

The following provides a chronological list of the investigations conducted at Site 15:

- 1985 - An Initial Assessment Study (IAS) was prepared for NAS Cecil Field by Envirodyne Engineers under the Navy Assessment and Control of Installation Pollutants (NACIP) program, which was eventually replaced by the Navy's Installation Restoration (IR) Program. The IAS consisted of the following stages: (1) records search, (2) on-site survey, (3) confirmation study ranking, (4) site ranking, and (5) confirmation study recommendations.

- 1988 - A Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) was performed for NAS Cecil Field by Harding Lawson Associates (HLA) (1988a). The goals of the RFI were to verify the existence of suspected hazardous constituents at various waste disposal sites, to delineate the boundaries of potentially contaminated sites, to investigate the surficial aquifer and potable water supply wells, and to investigate selected surface areas for possible contamination. One surface soil sample was collected at Site 15 as part of the RFI. A geophysical survey was also conducted at the site.

- July 1993 - As part of the Basewide Ecological Assessment, one soil sample was collected at Site 15 (HLA, 1998b).

- August 1994 to April 1995 - As part of the OU 5 RI (ABB-ES, 1997) a field screening program consisting of an unexploded ordnance (UXO) survey, surface and subsurface soil screening, and installation of piezometers was completed. The UXO survey was completed at the site prior to the sampling activities. No UXO was found; however, several pieces of metal shell casings and similar items were located and removed. The soil screening program was designed to delineate the nature and extent of PAH, lead, TNT, and TRPH contamination in surface soil using on-site and off-site data analysis. Surface soil screening consisted of sample collection from 0 to 1 foot bgs at 100-foot grid spacing over an area approximately 2,000 feet by 3,000 feet, except in the area around the burn chamber and blast platform, where the grid spacing was increased to 25 feet over an area of 100 feet by 100 feet. Collection and analysis of samples for target screening parameters continued outward from the burn chamber and firing pad until a "no detection" result was obtained for that particular parameter, thus delineating the extent of contamination for that parameter. Analyses for other target parameters with detections continued outward. This screening technique resulted in varying combinations of analyses for samples collected from 409 locations. A total of 324 samples were collected for off-site lead analysis, 263 samples were collected for on-site PAH analysis, 146 samples were collected for on-site TNT analysis, and 136 samples were collected for on-site TRPH analysis during the surface soil screening program. Subsurface soil screening consisted of the collection of 16 subsurface soil samples from four soil borings advanced in the area of the burn chamber and blast platform. Samples were collected at depths of 0 to 1 foot bgs, 1 to 3 feet bgs, 3 to 5 feet bgs, and 5 to 7 feet bgs at each of the four borings. Subsurface soil samples were analyzed off site for lead and on site for volatile organic compounds (VOCs), PAHs, and TRPH. Four temporary piezometers were installed to determine the direction of groundwater flow in the surficial aquifer. Evaluation of water level data collected on three separate occasions indicated that groundwater flow is to the southwest toward Yellow Water Creek. A groundwater screening program was not implemented at Site 15 because the chemicals of concern (COCs) were known to be relatively immobile when sorbed to site soil. However, eight monitoring wells, which would be used during the confirmatory sampling event, were installed at locations selected based on water level data.

- July and August 1995 - As part of the OU 5 RI, ABB-ES performed confirmatory sampling and analysis for surface and subsurface soil at Site 15 to refine the nature and extent of contamination in soil determined during the screening process. During this sampling round, 34 surface soil samples were collected at depths of 0 to 1 foot bgs and analyzed for Target Compound List (TCL) organics, Target Analyte List (TAL) inorganics, TRPH, and nitroaromatics. Six additional surface soil samples were analyzed for lead, four additional surface soil samples were analyzed for PAHs, and three additional surface soil samples were analyzed for nitroaromatics. Two of the surface soil samples were also analyzed for pH, moisture content, sieve and hydrometer size distribution, bulk density, and cation exchange capacity. Also during this sampling round, 12 subsurface soil samples were collected at depths of 1 to 3 feet (immediately above the water table) and were analyzed for TCL organics, TAL inorganics, TRPH, and nitroaromatics. In addition, four of these samples were analyzed for total organic carbon (TOC). One additional subsurface soil sample was analyzed for PAHs only, and one additional subsurface soil sample was analyzed for nitroaromatics only. Confirmatory groundwater samples collected from the eight Site 15 monitoring wells were analyzed for TCL organics, TAL inorganics, TRPH, and nitroaromatics. Selected groundwater samples were also submitted for TOC analysis, and slug tests on the monitoring wells were performed. A confirmatory surface water and sediment sampling program was completed to assess potential contaminant migration through groundwater-surface water interaction, surface runoff, and/or soil erosion, and to aid in assessment of potential human health and ecological risks. One surface water/sediment sample upgradient of the site and two downgradient surface water/sediment samples were collected and analyzed for TCL organics, TAL inorganics, TRPH, and nitroaromatics. Surface water samples were analyzed for cyanide, hexavalent chromium, sulfide, total dissolved solids (TDS), alkalinity, hardness, total phosphate, and Kjeldahl nitrogen. Field measurements of surface water pH, temperature, turbidity, conductivity, and dissolved oxygen were recorded at each location at the time of sample collection.

- June 1996 - Soil toxicity testing to evaluate ecological risk was preformed. Six soil samples, including a reference sample, were collected for whole-soil toxicity testing. Two additional soil samples were also collected for definitive (dilution series) toxicity testing.

- February 1997 - To support the RI, 38 additional surface soil samples from 17 screening locations across the site were submitted for sieve and lead analysis. The objective of this additional sampling effort was to determine if it was feasible to separate lead shot and lead shot fragments from soil, if the remaining lead shot was responsible for high lead concentrations or if concentrations are due to lead leached into the soil, if lead concentrations were localized vertically at the ground surface, and if the soil would be considered under RCRA as characteristically hazardous if excavated. Four samples from the seven locations with the highest lead concentrations were collected at 3-inch intervals from the ground surface to a depth of 1 foot. Single samples were collected from 0 to 1 foot from the remaining 10 locations of lesser lead concentrations, although concentrations at these locations exceeded the United States Environmental Protection Agency (U.S. EPA) soil screening value (400 mg/kg). All samples were submitted for lead analysis and Toxicity Characteristic Leaching Procedure (TCLP) lead analysis. Sieve analyses were not performed.

- May 1997 - Another sampling event for surface and subsurface soils involved the collection of 14 surface soil samples analyzed for lead, nine surface soil samples analyzed for antimony and arsenic, and eight subsurface soil samples analyzed for PAHs. During this event, four sediment and surface water samples were also collected. Surface water samples were analyzed for lead; sediment samples were analyzed for lead, PAHs, and TRPH. These were the last data included in the OU 5 RI Report (ABB-ES, 1997).

- December 1997 - An additional sampling event was conducted that included the collection of nine soil samples from four locations. Seven of these samples were analyzed for antimony and arsenic, and the other two samples were analyzed for PAHs.

- April/June 1999 - A supplemental sampling event for surface soil and sediment was conducted in April and June 1999 to further determine the limits of lead and PAH contamination in surface soil to avoid having to extrapolate analytical data to verify delineation of these contaminants. This sampling event involved the collection of surface soil samples from 130 new locations. A total of 78 samples were collected for lead analysis, and 60 samples were collected for PAH analysis. Eight of the 130 surface soil locations were analyzed for PAHs and lead. During this sampling round, six sediment samples were also collected and analyzed for PAHs and lead.

- February 2000 - A supplemental sampling event to obtain data to develop site-specific leachability values for PAHs at Site 15 was conducted. Five surface soil samples were collected from 0 to 1 foot bgs for PAHs and Synthetic Precipitation Leaching Procedure (SPLP) analysis. The results of the soil SPLP analysis are presented in Appendix A.

- April 2000 - Groundwater samples were collected from the eight existing wells at the site and analyzed for PAHs, nitroaromatics, arsenic, antimony, and lead. Because of high turbidity, one of the wells was redeveloped and resampled for the inorganics. The results of the groundwater analyses are presented in Appendix A.

- June 2001 - A supplemental sampling event was conducted to support an ecological study. Soil samples were collected from locations with a range of previous lead detections for subsequent invertebrate sampling. Thirty-one surface soil samples were collected from the first 3 inches of mineral soil and the overlying duff (decaying organic matter) and analyzed for lead. Based on results of this sampling, 15 invertebrate samples were collected and analyzed for lead. This investigation was conducted to generate ecologically based remediation goals for PAHs and lead in surface soil at the site. The results of this sampling event are presented in the Development of Ecologically Based Remediation Goals for Lead and PAHs in Soil (TtNUS, 2001b) provided in Appendix B.

- May 2003 - A supplemental sampling event was conducted to delineate the vertical extent of PAH and lead contamination and to delineate the horizontal extent of arsenic contamination. Thirty-eight surface soil samples were collected, 17 samples from 0 to 1 foot bgs and 21 samples from 1 to 2 feet bgs.

- June to August 2003 - Another supplemental sampling event was conducted to delineate the vertical extent of TRPH and lead contamination and to delineate the horizontal extent of arsenic contamination in soil. Six soil samples were collected, three samples from 0 to 1 foot bgs, one sample from 1 to 2 feet bgs, and two samples from 2 to 3 feet bgs. This investigation also included the installation of six new monitoring wells and collection of groundwater samples from these new wells and one existing well. The new monitoring wells were installed at locations where soil contaminant concentrations exceeded Florida Department of Environmental Protection (FDEP) Soil Cleanup Target Levels (SCTLs) for leachability based on groundwater criteria. The results of this investigation were used to eliminate groundwater as a medium of concern as identified in the Groundwater Technical Memorandum for No Further Action in Appendix A.1 and in the addendum to this report entitled Supplement to Groundwater Technical Memorandum for No Further Action provided in Appendix A.2, which specifically addresses potential arsenic contamination identified in one well due to a change in the regulatory criteria subsequent to this sampling effort.

- October 2003 - A wetland delineation study was performed to identify areas meeting the U.S. EPA and United States Army Corps of Engineers (COE) definition of wetlands under Section 404 of the Clean Water Act [33 United States Code (USC) 1344]. The delineation also identified areas meeting the definition of wetlands used by the FDEP and St. Johns River Water Management District under Chapter 62-340, F.A.C. Six areas were identified within Site 15 as meeting the U.S. EPA and COE delineation criteria. These areas were designated as Wetlands A, B, C, D, E, and F. These six areas also meet the FDEP and St. Johns River Water Management District delineation criteria. All are non-tidal, freshwater wetlands. Wetlands A, B, C, D, and E was classified as “adjacent” wetlands subject to regulation under Section 404 of the Clean Water Act. Wetland F was classified as an “isolated” wetland not under Section 404 jurisdiction. The study showed that the three larger wetlands (A, C, and D) appear to be of natural origin, providing a good habitat for terrestrial wildlife and offering substantial aesthetic and scientific value as natural features. As such, it was recommended that efforts be made to minimize disturbance of these three wetlands during any remediation at Site 15 and that they be restored following such remediation. The study also showed that three smaller wetlands (B, E, and F) appear to be of man-made origin and are clearly of lower significance with respect to wetland values and functions. Although these smaller are still subject to federal and/or state regulation, extraordinary efforts to minimize their disturbance or to restore them were not recommended. The Wetland Delineation Report (TtNUS, 2003b) is provided as Appendix C.

- Late 2003 to early 2004 - A Geostatistical Assessment Report (Newfields, 2004) was prepared for soil data to develop more accurate estimates of the areas and volumes requiring remediation based on human health and ecological criteria. This report was used to identify and delineate the following areas:

- Areas where concentrations of lead in soil are greater than the 6,500 mg/kg acute human health toxicity criterion.

- Areas to be excavated so that the mean soil lead concentration of any 2-acre parcel is less than the 2,512 mg/kg mammalian ecological criterion.

- Areas to be excavated so that the site-wide 95-percent upper confidence limit (UCL) of the mean concentration of BaPEqs in post-excavation soil is less than the 2,250 μg/kg human health toxicity criterion.

- Areas where concentrations of BaPEqs in soil are greater than 6,750 μg/kg, or three times the human health toxicity criterion.

Based on the above criteria, the geostatistical assessment determined that the areas to be excavated for lead totaled 1.84 acres and those to be excavated for BaPEqs totaled 5.33 acres, with no overlap. Assuming a 1-foot excavation depth, the total excavation volume was estimated as approximately 11,600 $yd^3$. The assessment also concluded that Site 15 has been thoroughly sampled for both lead and BaPEqs and that available data more than adequately characterized surficial soil at the site. Because of this and also because excavated soil would be replaced with clean fill, confirmation (post-excavation) sampling would not be warranted. A copy of the Geostatistical Assessment Report is provided as Appendix D.

- January 2005 - Supplemental sampling was performed. The first objective of this sampling was to investigate the potential for dioxins [polychlorinated dibenzo-p-dioxin (PCDD)/polychlolrinated dibenzofuran (PCDF)] to be present in soil immediately beyond the proposed excavation area around the burn chamber and static rocket stand. The second objective of this sampling was to investigate the potential for perchlorate to be present in groundwater of the same area. During this investigation, two surface soil samples were collected and analyzed for dioxin, and two groundwater samples were collected from existing monitoring wells CEF-015-02S and -11S and analyzed for perchlorate. Analytical results for these samples showed no exceedances.

- August 2006 - Wells CEF-015-01S and -05S were reinstalled (as CEF-015-01SR and CEF-015-05SR, respectively) and sampled to investigate exceedances of the RDX (CEF-015-01S only) and 4,4'-DDE FDEP Groundwater Cleanup Target Levels (GCTLs) detected in 1995 in these wells, which had since been abandoned (TtNUS, 2006b). RDX and 4,4'-DDE concentrations were less than analytical detection limits (0.07 μg/L for RDX, 0.02 μg/L for 4,4'-DDE) at both locations.

- November 2005 to February 2007. Three rounds of additional groundwater sampling were performed in the vicinity of well CEF-015-13S where a filtered arsenic concentration of 13.7 µg/L had been detected in July 2003. At that time, this concentration was less than the arsenic federal Maximum Contaminant Level (MCL) and FDEP GCTL, but these criteria were subsequently revised from 50 to 10 µg/L, prompting further investigation. In addition, the groundwater sample collected from well CEF-015-13S in 2003 was very turbid, with a reading of greater than 1,000 nephelometric turbidity units (NTUs), which cast doubt on the validity of the analytical results. In November 2005, well CEF-015-15S was installed and sampled at the location of well CEF-015-13S, which had been abandoned along with the other Site 15 wells. The unfiltered arsenic concentration measured in that sample was 16.5 µg/L, which was still greater than the revised MCL and GCTL, but groundwater turbidity was again very high, measuring approximately 500 NTUs immediately before collection of the filtered sample. Well CEF-015-15S was resampled on March 15, 2006, but sample turbidity was again greater than 1,000 NTUs, and the unfiltered arsenic concentration was 14.7 µg/L. In an effort to obtain a suitable sample, a new smaller (1-inch-diameter) (direct-push technology) DPT well identified as CEF-015-13S(R) was installed a few feet away from the location of CEF-015-15S and sampled on March 21, 2006. However, a clear sample still could not be obtained, and the unfiltered arsenic concentration was 22.4 µg/L. Finally, in February 2007, a new 2-inch well identified as CEF-015-16S was installed at the same location but with a larger diameter fine sand pack (30/45) and a smaller screen slot size (0.006-inch). After several days of purging, groundwater turbidity was reduced to approximately 110 NTUs, which is still greater than what standard procedures generally identify as appropriate (10 NTUs), but the sample was relatively clear compared to the samples previously submitted. The unfiltered arsenic concentration of this sample was less than the analytical detection limit of 2.8 µg/L.

  As presented in the Supplement to Groundwater Technical Memorandum for No Further Action provided in Appendix A.2, the monitoring wells installed in the CEF-015-13S area were never able to be developed to provide a representative groundwater sample due to high turbidities, and these samples should not have been submitted for analysis with turbidities in the ranges identified. The NAS Cecil Field Base Realignment and Closure (BRAC) Cleanup Team (BCT) discussed conducting additional groundwater investigation using DPT at the site; however, based on the problems with the temporary wells installed using DPT in the CEF-015-13S area, the decision to install the permanent, 2-inch well identified as CEF-015-16S was made, which did produce a more representative groundwater sample with lower turbidity.

## 1.3 SUMMARY OF SITE INVESTIGATION RESULTS

The analytical results obtained during the investigation of Site 15 have been organized by medium and are provided in Appendix E. The following sections provide details regarding the investigation of these media.

### 1.3.1 Summary of 1988 RFI Results

The one surface soil sample collected at Site 15 during the base-wide RFI contained lead and 14 PAHs at concentrations greater than detection limits. The geophysical survey identified several anomalies located along the southwestern edge of the site. The RFI identified that additional investigation of Site 15 was warranted.

### 1.3.2 Summary of Field Investigations

Surface soil, subsurface soil, groundwater, surface water, and sediment were collected during the screening, confirmatory, and supplemental sampling programs. As part of the OU 5 RI, assessments of contaminant fate and transport, human health risks, and ecological risks were also performed.

## 1.4 NATURE AND EXTENT OF CONTAMINATION

Surface soil, subsurface soil, surface water, sediment, and groundwater results will be discussed in this section, with the focus on those contaminants that determine the extent of remediation.

### 1.4.1 Surface Soil

During the initial field screening program, conducted from April 1994 to April 1995, a total of 409 samples were collected and analyzed on site for PAHs (U.S. EPA Method 8310), TNT (U.S. EPA Draft Method 8515), TRPH (U.S. EPA Method 418.1), and off site at a fixed-base laboratory for lead (U.S. EPA Method 6010). Only data from the samples analyzed at the fixed-base laboratory are included in tables. All of the samples collected during the subsequent confirmatory and supplemental sampling programs were analyzed off site at a fixed-base laboratory.

During various sampling events at Site 15, a total of 783 surface soil samples were collected and analyzed for a variety of constituents. Tables 1-1 and 1-2 summarize the frequencies of detection, concentration ranges, and cleanup goals for organics and inorganics, respectively, in surface soil. Only constituents detected at least once in screening, confirmatory, or post-RI sampling of surface soil at Site 15 are presented in these tables. The cleanup goals presented are the most restrictive of the FDEP residential direct exposure or leachability to groundwater SCTLs. The NAS Cecil Field Inorganic Background Data Set (IBDS) concentrations are also shown in Table 1-2 for inorganics (HLA, 1998a).

During the field screening, confirmatory sampling, and supplemental sampling programs, lead was detected in 555 of 584 samples at concentrations ranging from 1.1 to 65,500 mg/kg. Maximum concentrations were detected downrange of the trap and skeet field and approximately 750 feet north of the ordnance disposal areas. Lead concentrations greater than the U.S. EPA recommended lead screening criterion and FDEP SCTL of 400 mg/kg were distributed over a wide area associated with the trap and skeet range.

During the field screening program, PAHs were detected in 171 of 263 samples at concentrations ranging from 0.2 to 13,000 mg/kg (expressed as total PAHs). These results indicated a widespread distribution of PAHs, with the greatest concentrations in samples collected in the burn chamber and blast platform area and in the forest burn area. TNT was detected during the field screening program in 30 of 146 samples at concentrations ranging from 1.0 to 68 mg/kg. TNT was not detected during the confirmatory sampling program. The greatest concentrations of TNT were detected about 100 feet north of the burn chamber and blast platform areas. TRPH was detected in 26 of 136 field screening samples at concentrations ranging from 10 to 430 mg/kg. Maximum concentrations of TRPH were detected along the southwestern side of the former trap and skeet range.

The confirmatory and supplemental sampling programs verified that surface soil contamination at the site is generally continuous and widespread, covering an area of approximately 75 acres, with discrete areas of greater concentrations not always coincident for each of the contaminants.

During the field screening, confirmatory sampling, and supplemental sampling programs, the following organics were detected in surface soil samples from Site 15:

- VOCs – acetone and xylenes.
- Nitroaromatics – 3-nitrotoluene, 4-nitrotoluene, and cyclotetramethylenetetranitramine (HMX), and TNT.
- Pesticides – 4,4' DDE, 4,4'-DDT, dieldrin, Endosulfan II, endrin aldehyde, and methoxychlor.
- Semivolatile organic compounds (SVOCs) – 18 PAHs, three phthalates, carbazole, and dibenzofuran.
- TRPH.

Twenty-three inorganics were also detected in surface soil samples from Site 15.

Organic compounds detected at concentrations greater than SCTLs included the following:

- Benzo(a)pyrene equivalents (BaPEqs) – greater than the benzo(a)pyrene residential SCTL
- Fourteen PAHs – greater than leachability SCTLs
- Carbazole, dieldrin, 3-nitrotoluene, 4-nitrotoulene – greater than leachability SCTLs
- TRPH – greater than leachability SCTLs

Inorganics detected at concentrations greater than SCTLs and IBDS values include antimony, arsenic, and lead.

Soil samples collected in February 1997 were used to evaluate the leachability of lead and particulate distribution characteristics of lead contamination at the site. The results of this sampling effort indicated that most of the lead shot at the site had been oxidized and by that time was associated with medium- to fine-grained sand, with smaller amounts associated with silt and clay soil fractions. As a result, there would be little benefit in sieving out the remaining lead shot from Site 15 soil. The data also showed that, although lead concentrations decreased with depth, decreases were not significant enough to warrant remediation to a depth of less than 1 foot. Finally, based on the results of lead TCLP data, soil samples containing lead concentrations greater than 700 mg/kg generally failed to meet the TCLP lead regulatory level of 5.0 milligrams per liter for classifying potential solid waste (excavated contaminated soil) as hazardous waste (ABB-ES, 1998). Prior to off-site disposal, the soil being excavated for lead contamination would be tested for leachability characteristics to determine proper classification.

### 1.4.2 Subsurface Soil

During various investigations at Site 15, a total of 45 subsurface soil samples were collected and analyzed for a variety of constituents. Tables 1-3 and 1-4 summarize the frequencies of detection, concentration ranges, and cleanup goals (the most restrictive of the residential direct exposure and leachability to groundwater SCTLs) for organics and inorganics, respectively, detected at least once during screening, confirmatory, or supplemental sampling of subsurface soil at Site 15. IBDS concentrations are also shown in Table 1-4 for inorganics. Only results for samples analyzed at fixed-base laboratories are included in these tables.

Total PAHs were detected in 30 of 37 subsurface soil samples, with concentrations ranging from 1.5 to 366 mg/kg to a depth of 7 feet bgs. Generally, PAH concentrations decreased with depth. TRPH was detected in 11 of 17 subsurface samples collected, with concentrations ranging from 9.74 mg/kg to 103 mg/kg. Lead was detected in 17 of 19 samples to a depth of 7 feet bgs. Subsurface lead concentrations ranging from 1.1 to 223 mg/kg and were generally several orders of magnitude less than concentrations in corresponding surface soil samples.

Organics detected in subsurface soils at Site 15 included the following:

- VOCs – acetone and xylenes
- SVOCs – 16 PAHs, three phthalates, carbazole, and dibenzofuran
- TRPH

Thirteen inorganics were also detected in subsurface soil samples from Site 15.

Organic compounds detected in subsurface soil samples at concentrations greater than SCTLs included the following:

- BaPEqs – greater than the benzo(a)pyrene residential SCTL
- Six PAHs and carbazole – greater than leachability SCTLs

No inorganics were detected in subsurface soil samples at concentrations greater than SCTLs and IBDS values.

### 1.4.3 Groundwater

Table 1-5 summarizes the frequencies of detection, concentration ranges, FDEP GCTLs, U.S. EPA MCLs, and background screening concentrations for organic and inorganic analytes detected during groundwater sampling. Because bis-(2-ethylhexyl) phthalate (BEHP) is a common laboratory and field equipment contaminant, its detection at concentrations greater than the GCTL was determined not to be of concern. Aluminum was detected at concentrations greater than its GCTL but less than its IBDS value. Total arsenic concentrations in groundwater exceeded the FDEP GCTL, U.S. EPA MCL, and IBDS value. One exceedance of the 4,4'-DDE GCTL (0.26 µg/L at CEF-015-05S) and two exceedances of the RDX GCTL (0.451 µg/L at CEF-015-01S and 0.404 µg/L at CEF-015-05S) were also detected in 1995 but were not confirmed by the results of the resampling conducted in August 2006 in new wells installed at the same locations. Resampling results showed concentrations of 4,4'-DDE and RDX to be less than their respective analytical detection limits of 0.02 µg/L and 0.07 µg/L. One exceedance of the arsenic MCL and GCTL (13.7 µg/L at CEF-015-13S) was detected in July 2003 from a groundwater sample identified as having very high turbidity (greater than 1,000 NTUs). Although this exceedance was confirmed in November 2005 (16.5 µg/L at reinstalled CEF-015-13S) and in March 2006 (14.7 µg/L at reinstalled CEF-015-13S and 21.6 µg/L at new CEF-015-15S installed at same location), it was determined that the very high sample turbidities (up to 1,000 NTUs) observed in all of the collected samples were causing the elevated arsenic concentrations. All of the filtered samples had arsenic concentrations less than the FDEP GCTL and U.S. EPA MCL. Because of the high turbidities in the groundwater samples, the wells were not considered adequate to provide a representative sample from the aquifer. A third well, CEF-015-16S, was installed at the same location in February 2007. This monitoring well was a 2-inch well with a larger diameter and fine sand pack. Additionally, this well was purged for several days until the groundwater was relatively clear. The turbidity recorded prior to sample collection was reported as 110 NTUs. The unfiltered arsenic concentration detected in this last sample was less than the analytical detection limit of 2.8 µg/L, which is also less than the MCL and GCTL.

### 1.4.4 Sediment

Table 1-6 summarizes the frequencies of detection and the ranges of concentrations for analytes detected during confirmatory and supplemental sampling of Site 15 sediments. FDEP guidelines for the protection of freshwater sediment organisms are shown in Table 1-6. Because the ditches are typically dry and provide no permanent aquatic habitat, the table also includes FDEP SCTLs and IBDS concentrations. Sediment samples collected during the supplemental sampling program were collected in drainage ditches that are typically dry and contain water only intermittently after rain events (surface water samples could not be collected during the supplemental sampling program due to the lack of surface water in the ditches). One VOC, several SVOCs (including one phthalate, carbazole, and 16 PAHs), one nitroaromatic, four pesticides, TRPH, and eight inorganics were detected in sediment samples collected from the two ditches at Site 15. Maximum concentrations of 11 PAHs exceeded their respective probable effects concentrations (PECs). Maximum concentrations of three pesticides (4,4'-DDD, 4,4'-DDE, and 4,4' DDT) were greater than their respective threshold effects concentrations (TECs) but less than their respective PECs. Concentrations of these pesticides detected in Site 15 ditches were comparable to those detected at other Cecil Field locations and therefore it is probable that they are the result of previous base-wide applications for pest control. Lead was the only inorganic analyte detected at concentrations exceeding its TEC, and lead concentrations in some samples also exceeded the PEC.

### 1.4.5 Surface Water

Table 1-6 summarizes the frequencies of detection, concentration ranges, and Florida Water Quality Criteria for organics and inorganics detected during confirmatory sampling of surface water at Site 15. IBDS concentrations are also shown in Table 1-5 for inorganics. No VOCs or pesticides were detected in the three surface water samples analyzed for these constituents. Four nitroaromatics (1,3,5-trinitrobenzene, 3-nitrotoluene, 4-nitrotoluene, and tetryl), TRPH, and 11 inorganics were detected in surface water samples at Site 15. Arsenic, which was present in all three samples in which it was analyzed, was detected at concentrations less than Florida surface water standards but greater than the IBDS value. Lead, which was present in all seven samples in which it was analyzed, and aluminum and iron, which were present in all three samples in which they were analyzed, were detected at concentrations less than the IBDS value but greater than Florida surface water standards. The concentration of copper (only one detected value) slightly exceeded the surface water standard. In general, the maximum concentrations of these metals occurred in the surface water sample collected approximately 1,700 feet south of the ordnance disposal area.

## 1.5 PRELIMINARY RISK EVALUATION

The objective of a human health risk assessment is to characterize the risks associated with potential exposures to site-related constituents. As part of this FS, a human health Preliminary Risk Evaluation (PRE) was conducted. The PRE is a screening-level evaluation of potential risks from site constituents to human receptors at the site. Although a site may have numerous hypothetical receptors, it is common to use the most sensitive receptor as a site-screening tool for risk calculations. For Site 15, the protection of a hypothetical future residential receptor formed the basis for selecting chemicals of potential concern (COPCs) and for determining if potential risks at the site are significant.

### 1.5.1 Selection of Chemicals of Potential Concern

In the first step of the PRE, COPCs were selected for each medium. COPCs are potentially site related and have maximum detected concentrations greater than the lesser of the medium-specific FDEP Cleanup Target Levels (FDEP, 2005). Metals are regarded as COPCs if their concentrations are greater than background screening concentrations (IBDS values) and the lesser of the medium-specific FDEP Cleanup Target Levels.

#### 1.5.1.1 Surface Soil

To select COPCs in surface soil at Site 15, maximum detected concentrations of site constituents were compared to FDEP SCTLs for residential exposure and leachability (FDEP, 2005). For metals, the maximum concentrations were also compared to NAS Cecil Field IBDS values (HLA, 1998a). The data for surface soil are summarized in Tables 1-1 and 1-2. Table 1-8 includes the surface soil COPCs that were detected at concentrations greater than screening criteria.

No VOCs were detected In surface soil at Site 15 at concentrations greater than FDEP residential or leachability criteria. BaPEqs were identified as COPCs based on exceedances of the residential SCTL, and TRPH was identified as a COPC based on exceedances of leachability SCTLs. Antimony was identified as a COPC based on exceedances of residential and leachability SCTLs and its IBDS value. Arsenic and lead were identified as COPCs based on exceedances of residential SCTLs and IBDS values. Fourteen PAHs and carbazole were identified as COPCs in surface soil based on exceedances of leachability SCTLs (see Table 1-8).

The maximum detected concentrations of 3-nitrotoluene, 4-nitrotoluene, and dieldrin exceeded their leachability SCTLs, but these compounds were detected in less than 5 percent of the samples collected. Therefore, they are not considered COPCs based on their frequency of detection.

#### 1.5.1.2 Subsurface Soil

To select COPCs in subsurface soil at Site 15, maximum detected concentrations of site constituents were compared to the same criteria as for surface soils, FDEP SCTLs for residential exposure and leachability and IBDS values for inorganics. The data for subsurface soil are summarized in Tables 1-3 and 1-4. Table 1-9 includes the COPCs detected at concentrations greater than screening criteria.

In subsurface soil at Site 15, only SVOCs were identified as COPCs. BaPEq concentrations exceeded the residential SCTL, and six PAHs and carbazole were identified as COPCs in subsurface soil based on exceedances of leachability SCTLs.

#### 1.5.1.3 Groundwater

To select COPCs in groundwater at Site 15, maximum detected concentrations of site constituents were compared to FDEP GCTLs (FDEP, 2005), U.S. EPA MCLs (U.S. EPA, 2002), and NAS Cecil Field-specific IBDS values for inorganics (HLA, 1998a). The results of these comparisons are summarized in Table 1-5, which shows that none of the detected concentrations from samples identified as representative of the aquifer at Site 15 exceeded the screening criteria. Therefore, no groundwater COPCs were retained.

#### 1.5.1.4 Sediment

To select COPCs in sediment at Site 15, maximum detected concentrations of site constituents were compared to FDEP SCTLs (FDEP, 2005) for residential exposure and to IBDS values for inorganics. The data for sediment are summarized in Table 1-6. Table 1-10 includes COPCs detected in sediment at concentrations greater than FDEP SCTLs.

In sediment at Site 15, BaPEq concentrations were greater than the residential SCTL, and the following were identified as COPCs based on exceedances of leachability SCTLs:

- 1-Methylnaphthalene
- Acenaphthene
- Benzo(a)anthracene
- Benzo(a)pyrene

- Benzo(b)fluoroanthene
- Dibenzo(a,h)anthracene
- 4-Nitrotoluene

Lead was also identified as a COPC based on exceedances of its residential SCTL and IBDS value.

#### 1.5.1.5 Surface Water

To select COPCs in surface water at Site 15, maximum detected concentrations of site constituents were compared to FDEP freshwater surface water criteria (FDEP, 2005), and to IBDS values for inorganics. The data for surface water are summarized in Table 1-5. Table 1-11 includes COPCs detected at concentrations greater than their respective FDEP surface water criteria.

Lead was the only constituent identified as a COPC in surface water. Copper was detected at a concentration of 9 µg/L in one sample, which marginally exceeds the FDEP surface water criterion of 8.7 µg/L; therefore, it is not regarded as a COPC.

### 1.5.2 Risk Characterization

The risk characterization step of the PRE is conducted by generating a ratio between the exposure concentration and the appropriate screening value. For residential exposure, the exposure concentration is represented by the maximum detected concentration of the analyte. For industrial exposure, the exposure concentration is represented by the lesser of the 95-percent UCL of the mean or the maximum detected concentration (except for lead, see below). The maximum concentration is used for residential exposure because the exposure unit area for a residential site is typically expected to be less than 1 acre. Because industrial exposure may occur across the entire site, the UCL of the mean is generally used to represent industrial exposure. If the UCL exceeded the maximum detected concentration of a constituent, the maximum detected concentration was used as the industrial exposure concentration. UCLs of the mean were calculated using the Florida UCL (FL-UCL) tool. The statistical output of FL-UCL is presented in Appendix D.

In assessing risk for residential exposure to lead, the maximum detected concentration was compared to the residential SCTL. In assessing risk for industrial exposure to lead, the average concentration was compared to the industrial SCTL. The average concentration for lead was used because this is the input value for U.S. EPA's Adult Lead Model (U.S. EPA, 1996).

For soil and sediment, residential and industrial SCTLs correspond to a carcinogenic risk of $1 \times 10^{-6}$ and a hazard quotient (HQ) of 1.0 for carcinogens and non-carcinogens, respectively. Therefore, the ratio of the exposure concentration and the SCTL provides an indication of the total carcinogenic and non-carcinogenic risk associated with each constituent. For example, a ratio of 3 for a carcinogen indicates that the risk associated with that constituent is equivalent to $3 \times 10^{-6}$. This risk exceeds Florida's action level of $1 \times 10^{-6}$ but is within the U.S. EPA target risk range of $1 \times 10^{-4}$ to $1 \times 10^{-6}$. A ratio of 3 for a noncarcinogen indicates that the HQ is greater than 1, and there is a potential for non-carcinogenic effects upon exposure to that concentration. Also, comparisons of metals concentrations to NAS Cecil Field IBDS values (HLA, 1988a) were used to identify whether the data were truly site related.

For soil, leachability SCTLs correspond to levels protective of groundwater. Comparison to these levels are only relevant if groundwater data indicate that the constituent is present in groundwater at the site. Leachability criteria are based on conservative assumptions regarding site conditions. Therefore, the absence of a constituent's detection in groundwater in conjunction with an exceedance of its leachability SCTL is sufficient evidence that site-specific conditions do not favor leaching.

Based on FDEP guidance (FDEP, 2005), concentrations of carcinogenic PAHs (cPAHs) were converted to BaPEq concentrations and compared to benzo(a)pyrene SCTLs for direct exposure (residential and industrial). Leachability SCTLs are available for individual cPAHs. If a specific cPAH was not detected in a sample, one-half of its detection limit was used in the calculation of BaPEqs. If no cPAHs were detected in a sample, one-half of the benzo(a)pyrene detection limit was used as the BaPEq concentration. Non-carcinogenic PAH results were compared to individual FDEP SCTLs for direct exposure and leachability to groundwater.

For surface soil, BaPEqs and arsenic were the carcinogens detected at maximum concentrations greater than residential SCTLs. Together, the potential carcinogenic risk estimated for the maximum detected concentrations of these constituents was $9.8 \times 10^{-3}$ for potential future residents. This exceeds the FDEP's target risk and U.S. EPA target risk range. Using the UCL concentrations for these constituents, the potential carcinogenic risk for industrial exposure is $5.0 \times 10^{-5}$ (Table 1-12). This exceeds FDEP's target risk but is within U.S. EPA's target risk range. For surface soil, TRPH and antimony were the non-carcinogens detected at maximum concentrations greater than residential SCTLs. Together, the HQ estimated for the maximum detected concentrations of these constituents is 91.4. This exceeds the FDEP and U.S. EPA target HQ of 1.0. Using the UCL concentrations for these constituents, the potential HQ for industrial exposure is 0.98 (Table 1-12), which is less than the target HQ. With regard to exposure to lead, the maximum lead concentration exceeded the residential SCTL, but the average concentration was less than the industrial SCTL.

For surface soil, acenaphthene, fluoranthene, naphthalene, phenanthrene, pyrene, 1-methylnaphthalene 2 methylnaphthalene, and TRPH concentrations exceeded leachability SCTLs. However, these constituents were not detected in groundwater at the site; therefore, they would not be expected to pose any adverse impact to human health.

For subsurface soil, BaPEqs was the carcinogen detected at maximum concentrations greater than its residential SCTL. The potential carcinogenic risk estimated for the maximum detected concentration of BaPEqs was $4.9 \times 10^{-4}$ for potential future residents. This exceeds the target risk for FDEP and U.S. EPA. Using the UCL concentration of BaPEqs, the potential carcinogenic risk for industrial exposure is $7.4 \times 10^{-6}$ (Table 1-13). This exceeds the target risk for FDEP but is within U.S. EPA's target risk range.

For groundwater, no chemicals were detected at concentrations greater than their MCL or GCTL. Therefore, no unacceptable human health risk is associated with groundwater.

For sediment, exposure is treated in a manner similar to soil because sediments at the site are typically dry. BaPEqs was the carcinogen detected at maximum concentrations greater than its residential SCTL in sediment. The potential carcinogenic risk estimated for the maximum detected concentration of BaPEqs was $3.1 \times 10^{-4}$ for potential future residents. This exceeds FDEP's target risk and U.S. EPA's target risk range. Using the UCL concentrations for BaPEqs, the potential carcinogenic risk for industrial exposure was $4.4 \times 10^{-5}$ (Table 1-14). This exceeds the target risk for FDEP but is within the target risk range for U.S. EPA. With regard to exposure to lead, the maximum lead concentration exceeded the residential SCTL, but the average concentration was less than the industrial SCTL.

In surface water, lead was detected at concentrations greater than its FDEP surface water cleanup target level. However, the presence of surface water at the site is intermittent, and surface water contamination would not be regarded as posing a significant risk to human health.

### 1.5.3 Summary of Ecological Risk Assessment

An ecological risk assessment (ERA) for Site 15 was conducted by ABB-ES as part of OU 5 RI and was based on data from surface soil, sediment, and surface water samples collected in 1995 and 1997 (ABB-ES, 1997). Chemical concentrations in each of these media were compared to ecological screening values. In addition, the ERA evaluated risks to upper-level receptors by estimating doses for representative wildlife receptors and comparing the doses to literature-derived toxicity reference values. The ERA also incorporated soil toxicity tests using laboratory-reared earthworms (*Eisenia foetida*) and lettuce seed (*Lactuca sativa*). The initial ERA represents Step 1 (Screening Level Problem Formulation and Ecological Effects Evaluation) and Step 2 (Screening Level Exposure Estimate and Risk Calculation) of U.S. EPA's eight-step process for designing and conducting ERAs. The ERA concluded that potential risks to ecological receptors existed at the site, due primarily to lead and PAHs in soil. The ERA also concluded that potential risks to some ecological receptors might exist due to aluminum, antimony, and arsenic in soil; lead, PAHs, DDT, and its breakdown products in sediment; and lead in surface water. Subsequent to the initial ERA, several additional sampling events were conducted to further characterize locations of elevated concentrations of lead and PAHs in soil at the site. The results of the additional sampling were used to develop a draft Work Plan and Sampling and Analysis Plan, which were completed in March 2001. These plans represent Step 3 (Baseline Risk Assessment Problem Formulation) and Step 4 (Study Design and Data Quality Objective Process) of the eight-step process. Step 5 (Field Verification of Sampling Design) was conducted on May 3, 2001. The Work Plan and the Sampling and Analysis Plan were finalized on June 12, 2001 (TtNUS, 2001a). The field sampling component of Step 6 (Site Investigation and Data Analysis) was conducted from June 18 to 28, 2001. The development of remediation goals for the protection of ecological receptors is described in the document Ecologically Based Remediation Goals for Lead and PAHs in Soil, which is included in this report as Appendix B and represents the remainder of Step 6 (Data Analysis) and Step 7 (Risk Characterization). The methodologies through which the ecological cleanup goals were developed have been approved by representatives of the Navy, U.S. EPA Region 4, and FDEP. Subsections 1.5.3.1, 1.5.3.2, 1.5.3.3, and 1.5.3.4 below discuss ecological risk associated with Site 15 surface soil, groundwater, sediment, and surface water, respectively.

#### 1.5.3.1 Surface Soil

There was a moderate correlation ($r^2$ = 0.79) between aluminum concentrations and earthworm growth in toxicity tests, suggesting that aluminum in surface soil might pose risks to soil invertebrates (ABB-ES, 1997). However, statistical analyses showed that aluminum concentrations in Site 15 samples were not significantly different than aluminum concentrations in background samples (ABB-ES, 1997). Aluminum concentrations at Site 15 (88 to 7,140 mg/kg, average of 1,190 mg/kg) exceeded the Cecil Field IBDS value (4,430 mg/kg) in only 2 of 35 samples. Furthermore, earthworm 30-day survival rates in toxicity tests were not correlated with aluminum concentrations, and lettuce seed germination tests showed no adverse impacts associated with aluminum. As indicated in the 1997 ERA, aluminum would not be expected to be related to past activities at the site. Aluminum does not significantly bioaccumulate or biomagnify, and food-chain modeling showed that aluminum concentrations at Site 15 do not pose potential risks to upper-level terrestrial or aquatic receptors. Overall, ecological risk posed by aluminum was concluded to be negligible.

Toxicity data for antimony are sparse, resulting in uncertainty regarding potential toxicity at Site 15. However, antimony does not significantly bioaccumulate or biomagnify, thus it would not pose potential risks to upper-level receptors. This conclusion was supported by food-chain modeling, which showed that antimony concentrations at Site 15 do not pose potential risk to upper-level terrestrial or aquatic receptors (ABB-ES, 1997). Lettuce seed germination tests conducted in support of the 1997 ERA showed poor germination in only one sample, and antimony concentrations were lower in this sample than in other samples for which no adverse effects were observed. Thus, the germination tests did not show phytotoxic effects from antimony. In summary, although potential risk to soil invertebrates from antimony was uncertain based on the 1997 earthworm toxicity tests, the germination tests did not show phytotoxic effects from antimony. In addition, food-chain modeling showed that antimony did not pose potential risks to upper-level terrestrial or aquatic receptors. Overall risk posed by antimony appears to be negligible or minor at worst.

Arsenic was detected in 26 of 44 samples, and concentrations exceeded the U.S. EPA Region 4 ecological screening value (10 mg/kg based on plant toxicity) in 11 samples. However, lettuce seed germination tests showed poor germination in only one sample, and concentrations were lower in this sample than in other samples for which no adverse effects were observed (ABB-ES, 1997). Thus, the site-specific germination tests did not show phytotoxic effects from arsenic. Arsenic concentrations were not correlated with earthworm toxicity test results (ABB-ES, 1997). Nevertheless, arsenic can potentially be toxic to soil invertebrates at concentrations of 60 mg/kg or greater (Efroymson et al, 1997). Arsenic concentrations exceeded 60 mg/kg in two samples (451 and 96.5 mg/kg), thus arsenic could pose risk to soil invertebrates in the vicinity of these two samples (CF15SS015 and CF15SS055). Food-chain modeling indicated that arsenic might pose risk to small birds; however, associated HQs were relatively low. The maximum HQ was only 3.0 using a conservative area use factor of 100 percent (ABB-ES, 1997), which assumes that birds forage only in the vicinity of the maximum arsenic concentration. In summary, lettuce germination tests indicated negligible risk to plants. Potential risk to soil invertebrates and upper-level receptors such as birds exists only in the vicinity of two samples.

See Appendix B for an evaluation of ecological risks posed by lead and PAHs in surface soil.

#### 1.5.3.2 Groundwater

Ecological risks associated with groundwater were not evaluated during the ERA. The pathways of groundwater exposure to ecological receptors are limited to the two ditches where sediment and surface water samples were collected. The two ditches are typically dry, except in the vicinity of the culvert under the access road into the site. The ditches provide no permanent habitat for aquatic communities.

#### 1.5.3.3 Sediment

The 1997 ERA concluded that potential risks to some ecological receptors might exist due to lead, PAHs, DDT, and DDT breakdown products in sediment. The ditches from which sediment samples were collected include one in the northwestern portion of the site and one in the southern portion of the site. The northwestern ditch is typically dry, but the southern ditch often contains shallow standing water in the vicinity of the culvert under the access road into the site. The ditches provide no permanent habitat for aquatic communities, and the samples actually represent “damp soil” rather than sediment. Therefore, potential risk from lead and PAHs associated with the 13 sediment samples was evaluated as part of the assessment of soil data (see Appendix B).

Maximum concentrations of 4,4’-DDD, 4,4’-DDE, and 4,4’-DDT slightly exceeded their respective FDEP TECs for inland sediments but were less than their respective PECs. Food-chain modeling conducted during the 1997 ERA showed that these compounds did not pose potential risks to upper-level terrestrial or aquatic receptors. Concentrations of these pesticides detected in Site 15 ditches were comparable to those detected at other Cecil Field locations, and it is likely that they are the result of previous base-wide applications for pest control. Site-related risk from 4,4’-DDD, 4,4’-DDE, and 4,4’-DDT appears to be negligible.

#### 1.5.3.4 Surface Water

The 1997 ERA concluded that potential risks to some ecological receptors might exist due to lead in surface water. The surface water samples were collected from the same two ditches as the sediment samples. Lead concentrations in some surface water samples were elevated relative to ecological guidelines, but as mentioned above, the two ditches are typically dry except in the vicinity of the culvert under the access road into the site. The ditches provide no permanent habitat for aquatic communities. Lead-related risk has been investigated in other studies at NAS Cecil Field and appears to be negligible in water bodies into which these ditches drain. There are no other surface water bodies at Site 15.

#### 1.5.3.5 Ecological Risk Conclusions

Based on the results of the ERA and subsequent associated evaluations, the NAS Cecil Field Base BCT (composed of representatives from the Navy, U.S. EPA Region 4, and FDEP) concluded that ecological COPCs at Site 15 were limited to lead, PAHs, and arsenic in surface soil.

**TABLE 1-1**

**SUMMARY OF ORGANICS DETECTED IN SURFACE SOIL**
**SITE 15 FEASIBILITY STUDY REPORT**
**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**

| Chemical | Frequency of Detection | Range of Detections | FDEP Soil Cleanup Target Levels (1) | |
|---|---|---|---|---|
| | | | Residential | Leachability |
| **Volatile Organic Compounds, mg/kg** | | | | |
| Acetone | 1/36 | 0.006 | 11,000 | 25 |
| Xylenes, total | 1/44 | 0.002 | 130 | 0.2 |
| **Semivolatile Organic Compounds, mg/kg** | | | | |
| 1-Methylnaphthalene | 15/78 | 0.057 - 168 | 200 | 3.1 |
| 2-Methylnaphthalene | 29/128 | 0.022 - 204 | 210 | 8.5 |
| Acenaphthene | 67/400 | 0.031 - 410 | 2,400 | 2.1 |
| Acenaphthylene | 24/400 | 0.0423 - 17 | 1,800 | 27 |
| Anthracene | 88/400 | 0.0068 - 110 | 21,000 | 2,500 |
| Benzo(a)anthracene | 177/400 | 0.0058 - 1,300 | # | 0.8 |
| Benzo(a)pyrene | 171/400 | 0.0066 - 1,100 | 0.1 | 8 |
| Benzo(b)fluoranthene | 179/400 | 0.0079 - 1,300 | # | 2.4 |
| Benzo(g,h,i)perylene | 122/400 | 0.0074 - 820 | 2,500 | 32,000 |
| Benzo(k)fluoranthene | 150/400 | 0.0069 - 1,500 | # | 24 |
| bis(2-Ethylhexyl) phthalate | 12/44 | 0.021 - 0.52 | 72 | 3,600 |
| Butylbenzylphthalate | 10/44 | 0.082 - 0.44 | 17,000 | 310 |
| Carbazole | 15/44 | 0.021 - 43 | 49 | 0.2 |
| Chrysene | 195/400 | 0.0138 - 1,700 | # | 77 |
| Dibenzo(a,h)anthracene | 60/400 | 0.0216 - 140 | # | 0.7 |
| Dibenzofuran | 8/44 | 0.035 - 8 | 320 | 15 |
| Di-n-butylphthalate | 33/44 | 0.061 - 6.7 | 7,300 | 47 |
| Fluoranthene | 205/400 | 0.008 - 2,000 | 3,200 | 1,200 |
| Fluorene | 40/400 | 0.043 - 58 | 2,600 | 160 |
| Indeno(1,2,3-cd)pyrene | 113/400 | 0.0054 - 560 | # | 6.6 |
| Naphthalene | 44/400 | 0.024 - 17 | 55 | 1.2 |
| Phenanthrene | 154/400 | 0.0056 - 600 | 2,200 | 250 |
| Pyrene | 198/400 | 0.0085 - 1,800 | 2,400 | 880 |
| BaPEqs | 400/400 | 0.0026 - 956 | 0.1 | NC |
| **Pesticides/Herbicides, mg/kg** | | | | |
| 4,4'-DDE | 3/41 | 0.00016 - 0.0013 | 2.9 | 18 |
| 4,4'-DDT | 3/41 | 0.00069 - 0.021 | 2.9 | 11 |
| Dieldrin | 1/41 | 0.00037 - 0.024 | 0.06 | 0.002 |
| Endosulfan II | 3/41 | 0.00014 - 0.0019 | 450 | 3.8 |
| Endrin aldehyde | 1/41 | 0.0027 | NC | NC |
| Methoxychlor | 1/41 | 0.049 | 420 | 160 |
| **Nitroaromatic Compounds, mg/kg** | | | | |
| HMX(2) | 1/38 | 3.001 | NC | NC |
| 3-Nitrotoluene | 1/38 | 5.08 | 400 | 0.9 |
| 4-Nitrotoluene | 2/38 | 1.17 - 4.34 | 640 | 1.4 |
| **Miscellaneous Parameters, mg/kg** | | | | |
| TRPH | 33/40 | 9.74 - 450 | 460 | 340 |

1 - Florida Department of Environmental Protection (FDEP) Soil Cleanup Target Levels (SCTLs), Chapter 62-777, Florida Administrative Code (F.A.C.) (FDEP, 2005).
2 - Cyclotetramethylenetetranitramine.
NC - No criterion.
TRPH - Total recoverable petroleum hydrocarbons.
BaPEqs - Benzo(a)pyrene equivalents.
# = Based on Chapter 62-777, F.A.C., site concentrations of carginogenic polynuclear aromatic hydrocarbons (PAHs) are converted to BaPEqs before comparison to benzo(a)pyrene (BaP) SCTLs.
** = One-half of the BaP detection limit was used as the BaPEq concentration if no carcinogenic PAHs were detected in a sample.

**TABLE 1-2**

**SUMMARY OF INORGANICS DETECTED IN SURFACE SOIL**
**SITE 15 AMENDED FEASIBILITY STUDY REPORT**
**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**

| Chemical | Frequency of Detection | Range of Detections | FDEP Soil Cleanup Target Levels (1) | | Background Screening Concentration (2) |
|---|---|---|---|---|---|
| | | | Residential | Leachability | |
| **Inorganic Analytes, mg/kg** | | | | | |
| Aluminum | 39/40 | 29.4 - 7,140 | 80,000 | *** | 4,430 |
| Antimony | 30/56 | 0.46 - 2,440 | 27 | 0.03 | 9.44 |
| Arsenic | 41/69 | 0.91 - 451 | 2.1 | *** | 2.04 |
| Barium | 38/40 | 0.88 - 107 | 120** | 1,600 | 14.4 |
| Cadmium | 7/40 | 0.3 - 2.4 | 82 | 7.5 | 1.72 |
| Calcium | 31/40 | 38.3 - 102,000 | NC | NC | 9.44 |
| Chromium | 10/40 | 0.45 - 26.9 | 210 | 38 | 7.75 |
| Cobalt | 7/40 | 0.22 - 1.8 | 1,700 | *** | 3.11 |
| Copper | 14/40 | 0.835 - 21.2 | 150** | *** | 5.97 |
| Iron | 38/40 | 57.5 - 1,340 | 53,000 | *** | 1,490 |
| Lead | 555/584 | 1.1 - 65,500 | 400 | *** | 197 |
| Magnesium | 15/40 | 51.5 - 631 | NC | NC | 329 |
| Manganese | 28/40 | 0.45 - 32.2 | 3,500 | *** | 22.0 |
| Mercury | 4/39 | 0.09 - 0.8 | 3.0 | 2.1 | 0.16 |
| Nickel | 11/40 | 0.69 - 2.2 | 340** | 130 | 3.89 |
| Potassium | 18/40 | 21.7 - 2,130 | NC | NC | 102 |
| Selenium | 6/40 | 0.88 - 1.7 | 440 | 5.2 | 1.68 |
| Silver | 4/40 | 0.61 - 5.3 | 410 | 17 | 2.13 |
| Sodium | 18/40 | 118 - 1,370 | NC | NC | 343 |
| Thallium | 1/40 | 0.45 | NC | NC | 2.84 |
| Vanadium | 32/40 | 0.28 - 5.2 | 67 | 980 | 6.3 |
| Zinc | 7/40 | 20.3 - 57.5 | 26,000 | *** | 37.0 |
| Cyanide | 3/34 | 0.2 - 0.27 | 34** | 0.8 | 1.19 |

1 - Florida Department of Environmental Protection (FDEP) Soil Cleanup Target Levels (SCTLs), Chapter 62-777, Florida Administrative Code (F.A.C.) (FDEP, 2005).
2 - NAS Cecil Field Inorganic Background Data Set (HLA, 1998a).
NC - No criterion.
** - Direct exposure value based on acute toxicity considerations. The criterion is applicable in scenarios where children must be exposed to soils (e.g., residences, schools, playgrounds).
*** - Leachability values may be derived using SPLP Test to calculate site-specific SCTLs or may be determined using TCLP in the event oily wastes are present.

**TABLE 1-3**

**SUMMARY OF ORGANICS DETECTED IN SUBSURFACE SOIL**
**SITE 15 AMENDED FEASIBILITY STUDY REPORT**
**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**

| Chemical | Frequency of Detection | Range of Detections | FDEP Soil Cleanup Target Levels [1] | |
|---|---|---|---|---|
| | | | Residential | Leachability |
| **Volatile Organic Compounds, mg/kg** | | | | |
| Acetone | 2/12 | 0.009 - 0.013 | 11,000 | 25 |
| Xylenes, total | 3/23 | 0.003 - 0.004 | 130 | 0.2 |
| **Semivolatile Organic Compounds, mg/kg** | | | | |
| 2-Methylnaphthalene | 2/37 | 0.051 - 0.11 | 210 | 8.5 |
| Acenaphthene | 12/49 | 0.35 - 22 | 2,400 | 2.1 |
| Anthracene | 13/49 | 0.032 - 8.2 | 21,000 | 2,500 |
| Benzo(a)anthracene | 21/49 | 0.03 - 34 | # | 0.8 |
| Benzo(a)pyrene | 32/49 | 0.035 - 33 | 0.1 | 8 |
| Benzo(b)fluoranthene | 33/49 | 0.042 - 47 | # | 2.4 |
| Benzo(g,h,i)perylene | 21/49 | 0.034 - 14 | 2,500 | 32,000 |
| Benzo(k)fluoranthene | 26/49 | 0.03 - 21 | # | 24 |
| bis(2-Ethylhexyl) phthalate | 2/16 | 0.052 - 0.053 | 72 | 3,600 |
| Butylbenzylphthalate | 1/16 | 0.056 | 17,000 | 310 |
| Carbazole | 6/16 | 0.027 - 4.3 | 49 | 0.2 |
| Chrysene | 20/49 | 0.04 - 38 | # | 77 |
| Dibenzo(a,h)anthracene | 12/49 | 0.022 - 5.2 | # | 0.7 |
| Dibenzofuran | 2/16 | 0.085 - 0.46 | 320 | 15 |
| Di-n-butylphthalate | 11/16 | 0.099 - 5.6 | 7,300 | 47 |
| Fluoranthene | 32/49 | 0.039 - 61 | 3,200 | 1,200 |
| Fluorene | 3/49 | 0.11 - 1.1 | 2,600 | 160 |
| Indeno(1,2,3-cd)pyrene | 22/49 | 0.024 - 13 | # | 6.6 |
| Naphthalene | 6/49 | 0.064 - 1.1 | 55 | 1.2 |
| Phenanthrene | 26/49 | 0.033 - 27 | 2,200 | 250 |
| Pyrene | 31/49 | 0.041 - 51 | 2,400 | 880 |
| BaPEqs | 49/49 | 0.009 - 46 | 0.1 | NC |
| **Miscellaneous Parameters, mg/kg** | | | | |
| TRPH | 11/17 | 9.74 - 103 | 460 | 340 |

1 - Florida Department of Environmental Protection (FDEP) Soil Cleanup Target Levels (SCTLs), Chapter 62-777, Florida Administrative Code (F.A.C.) (FDEP, 2005).
NC - No criterion.
TRPH - Total recoverable petroleum hydrocarbons.
BaPEqs - Benzo(a)pyrene equivalents.
# = Based on Chapter 62-777, F.A.C., site concentrations of carginogenic polynuclear aromatic hydrocarbons (PAHs) are converted to BaPEqs before comparison to benzo(a)pyrene (BaP) SCTLs.
** = One-half of the BaP detection limit was used as the BaPEq concentration if no carcinogenic PAHs were detected in a sample.

**TABLE 1-4**

**SUMMARY OF INORGANICS DETECTED IN SUBSURFACE SOIL**
**SITE 15 AMENDED FEASIBILITY STUDY REPORT**
**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**

| Chemical | Frequency of Detection | Range of Detections | FDEP Soil Cleanup Target Levels [1] | | Background Screening Concentration [3] |
|---|---|---|---|---|---|
| | | | Residential | Leachability | |
| **Inorganic Analytes, mg/kg** | | | | | |
| Aluminum | 12/12 | 224 - 2,360 | 80,000 | *** | 4,430 |
| Antimony | 4/12 | 0.93 - 4.2 | 27 | 0 | 9.44 |
| Barium | 11/12 | 0.75 - 17.4 | 120** | 1,600 | 14.4 |
| Calcium | 9/12 | 62.7 - 2,510 | NC | NC | 9.44 |
| Chromium | 3/12 | 1.9 - 2.7 | 210.0 | 38 | 7.75 |
| Cobalt | 1/12 | 0.35 | 1,700 | *** | 3.11 |
| Iron | 12/12 | 66.6 - 298 | 53,000 | *** | 1,490 |
| Lead | 17/19 | 1.1 - 223 | 400 | *** | 197 |
| Manganese | 8/12 | 0.82 - 3 | 3,500 | *** | 22.0 |
| Nickel | 8/12 | 0.73 - 1.4 | 340** | 130 | 3.89 |
| Potassium | 2/12 | 22.7 - 27.6 | NC | NC | 102 |
| Sodium | 3/12 | 156 - 251 | NC | NC | 343 |
| Vanadium | 12/12 | 0.49 - 2.2 | 67 | 980 | 6.30 |

1 - Florida Department of Environmental Protection (FDEP) Soil Cleanup Target Levels (SCTLs), Chapter 62-777, Florida Administrative Code (F.A.C.) (FDEP, 2005).

2 - NAS Cecil Field Inorganic Background Data Set (HLA, 1998).

NC - No criterion.

** - Direct exposure value based on acute toxicity considerations. The criterion is applicable in scenarios where children must be exposed to soils (e.g., residences, schools, playgrounds).

*** - Leachability values may be derived using SPLP to calculate site-specific SCTLs or may be determined using TCLP in the event oily wastes are present.

**TABLE 1-8**

**SURFACE SOIL ANALYTES DETECTED AT CONCENTRATIONS GREATER THAN SCREENING CRITERIA**
**SITE 15 AMENDED FEASIBILITY STUDY REPORT**
**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**

| Analyte | Frequency of Detection(1) | Screening Concentration(2) | IBDS Value(3) | FDEP SCTL(4) | | |
|---|---|---|---|---|---|---|
| | | | | Residential | Industrial | Leachability |
| **Semivolatile Organic Compounds (mg/kg)** | | | | | | |
| 1-Methylnaphthalene | 15/78 | 168 | NA | 200 | 1,800 | **3.1** |
| 2-Methylnaphthalene | 29/128 | 204 | NA | 210 | 2,100 | **8.5** |
| Acenaphthene | 67/400 | 410 | NA | 2,400 | 20,000 | **2.1** |
| Benzo(a)anthracene | 177/400 | 1,300 | NA | # | # | **0.8** |
| Benzo(a)pyrene | 171/400 | 1,100 | NA | **0.1** | **0.7** | **8** |
| Benzo(b)fluoranthene | 179/400 | 1,300 | NA | # | # | **2.4** |
| Benzo(k)fluoranthene | 150/400 | 1,500 | NA | # | # | **24** |
| Carbazole | 15/44 | 43 | NA | 49 | 240 | **0.2** |
| Chrysene | 195/400 | 1,700 | NA | # | # | **77** |
| Dibenzo(a,h)anthracene | 60/400 | 140 | NA | # | # | **0.7** |
| Fluoranthene | 205/400 | 2,000 | NA | 3,200 | 59,000 | **1,200** |
| Indeno(1,2,3-cd)pyrene | 113/400 | 560 | NA | # | # | **6.6** |
| Naphthalene | 44/400 | 17 | NA | 55 | 300 | **1.2** |
| Phenanthrene | 154/400 | 600 | NA | 2,200 | 36,000 | **250** |
| Pyrene | 198/400 | 1,800 | NA | 2,400 | 45,000 | **880** |
| BaPEqs | 400/400 | 965 | NA | **0.1** | **0.7** | NC |
| **Pesticides/Herbicides (mg/kg)** | | | | | | |
| Dieldrin | 1/41 | 0.024 | NA | 0.06 | 0.3 | **0.002** |
| **Nitroaromatic Compounds (mg/kg)** | | | | | | |
| 3-Nitrotoluene | 1/38 | 5.08 | NA | 400 | 3,300 | **0.9** |
| 4-Nitrotoluene | 2/38 | 4.34 | NA | 640 | 12,000 | **1.4** |
| **Metals (mg/kg)** | | | | | | |
| Antimony | 30/56 | 2,440 | **9.44** | **27** | **370** | **0.03** |
| Arsenic | 41/69 | 451 | **2.04** | **2.1** | **12** | * |
| Lead | 555/584 | 65,500 | **197** | **400** | **1,400** | * |
| **Miscellaneous Parameters (mg/kg)** | | | | | | |
| TRPH | 33/40 | 450 | NA | 460 | 2,700 | 460 |

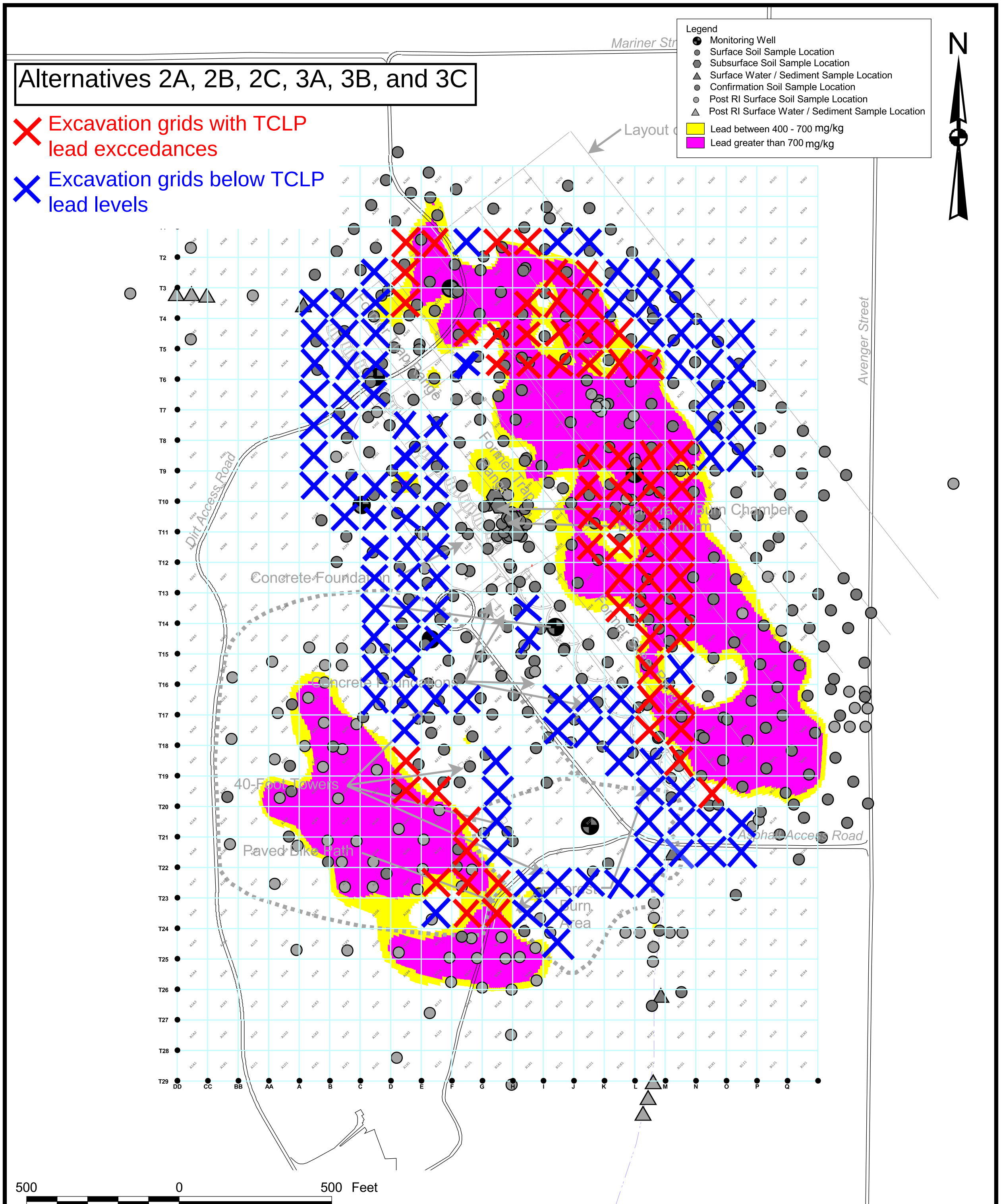
1 Frequency of detection is the number of samples in which the analyte was detected over the total number of samples analyzed.
2 Maximum detected concentration.
3 NAS Cecil Field Inorganic Background Data Set values (HLA, 1998a).
4 Florida Department of Environmental Protection (FDEP) Soil Cleanup Target Levels (SCTLs), Chapter 62-777, Florida Administrative Code (F.A.C.) (FDEP, 2005).
Bold indicates exceedance of SCTL.
NA Not applicable.
NC No criterion.
TRPH - Total recoveralbe petroleum hydrocarbons.
BaPEqs - Benzo(a)pyrene equivalents.
# = Based on Chapter 62-777, F.A.C., site concentrations of carginogenic polynuclear aromatic hydrocarbons (PAHs) are converted to BaPEqs before comparison to benzo(a)pyrene (BaP) SCTLs.
* = Leachability values may be derived using the Synthetic Precipitation Leaching Procedure (SPLP) test to calculate site-specific SCTLs or may be determined using the Toxicity Characteristic Leaching Procedure (TCLP) in the event that oily wastes are present.

**TABLE 1-9**

**SUBSURFACE SOIL ANALYTES DETECTED AT CONCENTRATIONS GREATER THAN SCREENING CRITERIA**
**SITE 15 AMENDED FEASIBILITY STUDY REPORT**
**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**

| Analyte | Frequency of Detection(1) | Screening Concentration(2) | FDEP SCTL(3) | | |
|---|---|---|---|---|---|
| | | | Residential | Industrial | Leachability |
| **Semivolatile Organic Compounds (mg/kg)** | | | | | |
| Acenaphthene | 13/49 | 22 | 2,400 | 20,000 | **2.1** |
| Benzo(a)anthracene | 21/49 | 36 | # | # | **0.8** |
| Benzo(a)pyrene | 32/49 | 35 | **0.1** | **0.7** | **8** |
| Benzo(b)fluoranthene | 33/49 | 53 | # | # | **2.4** |
| Carbazole | 6/16 | 4.6 | 49 | 240 | **0.2** |
| Dibenzo(a,h)anthracene | 12/49 | 5.2 | # | # | **0.7** |
| Indeno(1,2,3-cd)pyrene | 22/49 | 14 | # | # | **6.6** |
| BaPEqs | 49/49 | 49 | **0.1** | **0.7** | NC |

1 Frequency of detection is the number of samples in which the analyte was detected over the total number of samples analyzed.
2 Maximum detected concentration.
3 Florida Department of Environmental Protection (FDEP) Soil Cleanup Target Levels (SCTLs), Chapter 62-777, Florida Administrative Code (F.A.C.) (FDEP, 2005).
Bold indicates exceedance of SCTL.
NA Not applicable.
NC No criterion.
BaPEqs - Benzo(a)pyrene equivalents.
# = Based on Chapter 62-777, F.A.C., site concentrations of carginogenic polynuclear aromatic hydrocarbons (PAHs) are converted to BaPEqs before comparison to benzo(a)pyrene (BaP) SCTLs.
* = Leachability values may be derived using the Synthetic Precipitation Leaching Procedure (SPLP) test to calculate site-specific SCTLs or may be determined using the Toxicity Characteristic Leaching Procedure (TCLP) in the event that oily wastes are present.




| | | | |
|---|---|---|---|
| DRAWN BY MJJ / DATE 21Jan00 | | LEAD CONCENTRATIONS IN SURFACE SOIL SAMPLES | CONTRACT NUMBER 7653 |
| CHECKED BY / DATE | | EXCEEDING FDEP SCTLs | APPROVED BY / DATE |
| COST/SCHEDULE-AREA | | OU 5, SITE 15 | APPROVED BY / DATE |
| SCALE AS NOTED | NAVFAC | FEASIBILITY STUDY REPORT<br>NAS CECIL FIELD<br>JACKSONVILLE, FLORIDA | DRAWING NO. FIGURE 1-14 / REV 0 |

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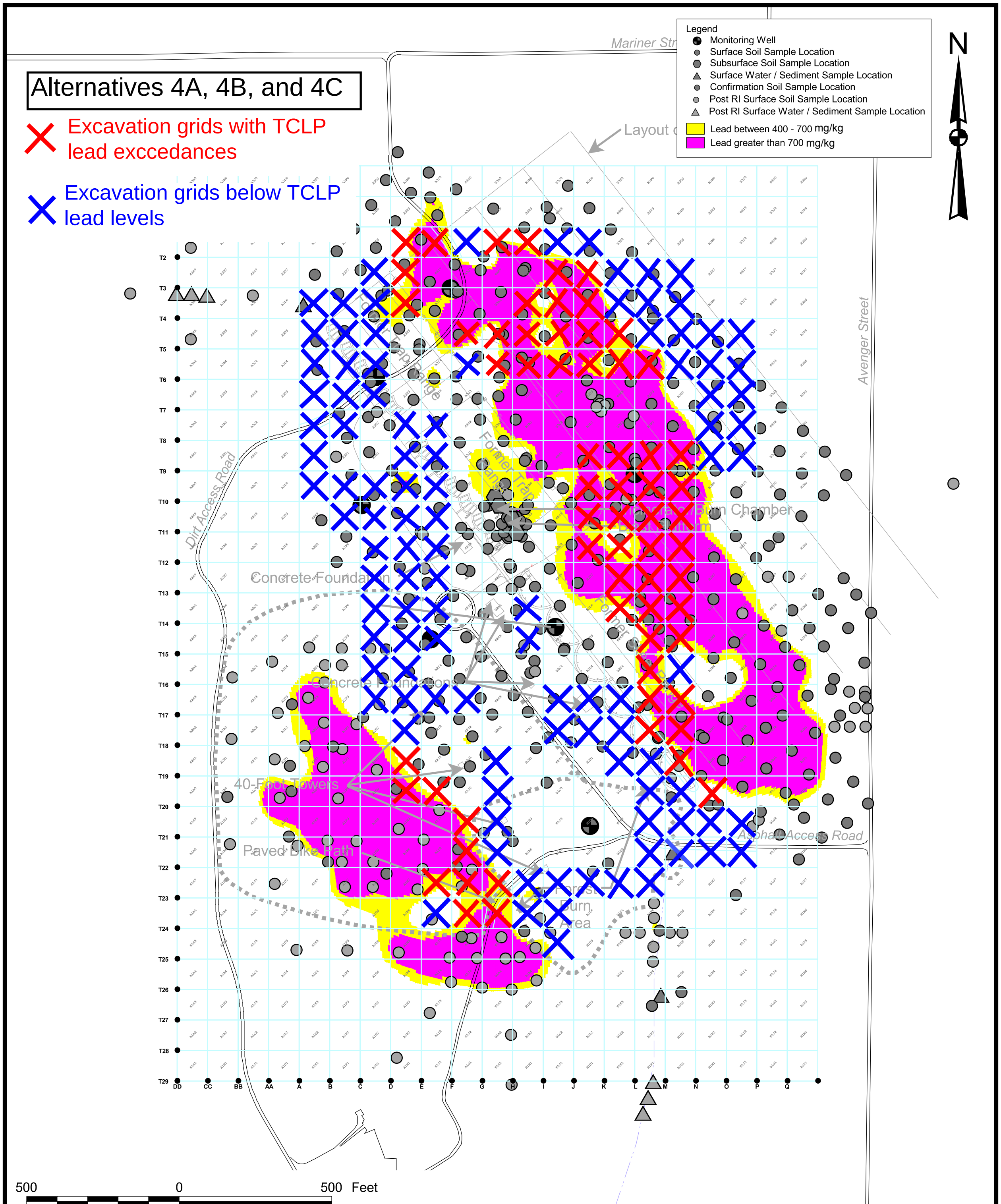


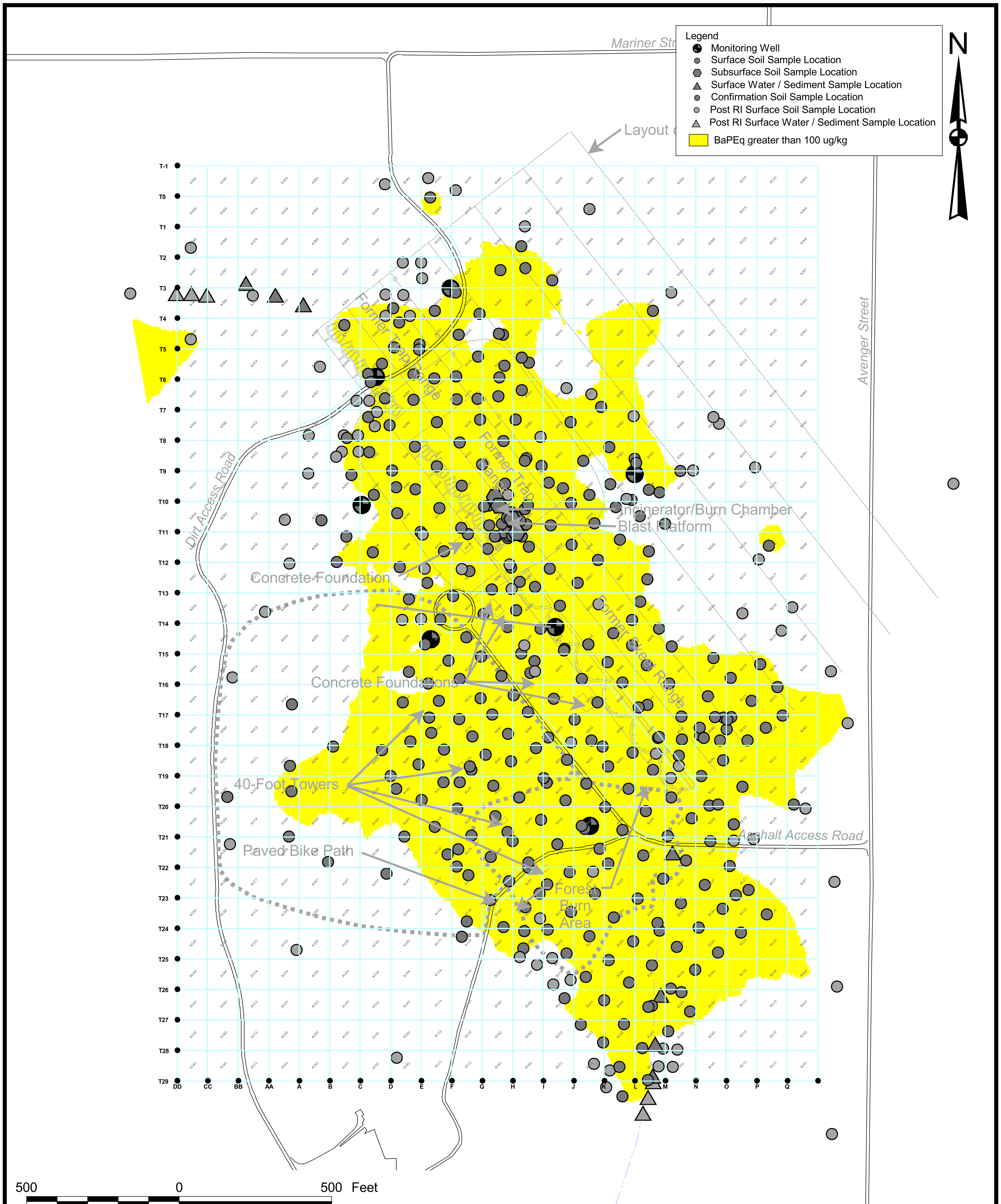

| DRAWN BY | DATE |
|---|---|
| MJJ | 21Jan00 |
| CHECKED BY | DATE |
| COST/SCHEDULE-AREA | |
| SCALE AS NOTED | |

NAVFAC

LEAD CONCENTRATIONS IN SURFACE SOIL SAMPLES
EXCEEDING FDEP SCTLs
OU 5, SITE 15
FEASIBILITY STUDY REPORT
NAS CECIL FIELD
JACKSONVILLE, FLORIDA

| CONTRACT NUMBER 7653 | |
|---|---|
| APPROVED BY | DATE |
| APPROVED BY | DATE |
| DRAWING NO. FIGURE 1-14 | REV 0 |

:\GIS\Cecil\Site-15_FS_20110818.apr 18Aug11 MJJ 13-Layout-Lead Exceeding FDEP




| | | | |
|---|---|---|---|
| DRAWN BY MJJ — DATE 21Jan00 | | PAH CONCENTRATIONS IN SURFACE SOIL SAMPLES EXCEEDING FDEP SCTLs | CONTRACT NUMBER 7653 |
| CHECKED BY — DATE | | OU 5, SITE 15 | APPROVED BY — DATE |
| COST/SCHEDULE-AREA | NAVFAC | FEASIBILITY STUDY REPORT | APPROVED BY — DATE |
| SCALE AS NOTED | | NAS CECIL FIELD JACKSONVILLE, FLORIDA | DRAWING NO. FIGURE 1-13 — REV 0 |

:\GIS\Cecil\Site-15_FS_20110818.apr 31Aug11 MJJ 12-Layout-PAH Exceeding FDEP

# A-3 MUNITIONS BACKGROUND INFORMATION

# SUPPLEMENTAL HISTORICAL DATA – MEC

The following provides information on munitions surveys conducted in support of the 2008/2009 contaminated soil removal effort. This information summarizes the munitions survey results and, in doing so, supports the presumption that no further munitions and explosives of concern (MEC) investigation is needed in those grids previously addressed and aids in planning the Remedial Investigation (RI).

The remedial action was conducted in 2008 and 2009 and included removal of soil contaminated with polycyclic aromatic hydrocarbons (PAHs), metals, and total recoverable petroleum hydrocarbons (TRPH) from 17 excavation areas (A to Q). Based on the findings of a MEC Preliminary Assessment/Site Inspection (PA/SI) conducted in 2007 (CH2MHill, 2007) MEC removal was necessary before soil excavation activities for the remedial action could proceed. As part of the remedial action, tree and vegetation clearance and clearance for MEC were conducted in portions of the site prior to soil excavation. The MEC-related remedial action activities related to soil removal are discussed in the Remedial Action Completion Report for Soil Remedial Activities (AGVIQ-Ch2MHill, August 2009 [Draft]).

The MEC removal included subdivision of Site 15 through land survey (100 feet by 100 feet grid cells), vegetation reduction, MEC surface clearance, digital geophysical mapping (DGM) with EM61-MK2 Time-domain Metal Detection and identification of target anomalies, manual and mechanical-aided intrusive investigation of target anomalies identified through DGM, and demolition of MEC items. The munitions survey included 100 percent clearance to 2 feet below ground surface (bgs) and removal of MEC and munitions debris (MD) from the grids included in the survey. The munitions clearance included geophysical prove-out (GPO) and appropriate QC as discussed further in the Remedial Action Completion Report for Soil Removal Action (AGVIQ-Ch2MHill, August 2009). Additional detail on the items found and removed are in the attached grid tracking table.

Munitions clearance activities as part of the remedial activities included the following:

- MEC avoidance as part of activities included unexploded ordnance (UXO) Technician III conducting a reconnaissance of the associated areas. Work locations and access routes were visually checked for anomalies using a magnetometer. Access routes were twice the width of the widest vehicle and clearly marked to prevent personnel from straying into non-cleared areas.
    - No anomalies were reported during pre-excavation sampling
    - No anomalies were reported (gopher tortoise survey and trapping and relocation activities)
    - No anomalies were reported for collection of soil samples for soil treatability study
    - MEC avoidance was conducted during tree and vegetation removal

- Subdivision of Site 15 through land survey into 600 100-foot by 100-foot grids for use for survey and clearance.
- Vegetation reduction.
- MEC surface clearance of 22 acres consisting of an instrument-assisted surface clearance. Surface clearance for MD was performed that included visual search of the surface, augmented with addition of handheld magnetometers to locate and remove MEC (including small arms) and ferrous items 2-inch by 2-inch and larger from the soil surface. Surface/near-surface search efforts were completed to identify MEC for assessment and disposition options; MPPEH was recovered for consolidated storage and processing, surface solid waste was collected, and MEC determined unsafe to move was flagged-in-place. Surface clearance included 114 grids.
- DGM with EM61-MK2 Time-domain Metal Detection and identification of target anomalies (included GPO grid for testing of equipment and personnel). DGM sweeps covering the 114 grids were conducted. Following selection of potential subsurface anomalies, a Nomad GPS RTK system was used to reacquire the anomalies for investigation.
- Manual and mechanical-aided intrusive investigation of target anomalies identified through DGM except for several grids in excavation area L, 100 percent of DGM-identified anomalies were excavated. Anomaly investigation included soil removal to identify the source of the anomaly. Focused investigations were also applied where anomaly investigations did not provide sufficient information to identify the source of the anomaly. Grids in excavation area L where intrusive investigation was only conducted in the excavation region are A2J0, A2J8, A2J9, A3J2, B2A0, B2A8, B2A9, B2B0, B2B8, B2B9, B3A1, B3A2, and B3B1
- Demolition of MEC items.

The table below provides the MEC items identified and removed during the clearance. All of the MEC items were found in the areas surveyed within or nearby the former ordnance disposal area. MD was found in and around the ordnance disposal area, in the former skeet range, and along access roads to the ordnance disposal area.

| Grid | MEC items found | Surface or Subsurface |
|---|---|---|
| A2J8 | One 20 mm TP projectile full up | Subsurface |
| A3H3 | One 20 mm Tp projectile full up | Surface |
| A3H4 | One M204 Practice mine Fuze | Subsurface |
| A3I3 | Six M204 Practice mine Fuzes | Subsurface |
| A3J3 | Two M204 Practice Mine Fuzes | Subsurface |

| Grid | MEC items found | Surface or Subsurface |
|---|---|---|
| B2A7 | Two M204 Practice Mine Fuzes and one M112 Photoflash cartridge | Subsurface |
| B2A8 | One M208 20 mm TP | Surface |
| B2A9 | Two 20 mm Tp projectiles full up | Subsurface |
| B2C0 | Three M204 Practice Mine Fuzes | Subsurface |
| B2C6 | One 20 mm projectile HE | Subsurface |
| B3A1 | One aircraft launched flare | Surface |
| B3B1 | Two Mk4 Spotting Charges | Subsurface |
| B3B2 | One M204 Practice Mine Fuze | Subsurface |
| B3B3 | Two M204 Practice Mine Fuzes | Subsurface |
| B3C1 | One BLU – 26/B Submunition Inert Bomblet | Subsurface |
| B3D3 | One M204 Practice Mine Fuze | Subsurface |

**REFERENCES**

AGVIQ-CH2MHill (AGVIQ-CH2MHill Constructors, Inc. Joint Venture III), August 2009. Remedial Action Completion Report – Soil Removal Action for Operable Unit 5, Site 15, Blue 10 Ordnance Disposal Area, Naval Air Station Cecil Field, Jacksonville, Florida. Prepared for Naval Facilities Engineering Command, Southern Division, North Charleston, South Carolina. [DRAFT]

CH2MHILL, February 2007. Preliminary Assessment/Site Inspection Report for Past Use of Munitions and Explosives of Concern for Blue Ordnance Disposal Area (Site 15), Former Naval Air Station Cecil Field, Jacksonville, Florida. Prepared for Naval Facilities Engineering Command, Southeast.

**From:** Michael.Halil@CH2M.com [mailto:Michael.Halil@CH2M.com]
**Sent:** Tuesday, January 26, 2010 10:50 AM
**To:** Simcik, Robert
**Cc:** Noah.Weinberg@CH2M.com; Jeffery.Marks@CH2M.com
**Subject:** Site 15 Intrusive Investigation Results

Rob-
Attached is the draft table of intrusive investigation results for the removal action at Site 15. I think the columns are pretty self-explanatory but here are a few notes:

Column A - Target ID; Grid-#
Column B/C - Coordinates
Column D - Geophysical Response associated with the anomaly
Column E - What the item was classified as
Column F - Description of Item
Column G - Item depth in inches
Column H - Item weight in pounds
Column I - If item was considered frag
Column J - Where the item was placed

You'll see large areas of highlighted information. This is where the density of finds was so large that it couldn't be tracked effectively. I'll work to get more information for these bulk areas.

Thanks and let me know if you have any questions.

Jeff/Noah-Anything that I left off or not accurate?

Mike

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| Grid | Vegetation Clearance Complete | Surface Clearance Comments | lbs of MD removed During Surface Sweep | Surface Clearance Completion Date | Digital Geophysical Mapping Comments | Digital Geophysical Completion Date | Number of Point Intrusive Anomalies | Intrusive Investigation Comments | Intrusive Investigation Completion Date | Lbs of MD removed during Subsurface Sweep |
|---|---|---|---|---|---|---|---|---|---|---|
| A1C0 | Yes | Swept North to South<br>37 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/8/2008 | | 5/15/2008 | 51 | | 6/9/2008 | 0 |
| A1C9 | Yes | Swept North to South<br>17 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/8/2008 | | 5/15/2008 | 54 | | 6/3/2008 | 0 |
| A1D0 | Yes | Swept North to South<br>0 MEC<br>7 lbs Non-MD Related Scrap | 0 | 4/8/2008 | | 5/7/2008 | 31 | | 6/2/2008 | 0 |
| A1D9 | Yes | Swept North to South<br>6 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/8/2008 | | 5/7/2008 | 31 | | 5/30/2008 | 2 |
| A1H8 | Yes | Swept East to West<br>1 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/1/2008 | | 5/7/2008 | 2 | polygon is a Monitoring Well | 5/28/2008 | 0 |
| A1H9 | Yes | Swept North to South<br>1 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/1/2008 | | 5/7/2008 | 9 | | 5/28/2008 | 0 |
| A1I4 | Yes | Swept East to West<br>1 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/7/2008 | | 5/13/2008 | 16 | | 5/19/2008 | 0 |
| A1I5 | Yes | Swept East to West<br>1 lbs Non-MD Related Scrap<br>Gopher Tortes Hole<br>0 MEC | 0 | 4/7/2008 | | 5/5/2008 | 9 | | 5/19/2008 | 0 |
| A1I8 | Yes | 1/2 Swept North to South<br>1/2 Swept East to West<br>1 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/1/2008 | | 5/7/2008 | 10 | | 5/28/2008 | 1 |
| A1I9 | Yes | Swept East to West<br>3 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/1/2008 | | 5/7/2008 | 2 | | 5/28/2008 | 0 |
| A1J0 | Yes | Swept North to South<br>1 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/1/2008 | | 5/1/2008 | 17 | | 5/21/2008 | 12 |
| A1J4 | Yes | Swept East to West<br>1 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/7/2008 | | 5/6/2008 | 18 | **polygon is forestry sign** | 5/14/2008 | 1 |
| A1J5 | Yes | Swept East to West<br>1 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/7/2008 | | 5/5/2008 | 7 | | 5/14/2008 | 0 |
| A2I1 | Yes | Swept North to South<br>3 lbs Non-MD Related Scrap<br>0 MEC | 0 | 3/31/2008 | | 5/8/2008 | 22 | | 5/16/2008 | 0 |
| A2I2 | Yes | Swept North to South<br>1 lbs Non-MD Related Scrap<br>0 MEC | 0 | 3/31/2008 | | 5/8/2008 | 24 | | 5/16/2008 | 1 |

| Grid | Vegetation Clearance Complete | Surface Clearance Comments | lbs of MD removed During Surface Sweep | Surface Clearance Completion Date | Digital Geophysical Mapping Comments | Digital Geophysical Completion Date | Number of Point Intrusive Anomalies | Intrusive Investigation Comments | Intrusive Investigation Completion Date | Lbs of MD removed during Subsurface Sweep |
|---|---|---|---|---|---|---|---|---|---|---|
| A2I4 | Yes | GPO | 0 | 4/12/2008 | | 5/6/2008 | N/A | | N/A | 0 |
| A2J0 | Yes | Swept North to South<br>29 lbs Non-MD Related Scrap<br>0 MEC | 32 | 4/30/2008 | | 5/20/2008 | 132 | **Mag And Dig in Excavation regions only** | 8/6/2008 | 4600 |
| A2J1 | Yes | Swept North to South<br>8 lbs Non-MD Related Scrap<br>0 MEC | 0 | 3/31/2008 | | 5/1/2008 | 15 | | 5/20/2008 | 0 |
| A2J2 | Yes | Swept North to South<br>0 lbs Non-MD Related Scrap<br>0 MEC | 0 | 3/31/2008 | | 5/1/2008 | 5 | | 5/22/2008 | 0 |
| A2J4 | Yes | Swept North to South<br>26 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/11/2008 | | 5/13/2008 | 47 | | 6/17/2008 | 1 |
| A2J5 | Yes | Swept North to South<br>49 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/11/2008 | | 5/15/2008 | 105 | **grid was reswept. failed info pro QC process** | 6/23/2008 | 5 |
| A2J6 | Yes | Swept East to West<br>150 lbs Non-MD Related Scrap<br>0 MEC | 3 | 4/24/2008 | | 5/14/2008 | 109 | | 6/23/2008 | 4 |
| A2J7 | Yes | Swept East to West<br>300 lbs Non-MD Related Scrap<br>0 MEC<br>(1) Mk 7 Marine Marker | 8 | 4/24/2008 | | 5/14/2008 | 63 | | 7/3/2008 | 8 |
| A2J8 | Yes | Swept East to West<br>0 lbs of Non-MD Related Scrap<br>0 MEC | 100 | 4/25/2008 | | 5/14/2008 | 83 | **Mag And Dig in Excavation regions only**<br>20mm TP Projectile Full Up | 7/18/2008 | 4600 |
| A2J9 | Yes | Swept East to West<br>600 lbs Non-MD Related Scrap<br>0 MEC | 12 | 4/25/2008 | | 5/20/2008 | 173 | **Mag And Dig in Excavation regions only** | 7/25/2008 | 4600 |
| A3F1 | Yes | Swept East to West<br>12 lbs Non-MD Related Scrap<br>0 MEC | 0 | 5/1/2008 | | 5/29/2008 | 82 | | 7/7/2008 | 54 |
| A3G1 | Yes | Swept East to West<br>39 lbs Non-MD Related Scrap<br>0 MEC | 0 | 5/1/2008 | | 5/29/2008 | 116 | | 7/7/2008 | 16 |
| A3G2 | Yes | Swept East to West<br>57 lbs Non-MD Related Scrap<br>0 MEC | 0 | 5/1/2008 | | 5/29/2008 | 95 | | 7/9/2008 | 26 |
| A3H3 | Yes | Swept East to West<br>140 lbs Non-MD Related Scrap<br>1 MEC Item - 20mm TP Full Up Round | 7 | 5/6/2008 | | 5/28/2008 | 116 | | 7/16/2008 | 51 |

| Grid | Vegetation Clearance Complete | Surface Clearance Comments | lbs of MD removed During Surface Sweep | Surface Clearance Completion Date | Digital Geophysical Mapping Comments | Digital Geophysical Completion Date | Number of Point Intrusive Anomalies | Intrusive Investigation Comments | Intrusive Investigation Completion Date | Lbs of MD removed during Subsurface Sweep |
|---|---|---|---|---|---|---|---|---|---|---|
| A3H4 | Yes | Swept North to South<br>24 lbs Non-MD Related Scrap<br>0 MEC | 0 | 5/6/2008 | | 5/28/2008 | 101 | (1) M204 Practice Mine Fuze | 7/9/2008 | 67 |
| A3H5 | Yes | Swept North to South<br>2 lbs Non-MD Related Scrap<br>0 MEC | 0 | 8/7/2008 | | 5/28/2008 | 56 | | 7/9/2008 | 31 |
| A3I3 | Yes | Swept East to West<br>120 lbs Non-MD Related Scrap<br>0 MEC | 2 | 5/5/2008 | | 5/28/2008 | 178 | (6) M204 Practice Mine Fuze | 7/14/2008 | 99 |
| A3I4 | Yes | Swept North to South<br>300 lbs Non-MD Related Scrap<br>0 MEC | 0 | 5/6/2008 | | 5/28/2008 | 119 | | 7/11/2008 | 38 |
| A3I5 | Yes | Swept North to South<br>2 lbs Non-MD Related Scrap<br>0 MEC | 0 | 5/7/2008 | | 5/28/2008 | 52 | | 7/9/2008 | 31 |
| A3I6 | Yes | Swept North to South<br>0 lbs Non-MD Related Scrap<br>0 MEC | 0 | 5/7/2008 | | 5/27/2008 | 42 | | 7/14/2009 | 27 |
| A3I7 | Yes | Swept North to South<br>0 lbs Non-MD Related Scrap<br>0 MEC | 0 | 5/7/2008 | | 5/28/2008 | 26 | | 7/17/2009 | 14 |
| A3J1 | Yes | Swept North to South<br>0 lbs Non-MD Related Scrap<br>0 MEC | 22 | 4/29/2008 | | 5/20/2008 | 178 | | | 0 |
| A3J2 | Yes | Swept East to West<br>400 lbs Non-MD Related Scrap<br>0 MEC | 17 | 5/5/2008 | | 5/20/2008 | 220 | **Mag And Dig in Excavation regions only** | 9/10/2008 | 4600 |
| A3J3 | Yes | Swept East to West<br>8 lbs Non-MD Related Scrap<br>0 MEC | 0 | 5/5/2008 | | 5/20/2008 | 188 | (2) M204 Practice Mine Fuze | 8/4/2009 | 59 |
| A3J6 | Yes | Swept North to South<br>50 lbs Non-MD Related Scrap<br>0 MEC | 0 | 5/8/2008 | | 5/27/2008 | 39 | | 7/17/2009 | 12 |
| A3J7 | Yes | Swept North to South<br>0 lbs Non-MD Related Scrap<br>0 MEC | 0 | 5/7/2008 | | 5/28/2008 | 26 | | 7/17/2009 | 11 |
| B1A4 | Yes | Swept East to West<br>0 Non-MD Related Scrap<br>0 MEC | 0 | 4/4/2008 | | 5/6/2008 | 28 | | 5/13/2008 | 0 |
| B1A5 | Yes | Swept East to West<br>1 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/4/2008 | | 5/5/2008 | 9 | **polygon is fence post left from soil samples** | 5/13/2008 | 0 |
| B1B0 | Yes | Swept North to South<br>1 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/10/2008 | | 5/12/2008 | 16 | | 6/10/2008 | 1 |

| Grid | Vegetation Clearance Complete | Surface Clearance Comments | lbs of MD removed During Surface Sweep | Surface Clearance Completion Date | Digital Geophysical Mapping Comments | Digital Geophysical Completion Date | Number of Point Intrusive Anomalies | Intrusive Investigation Comments | Intrusive Investigation Completion Date | Lbs of MD removed during Subsurface Sweep |
|---|---|---|---|---|---|---|---|---|---|---|
| B1B4 | Yes | Swept East to West<br>1 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/4/2008 | | 5/6/2008 | 15 | | 5/13/2008 | 0 |
| B1B5 | Yes | Swept North to South<br>1 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/4/2008 | | 5/5/2008 | 10 | | 5/13/2008 | 5 |
| B1B8 | Yes | Swept East to West<br>0 lbs Non-MD Related Scrap<br>0 MEC | 3 | 4/8/2008 | | 5/2/2008 | 17 | **polygon is an antenna foundation** | 5/14/2008 | 2 |
| B1B9 | Yes | Swept North to South<br>1 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/4/2008 | | 5/1/2008 | 23 | | 5/14/2008 | 0 |
| B1C0 | Yes | Swept North to South<br>1 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/10/2008 | | 5/12/2008 | 26 | | 5/19/2008 | 0 |
| B1C8 | Yes | Swept East to West<br>0 lbs Non-MD Related Scrap<br>0 lbs MEC | 47 | 4/9/2008 | | 5/2/2008 | 44 | | 5/16/2008 | 0 |
| B1C9 | Yes | Swept North to South<br>0 lbs Non-MD Related Scrap<br>0 MEC | 8 | 4/4/2008 | | 5/6/2008 | 10 | | 5/15/2008 | 0 |
| B1D0 | Yes | Swept North to South<br>0 lbs Non-MD Related Scrap<br>0 MEC | 27 | 4/9/2008 | | 5/12/2008 | 28 | | 5/29/2008 | 0 |
| B1D8 | Yes | Swept East to West<br>12 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/21/2008 | | 5/6/2008 | 20 | | 5/30/2008 | 0 |
| B1D9 | Yes | Swept East to West<br>0 lbs Non-MD Related Scrap<br>0 MEC | 39 | 4/9/2008 | | 5/6/2008 | 28 | | 6/10/2008 | 0 |
| B1E0 | Yes | Swept North to South<br>0 lbs Non-MD Related Scrap<br>Failed Info Pro QC. Reswept on 4/14/2008 | 17 | 4/14/2008 | | 5/12/2008 | 14 | | 5/30/2008 | 1 |
| B1E8 | Yes | Swept East to West<br>12 lbs Non-MD Related Scrap<br>0 MEC<br>galvanized wire fence cutting in grid, used magnetic pick-up devise. | 0 | 4/22/2008 | | 5/6/2008 | 15 | | 5/29/2008 | 0 |
| B1E9 | Yes | Swept East to West<br>0 lbs Non-MD Related Scrap<br>0 MEC | 33 | 4/9/2008 | | 5/15/2008 | 45 | | 6/12/2008 | 1 |
| B2A0 | Yes | Swept North to South<br>0 lbs Non-MD Related Scrap<br>0 MEC | 43 | 4/30/2008 | | 5/15/2008 | 0 | **Mag And Dig in Excavation regions only** | 10/29/2008 | 4600 |

| Grid | Vegetation Clearance Complete | Surface Clearance Comments | lbs of MD removed During Surface Sweep | Surface Clearance Completion Date | Digital Geophysical Mapping Comments | Digital Geophysical Completion Date | Number of Point Intrusive Anomalies | Intrusive Investigation Comments | Intrusive Investigation Completion Date | Lbs of MD removed during Subsurface Sweep |
|---|---|---|---|---|---|---|---|---|---|---|
| B2A2 | Yes | Swept North to South<br>2 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/10/2008 | | 5/12/2008 | 36 | | 6/13/2008 | 0 |
| B2A3 | Yes | Swept North to South<br>9lbs Non-MD Related Scrap<br>0 MEC<br>found .3030 rifle in grid @ N30 14 22.4 W081 55 22.4 | 0 | 4/11/2008 | | 5/12/2008 | 23 | | 6/13/2008 | 0 |
| B2A4 | Yes | Swept North to South<br>0 lbs Non-MD Related Scrap<br>0 MEC | 33 | 4/17/2008 | | 5/13/2008 | 66 | | 6/16/2008 | 0 |
| B2A5 | Yes | Swept North to South<br>0 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/22/2008 | | 5/14/2008 | 122 | | 6/20/2008 | 0 |
| B2A6 | Yes | Swept North to South<br>975 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/23/2008 | | 5/14/2008 | 111 | | 6/20/2008 | 3 |
| B2A7 | Yes | Swept East to West<br>750 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/23/2008 | | 5/14/2008 | 118 | (2) M204 Practice Mine Fuze<br>(1) M112 Photoflash Cartridge | 7/3/2008 | 9 |
| B2A8 | Yes | Swept East to West<br>0 lbs Non-MD Related Scrap<br>1 MEC item - 1 each M208 20mm TP | 121 | 4/24/2008 | | 5/14/2008 | 101 | **Mag And Dig in Excavation regions only** | 8/12/2008 | 4600 |
| B2A9 | Yes | Swept North to South<br>0 lbs Non-MD Related Scrap<br>0 MEC | 4039 | 5/2/2008 | | 5/2/2008 | 106 | **Mag And Dig in Excavation regions only**<br>(2) 20mm TP Projectiles Full Up | 12/15/2008 | 4600 |
| B2B0 | Yes | Swept North to South<br>0 lbs Non-MD Related Scrap<br>0 MEC | 38 | 4/30/2008 | | 5/15/2008 | 71 | **Mag And Dig in Excavation regions only** | 9/23/2008 | 4600 |
| B2B1 | Yes | Swept North to South<br>1 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/10/2008 | | 5/9/2008 | 25 | | 6/11/2008 | 1 |
| B2B2 | Yes | Swept North to South<br>17 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/11/2008 | | 5/12/2008 | 34 | | 6/13/2008 | 0 |
| B2B3 | Yes | Swept North to South<br>4 lbs Non-MD Related Scrap<br>0 MEC<br>Grid contains significant amount of roadway. | 0 | 4/16/2008 | | 5/12/2008 | 36 | | 6/13/2008 | 2 |

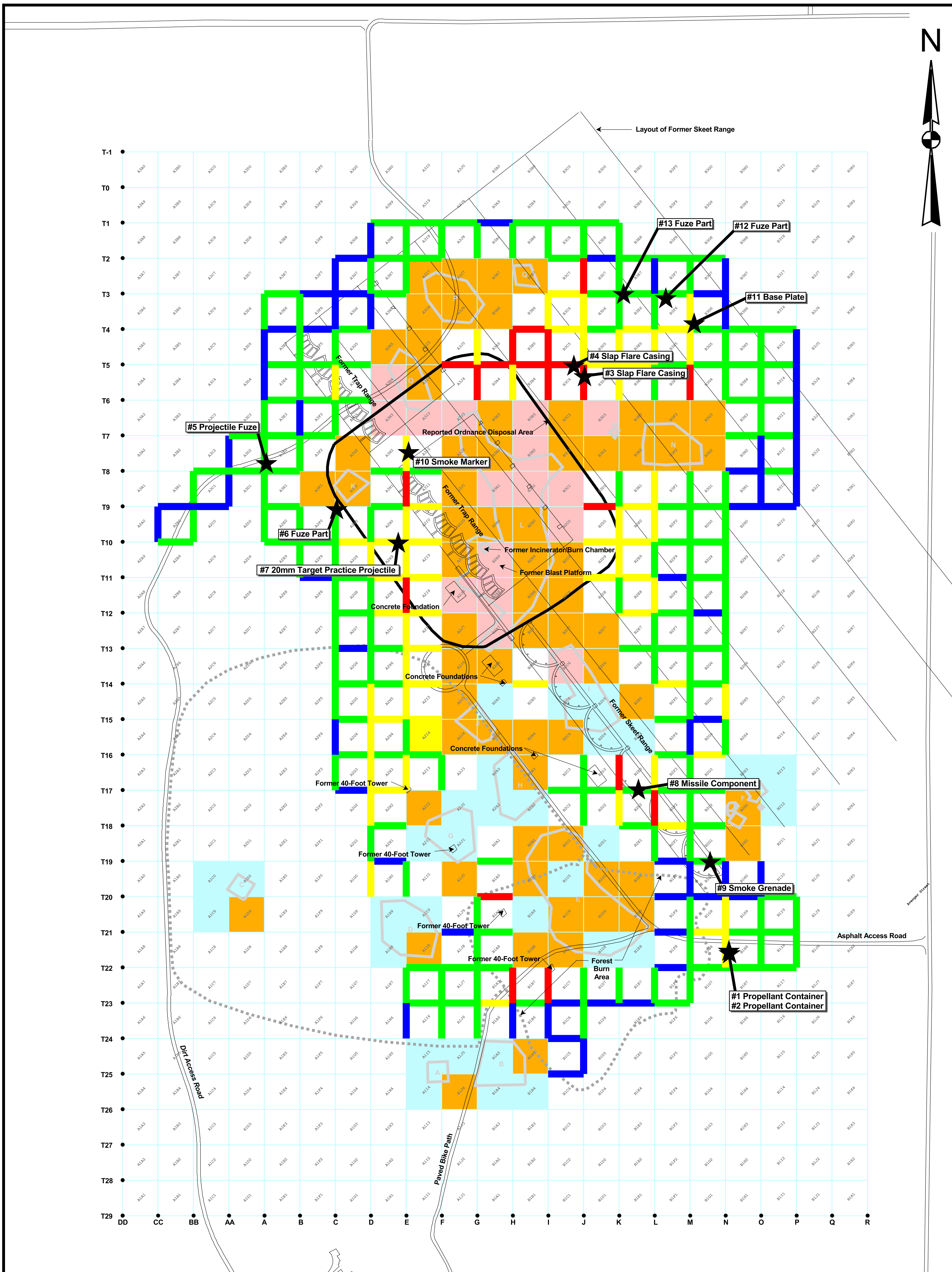
| Grid | Vegetation Clearance Complete | Surface Clearance Comments | lbs of MD removed During Surface Sweep | Surface Clearance Completion Date | Digital Geophysical Mapping Comments | Digital Geophysical Completion Date | Number of Point Intrusive Anomalies | Intrusive Investigation Comments | Intrusive Investigation Completion Date | Lbs of MD removed during Subsurface Sweep |
|---|---|---|---|---|---|---|---|---|---|---|
| B2B4 | Yes | Swept East to West<br>17 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/22/2008 | | 5/13/2008 | 55 | | 6/16/2008 | 2 |
| B2B7 | Yes | Swept East to West<br>0 lbs Non-MD Related Scrap<br>0 MEC | 36 | 4/23/2008 | | 5/2/2008 | 99 | | 7/3/2008 | 3 |
| B2B8 | Yes | Swept East to West<br>600 lbs Non-MD Related Scrap<br>0 MEC | 12 | 4/25/2008 | | 5/2/2008 | 234 | **Mag And Dig in Excavation regions only** | 7/28/2008 | 4600 |
| B2B9 | Yes | Swept North to South<br>0 lbs Non-MD Related Scrap<br>0 MEC | 3 | 5/1/2008 | | 5/2/2008 | 42 | **Mag And Dig in Excavation regions only** | 9/26/2008 | 4600 |
| B2C0 | Yes | Swept North to South<br>29 lbs Non-MD Related Scrap<br>0 MEC | 3 | 4/28/2008 | | 5/19/2008 | 182 | (3) M204 Practice Mine Fuze | 9/5/2008 | 3143 |
| B2C1 | Yes | Swept North to South<br>1 lbs Non-MD Related Scrap<br>0 MEC | 1 | 4/10/2008 | | 5/9/2008 | 46 | | 6/11/2008 | 3 |
| B2C4 | Yes | Swept North to South<br>1.75 lbs Non-MD Related Scrap<br>0 MEC<br>This grid contains significant amount of asphalt roadway. | 0 | 4/16/2008 | | 5/16/2008 | 18 | | 6/24/2008 | 2 |
| B2C5 | Yes | Swept North to South<br>1.5 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/16/2008 | | 5/16/2008 | 49 | | 6/26/2008 | 0 |
| B2C6 | Yes | Swept North to South<br>27 lbs Non-MD Related Scrap<br>0 MEC<br>Western portion of grid contains abandoned burn kettle remains requiring removal . | 1.25 | 4/16/2008 | | 5/16/2008 | 58 | (1) 20mm Projectile HE | 6/27/2008 | 5 |
| B2C7 | Yes | Swept North to South<br>17 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/15/2008 | | 5/16/2008 | 64 | | 6/30/2008 | 12 |
| B2C8 | Yes | Swept North to South<br>87 lbs Non-MD Related Scrap<br>0 MEC | 5 | 4/28/2008 | | 5/19/2008 | 121 | | 9/5/2008 | 80 |
| B2C9 | Yes | Swept North to South<br>37 lbs Non-MD Related Scrap<br>0 MEC | 8 | 4/28/2008 | | 5/19/2008 | 165 | | 10/1/2009 | 110 |
| B2D1 | Yes | Swept North to South<br>0 lbs Non MD Related Scrap<br>0 lbs MEC | 0 | 4/10/2008 | | 5/9/2008 | 19 | | 6/12/2008 | 0 |

| Grid | Vegetation Clearance Complete | Surface Clearance Comments | lbs of MD removed During Surface Sweep | Surface Clearance Completion Date | Digital Geophysical Mapping Comments | Digital Geophysical Completion Date | Number of Point Intrusive Anomalies | Intrusive Investigation Comments | Intrusive Investigation Completion Date | Lbs of MD removed during Subsurface Sweep |
|---|---|---|---|---|---|---|---|---|---|---|
| B2D4 | Yes | Swept North to South<br>107 lbs Non-MD Related Scrap<br>0 MEC<br>several foundations, walks (cement & asphalt) in grid. | 0 | 4/14/2008 | | 5/13/2008 | 52 | **Lots of Concrete and pipe running from boarders of grid** | 6/26/2008 | 0 |
| B2D5 | Yes | Swept North to South<br>1 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/15/2008 | | 5/13/2008 | 39 | | 6/26/2008 | 0 |
| B2D6 | Yes | Swept North to South<br>2000 lbs Non-MD Related Scrap<br>0 MEC<br>J57 ENGINE CASKET | 0 | 4/15/2008 | | 5/27/2008 | 38 | | 6/27/2008 | 1 |
| B2D7 | Yes | Swept North to South<br>9 lbs Non-MD Related Scrap<br>0 MEC | 1.25 | 4/15/2008 | | 5/27/2008 | 40 | | 6/17/2008 | 11 |
| B2E4 | Yes | Swept North to South<br>27 lbs Non-MD Related Scrap<br>0 MEC<br>significant cement foundations to be removed prior to DGM visitation. | 0 | 4/14/2008 | | 5/13/2008 | 21 | | 6/26/2008 | 0 |
| B2E5 | Yes | Swept North to South<br>0 lbs Non-MD Related Scrap<br>0 MEC | 1 | 4/14/2008 | | 5/13/2008 | 22 | | 6/25/2008 | 2 |
| B2H1 | Yes | Swept North to South<br>1 lbs Non-MD Related Scrap<br>0 MEC<br>ugly grid needs grubbing prior to dam | 0 | 4/3/2008 | | 5/9/2008 | 4 | | 5/28/2008 | 1 |
| B2H2 | Yes | Swept North to South<br>1 lbs Non-MD Related Scrap<br>0 MEC<br>extremely ugly grid<br>needs grubbing | 0 | 4/2/2008 | | 5/9/2008 | 4 | | 5/28/2008 | 2 |
| B2H3 | Yes | Swept North to South<br>1 lbs Non-MD Related Scrap<br>0 MEC<br>ugly grid needs grubbing prior to dam | 0 | 4/2/2008 | | 5/9/2008 | 5 | | 5/28/2008 | 0 |
| B2I2 | Yes | Swept North to South<br>1 lbs Non-MD Related Scrap<br>0 MEC<br>extremely ugly grid<br>needs grubbing | 0 | 4/3/2008 | | 5/9/2008 | 4 | | 5/28/2008 | 0 |
| B2I3 | Yes | Swept East to West<br>1 lbs Non-MD Related Scrap<br>0 MEC | 0 | 4/3/2008 | | 5/9/2008 | 6 | | 5/28/2008 | 0 |

| Grid | Vegetation Clearance Complete | Surface Clearance Comments | lbs of MD removed During Surface Sweep | Surface Clearance Completion Date | Digital Geophysical Mapping Comments | Digital Geophysical Completion Date | Number of Point Intrusive Anomalies | Intrusive Investigation Comments | Intrusive Investigation Completion Date | Lbs of MD removed during Subsurface Sweep |
|---|---|---|---|---|---|---|---|---|---|---|
| B3A1 | Yes | Swept North to South<br>0 lbs Non-MD Related Scrap<br>aircraft launched flair | 12 | 4/29/2008 | | 5/20/2008 | 115 | **Mag And Dig in Excavation regions only** | 10/15/2008 | 4600 |
| B3A2 | Yes | Swept East to West<br>17 lbs Non-MD Related Scrap<br>0 MEC | 3 | 5/2/2008 | | 5/27/2008 | 134 | **Mag And Dig in Excavation regions only** | | 4600 |
| B3A3 | Yes | Swept East to West<br>15 lbs Non-MD Related Scrap<br>0 MEC | 15 | 5/5/2008 | | 5/27/2008 | 222 | | 8/6/2008 | 97 |
| B3A6 | Yes | Swept North to South<br>17 lbs Non-MD Related Scrap<br>0 MEC | 17 | 8/8/2008 | | 5/27/2008 | 43 | | 7/17/2008 | 29 |
| B3A7 | Yes | Swept North to South<br>7 lbs Non-MD Related Scrap<br>0 MEC | 10 | 8/8/2008 | | 5/28/2008 | 46 | | 8/7/2008 | 29 |
| B3B1 | Yes | Swept North to South<br>0 lbs Non-MD Related Scrap<br>0 MEC | 10 | 4/29/2008 | | 5/20/2008 | 167 | **Mag And Dig in Excavation regions only**<br>(2) MK4 Spotting Charge | 9/11/2008 | 4600 |
| B3B2 | Yes | Swept East to West<br>40 lbs Non-MD Related Scrap<br>0 MEC | 0.5 | 5/2/2008 | | 5/20/2008 | 195 | (1) M204 Practice Mine Fuze | 8/1/2008 | 53 |
| B3B3 | Yes | Swept East to West<br>49 lbs Non-MD Related Scrap<br>0 MEC | 17 | 5/5/2008 | | 5/20/2008 | 149 | (2) M204 Practice Mine Fuze | 7/31/2008 | 53 |
| B3B7 | Yes | Swept North to South<br>6 lbs Non-MD Related Scrap<br>0 MEC | 0 | 8/8/2008 | | 5/28/2008 | 37 | | 6/18/2008 | 24 |
| B3C1 | Yes | Swept North to South<br>424 lbs Non-MD Related Scrap<br>0 MEC | 12 | 4/28/2008 | | 5/20/2008 | 144 | BLU - 26/B Submunition Inert Bomblet (BIP) | 7/24/2008 | 52 |
| B3C2 | Yes | Swept East to West<br>276 lbs Non-MD Related Scrap<br>0 MEC | 43 | 5/5/2008 | | 5/20/2008 | 118 | | 7/22/2008 | 58 |
| B3C3 | Yes | Swept East to West<br>276 lbs Non-MD Related Scrap<br>0 MEC | 43 | 5/5/2008 | | 5/20/2008 | 134 | | 9/8/2008 | 75 |
| B3D2 | Yes | Swept East to West<br>150 Non-MD Related Scrap<br>0 MEC | 0 | 4/21/2008 | | 5/27/2008 | 111 | | 7/23/2008 | 52 |
| B3D3 | Yes | Swept East to West<br>25 lbs Non-MD Related Scrap<br>0 MEC | 14 | 4/18/2008 | | 5/22/2008 | 113 | (1) M204 Practice Mine Fuze | 7/21/2008 | 57 |
| B3E2 | Yes | Swept East to West<br>37 lbs Non-MD Related Scrap<br>0 MEC | 30 | 4/21/2008 | | 5/27/2008 | 59 | | 8/26/2008 | 9 |

| Grid | Vegetation Clearance Complete | Surface Clearance Comments | lbs of MD removed During Surface Sweep | Surface Clearance Completion Date | Digital Geophysical Mapping Comments | Digital Geophysical Completion Date | Number of Point Intrusive Anomalies | Intrusive Investigation Comments | Intrusive Investigation Completion Date | Lbs of MD removed during Subsurface Sweep |
|---|---|---|---|---|---|---|---|---|---|---|
| B3E3 | Yes | Swept East to West<br>25 lbs Non-MD Related Scrap<br>0 MEC | 14 | 4/18/2008 | | 5/22/2008 | 46 | | 7/18/2008 | 30 |
| B3F2 | Yes | Swept East to West<br>12 lbs Non-MD Related Scrap<br>0 MEC | 6 | 4/18/2008 | | 5/27/2008 | 38 | | 7/23/2008 | 19 |
| B3F3 | Yes | Swept East to West<br>17 lbs Non-MD Related Scrap<br>0 MEC | 4 | 4/18/2008 | | 5/22/2008 | 35 | | 7/18/2009 | 19 |
| B3G2 | Yes | Swept East to West<br>5 lbs Non-MD Related Scrap<br>0 MEC | 8 | 4/18/2008 | | 5/27/2008 | 19 | | 7/18/2009 | 13 |
| B3G3 | Yes | Swept East to West<br>17 lbs Non-MD Related Scrap<br>0 MEC | 13 | 4/18/2008 | | 5/22/2008 | 22 | | 7/21/2008 | 15 |

:\GIS\NAS_CecilField\Site-15_20100607.apr 10Jan11 MJJ 10-03




**Legend**

2008 Soil Excavated Area (A through Q)

UXO Grid Number

**Subsurface Transect Anomaly Density**

- No anomalies
- Low (1 to 5) anomalies
- Medium (6 to 20) anomalies
- High (21 or more) anomalies

**Surface**

★ MPPEH Item

**2008 Munitions Surface and Subsurface Clearance Areas:**

- GPO from munitions support of 2008/2009 contaminated soil, reused area for 2010 MEC RI
- MEC or MEC/MDAS found and removed
- MDAS only found and removed
- No MEC or MDAS found although non-munitions related debris may have been present

300 0 300 Feet

| | | |
|---|---|---|
| DRAWN BY MJJ | DATE 20Oct10 | |
| CHECKED BY EIL | DATE | |
| COST/SCHEDULE-AREA | | |
| SCALE AS NOTED | | |

NAVFAC

DETECTOR-AIDED SURVEY TRANSECT RESULTS
OPERABLE UNIT 5, SITE 15
MEC REMEDIAL INVESTIGATION
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

| | |
|---|---|
| CONTRACT NUMBER 2267 | |
| APPROVED BY L. Klink | DATE |
| APPROVED BY | DATE |
| DRAWING NO. FIGURE 10-3 | REV 0 |

**SUMMARY OF MEC RI DETECTOR-AIDED SURFACE AND SUBSURFACE ANOMALY SURVEY RESULTS**
**OU 5, SITE 15 - BLUE 10 ORDNANCE DISPOSAL AREA**
**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**


| TRANSECT SEGMENT[(1)] | NUMBER OF ANOMALIES | COLOR CODE[(2)] | DATE COLLECTED |
|---|---|---|---|
| **EAST/WEST** | | | |
| T1-DE | 2 | Green | 5/15/2010 |
| T1-EF | 2 | Green | 5/15/2010 |
| T1-FG | 1 | Green | 5/15/2010 |
| T1-GH | 0 | Blue | 5/15/2010 |
| T1-HI | 1 | Green | 5/15/2010 |
| T1-IJ | 3 | Green | 5/15/2010 |
| T1-JK | 1 | Green | 5/19/2010 |
| T2-KL | 1 | Green | 5/22/2010 |
| T2-LM | 1 | Green | 5/22/2010 |
| T2-MN | 1 | Green | 5/22/2010 |
| T2-CD | 0 | Blue | 5/11/2010 |
| T2-DE | 1 | Green | 5/2/2010 |
| T2-EF | 2 | Green | 5/11/2010 |
| T2-IJ | 3 | Green | 5/3/2010 |
| T2-JK | 0 | Blue | 5/19/2010 |
| T3-AB | 2 | Green | 5/11/2010 |
| T3-BC | 0 | Blue | 5/11/2010 |
| T3-CD | 0 | Blue | 5/11/2010 |
| T3-DE | 1 | Green | 5/11/2010 |
| T3-IJ | 10 | Yellow | 5/3/2010 |
| T3-JK | 1 | Green | 5/19/2010 |
| T3-KL | 4 | Green | 5/19/2010 |
| T3-LM | 3 | Green | 5/19/2010 |
| T3-MN | 0 | Blue | 5/22/2010 |
| T4-AB | 0 | Blue | 5/11/2010 |
| T4-BC | 0 | Blue | 5/11/2010 |
| T4-CD | 2 | Green | 5/11/2010 |
| T4-HI | 30 | Red | 5/3/2010 |
| T4-IJ | 16 | Yellow | 5/3/2010 |
| T4-JK | 5 | Green | 5/3/2010 |
| T4-KL | 10 | Yellow | 5/3/2010 |
| T4-LM | 9 | Yellow | 5/3/2010 |
| T4-MN | 4 | Green | 5/3/2010 |
| T4-NO | 2 | Green | 5/3/2010 |
| T4-OP | 1 | Green | 5/3/2010 |
| T5-AB | 1 | Green | 5/11/2010 |
| T5-BC | 2 | Green | 5/11/2010 |

SUMMARY OF MEC RI DETECTOR-AIDED SURFACE AND SUBSURFACE
ANOMALY SURVEY RESULTS
OU 5, SITE 15 - BLUE 10 ORDNANCE DISPOSAL AREA
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA



| TRANSECT SEGMENT[(1)] | NUMBER OF ANOMALIES | COLOR CODE[(2)] | DATE COLLECTED |
|---|---|---|---|
| T5-CD | 1 | Green | 5/11/2010 |
| T5-FG | 23 | Red | 5/3/2010 |
| T5-GH | 22 | Red | 5/5/2010 |
| T5-HI | 29 | Red | 5/5/2010 |
| T5-IJ | 21 | Red | 5/5/2010 |
| T5-JK | 18 | Yellow | 5/5/2010 |
| T5-KL | 9 | Yellow | 5/5/2010 |
| T5-LM | 5 | Green | 5/3/2010 |
| T5-MN | 2 | Green | 5/3/2010 |
| T5-NO | 1 | Green | 5/3/2010 |
| T5-OP | 1 | Green | 5/3/2010 |
| T6-AB | 1 | Green | 5/11/2010 |
| T6-BC | 1 | Green | 5/11/2010 |
| T6-CD | 4 | Green | 5/11/2010 |
| T6-NO | 5 | Green | 5/12/2010 |
| T6-OP | 2 | Green | 5/12/2010 |
| T7-A AA | 3 | Green | 5/21/2010 |
| T7-AB | 1 | Green | 5/11/2010 |
| T7-BC | 3 | Green | 5/11/2010 |
| T7-NO | 1 | Green | 5/12/2010 |
| T7-OP | 1 | Green | 5/12/2010 |
| T8-AA BB | 1 | Green | 5/21/2010 |
| T8-A AA | 2 | Green | 5/21/2010 |
| T8-AB | 2 | Green | 5/11/2010 |
| T8-DE | 5 | Green | 5/12/2010 |
| T8-EF | 5 | Green | 5/12/2010 |
| T8-NO | 0 | Blue | 5/12/2010 |
| T8-OP | 1 | Green | 5/12/2010 |
| T9-BB CC | 0 | Blue | 5/21/2010 |
| T9-AA BB | 0 | Blue | 5/21/2010 |
| T9-AB | 3 | Green | 5/11/2010 |
| T9-DE | 4 | Green | 5/12/2010 |
| T9-EF | 6 | Yellow | 5/12/2010 |
| T9-JK | 23 | Red | 5/12/2010 |
| T9-KL | 11 | Yellow | 5/12/2010 |
| T9-LM | 1 | Green | 5/12/2010 |
| T9-MN | 4 | Green | 5/12/2010 |
| T9-NO | 0 | Blue | 5/12/2010 |

ATTACHMENT 1

SUMMARY OF MEC RI DETECTOR-AIDED SURFACE AND SUBSURFACE
ANOMALY SURVEY RESULTS
OU 5, SITE 15 - BLUE 10 ORDNANCE DISPOSAL AREA
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA


| TRANSECT SEGMENT[1] | NUMBER OF ANOMALIES | COLOR CODE[2] | DATE COLLECTED |
|---|---|---|---|
| T9-OP | 0 | Blue | 5/12/2010 |
| T10-BB CC | 1 | Green | 5/21/2010 |
| T10-BC | 4 | Green | 5/15/2010 |
| T10-AB | 1 | Green | 5/11/2010 |
| T10-CD | 12 | Yellow | 5/15/2010 |
| T10-DE | 8 | Yellow | 5/15/2010 |
| T10-EF | 9 | Yellow | 5/12/2010 |
| T10-JK | 11 | Yellow | 5/12/2010 |
| T10-KL | 19 | Yellow | 5/12/2010 |
| T10-LM | 1 | Green | 5/12/2010 |
| T10-MN | 2 | Green | 5/12/2010 |
| T11-BC | 0 | Blue | 5/11/2010 |
| T11-CD | 3 | Green | 5/15/2010 |
| T11-DE | 11 | Yellow | 5/15/2010 |
| T11-EF | 9 | Yellow | 5/12/2010 |
| T11-JK | 8 | Yellow | 5/12/2010 |
| T11-KL | 13 | Yellow | 5/12/2010 |
| T11-LM | 0 | Blue | 5/12/2010 |
| T11-MN | 1 | Green | 5/12/2010 |
| T12-CD | 4 | Green | 5/15/2010 |
| T12-DE | 17 | Yellow | 5/15/2010 |
| T12-EF | 15 | Yellow | 5/12/2010 |
| T12-KL | 14 | Yellow | 5/12/2010 |
| T12-LM | 2 | Green | 5/12/2010 |
| T12-MN | 0 | Blue | 5/12/2010 |
| T13-CD | 0 | Blue | 5/15/2010 |
| T13-DE | 5 | Green | 5/15/2010 |
| T13-EF | 11 | Yellow | 5/12/2010 |
| T13-KL | 4 | Green | 5/12/2010 |
| T13-LM | 3 | Green | 5/12/2010 |
| T13-MN | 3 | Green | 5/12/2010 |
| T14-CD | 2 | Green | 5/11/2010 |
| T14-DE | 2 | Green | 5/15/2010 |
| T14-EF | 13 | Yellow | 5/12/2010 |
| T14-HI | 8 | Yellow | 5/14/2010 |
| T14-LM | 6 | Yellow | 5/12/2010 |
| T14-MN | 3 | Green | 5/12/2010 |
| T15-CD | 4 | Green | 5/22/2010 |

# SUMMARY OF MEC RI DETECTOR-AIDED SURFACE AND SUBSURFACE ANOMALY SURVEY RESULTS
## OU 5, SITE 15 - BLUE 10 ORDNANCE DISPOSAL AREA
## NAVAL AIR STATION CECIL FIELD
## JACKSONVILLE, FLORIDA



| TRANSECT SEGMENT[1] | NUMBER OF ANOMALIES | COLOR CODE[2] | DATE COLLECTED |
|---|---|---|---|
| T15-DE | 7 | Yellow | 5/13/2010 |
| T15-EF | 11 | Yellow | 5/13/2010 |
| T15-LM | 2 | Green | 5/12/2010 |
| T15-MN | 0 | Blue | 5/15/2010 |
| T16-CD | 2 | Green | 5/22/2010 |
| T16-DE | 2 | Green | 5/13/2010 |
| T16-EF | 3 | Green | 5/13/2010 |
| T16-LM | 1 | Green | 5/12/2010 |
| T16-MN | 7 | Yellow | 5/15/2010 |
| T17-CD | 0 | Blue | 5/22/2010 |
| T17-DE | 7 | Yellow | 5/13/2010 |
| T17-IJ | 4 | Green | 5/14/2010 |
| T17-JK | 5 | Green | 5/14/2010 |
| T17-KL | 5 | Green | 5/14/2010 |
| T17-LM | 1 | Green | 5/14/2010 |
| T17-MN | 1 | Green | 5/14/2010 |
| T18-DE | 2 | Green | 5/13/2010 |
| T18-KL | 3 | Green | 5/15/2010 |
| T18-LM | 11 | Yellow | 5/15/2010 |
| T18-MN | 4 | Green | 5/15/2010 |
| T19-DE | 0 | Blue | 5/13/2010 |
| T19-GH | 4 | Green | 5/13/2010 |
| T19-LM | 0 | Blue | 5/15/2010 |
| T19-MN | 1 | Green | 5/15/2010 |
| T20-GH | 25 | Red | 5/13/2010 |
| T20-LM | 0 | Blue | 5/15/2010 |
| T20-MN | 0 | Blue | 5/15/2010 |
| T20-NO | 0 | Blue | 5/15/2010 |
| T20-OP | 2 | Green | 5/20/2010 |
| T21-FG | 0 | Blue | 5/13/2010 |
| T21-GH | 4 | Green | 5/13/2010 |
| T21-LM | 0 | Blue | 5/15/2010 |
| T21-MN | 7 | Yellow | 5/15/2010 |
| T21-NO | 5 | Green | 5/20/2010 |
| T21-OP | 1 | Green | 5/20/2010 |
| T22-EF | 1 | Green | 5/14/2010 |
| T22-FG | 1 | Green | 5/14/2010 |
| T22-GH | 2 | Green | 5/14/2010 |

ATTACHMENT 1

SUMMARY OF MEC RI DETECTOR-AIDED SURFACE AND SUBSURFACE
ANOMALY SURVEY RESULTS
OU 5, SITE 15 - BLUE 10 ORDNANCE DISPOSAL AREA
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA



| TRANSECT SEGMENT(1) | NUMBER OF ANOMALIES | COLOR CODE(2) | DATE COLLECTED |
|---|---|---|---|
| T22-LM | 0 | Blue | 5/15/2010 |
| T22-MN | 3 | Green | 5/15/2010 |
| T22-NO | 1 | Green | 5/20/2010 |
| T22-OP | 1 | Green | 5/20/2010 |
| T23-EF | 1 | Green | 5/14/2010 |
| T23-FG | 2 | Green | 5/14/2010 |
| T23-GH | 9 | Yellow | 5/14/2010 |
| T23-HI | 1 | Green | 5/15/2010 |
| T23-IJ | 0 | Blue | 5/15/2010 |
| T23-JK | 0 | Blue | 5/15/2010 |
| T23-KL | 0 | Blue | 5/15/2010 |
| T23-LM | 2 | Green | 5/15/2010 |
| T24-IJ | 0 | Blue | 5/15/2010 |
| T25-IJ | 0 | Blue | 5/15/2010 |
| **North / South** | | | |
| CC-T9T10 | 0 | Blue | 5/21/2010 |
| BB-T8T9 | 2 | Green | 5/21/2010 |
| BB-T9T10 | 2 | Green | 5/21/2010 |
| AA-T7T8 | 0 | Blue | 5/21/2010 |
| AA-T8T9 | 0 | Blue | 5/21/2010 |
| A-T3T4 | 1 | Green | 5/11/2010 |
| A-T4T5 | 0 | Blue | 5/11/2010 |
| A-T5T6 | 0 | Blue | 5/11/2010 |
| A-T6T7 | 1 | Green | 5/11/2010 |
| A-T7T8 | 1 | Green | 5/11/2010 |
| A-T8T9 | 2 | Green | 5/11/2010 |
| A-T9T10 | 2 | Green | 5/11/2010 |
| B-T3T4 | 1 | Green | 5/11/2010 |
| B-T4T5 | 2 | Green | 5/11/2010 |
| B-T5T6 | 2 | Green | 5/11/2010 |
| B-T6T7 | 0 | Blue | 5/11/2010 |
| B-T7T8 | 1 | Green | 5/11/2010 |
| B-T9T10 | 2 | Green | 5/11/2010 |
| B-T10T11 | 1 | Green | 5/11/2010 |
| C-T2T3 | 0 | Blue | 5/11/2010 |
| C-T3T4 | 0 | Blue | 5/11/2010 |
| C-T4T5 | 2 | Green | 5/11/2010 |
| C-T5T6 | 6 | Yellow | 5/11/2010 |

ATTACHMENT 1

SUMMARY OF MEC RI DETECTOR-AIDED SURFACE AND SUBSURFACE
ANOMALY SURVEY RESULTS
OU 5, SITE 15 - BLUE 10 ORDNANCE DISPOSAL AREA
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA


| TRANSECT SEGMENT(1) | NUMBER OF ANOMALIES | COLOR CODE(2) | DATE COLLECTED |
|---|---|---|---|
| C-T6T7 | 5 | Green | 5/11/2010 |
| C-T9T10 | 4 | Green | 5/11/2010 |
| C-T10T11 | 1 | Green | 5/11/2010 |
| C-T11T12 | 2 | Green | 5/11/2010 |
| C-T12T13 | 1 | Green | 5/11/2010 |
| C-T13T14 | 1 | Green | 5/11/2010 |
| C-T14T15 | 1 | Green | 5/22/2010 |
| C-T15T16 | 0 | Blue | 5/22/2010 |
| C-T16T17 | 3 | Green | 5/22/2010 |
| D-T1T2 | 0 | Blue | 5/11/2010 |
| D-T2T3 | 1 | Green | 5/15/2010 |
| D-T3T4 | 0 | Blue | 5/11/2010 |
| D-T9T10 | 5 | Green | 5/11/2010 |
| D-T10T11 | 6 | Yellow | 5/11/2010 |
| D-T11T12 | 2 | Green | 5/11/2010 |
| D-T12T13 | 2 | Green | 5/11/2010 |
| D-T13T14 | 2 | Green | 5/11/2010 |
| D-T14T15 | 14 | Yellow | 5/13/2010 |
| D-T15T16 | 9 | Yellow | 5/13/2010 |
| D-T16T17 | 8 | Yellow | 5/13/2010 |
| D-T17T18 | 6 | Yellow | 5/13/2010 |
| D-T18T19 | 4 | Green | 5/13/2010 |
| D-T19T20 | 6 | Yellow | 5/13/2010 |
| E-T1T2 | 2 | Green | 5/15/2010 |
| E-T2T3 | 1 | Green | 5/15/2010 |
| E-T7T8 | 15 | Yellow | 5/12/2010 |
| E-T8T9 | 24 | Red | 5/12/2010 |
| E-T9T10 | 9 | Yellow | 5/12/2010 |
| E-T10T11 | 11 | Yellow | 5/12/2010 |
| E-T11T12 | 22 | Red | 5/12/2010 |
| E-T12T13 | 9 | Yellow | 5/12/2010 |
| E-T13T14 | 6 | Yellow | 5/12/2010 |
| E-T14T15 | 8 | Yellow | 5/13/2010 |
| E-T15T16 | 5 | Green | 5/13/2010 |
| E-T16T17 | 20 | Yellow | 5/13/2010 |
| E-T19T20 | 1 | Green | 5/13/2010 |
| E-T22T23 | 2 | Green | 5/14/2010 |
| E-T23T24 | 0 | Blue | 5/14/2010 |

## SUMMARY OF MEC RI DETECTOR-AIDED SURFACE AND SUBSURFACE ANOMALY SURVEY RESULTS
## OU 5, SITE 15 - BLUE 10 ORDNANCE DISPOSAL AREA
## NAVAL AIR STATION CECIL FIELD
## JACKSONVILLE, FLORIDA



| TRANSECT SEGMENT(1) | NUMBER OF ANOMALIES | COLOR CODE(2) | DATE COLLECTED |
|---|---|---|---|
| F-T1T2 | 2 | Green | 5/15/2010 |
| F-T16T17 | 2 | Green | 5/13/2010 |
| F-T22T23 | 2 | Green | 5/14/2010 |
| F-T23T24 | 5 | Green | 5/14/2010 |
| G-T1T2 | 2 | Green | 5/15/2010 |
| G-T4T5 | 20 | Yellow | 5/5/2010 |
| G-T5T6 | 28 | Red | 5/3/2010 |
| G-T20T21 | 2 | Green | 5/13/2010 |
| G-T21T22 | 1 | Green | 5/14/2010 |
| G-T22T23 | 4 | Green | 5/14/2010 |
| G-T23T24 | 4 | Green | 5/14/2010 |
| H-T1T2 | 4 | Green | 5/15/2010 |
| H-T4T5 | 24 | Red | 5/5/2010 |
| H-T5T6 | 15 | Yellow | 5/5/2010 |
| H-T22T23 | 31 | Red | 5/15/2010 |
| H-T23T24 | 0 | Blue | 5/15/2010 |
| I-T1T2 | 1 | Green | 5/2/2010 |
| I-T3T4 | 11 | Yellow | 5/3/2010 |
| I-T4T5 | 23 | Red | 5/3/2010 |
| I-T5T6 | 25 | Red | 5/3/2010 |
| I-T22T23 | 31 | Red | 5/15/2010 |
| I-T23T24 | 0 | Blue | 5/15/2010 |
| J-T1T2 | 2 | Green | 5/15/2010 |
| J-T2T3 | 28 | Red | 5/3/2010 |
| J-T3T4 | 14 | Yellow | 5/3/2010 |
| J-T4T5 | 15 | Yellow | 5/3/2010 |
| J-T5T6 | 27 | Red | 5/3/2010 |
| J-T16T17 | 5 | Green | 5/15/2010 |
| J-T17T18 | 4 | Green | 5/15/2010 |
| J-T22T23 | 1 | Green | 5/15/2010 |
| J-T23T24 | 3 | Green | 5/15/2010 |
| J-T24T25 | 0 | Blue | 5/15/2010 |
| K-T1T2 | 1 | Green | 5/19/2010 |
| K-T2T3 | 1 | Green | 5/19/2010 |
| K-T3T4 | 3 | Green | 5/19/2010 |
| K-T4T5 | 19 | Yellow | 5/5/2010 |
| K-T5T6 | 20 | Yellow | 5/4/2010 |
| K-T8T9 | 2 | Green | 5/12/2010 |

ATTACHMENT 1

SUMMARY OF MEC RI DETECTOR-AIDED SURFACE AND SUBSURFACE
ANOMALY SURVEY RESULTS
OU 5, SITE 15 - BLUE 10 ORDNANCE DISPOSAL AREA
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA


| TRANSECT SEGMENT[(1)] | NUMBER OF ANOMALIES | COLOR CODE[(2)] | DATE COLLECTED |
|---|---|---|---|
| K-T9T10 | 7 | Yellow | 5/12/2010 |
| K-T10T11 | 8 | Yellow | 5/12/2010 |
| K-T11T12 | 3 | Green | 5/12/2010 |
| K-T16T17 | 36 | Red | 5/15/2010 |
| K-T17T18 | 12 | Yellow | 5/15/2010 |
| K-T22T23 | 1 | Green | 5/15/2010 |
| L-T2T3 | 0 | Blue | 5/22/2010 |
| L-T3T4 | 1 | Green | 5/19/2010 |
| L-T4T5 | 11 | Yellow | 5/5/2010 |
| L-T5T6 | 5 | Green | 5/5/2010 |
| L-T8T9 | 10 | Yellow | 5/12/2010 |
| L-T9T10 | 7 | Yellow | 5/12/2010 |
| L-T10T11 | 4 | Green | 5/12/2010 |
| L-T11T12 | 6 | Yellow | 5/12/2010 |
| L-T12T13 | 2 | Green | 5/12/2010 |
| L-T13T14 | 1 | Green | 5/12/2010 |
| L-T16T17 | 17 | Yellow | 5/15/2010 |
| L-T17T18 | 30 | Red | 5/15/2010 |
| L-T18T19 | 5 | Green | 5/15/2010 |
| L-T22T23 | 2 | Green | 5/15/2010 |
| M-T2T3 | 2 | Green | 5/22/2010 |
| M-T3T4 | 6 | Yellow | 5/19/2010 |
| M-T4T5 | 6 | Yellow | 5/5/2010 |
| M-T5T6 | 23 | Red | 5/5/2010 |
| M-T8T9 | 1 | Green | 5/12/2010 |
| M-T9T10 | 1 | Green | 5/12/2010 |
| M-T10T11 | 1 | Green | 5/12/2010 |
| M-T11T12 | 1 | Green | 5/12/2010 |
| M-T12T13 | 3 | Green | 5/12/2010 |
| M-T13T14 | 2 | Green | 5/12/2010 |
| M-T14T15 | 4 | Green | 5/12/2010 |
| M-T15T16 | 0 | Blue | 5/12/2010 |
| M-T16T17 | 5 | Green | 5/15/2010 |
| M-T17T18 | 3 | Green | 5/15/2010 |
| M-T18T19 | 2 | Green | 5/15/2010 |
| M-T19T20 | 0 | Blue | 5/15/2010 |
| M-T20T21 | 3 | Green | 5/15/2010 |
| M-T21T22 | 2 | Green | 5/15/2010 |

## ATTACHMENT 1

## SUMMARY OF MEC RI DETECTOR-AIDED SURFACE AND SUBSURFACE ANOMALY SURVEY RESULTS
## OU 5, SITE 15 - BLUE 10 ORDNANCE DISPOSAL AREA
## NAVAL AIR STATION CECIL FIELD
## JACKSONVILLE, FLORIDA



| TRANSECT SEGMENT[(1)] | NUMBER OF ANOMALIES | COLOR CODE[(2)] | DATE COLLECTED |
|---|---|---|---|
| M-T22T23 | 4 | Green | 5/15/2010 |
| N-T2T3 | 0 | Blue | 5/22/2010 |
| N-T3T4 | 0 | Blue | 5/22/2010 |
| N-T4T5 | 1 | Green | 5/5/2010 |
| N-T5T6 | 3 | Green | 5/5/2010 |
| N-T8T9 | 3 | Green | 5/12/2010 |
| N-T9T10 | 5 | Green | 5/12/2010 |
| N-T10T11 | 2 | Green | 5/12/2010 |
| N-T11T12 | 1 | Green | 5/12/2010 |
| N-T12T13 | 4 | Green | 5/12/2010 |
| N-T13T14 | 4 | Green | 5/12/2010 |
| N-T14T15 | 10 | Yellow | 5/12/2010 |
| N-T15T16 | 1 | Green | 5/12/2010 |
| N-T19T20 | 0 | Blue | 5/15/2010 |
| N-T20T21 | 6 | Yellow | 5/15/2010 |
| N-T21T22 | 6 | Yellow | 5/15/2010 |
| O-T4T5 | 2 | Green | 5/12/2010 |
| O-T5T6 | 1 | Green | 5/12/2010 |
| O-T6T7 | 1 | Green | 5/12/2010 |
| O-T7T8 | 0 | Blue | 5/12/2010 |
| O-T8T9 | 0 | Blue | 5/12/2010 |
| O-T19T20 | 0 | Blue | 5/15/2010 |
| O-T20T21 | 1 | Green | 5/20/2010 |
| O-T21T22 | 1 | Green | 5/20/2010 |
| P-T4T5 | 0 | Blue | 5/3/2010 |
| P-T5T6 | 0 | Blue | 5/12/2010 |
| P-T6T7 | 0 | Blue | 5/12/2010 |
| P-T7T8 | 0 | Blue | 5/12/2010 |
| P-T8T9 | 0 | Blue | 5/12/2010 |
| P-T20T21 | 3 | Green | 5/20/2010 |
| P-T21T22 | 1 | Green | 5/20/2010 |

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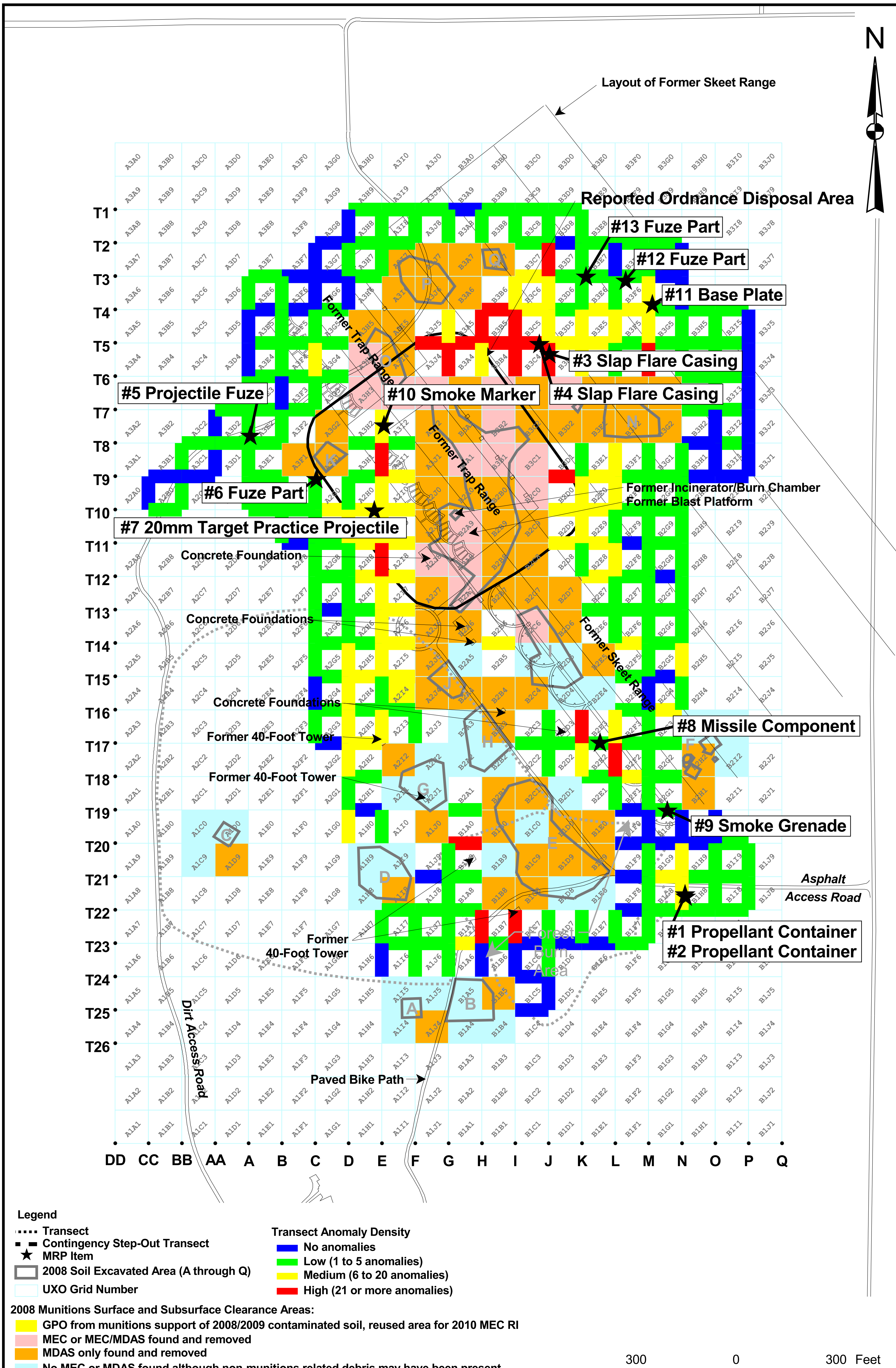


| DRAWN BY | DATE |
|---|---|
| MJJ | 07Jun10 |
| CHECKED BY | DATE |
| COST/SCHEDULE-AREA | |
| SCALE AS NOTED | |

NAVFAC

DETECTOR-AIDED SURVEY TRANSECT RESULTS
OPERABLE UNIT 5, SITE 15
MEC REMEDIAL INVESTIGATION
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

| CONTRACT NUMBER 2267 | |
|---|---|
| APPROVED BY L. Klink | DATE |
| APPROVED BY | DATE |
| DRAWING NO. FIGURE 5-2 | REV 0 |

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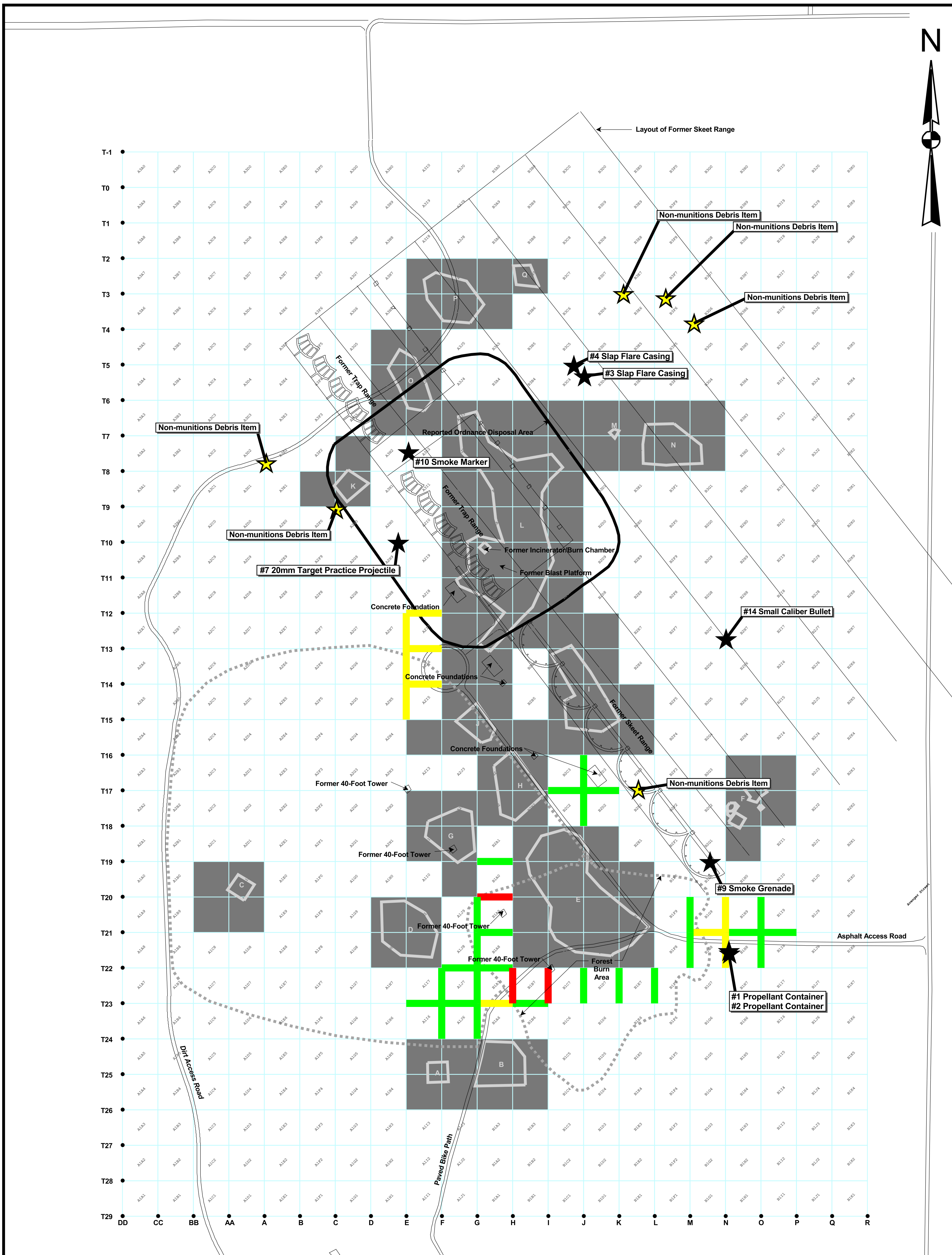


## Legend

UXO Grid Number

2008 Soil Excavated Area (A through Q)

2008 Munitions Surface and Subsurface Clearance Area

### Surface

★ Certified MDAS Item (May 2011)

☆ Non-munitions Debris Item (May 2011)

### Subsurface

| Number Of Hand Excavation Locations/Transect | Transect Anomaly Density |
|---|---|
| 0 | No anomalies |
| 1 | Low (1 to 5) anomalies |
| 2 | Medium (6 to 20) anomalies |
| 3 | High (21 or more) anomalies |

Notes: 1) Only transects for Supplemental RI work (along paved bike path and asphalt access road) are shown on this figure.

2) All MDAS items were containerized and disposed of off site.

300 0 300 Feet

| | |
|---|---|
| DRAWN BY MJJ | DATE 14Jul11 |
| CHECKED BY EIL | DATE |
| COST/SCHEDULE-AREA | |
| SCALE AS NOTED | |

NAVFAC

EXCAVATION LOCATIONS
PAVED BIKE PATH AND ASPHALT ACCESS ROAD
OPERABLE UNIT 5, SITE 15
SUPPLEMENTAL MEC REMEDIAL INVESTIGATION
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

| | |
|---|---|
| CONTRACT NUMBER 2267 | |
| APPROVED BY L. Klink | DATE |
| APPROVED BY | DATE |
| DRAWING NO. FIGURE 3-2 | REV 0 |

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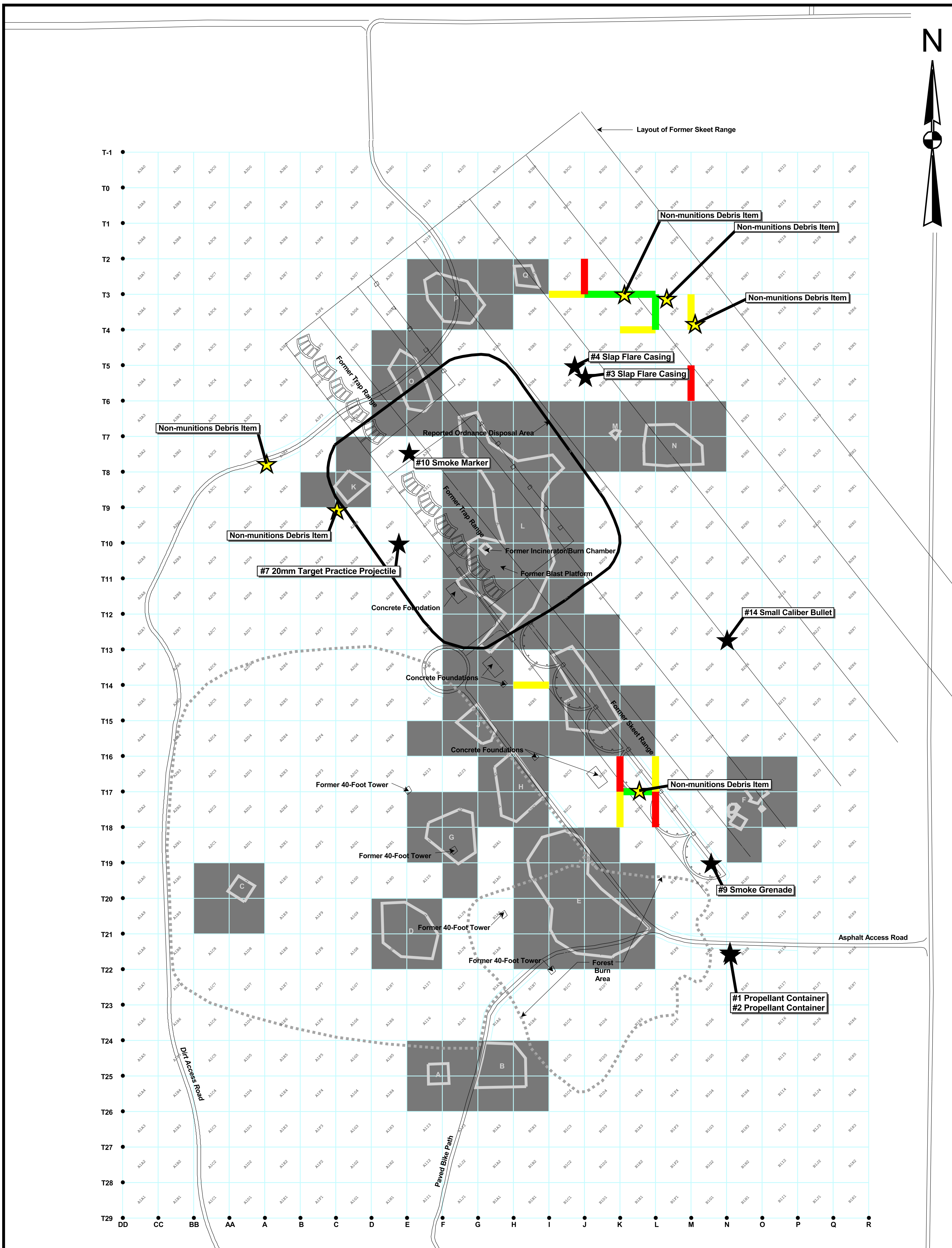


## Legend

UXO Grid Number

2008 Soil Excavated Area (A through Q)

2008 Munitions Surface and Subsurface Clearance Area

### Surface

★ Certified MDAS Item (May 2011)

☆ Non-munitions Debris Item (May 2011)

### Subsurface

| Number Of Hand Excavation Locations/Transect | Transect Anomaly Density |
|---|---|
| 0 | No anomalies |
| 1 | Low (1 to 5) anomalies |
| 2 | Medium (6 to 20) anomalies |
| 3 | High (21 or more) anomalies |

Notes: 1) Only transects for Supplemental RI work (high density anomaly area) are shown on this figure.

2) All MDAS items were containerized and disposed of off site.

300 0 300 Feet

| DRAWN BY MJJ | DATE 14Jul11 |
|---|---|
| CHECKED BY EIL | DATE |
| COST/SCHEDULE-AREA | |
| SCALE AS NOTED | |

NAVFAC

EXCAVATION LOCATIONS
HIGH ANOMALY DENSITY AREAS
OPERABLE UNIT 5, SITE 15
SUPPLEMENTAL MEC REMEDIAL INVESTIGATION
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

| CONTRACT NUMBER 2267 | |
|---|---|
| APPROVED BY L. Klink | DATE |
| APPROVED BY | DATE |
| DRAWING NO. FIGURE 3-3 | REV 0 |

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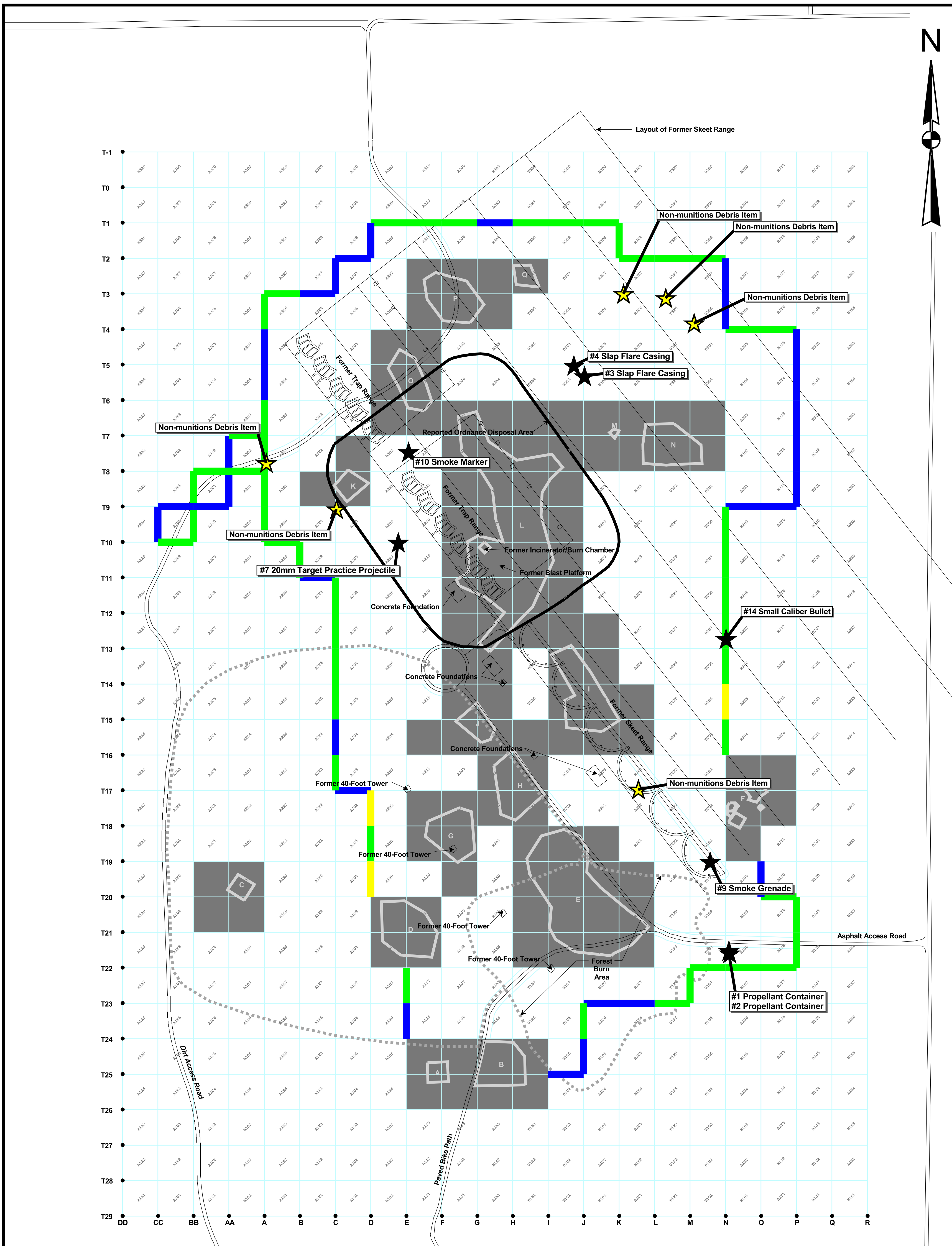



## Legend

UXO Grid Number

2008 Soil Excavated Area (A through Q)

2008 Munitions Surface and Subsurface Clearance Area

### Surface

★ Certified MDAS Item (May 2011)

☆ Non-munitions Debris Item (May 2011)

### Subsurface

| Number Of Hand Excavation Locations/Transect | Transect Anomaly Density |
|---|---|
| 0 | No anomalies |
| 1 | Low (1 to 5) anomalies |
| 2 | Medium (6 to 20) anomalies |
| 3 | High (21 or more) anomalies |

Notes: 1) Only transects for Supplemental RI work (site boundary transects) are shown on this figure.

2) All MDAS items were containerized and disposed of off site.

300 0 300 Feet

| DRAWN BY MJJ | DATE 14Jul11 | EXCAVATION LOCATIONS<br>SITE BOUNDARY TRANSECTS<br>OPERABLE UNIT 5, SITE 15<br>SUPPLEMENTAL MEC REMEDIAL INVESTIGATION<br>NAVAL AIR STATION CECIL FIELD<br>JACKSONVILLE, FLORIDA | CONTRACT NUMBER 2267 | |
|---|---|---|---|---|
| CHECKED BY EIL | DATE | | APPROVED BY L. Klink | DATE |
| COST/SCHEDULE-AREA | | | APPROVED BY | DATE |
| SCALE AS NOTED | NAVFAC | | DRAWING NO. FIGURE 3-4 | REV 0 |

TABLE 5-1

MDAS ITEMS CERTIFIED DURING THE SUPPLEMENTAL MEC RI
OU 5, SITE 15 - BLUE 10 ORDNANCE DISPOSAL AREA
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA


| ID # | Item(1) | Date Identified | GPS Location(2) US Survey Feet | | Physical Condition/ Appearance | Certified | Resolution | Disposal Date |
|---|---|---|---|---|---|---|---|---|
| | | | Northing (feet) | Easting (feet) | | | | |
| **2010 RI Findings** | | | | | | | | |
| 1 | Propellant Can | 4/28/10 | 2147746125 | 365412.93 | Rusted / Open | MDAS | Disposed off site | 6/6/11 |
| 2 | Two Propellant Cans | 4/28/10 | 2147752.62 | 365408.05 | Rusted / Open Intact | 2-MDAS | Disposed off site | 6/6/11 |
| 3 | Slap Flare Case | 5/3/10 | 2149369.30 | 365001.10 | Crushed / Corroded | MDAS | Disposed off site | 6/6/11 |
| 4 | Slap Flare Case | 5/3/10 | 2149402.86 | 364973.56 | Crushed / Corroded | MDAS | Disposed off site | 6/6/11 |
| 5 | Light Bulb socket ~~Projectile Fuze~~ | 5/11/10 | 2148124.03 | 364104.19 | Burned / Corroded | Non-munitions Debris | Segregated in parking area | NA |
| 6 | Electric Capacitor ~~Fuze Part~~ | 5/11/10 | 2148994.82 | 364300.49 | Burned / Corroded | Non-munitions Debris | Segregated in parking area | NA |
| 7 | 20mm TP Projectile | 5/12/10 | 2148900.23 | 364476.06 | Burned / Corroded | MDAS | Disposed off site | 6/6/11 |
| 8 | Electrical parts ~~Missile Parts~~ | 5/13/10 | 2148203.25 | 365154.48 | Burned / Corroded | Non-munitions Debris | Segregated in parking area | NA |
| 9 | Smoke Grenade | 5/13/10 | 2148001.09 | 365362.00 | Expended / Rusted | MDAS | Disposed off site | 6/6/11 |
| 10 | Smoke Marker flair end | 5/14/10 | 2149155.70 | 364505.67 | Broken open / Corroded | MDAS | Disposed off site | 6/6/11 |
| 11 | Electrical parts ~~Blast Plate~~ | 5/19/10 | 2149529.44 | 365306.69 | Corroded | Non-munitions Debris | Segregated in parking area | NA |
| 12 | Electrical parts ~~Fuze Part~~ | 5/19/10 | 2149599.43 | 365228.58 | Burned / Corroded | Non-munitions Debris | Segregated in parking area | NA |
| 13 | Electrical parts ~~Fuze Part~~ | 5/19/10 | 2149613.32 | 365103.81 | Burned / Corroded | Non-munitions Debris | Segregated in parking area | NA |
| **2011 Supplemental RI Findings** | | | | | | | | |
| 14 | Small Caliber Bullet | 5/31/2011 | 2148479.9 | 365402.92 | Corroded | MDAS | Disposed off site | 6/6/11 |

MDAS – Munitions Documented as Safe.
NA – Not Applicable

1 Items were identified following anomaly avoidance techniques during the 2010 RI and inspected/certified during the 2011 Supplemental RI. Items which have been struck out were initially identified as possible MPPEH but were then certified as non-munitions related debris.

2 GPS data were collected using the North American Datum of 1983, Florida State Plane (US Survey Feet). See Figures 3-2 through 3-4 for item locations.

# A-4 MEC HAs

# MEC HA Workbook v1.02

December-07

## Overview

This workbook is a tool for project teams to assess explosive hazards to human receptors at munitions response sites (MRSs) following the Munitions and Explosives of Concern Hazard Assessment (MEC HA) methodology. The MEC HA allows a project team to evaluate potential explosive hazard associated with a site, given current site conditions, under various cleanup, land use activities, and land use control alternatives. A complete description of the methodology can be found in the MEC HA Guidance (Public Review Draft, November 2006). Please reference this guidance when completing the worksheets.

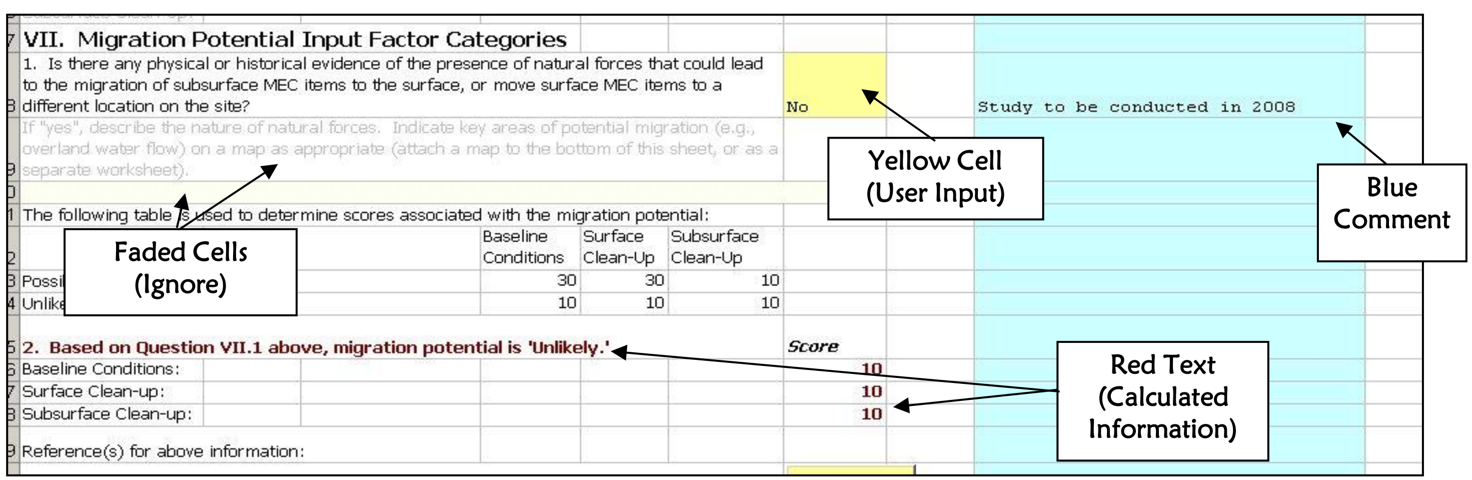
## Instructions

1. Open this file. Enable macros if prompted to do so. This spreadsheet will not work if your security setting is set to 'high' or 'very high'. To change your security level, go to the menu bar and select Tools/Macro/Security. Then close and reopen this spreadsheet.
2. This MS Excel workbook contains 9 worksheets, designed to be used in order. After the '***Instructions***' sheet, the first 5 sheets ask for information about the following topics:

***Summary Info -*** General information regarding the site.
***Munitions/Explosive Info*** - MECs and bulk explosives present at the site.
***Current and Future Activities*** - Current land use activites as well as planned future activities, if any.
***Remedial-Removal Action*** - General information regarding remediation/removal alternatives being considered for the site.
***Post-Response Land Use*** - Land use activities associated with the alternatives listed in the 'Remedial-Removal Action' sheet.

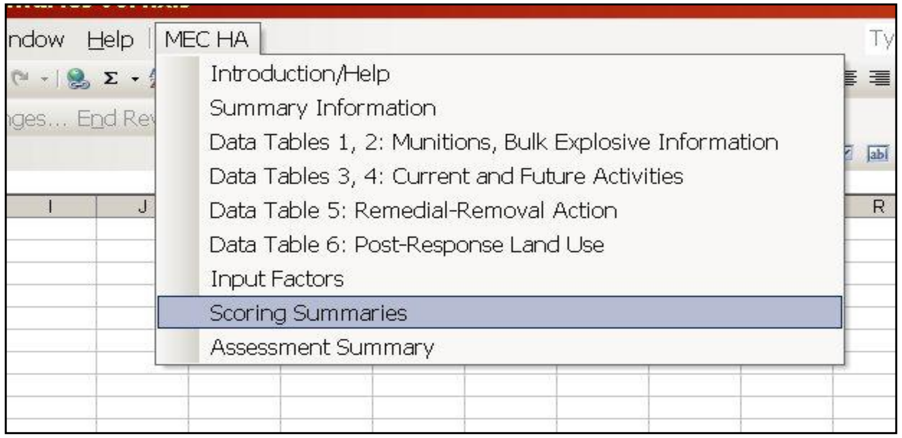
The remaining 3 sheets calculate and summarize the scores. The ***Input Factors*** sheet performs the Input Factor Score calculations, which are summarized in the ***Scoring Summaries*** sheet. The ***Hazard Level*** sheet presents the Hazard Level Category for current use activities, future use activities, and each response alternative based on the respective scores.

3. Starting with the ***Summary Info*** sheet, fill in any yellow cells. Some cells have drop-down lists from which you can select an answer. Select the cell. A down arrow to the right indicates that a drop-down list is available. Yellow buttons can be used to enter reference information. Blue cells can be used for any general comments you wish to make. Any faded cells can be ignored--these are questions that the spreadsheet has determined are not relevant for your situation.

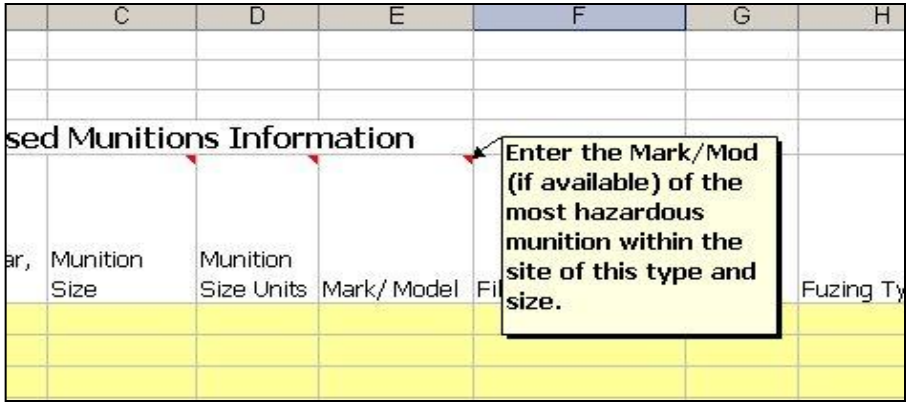



The computer will calculate information based on your inputs. Calculated information will appear as red text

4. The MEC HA menu bar can be used to navigate to different worksheets.




5. Small red triangles in the upper-right corners indicate that help text is available by putting the mouse cursor on that cell.



## MEC HA Summary Information

**Comments**

Site ID: Cecil Field - Site 15, Subunit 1
Date: 10/24/2011

Please identify the single specific area to be assessed in this hazard assessment. From this point forward, all references to "site" or "MRS" refer to the specific area that you have defined.

***A. Enter a unique identifier for the site:***

Site 15

Provide a list of information sources used for this hazard assessment. As you are completing the worksheets, use the "Select Ref(s)" buttons at the ends of each subsection to select the applicable information sources from the list below.

| Ref. No. | Title (include version, publication date) |
|---|---|
| 1 | ABB-ES (ABB Environmental Services, Inc.), 1997. Remedial Investigation, Operable Unit 5, Sites 14 and 15, Naval Air Station Cecil Field, Jacksonville, Florida. |
| 2 | AGVIQ-CH2MHill (AGVIQ-CH2MHill Constructors, Inc., Joint Venture III), 2009. Remedial Action Completion Report - Soil Removal Action for Operable Unit 5, Site 15 - Blue 10 Ordnance Disposal Area, Naval Air Station Cecil Field, Jacksonville, Florida. |
| 3 | CH2MHill, February 2007. Preliminary Assessment/Site Inspection Report for Past Use of Munitions and Explosives of Concern for Blue Ordnance Disposal Area Site 15), Former Naval Air Station Cecil Field, Jacksonville, Florida. |
| 4 | Tetra Tech, 2008. Record of Decision for Operable Unit 5, Site 15 - Blue 10 Ordnance Disposal Area, Naval Air Station Cecil Field, Jacksonville, Florida. |
| 5 | Tetra Tech, 2009a. Land Use Control Remedial Design, Operable Unit 5, Site 15, Naval Air Station Cecil Field, Jacksonville, Florida. |
| 6 | Tetra Tech, 2009b. Remedial Action Completion Report for OU5, Site 15, Naval Air Station Cecil Field, Jacksonville, Florida. Draft. |
| 7 | Tetra Tech, 2011. MEC Remedial Investigation Report for Munitions Response Program at Operable Unit 5, Site 15 Blue 10 Ordnance Disposal Area, Naval Air Station Cecil Field, Jacksonville, Florida. |
| 8 | Tetra Tech, 2011. Draft Remedial Investigation Report For Munitions Response Program Munitions and Explosives of Concern Supplemental Remedial Investigation at Operable Unit 5, Site 15 - Blue Ordnance Disposal Area, Naval Air Station Cecil Field, Jacksonville, Florida. |
| 9 | |
| 10 | |
| 11 | |
| 12 | |

***B. Briefly describe the site:***

| | | |
|---|---|---|
| 1. Area (include units): | 12 acres | 23 acres is the total acerage of Subunit 1. The area of the clean grids = 11 acres, so total hazard assessment area = 12 acres. |
| 2. Past munitions-related use: | | |
| OB/OD Area | | originally a skeet and trap range that operated from the early 1940s, 1950s. ordnance disposal from the 1960s to 1977, with disposal consisting of burning of ordnance materials in a large metal burn chamber and static firing of rockets. |
| 3. Current land-use activities (list all that occur): | | |
| Site 15 is currently not used by the Navy but has uncontroled access. Light recreational use will be limited to paved bike/walking paths. | | During Supplemental RI (2011) people observed walking through site. |
| 4. Are changes to the future land-use planned? | No | |
| 5. What is the basis for the site boundaries? | | |
| Subunit 1 boundary based on 2008-2009 soil removal actions and location of former Ordnance Disposal Area. | | |
| 6. How certain are the site boundaries? | | |
| Certain - based on 2011 MEC Supplemental Investigation and previous investigations. | | |

Reference(s) for Part B:

**ABB-ES (ABB Environmental Services, Inc.), 1997. Remedial Investigation, Operable Unit 5, Sites 14 and 15, Naval Air Station Cecil Field, Jacksonville, Florida.**

[redacted]

**AGVIQ-CH2MHill (AGVIQ-CH2MHill Constructors, Inc., Joint Venture III), 2009. Remedial Action Completion Report – Soil Removal Action for Operable Unit 5, Site 15 - Blue 10 Ordnance Disposal Area, Naval Air Station Cecil Field, Jacksonville, Florida.**

**CH2MHill, February 2007. Preliminary Assessment/Site Inspection Report for Past Use of Munitions and Explosives of Concern for Blue Ordnance Disposal Area Site 15), Former Naval Air Station Cecil Field, Jacksonville, Florida.**

**Tetra Tech, 2010. Sampling and Analysis Plan for Munitions Response Program MEC Remedial Investigation at Operable Unit 5, Site 15 – Blue 10 Ordnance Disposal Area, Naval Air Station Cecil Field, Jacksonville, Florida.**

### *C. Historical Clearances*

1. Have there been any historical clearances at the site?

Yes, subsurface clearance

2008-2009 - 100% MEC Surface and Subsurface removal in areas of chemcial contaminations (Areas A through Q), 2011 - Removal of surface MDAS items and investigation of randomly selected subsurface anomalies on select transects only.

2. If a clearance occurred:

   a. What year was the clearance performed?

   2009

   b. Provide a description of the clearance activity (e.g., extent, depth, amount of munitions-related items removed, types and sizes of

MEC surface clearance of 22 acres (114 grids)consisting of an instrument-assisted surface clearance. Surface clearance for MD was performed that included visual search of the surface, augmented with addition of handheld magnetometers to locate and remove MEC (including small arms) and ferrous items 2-inch by 2-inch and larger from the soil surface.

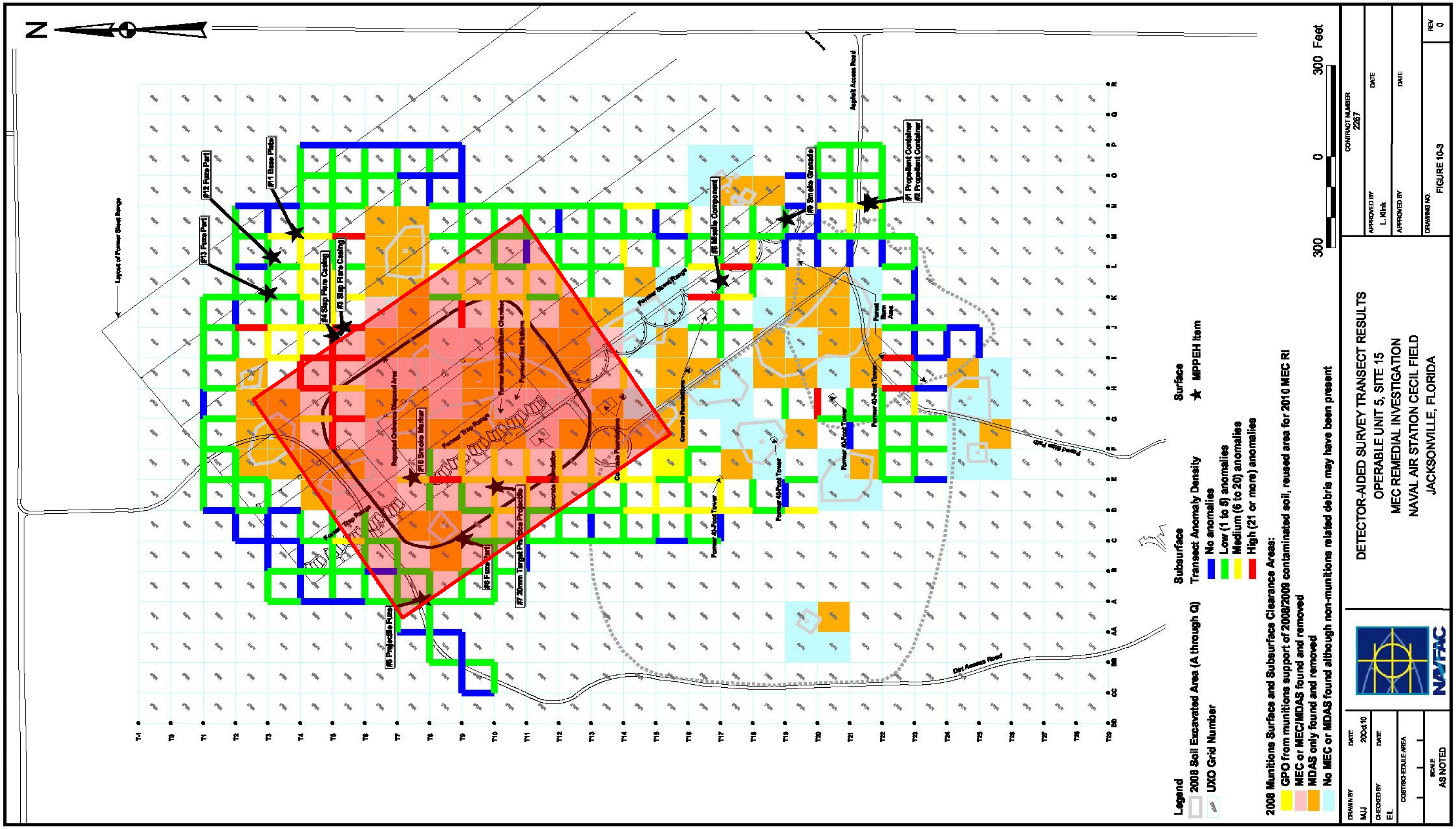
Manual and mechanical-aided intrusive investigation of target anomalies (to 2 feet bgs)identified through DGM except for several grids in excavation area L, 100 percent of DGM-identified anomalies were excavated. Anomaly investigation included soil removal to identify the source of the anomaly. Grids in excavation area L where intrusive investigation was only conducted in the excavation region are A2J0, A2J8, A2J9, A3J2, B2A0, B2A8, B2A9, B2B0, B2B8, B2B9, B3A1, B3A2, and B3B1

See Appendix A for summary of MEC removal actions during the 2008-2009 activities.

Reference(s) for Part C:

**AGVIQ-CH2MHill (AGVIQ-CH2MHill Constructors, Inc., Joint Venture III), 2009. Remedial Action Completion Report – Soil Removal Action for Operable Unit 5, Site 15 - Blue 10 Ordnance Disposal Area, Naval Air Station Cecil Field, Jacksonville, Florida.** [redacted]

*D. Attach maps of the site below (select 'Insert/Picture' on the menu bar.)*



Site ID: **Cecil Field - Site 15, Subunit 1**
Date: **10/24/2011**

## Activities Currently Occurring at the Site

| Activity No. | Activity | Number of people per year who participate in the activity | Number of hours per year a single person spends on the activity | Potential Contact Time (receptor hours/year) | Maximum intrusive depth (ft) | Comments |
|---|---|---|---|---|---|---|
| 1 | Light recreational use will be limited to paved bike/walking paths. | 100 | 4 | **400** | 0.5 | Estimated - no known data at this time |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |
| 9 | | | | | | |
| 10 | | | | | | |
| 11 | | | | | | |
| 12 | | | | | | |

Total Potential Contact Time (receptor hrs/yr): **400**
Maximum intrusive depth at site (ft): **0.5**

Reference(s) for table above:
**Tetra Tech, 2009a. Land Use Control Remedial Design, Operable Unit 5, Site 15, Naval Air Station Cecil Field, Jacksonville, Florida.** [redacted]

## Activities Planned for the Future at the Site (If any are planned: see 'Summary Info' Worksheet, Question 4)

| Activity No. | Activity | Number of people per year who participate in the activity | Number of hours per year a single person spends on the activity | Potential Contact Time (receptor hours/year) | Maximum intrusive depth (ft) | Comments |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |
| 9 | | | | | | |
| 10 | | | | | | |
| 11 | | | | | | |
| 12 | | | | | | |

Total Potential Contact Time (receptor hrs/yr):

Maximum intrusive depth at site (ft):

Reference(s) for table above:

[redacted]

Site ID: **Cecil Field - Site 15, Subunit 1**
Date: **10/24/2011**

## Cased Munitions Information

| Item No. | Munition Type (e.g., mortar, projectile, etc.) | Munition Size | Munition Size Units | Mark/ Model | Energetic Material Type | Is Munition Fuzed? | Fuzing Type | Fuze Condition | Minimum Depth for Munition (ft) | Location of Munitions | Comments (include rationale for munitions that are "subsurface only") |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Artillery | 20 | mm | | Propellant | No | | | 0 | Surface and Subsurface | 4 - 20 mm TP projectile full up, surface and subsurface |
| 2 | Fuzes | 0 | | M204 | High Explosive | Yes | UNK | UNK | 2 | Subsurface Only | 18 - M204 Practice mine Fuze, subsurface only |
| 3 | Pyrotechnic | | | M112 | Pyrotechnic | No | | | 2 | Subsurface Only | 1 - M112 Photoflash cartridge - subsurface |
| 4 | Artillery | 20 | mm | | Propellant | No | | | 2 | Surface and Subsurface | 1 - M208 20 mm TP, surface |
| 5 | Artillery | 20 | mm | | High Explosive | UNK | Impact | UNK | 0 | Surface and Subsurface | 1 - 20 mm projectile HE, surface |
| 6 | Pyrotechnic | | | | Pyrotechnic | UNK | Time | Unarmed | 0 | Surface and Subsurface | 1 - aircraft launched flare, surface |
| 7 | Pyrotechnic | 5 | inches | Mk 4 | Pyrotechnic | No | | | 2 | Subsurface Only | 2 - Mk4 Spotting Charges, subsurface |
| 8 | Submunitions | 2.5 | inches | BLU-26(T-1)/B | | No | | | 2 | Subsurface Only | 1 - BLU - 26/B Submunition Inert Bomblet, subsurface |
| 9 | | | | | | | | | | | |
| 10 | | | | | | | | | | | |
| 11 | | | | | | | | | | | |
| 12 | | | | | | | | | | | |
| 13 | | | | | | | | | | | |
| 14 | | | | | | | | | | | |
| 15 | | | | | | | | | | | |
| 16 | | | | | | | | | | | |
| 17 | | | | | | | | | | | |
| 18 | | | | | | | | | | | |
| 19 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |

Reference(s) for table above:

**AGVIQ-CH2MHill (AGVIQ-CH2MHill Constructors, Inc., Joint Venture III), 2009. Remedial Action Completion Report – Soil Removal Action for Operable Unit 5, Site 15 - Blue 10 Ordnance Disposal Area, Naval Air Station Cecil Field, Jacksonville, Florida.**

## Bulk Explosive Information

| Item No. | Explosive Type | Comments |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |

Reference(s) for table above:

Site ID: **Cecil Field - Site 15, Subunit 1**
Date: **10/24/2011**

## Planned Remedial or Removal Actions

| Response Action No. | Response Action Description | Expected Resulting Minimum MEC Depth (ft) | Expected Resulting Site Accessibility | Will land use activities change if this response action is implemented? | What is the expected scope of cleanup? | Comments |
|---|---|---|---|---|---|---|
| 1 | No action | 0 | Full Accessibility | No | No MEC cleanup | |
| 2 | AOC- Select Surface & Shallow Subsurface MEC & Anomaly Removal | 1 | Full Accessibility | No | cleanup of MECs located both on the surface and subsurface | Surface and shallow subsurface clearance (to 1 foot bgs) |
| 3 | All Surface & Shallow Subsurface MEC & Anomaly Removal | 1 | Full Accessibility | No | cleanup of MECs located both on the surface and subsurface | Surface and shallow subsurface clearance (to 1 foot bgs) |
| 4 | All Surface and Shallow Subsurface MEC Removal | 1 | Full Accessibility | No | cleanup of MECs located both on the surface and subsurface | Surface and shallow subsurface clearance (to 1 foot bgs) |
| 5 | | | | | | |
| 6 | | | | | | |

**According to the 'Summary Info' worksheet, no future land uses are planned. For those alternatives where you answered 'No' in Column E, the land use activities will be assessed against current land uses.**

Reference(s) for table above:

[redacted]

**AGVIQ-CH2MHill (AGVIQ-CH2MHill Constructors, Inc., Joint Venture III), 2009. Remedial Action Completion Report – Soil Removal Action for Operable Unit 5, Site 15 - Blue 10 Ordnance Disposal Area, Naval Air Station Cecil Field, Jacksonville, Florida.**
**Tetra Tech, 2011. MEC Remedial Investigation Report for Munitions Response Program at Operable Unit 5, Site 15 Blue 10 Ordnance Disposal Area, Naval Air Station Cecil Field, Jacksonville, Florida.**

Site ID: **Cecil Field - Site 15, Subunit 1**
Date: **10/24/2011**

***This worksheet needs to be completed for each remedial/removal action alternative listed in the 'Remedial-Removal Action' worksheet that will cause a change in land use.***

## Land Use Activities Planned After Response Alternative #1: No action

| Activity No. | Activity | Number of people per year who participate in the activity | Number of hours a single person spends on the activity | Potential Contact Time (receptor hours/year) | Maximum intrusive depth (ft) | Comments |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |
| 9 | | | | | | |
| 10 | | | | | | |
| 11 | | | | | | |
| 12 | | | | | | |

Total Potential Contact Time (receptor hrs/yr):
Maximum intrusive depth at site (ft):

Reference(s) for table above:

## Land Use Activities Planned After Response Alternative #2: AOC- Select Surface & Shallow Subsurface MEC & Anomaly Removal

| Activity No. | Activity | Number of people per year who participate in the activity | Number of hours a single person spends on the activity | Potential Contact Time (receptor hours/year) | Maximum intrusive depth (ft) | Comments |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |
| 9 | | | | | | |
| 10 | | | | | | |
| 11 | | | | | | |
| 12 | | | | | | |

Total Potential Contact Time (receptor hrs/yr):

Maximum intrusive depth at site (ft):

Reference(s) for table above:

## Land Use Activities Planned After Response Alternative #3: All Surface & Shallow Subsurface MEC & Anomaly Removal

| Activity No. | Activity | Number of people per year who participate in the activity | Number of hours a single person spends on the activity | Potential Contact Time (receptor hours/year) | Maximum intrusive depth (ft) | Comments |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |
| 9 | | | | | | |
| 10 | | | | | | |
| 11 | | | | | | |
| 12 | | | | | | |

Total Potential Contact Time (receptor hrs/yr):

Maximum intrusive depth at site (ft):

Reference(s) for table above:

[redacted]

## Land Use Activities Planned After Response Alternative #4: All Surface and Shallow Subsurface MEC Removal

| Activity No. | Activity | Number of people per year who participate in the activity | Number of hours a single person spends on the activity | Potential Contact Time (receptor hours/year) | Maximum intrusive depth (ft) | Comments |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |
| 9 | | | | | | |
| 10 | | | | | | |
| 11 | | | | | | |
| 12 | | | | | | |

Total Potential Contact Time (receptor hrs/yr):

Maximum intrusive depth at site (ft):

Reference(s) for table above:

Site ID: **Cecil Field - Site 15,**

Date: **10/24/2011**

## Energetic Material Type Input Factor Categories

**Comments**

The following table is used to determine scores associated with the energetic materials. Materials are listed in order from most hazardous to least hazardous.

| | Baseline Conditions | Surface Cleanup | Subsurface Cleanup |
|---|---|---|---|
| High Explosive and Low Explosive Filler in Fragmenting Rounds | 100 | 100 | 100 |
| White Phosphorus | 70 | 70 | 70 |
| Pyrotechnic | 60 | 60 | 60 |
| Propellant | 50 | 50 | 50 |
| Spotting Charge | 40 | 40 | 40 |
| Incendiary | 30 | 30 | 30 |

**The most hazardous type of energetic material listed in the 'Munitions, Bulk Explosive Info' Worksheet falls under the category 'High Explosive and Low Explosive Filler in Fragmenting Rounds'.**

| | ***Score*** |
|---|---|
| Baseline Conditions: | **100** |
| Surface Cleanup: | **100** |
| Subsurface Cleanup: | **100** |

## Location of Additional Human Receptors Input Factor Categories

1. What is the Explosive Safety Quantity Distance (ESQD) from the Explosive Siting Plan or the Explosive Safety Submission for the MRS? 535 feet

Intentional Detonation - MEC Treatment of MGFD 20mm Projectile, M56A4 - Public and all personnel, other ESQDs - unintentional - Public and non-essential personnel - 65 feet.

2. Are there currently any features or facilities where people may congregate within the MRS, or within the ESQD arc? No

3. Please describe the facility or feature.

MEC Item(s) used to calculate the ESQD for current use activities

**Item #5. Artillery (20mm, High Explosive)**

The following table is used to determine scores associated with the location of additional human receptors (current use activities):

| | Baseline Conditions | Surface Cleanup | Subsurface Cleanup |
|---|---|---|---|
| Inside the MRS or inside the ESQD arc | 30 | 30 | 30 |
| Outside of the ESQD arc | 0 | 0 | 0 |

**4. Current use activities are 'Outside of the ESQD arc', based on Question 2.'** ***Score***

| | |
|---|---|
| Baseline Conditions: | **0** |
| Surface Cleanup: | **0** |
| Subsurface Cleanup: | **0** |

5. Are there future plans to locate or construct features or facilities where people may congregate within the MRS, or within the ESQD arc?

6. Please describe the facility or feature.

MEC Item(s) used to calculate the ESQD for future use activities

The following table is used to determine scores associated with the location of additional human receptors (future use activities):

| | Baseline Conditions | Surface Cleanup | Subsurface Cleanup |
|---|---|---|---|
| Inside the MRS or inside the ESQD arc | 30 | 30 | 30 |
| Outside of the ESQD arc | 0 | 0 | 0 |

**7. Please answer Question 5 above to determine the scores.** ***Score***

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

## Site Accessibility Input Factor Categories

The following table is used to determine scores associated with site accessibility:

| | Description | Baseline Conditions | Surface Cleanup | Subsurface Cleanup |
|---|---|---|---|---|
| Full Accessibility | No barriers to entry, including signage but no fencing | 80 | 80 | 80 |
| Moderate Accessibility | Some barriers to entry, such as barbed wire fencing or rough terrain | 55 | 55 | 55 |
| Limited Accessibility | Significant barriers to entry, such as unguarded chain link fence or requirements for special transportation to reach the site | 15 | 15 | 15 |
| Very Limited Accessibility | A site with guarded chain link fence or terrain that requires special equipment and skills (e.g., rock climbing) to access | 5 | 5 | 5 |

### *Current Use Activities*

***Score***

Select the category that best describes the site accessibility under the current use scenario:

Full Accessibility

| | |
|---|---|
| Baseline Conditions: | **80** |
| Surface Cleanup: | **80** |
| Subsurface Cleanup: | **80** |

### *Future Use Activities*

Select the category that best describes the site accessibility under the future use scenario:

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Reference(s) for above information:

### *Response Alternative No. 1: No action*

**Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Full Accessibility'.**

| | |
|---|---|
| Baseline Conditions: | **80** |
| Surface Cleanup: | **80** |
| Subsurface Cleanup: | **80** |

***Response Alternative No. 2: AOC- Select Surface & Shallow Subsurface MEC & Anomaly Removal***

**Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Full Accessibility'.**

| | |
|---|---|
| Baseline Conditions: | **80** |
| Surface Cleanup: | **80** |
| Subsurface Cleanup: | **80** |

***Response Alternative No. 3: All Surface & Shallow Subsurface MEC & Anomaly Removal***

**Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Full Accessibility'.**

| | |
|---|---|
| Baseline Conditions: | **80** |
| Surface Cleanup: | **80** |
| Subsurface Cleanup: | **80** |

***Response Alternative No. 4: All Surface and Shallow Subsurface MEC Removal***

**Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Full Accessibility'.**

| | |
|---|---|
| Baseline Conditions: | **80** |
| Surface Cleanup: | **80** |
| Subsurface Cleanup: | **80** |

***Response Alternative No. 5:***

**Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.**

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

***Response Alternative No. 6:***

**Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.**

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

## Potential Contact Hours Input Factor Categories

The following table is used to determine scores associated with the total potential contact time:

| | Description | Baseline Conditions | Surface Cleanup | Subsurface Cleanup |
|---|---|---|---|---|
| Many Hours | ≥1,000,000 receptor-hrs/yr | 120 | 90 | 30 |
| Some Hours | 100,000 to 999,999 receptor hrs/yr | 70 | 50 | 20 |
| Few Hours | 10,000 to 99,999 receptor-hrs/yr | 40 | 20 | 10 |
| Very Few Hours | <10,000 receptor-hrs/yr | 15 | 10 | 5 |

***Current Use Activities*:**

Input factors are only determined for baseline conditions for current use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is: **400** receptor hrs/yr

Based on the table above, this corresponds to a input factor score for baseline conditions of: **15** Score

***Future Use Activities*:**

Input factors are only determined for baseline conditions for future use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is: receptor hrs/yr

Based on the table above, this corresponds to a input factor score of: Score

***Response Alternative No. 1: No action***

**Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.**

**Total Potential Contact Time, based on the contact time listed for current use activities (see 'Current and Future Activities' Worksheet)** **400**

Based on the table above, this corresponds to input factor scores of: ***Score***

Baseline Conditions: **15**

Surface Cleanup: **10**

Subsurface Cleanup: **5**

***Response Alternative No. 2: AOC- Select Surface & Shallow Subsurface***

**Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.**

**Total Potential Contact Time, based on the contact time listed for current use activities (see 'Current and Future Activities' Worksheet)** **400**

Based on the table above, this corresponds to input factor scores of: ***Score***

Baseline Conditions: **15**

Surface Cleanup: **10**

Subsurface Cleanup: **5**

***Response Alternative No. 3: All Surface & Shallow Subsurface MEC &***

| | |
|---|---|
| **Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.** | |
| **Total Potential Contact Time, based on the contact time listed for current use activities (see 'Current and Future Activities' Worksheet)** | **400** |
| Based on the table above, this corresponds to input factor scores of: | ***Score*** |
| Baseline Conditions: | **15** |
| Surface Cleanup: | **10** |
| Subsurface Cleanup: | **5** |
| ***Response Alternative No. 4: All Surface and Shallow Subsurface MEC*** | |
| **Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.** | |
| **Total Potential Contact Time, based on the contact time listed for current use activities (see 'Current and Future Activities' Worksheet)** | **400** |
| Based on the table above, this corresponds to input factor scores of: | ***Score*** |
| Baseline Conditions: | **15** |
| Surface Cleanup: | **10** |
| Subsurface Cleanup: | **5** |
| ***Response Alternative No. 5:*** | |
| **Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.** | |
| **Total Potential Contact Time** | |
| Based on the table above, this corresponds to input factor scores of: | **Score** |
| Baseline Conditions: | |
| Surface Cleanup: | |
| Subsurface Cleanup: | |
| ***Response Alternative No. 6:*** | |
| **Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.** | |
| **Total Potential Contact Time** | |
| Based on the table above, this corresponds to input factor scores of: | **Score** |
| Baseline Conditions: | |
| Surface Cleanup: | |
| Subsurface Cleanup: | |

## Amount of MEC Input Factor Categories

The following table is used to determine scores associated with the Amount of MEC:

| | Description | Baseline Conditions | Surface Cleanup | Subsurface Cleanup | |
|---|---|---|---|---|---|
| Target Area | Areas at which munitions fire was directed | 180 | 120 | 30 | |
| OB/OD Area | Sites where munitions were disposed of by open burn or open detonation methods. This category refers to the core activity area of an OB/OD area. See the "Safety Buffer Areas" category for safety fans and kick-outs. | 180 | 110 | 30 | The site was used to dispose of muniitons items and propellant. |
| Function Test Range | Areas where the serviceability of stored munitions or weapons systems are tested. Testing may include components, partial functioning or complete functioning of stockpile or developmental items. | 165 | 90 | 25 | |
| Burial Pit | The location of a burial of large quantities of MEC items. | 140 | 140 | 10 | |
| Maneuver Areas | Areas used for conducting military exercises in a simulated conflict area or war zone | 115 | 15 | 5 | |
| Firing Points | The location from which a projectile, grenade, ground signal, rocket, guided missile, or other device is to be ignited, propelled, or released. | 75 | 10 | 5 | |
| Safety Buffer Areas | Areas outside of target areas, test ranges, or OB/OD areas that were designed to act as a safety zone to contain munitions that do not hit targets or to contain kick-outs from OB/OD areas. | 30 | 10 | 5 | |
| Storage | Any facility used for the storage of military munitions, such as earth-covered magazines, above-ground magazines, and open-air storage areas. | 25 | 10 | 5 | |

| | | | | |
|---|---|---|---|---|
| Explosive-Related Industrial Facility | Former munitions manufacturing or demilitarization sites and TNT production plants | 20 | 10 | 5 |

Select the category that best describes the ***most hazardous*** amount of MEC: ***Score***

OB/OD Area

Baseline Conditions: **180**

Surface Cleanup: **110**

Subsurface Cleanup: **30**

## Minimum MEC Depth Relative to the Maximum Intrusive Depth Input Factor Categories

***Current Use Activities***

The shallowest minimum MEC depth, based on the 'Cased Munitions Information' Worksheet: **0** ft

The deepest intrusive depth: **0.5** ft

The table below is used to determine scores associated with the minimum MEC depth relative to the maximum intrusive depth:

| | Baseline Conditions | Surface Cleanup | Subsurface Cleanup |
|---|---|---|---|
| Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC. | 240 | 150 | 95 |
| Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC. | 240 | 50 | 25 |
| Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth. | 150 | N/A | 95 |
| Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth does not overlap with minimum MEC depth. | 50 | N/A | 25 |

**Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth will overlap after cleanup. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.' For 'Current Use Activities', only Baseline Conditions are considered.** **240** ***Score***

***Future Use Activities***

Deepest intrusive depth: ft

**Not enough information has been entered to determine the input factor category.** ***Score***

***Response Alternative No. 1: No action***

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): **0** ft

**Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.**

**Maximum Intrusive Depth, based on the maximum intrusive depth listed for current use activities (see 'Current and Future Activities' Worksheet)** **0.5** ft

**Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth overlaps. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.'**

| | ***Score*** |
|---|---|
| Baseline Conditions: | **240** |
| Surface Cleanup: | |
| Subsurface Cleanup: | |

***Response Alternative No. 2: AOC- Select Surface & Shallow Subsurface MEC & Anomaly***

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): **1** ft

**Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.**

**Maximum Intrusive Depth, based on the maximum intrusive depth listed for current use activities (see 'Current and Future Activities' Worksheet)** **0.5** ft

**Because the shallowest minimum MEC depth is greater than the deepest intrusive depth, the intrusive depth does not overlap. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.'**

| | ***Score*** |
|---|---|
| Baseline Conditions: | |
| Surface Cleanup: | |
| Subsurface Cleanup: | **25** |

***Response Alternative No. 3: All Surface & Shallow Subsurface MEC & Anomaly Removal***

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): **1** ft

**Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.**

**Maximum Intrusive Depth, based on the maximum intrusive depth listed for current use activities (see 'Current and Future Activities' Worksheet)** **0.5** ft

**Because the shallowest minimum MEC depth is greater than the deepest intrusive depth, the intrusive depth does not overlap. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.'**

***Score***

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup: **25**

***Response Alternative No. 4: All Surface and Shallow Subsurface MEC Removal***

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): **1** ft

**Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.**

**Maximum Intrusive Depth, based on the maximum intrusive depth listed for current use activities (see 'Current and Future Activities' Worksheet)** **0.5** ft

**Because the shallowest minimum MEC depth is greater than the deepest intrusive depth, the intrusive depth does not overlap. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.'**

***Score***

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup: **25**

***Response Alternative No. 5:***

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft

**Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.**

**Maximum Intrusive Depth** ft

**Not enough information has been entered to calculate this input factor.**

***Score***

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

***Response Alternative No. 6:***

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft

**Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.**

**Maximum Intrusive Depth** ft

**Not enough information has been entered to calculate this input factor.**

***Score***

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

## Migration Potential Input Factor Categories

Is there any physical or historical evidence that indicates it is possible for natural physical forces in the area (e.g., frost heave, erosion) to expose subsurface MEC items, or move surface or subsurface MEC items?

Yes

If "yes", describe the nature of natural forces. Indicate key areas of potential migration (e.g., overland water flow) on a map as appropriate (attach a map to the bottom of this sheet, or as a separate worksheet).

Errosional forces may occur due to rain or use of unpaved trails/paths.

Site is in FL, therefore no frost heave.

The following table is used to determine scores associated with the migration potential:

| | Baseline Conditions | Surface Cleanup | Subsurface Cleanup |
|---|---|---|---|
| Possible | 30 | 30 | 10 |
| Unlikely | 10 | 10 | 10 |

**Based on the question above, migration potential is 'Possible.'**

| | ***Score*** |
|---|---|
| Baseline Conditions: | **30** |
| Surface Cleanup: | **30** |
| Subsurface Cleanup: | **10** |

Reference(s) for above information:

**Tetra Tech, 2011. Draft Remedial Investigation Report For Munitions Response Program Munitions and Explosives of Concern Supplemental Remedial Investigation at Operable Unit 5, Site 15 – Blue Ordnance Disposal Area, Naval Air Station Cecil Field, Jacksonville, Florida.**

[redacted]

## MEC Classification Input Factor Categories

**Cased munitions information has been inputed into the 'Munitions, Bulk Explosive Info' Worksheet; therefore, bulk explosives do not comprise all MECs for this MRS.**

**The 'Amount of MEC' category is 'OB/OD Area'.**

Has a technical assessment shown that MEC in the OB/OD Area is DMM? No

Are any of the munitions listed in the 'Munitions, Bulk Explosive Info' Worksheet: Yes

- Submunitions
- Rifle-propelled 40mm projectiles (often called 40mm grenades)
- Munitions with white phosphorus filler
- High explosive anti-tank (HEAT) rounds
- Hand grenades
- Fuzes
- Mortars

**At least one item listed in the 'Munitions, Bulk Explosive Info' Worksheet was identified as 'fuzed'.**

The following table is used to determine scores associated with MEC classification categories:

| UXO Special Case | Baseline Conditions | Surface Cleanup | Subsurface Cleanup |
|---|---|---|---|
| UXO Special Case | 180 | 180 | 180 |
| UXO | 110 | 110 | 110 |
| Fuzed DMM Special Case | 105 | 105 | 105 |
| Fuzed DMM | 55 | 55 | 55 |
| Unfuzed DMM | 45 | 45 | 45 |
| Bulk Explosives | 45 | 45 | 45 |

**Based on your answers above, the MEC classification is 'UXO Special Case'.**

| | ***Score*** |
|---|---|
| Baseline Conditions: | **180** |
| Surface Cleanup: | **180** |
| Subsurface Cleanup: | **180** |

## MEC Size Input Factor Categories

The following table is used to determine scores associated with MEC Size:

| | Description | Baseline Conditions | Surface Cleanup | Subsurface Cleanup |
|---|---|---|---|---|
| Small | Any munitions (from the 'Munitions, Bulk Explosive Info' Worksheet) weigh less than 90 lbs; small enough for a receptor to be able to move and initiate a detonation | 40 | 40 | 40 |
| Large | All munitions weigh more than 90 lbs; too large to move without equipment | 0 | 0 | 0 |

Based on the definitions above and the types of munitions at the site (see 'Munitions, Bulk Explosive Info' Worksheet), the MEC Size Input Factor is: Small

| | ***Score*** |
|---|---|
| Baseline Conditions: | **40** |
| Surface Cleanup: | **40** |
| Subsurface Cleanup: | **40** |

## Scoring Summary

| Site ID: | Cecil Field - Site 15, Subunit 1 | a. Scoring Summary for Current Use Activities | |
|---|---|---|---|
| Date: | 10/24/2011 | Response Action Cleanup: | No Response Action |
| Input Factor | | Input Factor Category | Score |
| I. Energetic Material Type | | High Explosive and Low Explosive Filler in Fragmenting Rounds | 100 |
| II. Location of Additional Human Receptors | | Outside of the ESQD arc | 0 |
| III. Site Accessibility | | Full Accessibility | 80 |
| IV. Potential Contact Hours | | <10,000 receptor-hrs/yr | 15 |
| V. Amount of MEC | | OB/OD Area | 180 |
| VI. Minimum MEC Depth Relative to Maximum Intrusive Depth | | Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC. | 240 |
| VII. Migration Potential | | Possible | 30 |
| VIII. MEC Classification | | UXO Special Case | 180 |
| IX. MEC Size | | Small | 40 |
| | | Total Score | 865 |
| | | Hazard Level Category | 1 |

| Site ID: | Cecil Field - Site 15, Subunit 1 | b. Scoring Summary for Future Use Activities | |
|---|---|---|---|
| Date: | 10/24/2011 | Response Action Cleanup: | No Response Action |
| Input Factor | | Input Factor Category | Score |
| I. Energetic Material Type | | High Explosive and Low Explosive Filler in Fragmenting Rounds | 100 |
| II. Location of Additional Human Receptors | | | |
| III. Site Accessibility | | | |
| IV. Potential Contact Hours | | | |
| V. Amount of MEC | | OB/OD Area | 180 |
| VI. Minimum MEC Depth Relative to Maximum Intrusive Depth | | | |
| VII. Migration Potential | | Possible | 30 |
| VIII. MEC Classification | | UXO Special Case | 180 |
| IX. MEC Size | | Small | 40 |
| | | Total Score | 530 |
| | | Hazard Level Category | 3 |

| Site ID: | Cecil Field - Site 15, Subunit 1 | c. Scoring Summary for Response Alternative 1: No action | |
|---|---|---|---|
| Date: | 10/24/2011 | Response Action Cleanup: | No MEC cleanup |
| **Input Factor** | | **Input Factor Category** | **Score** |
| I. Energetic Material Type | | High Explosive and Low Explosive Filler in Fragmenting Rounds | 100 |
| II. Location of Additional Human Receptors | | Outside of the ESQD arc | 0 |
| III. Site Accessibility | | Full Accessibility | 80 |
| IV. Potential Contact Hours | | <10,000 receptor-hrs/yr | 15 |
| V. Amount of MEC | | OB/OD Area | 180 |
| VI. Minimum MEC Depth Relative to Maximum Intrusive Depth | | Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC. | 240 |
| VII. Migration Potential | | Possible | 30 |
| VIII. MEC Classification | | UXO Special Case | 180 |
| IX. MEC Size | | Small | 40 |
| | | **Total Score** | **865** |
| | | **Hazard Level Category** | **1** |

| Site ID: | Cecil Field - Site 15, Subunit 1 | d. Scoring Summary for Response Alternative 2: AOC- Select Surface & Shallow Subsurface MEC & Anomaly Removal | |
|---|---|---|---|
| Date: | 10/24/2011 | Response Action Cleanup: | cleanup of MECs located both on the surface and subsurface |
| **Input Factor** | | **Input Factor Category** | **Score** |
| I. Energetic Material Type | | High Explosive and Low Explosive Filler in Fragmenting Rounds | 100 |
| II. Location of Additional Human Receptors | | Outside of the ESQD arc | 0 |
| III. Site Accessibility | | Full Accessibility | 80 |
| IV. Potential Contact Hours | | <10,000 receptor-hrs/yr | 5 |
| V. Amount of MEC | | OB/OD Area | 30 |
| VI. Minimum MEC Depth Relative to Maximum Intrusive Depth | | Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC. | 25 |
| VII. Migration Potential | | Possible | 10 |
| VIII. MEC Classification | | UXO Special Case | 180 |
| IX. MEC Size | | Small | 40 |
| | | **Total Score** | **470** |
| | | **Hazard Level Category** | **4** |

| Site ID: | Cecil Field - Site 15, Subunit 1 | e. Scoring Summary for Response Alternative 3: All Surface & Shallow Subsurface MEC & Anomaly Removal | |
|---|---|---|---|
| Date: | 10/24/2011 | Response Action Cleanup: | cleanup of MECs located both on the surface and subsurface |
| **Input Factor** | | **Input Factor Category** | **Score** |
| I. Energetic Material Type | | High Explosive and Low Explosive Filler in Fragmenting Rounds | 100 |
| II. Location of Additional Human Receptors | | Outside of the ESQD arc | 0 |
| III. Site Accessibility | | Full Accessibility | 80 |
| IV. Potential Contact Hours | | <10,000 receptor-hrs/yr | 5 |
| V. Amount of MEC | | OB/OD Area | 30 |
| VI. Minimum MEC Depth Relative to Maximum Intrusive Depth | | Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC. | 25 |
| VII. Migration Potential | | Possible | 10 |
| VIII. MEC Classification | | UXO Special Case | 180 |
| IX. MEC Size | | Small | 40 |
| | | **Total Score** | **470** |
| | | **Hazard Level Category** | **4** |

| Site ID: | Cecil Field - Site 15, Subunit 1 | f. Scoring Summary for Response Alternative 4: All Surface and Shallow Subsurface MEC Removal | |
|---|---|---|---|
| Date: | 10/24/2011 | Response Action Cleanup: | cleanup of MECs located both on the surface and subsurface |

| Input Factor | Input Factor Category | Score |
|---|---|---|
| I. Energetic Material Type | High Explosive and Low Explosive Filler in Fragmenting Rounds | 100 |
| II. Location of Additional Human Receptors | Outside of the ESQD arc | 0 |
| III. Site Accessibility | Full Accessibility | 80 |
| IV. Potential Contact Hours | <10,000 receptor-hrs/yr | 5 |
| V. Amount of MEC | OB/OD Area | 30 |
| VI. Minimum MEC Depth Relative to Maximum Intrusive Depth | Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC. | 25 |
| VII. Migration Potential | Possible | 10 |
| VIII. MEC Classification | UXO Special Case | 180 |
| IX. MEC Size | Small | 40 |
| | **Total Score** | **470** |
| | **Hazard Level Category** | **4** |

| Site ID: | Cecil Field - Site 15, Subunit 1 | g. Scoring Summary for Response Alternative 5: | |
|---|---|---|---|
| Date: | 10/24/2011 | Response Action Cleanup: | |
| Input Factor | | Input Factor Category | Score |
| I. Energetic Material Type | | High Explosive and Low Explosive Filler in Fragmenting Rounds | |
| II. Location of Additional Human Receptors | | Outside of the ESQD arc | |
| III. Site Accessibility | | | |
| IV. Potential Contact Hours | | | |
| V. Amount of MEC | | OB/OD Area | |
| VI. Minimum MEC Depth Relative to Maximum Intrusive Depth | | | |
| VII. Migration Potential | | Possible | |
| VIII. MEC Classification | | UXO Special Case | |
| IX. MEC Size | | Small | |
| | | Total Score | |
| | | Hazard Level Category | |

| Site ID: | Cecil Field - Site 15, Subunit 1 | h. Scoring Summary for Response Alternative 6: | |
|---|---|---|---|
| Date: | 10/24/2011 | Response Action Cleanup: | |
| Input Factor | | Input Factor Category | Score |
| I. Energetic Material Type | | High Explosive and Low Explosive Filler in Fragmenting Rounds | |
| II. Location of Additional Human Receptors | | Outside of the ESQD arc | |
| III. Site Accessibility | | | |
| IV. Potential Contact Hours | | | |
| V. Amount of MEC | | OB/OD Area | |
| VI. Minimum MEC Depth Relative to Maximum Intrusive Depth | | | |
| VII. Migration Potential | | Possible | |
| VIII. MEC Classification | | UXO Special Case | |
| IX. MEC Size | | Small | |
| | | Total Score | |
| | | Hazard Level Category | |

| MEC HA Hazard Level Determination | | |
|---|---|---|
| **Site ID:** Cecil Field - Site 15, Subunit 1 | | |
| **Date:** 10/24/2011 | **Hazard Level Category** | **Score** |
| a. Current Use Activities | 1 | 865 |
| b. Future Use Activities | 3 | 530 |
| c. Response Alternative 1: No action | 1 | 865 |
| d. Response Alternative 2: AOC- Select Surface & Shallow Subsurface MEC & Anomaly Removal | 4 | 470 |
| e. Response Alternative 3: All Surface & Shallow Subsurface MEC & Anomaly Removal | 4 | 470 |
| f. Response Alternative 4: All Surface and Shallow Subsurface MEC Removal | 4 | 470 |
| g. Response Alternative 5: | | |
| h. Response Alternative 6: | | |

| Characteristics of the MRS | | |
|---|---|---|
| Is critical infrastructure located within the MRS or within the ESQD arc? | No | |
| Are cultural resources located within the MRS or within the ESQD arc? | No | |
| Are significant ecological resources located within the MRS or within the ESQD arc? | No | gopher tortis? |

# MEC HA Workbook v1.02

December-07

## Overview

This workbook is a tool for project teams to assess explosive hazards to human receptors at munitions response sites (MRSs) following the Munitions and Explosives of Concern Hazard Assessment (MEC HA) methodology. The MEC HA allows a project team to evaluate potential explosive hazard associated with a site, given current site conditions, under various cleanup, land use activities, and land use control alternatives. A complete description of the methodology can be found in the MEC HA Guidance (Public Review Draft, November 2006). Please reference this guidance when completing the worksheets.

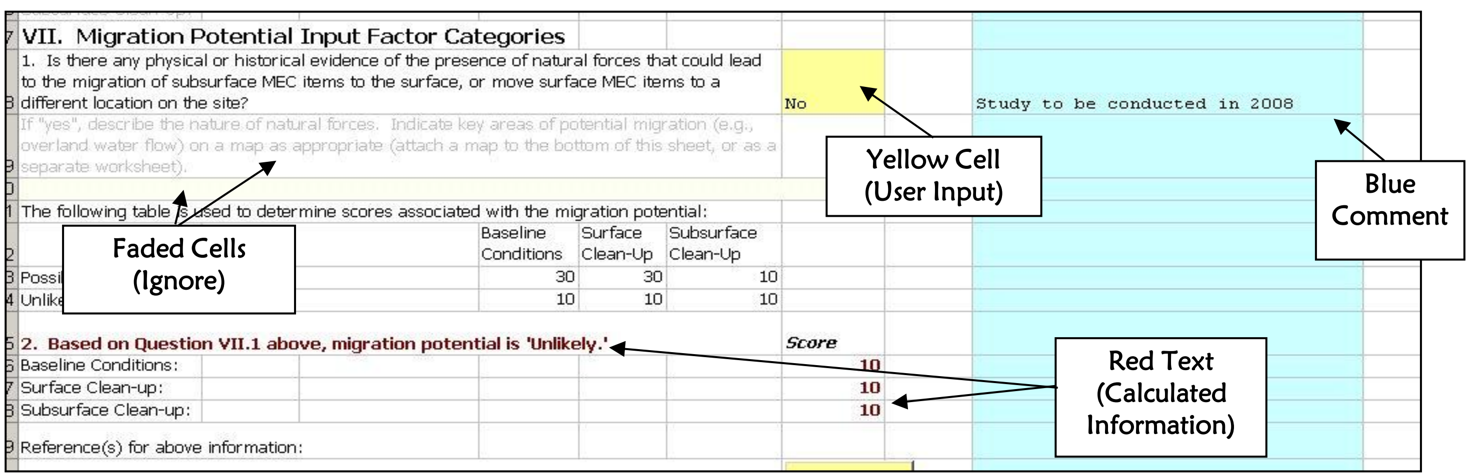
## Instructions

1. Open this file. Enable macros if prompted to do so. This spreadsheet will not work if your security setting is set to 'high' or 'very high'. To change your security level, go to the menu bar and select Tools/Macro/Security. Then close and reopen this spreadsheet.
2. This MS Excel workbook contains 9 worksheets, designed to be used in order. After the '***Instructions***' sheet, the first 5 sheets ask for information about the following topics:

***Summary Info -*** General information regarding the site.
***Munitions/Explosive Info*** - MECs and bulk explosives present at the site.
***Current and Future Activities*** - Current land use activites as well as planned future activities, if any.
***Remedial-Removal Action*** - General information regarding remediation/removal alternatives being considered for the site.
***Post-Response Land Use*** - Land use activities associated with the alternatives listed in the 'Remedial-Removal Action' sheet.

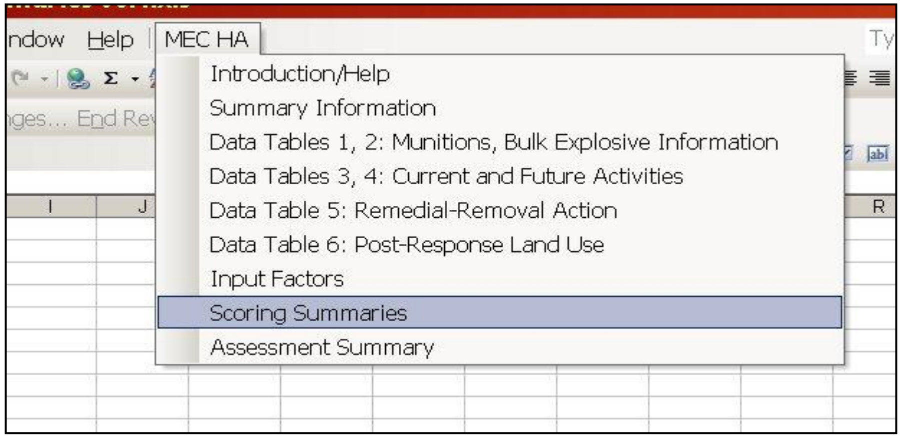
The remaining 3 sheets calculate and summarize the scores. The ***Input Factors*** sheet performs the Input Factor Score calculations, which are summarized in the ***Scoring Summaries*** sheet. The ***Hazard Level*** sheet presents the Hazard Level Category for current use activities, future use activities, and each response alternative based on the respective scores.

3. Starting with the ***Summary Info*** sheet, fill in any yellow cells. Some cells have drop-down lists from which you can select an answer. Select the cell. A down arrow to the right indicates that a drop-down list is available. Yellow buttons can be used to enter reference information. Blue cells can be used for any general comments you wish to make. Any faded cells can be ignored--these are questions that the spreadsheet has determined are not relevant for your situation.

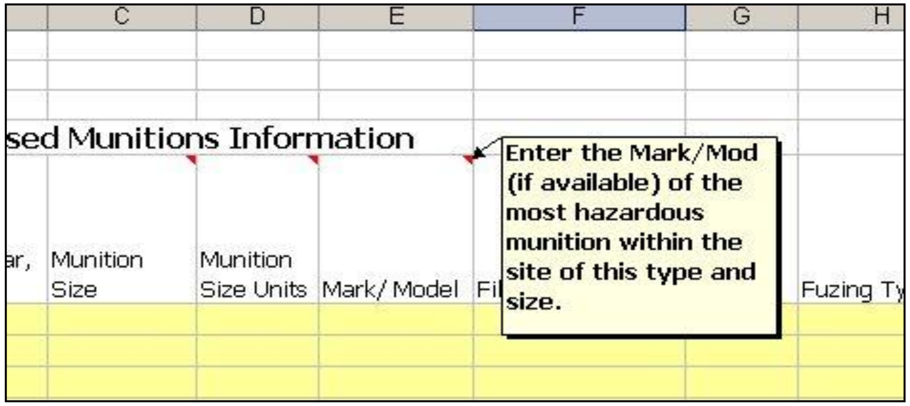



The computer will calculate information based on your inputs. Calculated information will appear as red text

4. The MEC HA menu bar can be used to navigate to different worksheets.




5. Small red triangles in the upper-right corners indicate that help text is available by putting the mouse cursor on that cell.



# MEC HA Summary Information

**Comments**

| | |
|---|---|
| Site ID: | Cecil Field - Site 15, Subunit 2 |
| Date: | 10/24/2011 |

Please identify the single specific area to be assessed in this hazard assessment. From this point forward, all references to "site" or "MRS" refer to the specific area that you have defined.

***A. Enter a unique identifier for the site:***

Site 15

Provide a list of information sources used for this hazard assessment. As you are completing the worksheets, use the "Select Ref(s)" buttons at the ends of each subsection to select the applicable information sources from the list below.

| Ref. No. | Title (include version, publication date) |
|---|---|
| 1 | ABB-ES (ABB Environmental Services, Inc.), 1997. Remedial Investigation, Operable Unit 5, Sites 14 and 15, Naval Air Station Cecil Field, Jacksonville, Florida. |
| 2 | AGVIQ-CH2MHill (AGVIQ-CH2MHill Constructors, Inc., Joint Venture III), 2009. Remedial Action Completion Report - Soil Removal Action for Operable Unit 5, Site 15 - Blue 10 Ordnance Disposal Area, Naval Air Station Cecil Field, Jacksonville, Florida. |
| 3 | CH2MHill, February 2007. Preliminary Assessment/Site Inspection Report for Past Use of Munitions and Explosives of Concern for Blue Ordnance Disposal Area Site 15), Former Naval Air Station Cecil Field, Jacksonville, Florida. |
| 4 | Tetra Tech, 2008. Record of Decision for Operable Unit 5, Site 15 - Blue 10 Ordnance Disposal Area, Naval Air Station Cecil Field, Jacksonville, Florida. |
| 5 | Tetra Tech, 2009a. Land Use Control Remedial Design, Operable Unit 5, Site 15, Naval Air Station Cecil Field, Jacksonville, Florida. |
| 6 | Tetra Tech, 2009b. Remedial Action Completion Report for OU5, Site 15, Naval Air Station Cecil Field, Jacksonville, Florida. Draft. |
| 7 | Tetra Tech, 2011. MEC Remedial Investigation Report for Munitions Response Program at Operable Unit 5, Site 15 Blue 10 Ordnance Disposal Area, Naval Air Station Cecil Field, Jacksonville, Florida. |
| 8 | Tetra Tech, 2011. Draft Remedial Investigation Report For Munitions Response Program Munitions and Explosives of Concern Supplemental Remedial Investigation at Operable Unit 5, Site 15 - Blue Ordnance Disposal Area, Naval Air Station Cecil Field, Jacksonville, Florida. |
| 9 | |
| 10 | |
| 11 | |
| 12 | |

***B. Briefly describe the site:***

| | | |
|---|---|---|
| 1. Area (include units): | 50 acres | 63 acres is the total acerage of Subunit 2. The area of the clean grids = 13 acres, so total hazard assessment area = 50 acres. |
| 2. Past munitions-related use: | | |
| Safety Buffer Areas | | originally a skeet and trap range that operated from the early 1940s, 1950s. ordnance disposal from the 1960s to 1977, with disposal consisting of burning of ordnance materials in a large metal burn chamber and static firing of rockets. |
| 3. Current land-use activities (list all that occur): | | |
| Site 15 is currently not used by the Navy but has uncontroled access. Light recreational use will be limited to paved bike/walking paths. | | During Supplemental RI (2011) people observed walking through site. |
| 4. Are changes to the future land-use planned? | No | |
| 5. What is the basis for the site boundaries? | | |
| Subunit 1 boundary based on 2008-2009 soil removal actions and location of former Ordnance Disposal Area. | | |
| 6. How certain are the site boundaries? | | |
| Certain - based on 2011 MEC Supplemental Investigation and previous investigations. | | |

Reference(s) for Part B:

**ABB-ES (ABB Environmental Services, Inc.), 1997. Remedial Investigation, Operable Unit 5, Sites 14 and 15, Naval Air Station Cecil Field, Jacksonville, Florida.** [redacted]

**AGVIQ-CH2MHill (AGVIQ-CH2MHill Constructors, Inc., Joint Venture III), 2009. Remedial Action Completion Report – Soil Removal Action for Operable Unit 5, Site 15 - Blue 10 Ordnance Disposal Area, Naval Air Station Cecil Field, Jacksonville, Florida.**

**CH2MHill, February 2007. Preliminary Assessment/Site Inspection Report for Past Use of Munitions and Explosives of Concern for Blue Ordnance Disposal Area Site 15), Former Naval Air Station Cecil Field, Jacksonville, Florida.**

**Tetra Tech, 2010. Sampling and Analysis Plan for Munitions Response Program MEC Remedial Investigation at Operable Unit 5, Site 15 – Blue 10 Ordnance Disposal Area, Naval Air Station Cecil Field, Jacksonville, Florida.**

### *C. Historical Clearances*

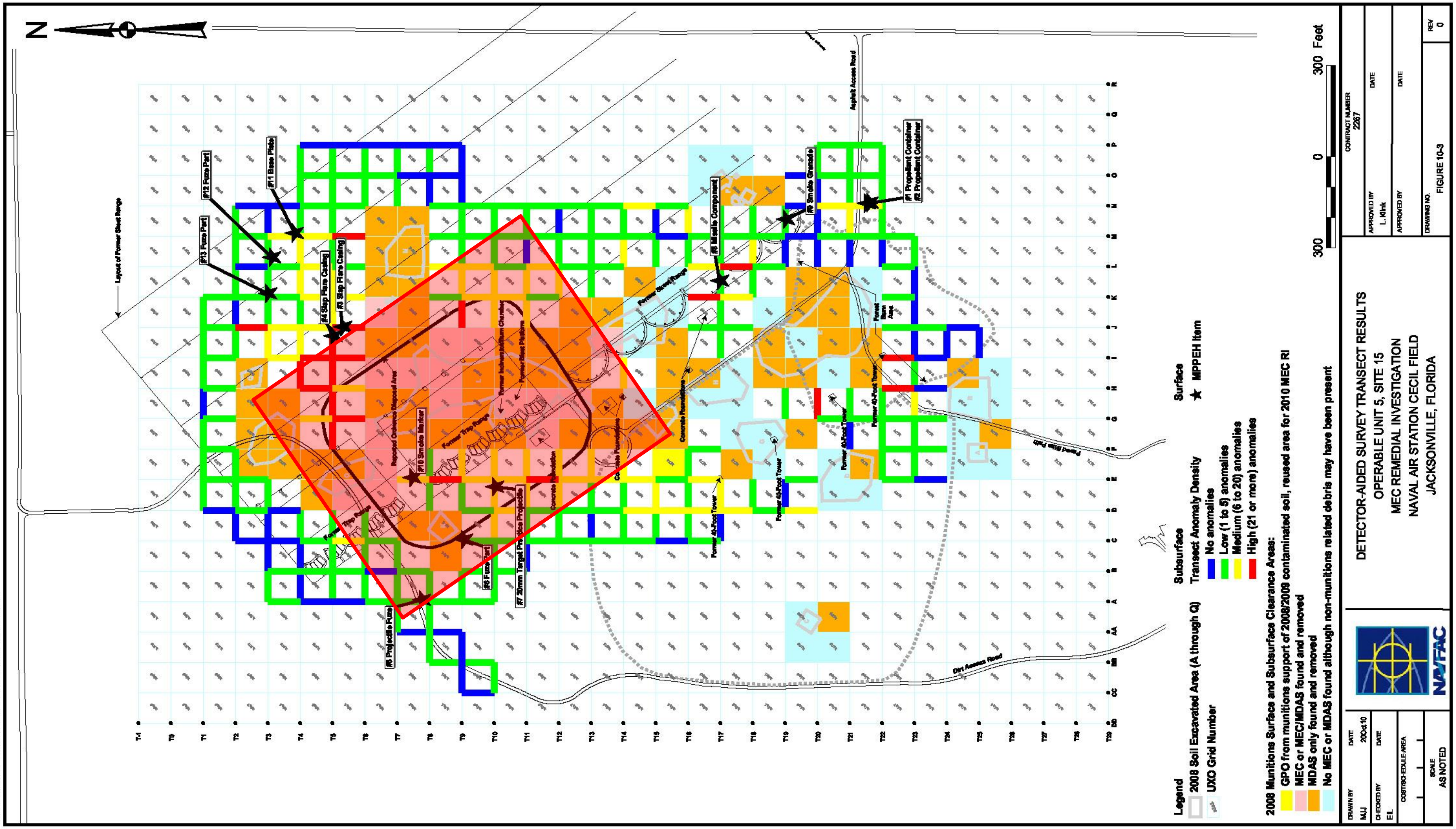
| | | |
|---|---|---|
| 1. Have there been any historical clearances at the site? | Yes, subsurface clearance | 2008-2009 - 100% MEC Surface and Subsurface removal in areas of chemcial contaminations (Areas A through Q), 2011 - Removal of surface MDAS items and investigation of randomly selected subsurface anomalies on select transects only. |
| 2. If a clearance occurred: | | |
| a. What year was the clearance performed? | 2009 | |
| b. Provide a description of the clearance activity (e.g., extent, depth, amount of munitions-related items removed, types and sizes of | | |
| MEC surface clearance of 22 acres (114 grids)consisting of an instrument-assisted surface clearance. Surface clearance for MD was performed that included visual search of the surface, augmented with addition of handheld magnetometers to locate and remove MEC (including small arms) and ferrous items 2-inch by 2-inch and larger from the soil surface.<br><br>Manual and mechanical-aided intrusive investigation of target anomalies (to 2 feet bgs)identified through DGM except for several grids in excavation area L, 100 percent of DGM-identified anomalies were excavated. Anomaly investigation included soil removal to identify the source of the anomaly. Grids in excavation area L where intrusive investigation was only conducted in the excavation region are A2J0, A2J8, A2J9, A3J2, B2A0, B2A8, B2A9, B2B0, B2B8, B2B9, B3A1, B3A2, and B3B1 | | See Appendix A for summary of MEC removal actions during the 2008-2009 activities. |

Reference(s) for Part C:

[redacted]

**AGVIQ-CH2MHill (AGVIQ-CH2MHill Constructors, Inc., Joint Venture III), 2009. Remedial Action Completion Report – Soil Removal Action for Operable Unit 5, Site 15 - Blue 10 Ordnance Disposal Area, Naval Air Station Cecil Field, Jacksonville, Florida.**

*D. Attach maps of the site below (select 'Insert/Picture' on the menu bar.)*



Site ID: **Cecil Field - Site 15, Subunit 2**
Date: **10/24/2011**

## Activities Currently Occurring at the Site

| Activity No. | Activity | Number of people per year who participate in the activity | Number of hours per year a single person spends on the activity | Potential Contact Time (receptor hours/year) | Maximum intrusive depth (ft) | Comments |
|---|---|---|---|---|---|---|
| 1 | Light recreational use will be limited to paved bike/walking paths. | 100 | 4 | **400** | 0.5 | Estimated - no known data at this time |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |
| 9 | | | | | | |
| 10 | | | | | | |
| 11 | | | | | | |
| 12 | | | | | | |

Total Potential Contact Time (receptor hrs/yr): **400**
Maximum intrusive depth at site (ft): **0.5**

Reference(s) for table above:
**Tetra Tech, 2009a. Land Use Control Remedial Design, Operable Unit 5, Site 15, Naval Air Station Cecil Field, Jacksonville, Florida.** [redacted]

## Activities Planned for the Future at the Site (If any are planned: see 'Summary Info' Worksheet, Question 4)

| Activity No. | Activity | Number of people per year who participate in the activity | Number of hours per year a single person spends on the activity | Potential Contact Time (receptor hours/year) | Maximum intrusive depth (ft) | Comments |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |
| 9 | | | | | | |
| 10 | | | | | | |
| 11 | | | | | | |
| 12 | | | | | | |

Total Potential Contact Time (receptor hrs/yr):

Maximum intrusive depth at site (ft):

Reference(s) for table above:

Site ID: **Cecil Field - Site 15, Subunit 2**
Date: **10/24/2011**

## Cased Munitions Information

| Item No. | Munition Type (e.g., mortar, projectile, etc.) | Munition Size | Munition Size Units | Mark/ Model | Energetic Material Type | Is Munition Fuzed? | Fuzing Type | Fuze Condition | Minimum Depth for Munition (ft) | Location of Munitions | Comments (include rationale for munitions that are "subsurface only") |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Artillery | 20 | mm | UNK | Propellant | No | | | 0 | Surface and Subsurface | 20mm TP Projectile (1) - surface |
| 2 | | | | | Propellant | No | | | 0 | Surface and Subsurface | Propellant Cans (3) - surface |
| 3 | Pyrotechnic | | | | Pyrotechnic | | | | 0 | Surface and Subsurface | Slap Flare Case (2) - surface |
| 4 | Pyrotechnic | | | | Pyrotechnic | | | | 0 | Surface and Subsurface | Smoke Grenade (1) - surface |
| 5 | Pyrotechnic | | | | Pyrotechnic | | | | 0 | Surface and Subsurface | Smoke Marker (1) - surface |
| 6 | Artillery | | | | | | | | 0.1 | Subsurface Only | Small Caliber Bullet (1) - subsurface |
| 7 | | | | | | | | | | | |
| 8 | | | | | | | | | | | |
| 9 | | | | | | | | | | | |
| 10 | | | | | | | | | | | |
| 11 | | | | | | | | | | | |
| 12 | | | | | | | | | | | |
| 13 | | | | | | | | | | | |
| 14 | | | | | | | | | | | |
| 15 | | | | | | | | | | | |
| 16 | | | | | | | | | | | |
| 17 | | | | | | | | | | | |
| 18 | | | | | | | | | | | |
| 19 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |

Reference(s) for table above:

**Tetra Tech, 2011. MEC Remedial Investigation Report for Munitions Response Program at Operable Unit 5, Site 15 Blue 10 Ordnance Disposal Area, Naval Air Station Cecil Field, Jacksonville, Florida.**
**Tetra Tech, 2011. Draft Remedial Investigation Report For Munitions Response Program Munitions and Explosives of Concern Supplemental Remedial Investigation at Operable Unit 5, Site 15 – Blue Ordnance Disposal Area, Naval Air Station Cecil Field, Jacksonville, Florida.**

## Bulk Explosive Information

| Item No. | Explosive Type | Comments |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |

Reference(s) for table above:

Site ID: **Cecil Field - Site 15, Subunit 2**
Date: **10/24/2011**

## Planned Remedial or Removal Actions

| Response Action No. | Response Action Description | Expected Resulting Minimum MEC Depth (ft) | Expected Resulting Site Accessibility | Will land use activities change if this response action is implemented? | What is the expected scope of cleanup? | Comments |
|---|---|---|---|---|---|---|
| 1 | No action | 0 | Full Accessibility | No | No MEC cleanup | |
| 2 | AOC- Select Surface & Shallow Subsurface MEC & Anomaly Removal | 1 | Full Accessibility | No | cleanup of MECs located both on the surface and subsurface | surface and shallow subsurface anomaly clearance (to 1 foot bgs), in select areas (10 feet on either side of access ways within the operational area) |
| 3 | All Surface & Shallow Subsurface MEC & Anomaly Removal | 1 | Full Accessibility | No | cleanup of MECs located both on the surface and subsurface | surface and shallow subsurface anomaly clearance (to 1 foot bgs), in the remaining areas, |
| 4 | All Surface and Shallow Subsurface MEC Removal | 1 | Full Accessibility | No | cleanup of MECs located both on the surface and subsurface | surface and subsurface clearance (to 1 foot bgs) |
| 5 | | | | | | |
| 6 | | | | | | |

**According to the 'Summary Info' worksheet, no future land uses are planned. For those alternatives where you answered 'No' in Column E, the land use activities will be assessed against current land uses.**

Reference(s) for table above:

[redacted]

**AGVIQ-CH2MHill (AGVIQ-CH2MHill Constructors, Inc., Joint Venture III), 2009. Remedial Action Completion Report – Soil Removal Action for Operable Unit 5, Site 15 - Blue 10 Ordnance Disposal Area, Naval Air Station Cecil Field, Jacksonville, Florida.**
**Tetra Tech, 2011. MEC Remedial Investigation Report for Munitions Response Program at Operable Unit 5, Site 15 Blue 10 Ordnance Disposal Area, Naval Air Station Cecil Field, Jacksonville, Florida.**

Site ID: **Cecil Field - Site 15, Subunit 2**
Date: **10/24/2011**

***This worksheet needs to be completed for each remedial/removal action alternative listed in the 'Remedial-Removal Action' worksheet that will cause a change in land use.***

## Land Use Activities Planned After Response Alternative #1: No action

| Activity No. | Activity | Number of people per year who participate in the activity | Number of hours a single person spends on the activity | Potential Contact Time (receptor hours/year) | Maximum intrusive depth (ft) | Comments |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |
| 9 | | | | | | |
| 10 | | | | | | |
| 11 | | | | | | |
| 12 | | | | | | |

Total Potential Contact Time (receptor hrs/yr):
Maximum intrusive depth at site (ft):

Reference(s) for table above:

## Land Use Activities Planned After Response Alternative #2: AOC- Select Surface & Shallow Subsurface MEC & Anomaly Removal

| Activity No. | Activity | Number of people per year who participate in the activity | Number of hours a single person spends on the activity | Potential Contact Time (receptor hours/year) | Maximum intrusive depth (ft) | Comments |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |
| 9 | | | | | | |
| 10 | | | | | | |
| 11 | | | | | | |
| 12 | | | | | | |

Total Potential Contact Time (receptor hrs/yr):

Maximum intrusive depth at site (ft):

Reference(s) for table above:

## Land Use Activities Planned After Response Alternative #3: All Surface & Shallow Subsurface MEC & Anomaly Removal

| Activity No. | Activity | Number of people per year who participate in the activity | Number of hours a single person spends on the activity | Potential Contact Time (receptor hours/year) | Maximum intrusive depth (ft) | Comments |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |
| 9 | | | | | | |
| 10 | | | | | | |
| 11 | | | | | | |
| 12 | | | | | | |

Total Potential Contact Time (receptor hrs/yr):

Maximum intrusive depth at site (ft):

Reference(s) for table above:

## Land Use Activities Planned After Response Alternative #4: All Surface and Shallow Subsurface MEC Removal

| Activity No. | Activity | Number of people per year who participate in the activity | Number of hours a single person spends on the activity | Potential Contact Time (receptor hours/year) | Maximum intrusive depth (ft) | Comments |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |
| 9 | | | | | | |
| 10 | | | | | | |
| 11 | | | | | | |
| 12 | | | | | | |

Total Potential Contact Time (receptor hrs/yr):

Maximum intrusive depth at site (ft):

Reference(s) for table above:

Site ID: **Cecil Field - Site 15, Subunit 2**

Date: **10/24/2011**

## Energetic Material Type Input Factor Categories

The following table is used to determine scores associated with the energetic materials. Materials are listed in order from most hazardous to least hazardous.

| | Baseline Conditions | Surface Cleanup | Subsurface Cleanup |
|---|---|---|---|
| High Explosive and Low Explosive Filler in Fragmenting Rounds | 100 | 100 | 100 |
| White Phosphorus | 70 | 70 | 70 |
| Pyrotechnic | 60 | 60 | 60 |
| Propellant | 50 | 50 | 50 |
| Spotting Charge | 40 | 40 | 40 |
| Incendiary | 30 | 30 | 30 |

**The most hazardous type of energetic material listed in the 'Munitions, Bulk Explosive Info' Worksheet falls under the category 'Pyrotechnic'.**

| | ***Score*** |
|---|---|
| Baseline Conditions: | **60** |
| Surface Cleanup: | **60** |
| Subsurface Cleanup: | **60** |

## Location of Additional Human Receptors Input Factor Categories

1. What is the Explosive Safety Quantity Distance (ESQD) from the Explosive Siting Plan or the Explosive Safety Submission for the MRS? 535 feet
2. Are there currently any features or facilities where people may congregate within the MRS, or within the ESQD arc? No
3. Please describe the facility or feature.

MEC Item(s) used to calculate the ESQD for current use activities

**Item #1. Artillery (20mm, Propellant)** [redacted]

**Comments**

Intentional Detonation - MEC Treatment of MGFD 20mm Projectile, M56A4 - Public and all personnel, other ESQDs - unintentional - Public and non-essential personnel - 65 feet.

The following table is used to determine scores associated with the location of additional human receptors (current use activities):

| | Baseline Conditions | Surface Cleanup | Subsurface Cleanup |
|---|---|---|---|
| Inside the MRS or inside the ESQD arc | 30 | 30 | 30 |
| Outside of the ESQD arc | 0 | 0 | 0 |

**4. Current use activities are 'Outside of the ESQD arc', based on Question 2.'**

| | ***Score*** |
|---|---|
| Baseline Conditions: | **0** |
| Surface Cleanup: | **0** |
| Subsurface Cleanup: | **0** |

5. Are there future plans to locate or construct features or facilities where people may congregate within the MRS, or within the ESQD arc?

6. Please describe the facility or feature.

MEC Item(s) used to calculate the ESQD for future use activities

The following table is used to determine scores associated with the location of additional human receptors (future use activities):

| | Baseline Conditions | Surface Cleanup | Subsurface Cleanup |
|---|---|---|---|
| Inside the MRS or inside the ESQD arc | 30 | 30 | 30 |
| Outside of the ESQD arc | 0 | 0 | 0 |

**7. Please answer Question 5 above to determine the scores.**

| | ***Score*** |
|---|---|
| Baseline Conditions: | |
| Surface Cleanup: | |
| Subsurface Cleanup: | |

## Site Accessibility Input Factor Categories

The following table is used to determine scores associated with site accessibility:

| | Description | Baseline Conditions | Surface Cleanup | Subsurface Cleanup |
|---|---|---|---|---|
| Full Accessibility | No barriers to entry, including signage but no fencing | 80 | 80 | 80 |
| Moderate Accessibility | Some barriers to entry, such as barbed wire fencing or rough terrain | 55 | 55 | 55 |
| Limited Accessibility | Significant barriers to entry, such as unguarded chain link fence or requirements for special transportation to reach the site | 15 | 15 | 15 |
| Very Limited Accessibility | A site with guarded chain link fence or terrain that requires special equipment and skills (e.g., rock climbing) to access | 5 | 5 | 5 |

### *Current Use Activities*

***Score***

Select the category that best describes the site accessibility under the current use scenario:

Full Accessibility

Baseline Conditions: **80**
Surface Cleanup: **80**
Subsurface Cleanup: **80**

### *Future Use Activities*

Select the category that best describes the site accessibility under the future use scenario:

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Reference(s) for above information:

### *Response Alternative No. 1: No action*

**Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Full Accessibility'.**

Baseline Conditions: **80**
Surface Cleanup: **80**
Subsurface Cleanup: **80**

***Response Alternative No. 2: AOC- Select Surface & Shallow Subsurface MEC & Anomaly Removal***

**Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Full Accessibility'.**

| | |
|---|---|
| Baseline Conditions: | **80** |
| Surface Cleanup: | **80** |
| Subsurface Cleanup: | **80** |

***Response Alternative No. 3: All Surface & Shallow Subsurface MEC & Anomaly Removal***

**Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Full Accessibility'.**

| | |
|---|---|
| Baseline Conditions: | **80** |
| Surface Cleanup: | **80** |
| Subsurface Cleanup: | **80** |

***Response Alternative No. 4: All Surface and Shallow Subsurface MEC Removal***

**Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Full Accessibility'.**

| | |
|---|---|
| Baseline Conditions: | **80** |
| Surface Cleanup: | **80** |
| Subsurface Cleanup: | **80** |

***Response Alternative No. 5:***

**Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.**

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

***Response Alternative No. 6:***

**Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.**

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

## Potential Contact Hours Input Factor Categories

The following table is used to determine scores associated with the total potential contact time:

| | Description | Baseline Conditions | Surface Cleanup | Subsurface Cleanup |
|---|---|---|---|---|
| Many Hours | ≥1,000,000 receptor-hrs/yr | 120 | 90 | 30 |
| Some Hours | 100,000 to 999,999 receptor hrs/yr | 70 | 50 | 20 |
| Few Hours | 10,000 to 99,999 receptor-hrs/yr | 40 | 20 | 10 |
| Very Few Hours | <10,000 receptor-hrs/yr | 15 | 10 | 5 |

***Current Use Activities***:

Input factors are only determined for baseline conditions for current use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is: **400** receptor hrs/yr

Based on the table above, this corresponds to a input factor score for baseline conditions of: **15** Score

***Future Use Activities***:

Input factors are only determined for baseline conditions for future use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is: receptor hrs/yr

Based on the table above, this corresponds to a input factor score of: Score

***Response Alternative No. 1: No action***

**Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.**

**Total Potential Contact Time, based on the contact time listed for current use activities (see 'Current and Future Activities' Worksheet)** **400**

Based on the table above, this corresponds to input factor scores of: ***Score***

Baseline Conditions: **15**

Surface Cleanup: **10**

Subsurface Cleanup: **5**

***Response Alternative No. 2: AOC- Select Surface & Shallow Subsurface MEC***

**Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.**

**Total Potential Contact Time, based on the contact time listed for current use activities (see 'Current and Future Activities' Worksheet)** **400**

Based on the table above, this corresponds to input factor scores of: ***Score***

Baseline Conditions: **15**

Surface Cleanup: **10**

Subsurface Cleanup: **5**

***Response Alternative No. 3: All Surface & Shallow Subsurface MEC &***

| | | |
|---|---|---|
| **Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.** | | |
| **Total Potential Contact Time, based on the contact time listed for current use activities (see 'Current and Future Activities' Worksheet)** | | **400** |
| Based on the table above, this corresponds to input factor scores of: | ***Score*** | |
| Baseline Conditions: | | **15** |
| Surface Cleanup: | | **10** |
| Subsurface Cleanup: | | **5** |
| ***Response Alternative No. 4: All Surface and Shallow Subsurface MEC*** | | |
| **Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.** | | |
| **Total Potential Contact Time, based on the contact time listed for current use activities (see 'Current and Future Activities' Worksheet)** | | **400** |
| Based on the table above, this corresponds to input factor scores of: | ***Score*** | |
| Baseline Conditions: | | **15** |
| Surface Cleanup: | | **10** |
| Subsurface Cleanup: | | **5** |
| ***Response Alternative No. 5:*** | | |
| **Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.** | | |
| **Total Potential Contact Time** | | |
| Based on the table above, this corresponds to input factor scores of: | Score | |
| Baseline Conditions: | | |
| Surface Cleanup: | | |
| Subsurface Cleanup: | | |
| ***Response Alternative No. 6:*** | | |
| **Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.** | | |
| **Total Potential Contact Time** | | |
| Based on the table above, this corresponds to input factor scores of: | Score | |
| Baseline Conditions: | | |
| Surface Cleanup: | | |
| Subsurface Cleanup: | | |

## Amount of MEC Input Factor Categories

The following table is used to determine scores associated with the Amount of MEC:

| | Description | Baseline Conditions | Surface Cleanup | Subsurface Cleanup | |
|---|---|---|---|---|---|
| Target Area | Areas at which munitions fire was directed | 180 | 120 | 30 | |
| OB/OD Area | Sites where munitions were disposed of by open burn or open detonation methods. This category refers to the core activity area of an OB/OD area. See the "Safety Buffer Areas" category for safety fans and kick-outs. | 180 | 110 | 30 | |
| Function Test Range | Areas where the serviceability of stored munitions or weapons systems are tested. Testing may include components, partial functioning or complete functioning of stockpile or developmental items. | 165 | 90 | 25 | |
| Burial Pit | The location of a burial of large quantities of MEC items. | 140 | 140 | 10 | |
| Maneuver Areas | Areas used for conducting military exercises in a simulated conflict area or war zone | 115 | 15 | 5 | |
| Firing Points | The location from which a projectile, grenade, ground signal, rocket, guided missile, or other device is to be ignited, propelled, or released. | 75 | 10 | 5 | |
| Safety Buffer Areas | Areas outside of target areas, test ranges, or OB/OD areas that were designed to act as a safety zone to contain munitions that do not hit targets or to contain kick-outs from OB/OD areas. | 30 | 10 | 5 | The site is most closely approximated by the Safety Buffer Area. |
| Storage | Any facility used for the storage of military munitions, such as earth-covered magazines, above-ground magazines, and open-air storage areas. | 25 | 10 | 5 | |

| | | | | |
|---|---|---|---|---|
| Explosive-Related Industrial Facility | Former munitions manufacturing or demilitarization sites and TNT production plants | 20 | 10 | 5 |

Select the category that best describes the ***most hazardous*** amount of MEC: ***Score***

Safety Buffer Areas

| | |
|---|---|
| Baseline Conditions: | **30** |
| Surface Cleanup: | **10** |
| Subsurface Cleanup: | **5** |

## Minimum MEC Depth Relative to the Maximum Intrusive Depth Input Factor Categories

***Current Use Activities***

The shallowest minimum MEC depth, based on the 'Cased Munitions Information' Worksheet: **0** ft
The deepest intrusive depth: **0.5** ft
The table below is used to determine scores associated with the minimum MEC depth relative to the maximum intrusive depth:

| | Baseline Conditions | Surface Cleanup | Subsurface Cleanup |
|---|---|---|---|
| Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC. | 240 | 150 | 95 |
| Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC. | 240 | 50 | 25 |
| Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth. | 150 | N/A | 95 |
| Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth does not overlap with minimum MEC depth. | 50 | N/A | 25 |

**Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth will overlap after cleanup. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.' For 'Current Use Activities', only Baseline Conditions are considered.** **240** ***Score***

***Future Use Activities***

Deepest intrusive depth: ft

**Not enough information has been entered to determine the input factor category.** ***Score***

***Response Alternative No. 1: No action***

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): **0** ft

**Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.**

**Maximum Intrusive Depth, based on the maximum intrusive depth listed for current use activities (see 'Current and Future Activities' Worksheet)** **0.5** ft

**Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth overlaps. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.'**

***Score***

Baseline Conditions: **240**

Surface Cleanup:

Subsurface Cleanup:

***Response Alternative No. 2: AOC- Select Surface & Shallow Subsurface MEC & Anomaly***

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): **1** ft

**Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.**

**Maximum Intrusive Depth, based on the maximum intrusive depth listed for current use activities (see 'Current and Future Activities' Worksheet)** **0.5** ft

**Because the shallowest minimum MEC depth is greater than the deepest intrusive depth, the intrusive depth does not overlap. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.'**

***Score***

Baseline Conditions:

Surface Cleanup:

Subsurface Cleanup: **25**

***Response Alternative No. 3: All Surface & Shallow Subsurface MEC & Anomaly Removal***

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): **1** ft

**Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.**

**Maximum Intrusive Depth, based on the maximum intrusive depth listed for current use activities (see 'Current and Future Activities' Worksheet)** **0.5** ft

**Because the shallowest minimum MEC depth is greater than the deepest intrusive depth, the intrusive depth does not overlap. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.'**

| | ***Score*** |
|---|---|
| Baseline Conditions: | |
| Surface Cleanup: | |
| Subsurface Cleanup: | **25** |

***Response Alternative No. 4: All Surface and Shallow Subsurface MEC Removal***

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): **1** ft

**Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.**

**Maximum Intrusive Depth, based on the maximum intrusive depth listed for current use activities (see 'Current and Future Activities' Worksheet)** **0.5** ft

**Because the shallowest minimum MEC depth is greater than the deepest intrusive depth, the intrusive depth does not overlap. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.'**

| | ***Score*** |
|---|---|
| Baseline Conditions: | |
| Surface Cleanup: | |
| Subsurface Cleanup: | **25** |

***Response Alternative No. 5:***

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft

**Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.**

**Maximum Intrusive Depth** ft

**Not enough information has been entered to calculate this input factor.**

| | ***Score*** |
|---|---|
| Baseline Conditions: | |
| Surface Cleanup: | |
| Subsurface Cleanup: | |

***Response Alternative No. 6:***

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft

**Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.**

**Maximum Intrusive Depth** ft

**Not enough information has been entered to calculate this input factor.**

***Score***

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

## Migration Potential Input Factor Categories

Is there any physical or historical evidence that indicates it is possible for natural physical forces in the area (e.g., frost heave, erosion) to expose subsurface MEC items, or move surface or subsurface MEC items?

Yes

If "yes", describe the nature of natural forces. Indicate key areas of potential migration (e.g., overland water flow) on a map as appropriate (attach a map to the bottom of this sheet, or as a separate worksheet).

Erosional forces may occur due to rain or use of unpaved trails/paths.

Site is in FL, therefore no frost heave.

The following table is used to determine scores associated with the migration potential:

| | Baseline Conditions | Surface Cleanup | Subsurface Cleanup |
|---|---|---|---|
| Possible | 30 | 30 | 10 |
| Unlikely | 10 | 10 | 10 |

**Based on the question above, migration potential is 'Possible.'**

| | ***Score*** |
|---|---|
| Baseline Conditions: | **30** |
| Surface Cleanup: | **30** |
| Subsurface Cleanup: | **10** |

Reference(s) for above information:

**Tetra Tech, 2011. Draft Remedial Investigation Report For Munitions Response Program Munitions and Explosives of Concern Supplemental Remedial Investigation at Operable Unit 5, Site 15 – Blue Ordnance Disposal Area, Naval Air Station Cecil Field, Jacksonville, Florida.**

## MEC Classification Input Factor Categories

**Cased munitions information has been inputed into the 'Munitions, Bulk Explosive Info' Worksheet; therefore, bulk explosives do not comprise all MECs for this MRS.**

**The 'Amount of MEC' category is 'Safety Buffer Areas'. It cannot be automatically assumed that the MEC items from this category are DMM. Therefore, the conservative assumption is that the MEC items in this MRS are UXO.**

Has a technical assessment shown that MEC in the OB/OD Area is DMM? No

Are any of the munitions listed in the 'Munitions, Bulk Explosive Info' Worksheet: No — MDAS only found in this area.

- Submunitions
- Rifle-propelled 40mm projectiles (often called 40mm grenades)
- Munitions with white phosphorus filler
- High explosive anti-tank (HEAT) rounds
- Hand grenades
- Fuzes
- Mortars

**None of the items listed in the 'Munitions, Bulk Explosive Info' Worksheet were identified as 'fuzed'.**

The following table is used to determine scores associated with MEC classification categories:

| UXO | Baseline Conditions | Surface Cleanup | Subsurface Cleanup |
|---|---|---|---|
| UXO Special Case | 180 | 180 | 180 |
| UXO | 110 | 110 | 110 |
| Fuzed DMM Special Case | 105 | 105 | 105 |
| Fuzed DMM | 55 | 55 | 55 |
| Unfuzed DMM | 45 | 45 | 45 |
| Bulk Explosives | 45 | 45 | 45 |

**Based on your answers above, the MEC classification is 'UXO'.**

| | ***Score*** |
|---|---|
| Baseline Conditions: | **110** |
| Surface Cleanup: | **110** |
| Subsurface Cleanup: | **110** |

## MEC Size Input Factor Categories

The following table is used to determine scores associated with MEC Size:

| | Description | Baseline Conditions | Surface Cleanup | Subsurface Cleanup |
|---|---|---|---|---|
| Small | Any munitions (from the 'Munitions, Bulk Explosive Info' Worksheet) weigh less than 90 lbs; small enough for a receptor to be able to move and initiate a detonation | 40 | 40 | 40 |

| | | | | |
|---|---|---|---|---|
| Large | All munitions weigh more than 90 lbs; too large to move without equipment | 0 | 0 | 0 |

Based on the definitions above and the types of munitions at the site (see 'Munitions, Bulk Explosive Info' Worksheet), the MEC Size Input Factor is: Small

| | ***Score*** |
|---|---|
| Baseline Conditions: | **40** |
| Surface Cleanup: | **40** |
| Subsurface Cleanup: | **40** |

## Scoring Summary

| Site ID: | Cecil Field - Site 15, Subunit 2 | a. Scoring Summary for Current Use Activities | |
|---|---|---|---|
| Date: | 10/24/2011 | Response Action Cleanup: | No Response Action |
| Input Factor | | Input Factor Category | Score |
| I. Energetic Material Type | | Pyrotechnic | 60 |
| II. Location of Additional Human Receptors | | Outside of the ESQD arc | 0 |
| III. Site Accessibility | | Full Accessibility | 80 |
| IV. Potential Contact Hours | | <10,000 receptor-hrs/yr | 15 |
| V. Amount of MEC | | Safety Buffer Areas | 30 |
| VI. Minimum MEC Depth Relative to Maximum Intrusive Depth | | Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC. | 240 |
| VII. Migration Potential | | Possible | 30 |
| VIII. MEC Classification | | UXO | 110 |
| IX. MEC Size | | Small | 40 |
| | | Total Score | 605 |
| | | Hazard Level Category | 3 |

| Site ID: | Cecil Field - Site 15, Subunit 2 | b. Scoring Summary for Future Use Activities | |
|---|---|---|---|
| Date: | 10/24/2011 | Response Action Cleanup: | No Response Action |
| Input Factor | | Input Factor Category | Score |
| I. Energetic Material Type | | Pyrotechnic | 60 |
| II. Location of Additional Human Receptors | | | |
| III. Site Accessibility | | | |
| IV. Potential Contact Hours | | | |
| V. Amount of MEC | | Safety Buffer Areas | 30 |
| VI. Minimum MEC Depth Relative to Maximum Intrusive Depth | | | |
| VII. Migration Potential | | Possible | 30 |
| VIII. MEC Classification | | UXO | 110 |
| IX. MEC Size | | Small | 40 |
| | | Total Score | 270 |
| | | Hazard Level Category | 4 |

| Site ID: | Cecil Field - Site 15, Subunit 2 | c. Scoring Summary for Response Alternative 1: No action | |
|---|---|---|---|
| Date: | 10/24/2011 | Response Action Cleanup: | No MEC cleanup |
| **Input Factor** | | **Input Factor Category** | **Score** |
| I. Energetic Material Type | | Pyrotechnic | 60 |
| II. Location of Additional Human Receptors | | Outside of the ESQD arc | 0 |
| III. Site Accessibility | | Full Accessibility | 80 |
| IV. Potential Contact Hours | | <10,000 receptor-hrs/yr | 15 |
| V. Amount of MEC | | Safety Buffer Areas | 30 |
| VI. Minimum MEC Depth Relative to Maximum Intrusive Depth | | Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC. | 240 |
| VII. Migration Potential | | Possible | 30 |
| VIII. MEC Classification | | UXO | 110 |
| IX. MEC Size | | Small | 40 |
| | | **Total Score** | **605** |
| | | **Hazard Level Category** | **3** |

| Site ID: | Cecil Field - Site 15, Subunit 2 | d. Scoring Summary for Response Alternative 2: AOC- Select Surface & Shallow Subsurface MEC & Anomaly | |
|---|---|---|---|
| Date: | 10/24/2011 | Response Action Cleanup: | cleanup of MECs located both on the surface and subsurface |
| **Input Factor** | | **Input Factor Category** | **Score** |
| I. Energetic Material Type | | Pyrotechnic | 60 |
| II. Location of Additional Human Receptors | | Outside of the ESQD arc | 0 |
| III. Site Accessibility | | Full Accessibility | 80 |
| IV. Potential Contact Hours | | <10,000 receptor-hrs/yr | 5 |
| V. Amount of MEC | | Safety Buffer Areas | 5 |
| VI. Minimum MEC Depth Relative to Maximum Intrusive Depth | | Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC. | 25 |
| VII. Migration Potential | | Possible | 10 |
| VIII. MEC Classification | | UXO | 110 |
| IX. MEC Size | | Small | 40 |
| | | **Total Score** | **335** |
| | | **Hazard Level Category** | **4** |

| Site ID: | Cecil Field - Site 15, Subunit 2 | e. Scoring Summary for Response Alternative 3: All Surface & Shallow Subsurface MEC & Anomaly Removal | |
|---|---|---|---|
| Date: | 10/24/2011 | Response Action Cleanup: | cleanup of MECs located both on the surface and subsurface |
| **Input Factor** | | **Input Factor Category** | **Score** |
| I. Energetic Material Type | | Pyrotechnic | 60 |
| II. Location of Additional Human Receptors | | Outside of the ESQD arc | 0 |
| III. Site Accessibility | | Full Accessibility | 80 |
| IV. Potential Contact Hours | | <10,000 receptor-hrs/yr | 5 |
| V. Amount of MEC | | Safety Buffer Areas | 5 |
| VI. Minimum MEC Depth Relative to Maximum Intrusive Depth | | Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC. | 25 |
| VII. Migration Potential | | Possible | 10 |
| VIII. MEC Classification | | UXO | 110 |
| IX. MEC Size | | Small | 40 |
| | | **Total Score** | **335** |
| | | **Hazard Level Category** | **4** |

| Site ID: | Cecil Field - Site 15, Subunit 2 | f. Scoring Summary for Response Alternative 4: All Surface and Shallow Subsurface MEC Removal | |
|---|---|---|---|
| Date: | 10/24/2011 | Response Action Cleanup: | cleanup of MECs located both on the surface and subsurface |
| **Input Factor** | | **Input Factor Category** | **Score** |
| I. Energetic Material Type | | Pyrotechnic | 60 |
| II. Location of Additional Human Receptors | | Outside of the ESQD arc | 0 |
| III. Site Accessibility | | Full Accessibility | 80 |
| IV. Potential Contact Hours | | <10,000 receptor-hrs/yr | 5 |
| V. Amount of MEC | | Safety Buffer Areas | 5 |
| VI. Minimum MEC Depth Relative to Maximum Intrusive Depth | | Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC. | 25 |
| VII. Migration Potential | | Possible | 10 |
| VIII. MEC Classification | | UXO | 110 |
| IX. MEC Size | | Small | 40 |
| | | **Total Score** | **335** |
| | | **Hazard Level Category** | **4** |

| Site ID: | Cecil Field - Site 15, Subunit 2 | g. Scoring Summary for Response Alternative 5: | |
|---|---|---|---|
| Date: | 10/24/2011 | Response Action Cleanup: | |
| Input Factor | | Input Factor Category | Score |
| I. Energetic Material Type | | Pyrotechnic | |
| II. Location of Additional Human Receptors | | Outside of the ESQD arc | |
| III. Site Accessibility | | | |
| IV. Potential Contact Hours | | | |
| V. Amount of MEC | | Safety Buffer Areas | |
| VI. Minimum MEC Depth Relative to Maximum Intrusive Depth | | | |
| VII. Migration Potential | | Possible | |
| VIII. MEC Classification | | UXO | |
| IX. MEC Size | | Small | |
| | | Total Score | |
| | | Hazard Level Category | |

| Site ID: | Cecil Field - Site 15, Subunit 2 | h. Scoring Summary for Response Alternative 6: | |
|---|---|---|---|
| Date: | 10/24/2011 | Response Action Cleanup: | |
| Input Factor | | Input Factor Category | Score |
| I. Energetic Material Type | | Pyrotechnic | |
| II. Location of Additional Human Receptors | | Outside of the ESQD arc | |
| III. Site Accessibility | | | |
| IV. Potential Contact Hours | | | |
| V. Amount of MEC | | Safety Buffer Areas | |
| VI. Minimum MEC Depth Relative to Maximum Intrusive Depth | | | |
| VII. Migration Potential | | Possible | |
| VIII. MEC Classification | | UXO | |
| IX. MEC Size | | Small | |
| | | Total Score | |
| | | Hazard Level Category | |

| MEC HA Hazard Level Determination | | |
|---|---|---|
| **Site ID:** **Cecil Field - Site 15, Subunit 2** | | |
| **Date:** **10/24/2011** | | |
| | **Hazard Level Category** | **Score** |
| a. Current Use Activities | **3** | **605** |
| b. Future Use Activities | **4** | **270** |
| c. Response Alternative 1: No action | **3** | **605** |
| d. Response Alternative 2: AOC- Select Surface & Shallow Subsurface MEC & Anomaly Removal | **4** | **335** |
| e. Response Alternative 3: All Surface & Shallow Subsurface MEC & Anomaly Removal | **4** | **335** |
| f. Response Alternative 4: All Surface and Shallow Subsurface MEC Removal | **4** | **335** |
| g. Response Alternative 5: | | |
| h. Response Alternative 6: | | |

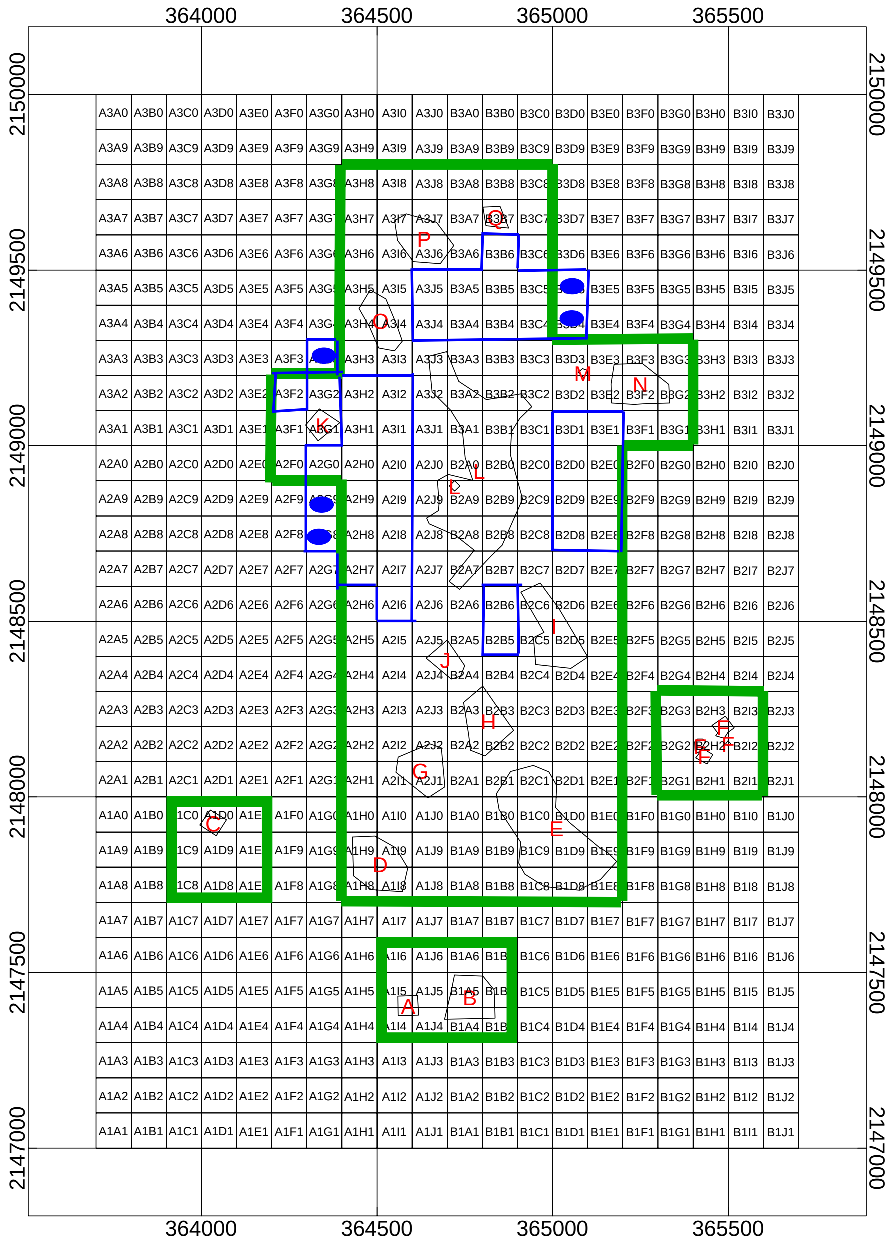
| Characteristics of the MRS | | |
|---|---|---|
| Is critical infrastructure located within the MRS or within the ESQD arc? | No | |
| Are cultural resources located within the MRS or within the ESQD arc? | No | |
| Are significant ecological resources located within the MRS or within the ESQD arc? | No | gopher tortis? |

## A-5 TREE AND VEGETAION REMOVAL AREAS

Alternatives 2A, 2B, 2C, 3A, 3B, and 3C

Excavation Area Outline

Grids To Be Cleared During Munitions Removal




Area cleared: 45.91 acres

250 0 250 500 750

US survey foot

*NAD83 / *StatePlane Florida East FIPS 0901 Feet*

Figure 3-4

Tree and Vegetation Removal

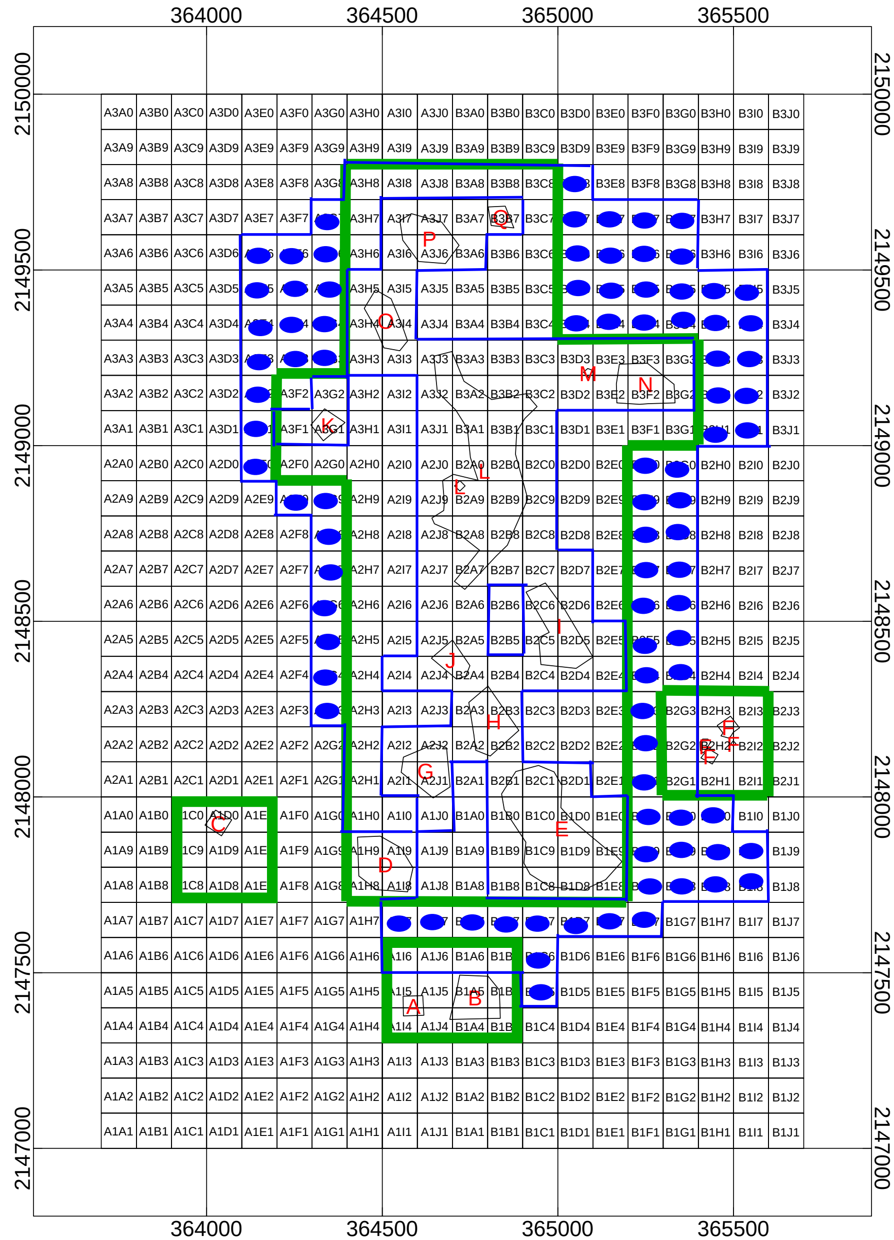
Cecil Field

Duval County, Florida

Alternatives 4A, 4B, and 4C

Excavation Area Outline

Grids To Be Cleared During Munitions Removal




Area cleared: 45.91 acres

Figure 3-4
Tree and Vegetation Removal
Cecil Field
Duval County, Florida

250 0 250 500 750

US survey foot

*NAD83 / *StatePlane Florida East FIPS 0901 Feet*

# APPENDIX B

# SUSTAINABLE EVALUATION

# APPENDIX B: SUSTAINABLE EVALUATION

# APPENDIX B1: SUSTAINABLE EVALUATION NARRATIVE

**APPENDIX B**

**Sustainable Remediation Evaluation for the Feasibility Study**
**Operable Unit 5, Site 15**
**Naval Air Station (NAS) Cecil Field**
**Jacksonville, Florida**
**April 2012**

## Objective

This Sustainable Remediation Evaluation (SRE) of the nine remediation alternatives previously described in the main text is provided as an appendix to the Feasibility Study (FS) for the Operable Unite (OU) 5 Site 15 located at Naval Air Station (NAS) Cecil Field, in Jacksonville, Florida. The purpose of the SRE is to assess the environmental impacts of the three remedial alternatives using the metrics of greenhouse gas (GHG) and criteria pollutant emissions, energy use, water consumption, and worker safety. The results of this SRE are intended to provide additional information for consideration during remedy selection and design and enhance the understanding of the environmental impacts throughout the remedy life-cycle for each of the proposed alternatives.

## Sustainability Evaluation Policy Background

Department of Defense (DOD) and Navy policies require continual optimization of remedies in every phase from remedy selection through site closeout (NAVFAC, 2010a).

In January 2007, Executive Order 13423 set targets for sustainable practices for (i) energy efficiency, greenhouse gas emissions avoidance or reduction, and petroleum products use reduction, (ii) renewable energy, including bioenergy, (iii) water conservation, (iv) acquisition, (v) pollution and waste prevention and recycling, etc. In October 2009, Executive Order 13514 was issued, which reinforced these sustainability requirements and established specific goals for federal agencies to meet by 2020.

In August 2009 DOD issued a policy for "Consideration of Green and Sustainable Remediation Practices in the Defense Environmental Restoration Program." The DOD policy and related Navy guidance state that opportunities to increase sustainability should be considered throughout all phases of remediation (i.e., site investigation, remedy selection, remedy design and construction, operation, monitoring, and site closeout). In response to this policy, the Department of the Navy (DON) issued an updated Navy Guidance for "Optimizing Remedy Evaluation, Selection, and Design" (NAVFAC, 2010), which includes sustainability evaluations as part of the traditional DON optimization review process for remedy selection, design, and remedial action operation. In August 2010 the Naval Facilities Engineering Command (NAVFAC) issued policy requiring use of the SiteWise tool to perform sustainability reviews as part of all

Feasibility Studies. As such, this sustainability evaluation of remedial alternatives is being performed to estimate the environmental footprint associated with each alternative in the interest of increasing the sustainability of remedial action at OU5 Site 15, NAS Cecil Field.

Applying the DON optimization concepts with a sustainability review within the remedial selection and design phases will allow for the following benefits:

- Determining factors in each remedial alternative with the greatest environmental impacts and gathering insight into how to reduce these impacts;
- Evaluating remedial alternatives with optimized or reduced environmental footprints in conjunction with other selection criteria;
- Designing and implementing a more robust remedy while balancing the impact to the environment; and
- Ensuring efficient, cost-effective and sustainable site closeout.

**Evaluation Tools**

This evaluation was performed using a hybrid model of the Navy's SiteWise tool supplemented with Tetra Tech's GSRx model as appropriate for some site-specific items.

SiteWise™ is a life-cycle assessment tool developed jointly by the U.S. Navy, U.S. Army Corps of Engineers (USACE), and Battelle, which assesses the environmental footprint of a remedial alternative/technology using a consistent set of metrics. The assessment is conducted using a building block approach where every remedial alternative is first broken down into modules that mimic the remedial phases in most remedial actions, including remedial investigation (RI), remedial action construction (RAC), remedial action operation (RA-O), and long-term monitoring (LTM). Once broken down by remedial phase, the footprint of each phase is calculated. The phase-specific footprints are then combined to estimate the overall footprint of the remedial alternative. This building block approach reduces redundancy in the sustainability evaluation and facilitates the identification of specific impact drivers that contribute to the environmental footprint. The inputs that need to be considered include (1) production of material required by the activity; (2) transportation of the required materials to the site; (3) all site activities to be performed; and (4) management of the waste produced by the activity.

GSRx builds off of SiteWise™ and allows for a flexible, detailed analysis, particularly for materials and equipment use. GSRx was used to account for materials not readily input into SiteWise™ and where equipment usage assumptions built into SiteWise were not consistent with site-specific requirements.

**Sustainability Evaluation Framework and Limitations**

The sustainability evaluation performed for the FS for the OU5 Site 15 at NAS Cecil Field considered life-cycle metrics for global warming potential (through green house gas emissions), criteria air pollutant emissions (through $NO_X$, $SO_X$ and $PM_{10}$ emissions), energy consumption, water usage, and worker safety.

Life cycle impacts were calculated for energy consumption, emissions of GHG (carbon dioxide [$CO_2$], methane [$CH_4$], and nitrous oxide [$N_2O$]) and criteria pollutants (nitrogen oxides [$NO_x$], sulfur oxides [$SO_x$] and particulate matter [$PM_{10}$]), water usage, and energy consumption, and worker safety.

Life cycle inventory inputs in SiteWise were divided into four categories – 1) materials production; 2) transportation of personnel, materials and equipment; 3) equipment use and miscellaneous; and 4) residual handling. Cost estimates from the RAP and design calculations were used as a basis for inventory quantities and related assumptions. Emission factors, energy consumption, and water usage data were correlated to material quantities, equipment, transportation distances, and installation time frames in order to calculate life-cycle emissions, energy consumption, water usage, and worker safety. Default SiteWise emission, energy usage, water consumption, and worker fatality and accident risk factors were utilized.

Although GSRx was used to minimize limitations resulting within SiteWise, elimination of all limitations was not possible while using a hybrid model of SiteWise and GSRx. For example, several materials and construction equipment inventoried were input into GSRx and these impacts were incorporated into SiteWise within the “Equipment Use and Miscellaneous” sector. This sector in SiteWise does not differentiate into the specific equipment usage or material consumption items that are input in GSRx, but rather are considered miscellaneous items. However, impact drivers for items input in GSRx can be identified and evaluated directly within the respective GSRx evaluation and output summary sheets. In addition, worker safety results in general do not include worker safety related to equipment usage that was input within GSRx because GSRx does not evaluate worker safety. However, for the alternatives evaluated for OU5 Site 15, this limitation related to equipment usage is considered minor compared to the amount of worker safety related to transportation for each alternative.

**Sustainability Evaluation Results**

The following are the alternatives that were analyzed with SiteWise™ and GSRx for OU5, Site 15 in Jacksonville, FL.:

- Alternative 2a: Areas of concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal (off-site disposal)
- Alternative 2b: Areas of concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal (on-site treatment)

- Alternative 2c: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal (no off-site disposal, no on-site treatment)
- Alternative 3a: All, Surface and Shallow Subsurface MEC and Anomaly Removal (off-site disposal)
- Alternative 3b: All, Surface and Shallow Subsurface MEC and Anomaly Removal (on-site treatment)
- Alternative 3c: All, Surface and Shallow Subsurface MEC and Anomaly Removal (no off-site disposal, no on-site treatment)
- Alternative 4a: All, Surface and Shallow Subsurface MEC Removal (off-site disposal)
- Alternative 4b: All, Surface and Shallow Subsurface MEC Removal (on-site treatment)
- Alternative 4c: All, Surface and Subsurface MEC Removal (no off-site disposal, no on-site treatment)

The following sections summarize the relative environmental impacts and primary impact drivers for the nine alternatives and respective metrics. The environmental impacts of the nine alternatives analyzed are summarized quantitatively in Table B1. In addition, the appendix includes the input and output sheets that were used for the SiteWise™/GSRx hybrid model (Appendix B-2 and B3 correspondignly). An evaluation of SiteWise™ and GSRx output summary sheets and related figures included in the SRE attachments, provides detailed information on the contribution to each metric from each phase of the remedial process (RI, RAC, RAO, and LTM) and for each respective input category (materials production, transportation, equipment usage, etc). Further inspection of related inventory and SiteWise™ and GSRx input sheets provide information on the specific contribution to a metric from each item of material, transportation, equipment, etc. This level of detail also helps clarify results that could be misinterpreted based on SiteWise™ data entry limitations mentioned previously.

*Greenhouse Gas Emissions*

Emissions of $CO_2$, $CH_4$, and $N_2O$ were normalized to $CO_2$ equivalents ($CO_2e$), which is a cumulative method of weighing GHG emissions relative to global warming potential. Figure B1 shows the breakdown of the GHG emissions from each of the alternatives evaluated. The x-axis represents the six proposed alternatives, and the y-axis represents the GHG emissions in metric tons of $CO_2e$.

The total amount of GHG emissions resulting from Alternative 2a is 1,042.5 metric tons of $CO_2e$. The category that contributes the most to GHG emissions is the residual handling operation (701.2 metric tons of $CO_2e$, corresponding to 67.2 percent of the total GHG emissions), due to the amount of soil that is disposed as hazardous waste and the distance that the waste needs to travel for proper disposal. The activity with the second highest contribution to GHG emissions is the production of materials, contributing 221.6 metric tons of $CO_2e$ (approximately 21.2 percent of the total GHG emissions), where the production of borrow soil contributes 208.6 metric tons of $CO_2e$. The third highest category contributing to GHG emissions is the equipment use and miscellaneous sector, contributing 62.3 metric tons of $CO_2e$ (5.9 percent of the total GHG emissions) due to the use of the excavator (which is in operation for 320 hours) contributing 31 metric tons of $CO_2e$.

The total amount of GHG emissions resulting from Alternative 2b is 930.46 metric tons of $CO_2e$. The category that contributes the most to the GHG emissions is the production of materials (618.37 metric tons of $CO_2e$, corresponding to 66 percent of the total amount of GHG emitted), where the production of the chemical that is used as the stabilizing material for the on–site treatment for the soil contributes 250.9 metric tons of $CO_2e$. The second highest category contributing to this environmental impact is the residual handling operation (191.85 metric tons of $CO_2e$, corresponding to 21 percent of the total GHG emissions). The equipment use and miscellaneous contributes to the GHG emissions with 60.87 metric tons of $CO_2e$, corresponding to 7 percent of the total GHG emissions.

The total amount of GHG emissions resulting from Alternative 2c is 48.39 metric tons of $CO_2e$. The category with the highest contribution to these emissions is the equipment use with 17.44 metric tons of $CO_2e$ (approximately 36 percent of the total emissions), where the use of the dozer accounts for 14.06 metric tons of $CO_2e$ due to its 128 hours of operation. The activity group with the second highest contribution to GHG emissions is the transportation of personnel through the lifetime of this alternative, where 15.07 metric tons of $CO_2e$ were emitted, corresponding to approximately 31 percent of the total $CO_2e$ emissions. The third highest contributor to the GHG emissions is the production of materials, where 13.04 metric tons of $CO_2e$ are released, corresponding to 27 percent of the total GHG emissions, where the production of fertilizer for revegetation purposes contributes with 5.6 metric tons of $CO_2e$.

The total amount of GHG emissions resulting from Alternative 3a is 1,062.6 metric tons of $CO_2e$. The category that contributes the most to GHG emissions is the residual handling operation, contributing 701.7 metric tons of $CO_2e$ (approximately 66 percent of the total GHG emissions) due to the large amount of hazardous materials that need to be disposed and the distance travelled in order to reach a hazardous waste facility. The activity with the second highest contribution to GHG emissions is the production of materials (contributing 221.6 metric tons of $CO_2e$, 20.8 percent of the total GHG emissions), where the production of borrow soil contributes 208.6 metric tons of $CO_2e$. The third highest category contributing to GHG emissions is the equipment use and miscellaneous sector, contributing 62.31 metric tons of $CO_2e$ (approximately 5.8 percent of the total GHG emissions).

The total amount of GHG emissions resulting from Alternative 3b is 956.45 metric tons of $CO_2e$. The category that contributes the most to the GHG emissions is the production of materials (618.37 metric tons of $CO_2e$, corresponding to 65 percent of total GHG emissions), where the production of the chemical used as the stabilizing material for the soil on-site treatment contributes 250.9 metric tons of $CO_2e$. The second highest category contributing to this environmental impact is the residual handling operations (194.28 metric tons of $CO_2e$, 20 percent of the total GHG emissions).

The total amount of GHG emissions resulting from Alternative 3c is 68.84 metric tons of $CO_2e$. The category that contributes the most to GHG emissions is the transportation of personnel, contributing 34.87 metric tons of $CO_2e$ (approximately 51 percent of the total GHG emissions). The activity with the second highest contribution to GHG emissions is the equipment use and miscellaneous (contributing 20.61 metric tons of $CO_2e$, 30 percent of the total GHG emissions), where the use of the dozer which is in operation 128 hours, contributes 14.06 metric tons of $CO_2e$. The third highest category contributing to GHG emissions is the production of materials, contributing 9.8 metric tons of $CO_2e$ (approximately 14 percent of the total GHG emissions), where the production of fertilizer, which is used for revegetation purposes, contributes 5.6 metric tons of $CO_2e$.

The total amount of GHG emissions resulting from Alternative 4a is 3,694.9 metric tons of $CO_2e$. The category that contributes the most to GHG emissions is the residual handling operations (2,489.9 metric tons of $CO_2e$, corresponding to 67.3 percent of the GHG emissions) due to the amount of hazardous waste that needs to be properly disposed. The second highest contributor to these emissions is the production of materials, contributing 811.4 metric tons of $CO_2e$ (approximately 21.9 percent of the total GHG emissions), where 741.7 metric tons of $CO_2e$ can be attributed to the production of borrow soil for backfilling purposes.

The total amount of GHG emissions resulting from Alternative 4b is 6,790.49 metric tons of $CO_2e$. The category that contributes the most to GHG emissions is transportation of equipment and materials (3,593.40 metric tons of $CO_2e$, corresponding to 53 percent of the total GHG emissions) The second highest category contributing to this environmental impact is the production of materials (2,223.67 metric tons of $CO_2e$, corresponding to 33 percent of the total amount of GHG emissions) where 893.3 metric tons of $CO_2e$ can be attributed to the production of the chemical that will be used as the stabilizing material for the soil on-site treatment.

The total amount of GHG emissions resulting from Alternative 4c is 177.07 metric tons of $CO_2e$. The category that contributes the most to GHG emissions is the production of materials (69.65 metric tons of $CO_2e$, corresponding to 39.3 percent of the total GHG emissions) where 29.1 metric tons of $CO_2e$ can be attributed to the production of the fertilizer that will be used for revegetation purposes. The second highest category contributing to this environmental impact is the equipment use and miscellaneous category (68.97 metric tons of $CO_2e$, corresponding to 38.9 percent of the total amount of GHG emissions) where the dozer contributes 28.1 metric tons of $CO_2e$ while being in operation for 256 hours. Transportation of personnel contributes 32.6 metric tons of $CO_2e$, corresponding to 18.4 percent of the total GHG emissions.

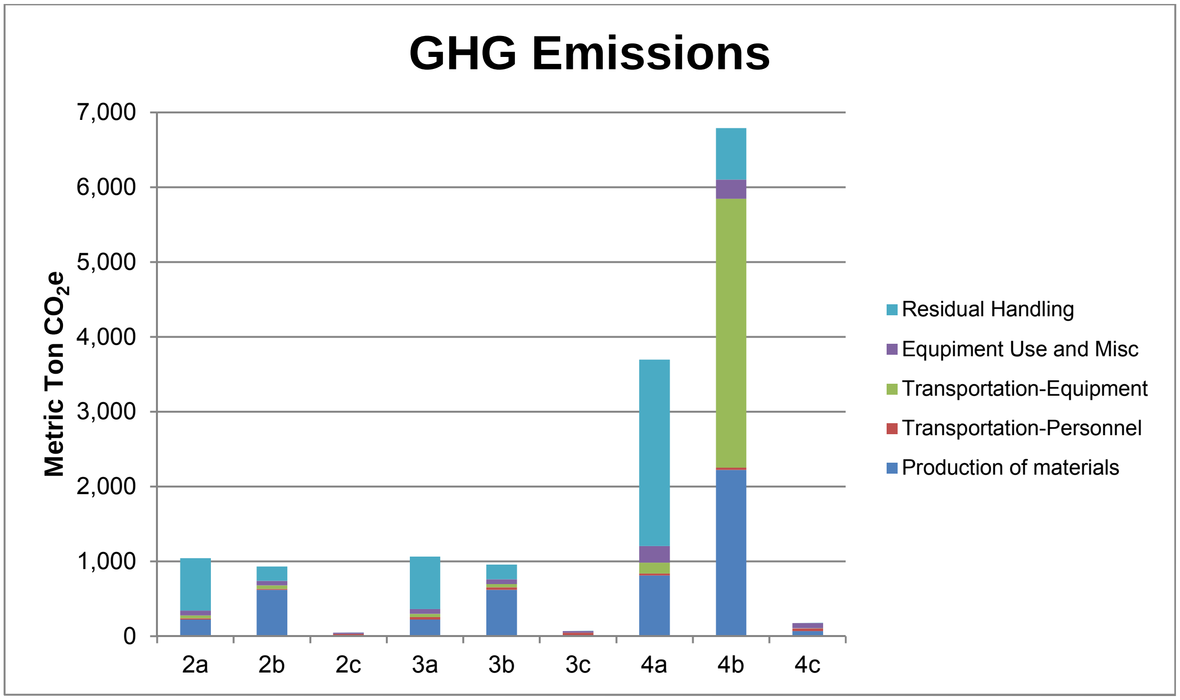



Figure B1: GHG Emissions For Proposed Alternatives At OU 5 Site 15, NAS Cecil Field

*Criteria Pollutant Emissions*

*$NO_X$*

Figure B2 shows a graphical representation of the breakdown of the $NO_X$ emissions resulting from the proposed alternatives. The x-axis represents the six proposed alternatives, and the y-axis represents the $NO_X$ emissions in metric tons.

The total amount of $NO_X$ emissions resulting from Alternative 2a is 1.3 metric tons of $NO_X$. The category that contributes the most to $NO_X$ emissions is residual handling operations with 68 percent of the total emissions ($8.8x10^{-1}$ metric tons of $NO_X$), due to the large amount of hazardous waste material (10,000 tons of soil) and the travel distance to the proper waste disposal facility. The activity with the second highest contribution to $NO_X$ is the equipment use and miscellaneous, emitting $3.9x10^{-1}$ metric tons (approximately 30 percent of the total emissions), where the use of the excavator (which is in operation for 320 hours) contributes with $1.95x10^{-1}$ metric tons of $NO_X$.

The total amount of $NO_X$ emissions resulting from Alternative 2b is $7.73x10^{-1}$ metric tons of $NO_X$. The category that contributes the most to the $NO_X$ emissions is the residual handling operations, responsible for approximately 56 percent of the total NOX emissions (6.6x10-1 metric tons of NOX). The activity with the second highest contribution to $NO_X$ emissions is the equipment use and miscellaneous responsible for 11 percent of the total $NO_X$ emissions ($8.9x10^{-2}$ metric tons of $NO_X$), where the use of the dozer (98 hours in operation) contributes with $6.48x10^{-2}$ metric tons of $NO_X$. The third highest category contributing to this environmental impact is the transportation of equipment and materials $1.45x10^{-2}$ metric tons of $NO_X$ approximately 2 percent of the total $NO_X$ emissions.

The total $NO_X$ emissions resulting from Alternative 2c is $1.2x10^{-1}$ metric tons. The activity group with the highest contribution to $NO_X$ emissions is the equipment use, where $1.1x10^{-1}$ metric tons of $NO_X$ are released to the atmosphere, corresponding to 92 percent of the total $NO_X$ emissions; the use of the dozer, which is in operation for 128 hours, contributes $8.6x10^{-2}$ metric tons of $NO_X$. The second highest contributor to $NO_X$ emissions is the transportation of personnel, where $5.6x10^{-3}$ metric tons of $NO_X$ are emitted, corresponding to approximately 4 percent of the total $NO_X$ emissions. The third highest contributor to $NO_X$ emissions is the residual handling operations, where $4x10^{-3}$ metric tons of $NO_X$ are released, corresponding to 3 percent of the total $NO_X$ emissions.

The total amount of $NO_X$ emissions resulting from Alternative 3a is 1.3 metric tons of $NO_X$: The category that contributes the most to $NO_X$ emissions is the residual handling operations releasing $8.9x10^{-}1$ metric tons of $NO_X$ (approximately 68 percent of the total emission) due to the large amount of hazardous waste materials that require proper disposal. The equipment use and miscellaneous sector has the second highest release of $NO_X$ emissions, $3.9x10^{-1}$ metric tons (approximately 30 percent of the total $NO_X$ emissions), where the use of the excavator (which is in operation for 320 hours) contributes with $1.9x10^{-1}$ metric tons of $NO_X$.

The total amount of $NO_X$ emissions resulting from Alternative 3b is 1.1 metric tons of $NO_X$. The category that contributes the most to the $NO_X$ emissions is the residual handling operation, where 6.7x10-1 metric tons of $NO_X$ are released (approximately 60 percent of the total $NO_X$ emission). The activity with the second highest NOX contribution is the equipment use and miscellaneous, releasing approximately 37 percent of the total $NO_X$ emissions ($4.1x10^{-1}$ metric tons of $NO_X$) where the use of the dozer (98 hours in operation) contributes with $6.5x10^{-2}$ metric tons of $NO_X$. The second highest category contributing to this environmental impact is the transportation of equipment and material contributing $1.4x10^{-2}$ metric tons of $NO_X$ (approximately 1.2 percent of the total $NO_X$ emissions).

The total $NO_X$ emissions resulting from Alternative 3c is $1.3x10^{-1}$ metric tons. The activity group with the highest contribution to $NO_X$ emissions is the equipment use, where $1.1x10^{-1}$ metric tons of $NO_X$ are released to the atmosphere, corresponding to 86 percent of the total $NO_X$ emissions; the use of the dozer, which is in operation for 128 hours, contributes $8.6x10^{-2}$ metric tons of $NO_X$. The second highest contributor to $NO_X$ emissions is the transportation of personnel, where $1.3x10^{-2}$ metric tons of $NO_X$ are emitted, corresponding to approximately 10 percent of the total $NO_X$ emissions. The third highest contributor to $NO_X$ emissions is the residual handling operations, where $5.9x10^{-3}$ metric tons of $NO_X$ are released, corresponding to 4 percent of the total $NO_X$ emissions.

The total amount of $NO_X$ emissions resulting from Alternative 4a is 4.6 metric tons of $NO_X$. The category that contributes the most to $NO_X$ emissions is the residual handling operations, releasing 3.1 metric tons of $NO_X$ (approximately 67 percent of the total $NO_X$ emissions) due to the large amount of contaminated soil disposed in a proper facility. The equipment use and miscellaneous sector has the second highest release of $NO_X$ emissions (1.5 metric tons of $NO_X$ approximately 31 percent of the total emissions) where the use of the excavator (which is in operation for 972 hours) contributes $5.9x10^{-2}$ metric tons of $NO_X$. The second highest category contributing to $NO_X$ emissions is the residual handling operation ($8.83x10^{-2}$ metric tons of $NO_X$).

The total amount of $NO_X$ emissions resulting from Alternative 4b is 5.22 metric tons of $NO_X$. The category that contributes the most to $NO_X$ emissions is the residual handling operations, where 2.4 metric tons of $NO_X$ are released to the atmosphere (approximately 45 percent of the total $NO_X$ emissions). The activity with the second highest contribution to $NO_X$ emissions is the equipment use and miscellaneous releasing 1.7 metric tons of $NO_X$ (approximately 33 percent of the total $NO_X$ emissions) where the use of the dozer (which is in operation for 35 hours) contributes $2.2x10^{-2}$ metric tons of $NO_X$. The third highest category contributing to this environmental impact is the transportation of equipment and materials (1.1 metric tons of $NO_X$ approximately 22 percent of the total $NO_X$ emissions).

The total $NO_X$ emissions resulting from Alternative 4c is $5.26x10^{-1}$ metric tons. The activity group with the highest contribution to $NO_X$ emissions is the equipment use, where $5.1x10^{-1}$ metric tons of $NO_X$ are released to the atmosphere, corresponding to 96 percent of the total $NO_X$ emissions; the use of the dozer, which is in operation for 256 hours, contributes $1.7x10^{-1}$ metric tons of $NO_X$. The second highest contributor to $NO_X$ emissions is the transportation of personnel, where $1.2x10^{-2}$ metric tons of $NO_X$ are emitted, corresponding to approximately 2 percent of the total $NO_X$ emissions. The third highest contributor to $NO_X$ emissions is the residual handling operations, where $5.6x10^{-3}$ metric tons of $NO_X$ are released, corresponding to approximately 1 percent of the total $NO_X$ emissions.

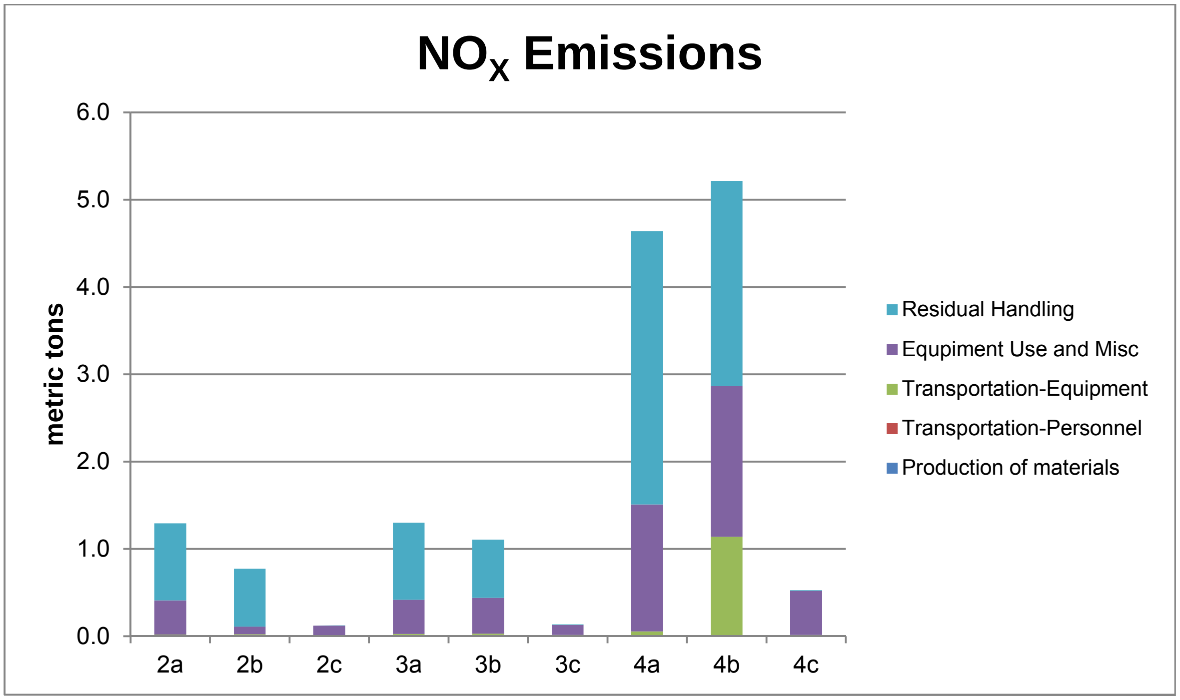



Figure B2: $NO_X$ Emissions For Proposed Alternatives At OU 5 Site 15, NAS Cecil Field

*$SO_X$*

Figure B3 shows a graphical representation of the breakdown of the $SO_X$ emissions resulting from the proposed alternatives. The x-axis represents the six proposed alternatives, and the y-axis represents the $SO_X$ emissions in metric tons.

The total amount of $SO_X$ emissions resulting from Alternative 2a is $5.1 \times 10^{-1}$ metric tons of $SO_X$. The category that contributes the most to SOX emissions is the residual handling operation, where $3.8 \times 10^{-1}$ metric tons of $SO_X$ are released to the atmosphere corresponding to 75 percent of the total $SO_X$ emissions. The equipment use and miscellaneous sector contributes 22 percent to the total $SO_X$ emissions ($1.10 \times 10^{-1}$ metric tons of $SO_X$); where the excavator, which is in operation for 320 hours, releases $5.75 \times 10^{-2}$ metric tons of $SO_X$.

The total amount of $SO_X$ emissions resulting from Alternative 2b is $4.83 \times 10^{-1}$ metric tons of $SO_X$. The category that contributes the most to the $SO_X$ emissions is the residual handling operations, where 3.4x10-1 metric tons of SOX are released to the atmosphere (approximately 71 percent of the total SOX emissions). The activity with the second highest contribution of these emissions is the production of materials ($1.2 \times 10^{-1}$ metric tons of $SO_X$, corresponding to 87 percent of the total emissions) where the production of the chemical that is used as the stabilization material for the on-site soil treatment, contributes $1x10^{-1}$ metric tons of $SO_X$. The third highest category contributing to this environmental impact is the equipment use and miscellaneous ($1.6x10^{-2}$ metric tons of $SO_X$) where the use of the dozer (which is in operation 98 hours) contributes $1.90x10^{-2}$ metric tons of $SO_X$.

The total amount of $SO_X$ emissions resulting from Alternative 2c is $4.8x10^{-2}$ metric tons. The equipment use and miscellaneous sector contributes with the most $SO_X$ emissions, $2.7x10^{-2}$ metric tons, corresponding to 57 percent of the total $SO_X$ emissions. The dozer which is in operation 128 hours, contributes $2.5x10^{-2}$ metric tons of $SO_X$. The production of materials for proposed Alternative 2c contributes $1.9x10^{-2}$ metric tons of $SO_X$ emissions, corresponding to 39 percent of the total emissions. The production of mulch, used for revegetation, contributes $1.7x10^{-2}$ metric tons of $SO_X$. Residual handling operations contribute $2x10^{-3}$ metric tons of $SO_X$, corresponding to 4 percent of the total $SO_X$ emissions.

The total amount of $SO_X$ emissions resulting from Alternative 3a is $5.1x10^{-1}$ metric tons of $SO_X$. Residual handling operations is the activity with the highest release of $SO_X$ emissions, $3.8x10^{-1}$ metric tons of $SO_X$ (approximately 75 percent of the total $SO_X$ emissions) due to the distance between the waste facility and the base, and also due to the large amount of soil that needs to be disposed of. The category that has the second highest contribution to $SO_X$ emissions is the equipment use and miscellaneous approximately 22 percent of the total $SO_X$ emissions ($1.1x10^{-1}$ metric tons of $SO_X$), where the excavator, which is in operation for 320 hours, contributes $5.7x10^{-2}$ metric tons of $SO_X$.

The total amount of $SO_X$ emissions resulting from Alternative 3b is $5.8x10^{-1}$ metric tons of $SO_X$. The category that contributes the most to the $SO_X$ emissions is the residual handling operation, where $3.4x10^{-1}$ metric tons of $SO_X$ are released, approximately 59 percent of the total $SO_X$ emissions. The activity with the second highest contribution to $SO_X$ emissions is the production of materials ($1.2x10^{-1}$ metric tons of $SO_X$, approximately 21 percent of the total $SO_X$ emissions) where the production of the chemical that is used as the stabilization material for the on-site soil treatment, contributes $1x10^{-1}$ metric tons of $SO_X$. The third highest category contributing to this environmental impact is the equipment use and miscellaneous releasing $1.1x10^{-1}$ metric tons of $SO_X$ (approximately 19 percent of the total $SO_X$ emissions) where the use of the dozer (which is in operation 98 hours) contributes $1.90x10^{-2}$ metric tons of $SO_X$.

The total amount of $SO_X$ emissions resulting from Alternative 3c is $4.9x10^{-2}$ metric tons. The equipment use and miscellaneous sector contributes with the most $SO_X$ emissions, $2.7x10^{-2}$ metric tons, corresponding to 55 percent of the total $SO_X$ emissions. The dozer which is in operation 128 hours, contributes $2.5x10^{-2}$ metric tons of $SO_X$. The production of materials for proposed Alternative 3c contributes $1.9x10^{-2}$ metric tons of $SO_X$ emissions, corresponding to 38 percent of the total emissions.

The production of mulch, used for revegetation, contributes $1.7x10^{-2}$ metric tons of $SO_X$. Residual handling operations contribute $3x10^{-3}$ metric tons of $SO_X$, corresponding to 6 percent of the total $SO_X$ emissions.

The total amount of $SO_X$ emissions resulting from Alternative 4a is 1.8 metric tons of $SO_X$. The category that contributes the most to $SO_X$ emissions is the residual handling operation, contributing with 1.3 metric tons of $SO_X$ (approximately 75 percent of the total $SO_X$ emissions) due to the amount of hazardous waste that require proper disposal. The equipment use and miscellaneous category is the activity with the second highest release of $SO_X$ emissions ($3.39x10^{-1}$ metric tons of $SO_X$ approximately 19 percent of the total emissions) where the use of the excavator (which is in operation for 972 hours) contributes $1.7x10^{-1}$ metric tons of $SO_X$, followed closely by the use of the dozer (793 hours) contributing $1.6x10^{-1}$ metric tons of $SO_X$.

The total amount of $SO_X$ emissions resulting from Alternative 4b is 2.1 metric tons of $SO_X$. The category that contributes the most to the $SO_X$ emissions is the residual handling operations, where 2.4 metric tons of $SO_X$ are released, approximately 58 percent of the total $SO_X$ emissions. The second highest contributor to these emissions is the production of materials releasing $4.7x10^{-1}$ metric tons of $SO_X$ (approximately 22 percent of the total $SO_X$ emissions) where the production of the chemical that is used as the stabilization material for the on-site soil treatment, contributes $3.71x10^{-1}$ metric tons of $SO_X$. The third highest category contributing to this environmental impact is the equipment use and miscellaneous sector, where $4x10^{-1}$ metric tons of $SO_X$ are released (corresponding to approximately 19 percent of the total $SO_X$ emissions) where the use of the dozer contributes $6.3x10^{-2}$ metric tons of $SO_X$ for its 35 hours of operation.

The total amount of $SO_X$ emissions resulting from Alternative 4c is $1.55x10^{-1}$ metric tons of $SO_X$. The category that contributes the most to the $SO_X$ emissions is the production of materials releasing $9.7x10^{-2}$ metric tons of $SO_X$ (approximately 63 percent of the total $SO_X$ emissions) where the production of mulch used for revegetation purposes, contributes $8.7x10^{-2}$ metric tons of $SO_X$. The second highest category contributing to this environmental impact is the equipment use and miscellaneous sector, where $5.5x10^{-2}$ metric tons of $SO_X$ are released (corresponding to approximately 35 percent of the total $SO_X$ emissions) where the use of the dozer contributes $5.1x10^{-2}$ metric tons of $SO_X$ for its 256 hours of operation. Residual handling operations contribute $2.9x10^{-3}$ metric tons of $SO_X$, corresponding to approximately 2 percent of the total $SO_X$ emissions.

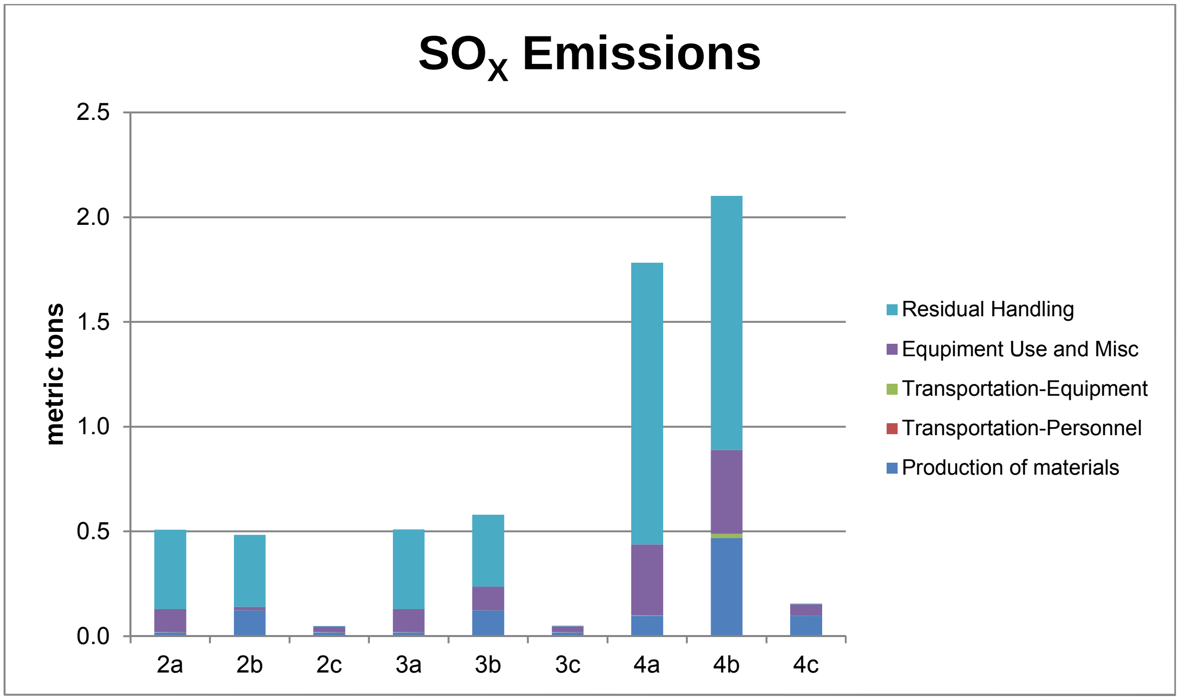



Figure B3: $SO_X$ Emissions For Proposed Alternatives At OU 5 Site 15, NAS Cecil Field

*$PM_{10}$*

Figure B4 shows a graphical representation of the breakdown of the $PM_{10}$ emissions resulting from the proposed alternatives. The x-axis represents the six proposed alternatives, and the y-axis represents the $PM_{10}$ emissions in metric tons.

The total amount of $PM_{10}$ emissions resulting from Alternative 2a is 2.1 metric tons. The category that contributes the most to $PM_{10}$ emissions is the residual handling operation responsible for 98 percent of the total $PM_{10}$ emissions (2 metric tons of $PM_{10}$). The equipment use and miscellaneous sector is the activity with the second highest contribution to $PM_{10}$ emissions (emissions from this category are $3.82 \times 10^{-2}$ metric tons of $PM_{10}$), where the use of the excavator contributes $1.85 \times 10^{-2}$ metric tons of $PM_{10}$.

The total amount of $PM_{10}$ emissions resulting from Alternative 2b is 1.91 metric tons. The category that contributes the most to the $PM_{10}$ emissions is the residual handling operations, where 1.8 metric tons of $PM_{10}$ are released to the atmosphere, approximately 96 percent of the total $PM_{10}$ emissions. The activity with the second highest contribution to these emissions is the production of materials ($7.3 \times 10^{-2}$ metric tons of $PM_{10}$ approximately 4 percent of the total emissions) where the production of the chemical that will be used as part of the stabilizing material for the on-site soil treatment, contributes $7.2 \times 10^{-2}$ metric tons of

$PM_{10}$. The second highest category contributing to this air pollutant is the residual handling operations releasing $1.2x10^{-2}$ metric tons of $PM_{10}$ (approximately 1 percent of the total emissions). The equipment use and miscellaneous sector is the third highest contributor to $PM_{10}$ emissions contributing approximately 1 percent of the total $PM_{10}$ emissions, $1.1x10^{-2}$ metric tons of $PM_{10}$ where the use of the dozer (in operation for 98 hours) contributes $6.42x10^{-3}$ metric tons of $PM_{10}$.

The total amount of $PM_{10}$ emissions resulting from Alternative 2c is $1.7x10^{-2}$ metric tons. The activity group with the highest contribution to $PM_{10}$ emissions is the equipment use and miscellaneous, releasing $1.2x10^{-2}$ metric tons of $PM_{10}$, corresponding to 73 percent of the total $PM_{10}$ emissions. The use of the dozer during the RAC stage, which is in operation for 128 hours, contributes with $8.55x10^{-3}$ metric tons of $PM_{10}$. Residual handling operations contribute $2.0x10^{-3}$ metric tons of $PM_{10}$ to the total, corresponding to 12 percent. The production of materials contributes with $1.3x10^{-3}$ metric tons of $PM_{10}$, corresponding to 8 percent of the total $PM_{10}$ emissions. The production of mulch, use for revegetation, contributes $1.3x10^{-3}$ metric tons of $PM_{10}$ to the total emissions.

The total amount of $PM_{10}$ emissions resulting from Alternative 3a is 2.1 metric tons. The category that contributes the most to $PM_{10}$ emissions is the residual handling operations, where the amount of $PM_{10}$ emissions released to the atmosphere is 2 metric tons (approximately 98 percent of the total emissions) due to the large amount of hazardous waste that needs proper disposal. The equipment use and miscellaneous sector is the activity with the second highest release of $PM_{10}$ emissions, approximately 2 percent of the total emissions (emissions from this category are $3.8x10^{-2}$ metric tons of $PM_{10}$), where the use of the excavator contributes $1.85x10^{-2}$ metric tons of $PM_{10}$.

The total amount of $PM_{10}$ emissions resulting from Alternative 3b is 1.95 metric tons. The category that contributes the most to the $PM_{10}$ emissions is the residual handling operations, releasing 1.8 metric tons of PM10, approximately 98 percent of the total PM10 emissions. The activity with the second highest contribution to PM10 emissions is the production of materials releases $7.3x10^{-2}$ metric tons of $PM_{10}$ (approximately 4 percent of the total $PM_{10}$ emissions), where the production of the chemical that will be used as part of the stabilizing material for the on-site soil treatment, contributes $7.2x10^{-2}$ metric tons of $PM_{10}$. The third highest category contributing to this environmental impact is the equipment use and miscellaneous sector ($4.2x10^{-2}$ metric tons of $PM_{10}$) where the use of the dozer (in operation for 98 hours) contributes $6.4x10^{-3}$ metric tons of $PM_{10}$.

The total amount of $PM_{10}$ emissions resulting from Alternative 3c is $3.2x10^{-2}$ metric tons. The activity group with the highest contribution to $PM_{10}$ emissions is the residual handling operations contributing $1.6x10^{-2}$ metric tons of $PM_{10}$ to the total, corresponding to 50 percent. The activity with the second highest $PM_{10}$ emissions is the equipment use and miscellaneous, releasing $1.2x10^{-2}$ metric tons of $PM_{10}$, corresponding to 38 percent of the total $PM_{10}$ emissions. The use of the dozer during the RAC stage, which is in operation for 128 hours, contributes with $8.55x10^{-3}$ metric tons of $PM_{10}$. Transportation of personnel is the activity with the third highest contribution of $PM_{10}$ emissions, releasing $2.6x10^{-3}$ metric tons, approximately 8 percent of the total $PM_{10}$ emissions.

The total amount of $PM_{10}$ emissions resulting from Alternative 4a is 7.3 metric tons. The category that contributes the most to $PM_{10}$ emissions is the residual handling operation, emitting 7.2 metric tons of $PM_{10}$ (corresponding to 98 percent of the total $PM_{10}$ emissions) due to the large amount of soil that need to be disposed in a hazardous waste facility. The equipment use and miscellaneous sector contributes $1.37x10^{-1}$ metric tons of $PM_{10}$, approximately 2 percent of the total $PM_{10}$ emissions, where the excavator contributes $5.64x10^{-2}$ metric tons of $PM_{10}$ due to its operation time (972 hours).

The total amount of $PM_{10}$ emissions resulting from Alternative 4b is 7.01 metric tons. The category that contributes the most to the $PM_{10}$ emissions is the residual handling operations, releasing 6.5 metric tons of $PM_{10}$, approximately 92 percent of the total $PM_{10}$ emissions. The second highest contributor to these emissions is the production of materials emitting $2.6x10^{-2}$ metric tons of $PM_{10}$ (approximately 4 percent of the total $PM_{10}$ emissions), where the production of the chemical that will be used as part of the stabilizing material for the on-site soil treatment, contributes $2.5x10^{-1}$ metric tons of $PM_{10}$. The third highest category contributing to this environmental impact is the equipment use and miscellaneous sector, where $4.0x10^{-1}$ metric tons of $PM_{10}$ are released due to the use of the dozer (in operation for 35 hours) contributes $2.14x10^{-2}$ metric tons of $PM_{10}$.

The total amount of $PM_{10}$ emissions resulting from Alternative 4c is $7.1x10^{-2}$ metric tons. The activity group with the highest contribution to $PM_{10}$ emissions is the equipment use and miscellaneous, releasing $4.7x10^{-2}$ metric tons of $PM_{10}$, corresponding to 66 percent of the total $PM_{10}$ emissions. The use of the dozer during the RAC stage, which is in operation for 256 hours, contributes with $1.7x10^{-2}$ metric tons of $PM_{10}$. Residual handling operations contribute $1.5x10^{-2}$ metric tons of $PM_{10}$ to the total, corresponding to 22 percent. The production of materials contributes with $6.6x10^{-3}$ metric tons of $PM_{10}$, corresponding to 9 percent of the total $PM_{10}$ emissions. The production of mulch, use for revegetation, contributes $6.6x10^{-3}$ metric tons of $PM_{10}$ to the total emissions.

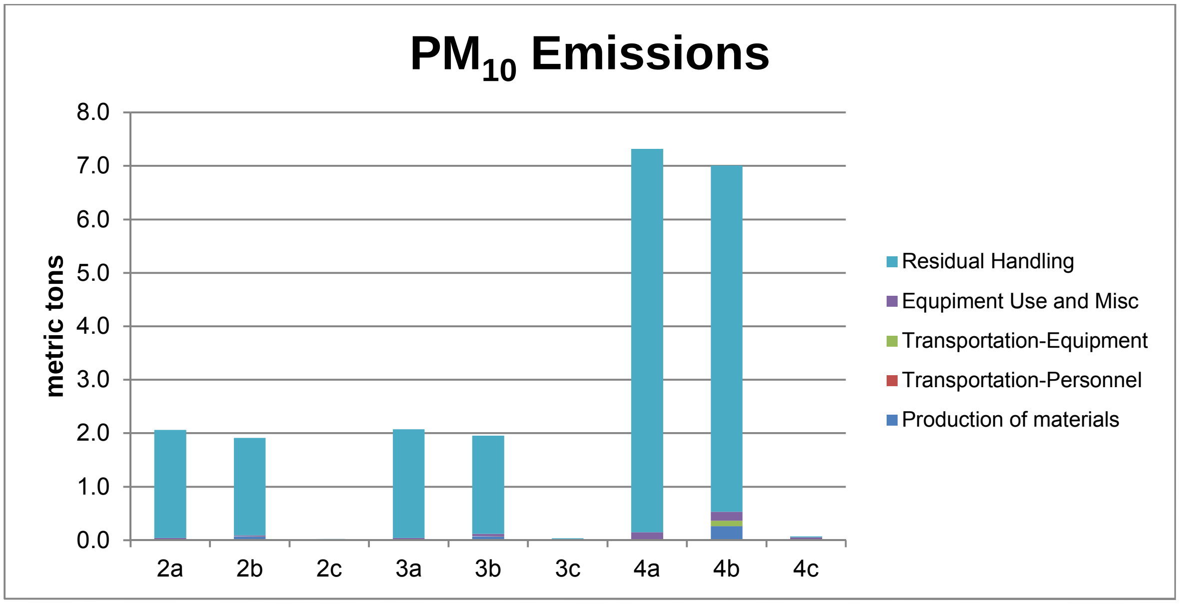



Figure B4: $PM_{10}$ Emissions For Proposed Alternatives At OU 5 Site 15, NAS Cecil Field

*Energy Consumption*

Figure B5 shows a graphical representation of the breakdown of the energy consumption resulting from the proposed alternatives. The x-axis represents the six proposed alternatives, and the y-axis represents the energy consumption in MMBTU.

The total amount of energy used for Alternative 2a is 31,443 MMBTU. The category with the highest consumption of energy is the production of materials (19,431 MMBTU corresponding to 62 percent of the total energy consumption), where the production of borrow soil contributes 18,811 MMBTU to the total amount of energy consumed. The category with the second highest consumption of energy is the residual handling operation, consuming 10,159.4 MMBTU through the operation (approximately 32 percent of the total energy use of the alternative) due to the distance between the site and the hazardous waste landfill facility.

The total amount of energy used for Alternative 2b is 33,036 MMBTU. The category with the highest consumption of energy is the production of materials (30,223 MMBTU corresponding to 91 percent of the total energy use) where the production of borrow soil contributes with 18,111 MMBTU and the chemical that is used as a component of the stabilizing material for the on-site soil treatment, consumes 6,409 MMBTU. The category with the second highest consumption of energy is the residual handling operations, where 1,876 MMBTU are consumed during this alternative. Transportation of equipment and materials is the activity group with the third highest energy consumption, with 571 MMBTU(approximately 2 percent of the total energy use).

The total amount of energy used for Alternative 2c is 1,190 MMBTU. The category with the highest consumption of energy is the production of materials (621 MMBTU corresponding to 52 percent of the total energy use) where the production of fertilizer, used for revegetation consumes 346 MMBTU. The category with the second highest consumption of energy is the equipment use and miscellaneous category (338 MMBTU which is approximately 28 percent of the total energy usage) where the dozer contributes 294 MMBTU during its operation (128 hours). Transportation of personnel utilizes 189 MMBTU, which corresponds to 16 percent of the total energy usage for the Alternative.

The total amount of energy used for Alternative 3a is 31,694 MMBTU. The category with the highest consumption of energy is the production of materials (19,432 MMBTU corresponding to approximately 62 percent of the total energy usage), where the production of borrow soil contributes 18,811 MMBTU to the total amount of energy consumed. The category with the second highest consumption of energy is the residual handling operations (10,163 MMBTU, approximately 32 percent of the total energy consumption), followed closely by the residual handling operations (1,041 MMBTU).

The total amount of energy used for Alternative 3b is 34,241 MMBTU. The category with the highest consumption of energy is the production of materials (30,223 MMBTU approximately 88 percent of the total energy consumed) where the production of borrow soil contributes with 18,111 MMBTU and of the chemical that is used as a component of the stabilizing material for the on-site soil treatment, consumes 6,409 MMBTU. The category with the second highest consumption of energy is the residual handling operation, where 1,860 MMBTU are consumed (approximately 5 percent of the total energy used. The sector with the third highest energy consumption is the equipment use, where 1,138 MMBTU are utilized, approximately 3 percent of the total energy consumption.

The total amount of energy used for Alternative 3c is 1,450 MMBTU. The category with the highest consumption of energy is the production of materials (621 MMBTU corresponding to 43 percent of the total energy use) where the production of fertilizer, used for revegetation consumes 346 MMBTU. The category with the second highest consumption of energy is the transportation of personnel utilizes 438 MMBTU, which corresponds to 30 percent of the total energy usage for the Alternative. The equipment use and miscellaneous category uses 338 MMBTU, which is approximately 23 percent of the total energy usage; where the dozer contributes 294 MMBTU during its operation (128 hours). .

The total amount of energy used for Alternative 4a is 113,017 MMBTU. The category with the highest consumption of energy is the production of materials (70,880 MMBTU) where the production of borrow soil contributes to the energy consumption with 66,882 MMBTU. The category with the second highest consumption of energy is the residual handling operation, where the energy consumption is 36,086

MMBTU (corresponding to 32 percent of the total energy usage) due to the large volume of contaminated soil requiring proper hazardous waste disposal.

The total amount of energy used for Alternative 4b is 167,613 MMBTU. The category with the highest consumption of energy is the production of materials, utilizing 109,297 MMBTU (approximately 65 percent of the total energy used by the alternative), where the production of borrow soil consumes 68,010 MMBTU and the chemical that is used as a component of the stabilizing material for the on-site soil treatment, consumes 22,817 MMBTU. The category with the second highest consumption of energy is the transportation of equipment and material, where 46,900 MMBTU are consumed, approximately 28 percent of the total energy utilized by this Alternative.  The activity with the third highest energy consumption is the residual handling operations, where 6,522 MMBTU are used, approximately 4 percent of the total energy used.

The total amount of energy used for Alternative 4c is 5,621 MMBTU.  The category with the highest consumption of energy is the production of materials (3,999 MMBTU corresponding to 71 percent of the total energy use) where the production of fertilizer, used for revegetation consumes 1,801 MMBTU.  The category with the second highest consumption of energy is the equipment use and miscellaneous category (1,128 MMBTU which is approximately 20 percent of the total energy usage) where the dozer contributes 587 MMBTU during its operation (256 hours).  Transportation of personnel utilizes 266 MMBTU, which corresponds to 5 percent of the total energy usage for the Alternative.  The activity with the third highest energy consumption is the transportation of personnel, with 410 MMBTU, approximately 7 percent of the total energy consumption by this Alternative.

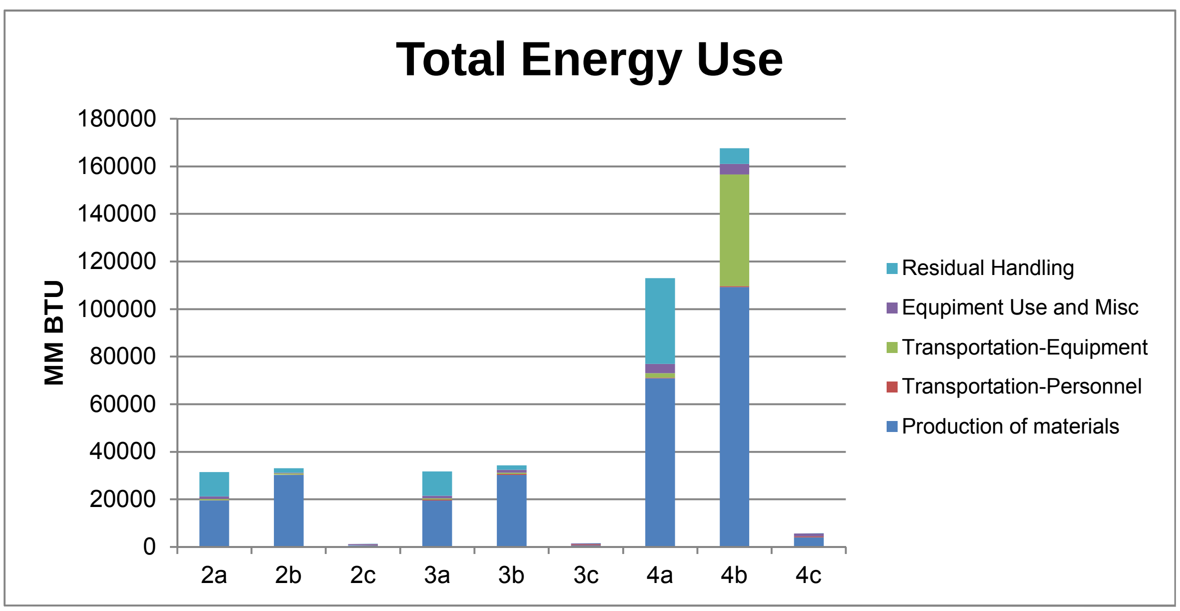



Figure B5: Energy Consumption For Proposed Alternatives At OU 5 Site 15, NAS Cecil Field

*Water Usage*

Figure B6 shows a graphical representation of the breakdown of the water consumption resulting from the proposed alternatives. The x-axis represents the six proposed alternatives, and the y-axis represents the energy consumption in thousands of gallons of water.

The total amount of water used during Alternative 2a is 3.02 thousand gallons of water. The category that consumes the most water is the production of materials, totaling 2.02 thousand gallons of water, and that amount of water can be attributed to the production of fertilizer. The use of decontamination water is the activity with the second highest water requirements, which consumes 1 thousand gallons.

The total amount of water used during Alternative 2b is 4.02 thousand gallons of water. The category that consumes the most water is the production of materials 2.02 thousand gallons of water, which can be attributed to the consumption of water to produce fertilizer for the revegetation activities. The use of decontamination water is the activity with the second highest water requirements, consuming 2 thousand gallons of water.

The total amount of water used during Alternative 2c is 3.02 thousand gallons of water. The category that consumes the most water is the production of materials, totaling 2.02 thousand gallons of water, and that amount of water can be attributed to the production of fertilizer used for revegetation purposes. The use of decontamination water is the activity with the second highest water requirements, which consumes 1 thousand gallons.

The total amount of water used during Alternative 3a is 3.02 thousand gallons of water. The category that consumes the most water is the production of materials, totaling 2.02 thousand gallons of water, and that amount of water can be attributed to the production of fertilizer. The use of decontamination water is the activity with the second highest water requirements, which consumes 1 thousand gallons.

The total amount of water used during Alternative 3b is 4.02 thousand gallons of water. The category that consumes the most water is the production of materials 2.02 thousand gallons of water, which can be attributed to the consumption of water to produce fertilizer for the revegetation activities. The use of decontamination water is the activity with the second highest water requirements, consuming 2 thousand gallons of water.

The total amount of water used during Alternative 3c is 3.02 thousand gallons of water. The category that consumes the most water is the production of materials, totaling 2.02 thousand gallons of water, and that amount of water can be attributed to the production of fertilizer used for revegetation purposes. The use of decontamination water is the activity with the second highest water requirements, which consumes 1 thousand gallons.

The total amount of water used during Alternative 4a is 14.554 thousand gallons of water. The category that consumes the most water is the production of materials 10.554 thousand gallons of water, which can be attributed to the consumption of water to produce fertilizer for the revegetation activities. The use of decontamination water is the activity with the second highest water requirements, consuming 4 thousand gallons of water.

The total amount of water used during Alternative 4b is 14.554 thousand gallons of water. The category that consumes the most water is the production of materials 10.554 thousand gallons of water, which can be attributed to the consumption of water to produce fertilizer for the revegetation activities. The use of decontamination water is the activity with the second highest water requirements, consuming 4 thousand gallons of water.

The total amount of water used during Alternative 4c is 13.554 thousand gallons of water. The category that consumes the most water is the production of materials 10.554 thousand gallons of water, which can be attributed to the consumption of water to produce fertilizer for the revegetation activities. The use of decontamination water is the activity with the second highest water requirements, consuming 3 thousand gallons of water.

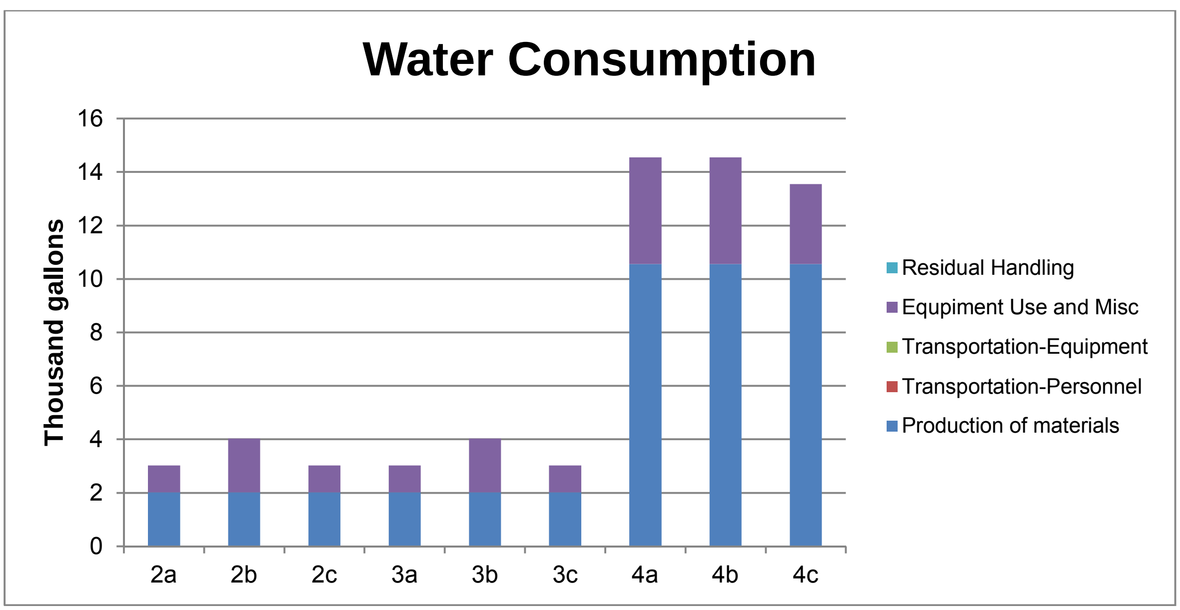


Figure B6: Water Consumption For Proposed Alternatives At OU 5 Site 15, NAS Cecil Field

*Accident Risk*

Personnel transport to and from the site contributes to the majority of worker risk. Figure B7 shows the risk of fatality among the three alternatives and Figure B8 shows the risk of injury.

For Alternatives 2a, 3a and 4a, the activity with the highest risk of fatality is the residual handling operations; the activity with the second highest risk of fatality is the transportation of personnel. For Alternatives 2b, 2c, 3b, 3c, 4b and 4c, the activity with the highest risk of resulting in a fatality is the transportation personnel. For Alternatives 2b, 3b and 4b the activity with the second highest risk of fatality is the residual handling operations. For Alternatives 2c, 3c, and 4c the activity with the second highest risk of fatality is the equipment use.

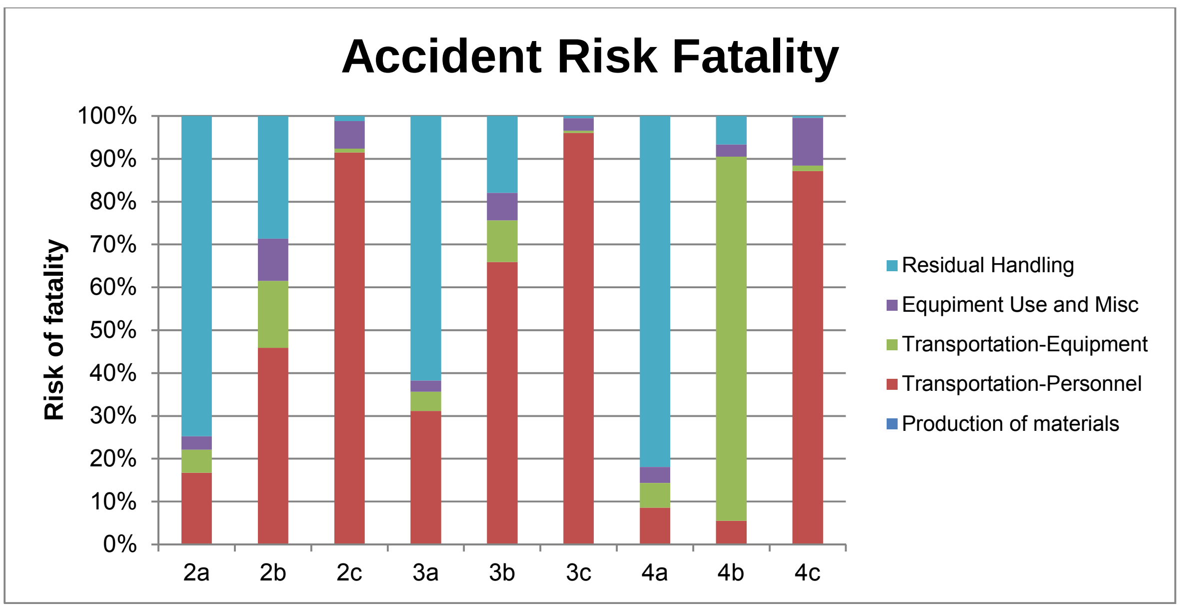



Figure B7 Risk Of Fatality For Proposed Alternatives at OU5 Site 15, NAS Cecil Field

For Alternatives 2a and 3a, the activity with the highest risk of injury is the residual handling operation, followed by the transportation of personnel. For Alternatives 2b, 2c, 3b and 3c, the transportation of personnel is that activity that poses the highest risk of injury, followed by the equipment use and miscellaneous activities. For Alternative 4a, the activity with the highest risk of injury is the residual handling operations, followed by the equipment use and miscellaneous sector. Transportation of personnel during Alternatives 4b and 4c is the activity with the highest risk of injury, followed by the equipment use and miscellaneous sector.

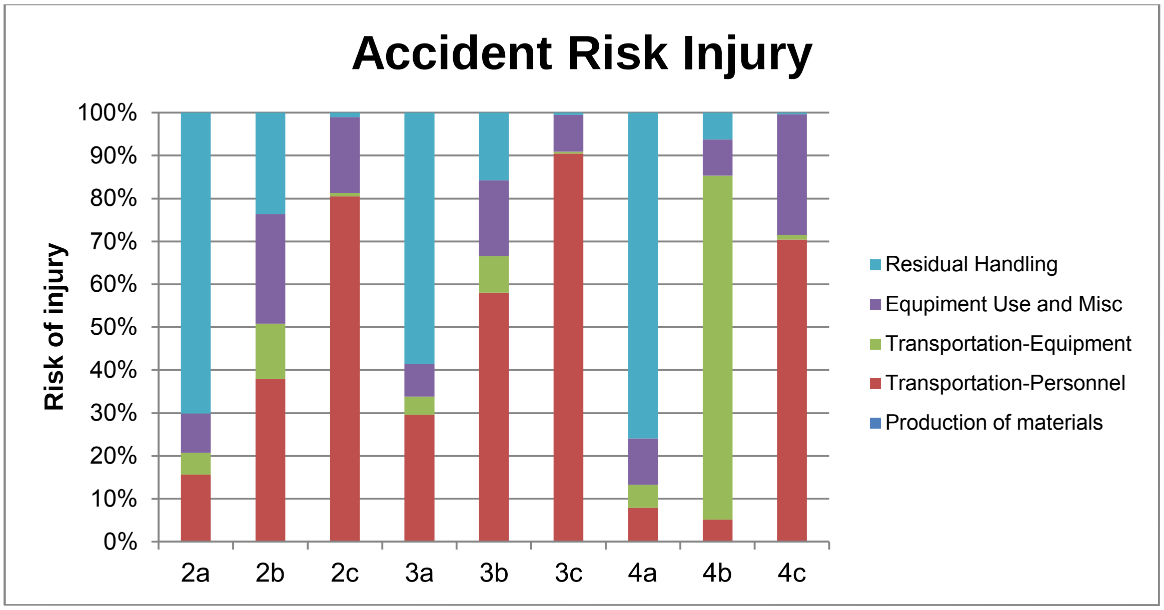



Figure B8 Risk Of Injury For Proposed Alternatives At OU5 Site 15, NAS Cecil Field

Conclusions and recommendations

During selection and design of the alternative, a sensitivity analysis considering elements of the alternative that have the greatest impact on the effectiveness, life-cycle cost, and sustainability metrics may provide additional insight into appropriate optimization. To aid in the sensitivity analysis, a summary was created to identify the primary drivers of emissions, energy consumption, water use and risk for each of the proposed alternatives.

Table B2 shows the relative impact of each of the metrics evaluated compared to each of the alternatives proposed. In order to evaluate the relative impact among the alternatives, a normalization process approach was performed. The five levels of relative impact used for this analysis are low, low to moderate, moderate to high, and high. A multi-criteria decision analysis is suggested in order to determine the alternative with the lowest overall impact among all the metrics evaluated.

Following are some recommendations resulting from the environmental evaluation of the proposed alternatives:

- All Alternatives: Consider ways to reduce vehicle mileage to reduce worker risk as well as energy use and emissions. Encourage site workers to carpool daily to the site to reduce total vehicle mileage.
- All Alternatives: Some reduction of the environmental footprint, particularly GHG emissions, could be realized for all alternatives through the possible use of emission control measures such as alternate fuel sources (e.g. biodiesel), equipment exhaust controls (e.g. diesel), and equipment idle reduction.
- Alternatives 2a, 3a and 4a: Revise the amount of soil that needs to be excavated, hauled off-site and the amount of soil that needs to be used for backfill. The amount of energy consumed and GHG emissions from the activity of producing borrow soil could be lowered once the amount of soil needed to backfill has been finalized.
- Alternatives 2b, 3b, and 3c: Revise the amount of soil that needs to be brought to the site to backfill the excavated area.
- All Alternatives: Appropriate scheduling and staffing could reduce the amount of equipment needed to be transported to site and reduce the amount of idling equipment.
- All Alternatives: Consider the optimization of transportation of personnel to reduce extra trips and reduce the risk of accidents and other environmental impacts.
- All Alternatives: Appropriate testing and characterization of excavated soils during the remedial investigation may reduce the amount of hazardous waste soils requiring transport to a hazardous waste facility.
- All Alternatives: If warranted by the amount of soils and/or transportation distance, transporting soils classified as hazardous waste via rail may significantly reduce emissions and energy usage.

The assumption for the composition of the stabilizing material used for the on-site soil treatment was a chemical with a high content of phosphorous. The results in this evaluation for the production of such materials provide an estimate of the possible environmental impacts from other materials used for the stabilizing chemical.

The risks of injury and fatality in this analysis are underestimated because the calculations performed did not incorporate the activities cleaning the explosives manually. Efforts will be made to incorporate such risk, given that the activity of clearing the explosives is extensive and requires a large number of personnel.

However, before selecting and implementing a particular transportation option, further analysis should be performed with regards to the cost and feasibility of implementing different types of transportation vehicles and fuel sources. One factor to consider for alternative vehicle transportation is the cost of technology. Typically, technology that has been in place for a number of years tends to be cheaper (i.e. light trucks that use diesel) while emerging technologies (i.e. hybrid trucks that use gasoline or even electric trucks) tend to be more expensive and face more challenges as new technology and techniques are being established.

Continual optimization of the selected remedy and any related monitoring plan throughout the project life-cycle in accordance with NAVY policy and guidance will continually reduce the life-cycle environmental footprint, as well as costs, of the project.

REFERENCES


(a) NAVFAC, DON Guidance for Optimizing Remedy Evaluation, Selection, and Design, March 2010
(b) NAVFAC, DON Policy on SiteWise Optimization/GSR Tool Usage, email received from Brian Harrison/NAVFAC HQ dated 10 AUG 2010

Table B1 Summary of Environmental Impacts For Proposed Alternatives
OU5 Site 15, NAS Cecil Field
Jacksonville, FL


| Alternative | Activities | GHG Emissions | Total Energy Used | Water Impacts | NOx Emissions | SOx Emissions | PM10 Emissions | Accident Risk Fatality | Accident Risk Injury |
|---|---|---|---|---|---|---|---|---|---|
| | | metric ton | MMBTU | gallons | metric ton | metric ton | metric ton | | |
| 2a | Materials Production | 221.66 | 19,431.59 | 2,023.92 | 2.91E-06 | 1.87E-02 | 1.27E-03 | NA | NA |
| | Transportation-Personnel | 15.59 | 196.06 | NA | 5.77E-03 | 2.03E-04 | 1.17E-03 | 3.19E-04 | 2.57E-02 |
| | Transportation-Equipment | 41.74 | 544.78 | NA | 1.31E-02 | 2.32E-04 | 1.17E-03 | 1.03E-04 | 8.32E-03 |
| | Equipment Use and Misc | 62.31 | 1,111.21 | 1,000.00 | 3.89E-01 | 1.10E-01 | 3.82E-02 | 0.00E+00 | 0.00E+00 |
| | Residual Handling | 701.27 | 10,159.39 | NA | 8.83E-01 | 3.80E-01 | 2.02E+00 | 1.15E-01 | 1.15E-01 |
| | Total | 1,042.57 | 31,443.04 | 3,023.92 | 1.29E+00 | 5.09E-01 | 2.07E+00 | 1.15E-01 | 1.49E-01 |
| 2b | Materials Production | 618.37 | 30,223.04 | 2,023.92 | 1.51E-05 | 1.23E-01 | 7.29E-02 | NA | NA |
| | Transportation-Personnel | 15.59 | 196.06 | NA | 5.77E-03 | 2.03E-04 | 1.17E-03 | 2.57E-02 | 2.57E-02 |
| | Transportation-Equipment | 43.79 | 571.53 | NA | 1.38E-02 | 2.43E-04 | 1.22E-03 | 8.73E-03 | 8.73E-03 |
| | Equipment Use and Misc | 60.87 | 169.74 | 2,000.00 | 8.87E-02 | 1.65E-02 | 1.06E-02 | 1.72E-02 | 1.72E-02 |
| | Residual Handling | 191.85 | 1,876.05 | NA | 6.64E-01 | 3.43E-01 | 1.83E+00 | 1.60E-02 | 1.60E-02 |
| | Total | 930.46 | 33,036.42 | 4,023.92 | 7.73E-01 | 4.83E-01 | 1.91E+00 | 6.76E-02 | 6.76E-02 |
| 2c | Materials Production | 13.04 | 620.49 | 2,023.92 | 2.91E-06 | 1.87E-02 | 1.27E-03 | NA | NA |
| | Transportation-Personnel | 15.07 | 189.59 | NA | 5.58E-03 | 1.96E-04 | 1.13E-03 | 3.08E-04 | 2.48E-02 |
| | Transportation-Equipment | 1.27 | 16.55 | NA | 3.99E-04 | 7.05E-06 | 3.54E-05 | 3.22E-06 | 2.59E-04 |
| | Equipment Use and Misc | 17.44 | 337.81 | 1,000.00 | 1.15E-01 | 2.73E-02 | 1.22E-02 | 2.17E-05 | 5.45E-03 |
| | Residual Handling | 1.57 | 25.89 | NA | 4.00E-03 | 1.99E-03 | 1.99E-03 | 3.90E-06 | 3.14E-04 |
| | Total | 48.39 | 1,190.33 | 3,023.92 | 1.25E-01 | 4.82E-02 | 1.66E-02 | 3.37E-04 | 3.09E-02 |
| 3a | Materials Production | 221.66 | 19,431.59 | 2,023.92 | 2.91E-06 | 1.87E-02 | 1.27E-03 | NA | NA |
| | Transportation-Personnel | 35.22 | 443.03 | NA | 1.30E-02 | 4.59E-04 | 2.64E-03 | 7.21E-04 | 5.80E-02 |
| | Transportation-Equipment | 41.74 | 544.78 | NA | 1.31E-02 | 2.32E-04 | 1.17E-03 | 1.03E-04 | 8.32E-03 |
| | Equipment Use and Misc | 62.31 | 1,111.21 | 1,000.00 | 3.89E-01 | 1.10E-01 | 3.82E-02 | 5.97E-05 | 1.50E-02 |
| | Residual Handling | 701.73 | 10,163.49 | NA | 8.85E-01 | 3.80E-01 | 2.03E+00 | 1.43E-03 | 1.15E-01 |
| | Total | 1,062.66 | 31,694.10 | 3,023.92 | 1.30E+00 | 5.10E-01 | 2.07E+00 | 2.31E-03 | 1.96E-01 |
| 3b | Materials Production | 618.37 | 30,223.04 | 2,023.92 | 1.51E-05 | 1.23E-01 | 7.29E-02 | NA | NA |
| | Transportation-Personnel | 35.80 | 450.36 | NA | 1.32E-02 | 4.67E-04 | 2.69E-03 | 7.33E-04 | 5.90E-02 |
| | Transportation-Equipment | 43.62 | 569.27 | NA | 1.37E-02 | 2.42E-04 | 1.22E-03 | 1.08E-04 | 8.69E-03 |
| | Equipment Use and Misc | 64.38 | 1,138.10 | 2,000.00 | 4.13E-01 | 1.12E-01 | 4.19E-02 | 7.15E-05 | 1.80E-02 |
| | Residual Handling | 194.28 | 1,860.37 | NA | 6.66E-01 | 3.44E-01 | 1.83E+00 | 1.99E-04 | 1.60E-02 |
| | Total | 956.45 | 34,241.14 | 4,023.92 | 1.11E+00 | 5.80E-01 | 1.95E+00 | 1.11E-03 | 1.02E-01 |
| 3c | Materials Production | 9.86 | 620.49 | 2,023.92 | 2.91E-06 | 1.87E-02 | 1.27E-03 | NA | NA |
| | Transportation-Personnel | 34.87 | 438.62 | 0.00 | 1.29E-02 | 4.54E-04 | 2.62E-03 | 7.14E-04 | 5.74E-02 |
| | Transportation-Equipment | 1.44 | 18.81 | 0.00 | 4.53E-04 | 8.01E-06 | 4.03E-05 | 3.65E-06 | 2.93E-04 |
| | Equipment Use and Misc | 20.61 | 337.81 | 1,000.00 | 1.15E-01 | 2.73E-02 | 1.22E-02 | 2.17E-05 | 5.45E-03 |
| | Residual Handling | 2.05 | 34.77 | 0.00 | 5.88E-03 | 2.97E-03 | 1.59E-02 | 3.90E-06 | 3.14E-04 |
| | Total | 68.84 | 1,450.50 | 3,023.92 | 1.34E-01 | 4.95E-02 | 3.20E-02 | 7.43E-04 | 6.35E-02 |
| 4a | Materials Production | 811.40 | 70,880.28 | 10,554.51 | 1.51E-05 | 9.74E-02 | 6.59E-03 | NA | NA |
| | Transportation-Personnel | 25.86 | 325.25 | NA | 9.57E-03 | 3.37E-04 | 1.94E-03 | 5.29E-04 | 4.26E-02 |
| | Transportation-Equipment | 144.60 | 1,887.22 | NA | 4.54E-02 | 8.04E-04 | 4.04E-03 | 3.58E-04 | 2.88E-02 |
| | Equipment Use and Misc | 223.08 | 3,837.99 | 4,000.00 | 1.45 | 3.39E-01 | 1.37E-01 | 2.30E-04 | 5.77E-02 |
| | Residual Handling | 2,489.98 | 36,086.04 | NA | 3.13E+00 | 1.35E+00 | 7.17E+00 | 5.07E-03 | 4.08E-01 |
| | Total | 3,694.91 | 113,016.77 | 14,554.51 | 4.64 | 1.78E+00 | 7.32E+00 | 6.18E-03 | 5.37E-01 |
| 4b | Materials Production | 2,223.67 | 109,297.87 | 10,554.51 | 5.85E-05 | 4.68E-01 | 2.62E-01 | NA | NA |
| | Transportation-Personnel | 28.14 | 354.01 | NA | 1.04E-02 | 3.67E-04 | 2.11E-03 | 5.76E-04 | 4.64E-02 |
| | Transportation-Equipment | 3,593.40 | 46,900.02 | NA | 1.13E+00 | 2.00E-02 | 1.00E-01 | 8.90E-03 | 7.16E-01 |
| | Equipment Use and Misc | 259.96 | 4,539.42 | 4,000.00 | 1.72E+00 | 3.99E-01 | 1.69E-01 | 3.00E-04 | 7.54E-02 |
| | Residual Handling | 685.32 | 6,522.17 | NA | 2.35E+00 | 1.21E+00 | 6.48E+00 | 6.97E-04 | 5.61E-02 |
| | Total | 6,790.49 | 167,613.49 | 14,554.51 | 5.22E+00 | 2.10E+00 | 7.01E+00 | 1.05E-02 | 8.94E-01 |
| 4c | Materials Production | 69.65 | 3,998.90 | 10,554.51 | 1.51E-05 | 9.74E-02 | 6.59E-03 | NA | NA |
| | Transportation-Personnel | 32.60 | 410.10 | NA | 1.21E-02 | 4.25E-04 | 2.45E-03 | 6.67E-04 | 5.37E-02 |
| | Transportation-Equipment | 3.97 | 51.81 | NA | 1.25E-03 | 2.21E-05 | 1.11E-04 | 9.83E-06 | 7.91E-04 |
| | Equipment Use and Misc | 68.97 | 1,128.04 | 3,000.00 | 5.07E-01 | 5.46E-02 | 4.66E-02 | 8.56E-05 | 2.15E-02 |
| | Residual Handling | 1.89 | 32.31 | NA | 5.63E-03 | 2.86E-03 | 1.53E-02 | 3.12E-06 | 2.51E-04 |
| | Total | 177.07 | 5,621.16 | 13,554.51 | 5.26E-01 | 1.55E-01 | 7.10E-02 | 7.66E-04 | 7.63E-02 |

Table B2 Environmental Impact Drivers For Proposed Alternatives
OU5 Site 15, NAS Cecil Field
Jacksonville, FL


| Remedial Alternatives | GHG Emissions | Total energy Used | Water Consumption | NOx emissions | SOx Emissions | PM10 Emissions | Accident Risk Fatality | Accident Risk Injury |
|---|---|---|---|---|---|---|---|---|
| Alternative 2a | Low | Low | Low to Moderate | Low to Moderate | Low to Moderate | Low to Moderate | Low | Low |
| | Residual Handling operations | Production of Borrow Soil | Production of fertilizer for revegetation and hydroseeding activities | Use of Exacator (320 hours in operation) | Use of Exacator (320 hours in operation) | Use of Exacator (320 hours in operation) | Transportation of personnel | Transportation of personnel |
| Alternative 2b | Low | Low | Low to Moderate | Low | Low to Moderate | Low to Moderate | Low | Low |
| | Production of chemical to be used as the stabilizing material | Production of cement to be used as the stabilizing chemical | Production of fertilizer for revegetation and hydroseeding activities | Residual handling operations | Production of chemical to be used as the stabilizing material | Production of chemical to be used as the stabilizing material | Transportation of personnel | Transportation of personnel |
| Alternative 2c | Low | Low | Low to Moderate | Low | Low | Low | Low | Low |
| | Use of Dozer (128 hours in operation) | Production of fertilizer used in revegetation | Production of fertilizer used in revegetation | Use of Dozer (128 hours in operation) | Use of Dozer (128 hours in operation) | Use of Dozer (128 hours in operation) | Transportation of personnel | Transportation of personnel |
| Alternative 3a | Low | Low | Low to Moderate | Low to Moderate | Low to Moderate | Low to Moderate | Low to Moderate | Low to Moderate |
| | Residual Handling operations | Production of Borrow Soil | Production of fertilizer for revegetation and hydroseeding activities | Use of Exacator (320 hours in operation) | Use of Exacator (320 hours in operation) | Use of Exacator (320 hours in operation) | Transportation of personnel | Transportation of personnel |
| Alternative 3b | Low | Low | Low to Moderate | Low to Moderate | Low to Moderate | Low to Moderate | Low | Low |
| | Production of chemicals to be used as the stabilizing material | Production of cement to be used as the stabilizing chemical | Production of fertilizer for revegetation and hydroseeding activities | Use of Dozer (98 hours in operation) | Production of chemical to be used as the stabilizing material | Production of chemical to be used as the stabilizing material | Transportation of personnel | Transportation of personnel |
| Alternative 3c | Low | Low | Low to Moderate | Low | Low | Low | Low | Low |
| | Transportation of personnel | Production of fertilizer used in revegetation | Production of fertilizer used in revegetation | Use of Dozer (128 hours in operation) | Use of Dozer (128 hours in operation) | Residual Handling Operations | Transportation of personnel | Transportation of personnel |
| Alternative 4a | Moderate | Moderate to high | High | High | High | High | Moderate | Moderate |
| | Residual Handling operations | Production of Borrow Soil | Production of fertilizer for revegetation and hydroseeding activities | Use of Exavator (972 hours in operation) | Use of Exavator (3972 hours in operation) | Use of Exavator (972 hours in operation) | Residual handling operations | Residual handling operations |
| Alternative 4b | High | High | High | High | High | High | High | High |
| | Transportation of equipment and materials | Production of cement to be used as the stabilizing chemical | Production of fertilizer for revegetation and hydroseeding activities | Use of Dozer (35 hours in operation) | Production of chemical to be used as the stabilizing material | Production of chemical to be used as the stabilizing material | Transportation of personnel | Transportation of personnel |
| Alternative 4c | Low | Low | High | Low | Low | Low | Low | Low |
| | Production of fertilizer used in revegetation | Production of fertilizer used in revegetation | Production of fertilizer used in revegetation | Use of Dozer (256 hours in operation) | Production of mulch used in revegetation | Use of Dozer (256 hours in operation) | Transportation of personnel | Transportation of personnel |

# APPENDIX B2: INPUT INVENTORIES

## Alternative 2a: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal (off-site disposal)

### RAC

#### Materials

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Pad | 43,500.00 | lb | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 |
| Decon Water | 1,000.00 | gallons | |
| Clean backfill | 20,001,000.00 | lb | Assume Soil, 6667 cy, 1.5 ton/cy, 2000 lb/ton |
| Revegetation, soil nutrients | 772.50 | lb | Assume fertilizer, 309 msf (thousand square feet), 3 lb of sed per 1.2 msf |
| Revegetation, hydroseed | 3,090.00 | lb | Assume fertilizer, 309 msf (thousand square feet), 10 lb of sed per 1 msf |
| Revegetation, hydroseed | 15,450.00 | lb | Assume wood mulch, 309 msf (thousand square feet), 50 lb of mulch per 1 msf |
| Revegetation, hydroseed | 618.00 | lb | Assume fertilizer, 309 msf (thousand square feet), 2 lb per 1 msf |

#### Transportation-Personnel

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Transportation UXO technician (site preparation) | 250.00 | miles | 5 days, 2 trips per day, 25 miles per trip, 1 person |
| Site Labor (excavation, transportation and disposal) | 3,000.00 | miles | 20 days, 2 trips per day, 25 miles per trip, 3 people |
| Site labor (cover and restoration) | 1,500.00 | miles | 10 days, 2 trips per day, 25 miles per trip, 3 people |
| Site Set up: establish grids | 500.00 | miles | 5 days, 2 trips per day, 25 miles per trip, 2 people |
| Site Set up: establish transects on access ways | 100.00 | miles | 1 day, 2 trips per day, 25 miles per trip, 2 people |
| Site set up: brush cutting | 2,100.00 | miles | 7 days, 2 trips per day, 25 miles per day, 6 people |
| Site set up brus cutting | 300.00 | miles | 1 day, 2 trips per day, 25 miles per trip, 6 people |
| visual & detector surveyers | 3,150.00 | miles | 7 days, 2 trips per day, 25 miles per day, 9 people |
| visual & detector surveyers | 900.00 | miles | 2 days, 2 trips per day, 25 miles per day, 9 people |
| Manual Remove & Treat surf | 4,050.00 | miles | 9 days, 2 trips per day, 25 miles per day, 9 people |
| intrusive investigation | 1,800.00 | miles | 4 days, 2 trips per day, 25 miles per trip, 9 people |
| remove and treat subsurface | 1,800.00 | miles | 4 days, 2 trips per day, 25 miles per trip, 9 people |
| mechanical excavation | 1,200.00 | miles | 8 days, 2 trips per day, 25 miles per trip, 3 people |
| remove and treat excavation | 1,350.00 | miles | 9 days, 2 trips per day, 25 miles per day, 3 people |
| backfill after sifting | 600.00 | miles | 4 days, 2 trips per day, 25 miles per trip, 3 people |
| step out brush cutting | 600.00 | miles | 2 days, 2 trips per day, 25 miles per day, 6 people |
| step out: visual and detectur surveyes | 900.00 | miles | 2 days, 2 trips per day, 25 miles per day, 9 people |
| step out: manual remove and treat surf | 1,350.00 | miles | 3 days, 2 trips per day, 25 miles per day, 9 people |
| step out: intrusive investigation | 900.00 | miles | 2 days, 2 trips per day, 25 miles per trip, 9 people |
| step out: remove and treat subsurface | 450.00 | miles | 1 day, 2 trips per day, 25 miles per trip, 9 people |
| MEC/MDEH Treatment | 2,700.00 | miles | 6 days, 2 trips per day, 25 miles per trip, 9 people |
| MDASCertification | 900.00 | miles | 6 days, 2 trips per day, 25 miles per trip, 3 people |

#### Transportation-equipment

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Trailers | 110.00 | ton | 11 trailers, 10 ton per trailers, 100 miles round trip |
| Decon Water Storage Tank | 0.90 | ton | 6000 gallons capacity, HPDE, 100 miles round trip, 150 ln per 500 gal capacity tank |
| Clean Water Storage Tank | 0.60 | ton | 4000 gallons capacity HPDE, 100 miles round trip |
| Brush mowing | 7.75 | ton | 1 tractor, 250 hp, 7.75 tons per tractor |
| Chipping tree | 2.85 | ton | 1 wood chipper, 2.85 tons per woodchipper, 100 miles round trip |
| Chipping tree | 0.01 | ton | 2 chain saws, gasoline, 18" 10 lb each |
| Dozer, 200 hp | 22.00 | ton | 1 dozer, 22 ton per excavator, 100 miles round trip |
| Excavator 2.5 CY | 40.00 | ton | 2 excavator, 20 ton per excavator, 100 miles round trip |
| Dozer, 200 hp | 44.00 | ton | 2 units, 22 ton per excavator, 100 miles round trip |
| Excavator 2.5 CY | 20.00 | ton | 1 excavator, 20 ton per excavator, 100 miles round trip |

#### Transportation-materials

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Pad | 21.75 | ton | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 |

| | | | |
|---|---|---|---|
| Clean backfill | 10,000.50 | ton | Assume Soil, 6667 cy, 1.5 ton/cy, 2000 lb/ton |
| Revegetation, soil nutrients | 0.39 | ton | Assume fertilizer, 309 msf (thousand square feet), 3 lb of sed per 1.2 msf |
| Revegetation, hydroseed | 1.55 | ton | Assume fertilizer, 309 msf (thousand square feet), 10 lb of sed per 1 msf |
| Revegetation, hydroseed | 7.73 | ton | Assume wood mulch, 309 msf (thousand square feet), 50 lb of mulch per 1 msf |
| Revegetation, hydroseed | 0.31 | ton | Assume fertilizer, 309 msf (thousand square feet), 2 lb per 1 msf |

## Equipment Use

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Brush mowing | 19.20 | hours | 1.2 acres, medium density area, uses a tractor, Assume 8 hours per day, 0.5 acres per day |
| Chipping tree | 19.20 | hours | 1.2 acres, medium density area, uses a woodchipper, 130 hp, assume 8 hours per day, 0.5 acres per day |
| Chipping tree | 38.40 | hours | 1.2 acres, medium density area, uses a 2 chain saws, gasoline, 18" , assume 3 days or work, 8 hours per day, 80%efficiency |
| Dozer, 200 hp | 128.00 | hours | 20 days, 8 hours per day, 80% efficiency |
| Excavator 2.5 CY | 256.00 | hours | 2 units, 20 days, 8 hours per day, 80%efficiency |
| Dozer, 200 hp | 128.00 | hours | 2 units, 10 days, 8 hours per day, 80% efficiency |
| Excavator 2.5 CY | 64.00 | hours | 10 days, 8 hours per day, 80%efficiency |

## Residual Handling

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Water | 4.16 | ton | 1000 gallons of water, assume 8.32 pounds per gallon |
| Soil (hazardous) | 10,000.00 | ton | 10000 ton of soil, hazardous |
| Debris, metals | 5.60 | ton | 11200 lb metal |
| manual remove and treat surf MDAS | 17.63 | ton | 30 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| MDAS Certification | 35.25 | ton | 60 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

## Transportation-residual handling

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Water | 100.00 | miles | 1000 gallons of water, assume 8.32 pounds per gallon |
| Soil (hazardous) | 730.00 | miles | 10000 ton of soil, hazardous |
| Debris, metals | 100.00 | miles | 11200 lb metal |
| manual remove and treat surf MDAS | 100.00 | miles | 30 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| MDAS Certification | 100.00 | miles | 60 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

## Laboratory Services

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Waste Characterizatioin | 1,400.00 | dollars | Assume each test to be $200, 7 tests |

# LTM

## Transportation-Personnel

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Transportation yearly inspection | 500.00 | miles | 1 day, 2 trips per day, 25 miles pre trip, 2 people, years 1, 2, 3, 4, and 5 |
| Transportation 5-year inspection | 100.00 | miles | 1 day, 2 trips per day, 25 miles pre trip, 2 people, years 10 |
| Annual inspection | 8,250.00 | miles | annual inspection: 2 days, 2 trips per day, 25 miles per trip, 6 people, for year 1, 2, 3, 4, and 5; visual detector surveyers: 3 days, 2 trips per day, 25 miles per trip, 6 people for year 1,2,3,4, and 5; manual remove and treat surf: 1 day, 2 trips per day, 25 miles per trip, 3 people, for years 1,2,3,4, and 5 |
| year 10 inspection | 1,650.00 | miles | 5 yr inpection: 2 days, 2 trips per day, 25 miles per trip, 6 people for year 10; visual and detector surveyes: 3 days, 2 trips per day, 25 miles per trip, 6 people, for year 10; manual remove and treat surf: 1 day, 2 trips per day, 25 miles per trip, 3 people for year 10 |

## Residual Handling

| Item | Quantity | Units | Comments |
|---|---|---|---|
| manual remove and treat surf MDAS | 2.94 | ton | 1 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| manual remove and treat surf MDAS | 0.59 | ton | 1 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

## Transportation-residual handling

| Item | Quantity | Units | Comments |
|---|---|---|---|
| manual remove and treat surf MDAS | 100.00 | miles | 1 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| manual remove and treat surf MDAS | 100.00 | miles | 1 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

## Alternative 2b: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal (on-site treatment)

RAC

Materials

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Pad | 43,500 | lb | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 |
| Decon Water | 2,000 | gallons | |
| Stabilization Material | 666,666.67 | lb | Assume cement, 500 ton, Assume 2/3 of 500 to be cement |
| Stabilization Material | 333,333.33 | lb | Assume lime, 500 ton, Assume 1/3 of 500 to be cement |
| Revegetation, soil nutrients | 772.50 | lb | Assume fertilizer, 309 msf (thousand square feet), 3 lb of sed per 1.2 msf |
| Revegetation, hydroseed | 3,090 | lb | Assume fertilizer, 309 msf (thousand square feet), 10 lb of sed per 1 msf |
| Revegetation, hydroseed | 15,450 | lb | Assume wood mulch, 309 msf (thousand square feet), 50 lb of mulch per 1 msf |
| Revegetation, hydroseed | 618 | lb | Assume fertilizer, 309 msf (thousand square feet), 2 lb per 1 msf |
| Clean Backfill | 20,001,000 | | 6667 CY, 1,5 ton/CY, 2000 lb/ton |

Transportation-Personnel

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Transportation UXO technician (site preparation) | 250 | miles | 5 days, 2 trips per day, 25 miles per trip, 1 person |
| Site Labor (in placement treatment and grading) | 3,000 | miles | 20 days, 2 trips per day, 25 miles per trip, 3 people |
| Site Labor (cover and restoration) | 1,500.00 | miles | 10 days, 2 trips per day, 25 miles per trip, 3 people |
| Site Set up: establish grids | 500 | miles | 5 days, 2 trips per day, 25 miles per trip, 2 people |
| Site Set up: establish transects on access ways | 100 | miles | 1 day, 2 trips per day, 25 miles per trip, 2 people |
| Site set up: brush cutting | 2,100 | miles | 7 days, 2 trips per day, 25 miles per day, 6 people |
| Site set up brus cutting | 300 | miles | 1 day, 2 trips per day, 25 miles per trip, 6 people |
| visual & detector surveyers | 3,150 | miles | 7 days, 2 trips per day, 25 miles per day, 9 people |
| visual & detector surveyers | 900 | miles | 2 days, 2 trips per day, 25 miles per day, 9 people |
| Manual Remove & Treat surf | 4,050 | miles | 9 days, 2 trips per day, 25 miles per day, 9 people |
| intrusive investigation | 1,800 | miles | 4 days, 2 trips per day, 25 miles per trip, 9 people |
| remove and treat subsurface | 1,800 | miles | 4 days, 2 trips per day, 25 miles per trip, 9 people |
| mechanical excavation | 1,200 | miles | 8 days, 2 trips per day, 25 miles per trip, 3 people |
| remove and treat excavation | 1,350 | miles | 9 days, 2 trips per day, 25 miles per day, 3 people |
| backfill after sifting | 600 | miles | 4 days, 2 trips per day, 25 miles per trip, 3 people |
| step out brush cutting | 600 | miles | 2 days, 2 trips per day, 25 miles per day, 6 people |
| step out: visual and detectur surveyes | 900 | miles | 2 days, 2 trips per day, 25 miles per day, 9 people |
| step out: manual remove and treat surf | 1,350 | miles | 3 days, 2 trips per day, 25 miles per day, 9 people |
| step out: intrusive investigation | 900 | miles | 2 days, 2 trips per day, 25 miles per trip, 9 people |
| step out: remove and treat subsurface | 450 | miles | 1 day, 2 trips per day, 25 miles per trip, 9 people |
| MEC/MDEH Treatment | 2,700 | miles | 6 days, 2 trips per day, 25 miles per trip, 9 people |
| MDASCertification | 900 | miles | 6 days, 2 trips per day, 25 miles per trip, 3 people |

Transportation-equipment

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Trailers | 110 | ton | 11 trailers, 10 ton per trailers, 100 miles round trip |
| Decon Water Storage Tank | 0.9 | ton | 6000 gallons capacity, HPDE, 100 miles round trip, 150 ln per 500 gal capacity tank |
| Clean Water Storage Tank | 0.6 | ton | 4000 gallons capacity HPDE, 100 miles round trip |
| Brush mowing | 7.75 | ton | 1 tractor, 250 hp, 7.75 tons per tractor |
| Chipping tree | 2.85 | ton | 1 wood chipper, 2.85 tons per woodchipper, 100 miles round trip |
| Chipping tree | 0.01 | ton | 2 chain saws, gasoline, 18" 10 lb each |
| Front End Loader 4 cy | 20 | ton | 1 front end loader, 20 tons per loader, 100 miles round trip |
| Dozer, 200 hp | 44 | ton | 2 dozer, 22 ton per excavator, 100 miles round trip |
| Excavator 2.5 cy | 40.00 | ton | 2 excavator, 20 ton per excavator, 100 miles round trip |
| Skid-steer, 78 hp | 4 | ton | 1 skid steer, 4 tons per skid steer, 100 miles round trip |
| Dozer, 200 hp | 44.00 | ton | 2 dozer, 22 ton per excavator, 100 miles round trip |
| Excavator 2.5 cy | 20.00 | ton | 1 excavator, 20 ton per excavator, 100 miles round trip |

| Transportation-materials | | | |
|---|---|---|---|
| Item | Quantity | Units | Comments |
| Decon Pad | 21.75 | ton | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 |
| Revegetation, soil nutrients | 0.39 | ton | Assume fertilizer, 309 msf (thousand square feet), 3 lb of sed per 1.2 msf |
| Revegetation, hydroseed | 2 | ton | Assume fertilizer, 309 msf (thousand square feet), 10 lb of sed per 1 msf |
| Revegetation, hydroseed | 8 | ton | Assume wood mulch, 309 msf (thousand square feet), 50 lb of mulch per 1 msf |
| Revegetation, hydroseed | 0.31 | ton | Assume fertilizer, 309 msf (thousand square feet), 2 lb per 1 msf |
| Clean Backfill | 10,001 | ton | 6667 CY, 1,5 ton/CY, 2000 lb/ton |
| Stabilization Material | 333.33 | ton | Assume cement, 500 ton, Assume 2/3 of 500 to be cement |
| Stabilization Material | 166.67 | ton | Assume lime, 500 ton, Assume 1/3 of 500 to be lime |

| Equipment Use | | | |
|---|---|---|---|
| Item | Quantity | Units | Comments |
| Brush mowing | 19.20 | hours | 1.2 acres, medium density area, uses a tractor, Assume 8 hours per day, 0.5 acres per day |
| Chipping tree | 19.20 | hours | 1.2 acres, medium density area, uses a woodchipper, 130 hp, assume 8 hours per day, 0.5 acres per day |
| Chipping tree | 38.40 | hours | 1.2 acres, medium density area, uses a 2 chain saws, gasoline, 18", assume 3 days or work, 8 hours per day, 80%efficiency |
| Front End Loader 4 cy | 64.00 | hours | 10 days, 8 hours per day, 80% of efficiency |
| Dozer, 200 hp | 64.00 | hours | 10 days, 8 hours per day, 80% of efficiency |
| Skid-steer, 78 hp | 64.00 | hours | 10 days, 8 hours per day, 80% of efficiency |
| Dozer, 200 hp | 128.00 | hours | 20 days, 8 hours per day, 80% of efficiency |
| Excavator 2.5 cy (2) | 256.00 | hours | 20 days, 8 hours per day, 80% of efficiency |
| Dozer, 200 hp (2) | 32.00 | hours | 10 days, 8 hours per day, 80% of efficiency |
| Excavator 2.5 cy | 64.00 | hours | 10 days, 8 hours per day, 80% of efficiency |

| Residual Handling | | | |
|---|---|---|---|
| Item | Quantity | Units | Comments |
| Decon Water | 8.32 | ton | 2000 gallons of water, assume 8.32 pounds per gallon |
| Debris, metals | 5.60 | ton | 11200 lb metal |
| Soil (non hazardous) | 10,000.00 | ton | 10000 ton of soil, hazardous |
| manual remove and treat surf MDAS | 17.63 | ton | 30 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| MDAS Certification | 35.25 | ton | 60 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

| Transportation-residual handling | | | |
|---|---|---|---|
| Item | Quantity | Units | Comments |
| Decon Water | 100 | miles | 2000 gallons of water, assume 8.32 pounds per gallon |
| Debris, metals | 100 | miles | 11200 lb metal |
| Soil (non hazardous) | 100 | miles | 10000 ton of soil, hazardous |
| manual remove and treat surf MDAS | 100 | miles | 30 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| MDAS Certification | 100 | miles | 60 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

| LTM | | | |
|---|---|---|---|
| Transportation-Personnel | | | |
| Item | Quantity | Units | Comments |
| Transportation yearly inspection | 500 | miles | 1 day, 2 trips per day, 25 miles pre trip, 2 people, years 1, 2, 3, 4, and 5 |
| Transportation 5-year inspection | 100 | miles | 1 day, 2 trips per day, 25 miles pre trip, 2 people, years 10 |
| Annual inspection | 8,250 | miles | annual inspection: 2 days, 2 trips per day, 25 miles per trip, 6 people, for year 1, 2, 3, 4, and 5; visual detector surveyers: 3 days, 2 trips per day, 25 miles per trip, 6 people for year 1,2,3,4, and 5; manual remove and treat surf: 1 day, 2 trips per day, 25 miles per trip, 3 people, for years 1,2,3,4, and 5 |

| | | | |
|---|---|---|---|
| year 10 inspection | 1,650 | miles | 5 yr inpection: 2 days, 2 trips per day, 25 miles per trip, 6 people for year 10; visual and detector surveyes: 3 days, 2 trips per day, 25 miles per trip, 6 people, for year 10; manual remove and treat surf: 1 day, 2 trips per day, 25 miles per trip, 3 people for year 10 |

**Residual Handling**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| manual remove and treat surf MDAS | 2.94 | ton | 1 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| manual remove and treat surf MDAS | 0.59 | ton | 1 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

**Transportation-residual handling**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| manual remove and treat surf MDAS | 100.00 | miles | 1 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| manual remove and treat surf MDAS | 100.00 | miles | 1 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

## Alternative 2c: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal (no off-site disposal, no on-site treatment)

RAC

Materials

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Pad | 43,500 | lb | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 |
| Decon Water | 1,000 | gallons | |
| Revegetation, soil nutrients | 772.50 | lb | Assume fertilizer, 309 msf (thousand square feet), 3 lb of sed per 1.2 msf |
| Revegetation, hydroseed | 3,090 | lb | Assume fertilizer, 309 msf (thousand square feet), 10 lb of sed per 1 msf |
| Revegetation, hydroseed | 15,450 | lb | Assume wood mulch, 309 msf (thousand square feet), 50 lb of mulch per 1 msf |
| Revegetation, hydroseed | 618 | lb | Assume fertilizer, 309 msf (thousand square feet), 2 lb per 1 msf |

Transportation-Personnel

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Transportation UXO technician (site preparation) | 250 | miles | 5 days, 2 trips per day, 25 miles per trip, 1 person |
| Site Labor (site clean up and restoration) | 750 | miles | 5days, 2 trips per day, 25 miles per trip, 3 people |
| Site Set up: establish grids | 500 | miles | 5 days, 2 trips per day, 25 miles per trip, 2 people |
| Site Set up: establish transects on access ways | 100 | miles | 1 day, 2 trips per day, 25 miles per trip, 2 people |
| Site set up: brush cutting | 2,100 | miles | 7 days, 2 trips per day, 25 miles per day, 6 people |
| Site set up brus cutting | 300 | miles | 1 day, 2 trips per day, 25 miles per trip, 6 people |
| visual & detector surveyers | 3,150 | miles | 7 days, 2 trips per day, 25 miles per day, 9 people |
| visual & detector surveyers | 900 | miles | 2 days, 2 trips per day, 25 miles per day, 9 people |
| Manual Remove & Treat surf | 4,050 | miles | 9 days, 2 trips per day, 25 miles per day, 9 people |
| intrusive investigation | 1,800 | miles | 4 days, 2 trips per day, 25 miles per trip, 9 people |
| remove and treat subsurface | 1,800 | miles | 4 days, 2 trips per day, 25 miles per trip, 9 people |
| mechanical excavation | 3,600 | miles | 8 days, 2 trips per day, 25 miles per trip, 9 people |
| remove and treat excavation | 1,350 | miles | 9 days, 2 trips per day, 25 miles per day, 3 people |
| backfill after sifting | 600 | miles | 4 days, 2 trips per day, 25 miles per trip, 3 people |
| step out brush cutting | 600 | miles | 2 days, 2 trips per day, 25 miles per day, 6 people |
| step out: visual and detectur surveyes | 900 | miles | 2 days, 2 trips per day, 25 miles per day, 9 people |
| step out: manual remove and treat surf | 1,350 | miles | 3 days, 2 trips per day, 25 miles per day, 9 people |
| step out: intrusive investigation | 900 | miles | 2 days, 2 trips per day, 25 miles per trip, 9 people |
| step out: remove and treat subsurface | 450 | miles | 1 day, 2 trips per day, 25 miles per trip, 9 people |
| MEC/MDEH Treatment | 2,700 | miles | 6 days, 2 trips per day, 25 miles per trip, 9 people |
| MDASCertification | 900 | miles | 6 days, 2 trips per day, 25 miles per trip, 3 people |

Transportation-equipment

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Trailers | 90 | ton | 9 trailers, 10 ton per trailers, 100 miles round trip |
| Decon Water Storage Tank | 0.9 | ton | 6000 gallons capacity, HPDE, 100 miles round trip, 150 ln per 500 gal capacity tank |
| Clean Water Storage Tank | 0.6 | ton | 4000 gallons capacity HPDE, 100 miles round trip |
| Brush mowing | 7.75 | ton | 1 tractor, 250 hp, 7.75 tons per tractor |
| Chipping tree | 2.85 | ton | 1 wood chipper, 2.85 tons per woodchipper, 100 miles round trip |
| Chipping tree | 0.01 | ton | 2 chain saws, gasoline, 18" 10 lb each |
| Dozer, 200 hp | 22 | ton | 1 dozer, 22 ton per excavator, 100 miles round trip |
| Front End Loader | 20.492 | ton | 1 front end loader, 20.4 tons |

Transportation-materials

| Item | Quantity | Units | Comments |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Decon Pad | 21.75 | ton | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 |
| Revegetation, soil nutrients | 0.39 | ton | Assume fertilizer, 309 msf (thousand square feet), 3 lb of sed per 1.2 msf |
| Revegetation, hydroseed | 1.55 | ton | Assume fertilizer, 309 msf (thousand square feet), 10 lb of sed per 1 msf |
| Revegetation, hydroseed | 7.73 | ton | Assume wood mulch, 309 msf (thousand square feet), 50 lb of mulch per 1 msf |
| Revegetation, hydroseed | 0.31 | ton | Assume fertilizer, 309 msf (thousand square feet), 2 lb per 1 msf |

**Equipment Use**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Brush mowing | 19.20 | hours | 1.2 acres, medium density area, uses a tractor, Assume 8 hours per day, 0.5 acres per day |
| Chipping tree | 19.20 | hours | 1.2 acres, medium density area, uses a woodchipper, 130 hp, assume 8 hours per day, 0.5 acres per day |
| Chipping tree | 38.40 | hours | 1.2 acres, medium density area, uses a 2 chain saws, gasoline, 18" , assume 3 days or work, 8 hours per day, 80%efficiency |
| Dozer, 200 hp (2 units) | 128 | hours | 10 days, 8 hours per day, 80% efficiency |
| Front End Loader, 185 hp | 32 | hours | 5 days, 8 hours per day, 80% efficienty |

**Residual Handling**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Water | 4.16 | ton | 1000 gallons of water, assume 8.32 pounds per gallon |
| Debris, metals | 5.60 | ton | 11200 lb metal |
| manual remove and treat surf MDAS | 17.63 | ton | 30 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| MDAS Certification | 35.25 | ton | 60 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

**Transportation-residual handling**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Water | 100 | miles | 1000 gallons of water, assume 8.32 pounds per gallon |
| Debris, metals | 100 | miles | 11200 lb metal |
| manual remove and treat surf MDAS | 100 | miles | 30 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| MDAS Certification | 100 | miles | 60 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

**LTM**

**Materials**

| Item | Quantity | Units | Comments |
|---|---|---|---|

**Transportation-Personnel**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Transportation yearly inspection | 500 | miles | 1 day, 2 trips per day, 25 miles pre trip, 2 people, years 1, 2, 3, 4, and 5 |
| Transportation 5-year inspection | 100 | miles | 1 day, 2 trips per day, 25 miles pre trip, 2 people, years 10 |
| Annual inspection | 8,250 | miles | annual inspection: 2 days, 2 trips per day, 25 miles per trip, 6 people, for year 1, 2, 3, 4, and 5; visual detector surveyers: 3 days, 2 trips per day, 25 miles per trip, 6 people for year 1,2,3,4, and 5; manual remove and treat surf: 1 day, 2 trips per day, 25 miles per trip, 3 people, for years 1,2,3,4, and 5 |

| | | | |
|---|---|---|---|
| year 10 inspection | 1,650 | miles | 5 yr inpection: 2 days, 2 trips per day, 25 miles per trip, 6 people for year 10; visual and detector surveyes: 3 days, 2 trips per day, 25 miles per trip, 6 people, for year 10; manual remove and treat surf: 1 day, 2 trips per day, 25 miles per trip, 3 people for year 10 |

**Transportation-equipment**

| Item | Quantity | Units | Comments |
|---|---|---|---|

**Transportation-materials**

| Item | Quantity | Units | Comments |
|---|---|---|---|

**Equipment Use**

| Item | Quantity | Units | Comments |
|---|---|---|---|

**Residual Handling**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| manual remove and treat surf MDAS | 2.94 | ton | 1 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| manual remove and treat surf MDAS | 0.59 | ton | 1 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

**Transportation-residual handling**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| manual remove and treat surf MDAS | 100.00 | miles | 1 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| manual remove and treat surf MDAS | 100.00 | miles | 1 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

## Alternative 3a: All, Surface and Shallow Subsurface MEC and Anomaly Removal (off-site disposal)

RAC

**Materials**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Pad | 43,500 | lb | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 |
| Decon Water | 1,000 | gallons | |
| Clean backfill | 20,001,000 | lb | Assume Soil, 6667 cy, 1.5 ton/cy, 2000 lb/ton |
| Revegetation, soil nutrients | 772.50 | lb | Assume fertilizer, 309 msf (thousand square feet), 3 lb of sed per 1.2 msf |
| Revegetation, hydroseed | 3,090 | lb | Assume fertilizer, 309 msf (thousand square feet), 10 lb of sed per 1 msf |
| Revegetation, hydroseed | 15,450 | lb | Assume wood mulch, 309 msf (thousand square feet), 50 lb of mulch per 1 msf |
| Revegetation, hydroseed | 618 | lb | Assume fertilizer, 309 msf (thousand square feet), 2 lb per 1 msf |

**Transportation-Personnel**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Transportation UXO technician (site preparation) | 250 | miles | 5 days, 2 trips per day, 25 miles per trip, 1 person |
| Site Labor (excavation, transportation and disposal) | 3,000 | miles | 20 days, 2 trips per day, 25 miles per trip, 3 people |
| Site labor (cover and restoration) | 1,500 | miles | 10 days, 2 trips per day, 25 miles per trip, 3 people |
| Set up: establish grids | 800 | miles | 8 days, 2 trips per day, 25 miles per trip, 2 person |
| Site Set up : brush cutting | 6000 | miles | 20 days, 2 trips per day, 25 miles per trip, 6 people |
| visual & detector surveyes | 9900 | miles | 22 days, 2 trips per day, 25 miles per trip, 9 people |
| Manual remove and treat surf | 4500 | miles | 10 days, 2 trips per day, 25 miles per trip, 9 people |
| intrusive investigation | 38250 | miles | 85 days, 2 trips per day, 25 miles per trip, 9 people |
| remove and treat subsurface | 600 | miles | 4 days, 2 trips per day, 25 miles per trip, 3 people |
| mechanical excavation | 1200 | miles | 8 days, 2 trips per day, 25 miles per trip, 3 person |
| remove and treat excavation | 7200 | miles | 16 days, 2 trips per day, 25 miles per trip,9 people |
| backfill after sifting | 600 | miles | 4 days, 2 trips per day, 25 miles per trip, 3 people |
| step out: brush cutting | 600 | miles | 2 days, 2 trips per day, 25 miles per trip, 6 people |
| step out visual and detector surveyes | 900 | miles | 2 days, 2 trips per day, 25 miles per trip, 9 people |
| step out manual remove and treat surf | 1350 | miles | 3 people, 2 trips per day, 25 miles per trip, 9 people |
| step out: intrusive investigation | 900 | miles | 2 days, 2 trips per day, 25 miles per trip, 9 people |
| step out: remove and treat subsurface | 450 | miles | 1 day, 2 trips per day, 25 miles per trip, 9 people |
| MEC/MDEH Treatment | 2700 | miles | 6 days, 2 trips per day, 25 miles per trip, 9 people |
| MDAS Certification | 1650 | miles | 11 days, 2 trips per day, 25 miles per trip, 3 people |

**Transportation-equipment**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Trailers | 110 | | 11 trailers, 10 ton per trailers, 100 miles round trip |
| Decon Water Storage Tank | 0.9 | ton | 6000 gallons capacity, HPDE, 100 miles round trip, 150 ln per 500 gal capacity tank |
| Clean Water Storage Tank | 0.6 | ton | 4000 gallons capacity HPDE, 100 miles round trip |
| Brush mowing | 7.75 | ton | 1 tractor, 250 hp, 7.75 tons per tractor |
| Chipping tree | 2.85 | ton | 1 wood chipper, 2.85 tons per woodchipper, 100 miles round trip |
| Chipping tree | 0.01 | ton | 2 chain saws, gasoline, 18" 10 lb each |
| Dozer, 200 hp | 44 | ton | 2 dozer, 22 ton per excavator, 100 miles round trip |
| Excavator 2.5 CY | 20 | ton | 1 excavator, 20 ton per excavator, 100 miles round trip |
| Dozer, 200 hp | 22.00 | | 1 dozer, 22 ton per excavator, 100 miles round trip |
| Excavator 2.5 CY | 40.00 | | 2 excavator, 20 ton per excavator, 100 miles round trip |

**Transportation-materials**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Pad | 22 | ton | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 |
| Clean backfill | 10,001 | ton | Assume Soil, 6667 cy, 1.5 ton/cy, 2000 lb/ton |
| Revegetation, soil nutrients | 0.39 | ton | Assume fertilizer, 309 msf (thousand square feet), 3 lb of sed per 1.2 msf |

| | | | |
|---|---|---|---|
| Revegetation, hydroseed | 2 | ton | Assume fertilizer, 309 msf (thousand square feet), 10 lb of sed per 1 msf |
| Revegetation, hydroseed | 8 | ton | Assume wood mulch, 309 msf (thousand square feet), 50 lb of mulch per 1 msf |
| Revegetation, hydroseed | 0.31 | ton | Assume fertilizer, 309 msf (thousand square feet), 2 lb per 1 msf |

**Equipment Use**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Brush mowing | 19.20 | hours | 1.2 acres, medium density area, uses a tractor, Assume 8 hours per day, 0.5 acres per day |
| Chipping tree | 19.20 | hours | 1.2 acres, medium density area, uses a woodchipper, 130 hp, assume 8 hours per day, 0.5 acres per day |
| Chipping tree | 38.40 | hours | 1.2 acres, medium density area, uses a 2 chain saws, gasoline, 18" , assume 3 days or work, 8 hours per day, 80%efficiency |
| Dozer, 200 hp | 128.00 | hours | 20 days, 8 hours per day, 80% efficiency |
| Excavator 2.5 CY | 256.00 | hours | 2 units, 20 days, 8 hours per day, 80% efficiency |
| Dozer, 200 hp | 128 | hours | 2 units, 10 days, 8 hours per day, 80% efficiency |
| Excavator 2.5 CY | 64 | hours | 10 days, 8 hours per day, 80%efficiency |

**Residual Handling**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Water | 4.16 | ton | 1000 gallons of water, assume 8.32 pounds per gallon |
| Soil (hazardous) | 10,000 | ton | 10000 ton of soil, hazardous |
| Debris, metals | 6.55 | ton | 13,100 lb metal |
| manual remove and treat surf MDAS | 20.56 | ton | 35 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat subsurface | 1.18 | ton | 2 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat subsurface | 17.63 | ton | 30 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat subsurface | 38.78 | ton | 66 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

**Transportation-residual handling**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Water | 100 | miles | 1000 gallons of water, assume 8.32 pounds per gallon |
| Soil (hazardous) | 730 | miles | 10000 ton of soil, hazardous |
| Debris, metals | 100 | miles | 13100 lb metal |
| manual remove and treat surf MDAS | 100 | miles | 35 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat subsurface | 100 | miles | 2 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat subsurface | 100 | miles | 30 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat subsurface | 100 | miles | 66 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

**Laboratory Services**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Waste Characterizatioin | 1,400 | dollars | Assume each test to be $200, 7 tests |

**LTM**

**Transportation-Personnel**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Transportation yearly inspection | 500 | miles | 1 day, 2 trips per day, 25 miles pre trip, 2 people, years 1, 2, 3, 4, and 5 |
| Transportation 5-year inspection | 100 | miles | 1 day, 2 trips per day, 25 miles pre trip, 2 people, years 10 |
| Annual inspection | 8,250 | miles | annual inspection: 2 days, 2 trips per day, 25 miles per trip, 6 people, for year 1, 2, 3, 4, and 5; visual detector surveyers: 3 days, 2 trips per day, 25 miles per trip, 6 people for year 1,2,3,4, and 5; manual remove and treat surf: 1 day, 2 trips per day, 25 miles per trip, 3 people, for years 1,2,3,4, and 5 |

| | | | |
|---|---|---|---|
| year 10 inspection | 1,650 | miles | 5 yr inpection: 2 days, 2 trips per day, 25 miles per trip, 6 people for year 10; visual and detector surveyes: 3 days, 2 trips per day, 25 miles per trip, 6 people, for year 10; manual remove and treat surf: 1 day, 2 trips per day, 25 miles per trip, 3 people for year 10 |

**Residual Handling**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| manual remove and treat surf MDAS | 2.94 | ton | 1 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| manual remove and treat surf MDAS | 0.59 | ton | 1 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

**Transportation-residual handling**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| manual remove and treat surf MDAS | 100.00 | miles | 1 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| manual remove and treat surf MDAS | 100.00 | miles | 1 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

## Alternative 3b: All, Surface and Shallow Subsurface MEC and Anomaly Removal (on-site treatment)

RAC

Materials

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Pad | 43,500 | lb | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 |
| Decon Water | 2,000 | gallons | |
| Stabilization Material | 666,666.67 | lb | Assume cement, 500 ton, Assume 2/3 of 500 to be cement |
| Stabilization Material | 333,333.33 | lb | Assume lime, 500 ton, Assume 1/3 of 500 to be cement |
| Revegetation, soil nutrients | 772.50 | lb | Assume fertilizer, 309 msf (thousand square feet), 3 lb of sed per 1.2 msf |
| Revegetation, hydroseed | 3,090 | lb | Assume fertilizer, 309 msf (thousand square feet), 10 lb of sed per 1 msf |
| Revegetation, hydroseed | 15,450 | lb | Assume wood mulch, 309 msf (thousand square feet), 50 lb of mulch per 1 msf |
| Revegetation, hydroseed | 618 | lb | Assume fertilizer, 309 msf (thousand square feet), 2 lb per 1 msf |
| Clean Backfill | 20,001,000 | lb | 6667 CY, 1,5 ton/CY, 2000 lb/ton |

Transportation-Personnel

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Transportation UXO technician (site preparation) | 250 | miles | 5 days, 2 trips per day, 25 miles per trip, 1 person |
| Site Labor (in placement treatment and grading) | 1,500 | miles | 10 days, 2 trips per day, 25 miles per trip, 3 people |
| Site Labor (cover and restoration) | 4,500 | miles | 30 days, 2 trips per day, 25 miles per trip, 3 people |
| Set up: establish grids | 800 | miles | 8 days, 2 trips per day, 25 miles per trip, 2 person |
| Site Set up : brush cutting | 6000 | miles | 20 days, 2 trips per day, 25 miles per trip, 6 people |
| visual & detector surveyes | 9900 | miles | 22 days, 2 trips per day, 25 miles per trip, 9 people |
| Manual remove and treat surf | 4500 | miles | 10 days, 2 trips per day, 25 miles per trip, 9 people |
| intrusive investigation | 38250 | miles | 85 days, 2 trips per day, 25 miles per trip, 9 people |
| remove and treat subsurface | 600 | miles | 4 days, 2 trips per day, 25 miles per trip, 3 people |
| mechanical excavation | 1200 | miles | 8 days, 2 trips per day, 25 miles per trip, 3 person |
| remove and treat excavation | 7200 | miles | 16 days, 2 trips per day, 25 miles per trip,9 people |
| Backfill after sifting | 600 | miles | 4 days, 2 trips per day, 25 miles per trip, 3 people |
| step out: brush cutting | 600 | miles | 2 days, 2 trips per day, 25 miles per trip, 6 people |
| step out visual and detector surveyes | 900 | miles | 2 days, 2 trips per day, 25 miles per trip, 9 people |
| step out manual remove and treat surf | 1350 | miles | 3 days, 2 trips per day, 25 miles per trip, 9 people |
| step out: intrusive investigation | 900 | miles | 2 days, 2 trips per day, 25 miles per trip, 9 people |
| step out: remove and treat subsurface | 450 | miles | 1 day, 2 trips per day, 25 miles per trip, 9 people |
| MEC/MDEH Treatment | 2700 | miles | 6 days, 2 trips per day, 25 miles per trip, 9 people |
| MDAS Certification | 1650 | miles | 11 days, 2 trips per day, 25 miles per trip, 3 people |

Transportation-equipment

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Trailers | 110 | ton | 11 trailers, 10 ton per trailers, 100 miles round trip |
| Decon Water Storage Tank | 0.9 | ton | 6000 gallons capacity, HPDE, 100 miles round trip, 150 ln per 500 gal capacity tank |
| Clean Water Storage Tank | 0.6 | ton | 4000 gallons capacity HPDE, 100 miles round trip |
| Brush mowing | 7.75 | ton | 1 tractor, 250 hp, 7.75 tons per tractor |
| Chipping tree | 2.85 | ton | 1 wood chipper, 2.85 tons per woodchipper, 100 miles round trip |
| Chipping tree | 0.01 | ton | 2 chain saws, gasoline, 18" 10 lb each |
| Front End Loader 4 cy | 20 | ton | 1 front end loader, 20 tons per loader, 100 miles round trip |
| Dozer, 200 hp | 22 | ton | 1 dozer, 22 ton per excavator, 100 miles round trip |
| Skid-steer, 78 hp | 4 | ton | 1 skid steer, 4 tons per skid steer, 100 miles round trip |
| Dozer, 200 hp | 22 | ton | 1 dozer, 22 ton per excavator, 100 miles round trip |
| Excavator 2.5 cy (2) | 40.00 | ton | 2 excavator, 20 ton per excavator, 100 miles round trip |
| Dozer, 200 hp | 22.00 | ton | 1 dozer, 22 ton per excavator, 100 miles round trip |
| Excavator 2.5 cy | 20.00 | ton | 1 excavator, 20 ton per excavator, 100 miles round trip |

| Transportation-materials | | | |
|---|---|---|---|
| Item | Quantity | Units | Comments |
| Decon Pad | 21.75 | ton | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 |
| Revegetation, soil nutrients | 0.39 | ton | Assume fertilizer, 309 msf (thousand square feet), 3 lb of sed per 1.2 msf |
| Clean Backfill | 10,001 | ton | 6667 CY, 1,5 ton/CY, 2000 lb/ton |
| Revegetation, hydroseed | 2 | ton | Assume fertilizer, 309 msf (thousand square feet), 10 lb of sed per 1 msf |
| Revegetation, hydroseed | 8 | ton | Assume wood mulch, 309 msf (thousand square feet), 50 lb of mulch per 1 msf |
| Revegetation, hydroseed | 0.31 | ton | Assume fertilizer, 309 msf (thousand square feet), 2 lb per 1 msf |
| Stabilization Material | 333.33 | ton | Assume cement, 500 ton, Assume 2/3 of 500 to be cement |
| Stabilization Material | 166.67 | ton | Assume lime, 500 ton, Assume 1/3 of 500 to be lime |

| Equipment Use | | | |
|---|---|---|---|
| Item | Quantity | Units | Comments |
| Brush mowing | 19.20 | hours | 1.2 acres, medium density area, uses a tractor, Assume 8 hours per day, 0.5 acres per day |
| Chipping tree | 19.20 | hours | 1.2 acres, medium density area, uses a woodchipper, 130 hp, assume 8 hours per day, 0.5 acres per day |
| Chipping tree | 38.40 | hours | 1.2 acres, medium density area, uses a 2 chain saws, gasoline, 18" , assume 3 days or work, 8 hours per day, 80%efficiency |
| Front End Loader 4 cy | 64.00 | hours | 10 days, 8 hours per day, 80% of efficiency |
| Dozer, 200 hp | 64.00 | hours | 10 days, 8 hours per day, 80% of efficiency |
| Skid-steer, 78 hp | 64.00 | hours | 10 days, 8 hours per day, 80% of efficiency |
| Dozer, 200 hp | 128.00 | hours | 20 days, 8 hours per day, 80% utilization |
| Excavator 2.5 cy (2) | 256.00 | hours | 20 days, 8 hours per day, 80% of efficiency |
| Dozer, 200 hp (2) | 64.00 | hours | 10 days, 8 hours per day, 80% of efficiency |
| Excavator 2.5 cy | 64.00 | hours | 10 days, 8 hours per day, 80% of efficiency |

| Residual Handling | | | |
|---|---|---|---|
| Item | Quantity | Units | Comments |
| Decon Water | 8.32 | ton | 2000 gallons of water, assume 8.32 pounds per gallon |
| Debris, metals | 6.55 | ton | 13,100 lb metal |
| Soil (hazardous) | 10,000.00 | ton | 10000 ton of soil, hazardous |
| manual remove and treat surf MDAS | 20.56 | ton | 35 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat subsurface | 1.18 | ton | 2 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat subsurface | 17.63 | ton | 30 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat subsurface | 38.78 | ton | 66 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

| Transportation-residual handling | | | |
|---|---|---|---|
| Item | Quantity | Units | Comments |
| Decon Water | 100 | miles | 2000 gallons of water, assume 8.32 pounds per gallon |
| Debris, metals | 100 | miles | 13,100 lb metal |
| Soil (hazardous) | 730.00 | miles | 10000 ton of soil, hazardous |
| manual remove and treat surf MDAS | 100 | miles | 35 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat subsurface | 100 | miles | 2 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat subsurface | 100 | miles | 30 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat subsurface | 100 | miles | 66 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| | 250 | | |

## LTM

| Transportation-Personnel | | | |
|---|---|---|---|
| Item | Quantity | Units | Comments |

| | | | |
|---|---|---|---|
| Transportation yearly inspection | 500 | miles | 1 day, 2 trips per day, 25 miles pre trip, 2 people, years 1, 2, 3, 4, and 5 |
| Transportation 5-year inspection | 100 | miles | 1 day, 2 trips per day, 25 miles pre trip, 2 people, years 10 |
| Annual inspection | 8,250 | miles | annual inspection: 2 days, 2 trips per day, 25 miles per trip, 6 people, for year 1, 2, 3, 4, and 5; visual detector surveyers: 3 days, 2 trips per day, 25 miles per trip, 6 people for year 1,2,3,4, and 5; manual remove and treat surf: 1 day, 2 trips per day, 25 miles per trip, 3 people, for years 1,2,3,4, and 5 |
| year 10 inspection | 1,650 | miles | 5 yr inpection: 2 days, 2 trips per day, 25 miles per trip, 6 people for year 10; visual and detector surveyes: 3 days, 2 trips per day, 25 miles per trip, 6 people, for year 10; manual remove and treat surf: 1 day, 2 trips per day, 25 miles per trip, 3 people for year 10 |

Residual Handling

| Item | Quantity | Units | Comments |
|---|---|---|---|
| manual remove and treat surf MDAS | 2.94 | ton | 1 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| manual remove and treat surf MDAS | 0.59 | ton | 1 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

Transportation-residual handling

| Item | Quantity | Units | Comments |
|---|---|---|---|
| manual remove and treat surf MDAS | 100.00 | miles | 1 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| manual remove and treat surf MDAS | 100.00 | miles | 1 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

## Alternative 3c: All, Surface and Shalow Subsurface MEC and Anomaly Removal (no off-site disposal, no on-site treatment)

RAC

Materials

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Pad | 43,500 | lb | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 |
| Decon Water | 1,000 | gallons | |
| Revegetation, soil nutrients | 772.50 | lb | Assume fertilizer, 309 msf (thousand square feet), 3 lb of sed per 1.2 msf |
| Revegetation, hydroseed | 3,090 | lb | Assume fertilizer, 309 msf (thousand square feet), 10 lb of sed per 1 msf |
| Revegetation, hydroseed | 15,450 | lb | Assume wood mulch, 309 msf (thousand square feet), 50 lb of mulch per 1 msf |
| Revegetation, hydroseed | 618 | lb | Assume fertilizer, 309 msf (thousand square feet), 2 lb per 1 msf |

Transportation-Personnel

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Transportation UXO technician (site preparation) | 250 | miles | 5 days, 2 trips per day, 25 miles per trip, 1 person |
| Site Labor (excavation, transportation and disposal) | 750 | miles | 5 days, 2 trips per day, 25 miles per trip, 3 people |
| Set up: establish grids | 800 | miles | 8 days, 2 trips per day, 25 miles per trip, 2 person |
| Site Set up : brush cutting | 6000 | miles | 20 days, 2 trips per day, 25 miles per trip, 6 people |
| visual & detector surveyes | 9900 | miles | 22 days, 2 trips per day, 25 miles per trip, 9 people |
| Manual remove and treat surf | 4500 | miles | 10 days, 2 trips per day, 25 miles per trip, 9 people |
| intrusive investigation | 38250 | miles | 85 days, 2 trips per day, 25 miles per trip, 9 people |
| remove and treat subsurface | 600 | miles | 4 days, 2 trips per day, 25 miles per trip, 3 people |
| mechanical excavation | 3600 | miles | 8 days, 2 trips per day, 25 miles per trip, 9 person |
| remove and treat excavation | 7200 | miles | 16 days, 2 trips per day, 25 miles per trip,9 people |
| backfill after sifting | 600 | miles | 4 days, 2 trips per day, 25 miles per trip, 3 people |
| step out: brush cutting | 600 | miles | 2 days, 2 trips per day, 25 miles per trip, 6 people |
| step out visual and detector surveyes | 900 | miles | 2 days, 2 trips per day, 25 miles per trip, 9 people |
| step out manual remove and treat surf | 1350 | miles | 3 people, 2 trips per day, 25 miles per trip, 9 people |
| step out: intrusive investigation | 900 | miles | 2 days, 2 trips per day, 25 miles per trip, 9 people |
| step out: remove and treat subsurface | 450 | miles | 1 day, 2 trips per day, 25 miles per trip, 9 people |
| MEC/MDEH Treatment | 2700 | miles | 6 days, 2 trips per day, 25 miles per trip, 9 people |
| MDAS Certification | 1650 | miles | 11 days, 2 trips per day, 25 miles per trip, 3 people |

Transportation-equipment

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Trailers | 90 | ton | 9 trailers, 10 ton per trailers, 100 miles round trip |
| Decon Water Storage Tank | 0.9 | ton | 6000 gallons capacity, HPDE, 100 miles round trip, 150 ln per 500 gal capacity tank |
| Clean Water Storage Tank | 0.6 | ton | 4000 gallons capacity HPDE, 100 miles round trip |
| Brush mowing | 7.75 | ton | 1 tractor, 250 hp, 7.75 tons per tractor |
| Chipping tree | 2.85 | ton | 1 wood chipper, 2.85 tons per woodchipper, 100 miles round trip |
| Chipping tree | 0.01 | ton | 2 chain saws, gasoline, 18" 10 lb each |
| Dozer, 200 hp | 44.00 | ton | 2 dozers, 22 ton per dozer, 100 miles round trip |
| Front End Loader, 185 hp | 20.492 | ton | 1 front end loader, 20.4 tons |

Transportation-materials

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Pad | 22 | ton | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 |

| | | | |
|---|---|---|---|
| Revegetation, soil nutrients | 0.39 | ton | Assume fertilizer, 309 msf (thousand square feet), 3 lb of sed per 1.2 msf |
| Revegetation, hydroseed | 2 | ton | Assume fertilizer, 309 msf (thousand square feet), 10 lb of sed per 1 msf |
| Revegetation, hydroseed | 8 | ton | Assume wood mulch, 309 msf (thousand square feet), 50 lb of mulch per 1 msf |
| Revegetation, hydroseed | 0.31 | ton | Assume fertilizer, 309 msf (thousand square feet), 2 lb per 1 msf |

## Equipment Use

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Brush mowing | 19.20 | hours | 1.2 acres, medium density area, uses a tractor, Assume 8 hours per day, 0.5 acres per day |
| Chipping tree | 19.20 | hours | 1.2 acres, medium density area, uses a woodchipper, 130 hp, assume 8 hours per day, 0.5 acres per day |
| Chipping tree | 38.40 | hours | 1.2 acres, medium density area, uses a 2 chain saws, gasoline, 18" , assume 3 days or work, 8 hours per day, 80%efficiency |
| Dozer, 200 hp (2 units) | 128.00 | hours | 10 days, 8 hours per day, 80% efficiency |
| Front End Loader, 185 hp | 32.00 | hours | 5 days, 8 hours per day, 80% efficiency |

## Residual Handling

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Water | 4.16 | ton | 1000 gallons of water, assume 8.32 pounds per gallon |
| Debris, metals | 5.60 | ton | 11,200 lb metal |
| manual remove and treat surf MDAS | 20.56 | ton | 35 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat subsurface | 1.18 | ton | 2 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat subsurface | 17.63 | ton | 30 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat subsurface | 38.78 | ton | 66 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

## Transportation-residual handling

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Water | 100 | miles | 1000 gallons of water, assume 8.32 pounds per gallon |
| Debris, metals | 100 | miles | 13100 lb metal |
| manual remove and treat surf MDAS | 100 | miles | 35 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat subsurface | 100 | miles | 2 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat subsurface | 100 | miles | 30 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat subsurface | 100 | miles | 66 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

# LTM

## Transportation-Personnel

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Transportation yearly inspection | 500 | miles | 1 day, 2 trips per day, 25  miles pre trip, 2 people, years 1, 2, 3, 4, and 5 |
| Transportation 5-year inspection | 100 | miles | 1 day, 2 trips per day, 25  miles pre trip, 2 people, years 10 |

| | | | |
|---|---|---|---|
| Annual inspection | 8,250 | miles | annual inspection: 2 days, 2 trips per day, 25 miles per trip, 6 people, for year 1, 2, 3, 4, and 5; visual detector surveyers: 3 days, 2 trips per day, 25 miles per trip, 6 people for year 1,2,3,4, and 5; manual remove and treat surf: 1 day, 2 trips per day, 25 miles per trip, 3 people, for years 1,2,3,4, and 5 |
| year 10 inspection | 1,650 | miles | 5 yr inpection: 2 days, 2 trips per day, 25 miles per trip, 6 people for year 10; visual and detector surveyes: 3 days, 2 trips per day, 25 miles per trip, 6 people, for year 10; manual remove and treat surf: 1 day, 2 trips per day, 25 miles per trip, 3 people for year 10 |

**Residual Handling**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| manual remove and treat surf MDAS | 2.94 | ton | 1 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| manual remove and treat surf MDAS | 0.59 | ton | 1 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

**Transportation-residual handling**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| manual remove and treat surf MDAS | 100.00 | miles | 1 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| manual remove and treat surf MDAS | 100.00 | miles | 1 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

## Alternative 4a: All, Surface and Shallow Subsurface MEC Removal (off-site disposal)

RAC

Materials

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Pad | 43,500 | lb | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 |
| Decon Water | 4,000 | gallons | |
| Clean backfill | 71,112,000 | lb | Assume Soil, 23,704 cy, 1.5 ton/cy, 2000 lb/ton |
| Revegetation, soil nutrients | 4,022.50 | lb | Assume fertilizer, 1609 msf (thousand square feet), 3 lb of sed per 1.2 msf |
| Revegetation, hydroseed | 16,090 | lb | Assume fertilizer, 1609 msf (thousand square feet), 10 lb of sed per 1 msf |
| Revegetation, hydroseed | 80,450 | lb | Assume wood mulch, 1609 msf (thousand square feet), 50 lb of mulch per 1 msf |
| Revegetation, hydroseed | 3,218 | lb | Assume fertilizer, 1609 msf (thousand square feet), 2 lb per 1 msf |
| Revegetation, wetland nutrients | 34.8 | lb | Assume fertilizer, 87 msf (thousand square feet), 1 lb of seed per 2500 sf, transportation disntance 50 miles |
| wetland soil | 1200000 | lb | Assume soil, 400 cy, 1.5 ton/cy, 2000 lb/ton |

Transportation-Personnel

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Transportation UXO technician (site preparation) | 1,500 | miles | 30 days, 2 trips per day, 25 miles per trip, 1 person |
| Site Labor (excavation, transportation and disposal) | 9,000 | miles | 60 days, 2 trips per day, 25 miles per trip, 3 people |
| Site labor (cover and restoration) | 4,800 | miles | 32 days, 2 trips per day, 25 miles per trip, 3 people |
| Set up: establish grids | 800 | miles | 8 days, 2 trips per day, 25 miles per trip, 2 person |
| Site Set up : brush cutting | 6000 | miles | 20 days, 2 trips per day, 25 miles per trip, 6 people |
| visual & detector surveyes | 9900 | miles | 22 days, 2 trips per day, 25 miles per trip, 9 people |
| Manual remove and treat surf | 4500 | miles | 10 days, 2 trips per day, 25 miles per trip, 9 people |
| mechanical excavation | 15000 | miles | 100 days, 2 trips per day, 25 miles per trip, 3 people |
| remove and treat excavation | 7200 | miles | 16 days, 2 trips per day, 25 miles per trip,9 people |
| backfilling after sifting | 600 | miles | 4 days, 2 trips per day, 25 miles per trip, 3 people |
| step out: brush cutting | 600 | miles | 2 days, 2 trips per day, 25 miles per trip, 6 people |
| step out visual and detector surveyes | 900 | miles | 2 days, 2 trips per day, 25 miles per trip, 9 people |
| step out manual remove and treat surf | 1350 | miles | 3 people, 2 trips per day, 25 miles per trip, 9 people |
| step out: intrusive investigation | 900 | miles | 2 days, 2 trips per day, 25 miles per trip, 9 people |
| step out: remove and treat subsurface | 450 | miles | 1 day, 2 trips per day, 25 miles per trip, 9 people |
| MEC/MDEH Treatment | 2700 | miles | 6 days, 2 trips per day, 25 miles per trip, 9 people |
| MDAS Certification | 1650 | miles | 11 days, 2 trips per day, 25 miles per trip, 3 people |

Transportation-equipment

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Trailers | 110 | ton | 11 trailers, 10 ton per trailers, 100 miles round trip |
| Decon Water Storage Tank | 0.9 | ton | 6000 gallons capacity, HPDE, 100 miles round trip, 150 ln per 500 gal capacity tank |
| Clean Water Storage Tank | 0.6 | ton | 4000 gallons capacity HPDE, 100 miles round trip |
| Brush mowing | 7.75 | ton | 1 tractor, 250 hp, 7.75 tons per tractor |
| Chipping tree | 2.85 | ton | 1 wood chipper, 2.85 tons per woodchipper, 100 miles round trip |
| Chipping tree | 0.01 | ton | 2 chain saws, gasoline, 18" 10 lb each |
| Dozer, 200 hp | 22 | ton | 1 dozer, 22 ton per excavator, 100 miles round trip |
| Excavator 2.5 CY | 40 | ton | 2 excavator, 20 ton per excavator, 100 miles round trip |
| Dozer, 200 hp | 22 | ton | 1 units, 22 ton per excavator, 100 miles round trip |
| Excavator 2.5 CY | 20 | ton | 1 excavator, 20 ton per excavator, 100 miles round trip |

Transportation-materials

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Pad | 21.75 | ton | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 |
| Clean backfill | 35,556 | ton | Assume Soil, 23,704 cy, 1.5 ton/cy, 2000 lb/ton |
| Revegetation, soil nutrients | 2.01 | ton | Assume fertilizer, 1609 msf (thousand square feet), 3 lb of sed per 1.2 msf |
| Revegetation, hydroseed | 8 | ton | Assume fertilizer, 1609 msf (thousand square feet), 10 lb of sed per 1 msf |

| | | | |
|---|---|---|---|
| Revegetation, hydroseed | 40 | ton | Assume wood mulch, 1609 msf (thousand square feet), 50 lb of mulch per 1 msf |
| Revegetation, hydroseed | 2 | ton | Assume fertilizer, 1609 msf (thousand square feet), 2 lb per 1 msf |
| Revegetation, wetland nutrients | 0.0174 | ton | Assume fertilizer, 87 msf (thousand square feet), 1 lb of seed per 2500 sf, transportation disntance 50 miles |
| wetland soil | 600 | ton | Assume soil, 400 cy, 1.5 ton/cy, 2000 lb/ton |

**Equipment Use**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Brush mowing | 326.40 | hours | 20.4 acres, mediom density area, uses a tractor, Assume 8 hours per day, 0.5 acres per day |
| Chipping tree | 326.40 | hours | 20.4 acres, mediom density area, uses a woodchipper, 130 hp, assume 8 hours per day, 0.5 acres per day |
| Chipping tree | 89.60 | hours | 20.4 acres, medium density area, uses a 2 chain saws, gasoline, 18" , assume 3 days or work, 8 hours per day, 80%efficiency |
| Dozer, 200 hp | 384 | hours | 1 units, 60 days, 8 hours per day, 80% efficiency |
| Excavator 2.5 CY | 768 | hours | 2 units, 60 days, 8 hours per day, 80%efficiency |
| Dozer, 200 hp | 410 | hours | 1 units, 64 days, 8 hours per day, 80% efficiency |
| Excavator 2.5 CY | 205 | hours | 32 days, 8 hours per day, 80%efficiency |

**Residual Handling**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Water | 16.64 | ton | 4000 gallons of water, assume 8.32 pounds per gallon |
| Soil (hazardous) | 35,556 | ton | 35,556 ton of soil, hazardous |
| Debris, metals | 6.05 | ton | 12.100 lb metal |
| manual remove and treat surf MDAS | 20.56 | ton | 35 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat subsurface | 17.63 | ton | 30 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat excavation | 38.78 | ton | 66 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

**Transportation-residual handling**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Water | 100 | miles | 4000 gallons of water, assume 8.32 pounds per gallon |
| Soil (hazardous) | 730 | miles | 35,556 ton of soil, hazardous |
| Debris, metals | 100 | miles | 15,100 lb metal |
| manual remove and treat surf MDAS | 100 | miles | 35 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat subsurface | 100 | miles | 30 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat excavation | 100 | miles | 66 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

**Laboratory Services**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Waste Characterizatioin | 4,800 | dollars | Assume each test to be $200, 24 tests |

## Alternative 4b: All, Surface and Shallow Subsurface MEC Removal (on-site treatment)

RAC

Materials

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Pad | 43,500 | lb | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 |
| Decon Water | 4,000 | gallons | |
| Revegetation, soil nutrients | 4,022.50 | lb | Assume fertilizer, 1609 msf (thousand square feet), 3 lb of sed per 1.2 msf |
| Revegetation, hydroseed | 16,090 | lb | Assume fertilizer, 1609 msf (thousand square feet), 10 lb of sed per 1 msf |
| Revegetation, hydroseed | 80,450 | lb | Assume wood mulch, 1609 msf (thousand square feet), 50 lb of mulch per 1 msf |
| Revegetation, hydroseed | 3,218 | lb | Assume fertilizer, 1609 msf (thousand square feet), 2 lb per 1 msf |
| Revegetation, wetland nutrients | 34.8 | lb | Assume fertilizer, 87 msf (thousand square feet), 1 lb of seed per 2500 sf, transportation disntance 50 miles |
| wetland soil | 1,200,000.00 | lb | Assume soil, 400 cy, 1.5 ton/cy, 2000 lb/ton |
| Clean Backfill | 71,112,000.00 | lb | 23,704 CY, 1.5 ton/cy, 2000 lb/ft |
| Stabilization Material | 2,373,333.33 | lb | Assume cement, 1780 ton, Assume 2/3 of 1780 to be cement |
| Stabilization Material | 1,186,666.67 | lb | Assume lime, 1780 ton, Assume 1/3 of 1780 to be lime |

Transportation-Personnel

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Transportation UXO technician (site preparation) | 1,500 | miles | 30 days, 2 trips per day, 25 miles per trip, 1 person |
| Site Labor (in placement treatment and grading) | 15,000 | miles | 100 days, 2 trips per day, 25 miles per trip, 3 people |
| Site Labor (cover and restoration) | 4,800 | miles | 32 days, 2 trips per day, 25 miles per trip, 3 people |
| Set up: establish grids | 800 | miles | 8 days, 2 trips per day, 25 miles per trip, 2 people |
| Site Set up : brush cutting | 6000 | miles | 20 days, 2 trips per day, 25 miles per trip, 6 people |
| visual & detector surveyes | 9900 | miles | 22 days, 2 trips per day, 25 miles per trip, 9 people |
| Manual remove and treat surf | 4500 | miles | 10 days, 2 trips per day, 25 miles per trip, 9 people |
| mechanical excavation | 15000 | miles | 100 days, 2 trips per day, 25 miles per trip, 3 people |
| remove and treat excavation | 7200 | miles | 16 days, 2 trips per day, 25 miles per trip,9 people |
| backfilling after sifting | 600 | miles | 4 days, 2 trips per day, 25 miles per trip, 3 people |
| step out: brush cutting | 600 | miles | 2 days, 2 trips per day, 25 miles per trip, 6 people |
| step out visual and detector surveyes | 900 | miles | 2 days, 2 trips per day, 25 miles per trip, 9 people |
| step out manual remove and treat surf | 1350 | miles | 3 people, 2 trips per day, 25 miles per trip, 9 people |
| step out: intrusive investigation | 900 | miles | 2 days, 2 trips per day, 25 miles per trip, 9 people |
| step out: remove and treat subsurface | 450 | miles | 1 day, 2 trips per day, 25 miles per trip, 9 people |
| MEC/MDEH Treatment | 2700 | miles | 6 days, 2 trips per day, 25 miles per trip, 9 people |
| MDAS Certification | 1650 | miles | 11 days, 2 trips per day, 25 miles per trip, 3 people |

Transportation-equipment

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Trailers | 110 | ton | 11 trailers, 10 ton per trailers, 100 miles round trip |
| Decon Water Storage Tank | 0.9 | ton | 6000 gallons capacity, HPDE, 100 miles round trip, 150 ln per 500 gal capacity tank |
| Clean Water Storage Tank | 0.6 | ton | 4000 gallons capacity HPDE, 100 miles round trip |
| Brush mowing | 7.75 | ton | 1 tractor, 250 hp, 7.75 tons per tractor |
| Chipping tree | 2.85 | ton | 1 wood chipper, 2.85 tons per woodchipper, 100 miles round trip |
| Chipping tree | 0.01 | ton | 2 chain saws, gasoline, 18" 10 lb each |
| Front End Loader, 4 CY | 20 | ton | 1 front end loader, 20 tons per loader, 100 miles round trip |
| Dozer, 200 hp | 22 | ton | 1 dozer, 22 ton per excavator, 100 miles round trip |
| Dozer, 200 hp | 22 | ton | 1 dozer, 22 ton per excavator, 100 miles round trip |
| Excavator 2.5 cy (2) | 40.00 | ton | 2 excavator, 20 ton per excavator, 100 miles round trip |
| Skid-steer, 78 hp | 4 | ton | 1 skid steer, 4 tons per skid steer, 100 miles round trip |
| Dozer, 200 hp | 22 | ton | 1 units, 22 ton per excavator, 100 miles round trip |
| Excavator 2.5 cy | 20.00 | ton | 1 excavator, 20 ton per excavator, 100 miles round trip |
| | | 6.80 | |

Transportation-materials

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Pad | 21.75 | ton | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 |
| Revegetation, soil nutrients | 2.01 | ton | Assume fertilizer, 1609 msf (thousand square feet), 3 lb of sed per 1.2 msf |

| | | | |
|---|---|---|---|
| Revegetation, hydroseed | 8 | ton | Assume fertilizer, 1609 msf (thousand square feet), 10 lb of sed per 1 msf |
| Revegetation, hydroseed | 40 | ton | Assume wood mulch, 1609 msf (thousand square feet), 50 lb of mulch per 1 msf |
| Revegetation, hydroseed | 2 | ton | Assume fertilizer, 1609 msf (thousand square feet), 2 lb per 1 msf |
| Revegetation, wetland nutrients | 0.0174 | ton | Assume fertilizer, 87 msf (thousand square feet), 1 lb of seed per 2500 sf, transportation disntance 50 miles |
| wetland soil | 600 | ton | Assume soil, 400 cy, 1.5 ton/cy, 2000 lb/ton |
| Clean Backfill | 35,556.00 | ton | 23,704 CY, 1.5 ton/cy, 2000 lb/ft |
| Stabilization Material | 1,186.67 | ton | Assume cement, 1780 ton, Assume 2/3 of 1780 to be cement |
| Stabilization Material | 593.33 | ton | Assume lime, 1780 ton, Assume 1/3 of 1780 to be lime |
| | 950.241 | | |

## Equipment Use

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Brush mowing | 326.40 | hours | 20.4 acres, mediom density area, uses a tractor, Assume 8 hours per day, 0.5 acres per day |
| Chipping tree | 326.40 | hours | 20.4 acres, mediom density area, uses a woodchipper, 130 hp, assume 8 hours per day, 0.5 acres per day |
| Chipping tree | 89.60 | hours | 20.4 acres, medium density area, uses a 2 chain saws, gasoline, 18" , assume 3 days or work, 8 hours per day, 80%efficiency |
| Front End Loader, 4 CY | 256 | hours | 1 unit, 40 days, 80% efficiency, 8 hours per day |
| Dozer, 200 hp | 256 | hours | 1 units, 40 days, 8 hours per day, 80% efficiency |
| Skid-steer, 78 hp | 256.00 | hours | 40 days, 8 hours per day, 80% of efficiency |
| Dozer, 200 hp | 384.00 | hours | 60 days, 8 hours per day, 80% efficiency |
| Excavator 2.5 cy (2) | 768.00 | hours | 60 days, 8 hours per day, 80% efficiency |
| Dozer, 200 hp (2) | 410 | hours | 1 units, 32 days, 8 hours per day, 80% efficiency |
| Excavator 2.5 cy | 204.80 | hours | 32 days, 8 hours per day, 80% efficiency |

## Residual Handling

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Water | 16.64 | ton | 4000 gallons of water, assume 8.32 pounds per gallon |
| Debris, metals | 6.05 | ton | 12,100 lb metal |
| Soil non-Hazardous | 35,556.00 | ton | |
| manual remove and treat surf MDAS | 20.56 | ton | 35 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat subsurface | 17.63 | ton | 30 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat excavation | 38.78 | ton | 66 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| | 888.9 | | |

## Transportation-residual handling

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Water | 100 | miles | 4000 gallons of water, assume 8.32 pounds per gallon |
| Debris, metals | 100 | miles | 15,100 lb metal |
| Soil non-Hazardous | 100 | miles | |
| manual remove and treat surf MDAS | 100 | miles | 35 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat subsurface | 100 | miles | 30 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat excavation | 100 | miles | 66 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

## Alternative 4c: All, Surface and Subsurface MEC Removal (no off-site disposal, no on-site treatment)

RAC

Materials

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Pad | 43,500.00 | lb | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 |
| Decon Water | 3,000.00 | gallons | |
| Revegetation, soil nutrients | 4,022.50 | lb | Assume fertilizer, 1609 msf (thousand square feet), 3 lb of sed per 1.2 msf |
| Revegetation, hydroseed | 16,090.00 | lb | Assume fertilizer, 1609 msf (thousand square feet), 10 lb of sed per 1 msf |
| Revegetation, hydroseed | 80,450.00 | lb | Assume wood mulch, 1609 msf (thousand square feet), 50 lb of mulch per 1 msf |
| Revegetation, hydroseed | 3,218.00 | lb | Assume fertilizer, 1609 msf (thousand square feet), 2 lb per 1 msf |
| Revegetation, wetland nutrients | 34.80 | lb | Assume fertilizer, 87 msf (thousand square feet), 1 lb of seed per 2500 sf, transportation disntance 50 miles |
| wetland soil | 1,200,000.00 | lb | Assume soil, 400 cy, 1.5 ton/cy, 2000 lb/ton |

Transportation-Personnel

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Transportation UXO technician (site preparation)+B59 | 1,500.00 | miles | 30 days, 2 trips per day, 25 miles per trip, 1 person |
| Site Labor (excavation, transportation and disposal) | 1,500.00 | miles | 10 days, 2 trips per day, 25 miles per trip, 3 people |
| Set up: establish grids | 800.00 | miles | 8 days, 2 trips per day, 25 miles per trip, 2 person |
| Site Set up : brush cutting | 6,000.00 | miles | 20 days, 2 trips per day, 25 miles per trip, 6 people |
| visual & detector surveyes | 9,900.00 | miles | 22 days, 2 trips per day, 25 miles per trip, 9 people |
| Manual remove and treat surf | 4,500.00 | miles | 10 days, 2 trips per day, 25 miles per trip, 9 people |
| mechanical excavation | 45,000.00 | miles | 100 days, 2 trips per day, 25 miles per trip, 9 people |
| remove and treat excavation | 7,200.00 | miles | 16 days, 2 trips per day, 25 miles per trip,9 people |
| backfilling after sifting | 600.00 | miles | 4 days, 2 trips per day, 25 miles per trip, 3 people |
| step out: brush cutting | 600.00 | miles | 2 days, 2 trips per day, 25 miles per trip, 6 people |
| step out visual and detector surveyes | 900.00 | miles | 2 days, 2 trips per day, 25 miles per trip, 9 people |
| step out manual remove and treat surf | 1,350.00 | miles | 3 people, 2 trips per day, 25 miles per trip, 9 people |
| step out: intrusive investigation | 900.00 | miles | 2 days, 2 trips per day, 25 miles per trip, 9 people |
| step out: remove and treat subsurface | 450.00 | miles | 1 day, 2 trips per day, 25 miles per trip, 9 people |
| MEC/MDEH Treatment | 2,700.00 | miles | 6 days, 2 trips per day, 25 miles per trip, 9 people |
| MDAS Certification | 1,650.00 | miles | 11 days, 2 trips per day, 25 miles per trip, 3 people |

Transportation-equipment

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Trailers | 90.00 | ton | 9 trailers, 10 ton per trailers, 100 miles round trip |
| Decon Water Storage Tank | 0.90 | ton | 6000 gallons capacity, HPDE, 100 miles round trip, 150 ln per 500 gal capacity tank |
| Clean Water Storage Tank | 0.60 | ton | 4000 gallons capacity HPDE, 100 miles round trip |
| Brush mowing | 7.75 | ton | 1 tractor, 250 hp, 7.75 tons per tractor |
| Chipping tree | 2.85 | ton | 1 wood chipper, 2.85 tons per woodchipper, 100 miles round trip |
| Chipping tree | 0.01 | ton | 2 chain saws, gasoline, 18" 10 lb each |
| Dozer, 200 hp | 44.00 | ton | 2 units, 22 ton per excavator, 100 miles round trip |
| Front End Loader, 185 hp | 20.49 | ton | 1 front end loader, 20.4 tons |

Transportation-materials

| Item | Quantity | Units | Comments |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Decon Pad | 21.75 | ton | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 |
| Revegetation, soil nutrients | 2.01 | ton | Assume fertilizer, 1609 msf (thousand square feet), 3 lb of sed per 1.2 msf |
| Revegetation, hydroseed | 8.05 | ton | Assume fertilizer, 1609 msf (thousand square feet), 10 lb of sed per 1 msf |
| Revegetation, hydroseed | 40.23 | ton | Assume wood mulch, 1609 msf (thousand square feet), 50 lb of mulch per 1 msf |
| Revegetation, hydroseed | 1.61 | ton | Assume fertilizer, 1609 msf (thousand square feet), 2 lb per 1 msf |
| Revegetation, wetland nutrients | 0.02 | ton | Assume fertilizer, 87 msf (thousand square feet), 1 lb of seed per 2500 sf, transportation disntance 50 miles |
| wetland soil | 600.00 | ton | Assume soil, 400 cy, 1.5 ton/cy, 2000 lb/ton |

**Equipment Use**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Brush mowing | 326.40 | hours | 20.4 acres, mediom density area, uses a tractor, Assume 8 hours per day, 0.5 acres per day |
| Chipping tree | 326.40 | hours | 20.4 acres, mediom density area, uses a woodchipper, 130 hp, assume 8 hours per day, 0.5 acres per day |
| Chipping tree | 89.60 | hours | 20.4 acres, medium density area, uses a 2 chain saws, gasoline, 18" , assume 7 days or work, 8 hours per day, 80%efficiency |
| Dozer, 200 hp | 256.00 | hours | 2 units, 20 days, 8 hours per day, 80% efficiency |
| Front End Loader, 185 hp | 64.00 | hours | 10 days, 8 hours per day, 80% efficiency |

**Residual Handling**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Water | 12.48 | ton | 3000 gallons of water, assume 8.32 pounds per gallon |
| Debris, metals | 5.60 | ton | 11.200 lb metal |
| manual remove and treat surf MDAS | 20.56 | ton | 35 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat subsurface | 17.63 | ton | 30 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat excavation | 38.78 | ton | 66 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

**Transportation-residual handling**

| Item | Quantity | Units | Comments |
|---|---|---|---|
| Decon Water | 100.00 | miles | 4000 gallons of water, assume 8.32 pounds per gallon |
| Debris, metals | 100.00 | miles | 15,100 lb metal |
| manual remove and treat surf MDAS | 100.00 | miles | 35 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat subsurface | 100.00 | miles | 30 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |
| Remove and treat excavation | 100.00 | miles | 66 drums, filled with metal, 55 gallons per drum, assume 2560 kg/m3 of light alloy based on Al |

## APPENDIX B3: RESULTS

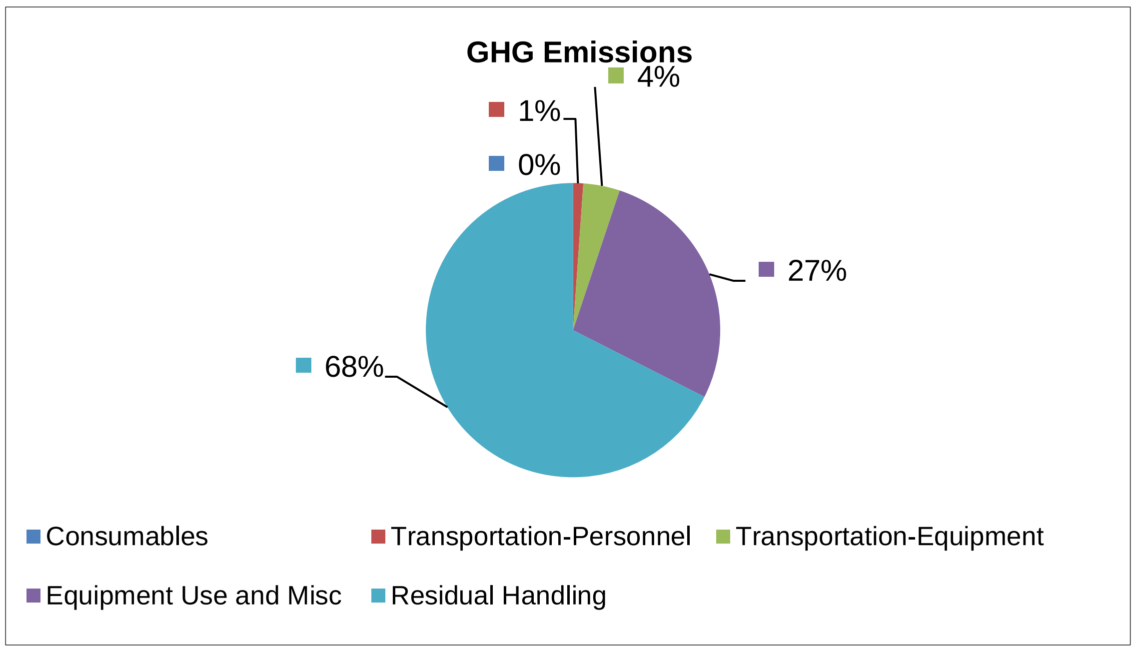
## Sustainable Remediation - Environmental Footprint Summary 2a

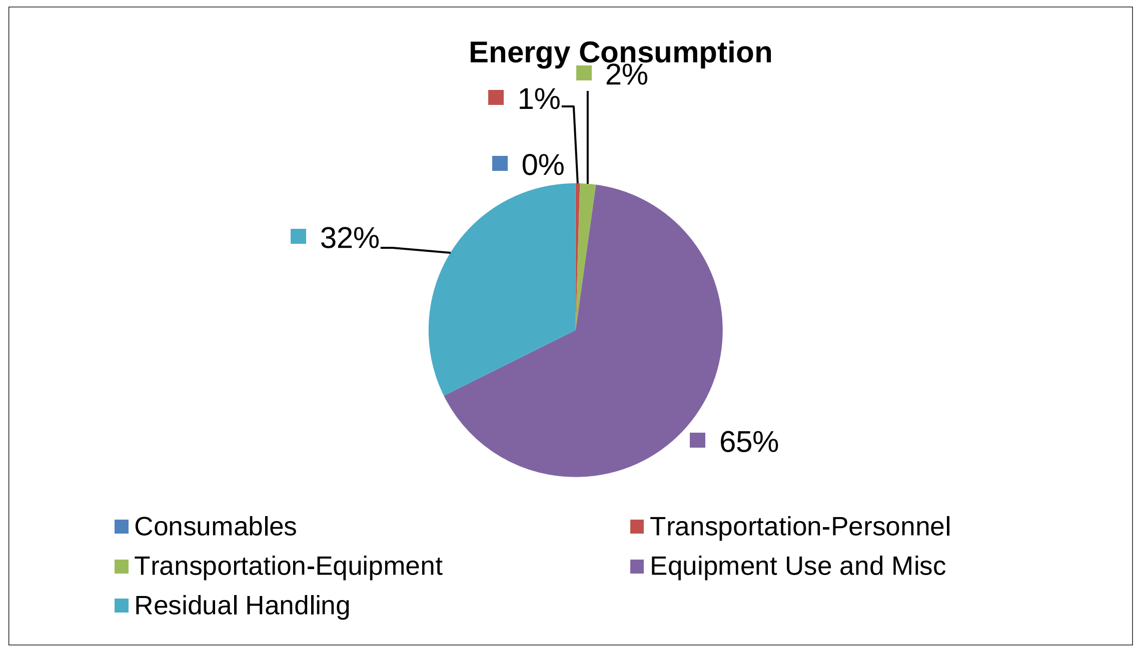
| Phase | Activities | GHG Emissions (metric ton) | Total energy Used (MMBTU) | Water Consumption (gallons) | NOx emissions (metric ton) | SOx Emissions (metric ton) | PM10 Emissions (metric ton) | Accident Risk Fatality | Accident Risk Injury |
|---|---|---|---|---|---|---|---|---|---|
| Remedial Investigation | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Sub-Total | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Remedial Action Construction | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 11.59 | 1.5E+02 | NA | 4.3E-03 | 1.5E-04 | 8.7E-04 | 2.4E-04 | 1.9E-02 |
| | Transportation-Equipment | 41.74 | 5.4E+02 | NA | 1.3E-02 | 2.3E-04 | 1.2E-03 | 1.0E-04 | 8.3E-03 |
| | Equipment Use and Misc | 283.97 | 2.1E+04 | 3.0E+03 | 3.9E-01 | 1.3E-01 | 3.9E-02 | 6.0E-05 | 1.5E-02 |
| | Residual Handling | 701.13 | 1.0E+04 | NA | 8.8E-01 | 3.8E-01 | 2.0E+00 | 1.4E-03 | 1.1E-01 |
| | Sub-Total | 1,038.42 | 3.14E+04 | 3.02E+03 | 1.29E+00 | 5.09E-01 | 2.06E+00 | 1.83E-03 | 1.57E-01 |
| Remedial Action Operations | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Sub-Total | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Longterm Monitoring | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 4.00 | 5.0E+01 | NA | 1.5E-03 | 5.2E-05 | 3.0E-04 | 8.2E-05 | 6.6E-03 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.15 | 1.9E+00 | NA | 4.6E-05 | 8.2E-07 | 4.1E-06 | 7.8E-07 | 6.3E-05 |
| | Sub-Total | 4.15 | 5.23E+01 | 0.00E+00 | 1.53E-03 | 5.30E-05 | 3.04E-04 | 8.27E-05 | 6.65E-03 |
| **Total** | | **1.0E+03** | **3.1E+04** | **3.0E+03** | **1.3E+00** | **5.1E-01** | **2.1E+00** | **1.9E-03** | **1.6E-01** |

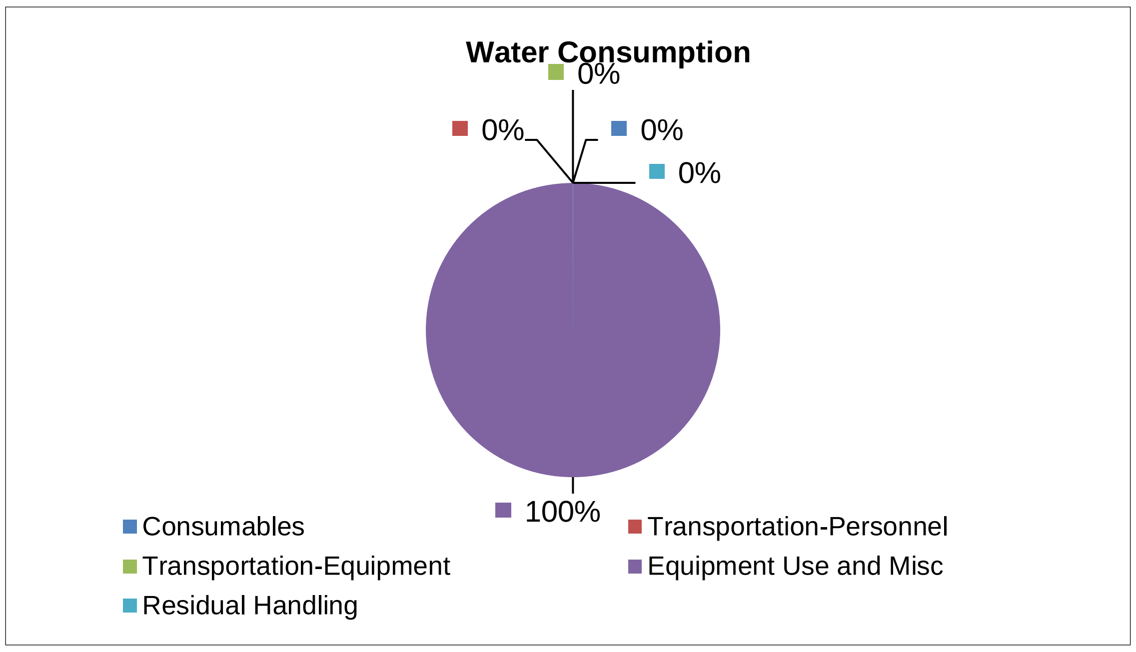
| Remedial Alternative Phase | Non-Hazardous Waste Landfill Space (tons) | Hazardous Waste Landfill Space (tons) | Topsoil Consumption (cubic yards) | Costing ($) | Lost Hours - Injury |
|---|---|---|---|---|---|
| **Remedial Investigation** | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 | 0.0E+00 |
| **Remedial Action Construction** | 6.3E+01 | 1.0E+04 | 6.7E+03 | 0 | 1.3E+00 |
| **Remedial Action Operations** | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 | 0.0E+00 |
| **Longterm Monitoring** | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 | 5.3E-02 |
| **Total** | **6.3E+01** | **1.0E+04** | **6.7E+03** | **$0** | **1.3E+00** |

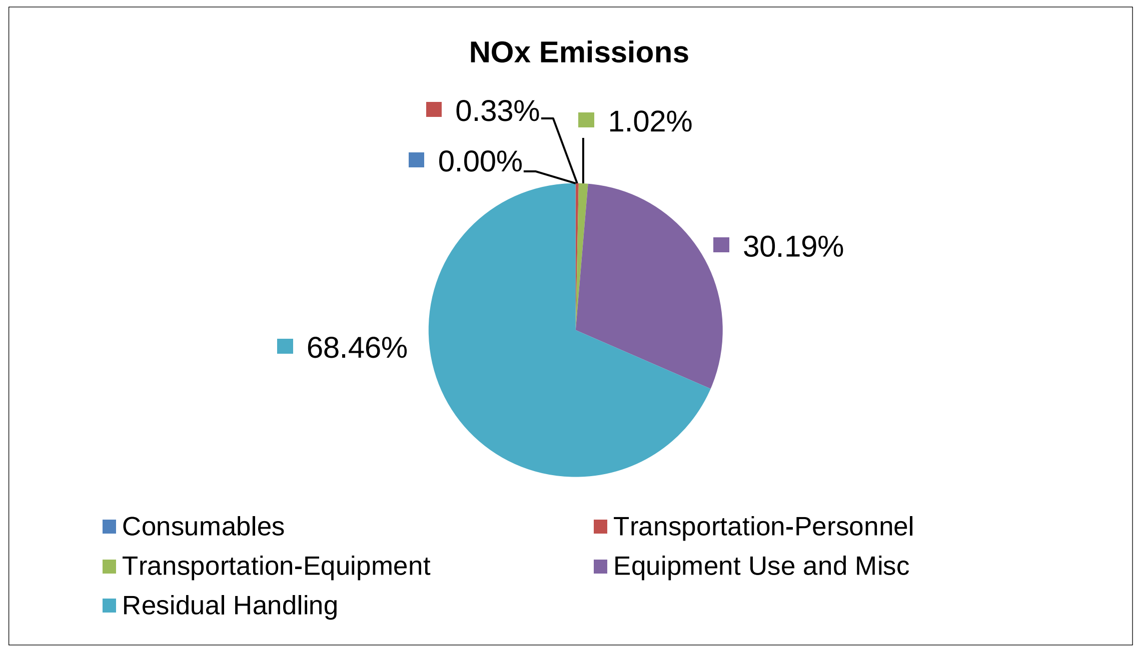
| Total Cost with Footprint Reduction |
|---|
| **$0** |

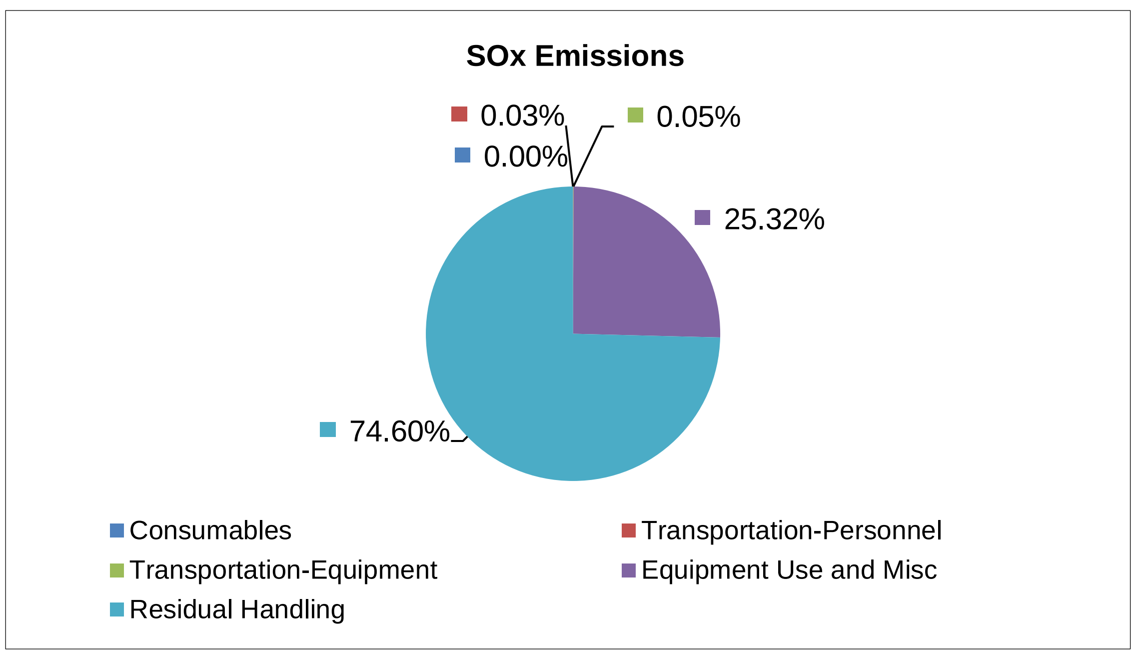
SiteWise™ Results Alternative 2a
Remedial Action Construction Stage
OU5 Site 15, NAS Cecil Field
Jacksonville, FL

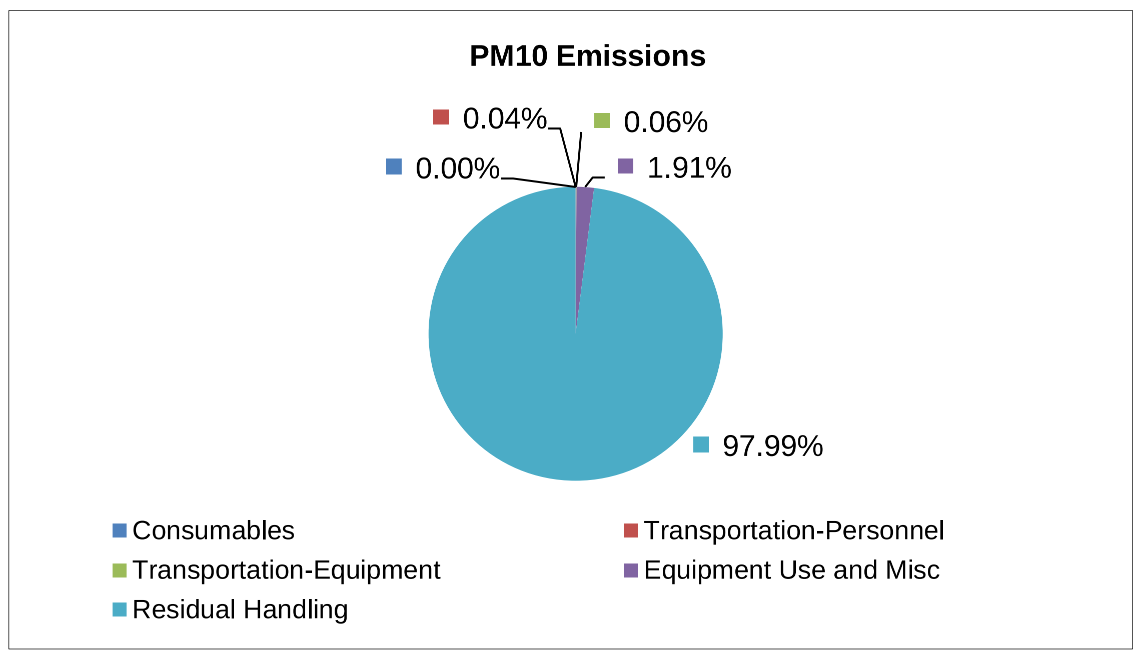



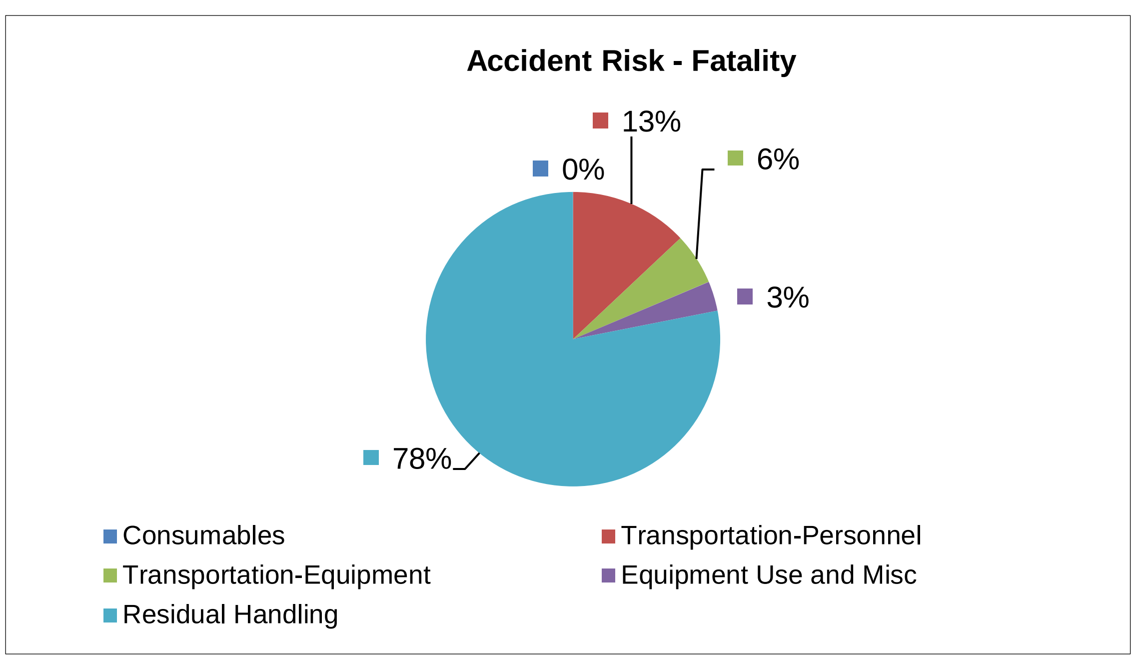



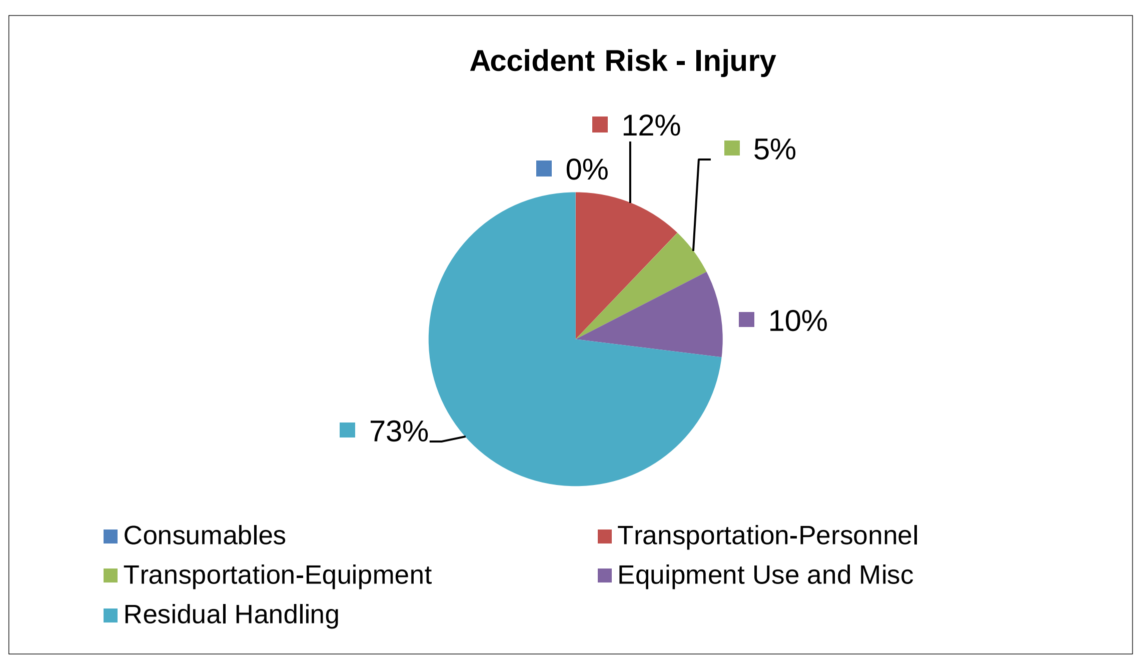



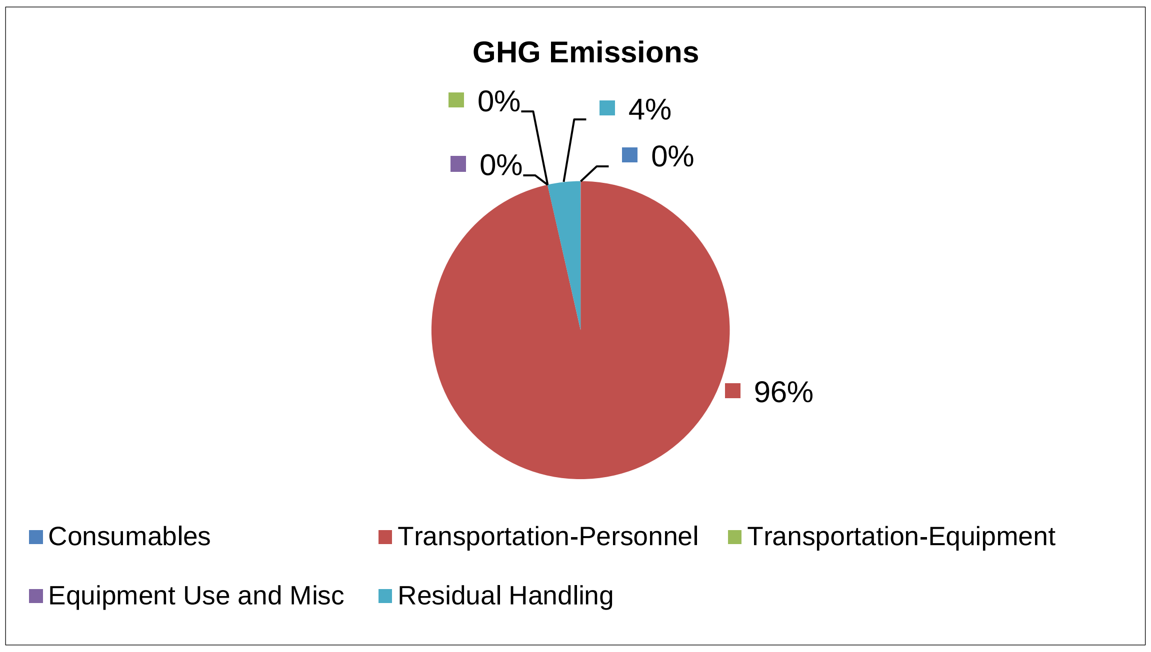



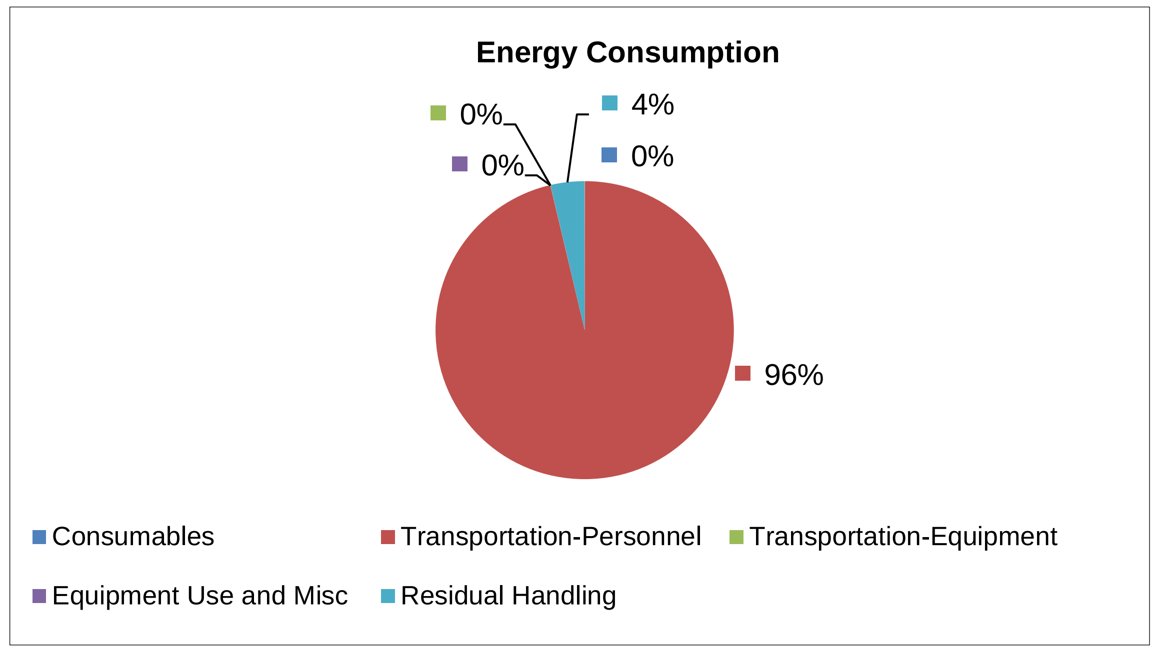



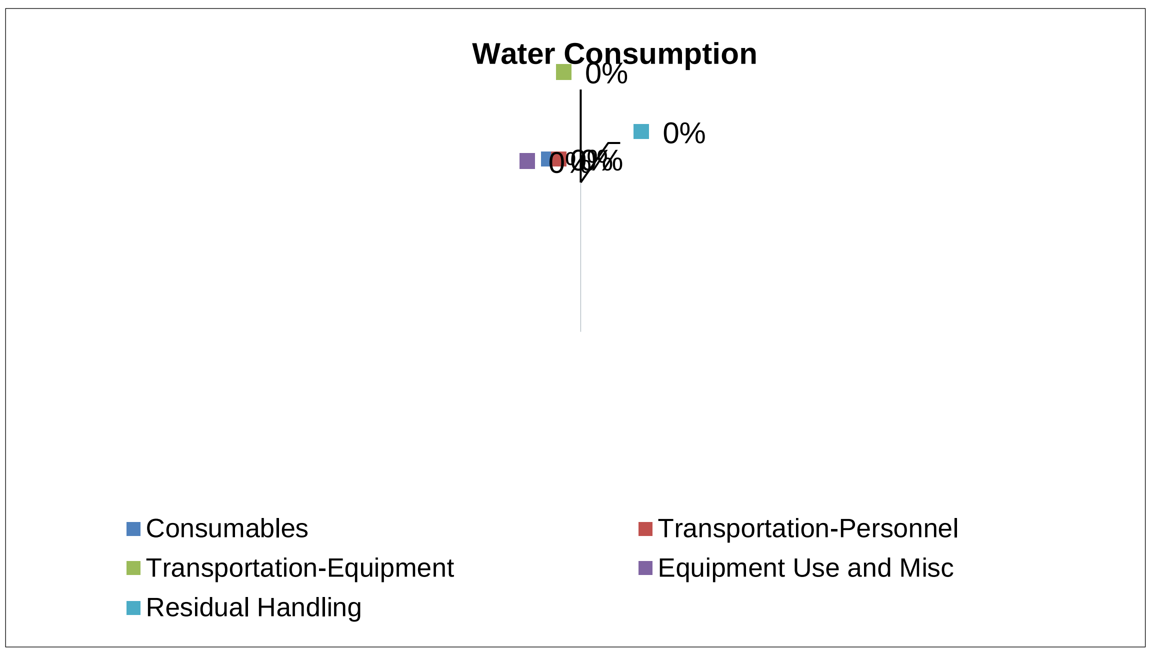



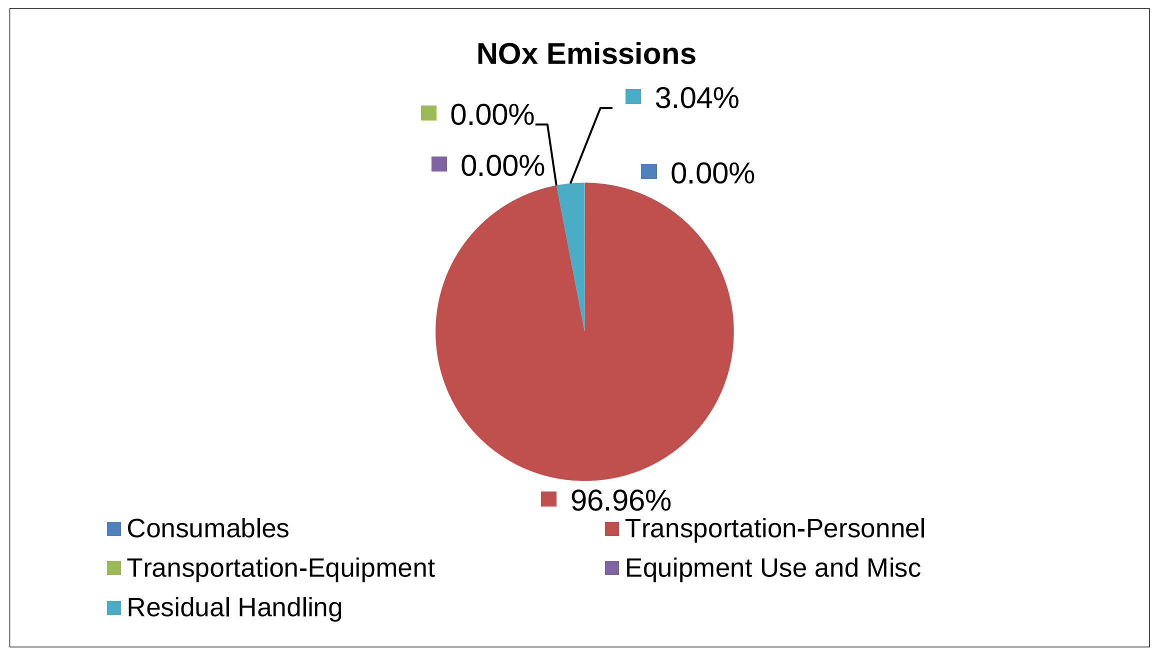



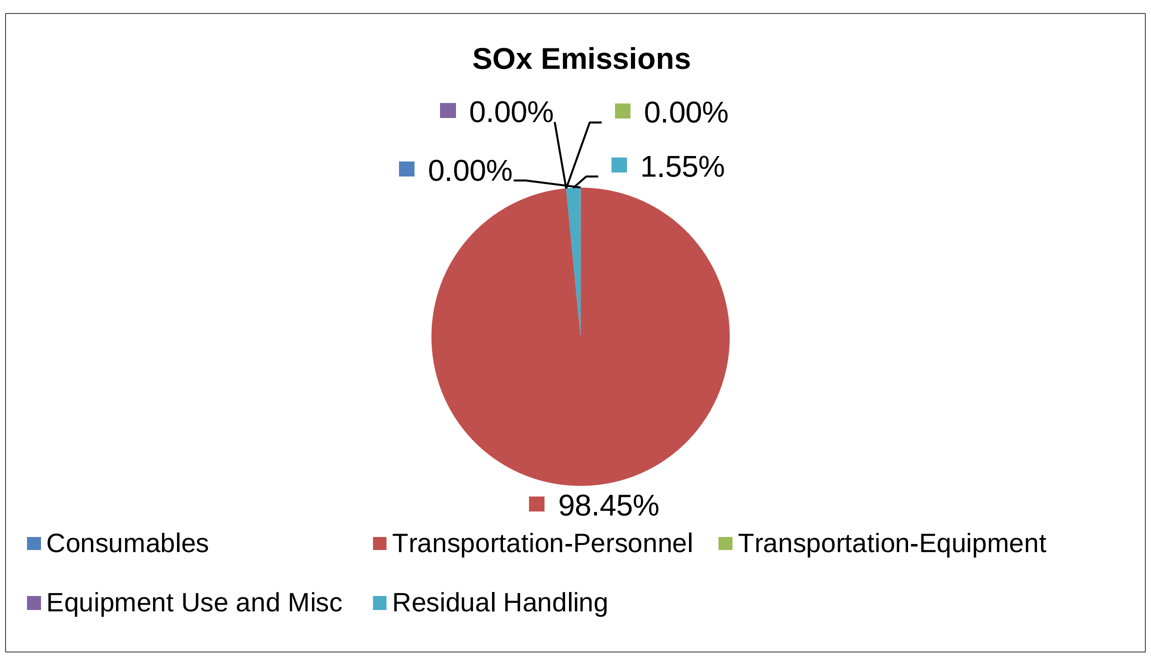
SiteWise™ Results Alternative 2a
Remedial Action Construction Stage
OU5 Site 15, NAS Cecil Field
Jacksonville, FL

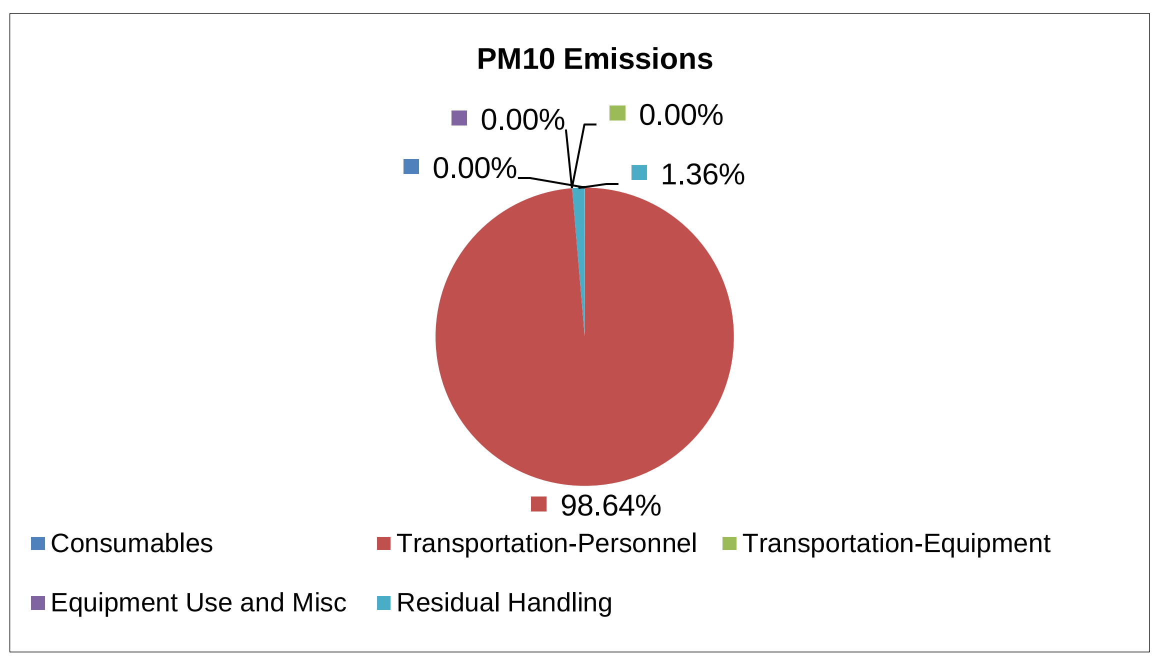



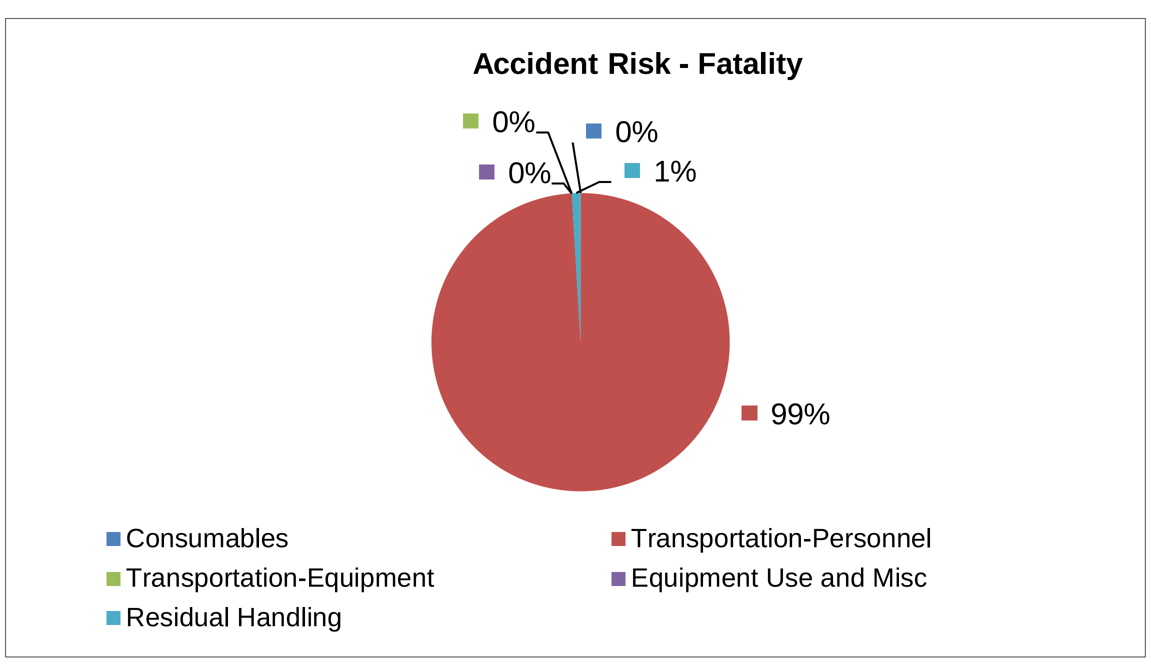



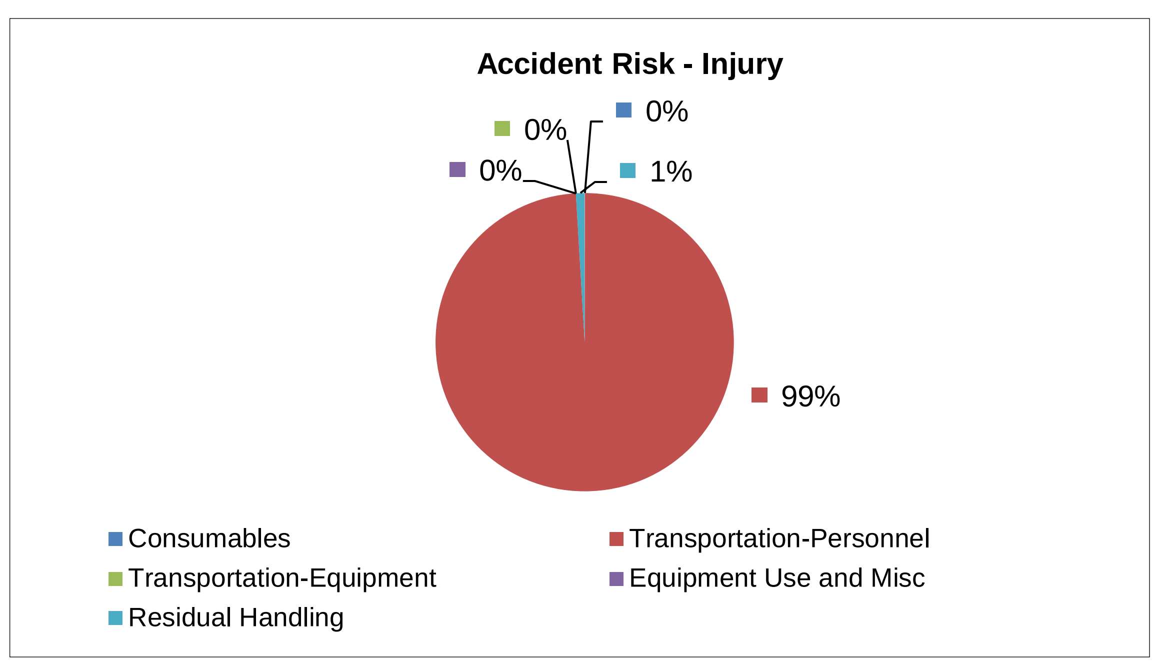



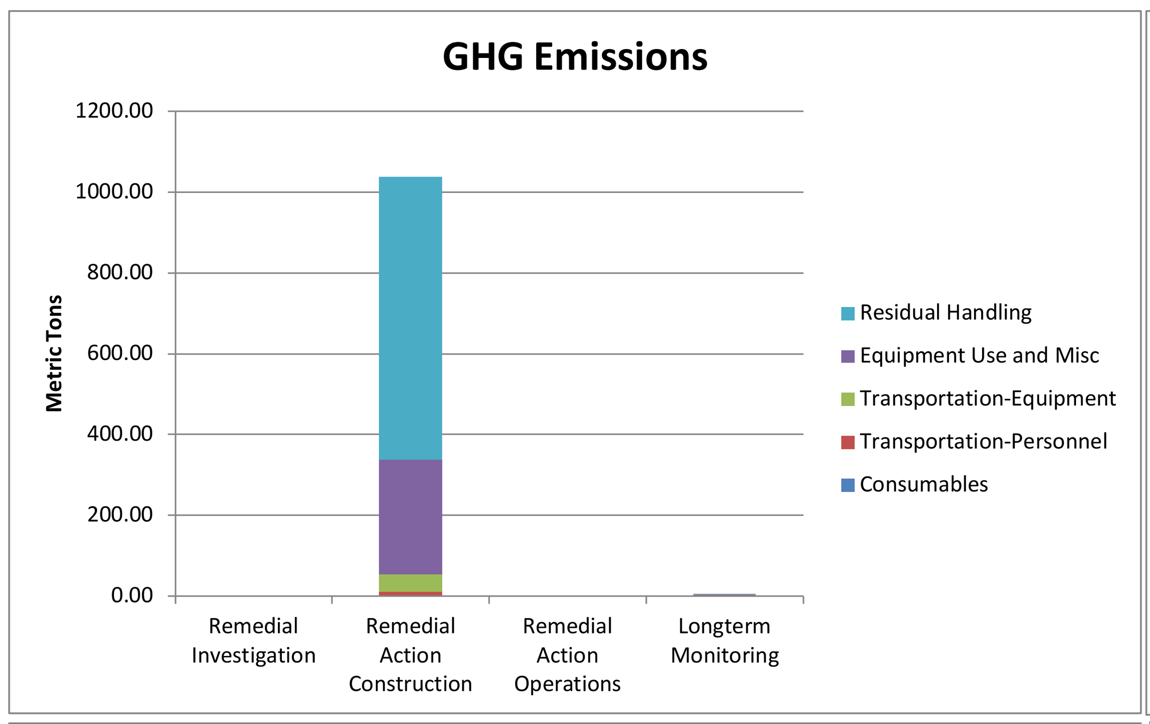



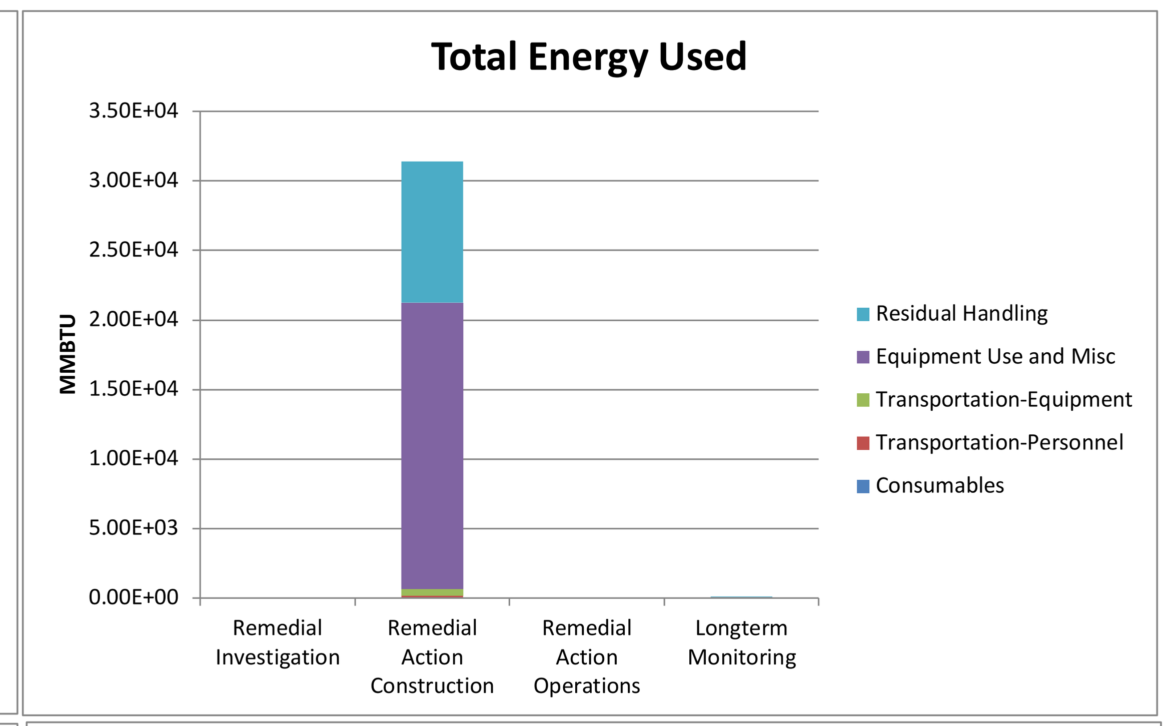



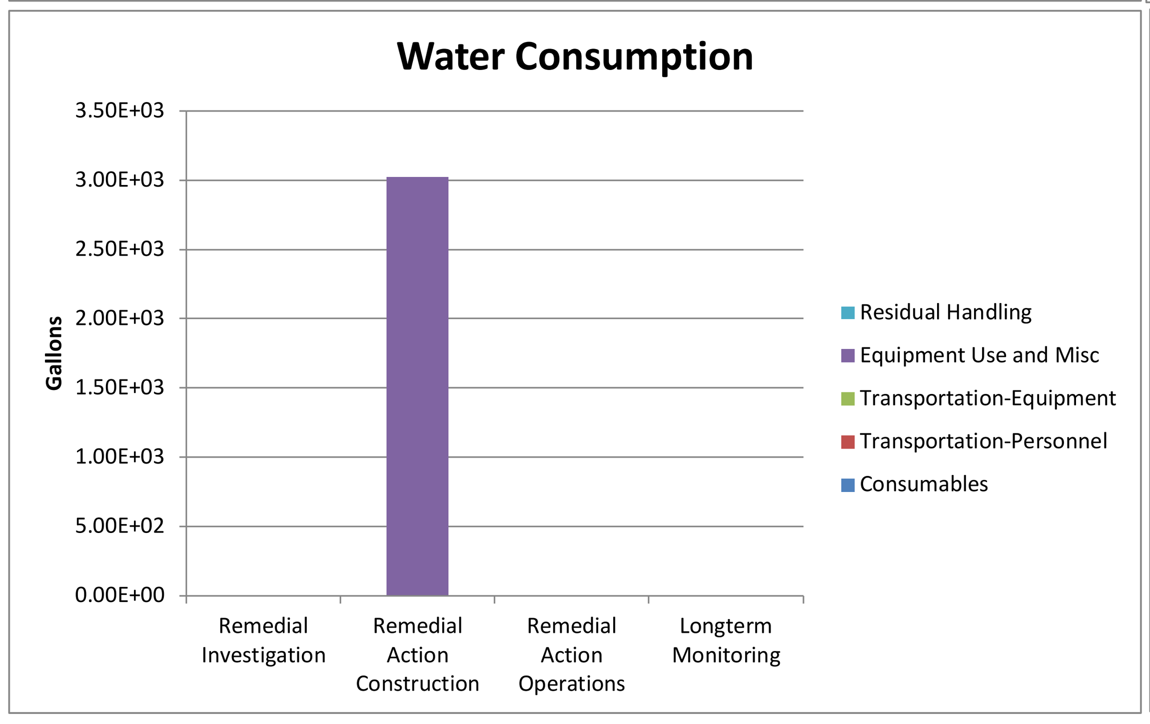



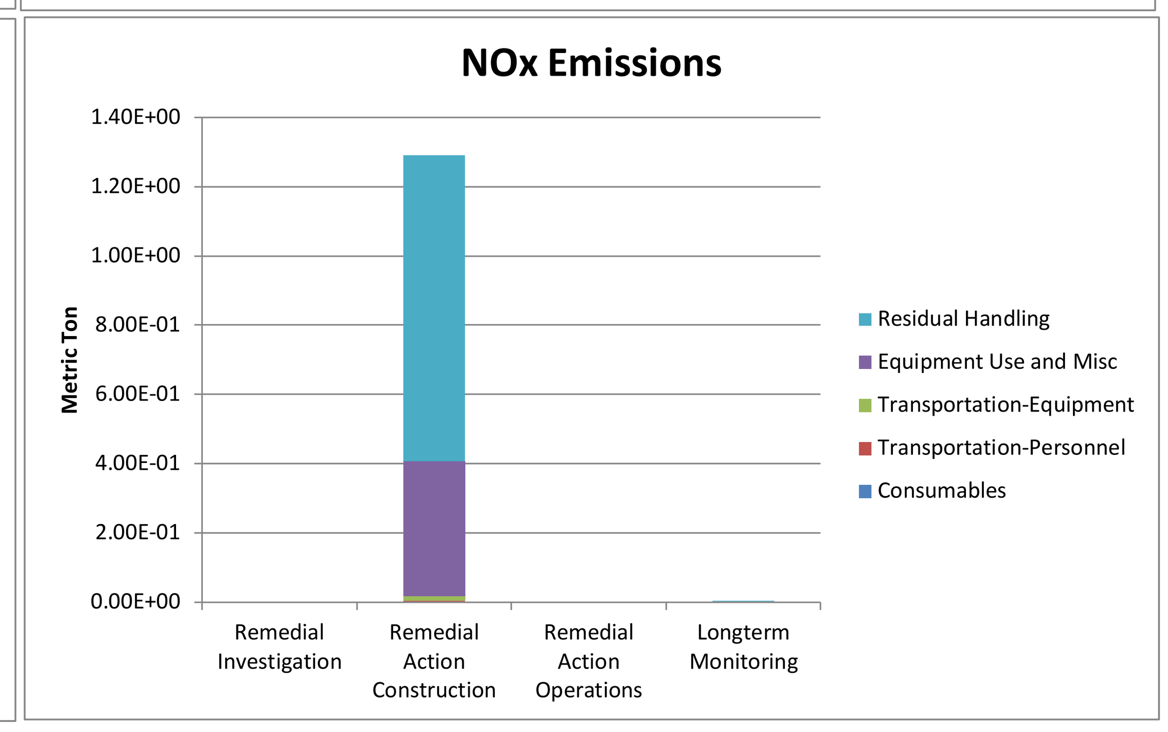



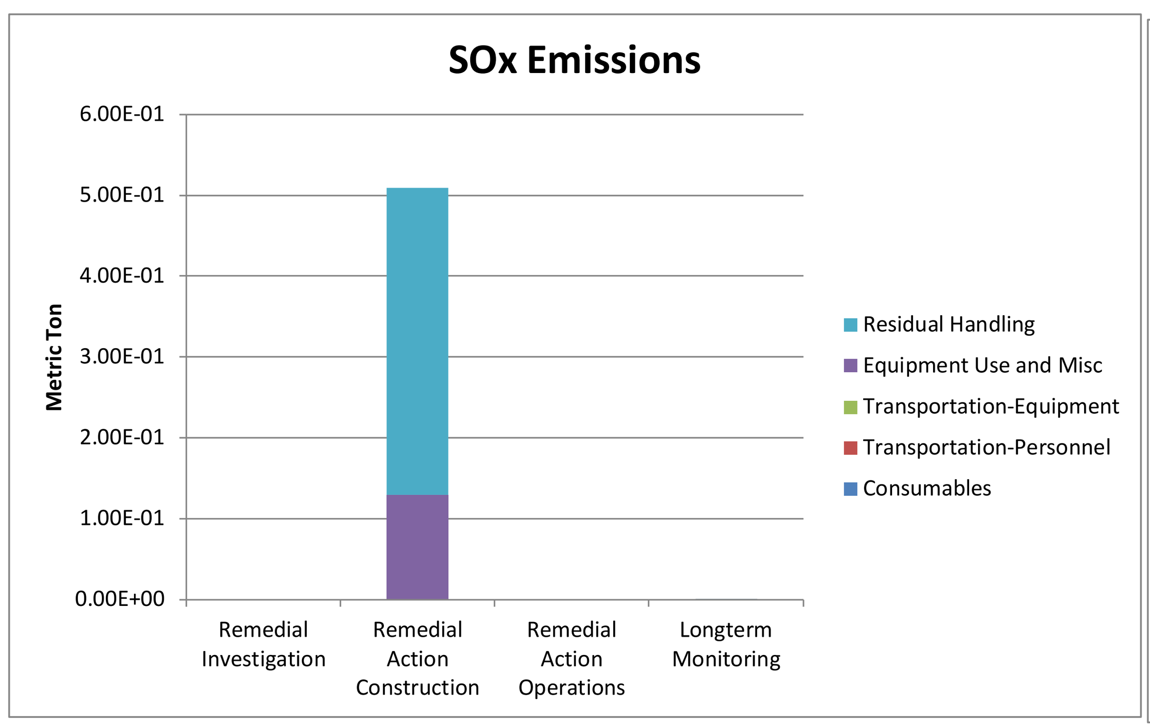



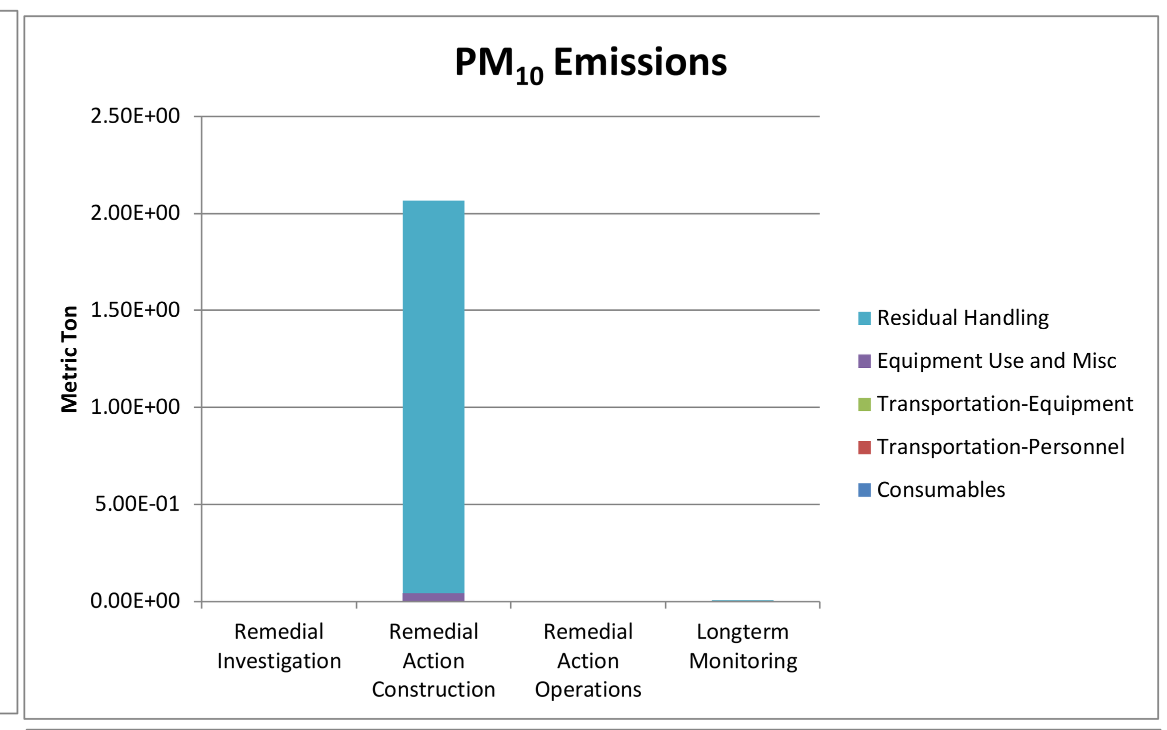

GHG Emissions
Metric Tons
1200.00
1000.00
800.00
600.00
400.00
200.00
0.00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

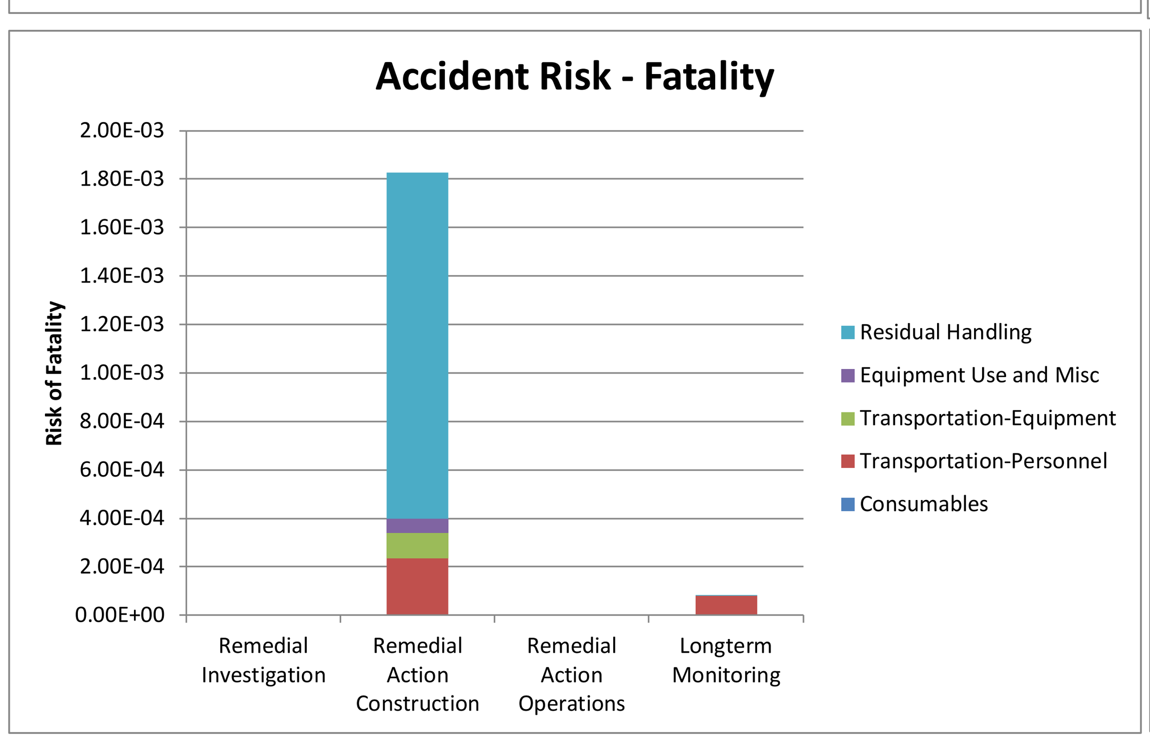

Total Energy Used
MMBTU
3.50E+04
3.00E+04
2.50E+04
2.00E+04
1.50E+04
1.00E+04
5.00E+03
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

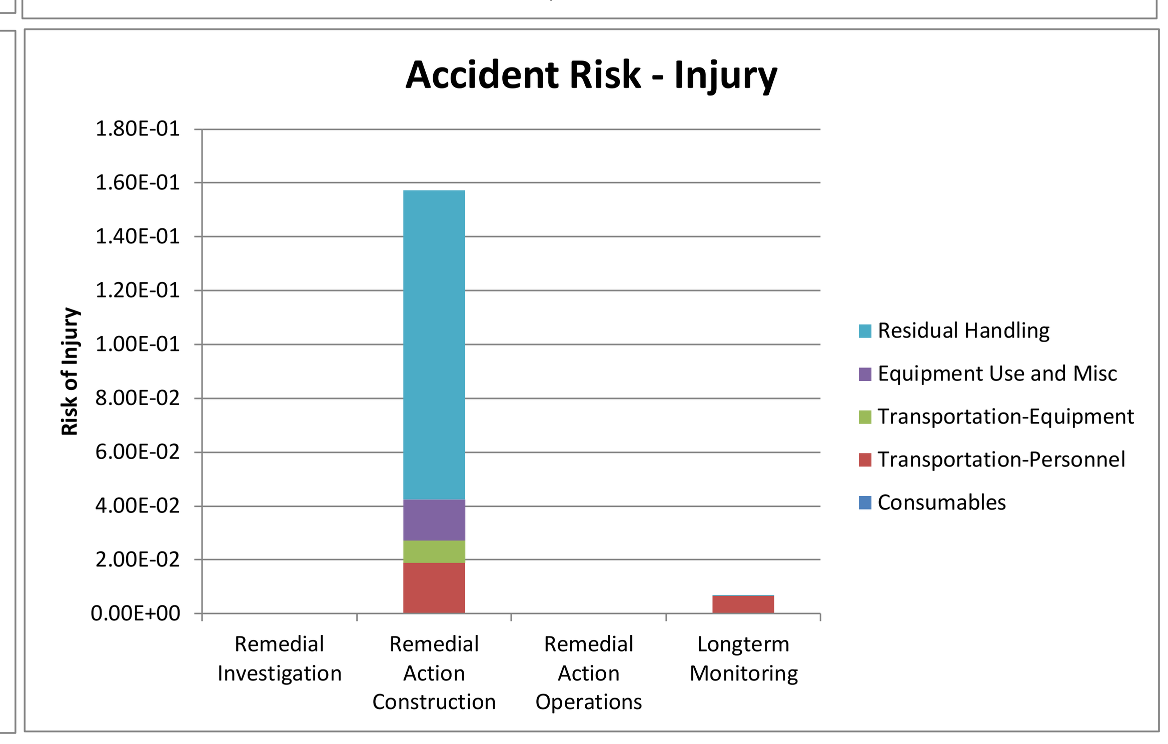

Water Consumption
Gallons
3.50E+03
3.00E+03
2.50E+03
2.00E+03
1.50E+03
1.00E+03
5.00E+02
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

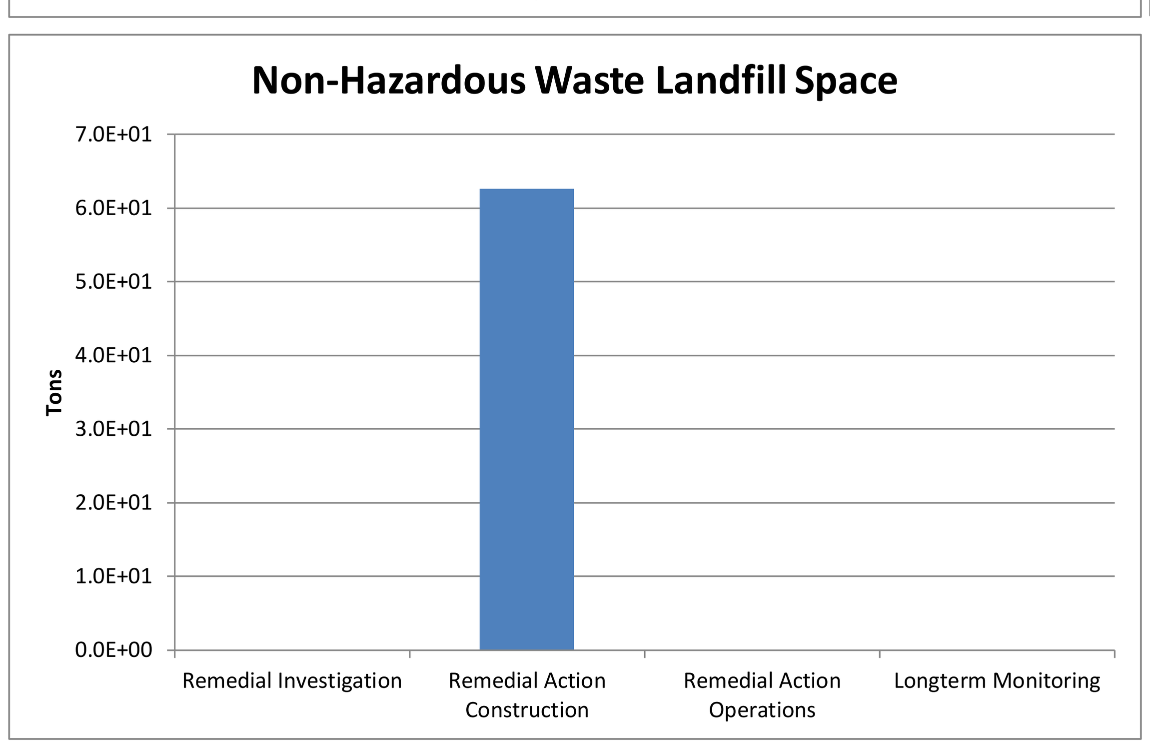

NOx Emissions
Metric Ton
1.40E+00
1.20E+00
1.00E+00
8.00E-01
6.00E-01
4.00E-01
2.00E-01
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

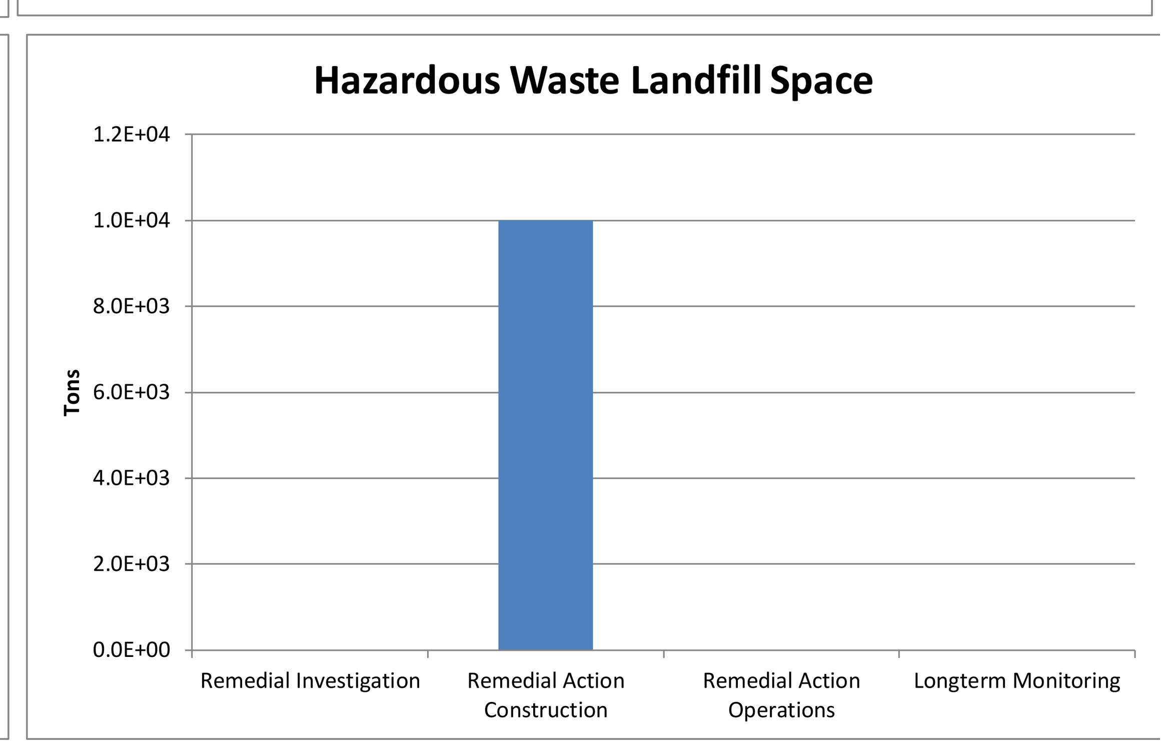

SOx Emissions
Metric Ton
6.00E-01
5.00E-01
4.00E-01
3.00E-01
2.00E-01
1.00E-01
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

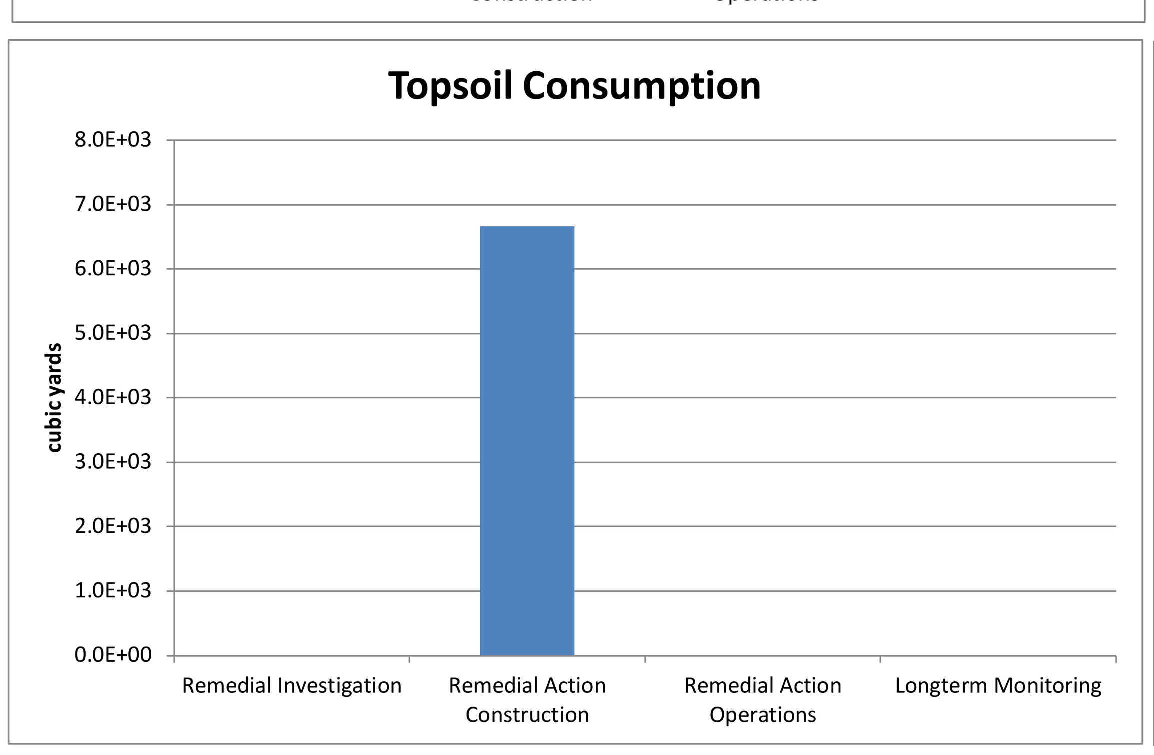

$PM_{10}$ Emissions
Metric Ton
2.50E+00
2.00E+00
1.50E+00
1.00E+00
5.00E-01
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

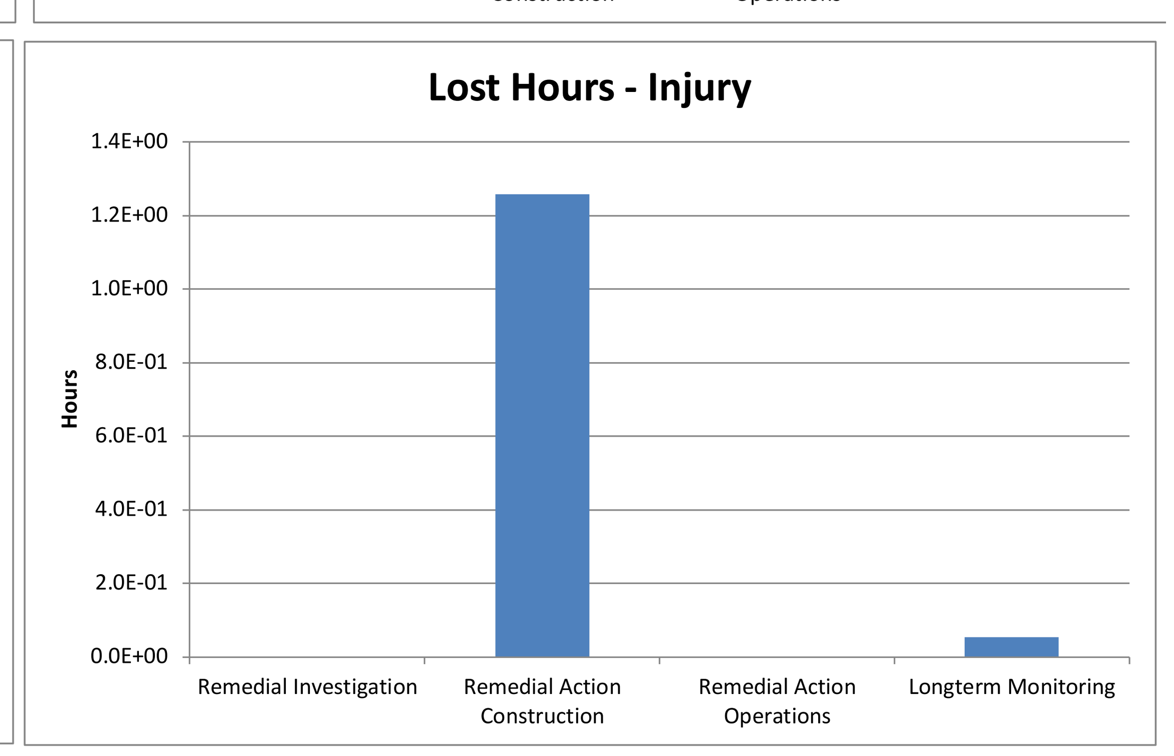

Accident Risk - Fatality
Risk of Fatality
2.00E-03
1.80E-03
1.60E-03
1.40E-03
1.20E-03
1.00E-03
8.00E-04
6.00E-04
4.00E-04
2.00E-04
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables


Accident Risk - Injury
Risk of Injury
1.80E-01
1.60E-01
1.40E-01
1.20E-01
1.00E-01
8.00E-02
6.00E-02
4.00E-02
2.00E-02
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables


Non-Hazardous Waste Landfill Space
Tons
7.0E+01
6.0E+01
5.0E+01
4.0E+01
3.0E+01
2.0E+01
1.0E+01
0.0E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring


Hazardous Waste Landfill Space
Tons
1.2E+04
1.0E+04
8.0E+03
6.0E+03
4.0E+03
2.0E+03
0.0E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring


Topsoil Consumption
cubic yards
8.0E+03
7.0E+03
6.0E+03
5.0E+03
4.0E+03
3.0E+03
2.0E+03
1.0E+03
0.0E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring


Lost Hours - Injury
Hours
1.4E+00
1.2E+00
1.0E+00
8.0E-01
6.0E-01
4.0E-01
2.0E-01
0.0E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring

GSRx Results Alternative 2a
OU5 Site 15, NAS Cecil Field
Jacksonville, FL


| | Technology Module / Phase | Module Components | Comments / Assumptions | Quantity | (Units) | Greenhouse Gas Emissions | | | | Criteria Pollutant Emission | | | Energy Consumption | Water Consumption |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $CO_{2\ equiv}$ | $CO_2$ | $N_20$ | $CH_4$ | $NO_x$ | $SO_x$ | $PM_{10}$ | | |
| **Stage** | **Materials** | | | | | | **Tonnes** | | | | | | **MWhr** | **gal x 1000** |
| RAC | Decon Pad | General Concrete | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 | 43,500.0 | lbs | 2.56 | 2.56 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 25.31 | 0.00 |
| RAC | Clean backfill | Soil | Assume Soil, 6667 cy, 1.5 ton/cy, 2000 lb/ton | 20,001,000.0 | lbs | 208.63 | 208.63 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5513.22 | 0.00 |
| RAC | Revegetation, soil nutrients | Fertilizer | Assume fertilizer, 309 msf (thousand square feet), 3 lb of sed per 1.2 msf | 772.5 | lbs | 0.96 | 0.96 | 1.27E-09 | 0.00E+00 | 0.00E+00 | 3.50E-04 | 7.04E-07 | 17.46 | 0.35 |
| RAC | Revegetation, hydroseed | Fertilizer | Assume fertilizer, 309 msf (thousand square feet), 10 lb of sed per 1 msf | 3,090.0 | lbs | 3.85 | 3.85 | 5.07E-09 | 0.00E+00 | 0.00E+00 | 1.40E-03 | 2.82E-06 | 69.84 | 1.40 |
| RAC | Revegetation, hydroseed | Mulch | Assume wood mulch, 309 msf (thousand square feet), 50 lb of mulch per 1 msf | 15,450.0 | lbs | 4.88 | 1.71 | 9.88E-03 | 5.26E-03 | 2.91E-06 | 1.67E-02 | 1.26E-03 | 55.27 | 0.00 |
| RAC | Revegetation, hydroseed | Fertilizer | Assume fertilizer, 309 msf (thousand square feet), 2 lb per 1 msf | 618.0 | lbs | 0.77 | 0.77 | 1.01E-09 | 0.00E+00 | 0.00E+00 | 2.80E-04 | 5.63E-07 | 13.97 | 0.28 |
| | **Subtotal** | | | | | **221.66** | **218.49** | **0.01** | **0.01** | **0.00** | **0.02** | **0.00** | **5695.07** | **2.02** |
| **Stage** | **Construction Equipment** | | | | | | **Tonnes** | | | | | | **MWhr** | **gal x 1000** |
| RAC | Brush mowing | Tractor, 250 hp, diesel | 1.2 acres, medium density area, uses a tractor, Assume 8 hours per day, 0.5 acres per day | 19.20 | hrs | 1.43 | 1.43 | 0.00E+00 | 0.00E+00 | 1.20E-02 | 0.00E+00 | 9.06E-04 | 5.16 | |
| RAC | Chipping tree | WOOD CHIPPER | 1.2 acres, medium density area, uses a woodchipper, 130 hp, assume 8 hours per day, 0.5 acres per day | 19.20 | hrs | 0.84 | 0.84 | 0.00E+00 | 0.00E+00 | 6.56E-03 | 0.00E+00 | 5.54E-04 | 3.67 | |
| RAC | Chipping tree | Chainsaw, gasoline, 3<hp<=6, 2 stroke | 1.2 acres, medium density area, uses a 2 chain saws, gasoline, 18" , assume 3 days or work, 8 hours per day, 80% efficiency | 38.40 | hrs | 0.07 | 0.07 | 0.00E+00 | 0.00E+00 | 1.39E-04 | 0.00E+00 | 1.03E-03 | 0.36 | |
| RAC | Dozer, 200 hp | Dozer, 200 HP (D7) w/U Blade (diesel) | 20 days, 8 hours per day, 80% efficiency | 128.00 | hrs | 14.06 | 14.06 | 0.00 | 0.00 | 8.64E-02 | 2.54E-02 | 8.55E-03 | 86.04 | |
| RAC | Excavator 2.5 CY | Excavator, Hydraulic, 2 CY (diesel) | 2 units, 20 days, 8 hours per day, 80%efficiency | 256.00 | hrs | 24.81 | 24.81 | 0.00 | 0.00 | 1.56E-01 | 4.60E-02 | 1.48E-02 | 112.63 | |
| RAC | Dozer, 200 hp | Dozer, 200 HP (D7) w/U Blade (diesel) | 2 units, 10 days, 8 hours per day, 80% efficiency | 128.00 | hrs | 14.06 | 14.06 | 0.00 | 0.00 | 8.64E-02 | 2.54E-02 | 8.55E-03 | 86.04 | |
| RAC | Excavator 2.5 CY | Excavator, Hydraulic, 2 CY (diesel) | 10 days, 8 hours per day, 80%efficiency | 64.00 | hrs | 6.20 | 6.20 | 0.00 | 0.00 | 3.90E-02 | 1.15E-02 | 3.71E-03 | 28.16 | |
| | **Subtotal** | | | | | **61.48** | **61.48** | **0.00** | **0.00** | **0.39** | **0.11** | **0.04** | **322.05** | **0** |
| | | | | **Total** | | **283** | **280** | **0.01** | **0.01** | **0.39** | **0.13** | **0.04** | **6,017** | **2** |

**Alternative 1**
**Values Input into SiteWise as "Other"**

| Module | Greenhouse Gas Emissions | | | | Criteria Pollutant Emission | | | Energy Consumption | Water Consumption |
|---|---|---|---|---|---|---|---|---|---|
| | $CO_{2\ equiv}$ | $CO_2$ | $N_20$ (CO2e) | $CH_4$ (CO2e) | $NO_x$ | $SO_x$ | $PM_{10}$ | | |
| | | **Tonnes** | | | | | | **MMBTU** | **gal** |
| RI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| RAC | 283.143 | 279.970 | 3.063 | 0.110 | 0.387 | 0.127 | 0.039 | 20530.414 | 2023.920 |
| RAO | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LTM | 0.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Note: 1 MWhr = 3412141.4799 BTU, 1MMTBU = 10^6 BTU

## Sustainable Remediation - Environmental Footprint Summary 2b

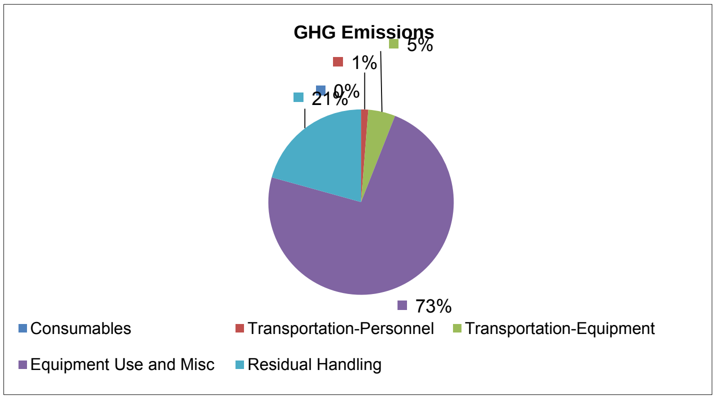
™

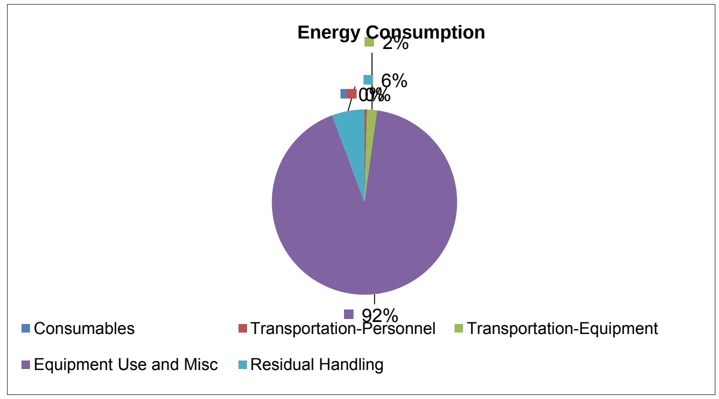
| Phase | Activities | GHG Emissions (metric ton) | Total energy Used (MMBTU) | Water Consumption (gallons) | NOx emissions (metric ton) | SOx Emissions (metric ton) | PM10 Emissions (metric ton) | Accident Risk Fatality | Accident Risk Injury |
|---|---|---|---|---|---|---|---|---|---|
| Remedial Investigation | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Sub-Total | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Remedial Action Construction | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 11.59 | 1.5E+02 | NA | 4.3E-03 | 1.5E-04 | 8.7E-04 | 2.4E-04 | 1.9E-02 |
| | Transportation-Equipment | 43.79 | 5.7E+02 | NA | 1.4E-02 | 2.4E-04 | 1.2E-03 | 1.1E-04 | 8.7E-03 |
| | Equipment Use and Misc | 679.23 | 3.0E+04 | 4.0E+03 | 8.9E-02 | 1.4E-01 | 8.3E-02 | 6.9E-05 | 1.7E-02 |
| | Residual Handling | 191.71 | 1.9E+03 | NA | 6.6E-01 | 3.4E-01 | 1.8E+00 | 2.0E-04 | 1.6E-02 |
| | Sub-Total | 926.31 | 3.30E+04 | 4.02E+03 | 7.71E-01 | 4.83E-01 | 1.91E+00 | 6.12E-04 | 6.10E-02 |
| Remedial Action Operations | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Sub-Total | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Longterm Monitoring | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 4.00 | 5.0E+01 | NA | 1.5E-03 | 5.2E-05 | 3.0E-04 | 8.2E-05 | 6.6E-03 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.15 | 1.9E+00 | NA | 4.6E-05 | 8.2E-07 | 4.1E-06 | 7.8E-07 | 6.3E-05 |
| | Sub-Total | 4.15 | 5.23E+01 | 0.00E+00 | 1.53E-03 | 5.30E-05 | 3.04E-04 | 8.27E-05 | 6.65E-03 |
| **Total** | | **9.3E+02** | **3.3E+04** | **4.0E+03** | **7.7E-01** | **4.8E-01** | **1.9E+00** | **6.9E-04** | **6.8E-02** |

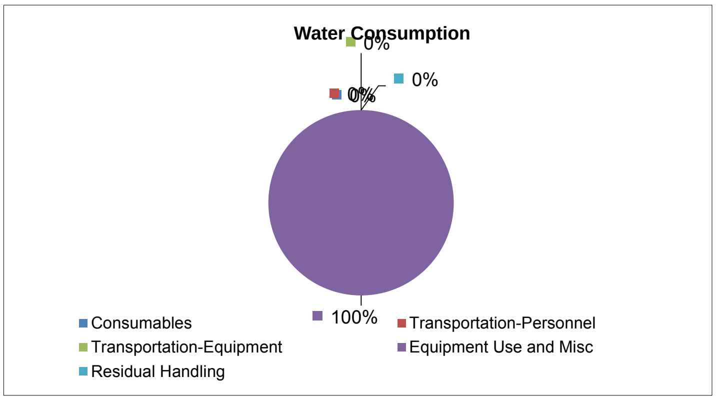
| Remedial Alternative Phase | Non-Hazardous Waste Landfill Space (tons) | Hazardous Waste Landfill Space (tons) | Topsoil Consumption (cubic yards) | Costing ($) | Lost Hours - Injury |
|---|---|---|---|---|---|
| Remedial Investigation | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 | 0.0E+00 |
| Remedial Action Construction | 1.0E+04 | 0.0E+00 | 0.0E+00 | 0 | 4.9E-01 |
| Remedial Action Operations | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 | 0.0E+00 |
| Longterm Monitoring | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 | 5.3E-02 |
| **Total** | **1.0E+04** | **0.0E+00** | **0.0E+00** | **$0** | **5.4E-01** |

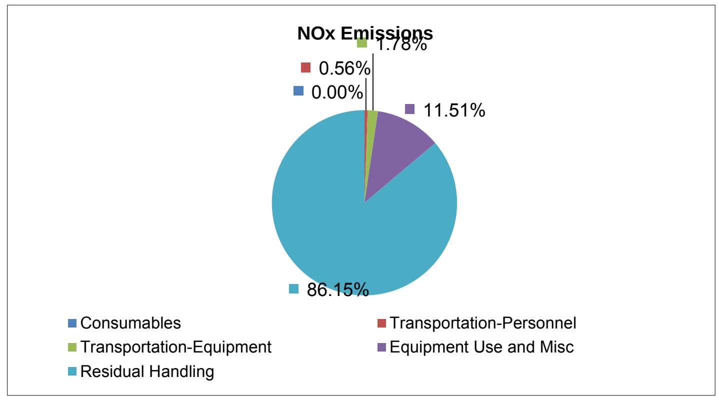
| Total Cost with Footprint Reduction |
|---|
| **$0** |

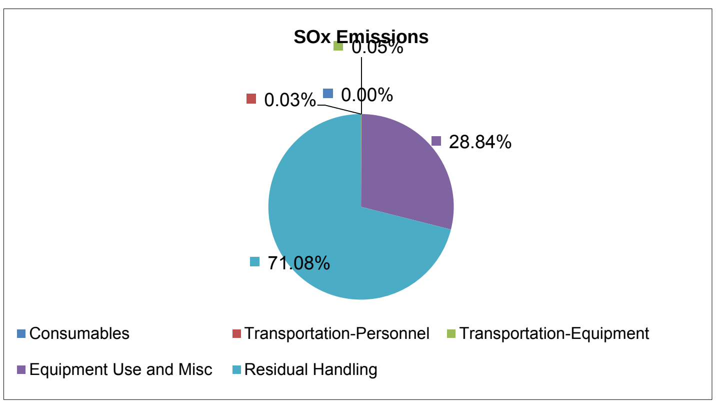
SiteWise™ Results Alternative 2b
Remedial Action Construction Stage
Site, Place
Place, State

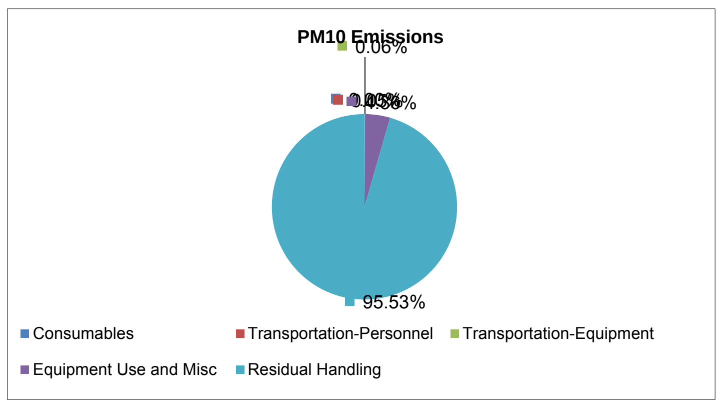



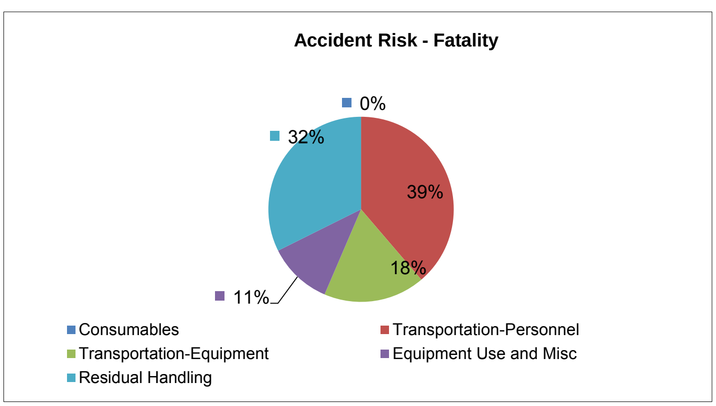



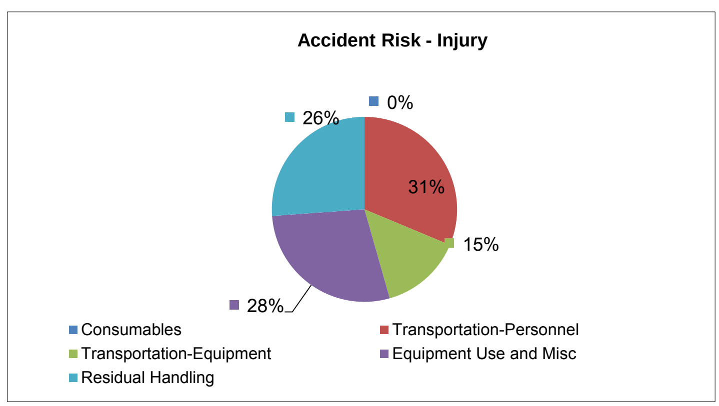



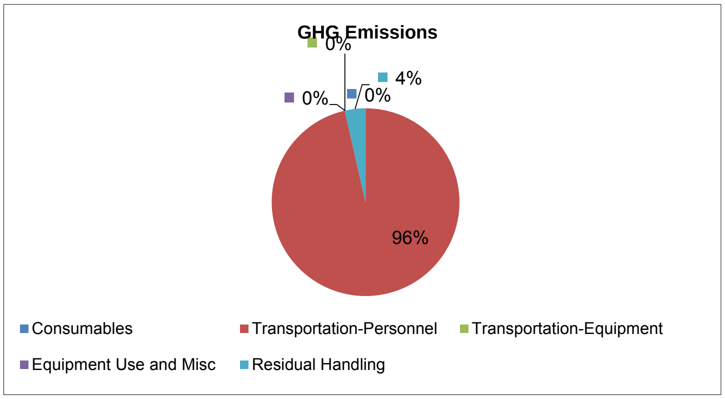



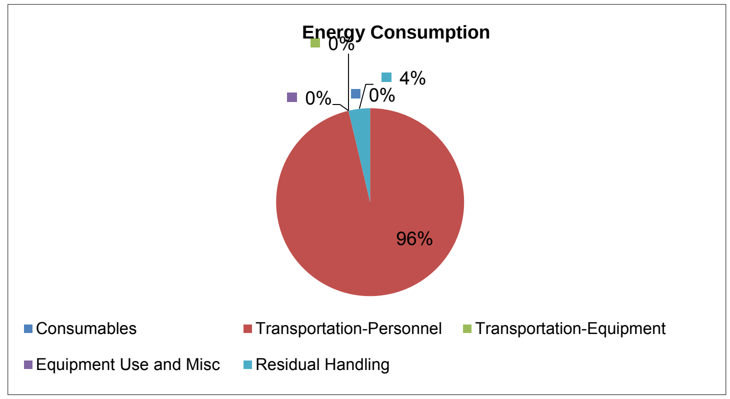



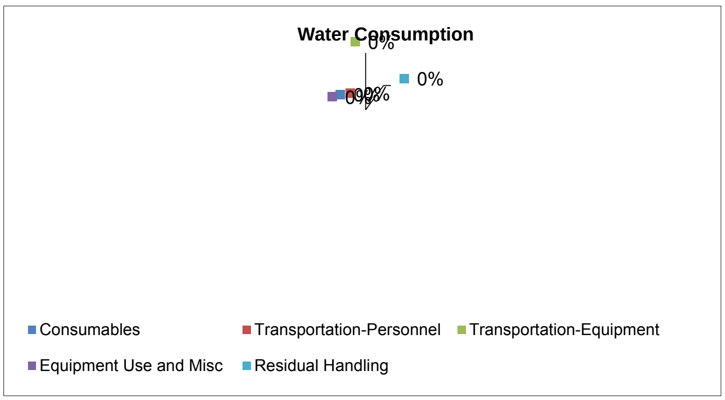



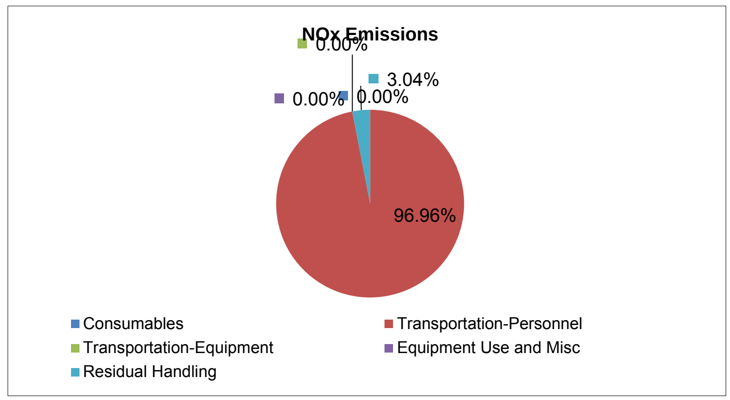



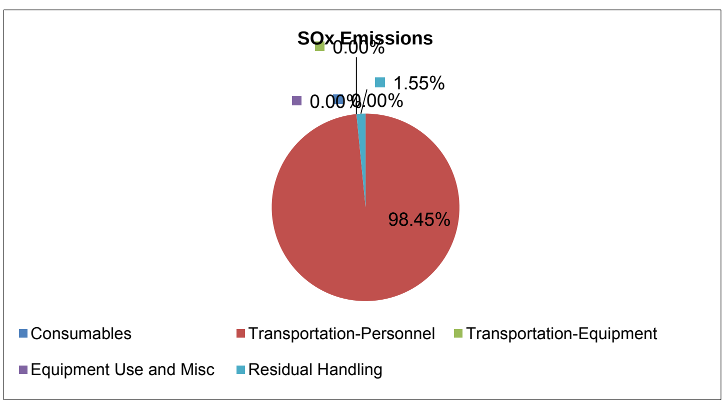
SiteWise™ Results Alternative 2b
Remedial Action Construction Stage
Site, Place
Place, State

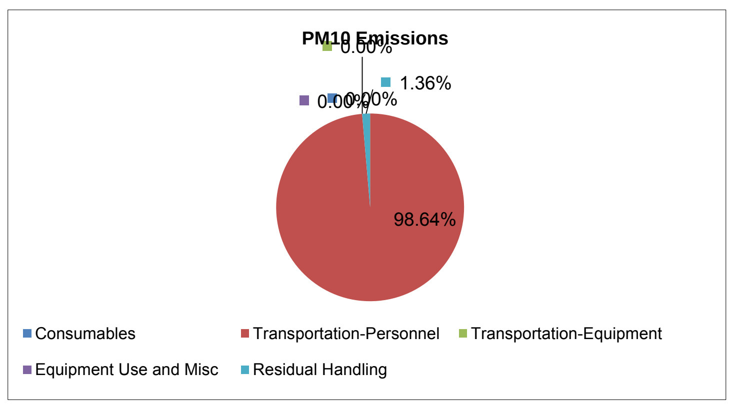



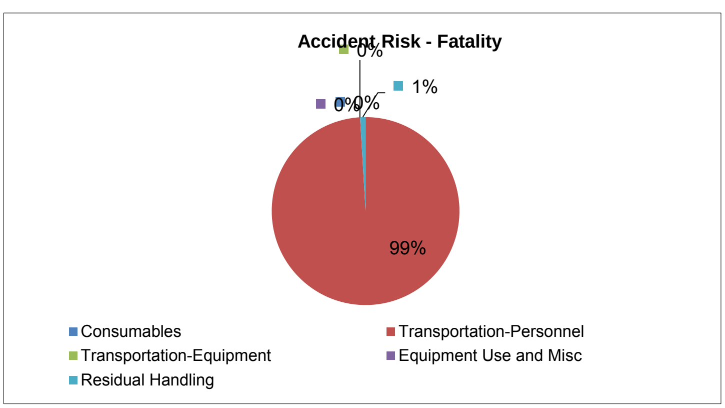



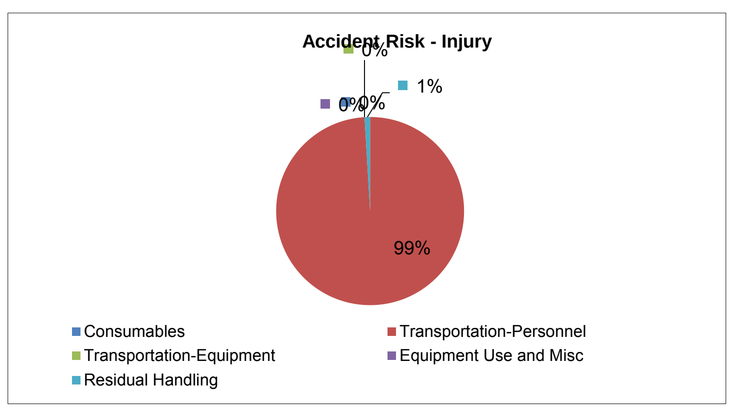



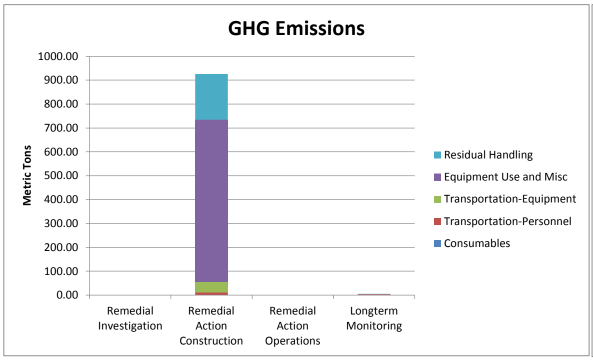



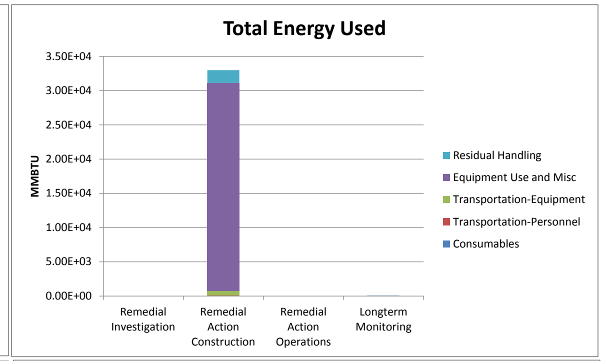



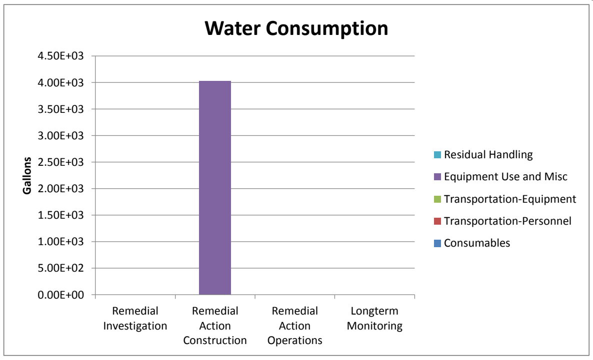



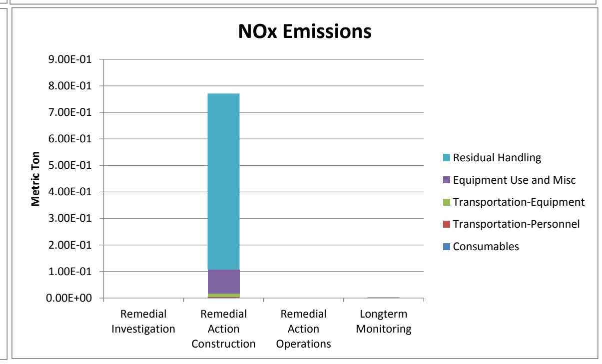



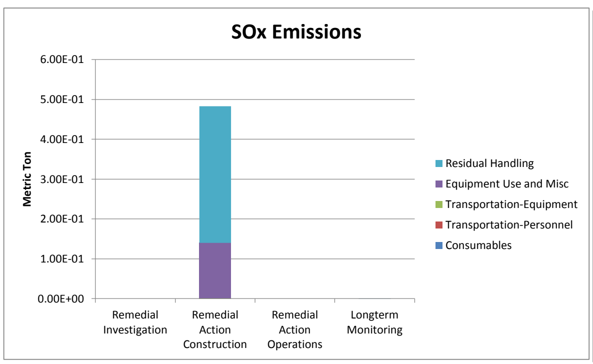
SiteWise™ Results Alternative 2b
Remedial Action Construction Stage
Site, Place
Place, State

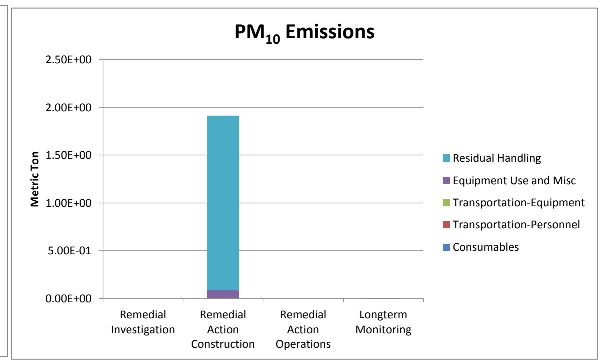



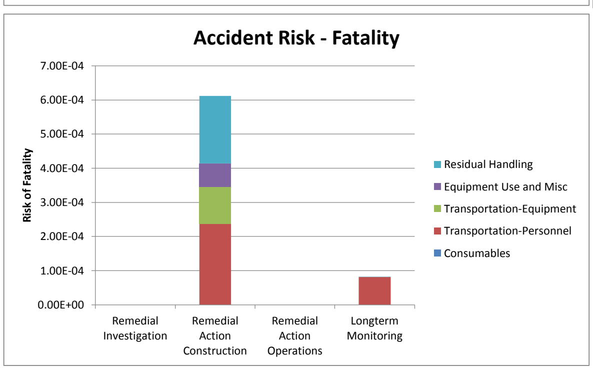



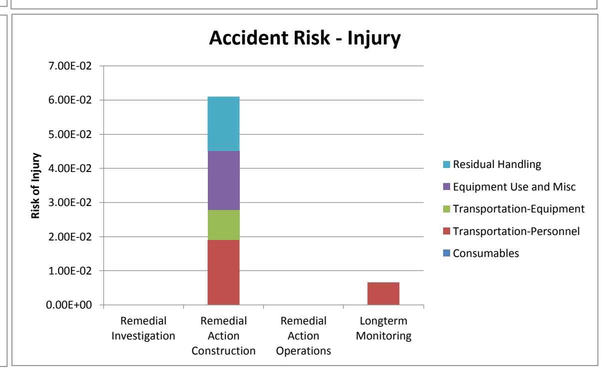



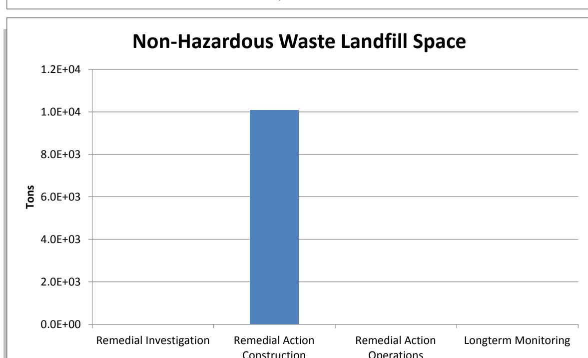



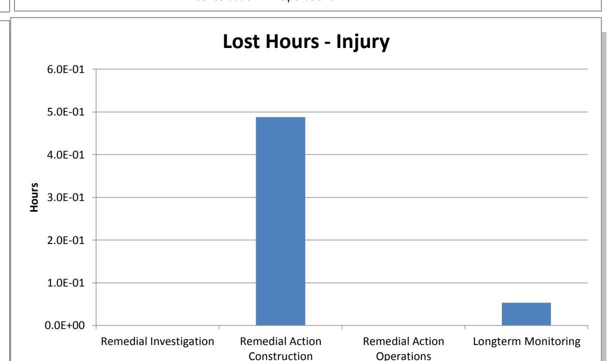



GSRx Results Alternative 2b
OU5 Site 15, NAS Cecil Field
Jacksonville, FL


| | Technology Module / Phase | Module Components | Comments / Assumptions | Quantity | (Units) | Greenhouse Gas Emissions | | | | Criteria Pollutant Emission | | | Energy Consumption | Water Consumption |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $CO_{2\ equiv}$ | $CO_2$ | $N_20$ | $CH_4$ | $NO_x$ | $SO_x$ | $PM_{10}$ | | |
| **Stage** | **Materials** | | | | | | **Tonnes** | | | | | | **MWhr** | **gal x 1000** |
| RAC | Decon Pad | General Concrete | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 | 43,500.00 | lbs | 2.56 | 2.56 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 25.31 | 0.00 |
| RAC | Clean Backfill | Soil | Assume soil, 6,667 CY, 1.5 ton/CY, 2000 lb/ft | 20,001,000.00 | lbs | 208.63 | 208.63 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5513.22 | 0.00 |
| RAC | Stabilization Material | Typical Cement | Assume cement, 500 ton, Assume 2/3 of 500 to be cement | 666,666.67 | lbs | 250.94 | 250.94 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1878.48 | 0.00 |
| RAC | Stabilization Material | Lime | Assume lime, 500 ton, Assume 1/3 of 500 to be cement | 333,333.33 | lbs | 145.76 | 124.87 | 5.68E-02 | 1.56E-01 | 1.22E-05 | 1.04E-01 | 7.17E-02 | 1284.31 | 0.00 |
| RAC | Revegetation, soil nutrients | Fertilizer | Assume fertilizer, 309 msf (thousand square feet), 3 lb of sed per 1.2 msf | 772.50 | lbs | 0.96 | 0.96 | 1.27E-09 | 0.00E+00 | 0.00E+00 | 3.50E-04 | 7.04E-07 | 17.46 | 0.35 |
| RAC | Revegetation, hydroseed | Fertilizer | Assume fertilizer, 309 msf (thousand square feet), 10 lb of sed per 1 msf | 3,090.00 | lbs | 3.85 | 3.85 | 5.07E-09 | 0.00E+00 | 0.00E+00 | 1.40E-03 | 2.82E-06 | 69.84 | 1.40 |
| RAC | Revegetation, hydroseed | Mulch | Assume wood mulch, 309 msf (thousand square feet), 50 lb of mulch per 1 msf | 15,450.00 | lbs | 4.88 | 1.71 | 9.88E-03 | 5.26E-03 | 2.91E-06 | 1.67E-02 | 1.26E-03 | 55.27 | 0.00 |
| RAC | Revegetation, hydroseed | Fertilizer | Assume fertilizer, 309 msf (thousand square feet), 2 lb per 1 msf | 618.00 | lbs | 0.77 | 0.77 | 1.01E-09 | 0.00E+00 | 0.00E+00 | 2.80E-04 | 5.63E-07 | 13.97 | 0.28 |
| | **Subtotal** | | | | | **618.37** | **594.30** | **0.07** | **0.16** | **0.00** | **0.12** | **0.07** | **8857.87** | **2.02** |
| **Stage** | **Construction Equipment** | | | | | | **Tonnes** | | | | | | **MWhr** | **gal x 1000** |
| RAC | Brush mowing | Tractor, 250 hp, diesel | 1.2 acres, medium density area, uses a tractor, Assume 8 hours per day, 0.5 acres per day | 19.20 | hrs | 1.43 | 1.43 | 0.00E+00 | 0.00E+00 | 1.20E-02 | 0.00E+00 | 9.06E-04 | 5.16 | |
| RAC | Chipping tree | WOOD CHIPPER | 1.2 acres, medium density area, uses a woodchipper, 130 hp, assume 8 hours per day, 0.5 acres per day | 19.20 | hrs | 0.84 | 0.84 | 0.00E+00 | 0.00E+00 | 6.56E-03 | 0.00E+00 | 5.54E-04 | 3.67 | |
| RAC | Chipping tree | Chainsaw, gasoline, 3<hp<=6, 2 stroke | 1.2 acres, medium density area, uses a 2 chain saws, gasoline, 18", assume 3 days or work, 8 hours per day, 80%efficiency | 38.40 | hrs | 0.07 | 0.07 | 0.00E+00 | 0.00E+00 | 1.39E-04 | 0.00E+00 | 1.03E-03 | 0.36 | |
| RAC | Front End Loader 4 cy | Loader, 200 HP, 4 CY (diesel) | 10 days, 8 hours per day, 80% of efficiency | 64.00 | hrs | 2.07 | 2.07 | 0.00 | 0.00 | 1.89E-02 | 3.92E-03 | 2.27E-03 | 7.56 | |
| RAC | Dozer, 200 hp | Dozer, 200 HP (D7) w/U Blade (diesel) | 10 days, 8 hours per day, 80% of efficiency | 64.00 | hrs | 7.03 | 7.03 | 0.00 | 0.00 | 4.32E-02 | 1.27E-02 | 4.28E-03 | 43.02 | |
| RAC | Skid-steer, 78 hp | Skid Steer (diesel) | 10 days, 8 hours per day, 80% of efficiency | 64.00 | hrs | 0.83 | 0.78 | 0.00 | 2.03E-03 | 7.91E-03 | 1.68E-04 | 1.52E-03 | 3.91 | |
| RAC | Dozer, 200 hp | Dozer, 200 HP (D7) w/U Blade (diesel) | 20 days, 8 hours per day, 80% of efficiency | 128.00 | hrs | 14.06 | 14.06 | 0.00 | 0.00 | 8.64E-02 | 2.54E-02 | 8.55E-03 | 86.04 | |
| RAC | Excavator 2.5 cy (2) | Excavator, Hydraulic, 2 CY (diesel) | 20 days, 8 hours per day, 80% of efficiency | 256.00 | hrs | 24.81 | 24.81 | 0.00 | 0.00 | 1.56E-01 | 4.60E-02 | 1.48E-02 | 112.63 | |
| RAC | Excavator 2.5 cy | Excavator, Hydraulic, 2 CY (diesel) | 10 days, 8 hours per day, 80% of efficiency | 64.00 | hrs | 6.20 | 6.20 | 0.00 | 0.00 | 3.90E-02 | 1.15E-02 | 3.71E-03 | 28.16 | |
| RAC | Dozer, 200 hp | Dozer, 200 HP (D7) w/U Blade (diesel) | 5 days, 8 hours per day, 80% of efficiency | 32.00 | hrs | 3.52 | 3.52 | 0.00 | 0.00 | 2.16E-02 | 6.34E-03 | 2.14E-03 | 21.51 | |
| | **Subtotal** | | | | | **60.86** | **60.82** | **0.00** | **0.00** | **0.39** | **0.11** | **0.04** | **312.01** | **0** |
| | | | | **Total** | | **679** | **655** | **0.07** | **0.16** | **0.39** | **0.23** | **0.11** | **9,170** | **2** |

**Alternative 1**
**Values Input into SiteWise as "Other"**

| Module | Greenhouse Gas Emissions | | | | Criteria Pollutant Emission | | | Energy Consumption | Water Consumption |
|---|---|---|---|---|---|---|---|---|---|
| | $CO_{2\ equiv}$ | $CO_2$ | $N_20$ (CO2e) | $CH_4$ (CO2e) | $NO_x$ | $SO_x$ | $PM_{10}$ | | |
| | | **Tonnes** | | | | | | **MMBTU** | **gal** |
| RI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| RAC | 679.228 | 655.123 | 20.683 | 3.423 | 0.089 | 0.139 | 0.083 | 30392.651 | 2023.920 |
| RAO | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LTM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Note: 1 MWhr = 3412141.4799 BTU, 1MMTBU = 10^6 BTU

## Sustainable Remediation - Environmental Footprint Summary 2c

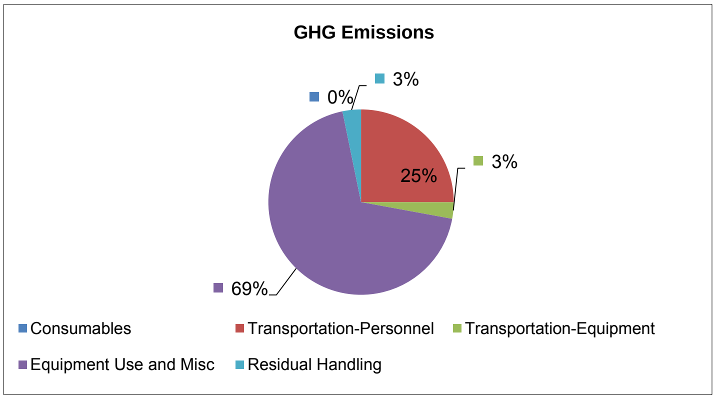
™

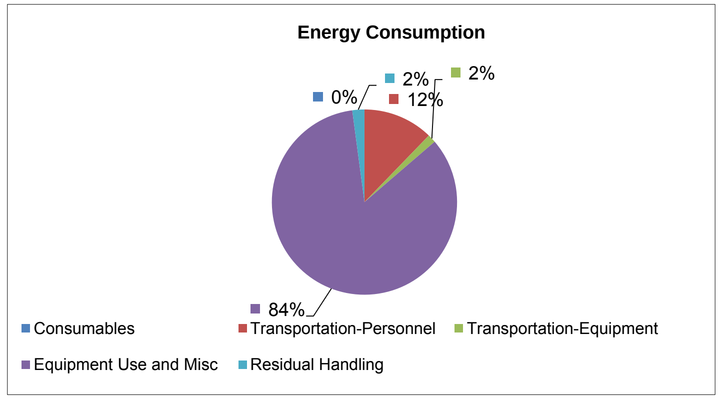
| Phase | Activities | GHG Emissions (metric ton) | Total energy Used (MMBTU) | Water Consumption (gallons) | NOx emissions (metric ton) | SOx Emissions (metric ton) | PM10 Emissions (metric ton) | Accident Risk Fatality | Accident Risk Injury |
|---|---|---|---|---|---|---|---|---|---|
| Remedial Investigation | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Sub-Total | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Remedial Action Construction | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 11.07 | 1.4E+02 | NA | 4.1E-03 | 1.4E-04 | 8.3E-04 | 2.3E-04 | 1.8E-02 |
| | Transportation-Equipment | 1.27 | 1.7E+01 | NA | 4.0E-04 | 7.1E-06 | 3.5E-05 | 3.2E-06 | 2.6E-04 |
| | Equipment Use and Misc | 30.48 | 9.6E+02 | 3.0E+03 | 1.1E-01 | 4.6E-02 | 1.3E-02 | 2.2E-05 | 5.5E-03 |
| | Residual Handling | 1.43 | 2.4E+01 | NA | 4.0E-03 | 2.0E-03 | 1.1E-02 | 3.1E-06 | 2.5E-04 |
| | Sub-Total | 44.24 | 1.14E+03 | 3.02E+03 | 1.23E-01 | 4.82E-02 | 2.49E-02 | 2.55E-04 | 2.42E-02 |
| Remedial Action Operations | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Sub-Total | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Longterm Monitoring | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 4.00 | 5.0E+01 | NA | 1.5E-03 | 5.2E-05 | 3.0E-04 | 8.2E-05 | 6.6E-03 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.15 | 1.9E+00 | NA | 4.6E-05 | 8.2E-07 | 4.1E-06 | 7.8E-07 | 6.3E-05 |
| | Sub-Total | 4.15 | 5.23E+01 | 0.00E+00 | 1.53E-03 | 5.30E-05 | 3.04E-04 | 8.27E-05 | 6.65E-03 |
| **Total** | | **4.8E+01** | **1.2E+03** | **3.0E+03** | **1.2E-01** | **4.8E-02** | **2.5E-02** | **3.4E-04** | **3.1E-02** |

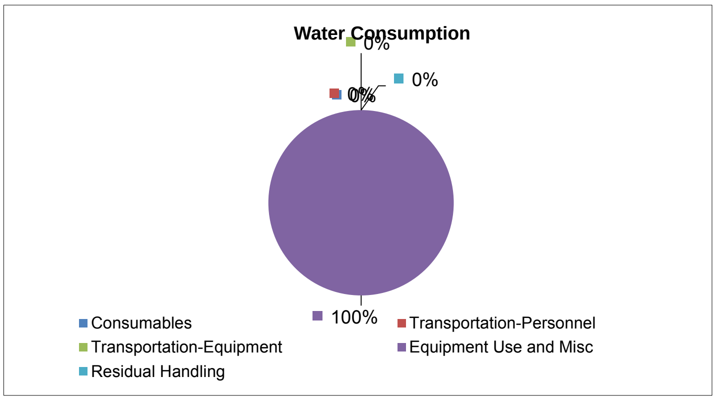
| Remedial Alternative Phase | Non-Hazardous Waste Landfill Space (tons) | Hazardous Waste Landfill Space (tons) | Topsoil Consumption (cubic yards) | Costing ($) | Lost Hours - Injury |
|---|---|---|---|---|---|
| Remedial Investigation | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 | 0.0E+00 |
| Remedial Action Construction | 5.8E+01 | 0.0E+00 | 0.0E+00 | 0 | 1.9E-01 |
| Remedial Action Operations | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 | 0.0E+00 |
| Longterm Monitoring | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 | 5.3E-02 |
| **Total** | **5.8E+01** | **0.0E+00** | **0.0E+00** | **$0** | **2.5E-01** |

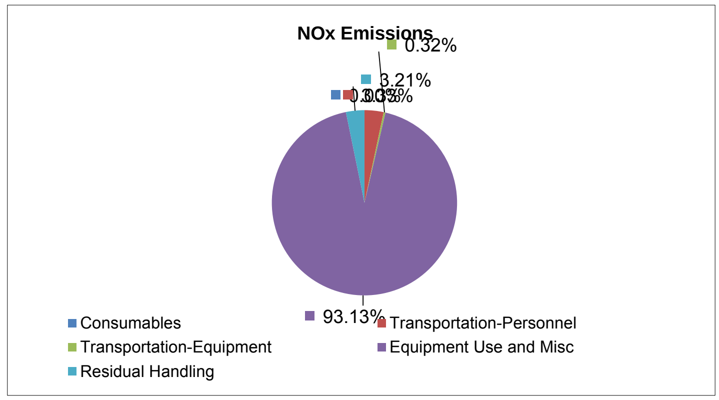
| Total Cost with Footprint Reduction |
|---|
| **$0** |

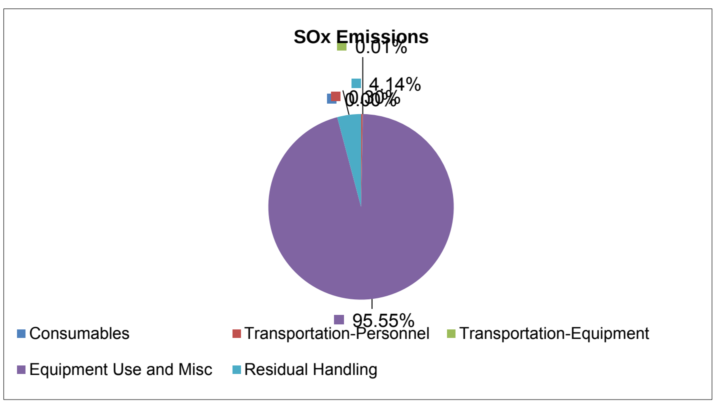
SiteWise™ Results Alternative 2c
Remedial Action Construction Stage
Site, Place
Place, State

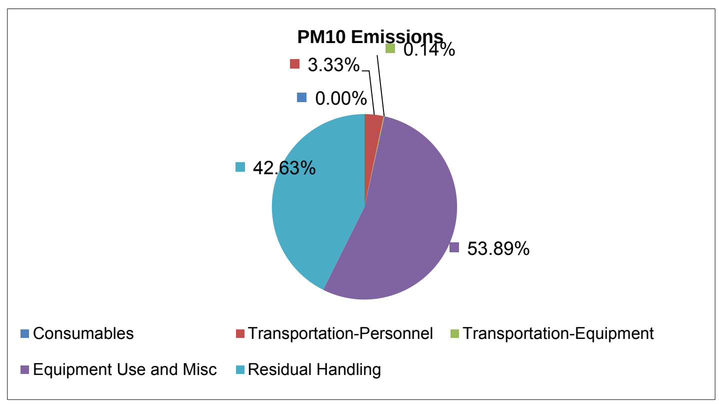



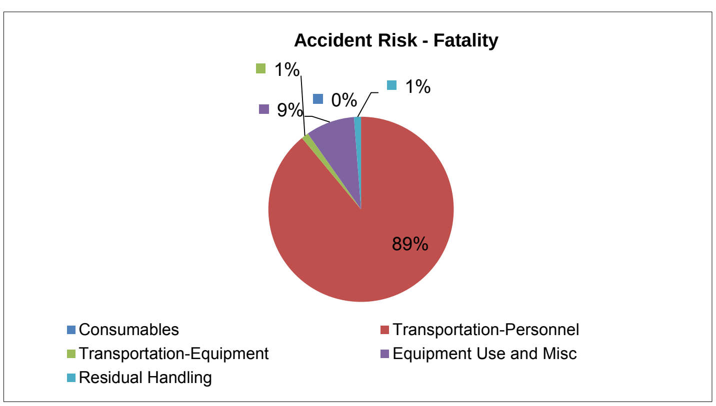



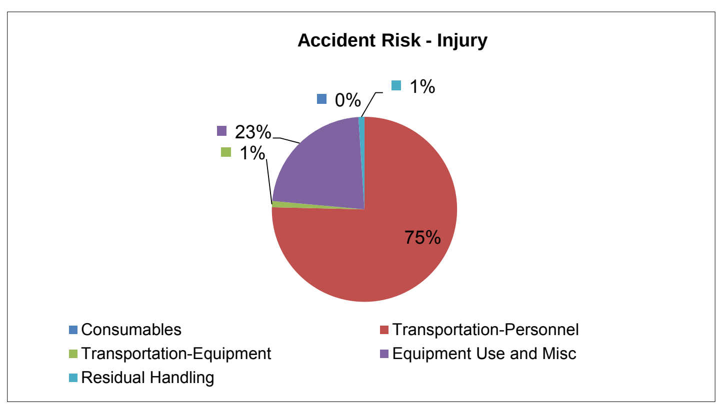



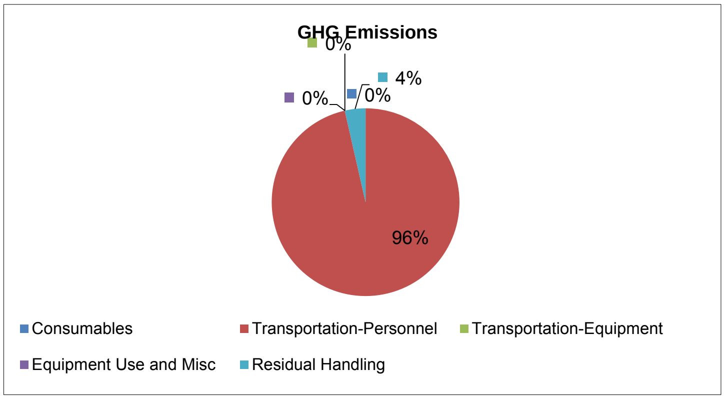



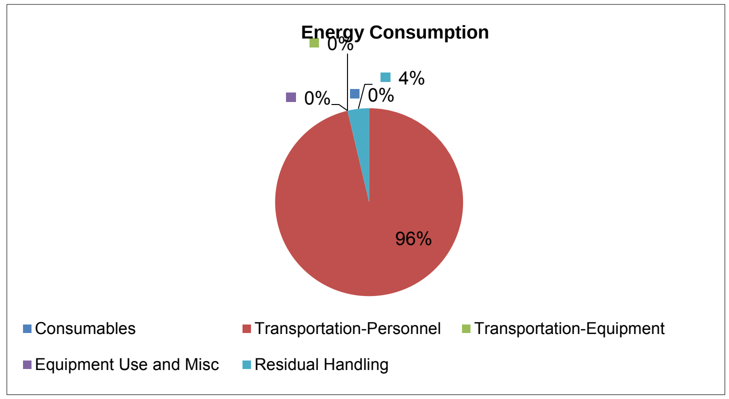



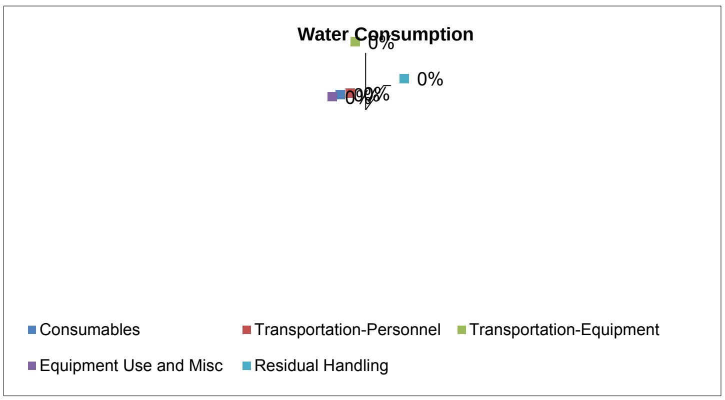



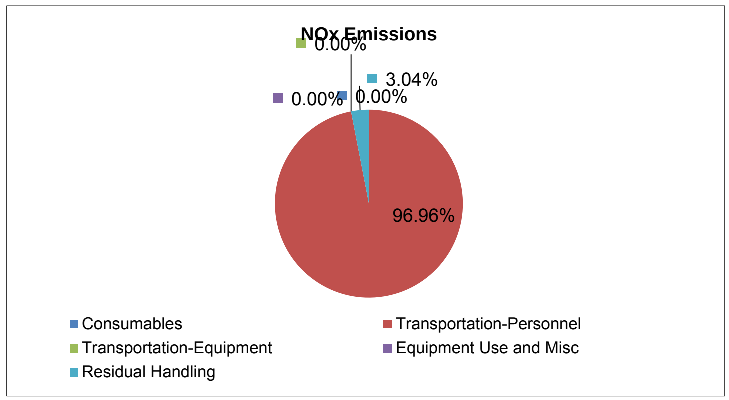



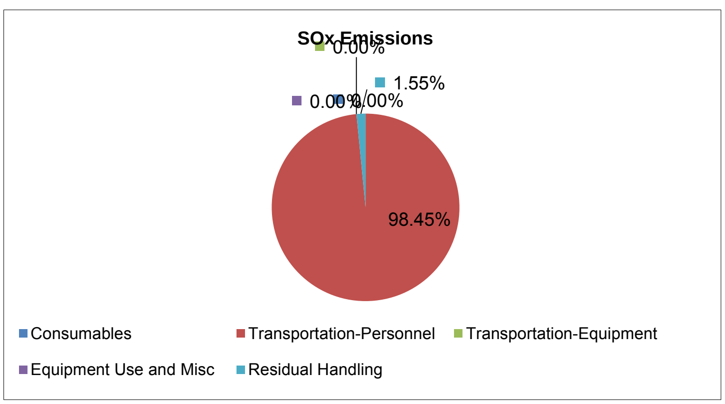
SiteWise™ Results Alternative 2c
Remedial Action Construction Stage
Site, Place
Place, State

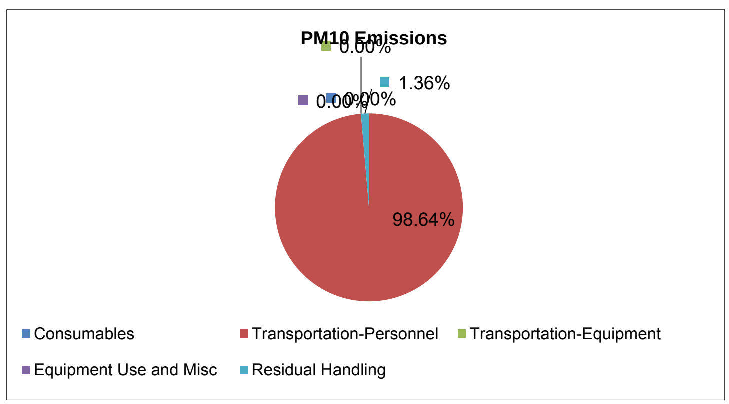



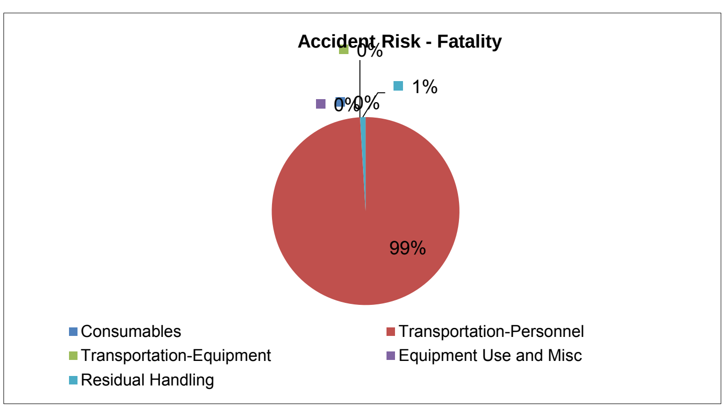



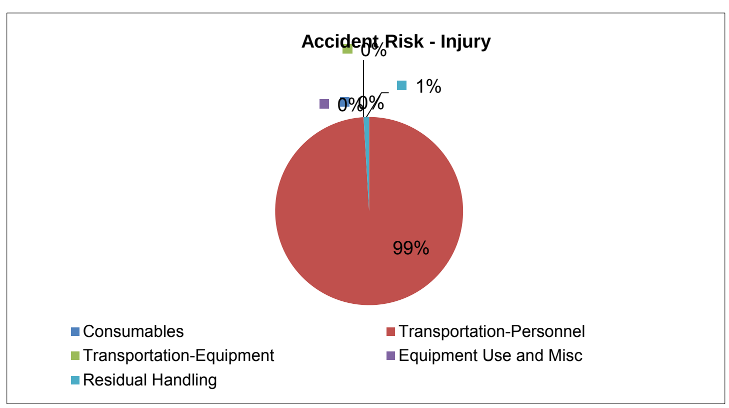



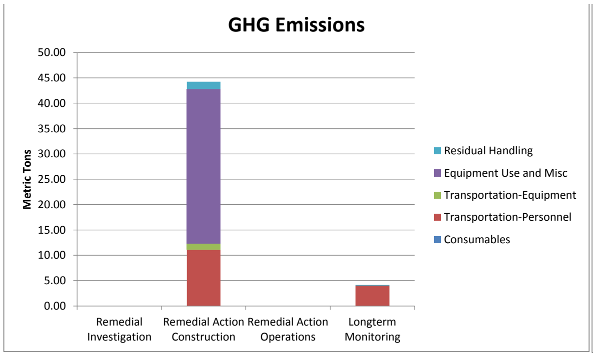



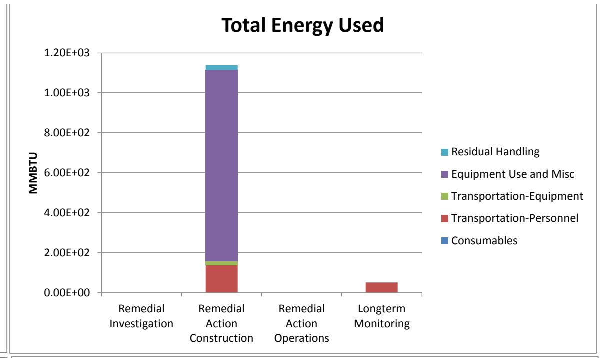



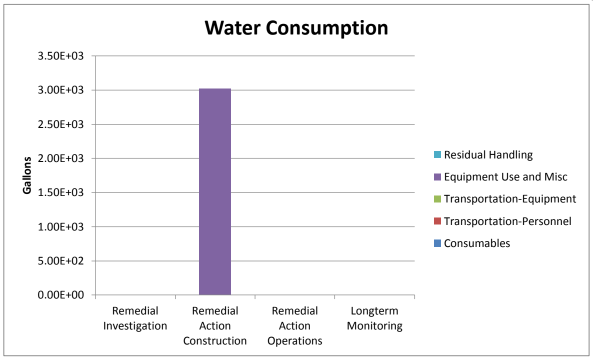



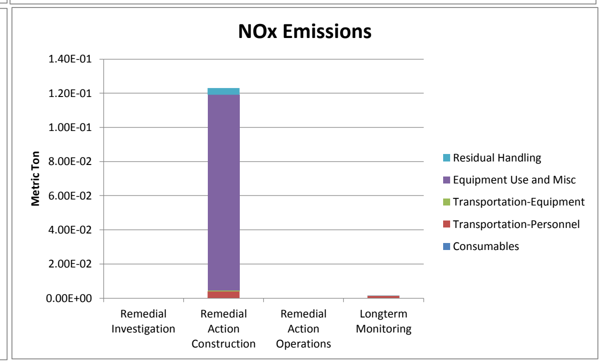



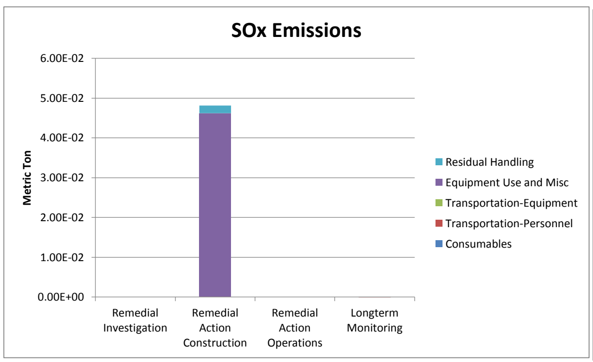
SiteWise™ Results Alternative 2c
Remedial Action Construction Stage
Site, Place
Place, State

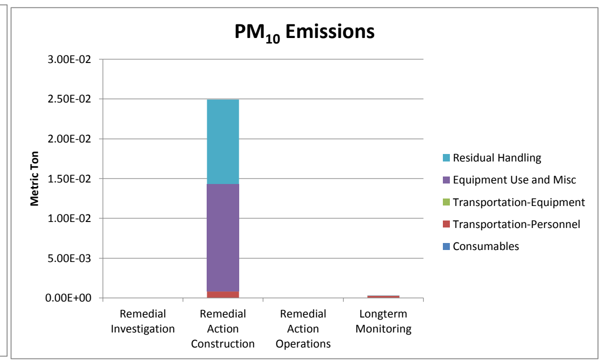



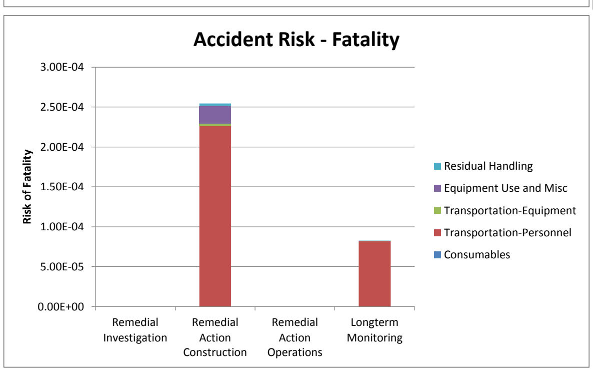



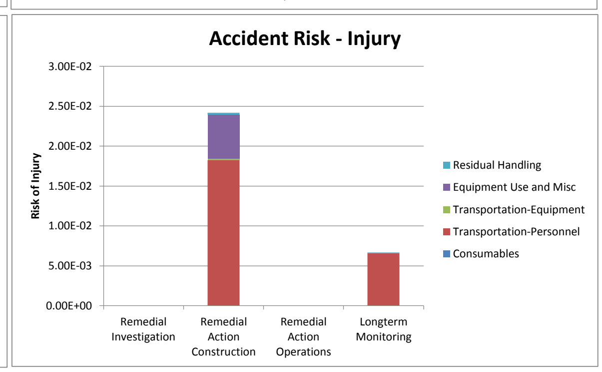



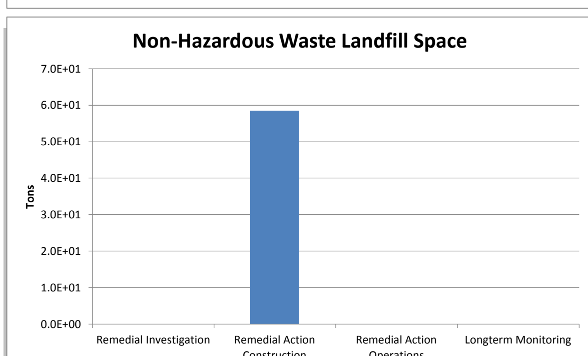



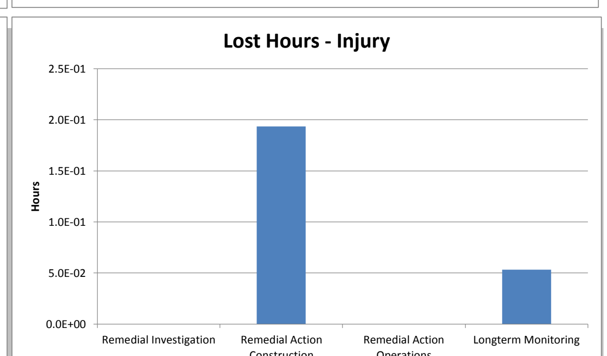



GSRx Results Alternative 2c
OU5 Site 15, NAS Cecil Field
Jacksonville, FL


| | Technology Module / Phase | Module Components | Comments / Assumptions | Quantity | (Units) | Greenhouse Gas Emissions | | | | Criteria Pollutant Emission | | | Energy Consumption | Water Consumption |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $CO_2e$ | $CO_2$ | $N_20$ | $CH_4$ | $NO_x$ | $SO_x$ | $PM_{10}$ | | |
| **Stage** | **Materials** | | | | | | **Tonnes** | | | | | | **MWhr** | **gal x 1000** |
| RAC | Decon Pad | General Concrete | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 | 43,500.00 | lbs | 2.56 | 2.56 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 25.31 | 0.00 |
| RAC | Revegetation, soil nutrients | Fertilizer | Assume fertilizer, 309 msf (thousand square feet), 3 lb of sed per 1.2 msf | 772.50 | lbs | 0.96 | 0.96 | 1.27E-09 | 0.00E+00 | 0.00E+00 | 3.50E-04 | 7.04E-07 | 17.46 | 0.35 |
| RAC | Revegetation, hydroseed | Fertilizer | Assume fertilizer, 309 msf (thousand square feet), 10 lb of sed per 1 msf | 3,090.00 | lbs | 3.85 | 3.85 | 5.07E-09 | 0.00E+00 | 0.00E+00 | 1.40E-03 | 2.82E-06 | 69.84 | 1.40 |
| RAC | Revegetation, hydroseed | Mulch | Assume wood mulch, 309 msf (thousand square feet), 50 lb of mulch per 1 msf | 15,450.00 | lbs | 4.88 | 1.71 | 9.88E-03 | 5.26E-03 | 2.91E-06 | 1.67E-02 | 1.26E-03 | 55.27 | 0.00 |
| RAC | Revegetation, hydroseed | Fertilizer | Assume fertilizer, 309 msf (thousand square feet), 2 lb per 1 msf | 618.00 | lbs | 0.77 | 0.77 | 1.01E-09 | 0.00E+00 | 0.00E+00 | 2.80E-04 | 5.63E-07 | 13.97 | 0.28 |
| | **Subtotal** | | | | | **13.04** | **9.86** | **0.01** | **0.01** | **0.00** | **0.02** | **0.00** | **181.86** | **2.02** |
| **Stage** | **Construction Equipment** | | | | | | **Tonnes** | | | | | | **MWhr** | **gal x 1000** |
| RAC | Brush mowing | Tractor, 250 hp, diesel | 1.2 acres, medium density area, uses a tractor, Assume 8 hours per day, 0.5 acres per day | 19.20 | hrs | 1.43 | 1.43 | 0.00E+00 | 0.00E+00 | 1.20E-02 | 0.00E+00 | 9.06E-04 | 5.16 | |
| RAC | Chipping tree | WOOD CHIPPER | 1.2 acres, medium density area, uses a woodchipper, 130 hp, assume 8 hours per day, 0.5 acres per day | 19.20 | hrs | 0.84 | 0.84 | 0.00E+00 | 0.00E+00 | 6.56E-03 | 0.00E+00 | 5.54E-04 | 3.67 | |
| RAC | Chipping tree | Chainsaw, gasoline, 3<hp<=6, 2 stroke | 1.2 acres, medium density area, uses a 2 chain saws, gasoline, 18" , assume 3 days or work, 8 hours per day, 80%efficiency | 38.40 | hrs | 0.07 | 0.07 | 0.00E+00 | 0.00E+00 | 1.39E-04 | 0.00E+00 | 1.03E-03 | 0.36 | |
| RAC | Dozer, 200 hp | Dozer, 200 HP (D7) w/U Blade (diesel) | 20 days, 8 hours per day, 80% efficiency | 128.00 | hrs | 14.06 | 14.06 | 0.00 | 0.00 | 8.64E-02 | 2.54E-02 | 8.55E-03 | 86.04 | |
| RAC | Front End Loader, 185 hp | Loader, 200 HP, 4 CY (diesel) | 5 days, 8 hours per day, 80% efficiency | 32.00 | hrs | 1.04 | 1.04 | 0.00 | 0.00 | 9.44E-03 | 1.96E-03 | 1.13E-03 | 3.78 | |
| | **Subtotal** | | | | | **17.44** | **17.44** | **0.00** | **0.00** | **0.11** | **0.03** | **1.22E-02** | **99.01** | **0** |
| | | | | **Total** | | **30** | **27** | **0.01** | **0.01** | **0.11** | **0.05** | **0.01** | **281** | **2** |

**Alternative 1**
**Values Input into SiteWise as "Other"**

| Module | Greenhouse Gas Emissions | | | | Criteria Pollutant Emission | | | Energy Consumption | Water Consumption |
|---|---|---|---|---|---|---|---|---|---|
| | $CO_2e$ | $CO_2$ | $N_20$ ($CO_2e$) | $CH_4$ ($CO_2e$) | $NO_x$ | $SO_x$ | $PM_{10}$ | | |
| | | **Tonnes** | | | | | | **MMBTU** | **gal** |
| RI | - | - | - | - | - | - | - | - | - |
| RAC | 30.48 | 27.30 | 3.06 | 0.11 | 0.11 | 0.05 | 0.01 | 958.30 | 2,023.92 |
| RAO | - | - | - | - | - | - | - | - | - |
| LTM | - | - | - | - | - | - | - | - | - |

Note: 1 MWhr = 3412141.4799 BTU, 1MMTBU = 10^6 BTU

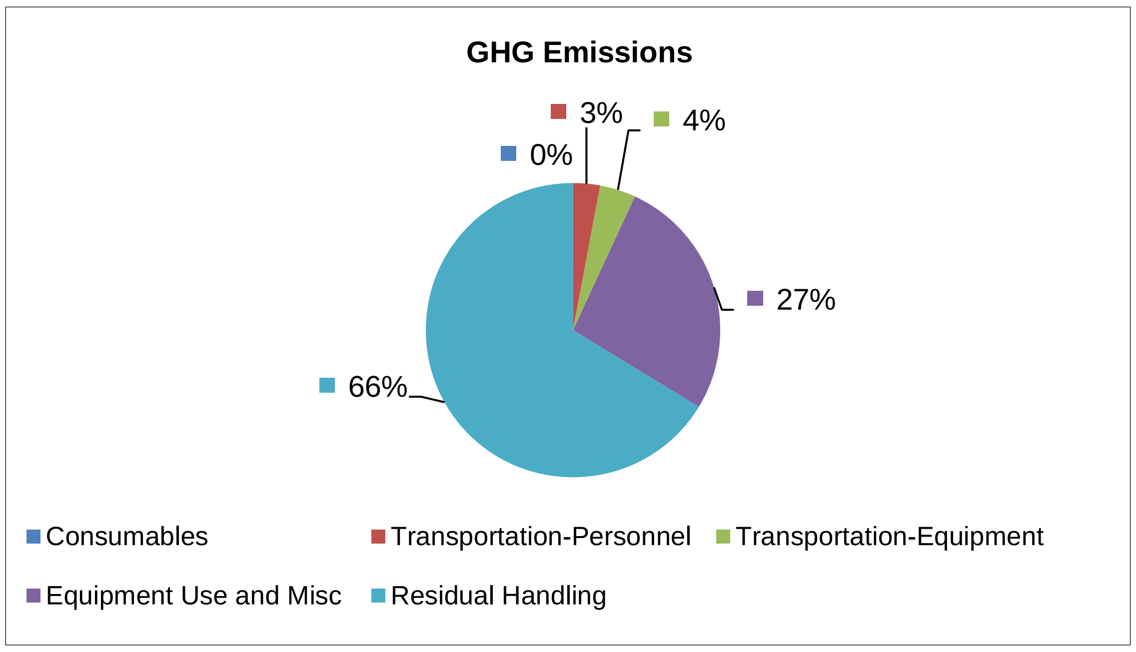
## Sustainable Remediation - Environmental Footprint Summary
## 3a

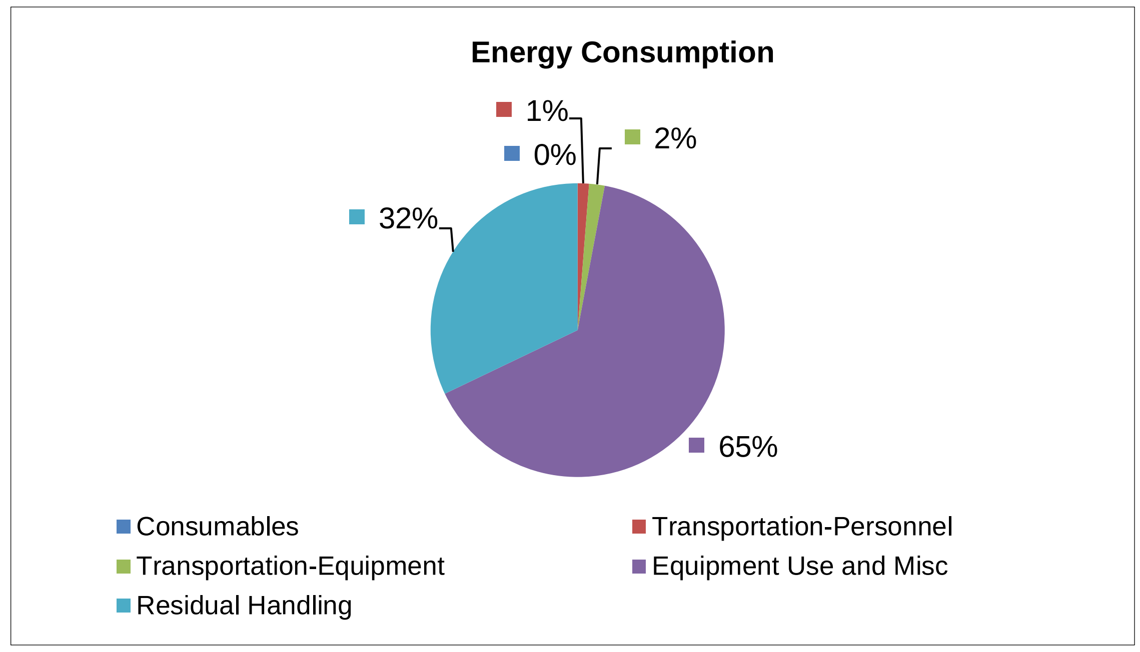
| Phase | Activities | GHG Emissions | Total energy Used | Water Consumption | NOx emissions | SOx Emissions | PM10 Emissions | Accident Risk Fatality | Accident Risk Injury |
|---|---|---|---|---|---|---|---|---|---|
| | | metric ton | MMBTU | gallons | metric ton | metric ton | metric ton | | |
| Remedial Investigation | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Sub-Total | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Remedial Action Construction | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 31.23 | 3.9E+02 | NA | 1.2E-02 | 4.1E-04 | 2.3E-03 | 6.4E-04 | 5.1E-02 |
| | Transportation-Equipment | 41.74 | 5.4E+02 | NA | 1.3E-02 | 2.3E-04 | 1.2E-03 | 1.0E-04 | 8.3E-03 |
| | Equipment Use and Misc | 283.97 | 2.1E+04 | 3.0E+03 | 3.9E-01 | 1.3E-01 | 3.9E-02 | 6.0E-05 | 1.5E-02 |
| | Residual Handling | 701.58 | 1.0E+04 | NA | 8.9E-01 | 3.8E-01 | 2.0E+00 | 1.4E-03 | 1.1E-01 |
| | Sub-Total | 1,058.52 | 3.16E+04 | 3.02E+03 | 1.30E+00 | 5.10E-01 | 2.07E+00 | 2.23E-03 | 1.90E-01 |
| Remedial Action Operations | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Sub-Total | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Longterm Monitoring | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 3.99 | 5.0E+01 | NA | 1.5E-03 | 5.2E-05 | 3.0E-04 | 8.2E-05 | 6.6E-03 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.15 | 1.9E+00 | NA | 4.6E-05 | 8.2E-07 | 4.1E-06 | 7.8E-07 | 6.3E-05 |
| | Sub-Total | 4.14 | 5.21E+01 | 0.00E+00 | 1.52E-03 | 5.28E-05 | 3.04E-04 | 8.24E-05 | 6.64E-03 |
| **Total** | | **1.1E+03** | **3.2E+04** | **3.0E+03** | **1.3E+00** | **5.1E-01** | **2.1E+00** | **2.3E-03** | **2.0E-01** |

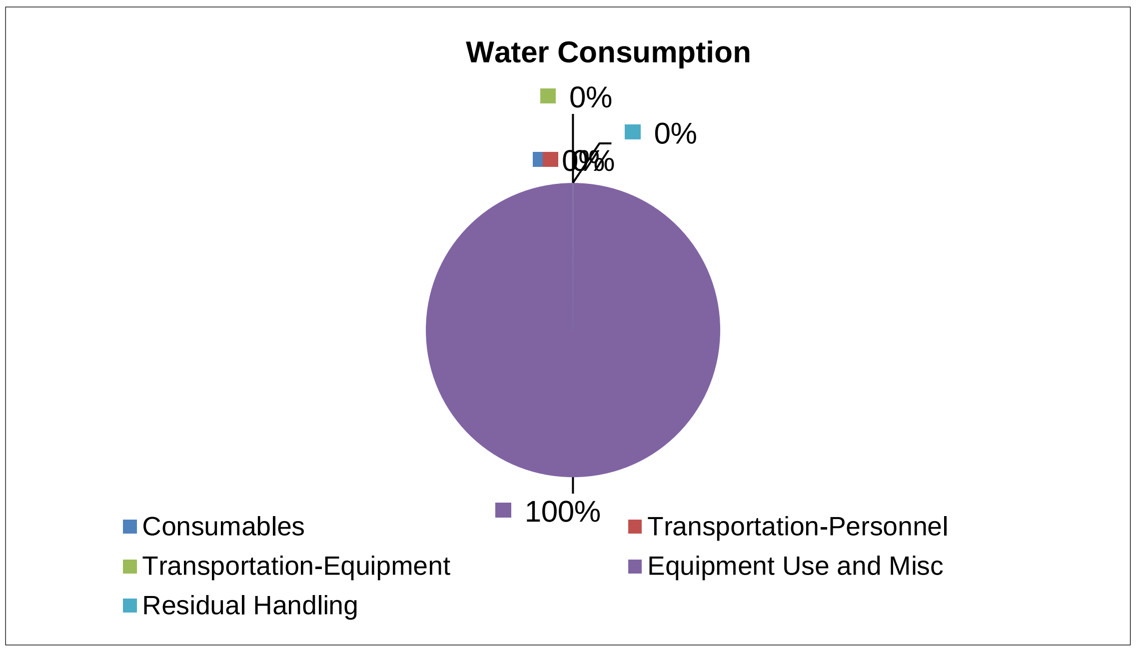
| Remedial Alternative Phase | Non-Hazardous Waste Landfill Space | Hazardous Waste Landfill Space | Topsoil Consumption | Costing | Lost Hours - Injury |
|---|---|---|---|---|---|
| | tons | tons | cubic yards | $ | |
| **Remedial Investigation** | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 | 0.0E+00 |
| **Remedial Action Construction** | 8.9E+01 | 1.0E+04 | 6.7E+03 | 0 | 1.5E+00 |
| **Remedial Action Operations** | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 | 0.0E+00 |
| **Longterm Monitoring** | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 | 5.3E-02 |
| **Total** | **8.9E+01** | **1.0E+04** | **6.7E+03** | **$0** | **1.6E+00** |

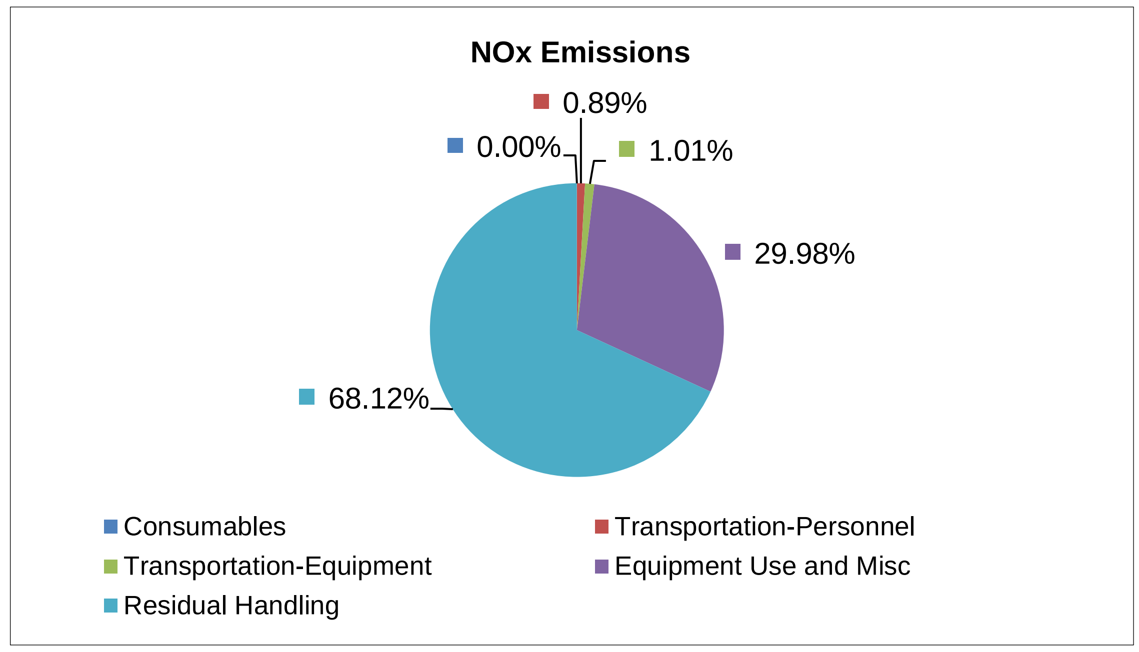
| Total Cost with Footprint Reduction |
|---|
| **$0** |

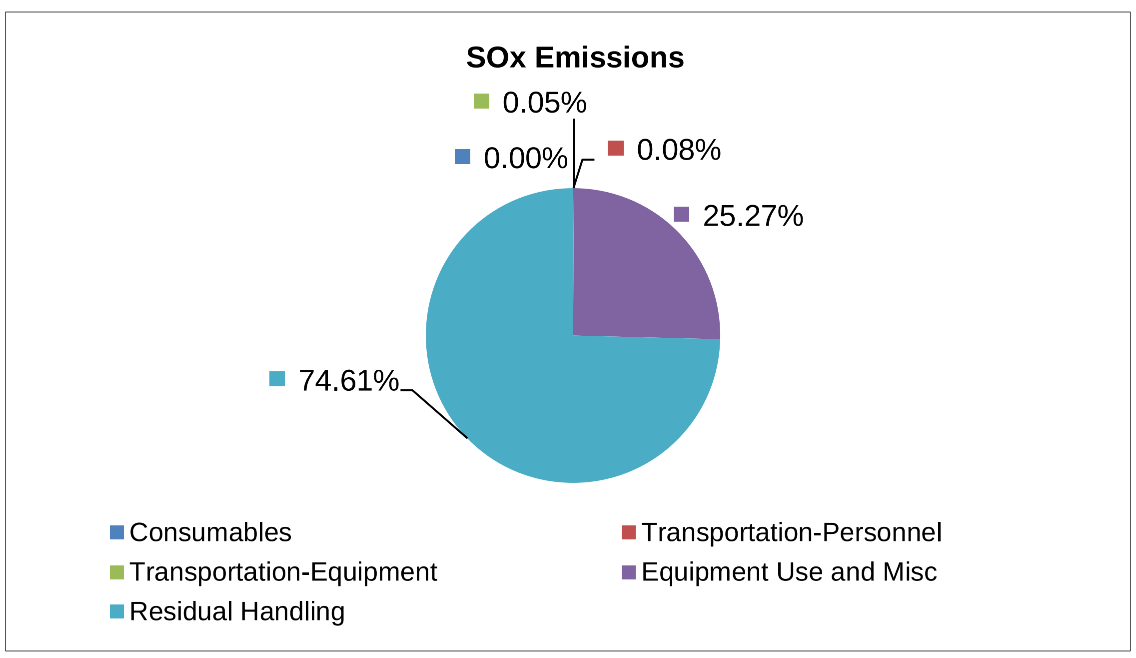
SiteWise™ Results Alternative 3a
Remedial Action Construction Stage
OU5, Site 15, NAS Cecil Field
Jacksonville, FL

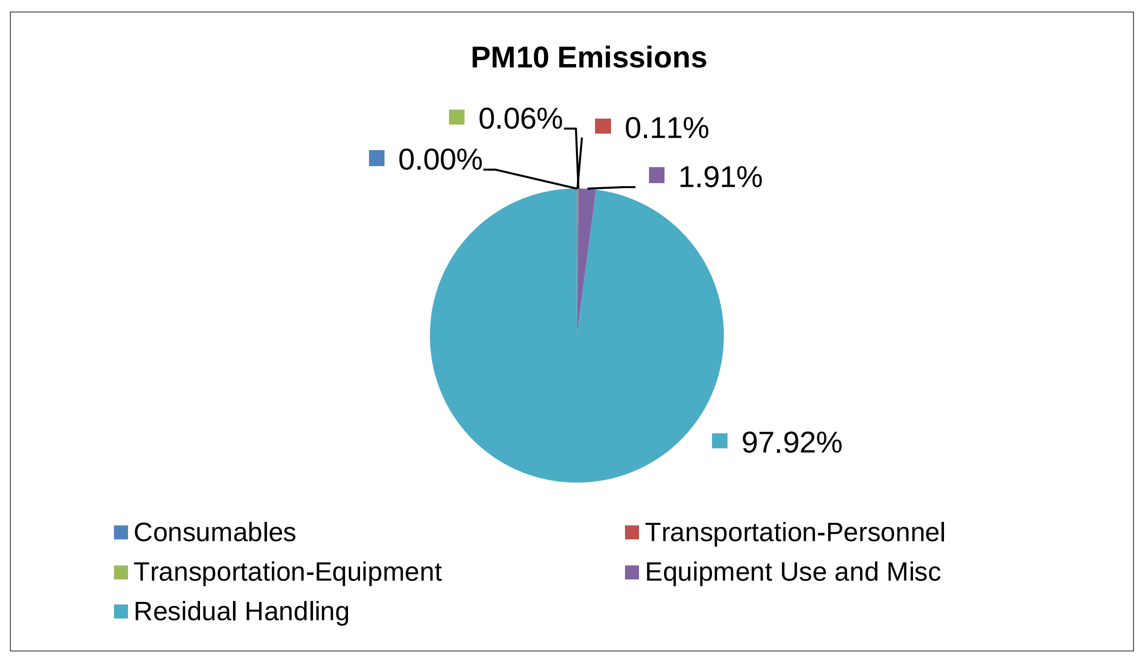



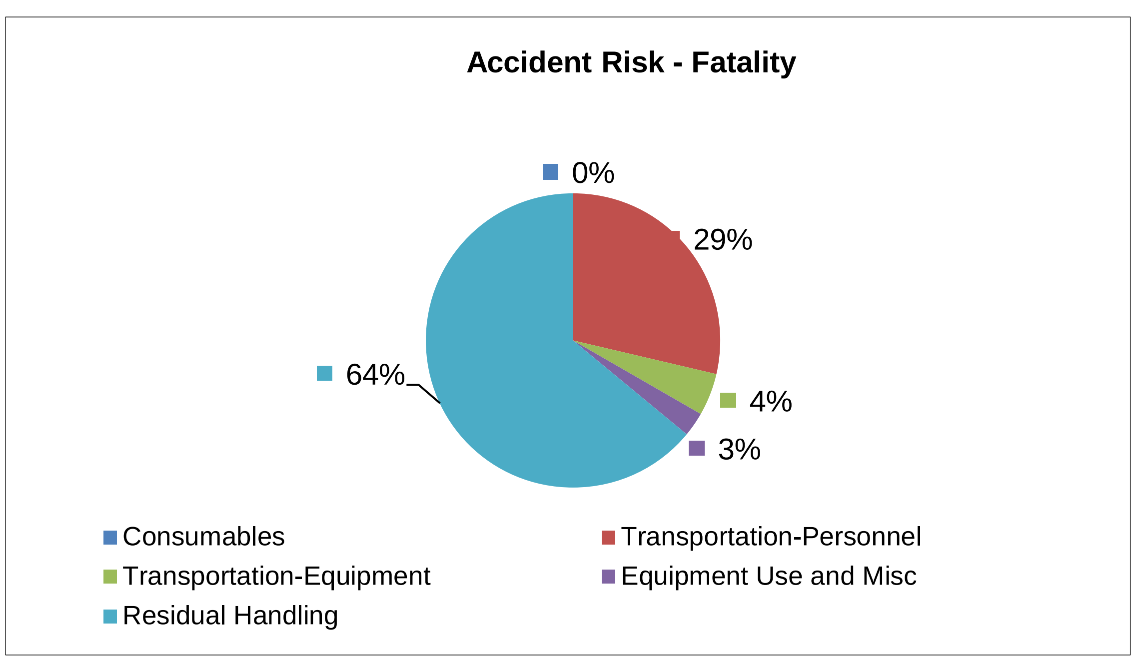



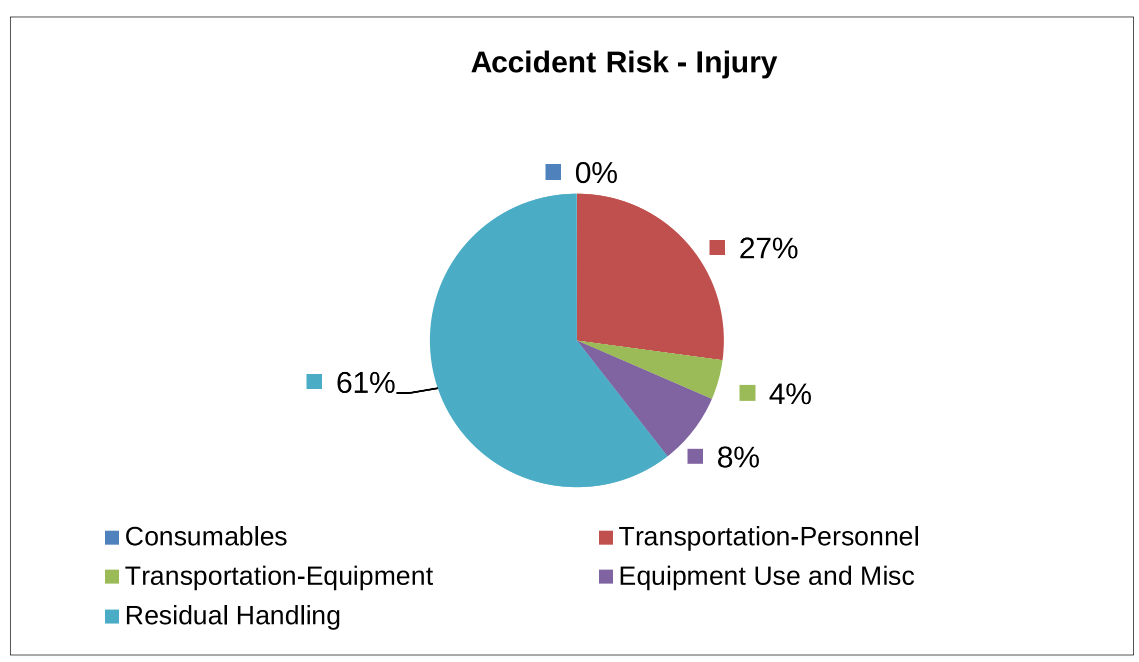



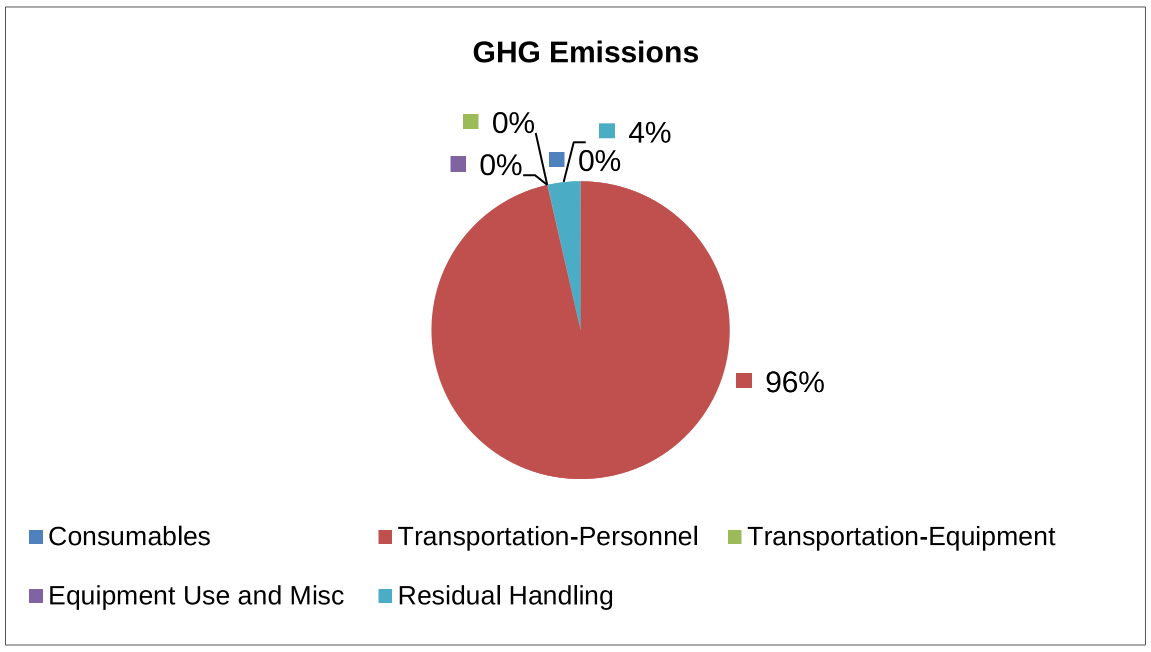



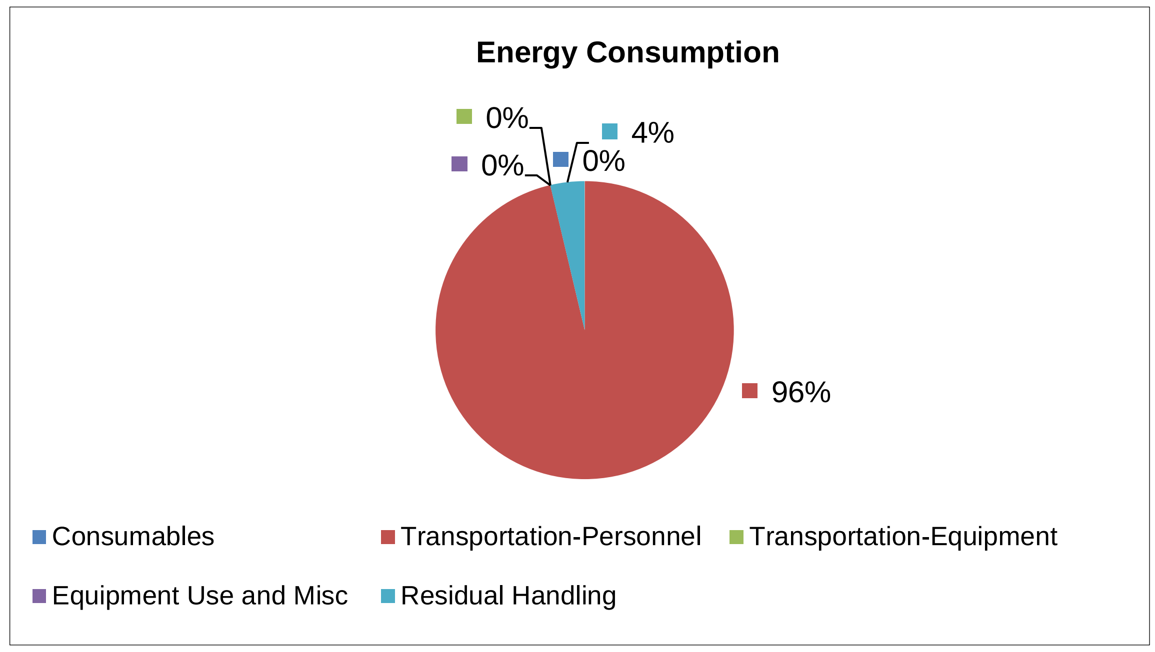



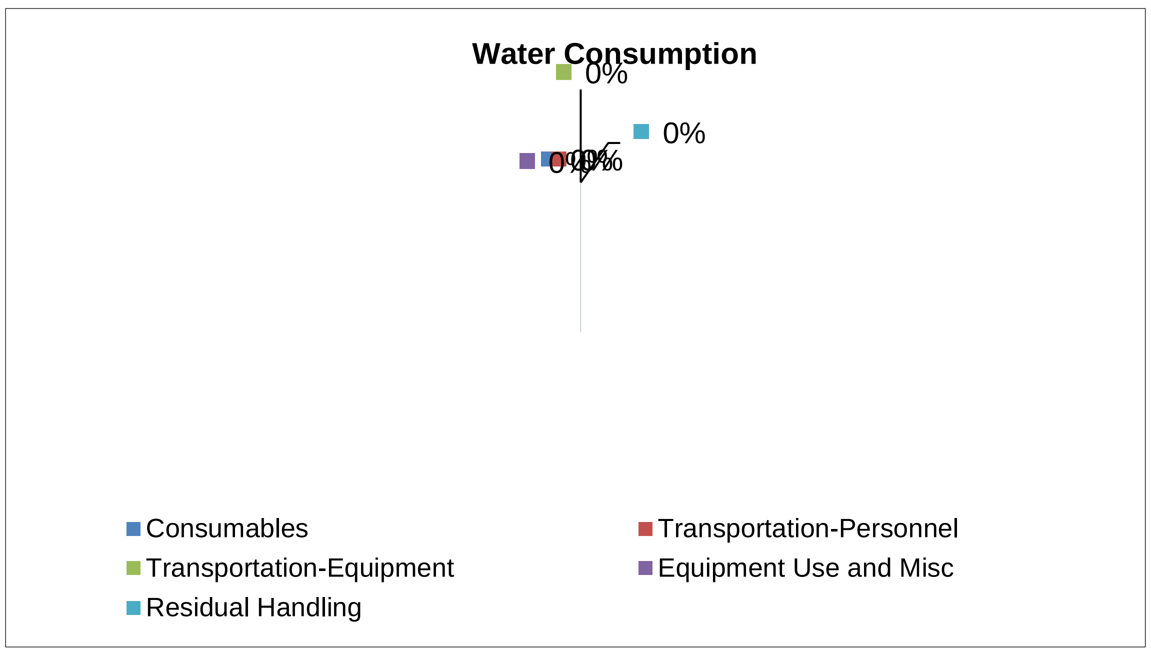



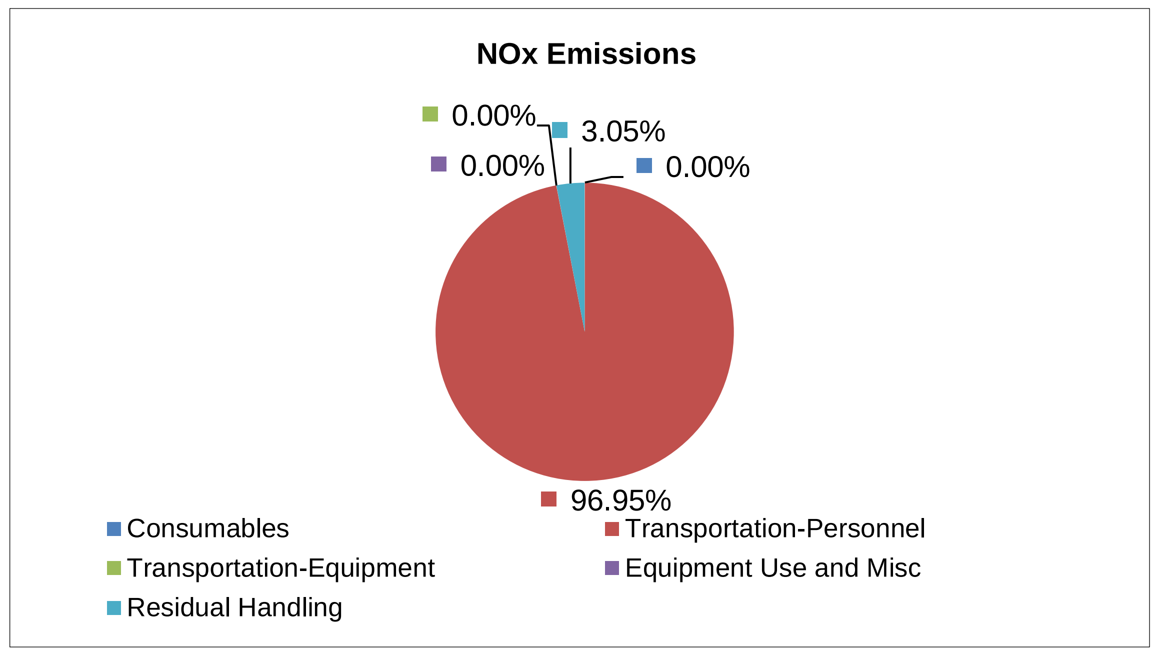



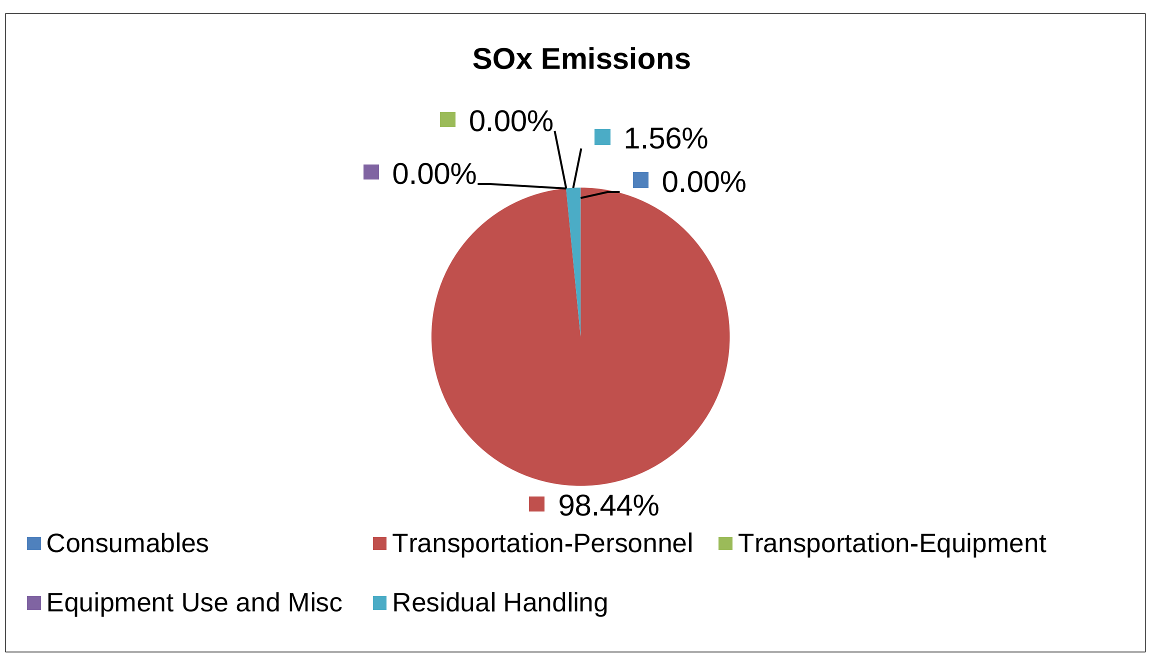



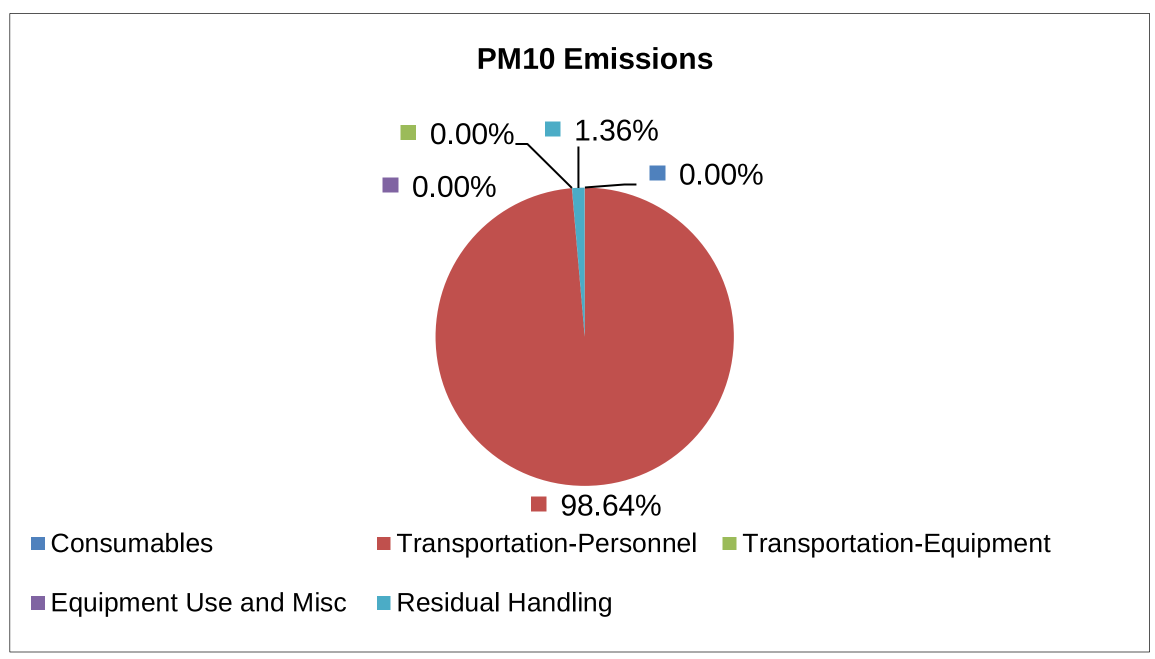

GHG Emissions
0%
0%
0%
4%
96%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

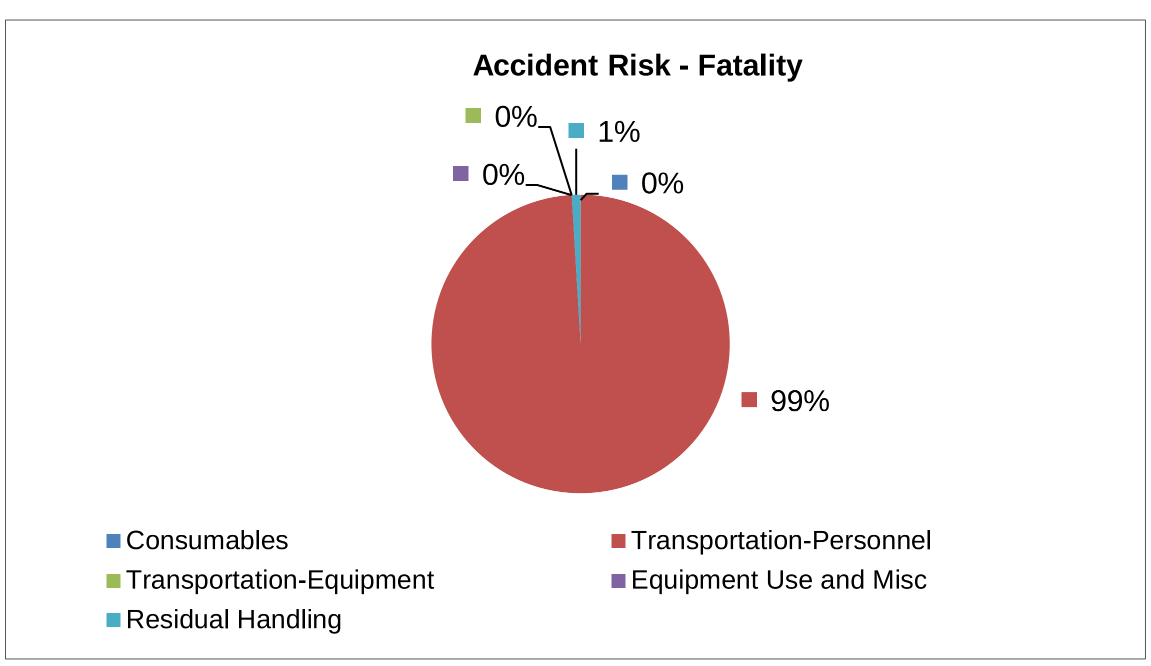

Energy Consumption
0%
0%
0%
4%
96%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

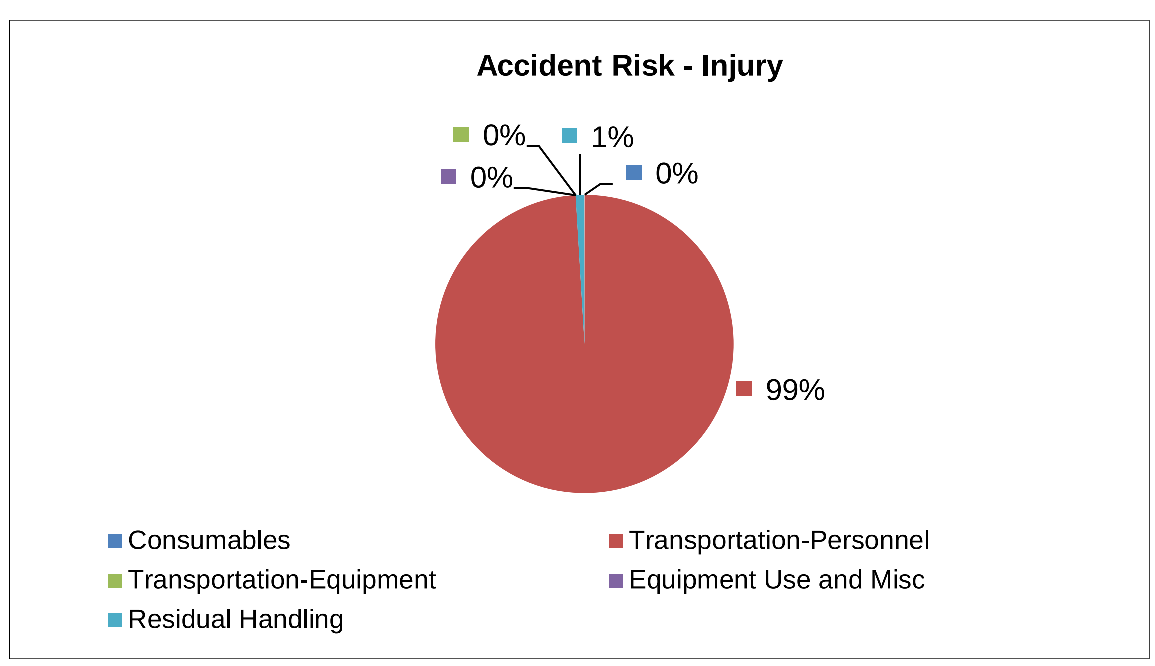

Water Consumption
0%
0%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

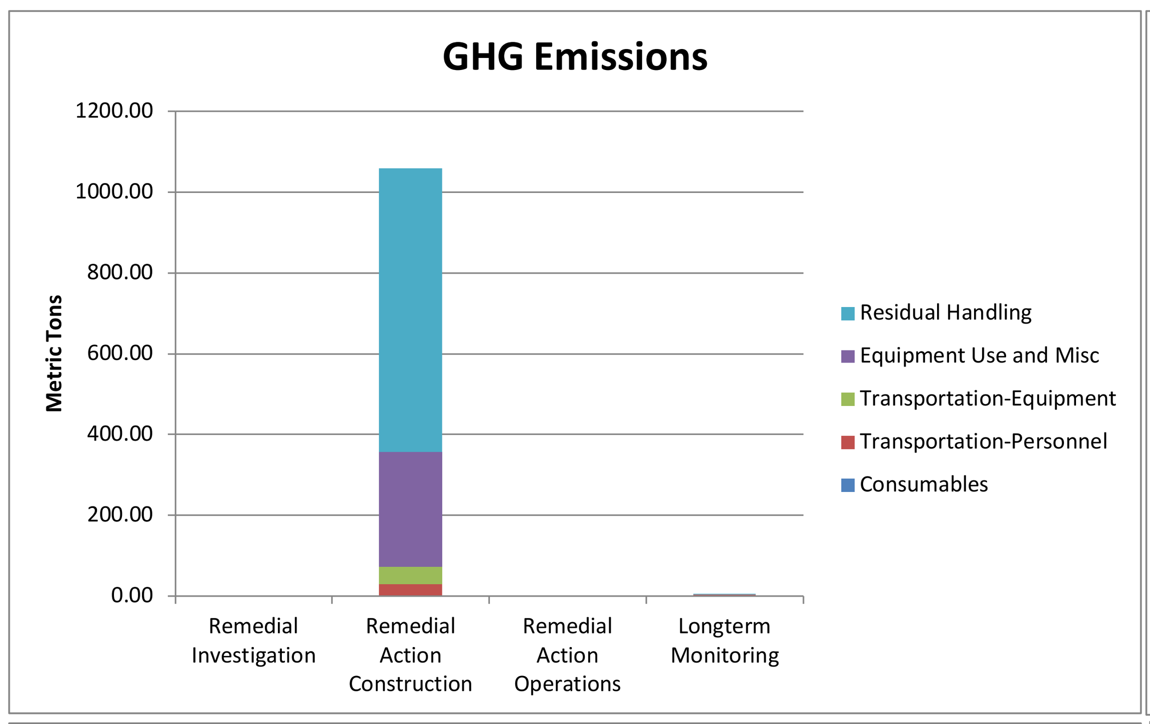

NOx Emissions
0.00%
3.05%
0.00%
0.00%
96.95%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

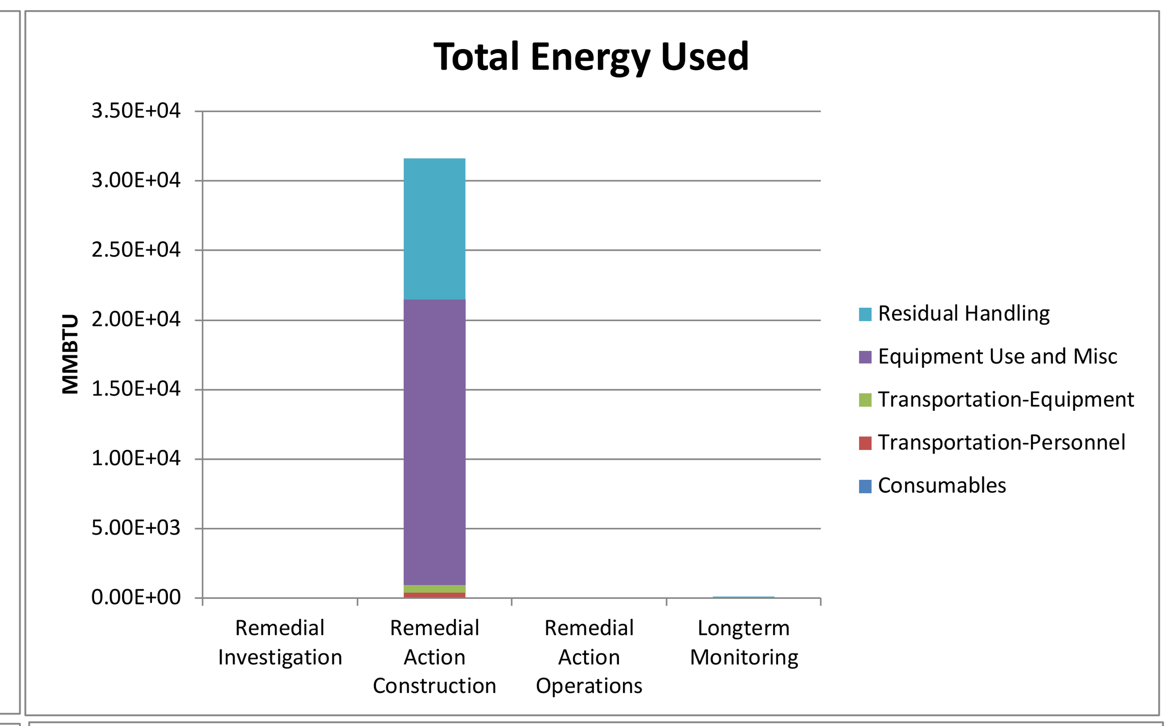

SOx Emissions
0.00%
1.56%
0.00%
0.00%
98.44%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

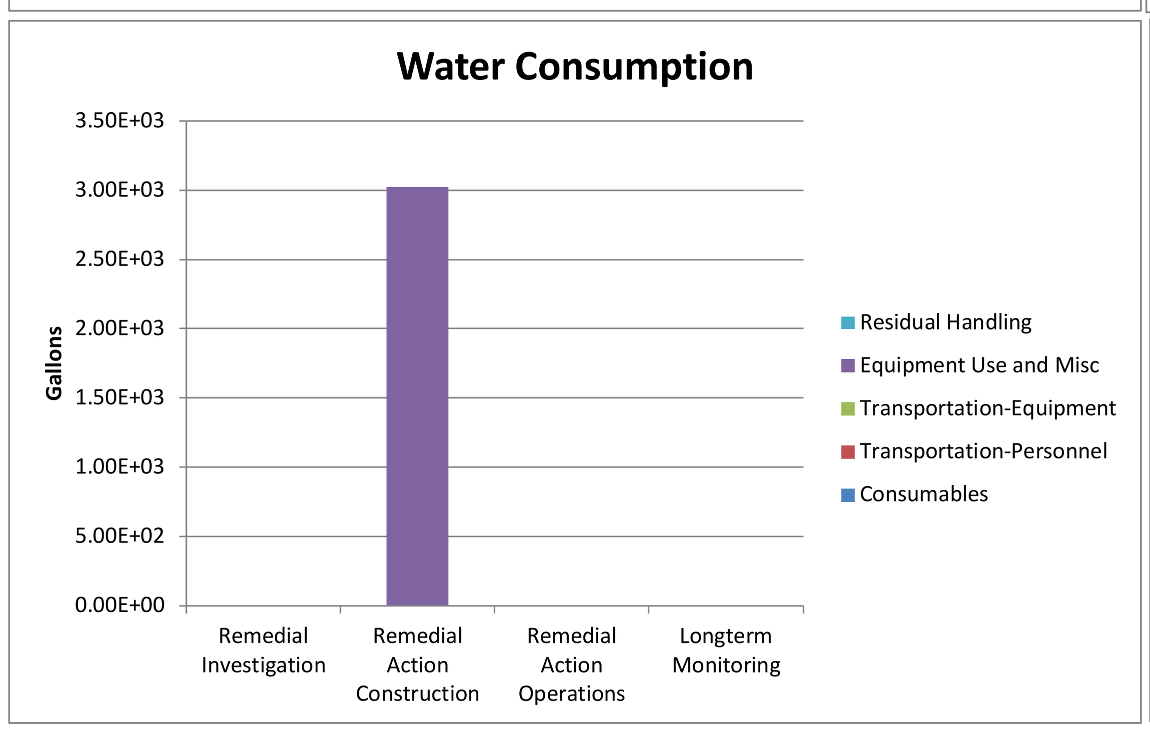

PM10 Emissions
0.00%
1.36%
0.00%
0.00%
98.64%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

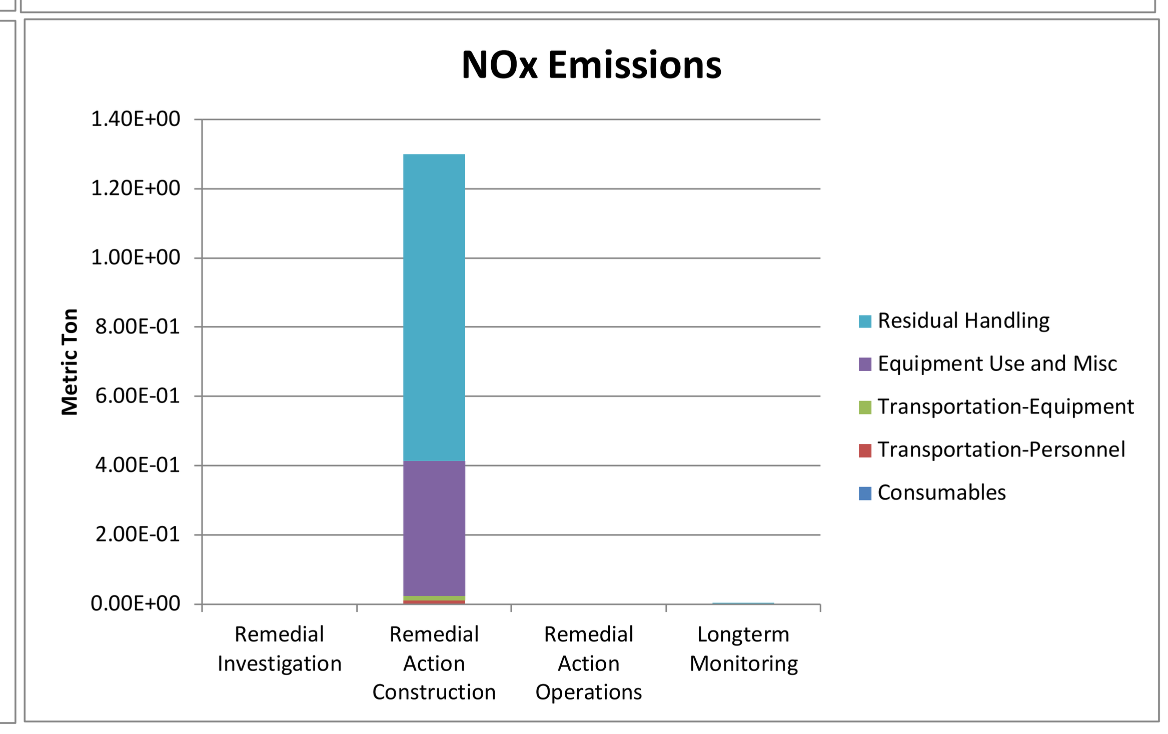

Accident Risk - Fatality
0%
1%
0%
0%
99%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

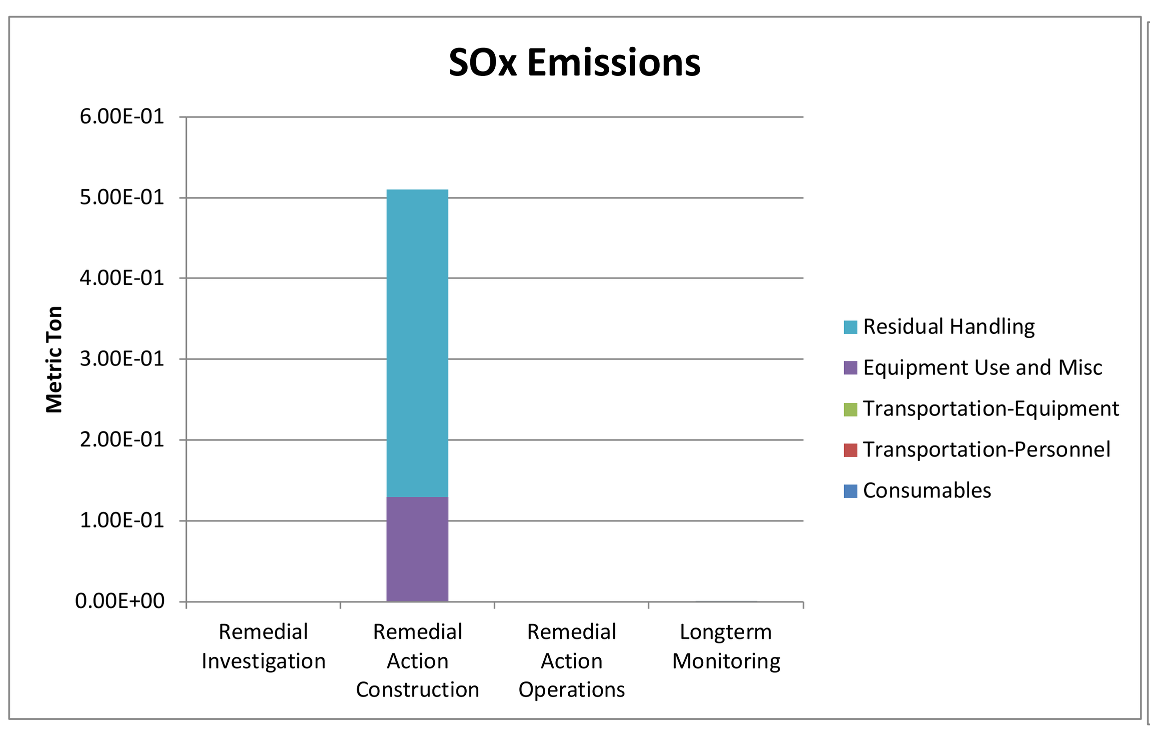

Accident Risk - Injury
0%
1%
0%
0%
99%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

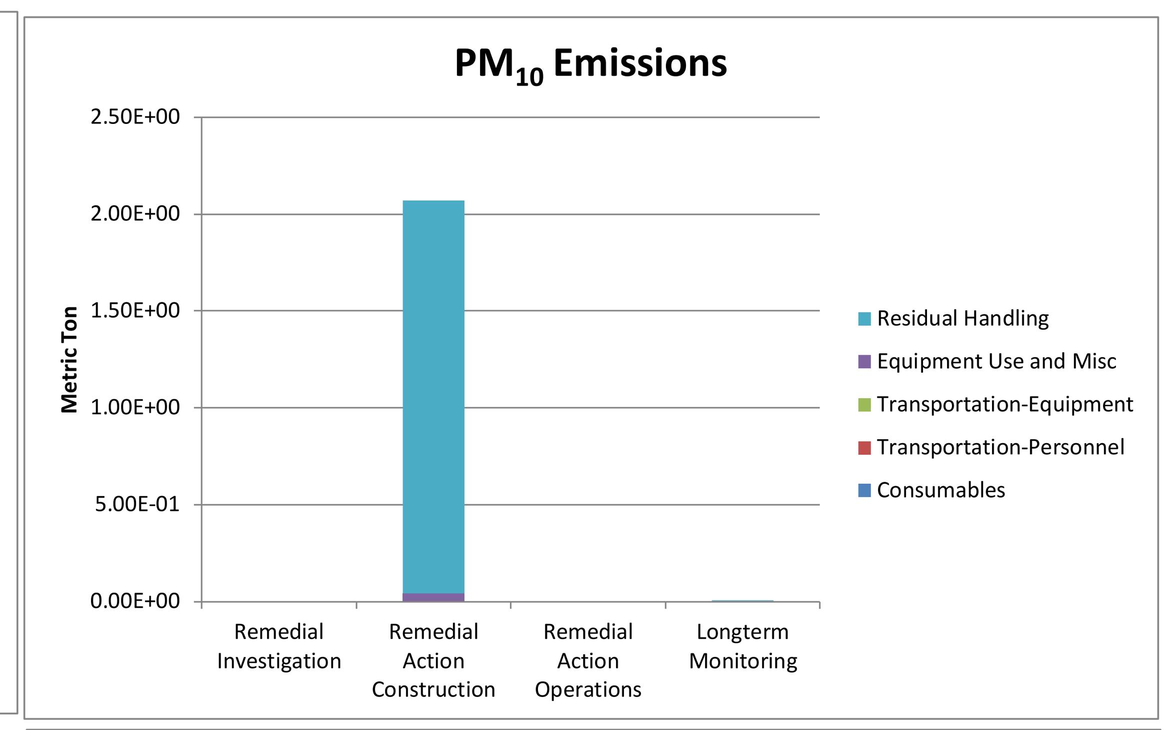

GHG Emissions
Metric Tons
1200.00
1000.00
800.00
600.00
400.00
200.00
0.00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

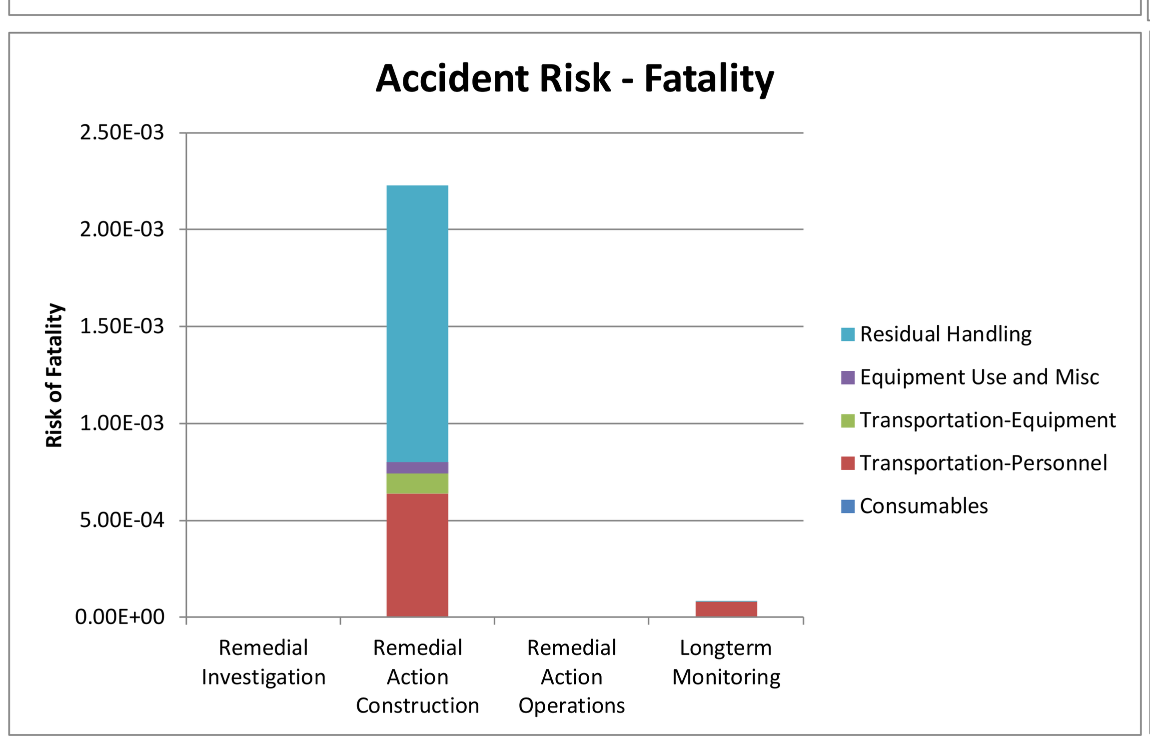

Total Energy Used
MMBTU
3.50E+04
3.00E+04
2.50E+04
2.00E+04
1.50E+04
1.00E+04
5.00E+03
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

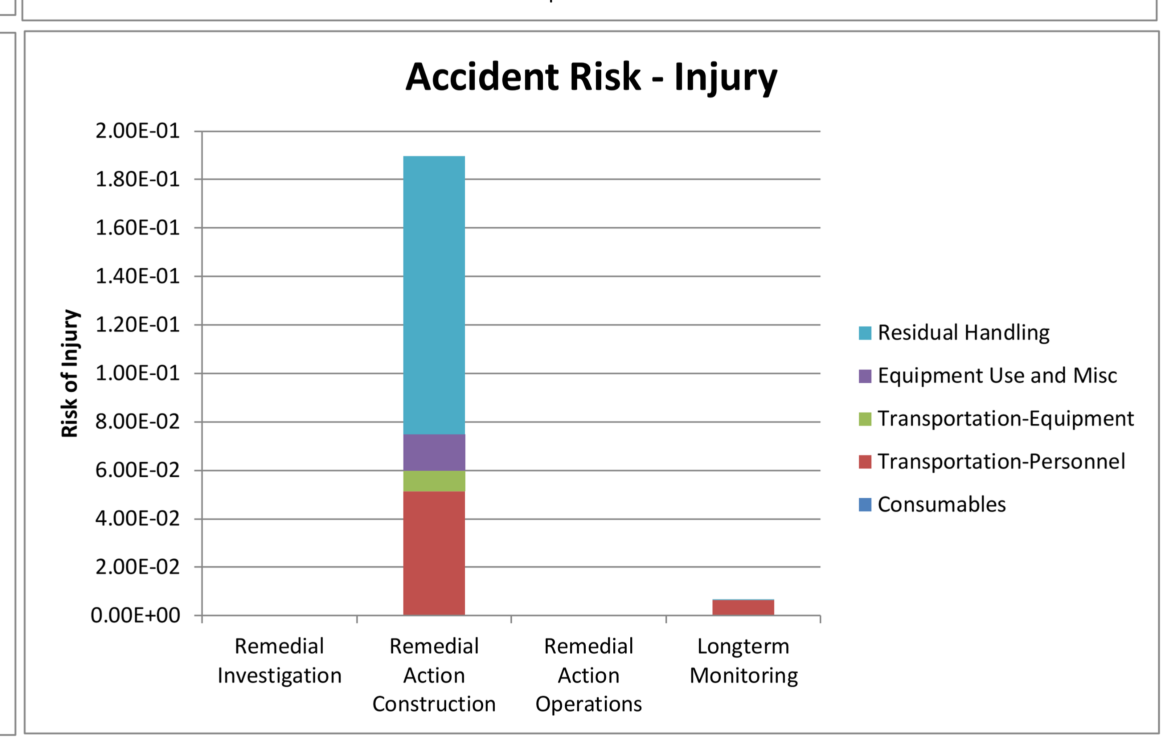

Water Consumption
Gallons
3.50E+03
3.00E+03
2.50E+03
2.00E+03
1.50E+03
1.00E+03
5.00E+02
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

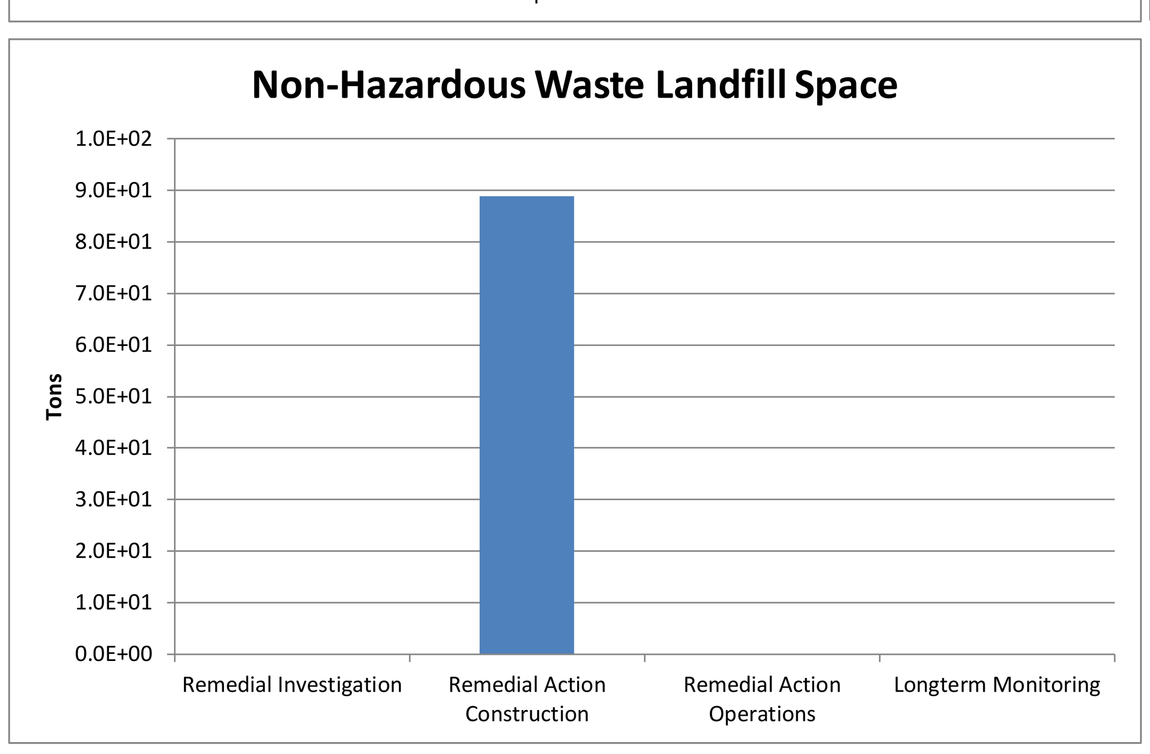

NOx Emissions
Metric Ton
1.40E+00
1.20E+00
1.00E+00
8.00E-01
6.00E-01
4.00E-01
2.00E-01
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

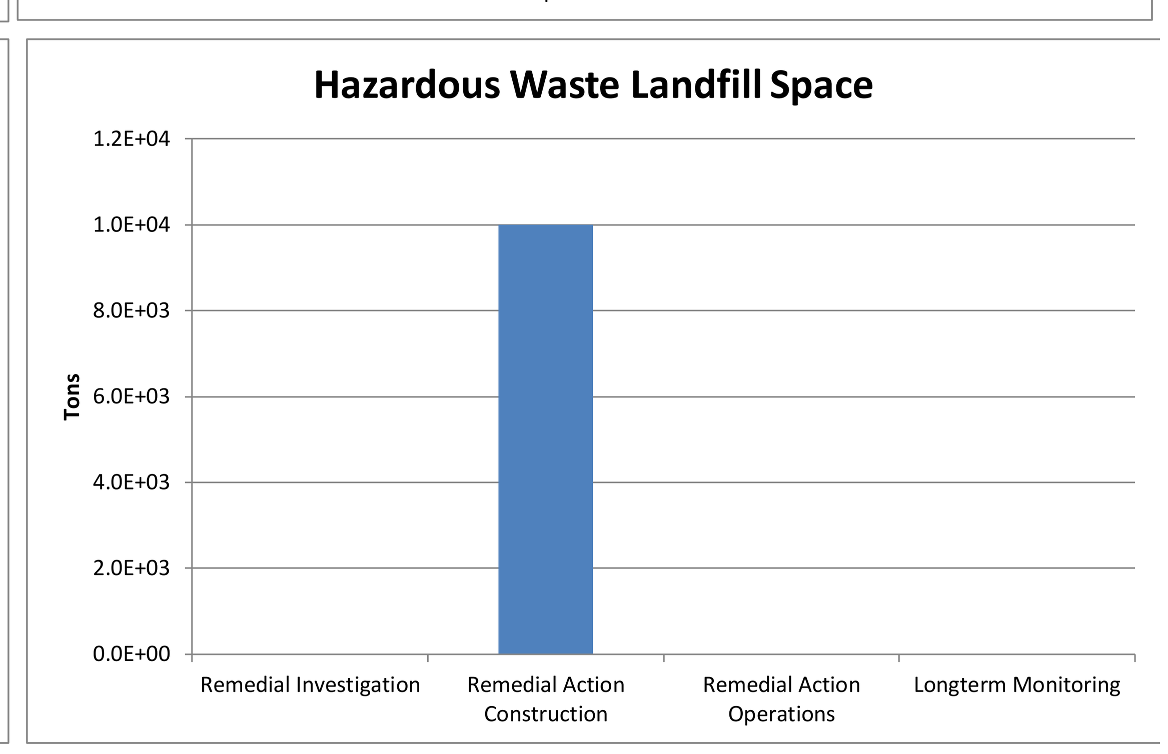

SOx Emissions
Metric Ton
6.00E-01
5.00E-01
4.00E-01
3.00E-01
2.00E-01
1.00E-01
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

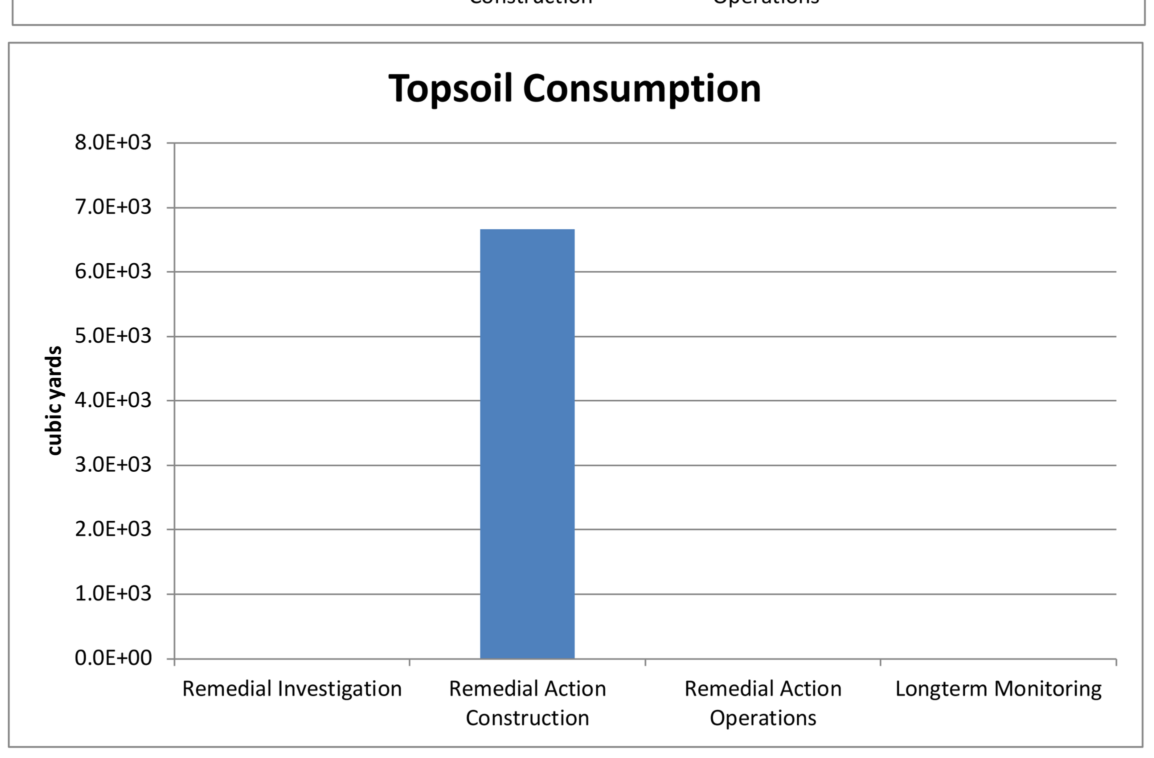

$PM_{10}$ Emissions
Metric Ton
2.50E+00
2.00E+00
1.50E+00
1.00E+00
5.00E-01
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

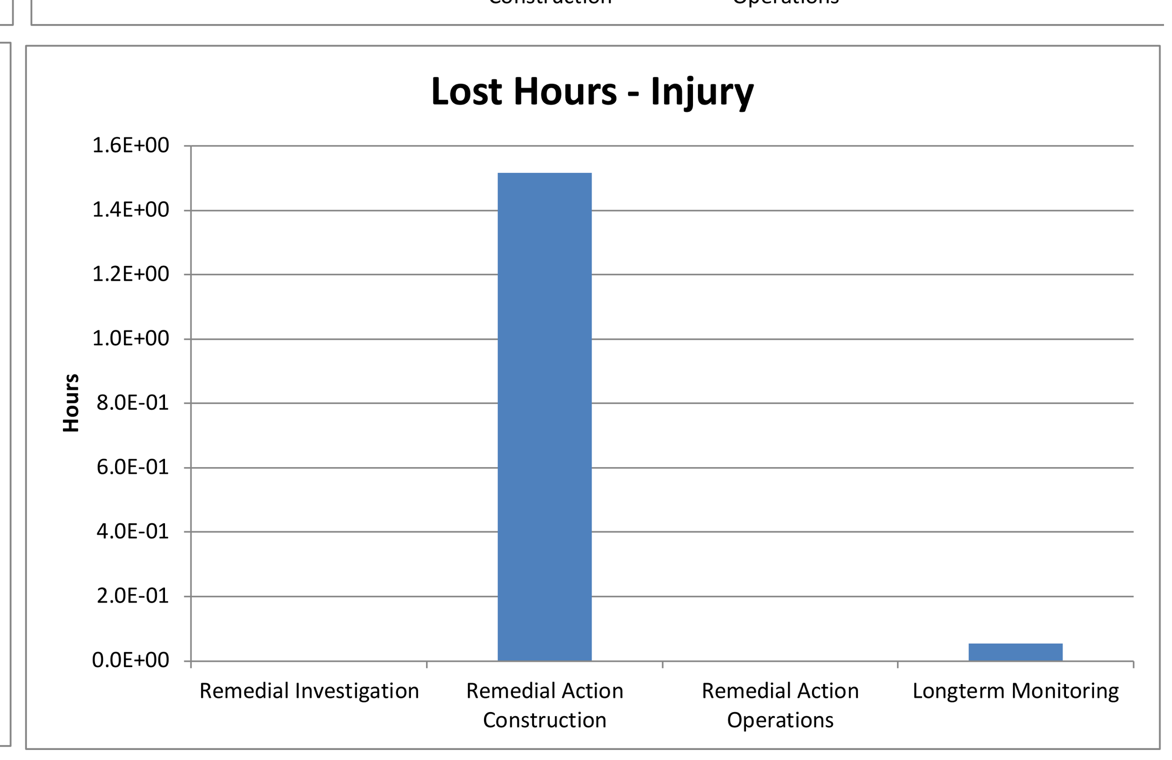

Accident Risk - Fatality
Risk of Fatality
2.50E-03
2.00E-03
1.50E-03
1.00E-03
5.00E-04
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables


Accident Risk - Injury
Risk of Injury
2.00E-01
1.80E-01
1.60E-01
1.40E-01
1.20E-01
1.00E-01
8.00E-02
6.00E-02
4.00E-02
2.00E-02
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables


Non-Hazardous Waste Landfill Space
Tons
1.0E+02
9.0E+01
8.0E+01
7.0E+01
6.0E+01
5.0E+01
4.0E+01
3.0E+01
2.0E+01
1.0E+01
0.0E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring


Hazardous Waste Landfill Space
Tons
1.2E+04
1.0E+04
8.0E+03
6.0E+03
4.0E+03
2.0E+03
0.0E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring


Topsoil Consumption
cubic yards
8.0E+03
7.0E+03
6.0E+03
5.0E+03
4.0E+03
3.0E+03
2.0E+03
1.0E+03
0.0E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring


Lost Hours - Injury
Hours
1.6E+00
1.4E+00
1.2E+00
1.0E+00
8.0E-01
6.0E-01
4.0E-01
2.0E-01
0.0E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring

| | Technology Module / Phase | Module Components | Comments / Assumptions | Quantity | (Units) | Greenhouse Gas Emissions | | | | Criteria Pollutant Emission | | | Energy Consumption | Water Consumption |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $CO_2e$ | $CO_2$ | $N_20$ | $CH_4$ | $NO_x$ | $SO_x$ | $PM_{10}$ | | |
| **Stage** | **Materials** | | | | | | **Tonnes** | | | | | | **MWhr** | **gal x 1000** |
| RAC | Decon Pad | General Concrete | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 | 43,500.0 | lbs | 2.56 | 2.56 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 25.31 | 0.00 |
| RAC | Clean backfill | Soil | Assume Soil, 6667 cy, 1.5 ton/cy, 2000 lb/ton | 20,001,000.0 | lbs | 208.63 | 208.63 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5513.22 | 0.00 |
| RAC | Revegetation, soil nutrients | Fertilizer | Assume fertilizer, 309 msf (thousand square feet), 3 lb of sed per 1.2 msf | 772.5 | lbs | 0.96 | 0.96 | 1.27E-09 | 0.00E+00 | 0.00E+00 | 3.50E-04 | 7.04E-07 | 17.46 | 0.35 |
| RAC | Revegetation, hydroseed | Fertilizer | Assume fertilizer, 309 msf (thousand square feet), 10 lb of sed per 1 msf | 3,090.0 | lbs | 3.85 | 3.85 | 5.07E-09 | 0.00E+00 | 0.00E+00 | 1.40E-03 | 2.82E-06 | 69.84 | 1.40 |
| RAC | Revegetation, hydroseed | Mulch | Assume wood mulch, 309 msf (thousand square feet), 50 lb of mulch per 1 msf | 15,450.0 | lbs | 4.88 | 1.71 | 9.88E-03 | 5.26E-03 | 2.91E-06 | 1.67E-02 | 1.26E-03 | 55.27 | 0.00 |
| RAC | Revegetation, hydroseed | Fertilizer | Assume fertilizer, 309 msf (thousand square feet), 2 lb per 1 msf | 618.0 | lbs | 0.77 | 0.77 | 1.01E-09 | 0.00E+00 | 0.00E+00 | 2.80E-04 | 5.63E-07 | 13.97 | 0.28 |
| | **Subtotal** | | | | | **221.66** | **218.49** | **0.01** | **0.01** | **0.00** | **0.02** | **0.00** | **5695.07** | **2.02** |
| | **Construction Equipment** | | | | | | **Tonnes** | | | | | | **MWhr** | **gal x 1000** |
| RAC | Brush mowing | Tractor, 250 hp, diesel | 1.2 acres, medium density area, uses a tractor, Assume 8 hours per day, 0.5 acres per day | 19.2 | hrs | 1.43 | 1.43 | 0.00E+00 | 0.00E+00 | 1.20E-02 | 0.00E+00 | 9.06E-04 | 5.16 | |
| RAC | Chipping tree | WOOD CHIPPER | 1.2 acres, medium density area, uses a woodchipper, 130 hp, assume 8 hours per day, 0.5 acres per day | 19.2 | hrs | 0.84 | 0.84 | 0.00E+00 | 0.00E+00 | 6.56E-03 | 0.00E+00 | 5.54E-04 | 3.67 | |
| RAC | Chipping tree | Chainsaw, gasoline, 3<hp<=6, 2 stroke | 1.2 acres, medium density area, uses a 2 chain saws, gasoline, 18" , assume 3 days or work, 8 hours per day, 80%efficiency | 38.4 | hrs | 0.07 | 0.07 | 0.00E+00 | 0.00E+00 | 1.39E-04 | 0.00E+00 | 1.03E-03 | 0.36 | |
| RAC | Dozer, 200 hp | Dozer, 200 HP (D7) w/U Blade (diesel) | 20 days, 8 hours per day, 80% efficiency | 128.0 | hrs | 14.06 | 14.06 | 0.00 | 0.00 | 8.64E-02 | 2.54E-02 | 8.55E-03 | 86.04 | |
| RAC | Excavator 2.5 CY | Excavator, Hydraulic, 2 CY (diesel) | 2 units, 20 days, 8 hours per day, 80% efficiency | 256.0 | hrs | 24.81 | 24.81 | 0.00 | 0.00 | 1.56E-01 | 4.60E-02 | 1.48E-02 | 112.63 | |
| RAC | Dozer, 200 hp | Dozer, 200 HP (D7) w/U Blade (diesel) | 2 units, 10 days, 8 hours per day, 80% efficiency | 128.0 | hrs | 14.06 | 14.06 | 0.00 | 0.00 | 8.64E-02 | 2.54E-02 | 8.55E-03 | 86.04 | |
| RAC | Excavator 2.5 CY | Excavator, Hydraulic, 2 CY (diesel) | 10 days, 8 hours per day, 80%efficiency | 64.0 | hrs | 6.20 | 6.20 | 0.00 | 0.00 | 3.90E-02 | 1.15E-02 | 3.71E-03 | 28.16 | |
| | **Subtotal** | | | | | **61.48** | **61.48** | **0.00** | **0.00** | **0.39** | **0.11** | **0.04** | **322.05** | **0** |
| | | | | **Total** | | **283** | **280** | **0.01** | **0.01** | **0.39** | **0.13** | **0.04** | **6,017** | **2** |

**Alternative 1**
**Values Input into SiteWise as "Other"**

| Module | Greenhouse Gas Emissions | | | | Criteria Pollutant Emission | | | Energy Consumption | Water Consumption |
|---|---|---|---|---|---|---|---|---|---|
| | $CO_2e$ | $CO_2$ | $N_20$ (CO2e) | $CH_4$ (CO2e) | $NO_x$ | $SO_x$ | $PM_{10}$ | | |
| | | **Tonnes** | | | | | | **MMBTU** | **gal** |
| RI | - | - | - | - | - | - | - | - | - |
| RAC | 283.14 | 279.97 | 3.06 | 0.11 | 0.39 | 0.13 | 0.04 | 20,530.41 | 2,023.92 |
| RAO | - | - | - | - | - | - | - | - | - |
| LTM | - | - | - | - | - | - | - | - | - |

Note: 1 MWhr = 3412141.4799 BTU, 1MMTBU = 10^6 BTU

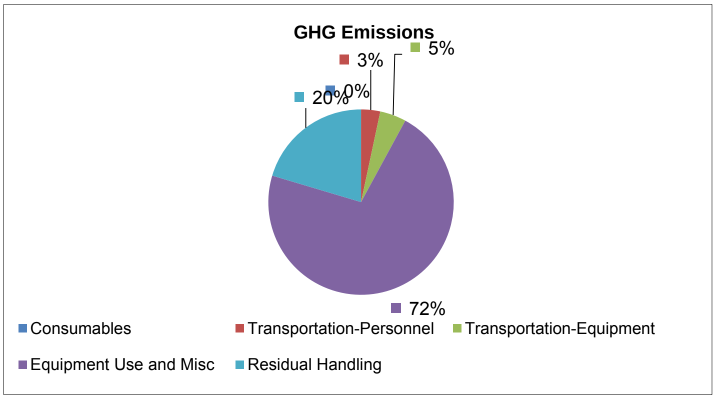
## Sustainable Remediation - Environmental Footprint Summary 3b

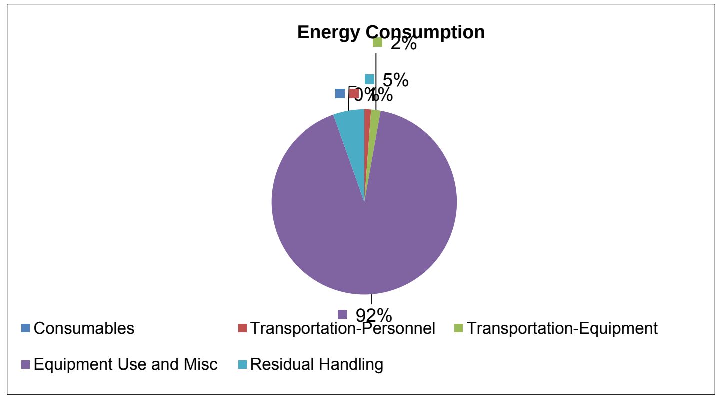
| Phase | Activities | GHG Emissions (metric ton) | Total energy Used (MMBTU) | Water Consumption (gallons) | NOx emissions (metric ton) | SOx Emissions (metric ton) | PM10 Emissions (metric ton) | Accident Risk Fatality | Accident Risk Injury |
|---|---|---|---|---|---|---|---|---|---|
| Remedial Investigation | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Sub-Total | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Remedial Action Construction | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 31.80 | 4.0E+02 | NA | 1.2E-02 | 4.1E-04 | 2.4E-03 | 6.5E-04 | 5.2E-02 |
| | Transportation-Equipment | 43.62 | 5.7E+02 | NA | 1.4E-02 | 2.4E-04 | 1.2E-03 | 1.1E-04 | 8.7E-03 |
| | Equipment Use and Misc | 682.75 | 3.1E+04 | 4.0E+03 | 4.1E-01 | 2.4E-01 | 1.1E-01 | 7.1E-05 | 1.8E-02 |
| | Residual Handling | 194.13 | 1.9E+03 | NA | 6.7E-01 | 3.4E-01 | 1.8E+00 | 2.0E-04 | 1.6E-02 |
| | Sub-Total | 952.30 | 3.42E+04 | 4.02E+03 | 1.10E+00 | 5.80E-01 | 1.95E+00 | 1.03E-03 | 9.50E-02 |
| Remedial Action Operations | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Sub-Total | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Longterm Monitoring | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 4.00 | 5.0E+01 | NA | 1.5E-03 | 5.2E-05 | 3.0E-04 | 8.2E-05 | 6.6E-03 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.15 | 1.9E+00 | NA | 4.6E-05 | 8.2E-07 | 4.1E-06 | 7.8E-07 | 6.3E-05 |
| | Sub-Total | 4.15 | 5.23E+01 | 0.00E+00 | 1.53E-03 | 5.30E-05 | 3.04E-04 | 8.27E-05 | 6.65E-03 |
| **Total** | | **9.6E+02** | **3.4E+04** | **4.0E+03** | **1.1E+00** | **5.8E-01** | **2.0E+00** | **1.1E-03** | **1.0E-01** |

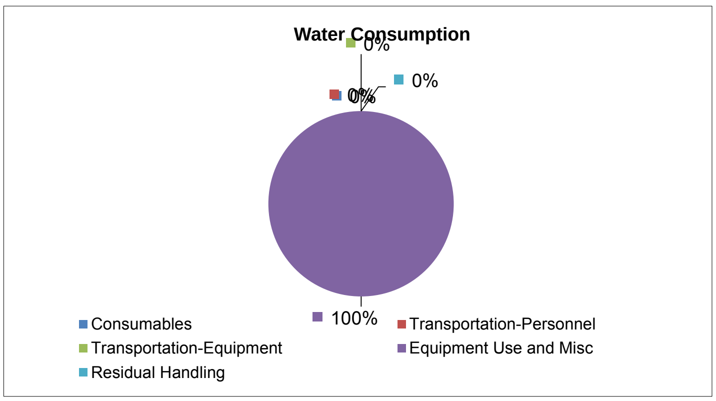
| Remedial Alternative Phase | Non-Hazardous Waste Landfill Space (tons) | Hazardous Waste Landfill Space (tons) | Topsoil Consumption (cubic yards) | Costing ($) | Lost Hours - Injury |
|---|---|---|---|---|---|
| Remedial Investigation | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 | 0.0E+00 |
| Remedial Action Construction | 1.0E+04 | 0.0E+00 | 0.0E+00 | 0 | 7.6E-01 |
| Remedial Action Operations | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 | 0.0E+00 |
| Longterm Monitoring | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 | 5.3E-02 |
| **Total** | **1.0E+04** | **0.0E+00** | **0.0E+00** | **$0** | **8.1E-01** |

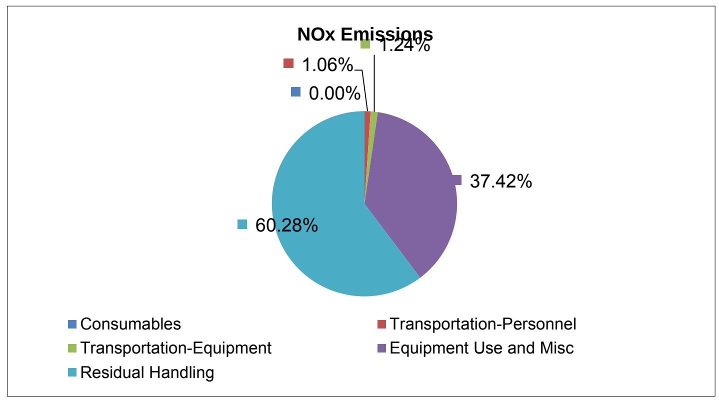
| Total Cost with Footprint Reduction |
|---|
| **$0** |

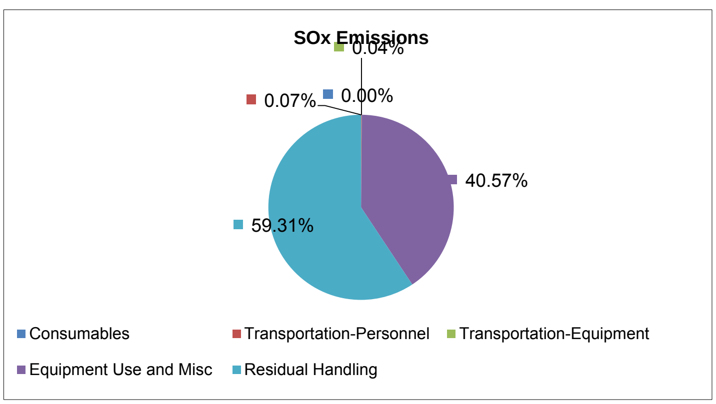
SiteWise™ Results Alternative XX
Remedial Action Construction Stage
Site, Place
Place, State

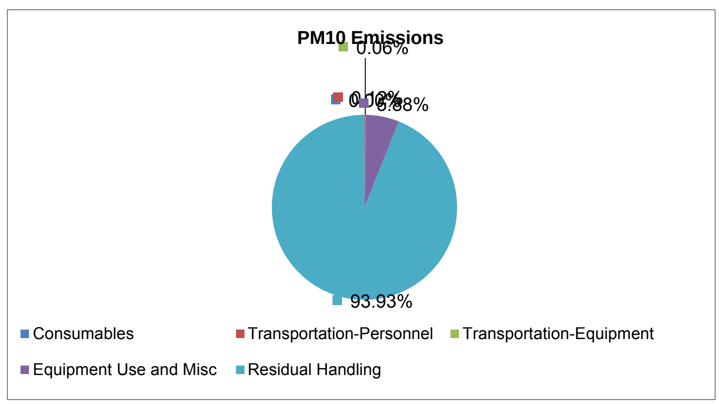



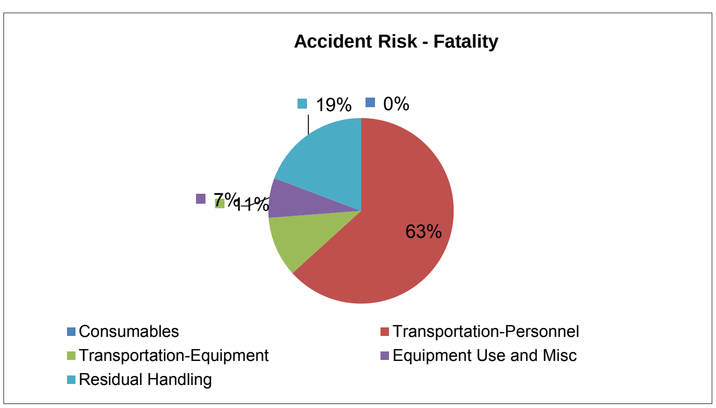



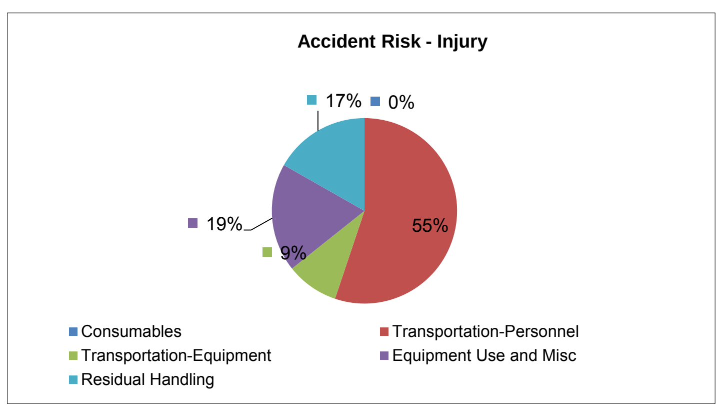



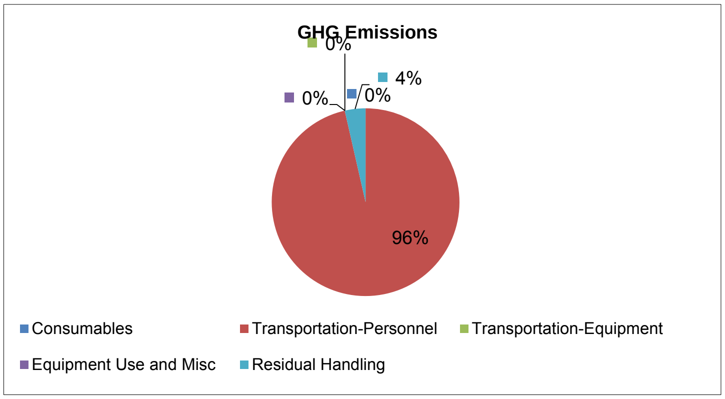



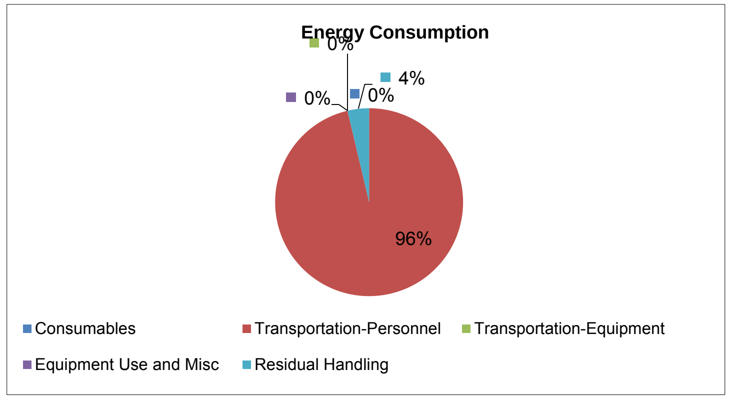



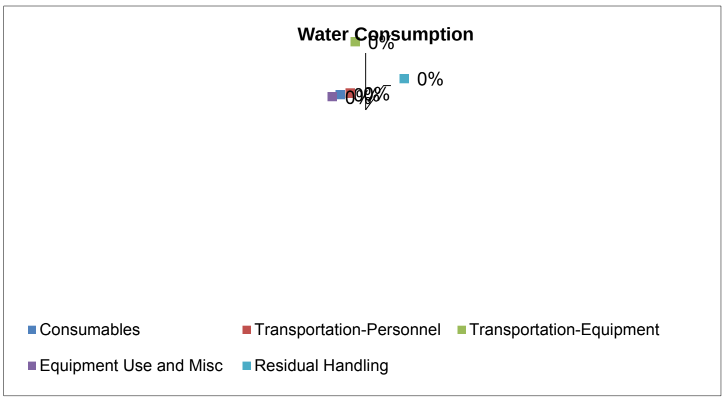



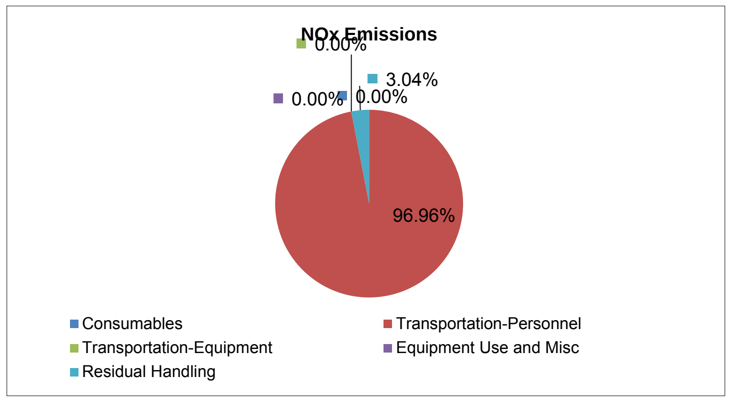



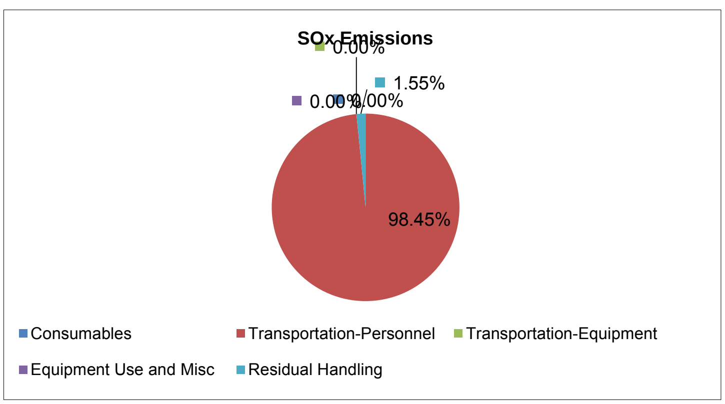
SiteWise™ Results Alternative XX
Remedial Action Construction Stage
Site, Place
Place, State

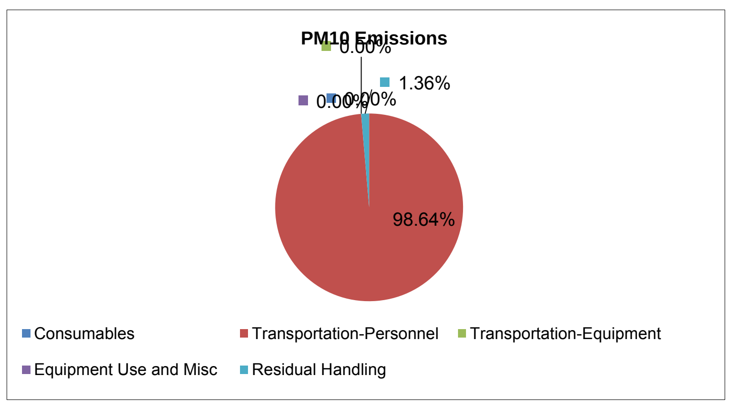



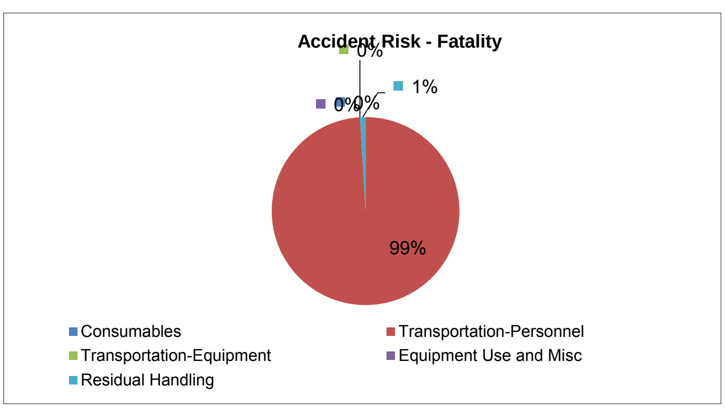



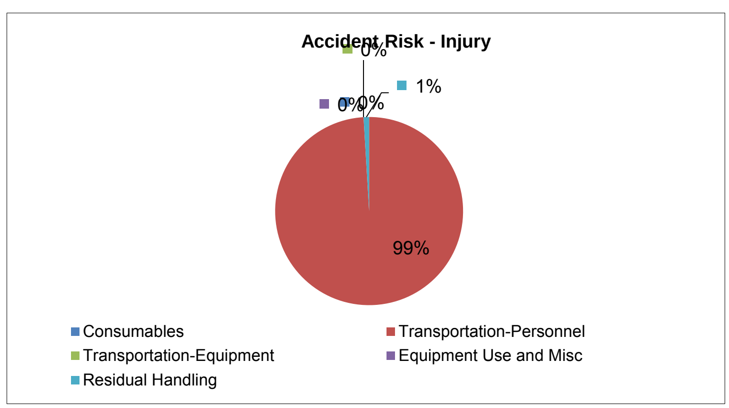



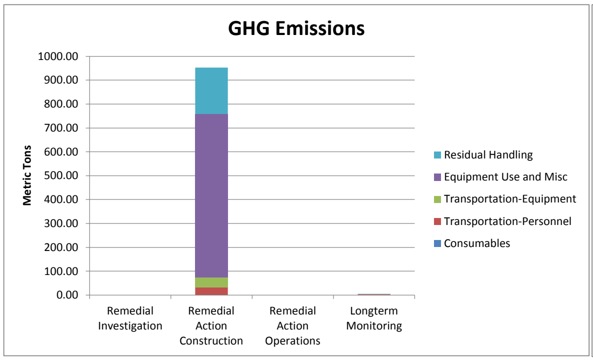



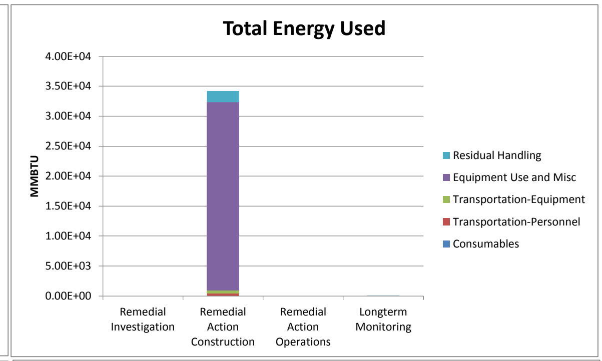



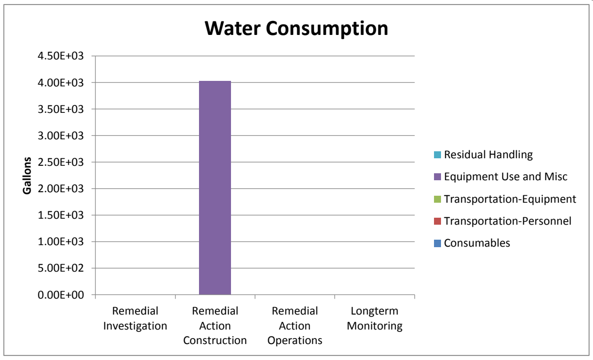



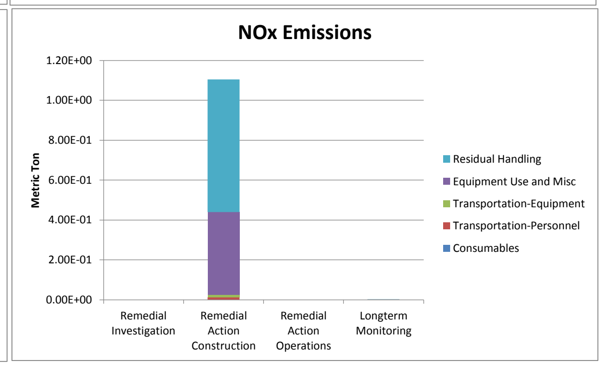



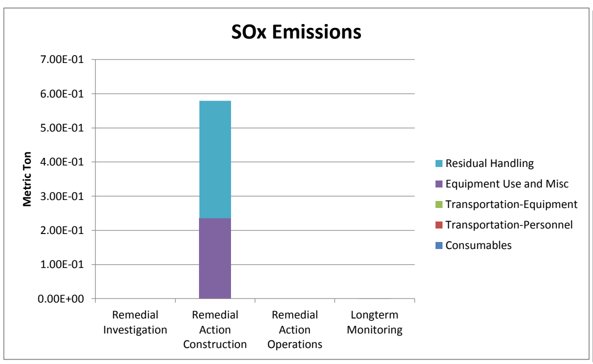
SiteWise™ Results Alternative XX
Remedial Action Construction Stage
Site, Place
Place, State

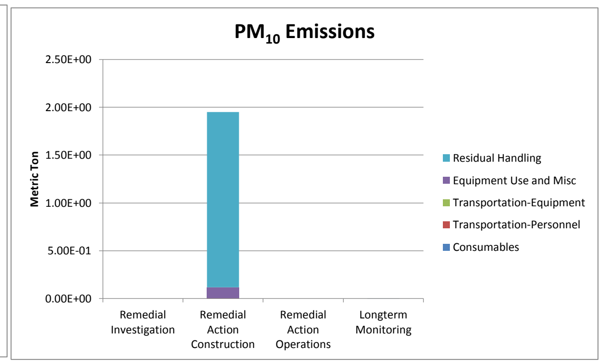



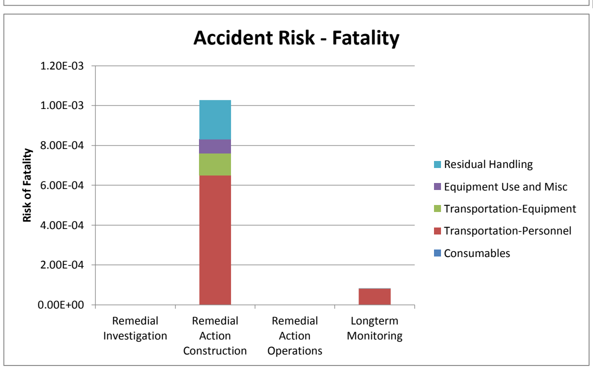



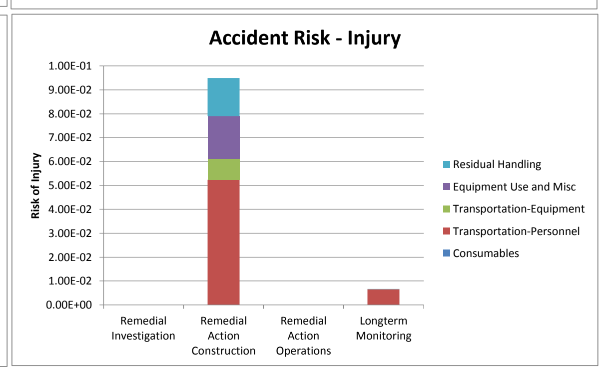



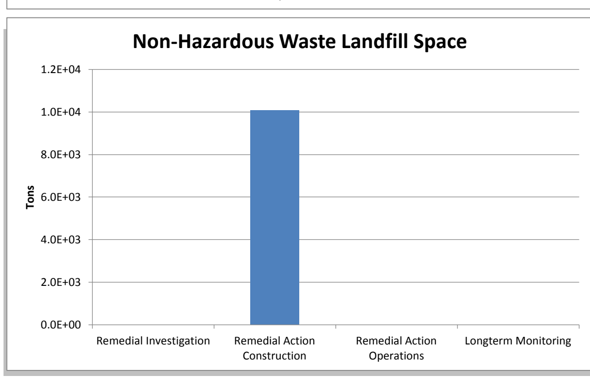



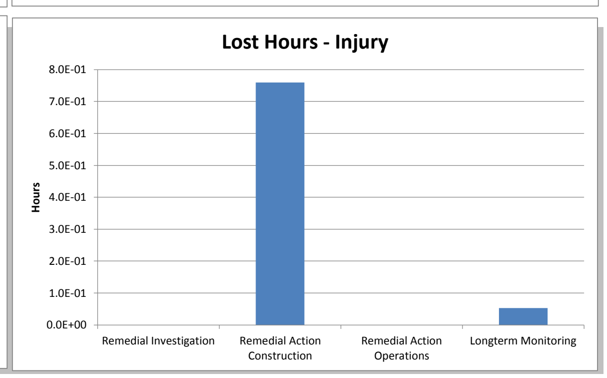



GSRx Results Alternative 3b
OU5 Site 15, NAS Cecil Field
Jacksonville, FL


| | Technology Module / Phase | Module Components | Comments / Assumptions | Quantity | (Units) | Greenhouse Gas Emissions | | | | Criteria Pollutant Emission | | | Energy Consumption | Water Consumption |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $CO_2e$ | $CO_2$ | $N_20$ | $CH_4$ | $NO_x$ | $SO_x$ | $PM_{10}$ | | |
| Stage | Materials | | | | | | Tonnes | | | | | | MWhr | gal x 1000 |
| RAC | Decon Pad | General Concrete | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 | 43,500.00 | lbs | 2.56 | 2.56 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 25.31 | 0.00 |
| RAC | Stabilization Material | Typical Cement | Assume cement, 500 ton, Assume 2/3 of 500 to be cement | 666,666.67 | lbs | 250.94 | 250.94 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1,878.48 | 0.00 |
| RAC | Stabilization Material | Lime | Assume lime, 500 ton, Assume 1/3 of 500 to be cement | 333,333.33 | lbs | 145.76 | 124.87 | 5.68E-02 | 1.56E-01 | 1.22E-05 | 1.04E-01 | 7.17E-02 | 1,284.31 | 0.00 |
| RAC | Clean Backfill | Soil | 6667 CY, 1,5 ton/CY, 2000 lb/ton | 20,001,000.00 | lbs | 208.63 | 208.63 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5,513.22 | 0.00 |
| RAC | Revegetation, soil nutrients | Fertilizer | Assume fertilizer, 309 msf (thousand square feet), 3 lb of sed per 1.2 msf | 772.50 | lbs | 0.96 | 0.96 | 1.27E-09 | 0.00E+00 | 0.00E+00 | 3.50E-04 | 7.04E-07 | 17.46 | 0.35 |
| RAC | Revegetation, hydroseed | Fertilizer | Assume fertilizer, 309 msf (thousand square feet), 10 lb of sed per 1 msf | 3,090.00 | lbs | 3.85 | 3.85 | 5.07E-09 | 0.00E+00 | 0.00E+00 | 1.40E-03 | 2.82E-06 | 69.84 | 1.40 |
| RAC | Revegetation, hydroseed | Mulch | Assume wood mulch, 309 msf (thousand square feet), 50 lb of mulch per 1 msf | 15,450.00 | lbs | 4.88 | 1.71 | 9.88E-03 | 5.26E-03 | 2.91E-06 | 1.67E-02 | 1.26E-03 | 55.27 | 0.00 |
| RAC | Revegetation, hydroseed | Fertilizer | Assume fertilizer, 309 msf (thousand square feet), 2 lb per 1 msf | 618.00 | lbs | 0.77 | 0.77 | 1.01E-09 | 0.00E+00 | 0.00E+00 | 2.80E-04 | 5.63E-07 | 13.97 | 0.28 |
| | **Subtotal** | | | | | **618.37** | **594.30** | **0.07** | **0.16** | **0.00** | **0.12** | **0.07** | **8857.87** | **2.02** |
| Stage | Construction Equipment | | | | | | Tonnes | | | | | | MWhr | gal x 1000 |
| RAC | Brush mowing | Tractor, 250 hp, diesel | 1.2 acres, medium density area, uses a tractor, Assume 8 hours per day, 0.5 acres per day | 19.20 | hrs | 1.43 | 1.43 | 0.00E+00 | 0.00E+00 | 1.20E-02 | 0.00E+00 | 9.06E-04 | 5.16 | |
| RAC | Chipping tree | WOOD CHIPPER | 1.2 acres, medium density area, uses a woodchipper, 130 hp, assume 8 hours per day, 0.5 acres per day | 19.20 | hrs | 0.84 | 0.84 | 0.00E+00 | 0.00E+00 | 6.56E-03 | 0.00E+00 | 5.54E-04 | 3.67 | |
| RAC | Chipping tree | Chainsaw, gasoline, 3<hp<=6, 2 stroke | 1.2 acres, medium density area, uses a 2 chain saws, gasoline, 18" , assume 3 days or work, 8 hours per day, 80%efficiency | 38.40 | hrs | 0.07 | 0.07 | 0.00E+00 | 0.00E+00 | 1.39E-04 | 0.00E+00 | 1.03E-03 | 0.36 | |
| RAC | Front End Loader 4 cy | Loader, 200 HP, 4 CY (diesel) | 10 days, 8 hours per day, 80% of efficiency | 64.00 | hrs | 2.07 | 2.07 | 0.00 | 0.00 | 1.89E-02 | 3.92E-03 | 2.27E-03 | 7.56 | |
| RAC | Dozer, 200 hp | Dozer, 200 HP (D7) w/U Blade (diesel) | 10 days, 8 hours per day, 80% of efficiency | 64.00 | hrs | 7.03 | 7.03 | 0.00 | 0.00 | 4.32E-02 | 1.27E-02 | 4.28E-03 | 43.02 | |
| RAC | Skid-steer, 78 hp | Skid Steer (diesel) | 10 days, 8 hours per day, 80% of efficiency | 64.00 | hrs | 0.83 | 0.78 | 0.00 | 2.03E-03 | 7.91E-03 | 1.68E-04 | 1.52E-03 | 3.91 | |
| RAC | Dozer, 200 hp | Dozer, 200 HP (D7) w/U Blade (diesel) | 20 days, 8 hours per day, 80% utilization | 128.00 | hrs | 14.06 | 14.06 | 0.00 | 0.00 | 8.64E-02 | 2.54E-02 | 8.55E-03 | 86.04 | |
| RAC | Excavator 2.5 cy (2) | Excavator, Hydraulic, 2 CY (diesel) | 20 days, 8 hours per day, 80% of efficiency | 256.00 | hrs | 24.81 | 24.81 | 0.00 | 0.00 | 1.56E-01 | 4.60E-02 | 1.48E-02 | 112.63 | |
| RAC | Excavator 2.5 cy | Excavator, Hydraulic, 2 CY (diesel) | 10 days, 8 hours per day, 80% of efficiency | 64.00 | hrs | 6.20 | 6.20 | 0.00 | 0.00 | 3.90E-02 | 1.15E-02 | 3.71E-03 | 28.16 | |
| RAC | Dozer, 200 hp (2) | Dozer, 200 HP (D7) w/U Blade (diesel) | 10 days, 8 hours per day, 80% of efficiency | 64.00 | hrs | 7.03 | 7.03 | 0.00 | 0.00 | 4.32E-02 | 1.27E-02 | 4.28E-03 | 43.02 | |
| | **Subtotal** | | | | | **64.38** | **64.34** | **0.00** | **0.00** | **0.41** | **0.11** | **0.04** | **333.52** | **0** |
| | | | | **Total** | | **683** | **659** | **0.07** | **0.16** | **0.41** | **0.24** | **0.11** | **9,191** | **2** |

**Alternative 1**
**Values Input into SiteWise as "Other"**

| Module | Greenhouse Gas Emissions | | | | Criteria Pollutant Emission | | | Energy Consumption | Water Consumption |
|---|---|---|---|---|---|---|---|---|---|
| | $CO_2e$ | $CO_2$ | $N_20$ ($CO_2e$) | $CH_4$ ($CO_2e$) | $NO_x$ | $SO_x$ | $PM_{10}$ | | |
| | | Tonnes | | | | | | MMBTU | gal |
| RI | - | - | - | - | - | - | - | - | - |
| RAC | 682.74 | 658.64 | 20.68 | 3.42 | 0.41 | 0.24 | 0.11 | 31,361.01 | 2,023.92 |
| RAO | - | - | - | - | - | - | - | - | - |
| LTM | - | - | - | - | - | - | - | - | - |

Note: 1 MWhr = 3412141.4799 BTU, 1MMTBU = 10^6 BTU

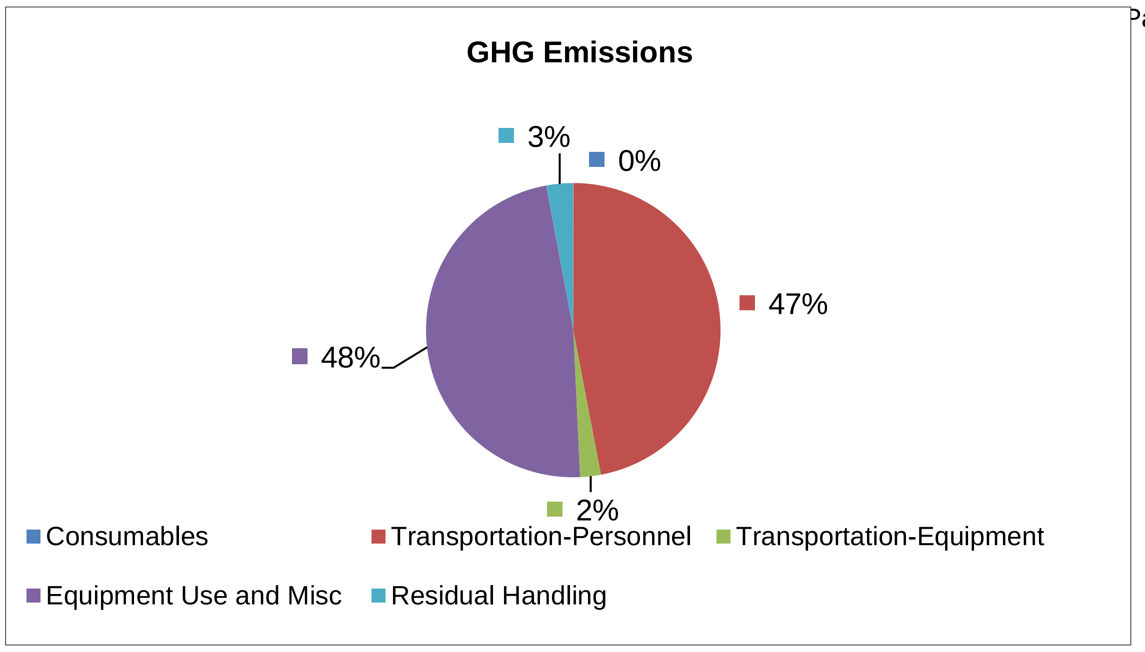
## Sustainable Remediation - Environmental Footprint Summary 3c

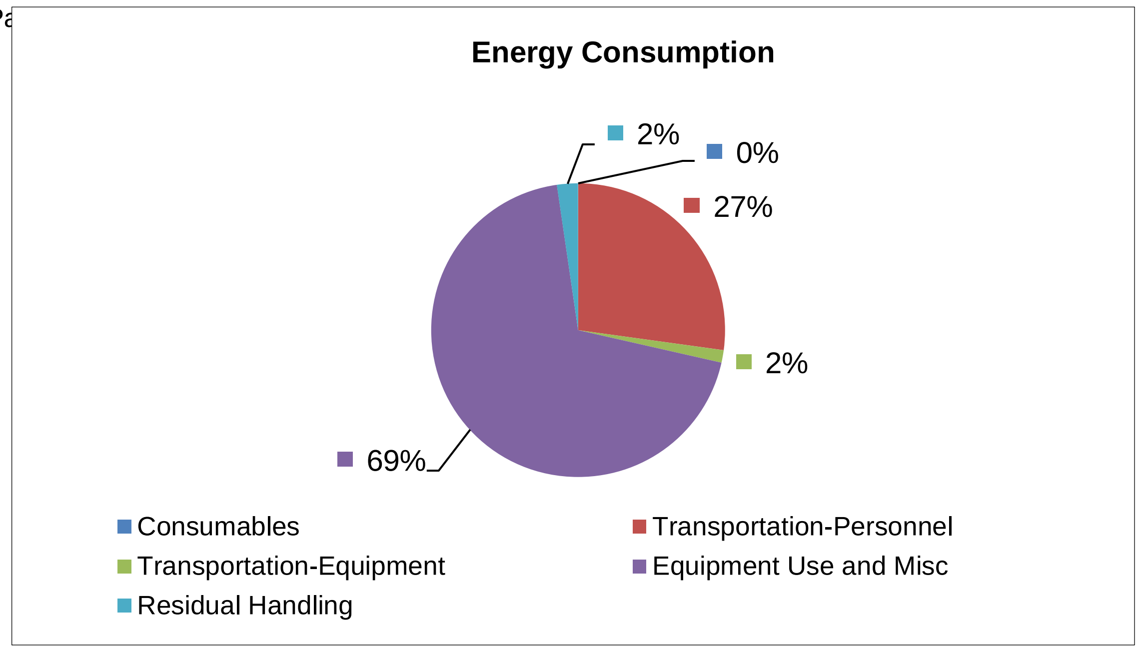
| Phase | Activities | GHG Emissions (metric ton) | Total energy Used (MMBTU) | Water Consumption (gallons) | NOx emissions (metric ton) | SOx Emissions (metric ton) | PM10 Emissions (metric ton) | Accident Risk Fatality | Accident Risk Injury |
|---|---|---|---|---|---|---|---|---|---|
| Remedial Investigation | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Sub-Total | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Remedial Action Construction | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 29.95 | 3.8E+02 | NA | 1.1E-02 | 3.9E-04 | 2.2E-03 | 6.1E-04 | 4.9E-02 |
| | Transportation-Equipment | 1.44 | 1.9E+01 | NA | 4.5E-04 | 8.0E-06 | 4.0E-05 | 3.6E-06 | 2.9E-04 |
| | Equipment Use and Misc | 30.48 | 9.6E+02 | 3.0E+03 | 1.1E-01 | 4.6E-02 | 1.3E-02 | 2.2E-05 | 5.5E-03 |
| | Residual Handling | 1.86 | 3.2E+01 | NA | 5.6E-03 | 2.9E-03 | 1.5E-02 | 3.1E-06 | 2.5E-04 |
| | Sub-Total | 63.74 | 1.39E+03 | 3.02E+03 | 1.32E-01 | 4.93E-02 | 3.09E-02 | 6.42E-04 | 5.53E-02 |
| Remedial Action Operations | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Sub-Total | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Longterm Monitoring | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 4.00 | 5.0E+01 | NA | 1.5E-03 | 5.2E-05 | 3.0E-04 | 8.2E-05 | 6.6E-03 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.19 | 2.8E+00 | NA | 2.7E-04 | 1.2E-04 | 6.4E-04 | 7.8E-07 | 6.3E-05 |
| | Sub-Total | 4.19 | 5.31E+01 | 0.00E+00 | 1.75E-03 | 1.73E-04 | 9.45E-04 | 8.27E-05 | 6.65E-03 |
| **Total** | | **6.8E+01** | **1.4E+03** | **3.0E+03** | **1.3E-01** | **4.9E-02** | **3.2E-02** | **7.2E-04** | **6.2E-02** |

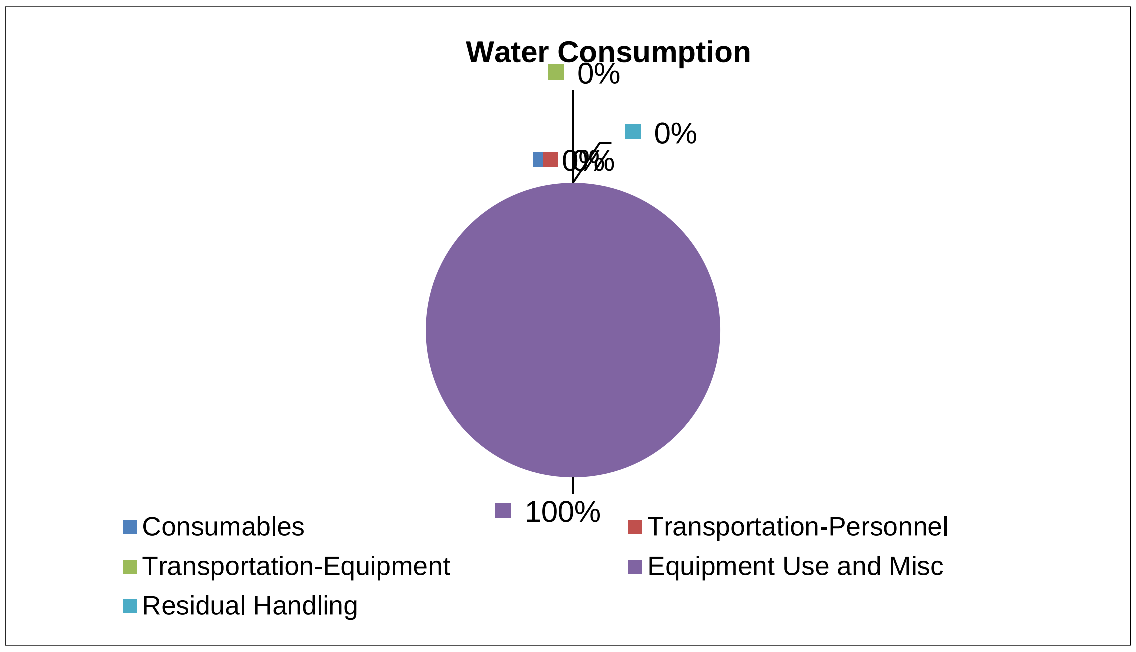
| Remedial Alternative Phase | Non-Hazardous Waste Landfill Space (tons) | Hazardous Waste Landfill Space (tons) | Topsoil Consumption (cubic yards) | Costing ($) | Lost Hours - Injury |
|---|---|---|---|---|---|
| Remedial Investigation | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 | 0.0E+00 |
| Remedial Action Construction | 8.4E+01 | 0.0E+00 | 0.0E+00 | 0 | 4.4E-01 |
| Remedial Action Operations | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 | 0.0E+00 |
| Longterm Monitoring | 3.5E+00 | 0.0E+00 | 0.0E+00 | 0 | 5.3E-02 |
| **Total** | **8.7E+01** | **0.0E+00** | **0.0E+00** | **$0** | **5.0E-01** |

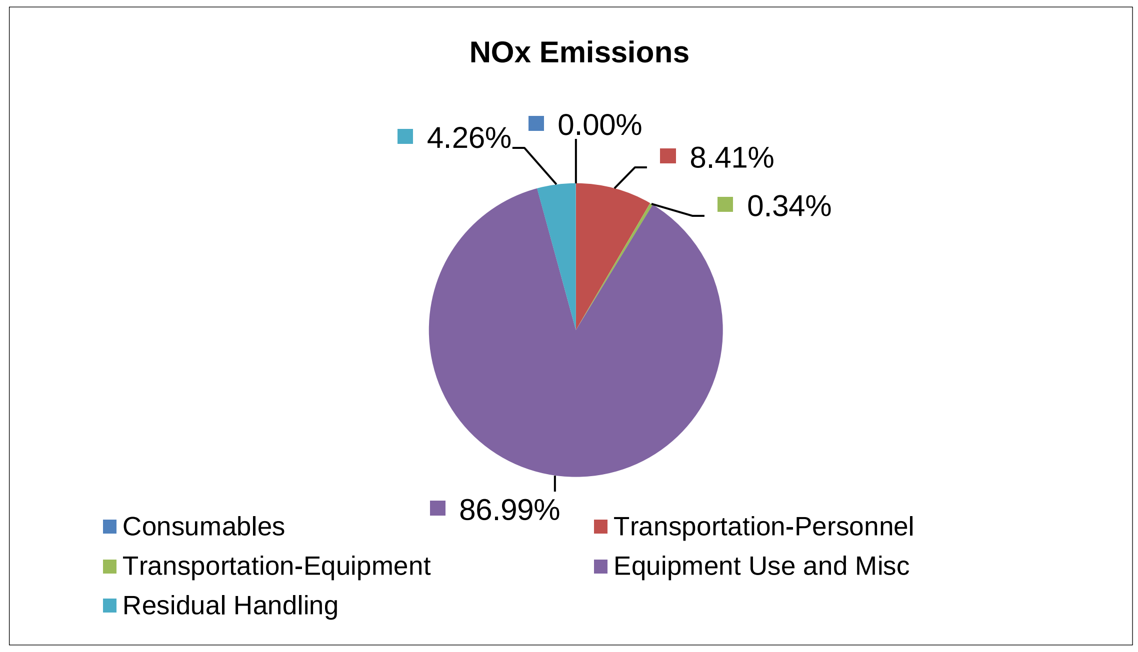
| Total Cost with Footprint Reduction |
|---|
| **$0** |

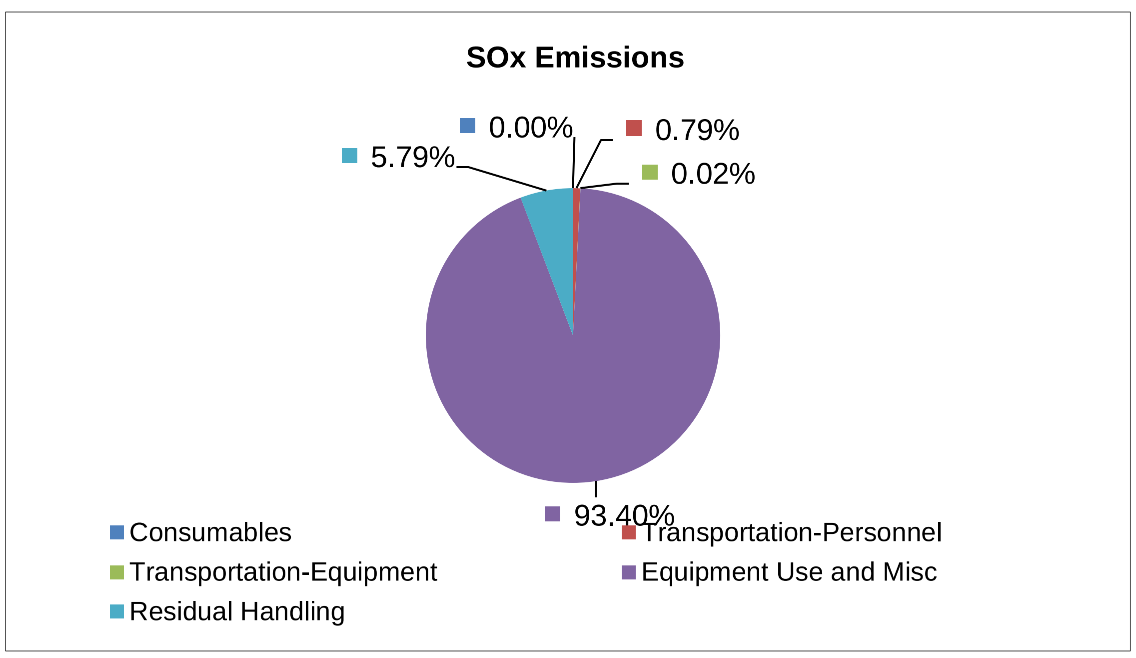
SiteWise™ Results Alternative 3c
Remedial Action Construction Stage
OU5, Site 15, NAS Cecil Field
Jacksonville, FL

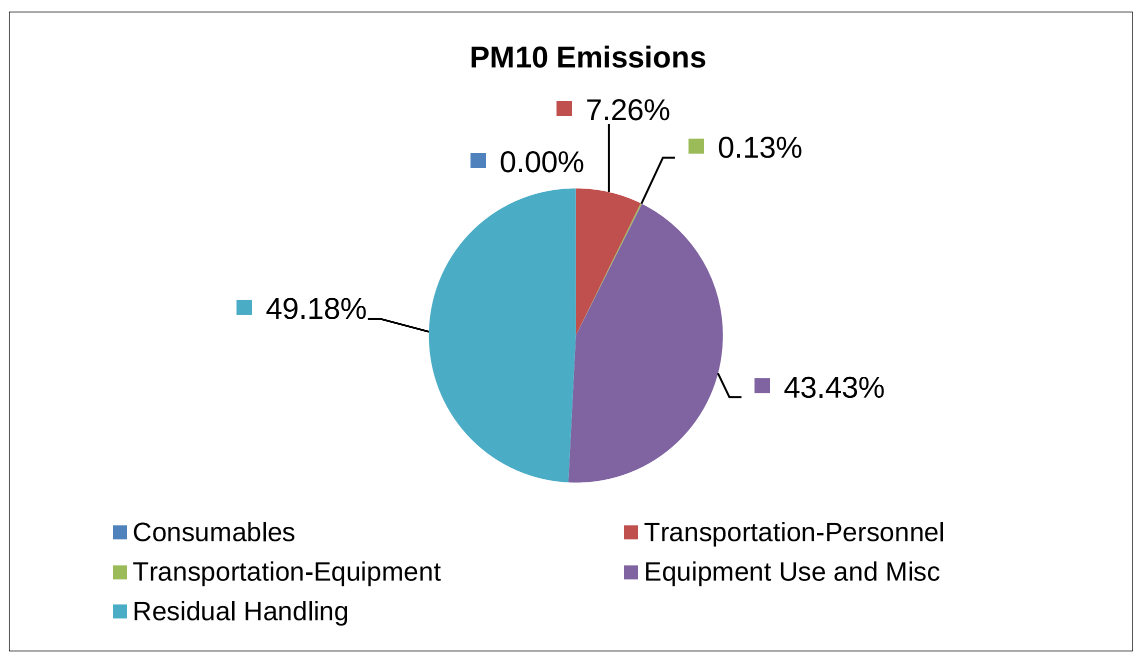


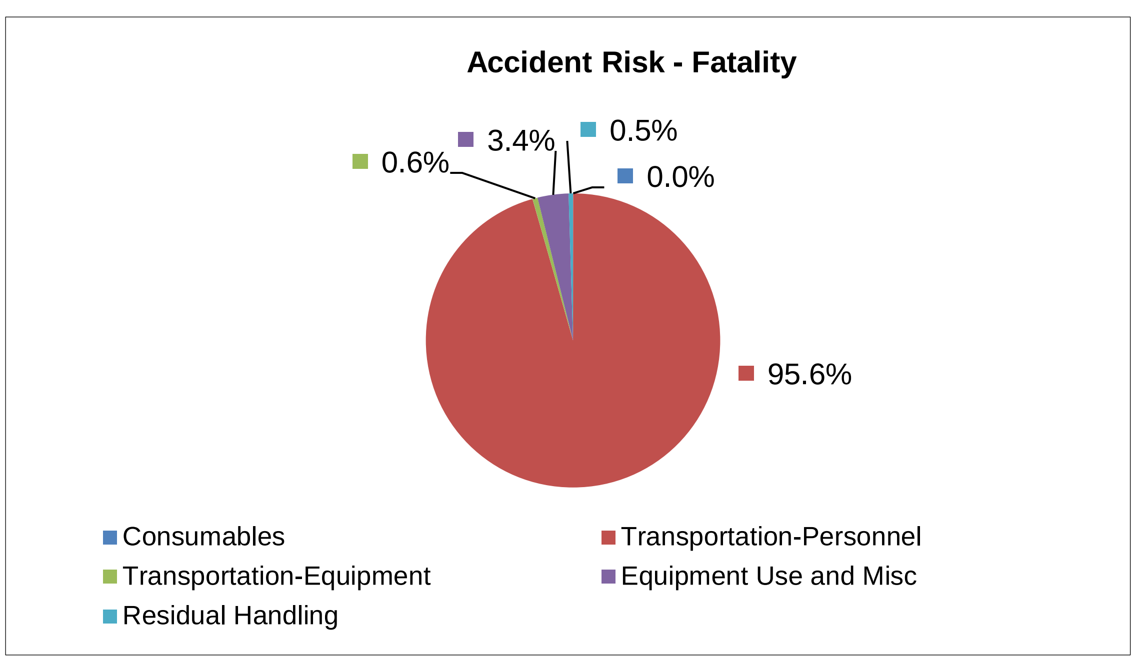



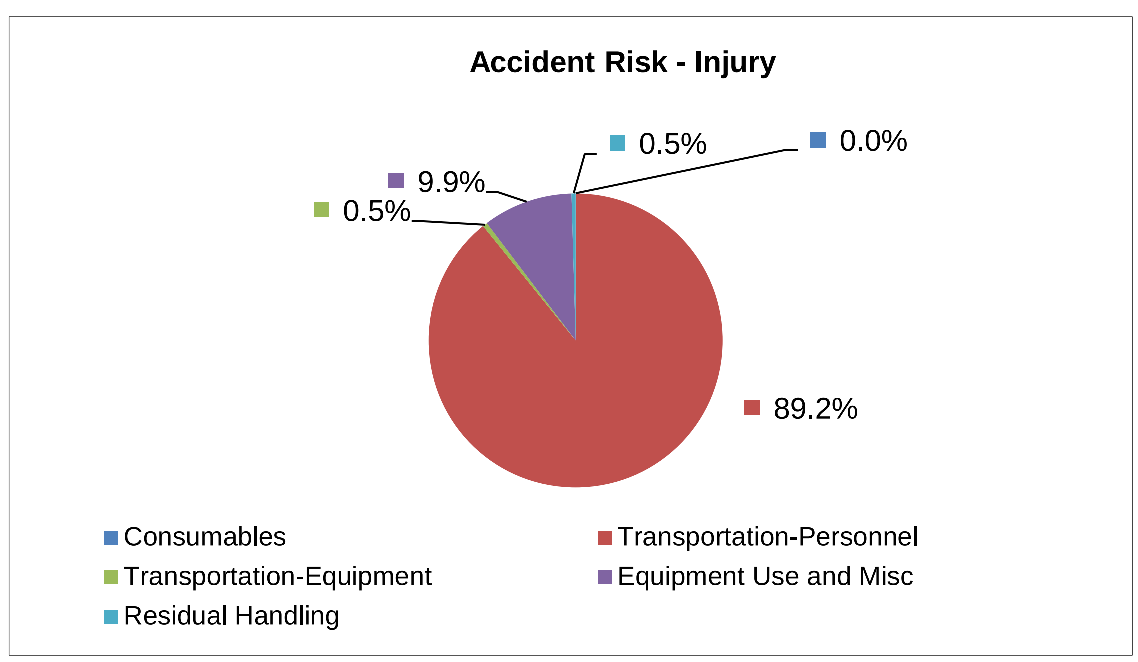



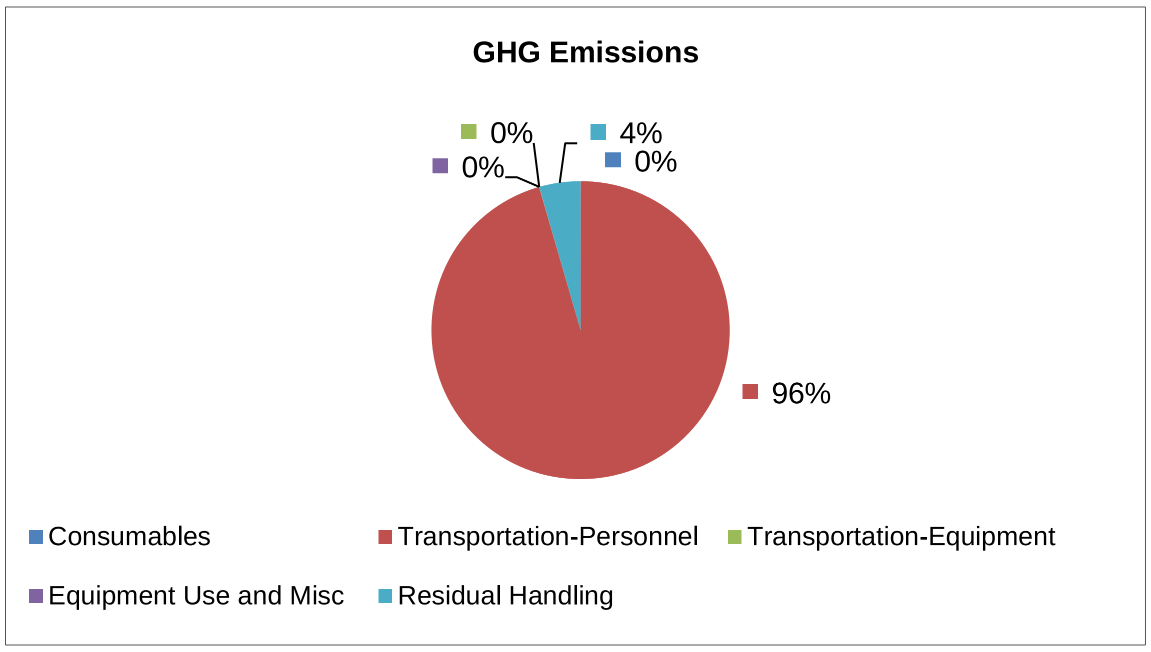



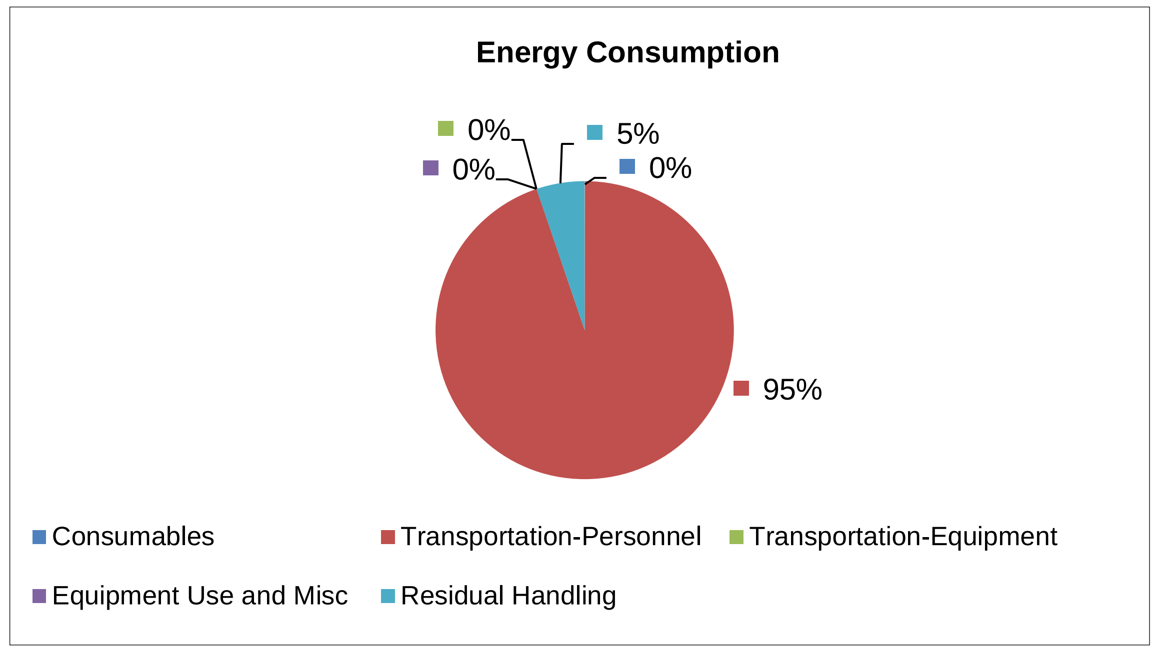



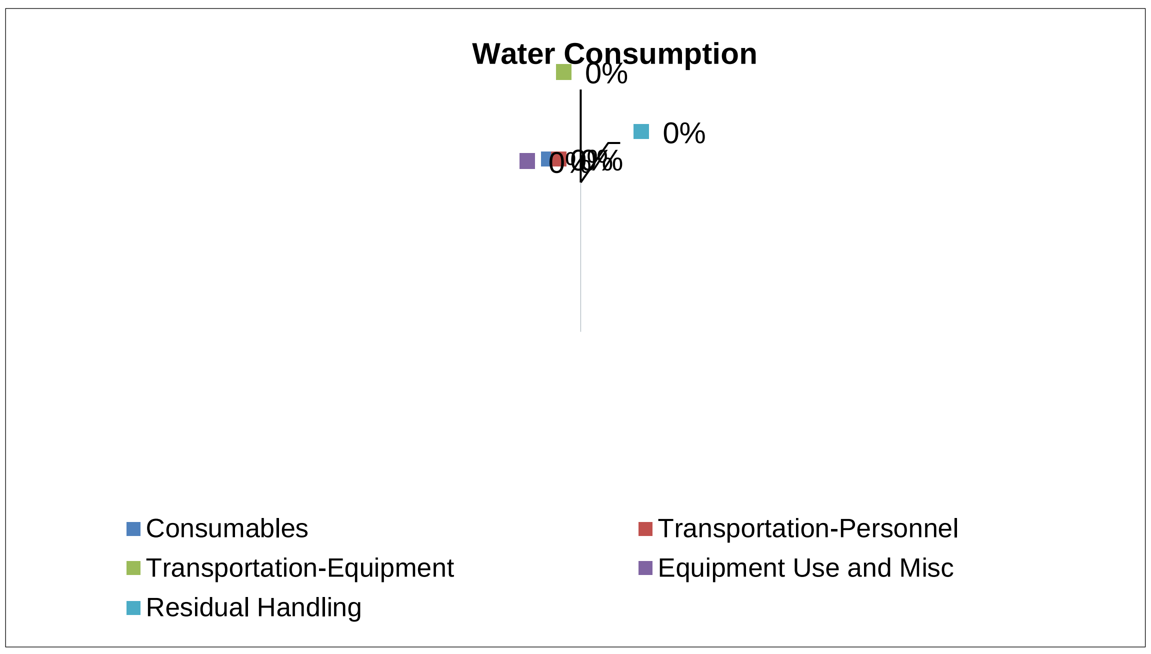



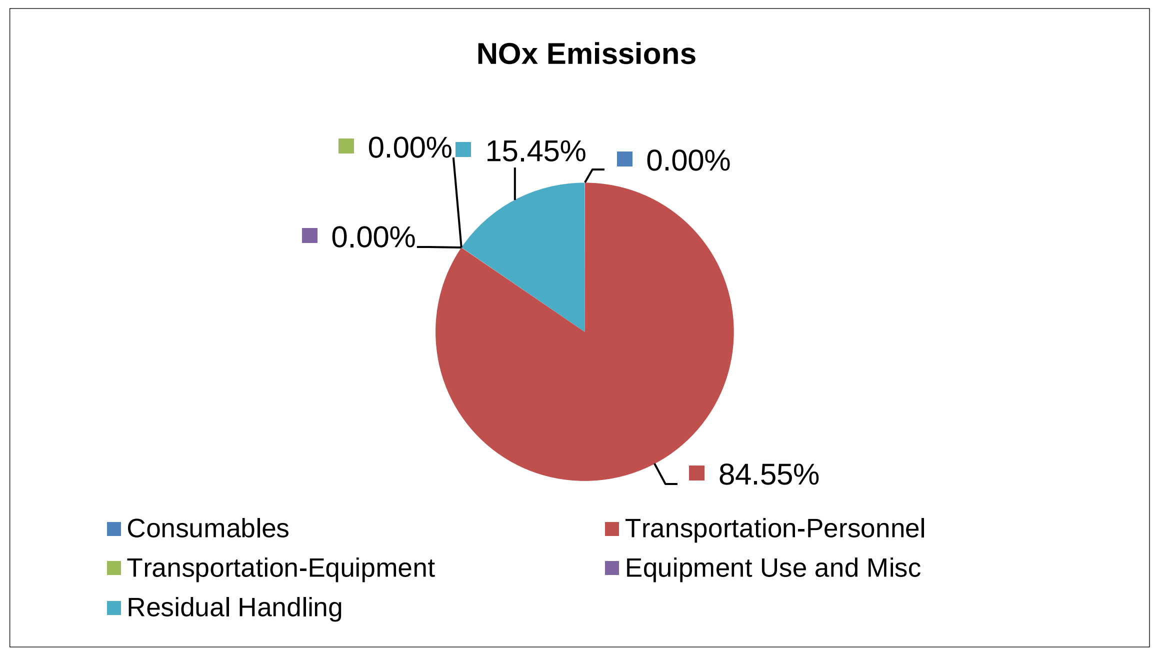



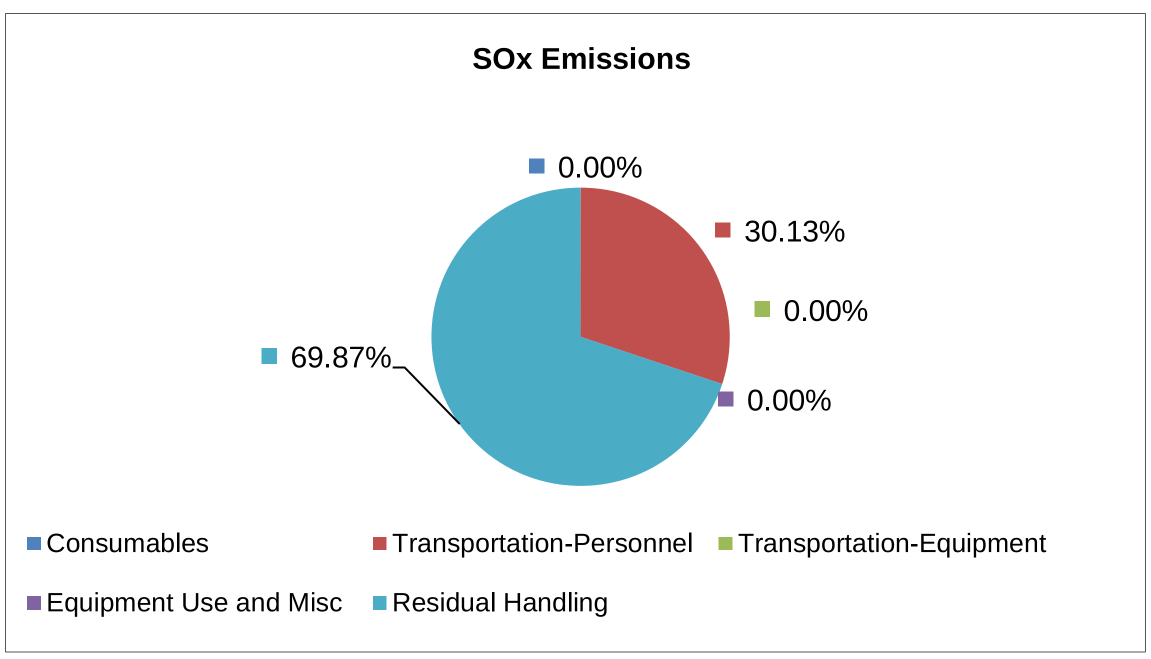



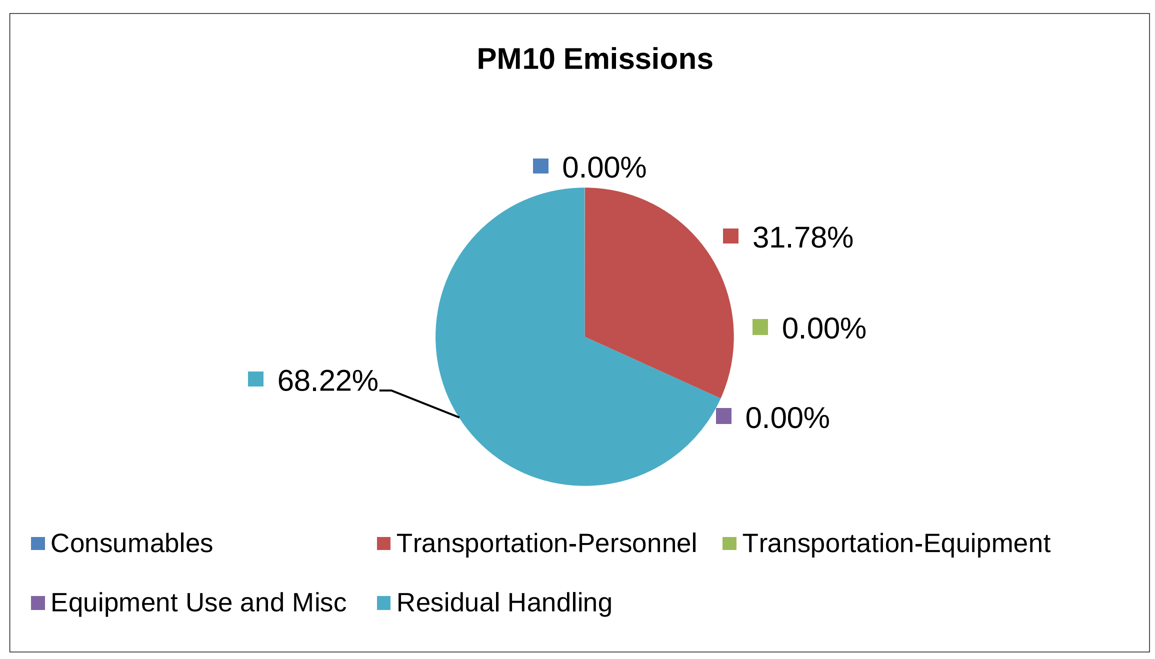

GHG Emissions
0%
4%
0%
0%
96%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

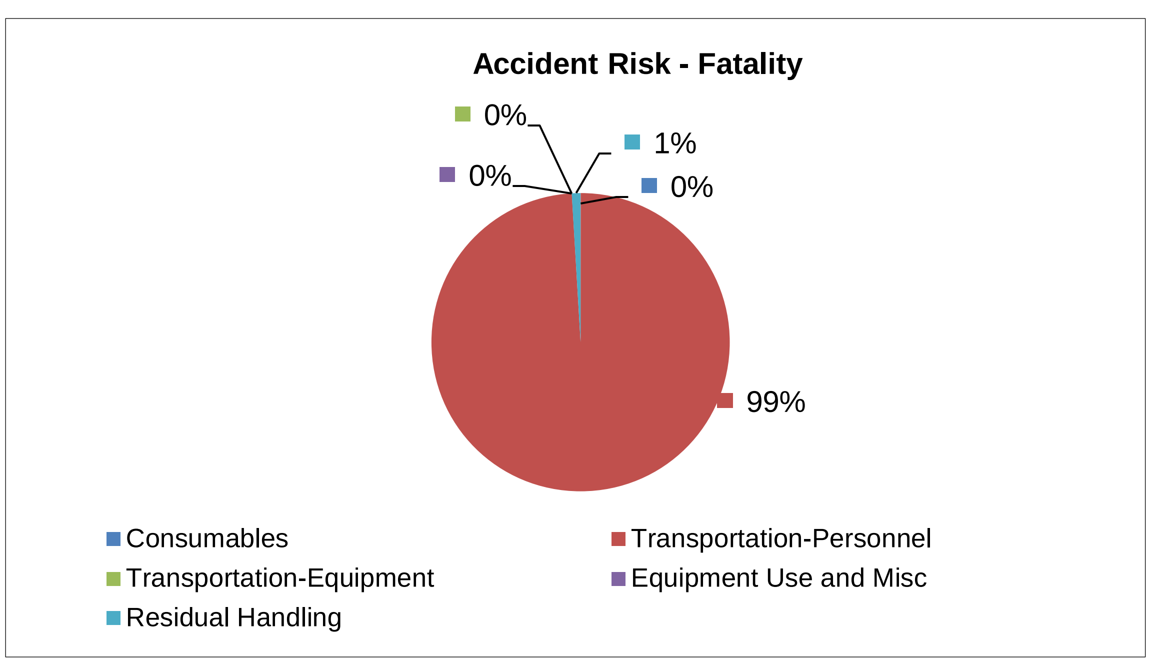

Energy Consumption
0%
5%
0%
0%
95%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

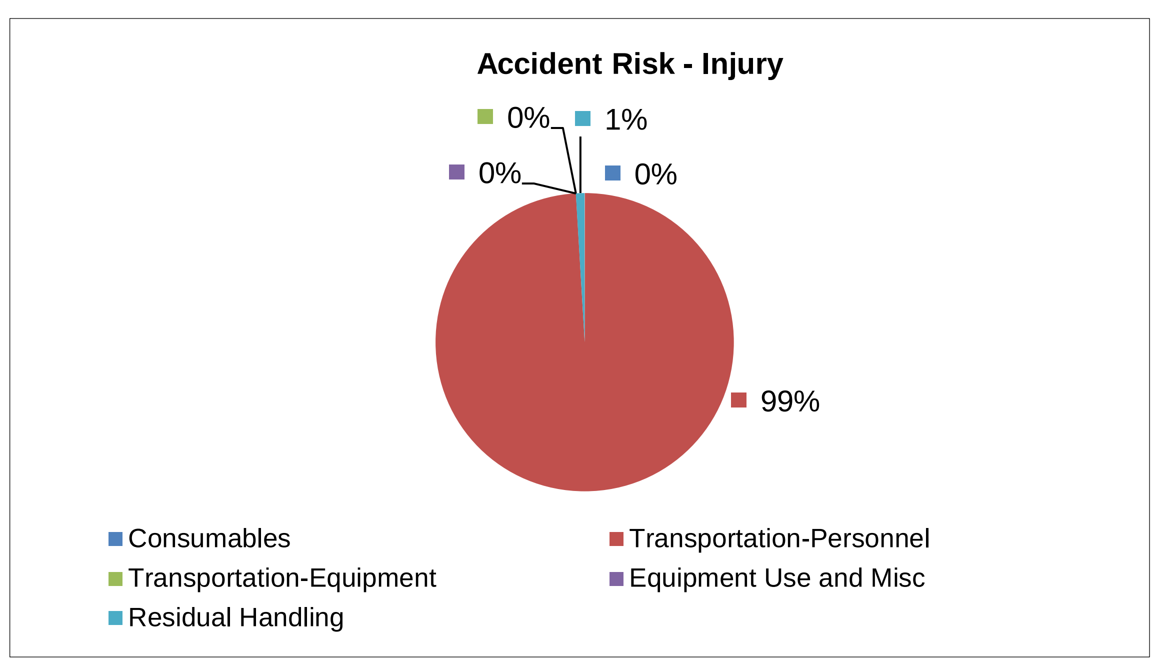

Water Consumption
0%
0%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling


NOx Emissions
0.00%
15.45%
0.00%
0.00%
84.55%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

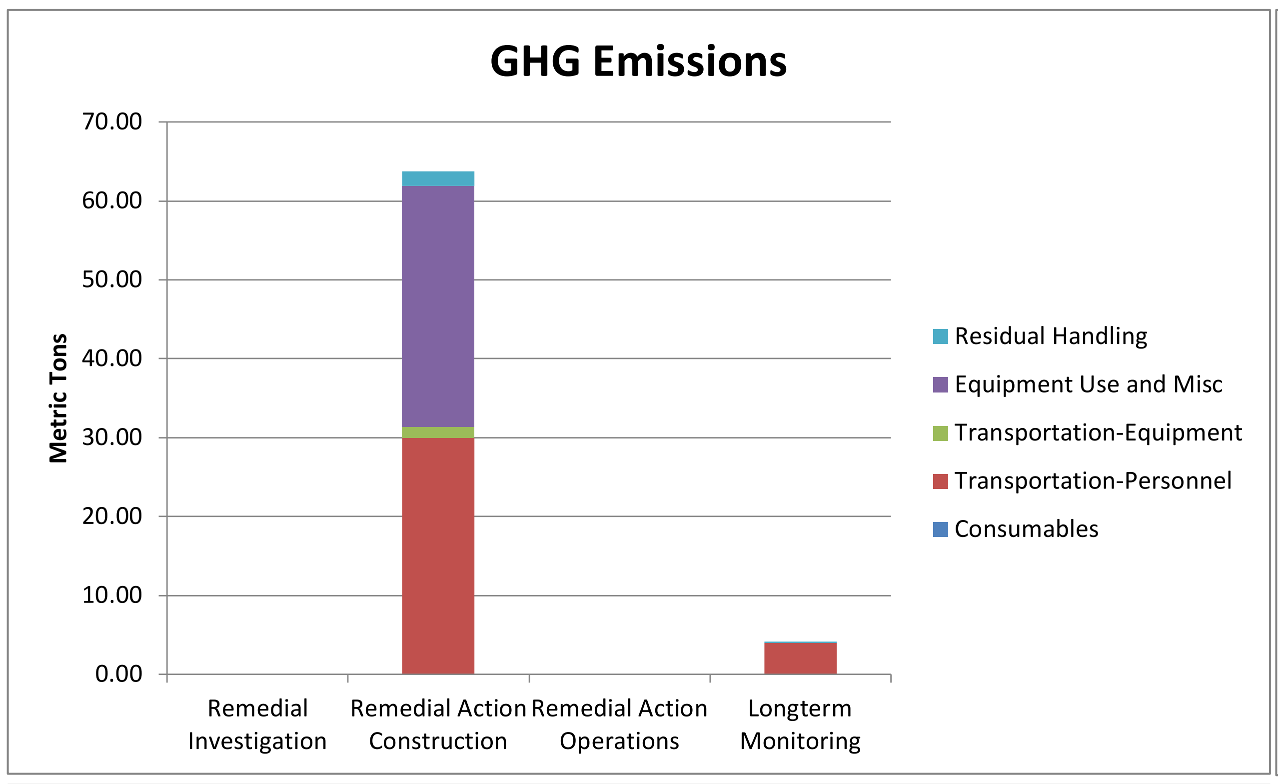

SOx Emissions
0.00%
30.13%
0.00%
69.87%
0.00%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

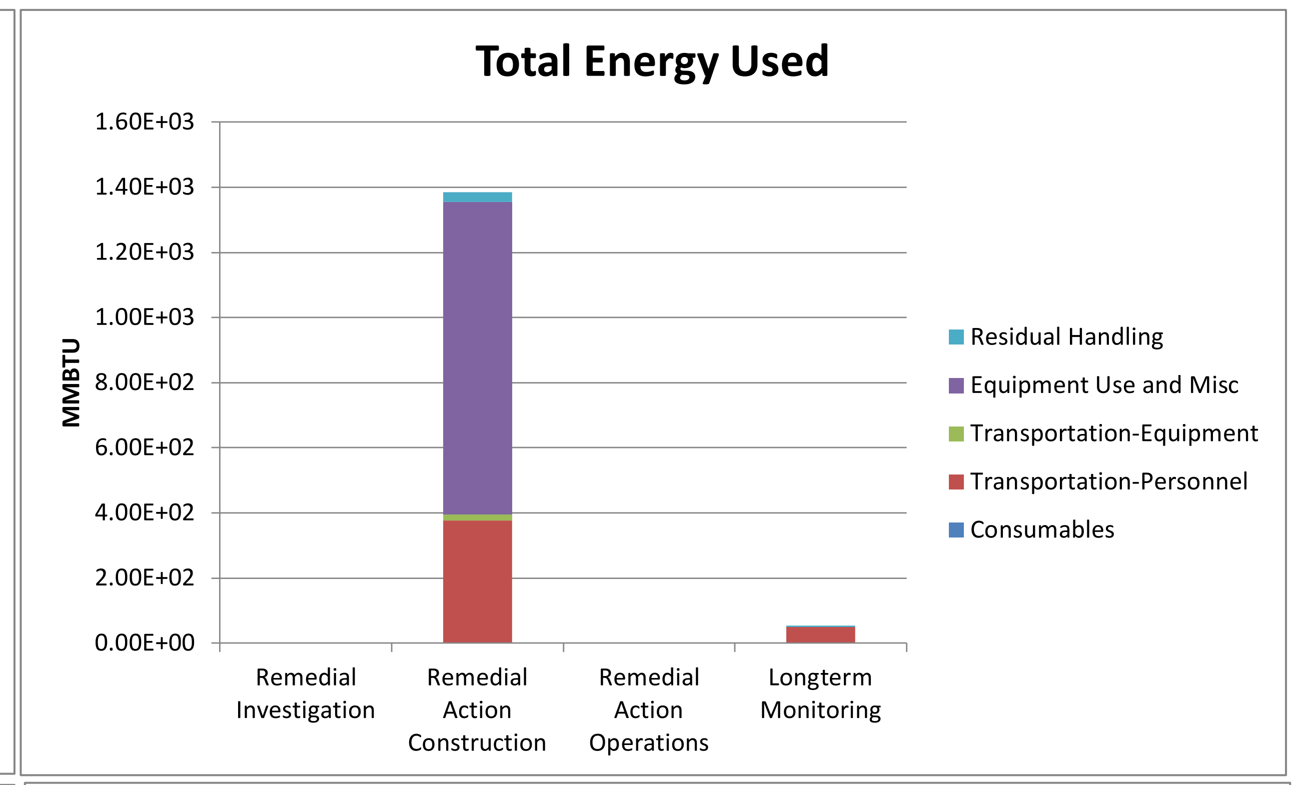

PM10 Emissions
0.00%
31.78%
0.00%
68.22%
0.00%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

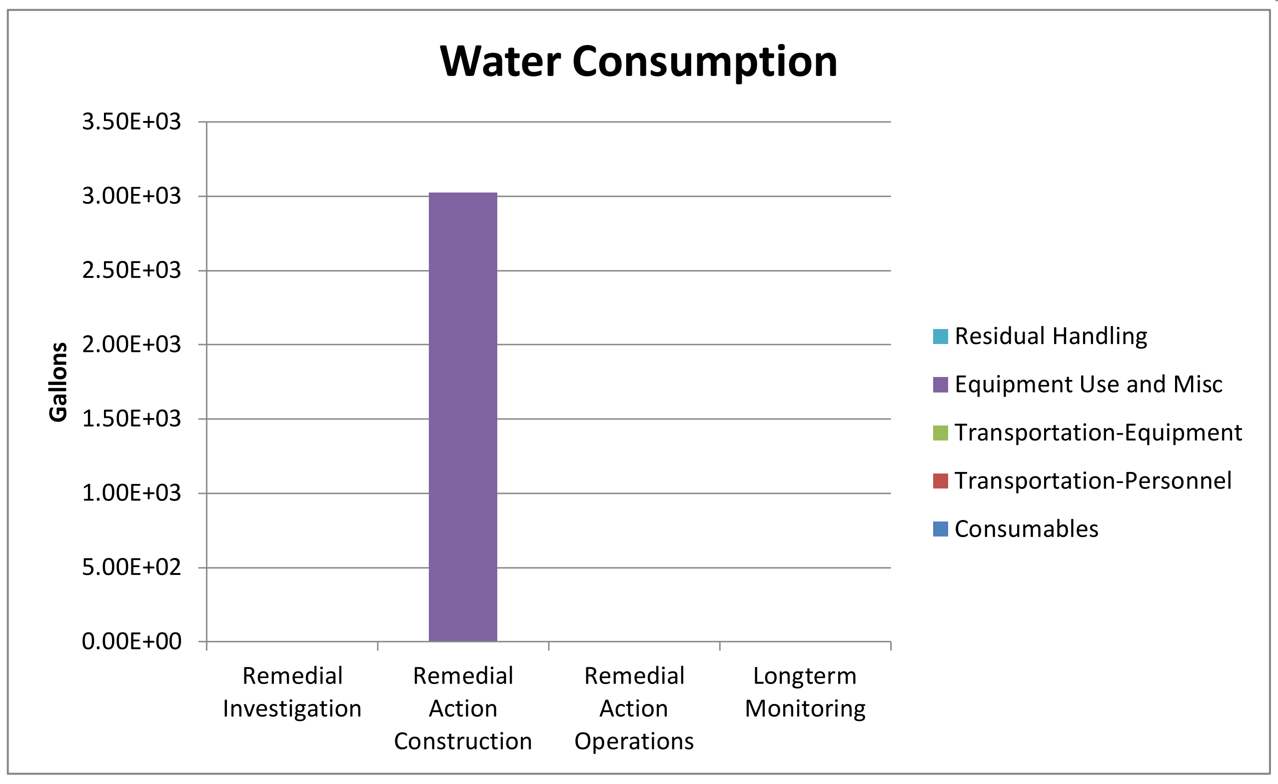

Accident Risk - Fatality
0%
1%
0%
0%
99%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

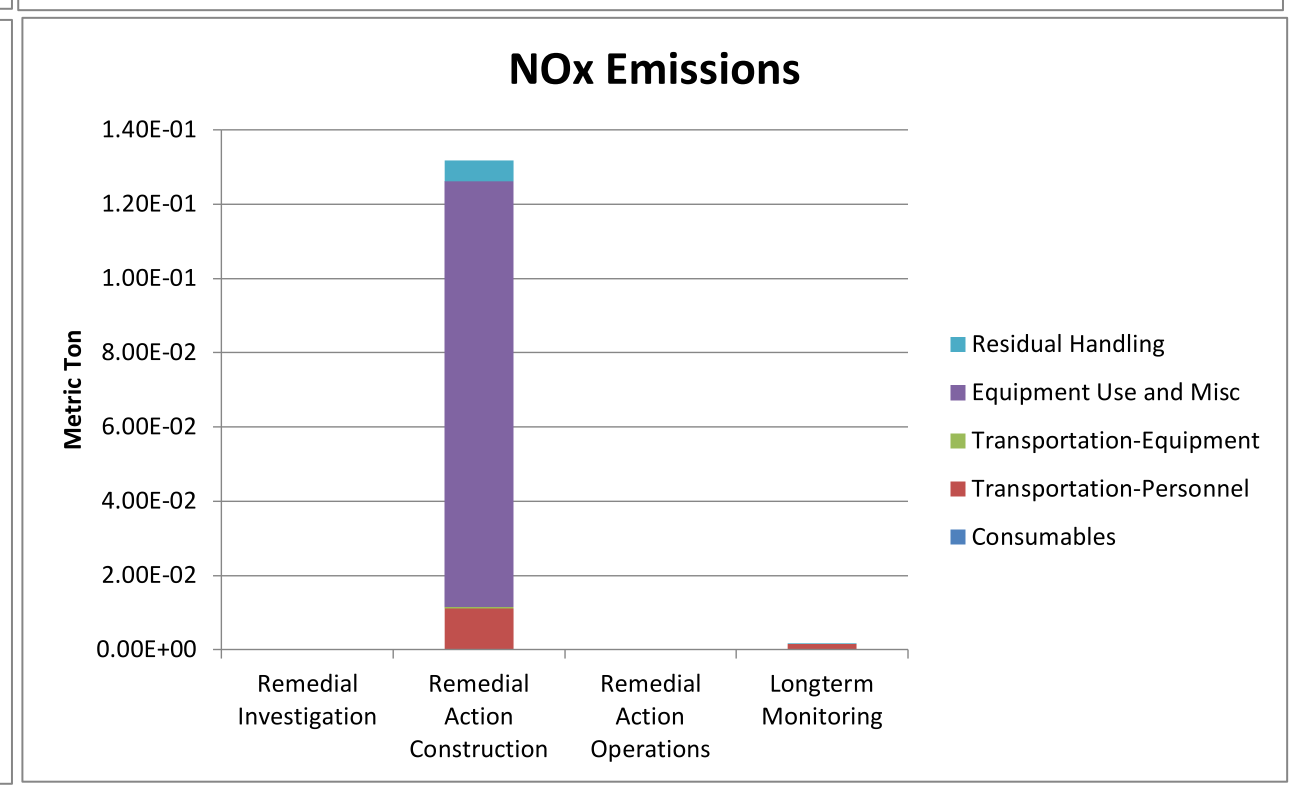

Accident Risk - Injury
0%
1%
0%
0%
99%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

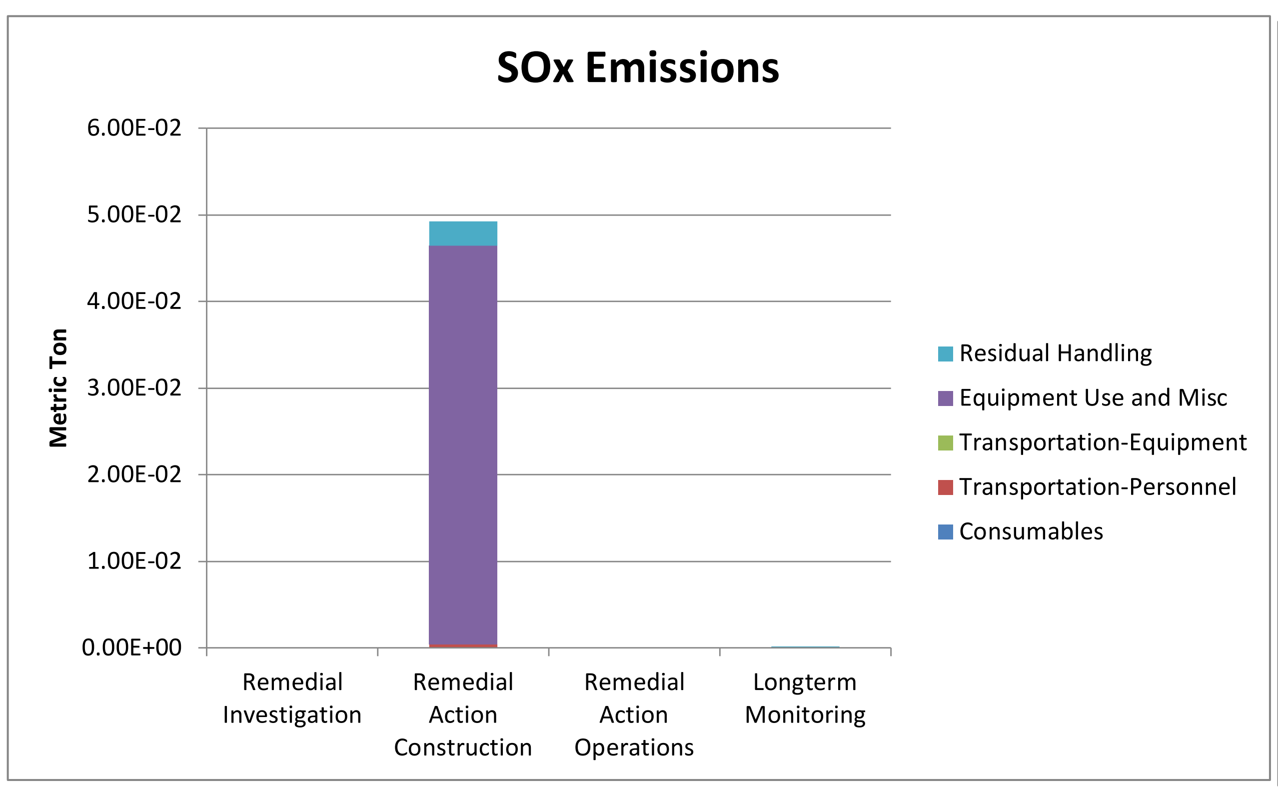
SiteWise™ Results Alternative 3c
OU5, Site 15, NAS Cecil Field
Jacksonville, FL

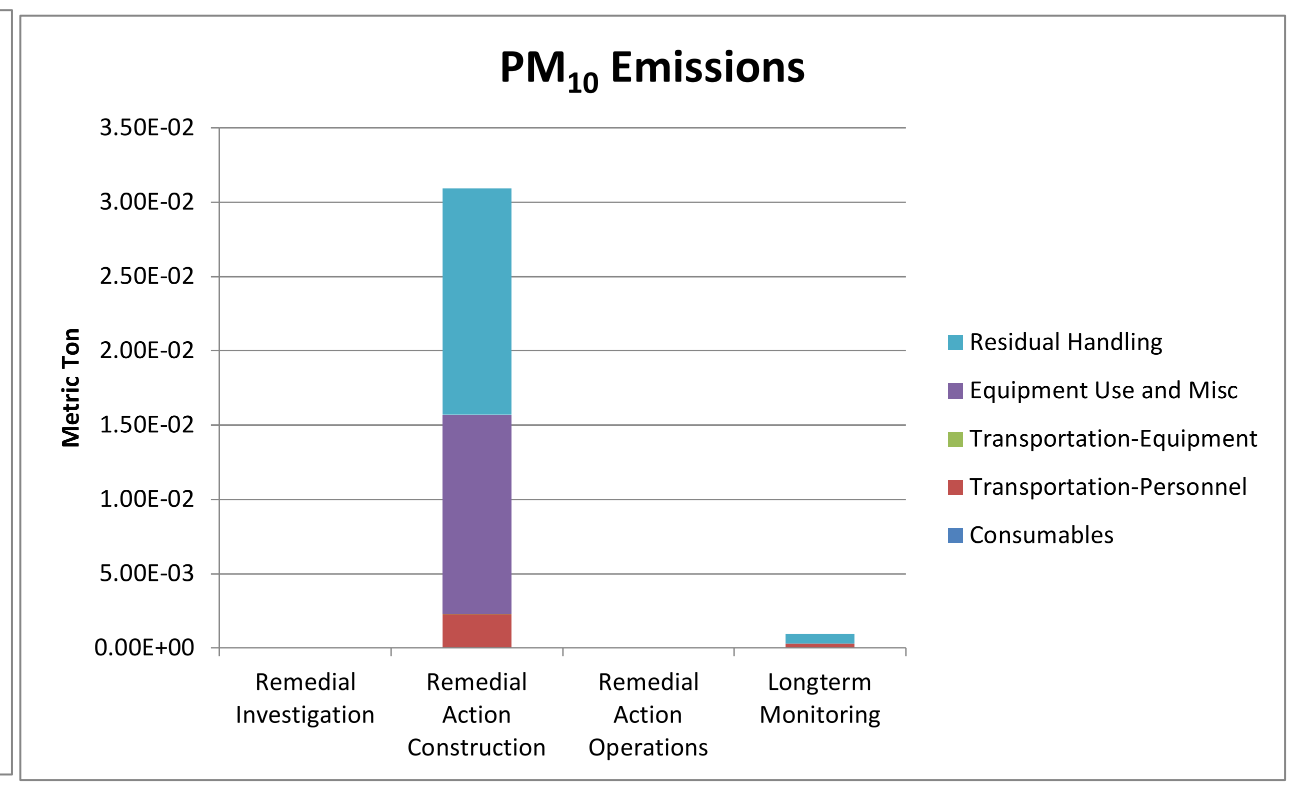



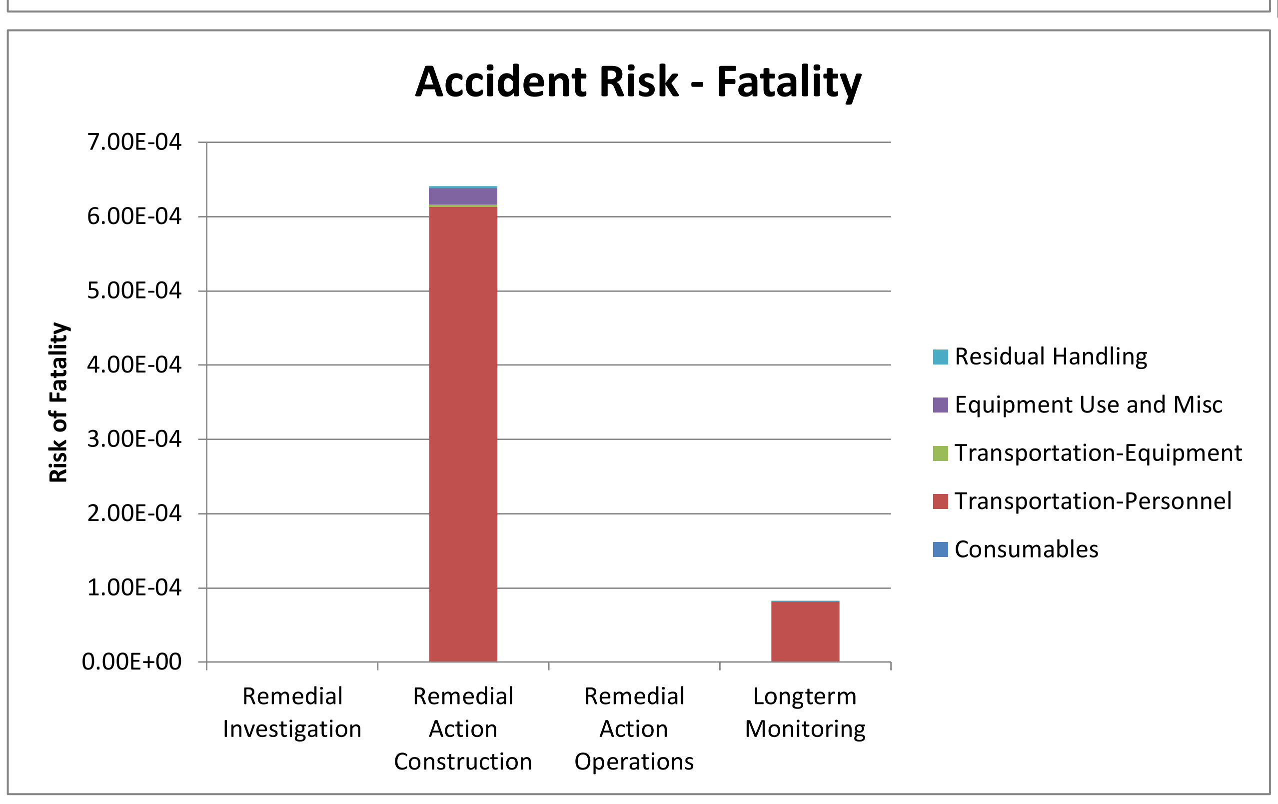



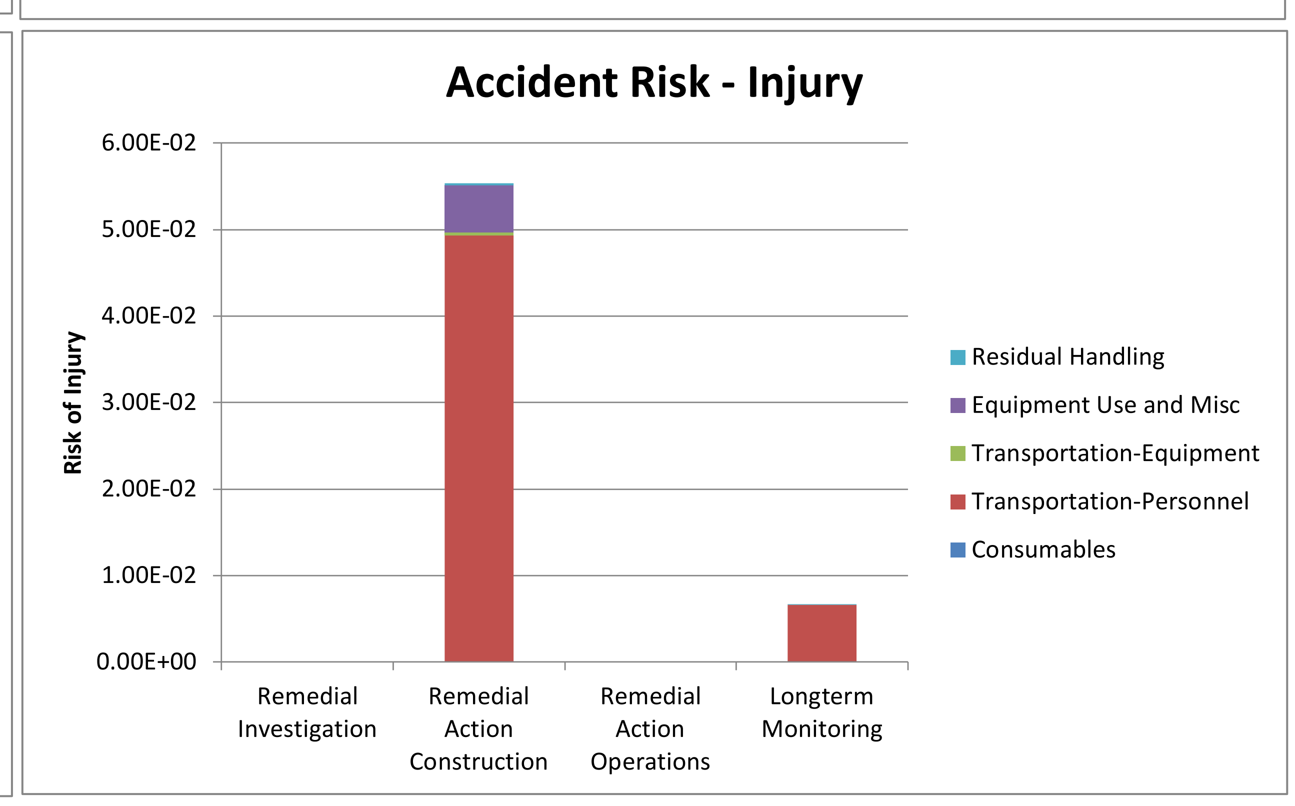



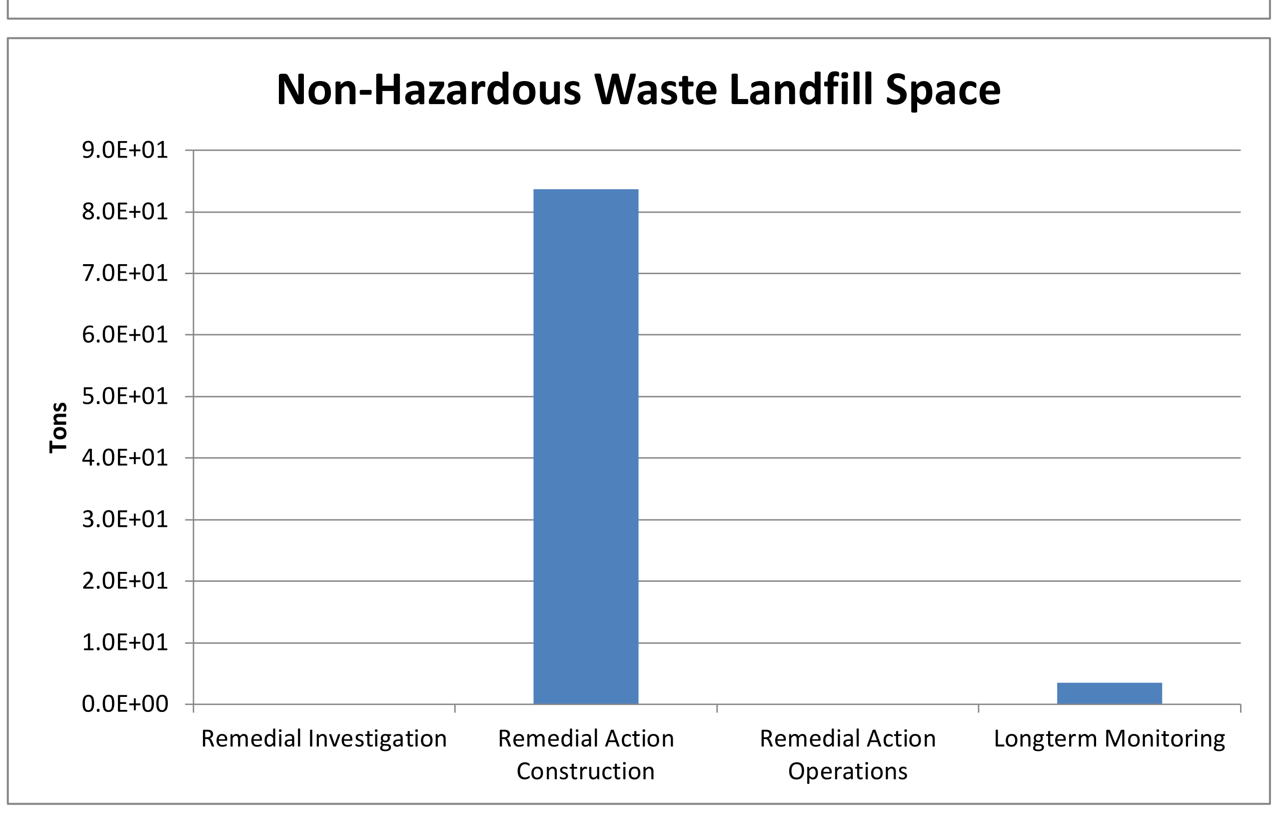



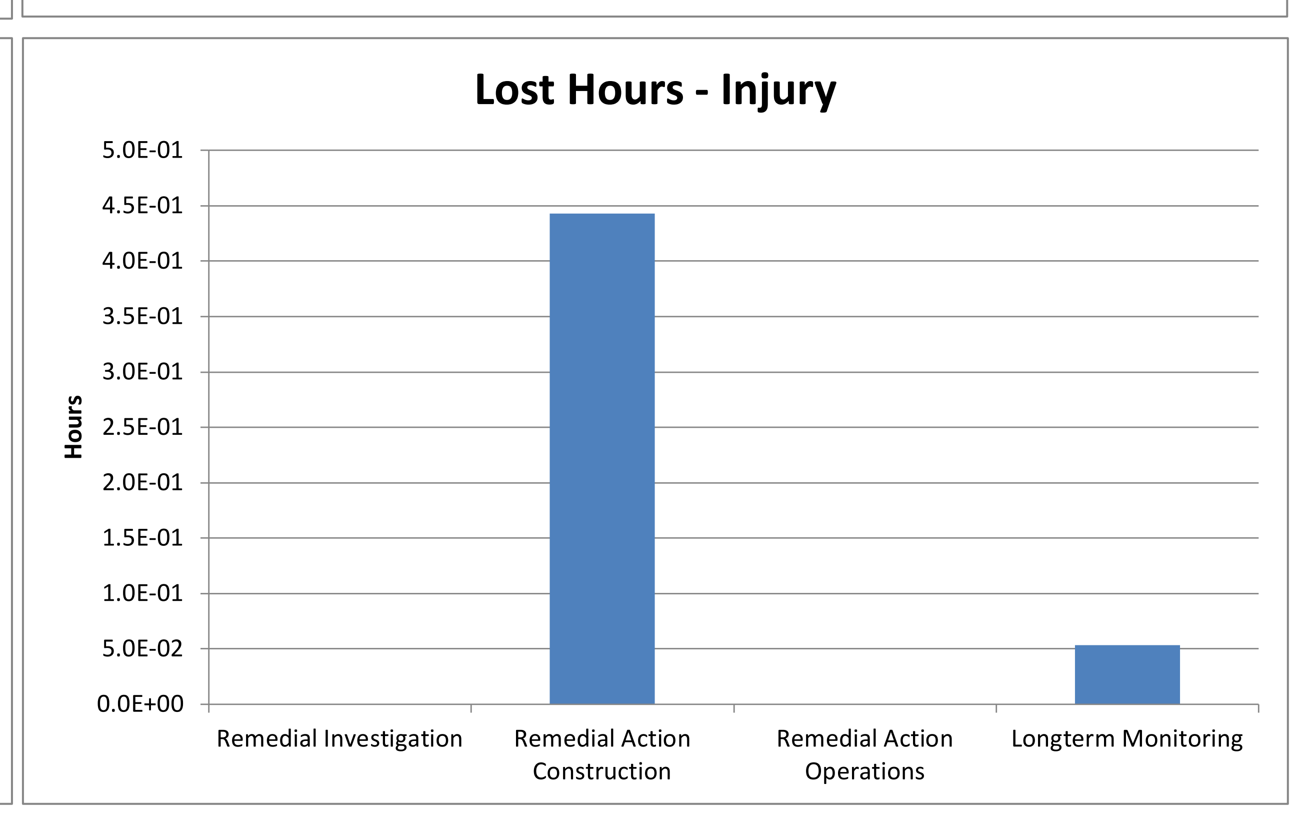



| | Technology Module / Phase | Module Components | Comments / Assumptions | Quantity | (Units) | Greenhouse Gas Emissions | | | | Criteria Pollutant Emission | | | Energy Consumption | Water Consumption |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $CO_2e$ | $CO_2$ | $N_20$ | $CH_4$ | $NO_x$ | $SO_x$ | $PM_{10}$ | | |
| **Stage** | **Materials** | | | | | | | | **Tonnes** | | | | **MWhr** | **gal x 1000** |
| RAC | Decon Pad | General Concrete | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 | 43,500.0 | lbs | 2.56 | 2.56 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 25.31 | 0.00 |
| RAC | Revegetation, soil nutrients | Fertilizer | Assume fertilizer, 309 msf (thousand square feet), 3 lb of sed per 1.2 msf | 772.5 | lbs | 0.96 | 0.96 | 1.27E-09 | 0.00E+00 | 0.00E+00 | 3.50E-04 | 7.04E-07 | 17.46 | 0.35 |
| RAC | Revegetation, hydroseed | Fertilizer | Assume fertilizer, 309 msf (thousand square feet), 10 lb of sed per 1 msf | 3,090.0 | lbs | 3.85 | 3.85 | 5.07E-09 | 0.00E+00 | 0.00E+00 | 1.40E-03 | 2.82E-06 | 69.84 | 1.40 |
| RAC | Revegetation, hydroseed | Mulch | Assume wood mulch, 309 msf (thousand square feet), 50 lb of mulch per 1 msf | 15,450.0 | lbs | 4.88 | 1.71 | 9.88E-03 | 5.26E-03 | 2.91E-06 | 1.67E-02 | 1.26E-03 | 55.27 | 0.00 |
| RAC | Revegetation, hydroseed | Fertilizer | Assume fertilizer, 309 msf (thousand square feet), 2 lb per 1 msf | 618.0 | lbs | 0.77 | 0.77 | 1.01E-09 | 0.00E+00 | 0.00E+00 | 2.80E-04 | 5.63E-07 | 13.97 | 0.28 |
| | **Subtotal** | | | | | **13.04** | **9.86** | **0.01** | **0.01** | **0.00** | **0.02** | **1.27E-03** | **181.86** | **2.02** |
| **Stage** | **Construction Equipment** | | | | | | | | **Tonnes** | | | | **MWhr** | **gal x 1000** |
| RAC | Brush mowing | Tractor, 250 hp, diesel | 1.2 acres, medium density area, uses a tractor, Assume 8 hours per day, 0.5 acres per day | 19.2 | hrs | 1.43 | 1.43 | 0.00E+00 | 0.00E+00 | 1.20E-02 | 0.00E+00 | 9.06E-04 | 5.16 | |
| RAC | Chipping tree | WOOD CHIPPER | 1.2 acres, medium density area, uses a woodchipper, 130 hp, assume 8 hours per day, 0.5 acres per day | 19.2 | hrs | 0.84 | 0.84 | 0.00E+00 | 0.00E+00 | 6.56E-03 | 0.00E+00 | 5.54E-04 | 3.67 | |
| RAC | Chipping tree | Chainsaw, gasoline, 3<hp<=6, 2 stroke | 1.2 acres, medium density area, uses a 2 chain saws, gasoline, 18" , assume 3 days or work, 8 hours per day, 80%efficiency | 38.4 | hrs | 0.07 | 0.07 | 0.00E+00 | 0.00E+00 | 1.39E-04 | 0.00E+00 | 1.03E-03 | 0.36 | |
| RAC | Dozer, 200 hp | Dozer, 200 HP (D7) w/U Blade (diesel) | 20 days, 8 hours per day, 80% efficiency | 128.0 | hrs | 14.06 | 14.06 | 0.00 | 0.00 | 8.64E-02 | 2.54E-02 | 8.55E-03 | 86.04 | |
| RAC | Front End Loader, 185 hp | Loader, 200 HP, 4 CY (diesel) | 5 days, 8 hours per day, 80%efficiency | 32.0 | hrs | 1.04 | 1.04 | 0.00 | 0.00 | 9.44E-03 | 1.96E-03 | 1.13E-03 | 3.78 | |
| | **Subtotal** | | | | | **17.44** | **17.44** | **0.00** | **0.00** | **0.11** | **0.03** | **1.22E-02** | **99.01** | **0** |
| | | | | **Total** | | **30** | **27** | **0.01** | **0.01** | **0.11** | **0.05** | **0.01** | **281** | **2** |

**Alternative 1**
**Values Input into SiteWise as "Other"**

| Module | Greenhouse Gas Emissions | | | | Criteria Pollutant Emission | | | Energy Consumption | Water Consumption |
|---|---|---|---|---|---|---|---|---|---|
| | $CO_2e$ | $CO_2$ | $N_20$ ($CO_2e$) | $CH_4$ ($CO_2e$) | $NO_x$ | $SO_x$ | $PM_{10}$ | | |
| | | **Tonnes** | | | | | | **MMBTU** | **gal** |
| RI | - | - | - | - | - | - | - | - | - |
| RAC | 30.48 | 27.30 | 3.06 | 0.11 | 0.11 | 0.05 | 0.01 | 958.30 | 2,023.92 |
| RAO | - | - | - | - | - | - | - | - | - |
| LTM | - | - | - | - | - | - | - | - | - |

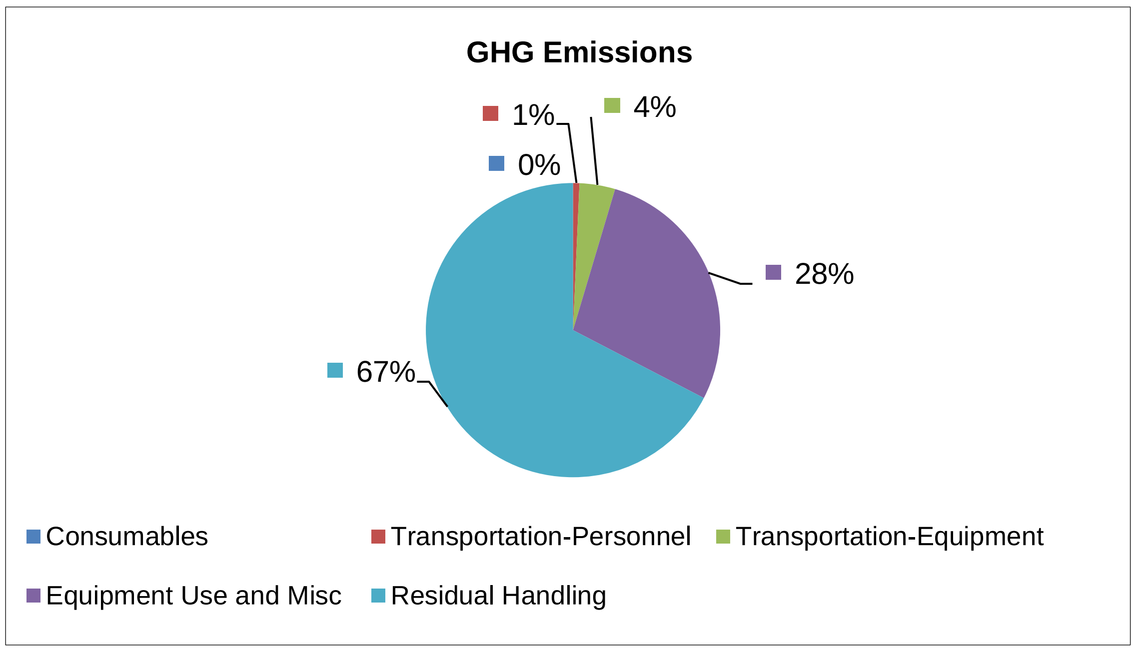
Note: 1 MWhr = 3412141.4799 BTU, 1MMTBU = 10^6 BTU

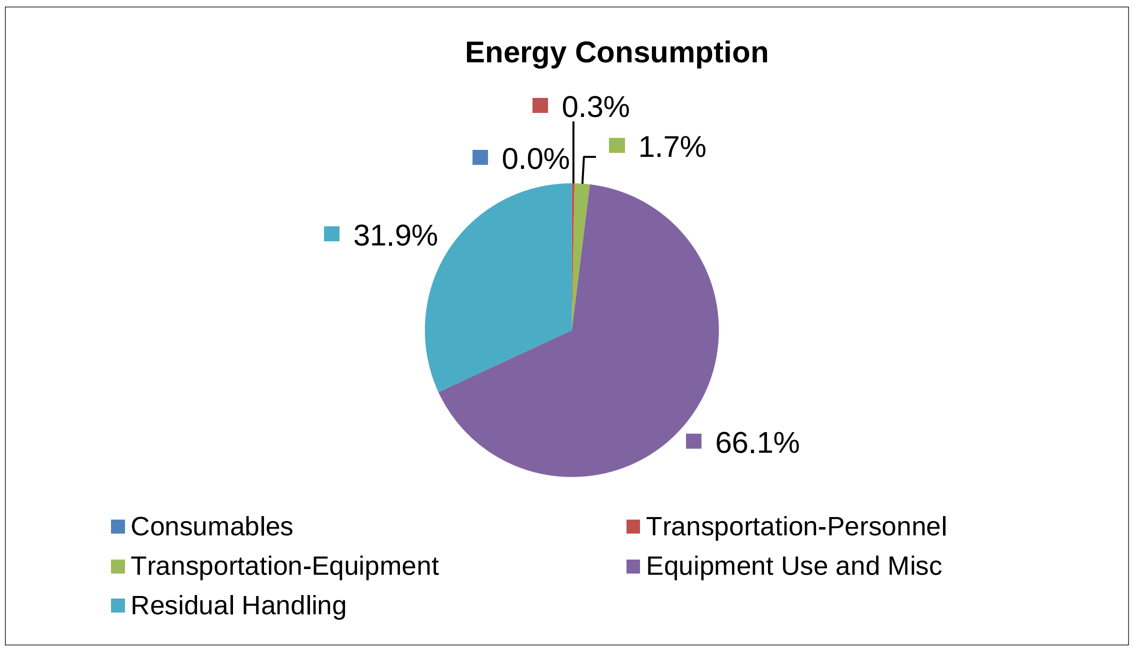
## Sustainable Remediation - Environmental Footprint Summary 4a

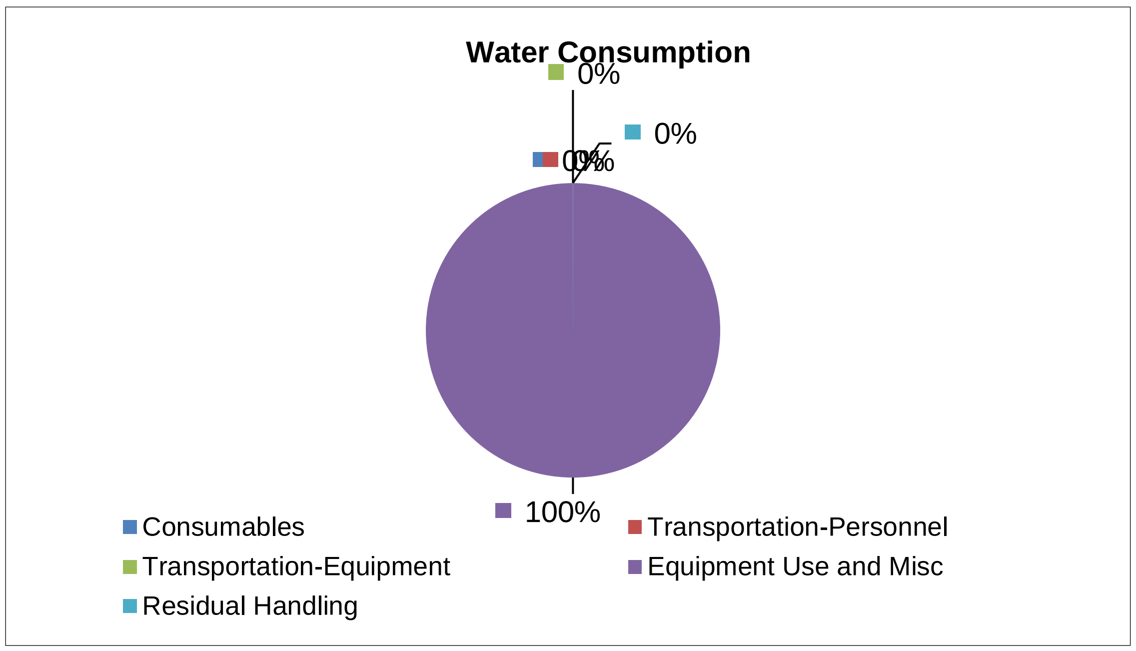
| Phase | Activities | GHG Emissions | Total energy Used | Water Consumption | NOx emissions | SOx Emissions | PM10 Emissions | Accident Risk Fatality | Accident Risk Injury |
|---|---|---|---|---|---|---|---|---|---|
| | | metric ton | MMBTU | gallons | metric ton | metric ton | metric ton | | |
| Remedial Investigation | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Sub-Total | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Remedial Action Construction | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 25.86 | 3.3E+02 | NA | 9.6E-03 | 3.4E-04 | 1.9E-03 | 5.3E-04 | 4.3E-02 |
| | Transportation-Equipment | 144.60 | 1.9E+03 | NA | 4.5E-02 | 8.0E-04 | 4.0E-03 | 3.6E-04 | 2.9E-02 |
| | Equipment Use and Misc | 1,034.48 | 7.5E+04 | 1.5E+04 | 1.5E+00 | 4.4E-01 | 1.4E-01 | 2.3E-04 | 5.8E-02 |
| | Residual Handling | 2,489.98 | 3.6E+04 | NA | 3.1E+00 | 1.3E+00 | 7.2E+00 | 5.1E-03 | 4.1E-01 |
| | Sub-Total | 3,694.91 | 1.13E+05 | 1.46E+04 | 4.64E+00 | 1.78E+00 | 7.32E+00 | 6.18E-03 | 5.37E-01 |
| Remedial Action Operations | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Sub-Total | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Longterm Monitoring | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Sub-Total | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Total** | | **3.7E+03** | **1.1E+05** | **1.5E+04** | **4.6E+00** | **1.8E+00** | **7.3E+00** | **6.2E-03** | **5.4E-01** |

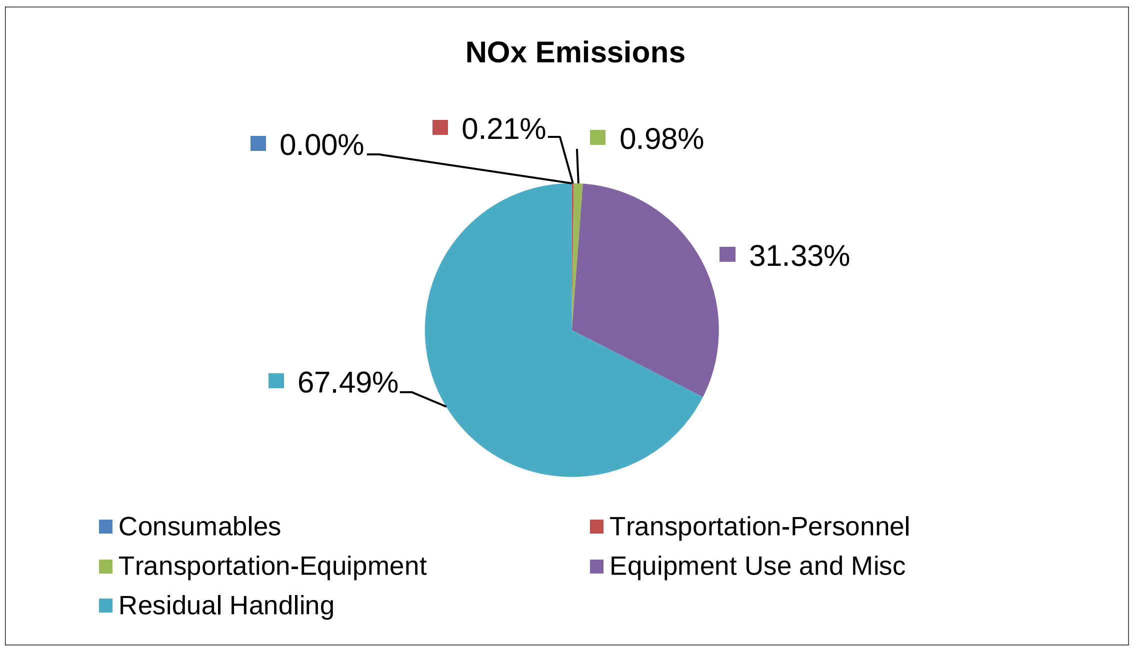
| Remedial Alternative Phase | Non-Hazardous Waste Landfill Space | Hazardous Waste Landfill Space | Topsoil Consumption | Costing | Lost Hours - Injury |
|---|---|---|---|---|---|
| | tons | tons | cubic yards | $ | |
| **Remedial Investigation** | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 | 0.0E+00 |
| **Remedial Action Construction** | 1.0E+02 | 3.6E+04 | 2.4E+04 | 0 | 4.3E+00 |
| **Remedial Action Operations** | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 | 0.0E+00 |
| **Longterm Monitoring** | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 | 0.0E+00 |
| **Total** | **1.0E+02** | **3.6E+04** | **2.4E+04** | **$0** | **4.3E+00** |

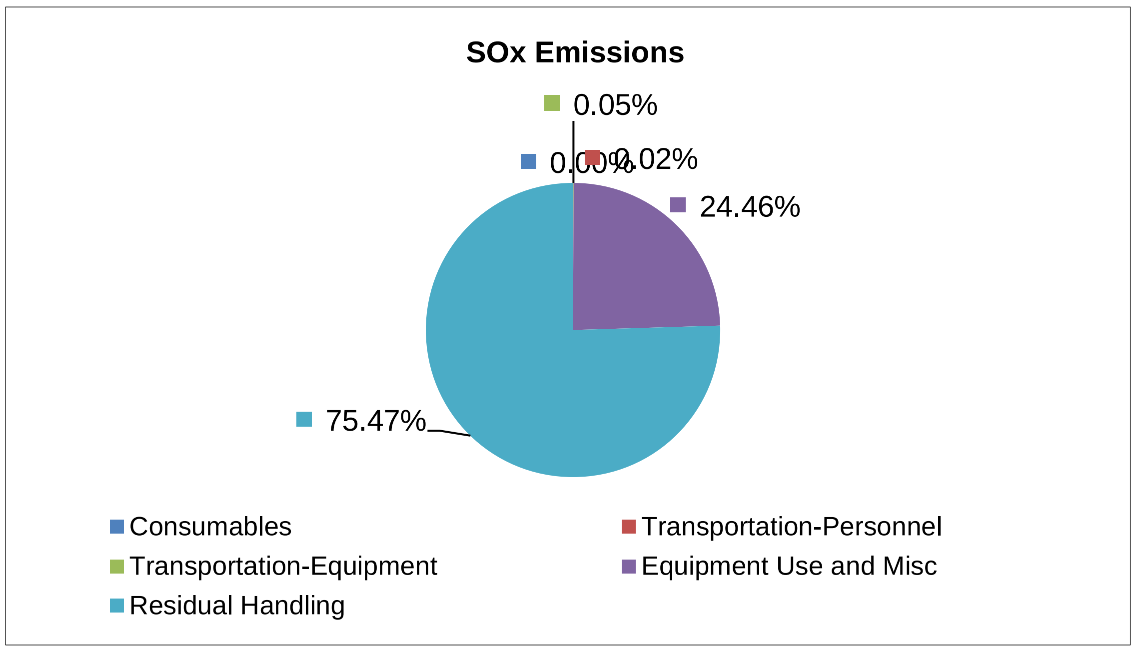
| Total Cost with Footprint Reduction |
|---|
| **$0** |

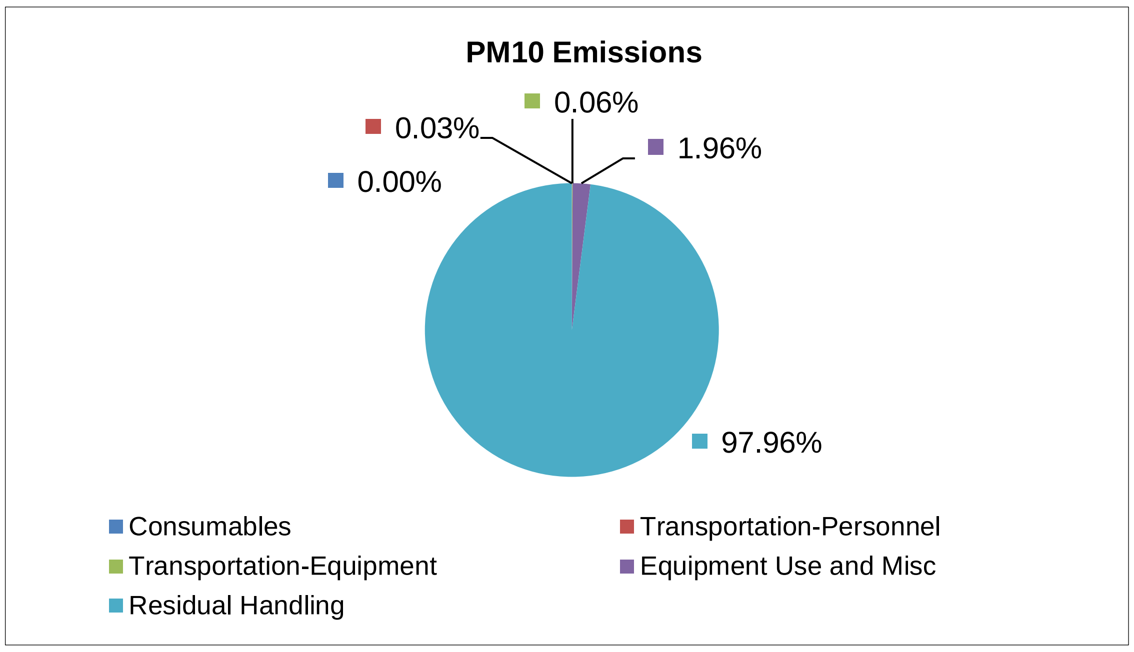

GHG Emissions
1%
4%
0%
28%
67%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

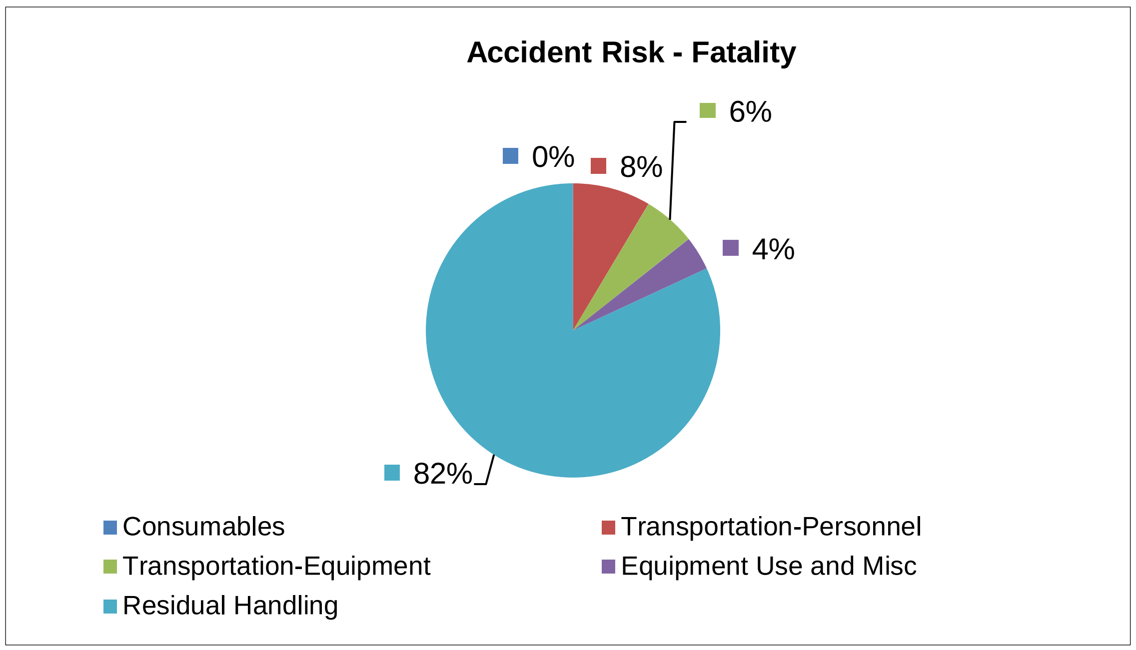

Energy Consumption
0.3%
0.0%
1.7%
31.9%
66.1%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

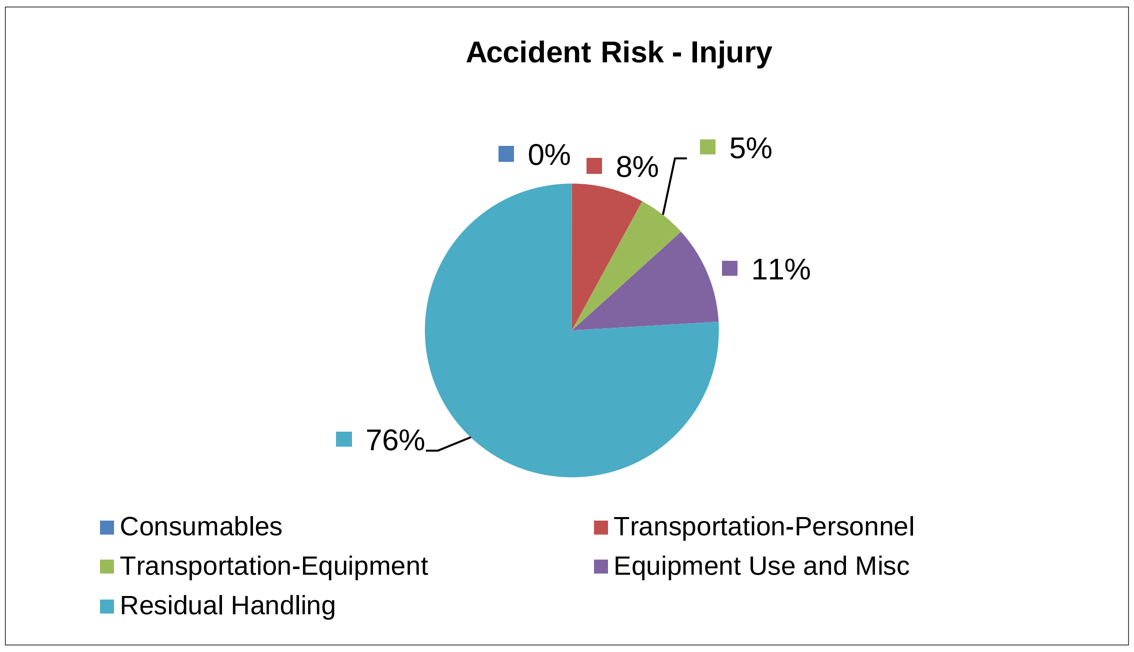

Water Consumption
0%
0%
100%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

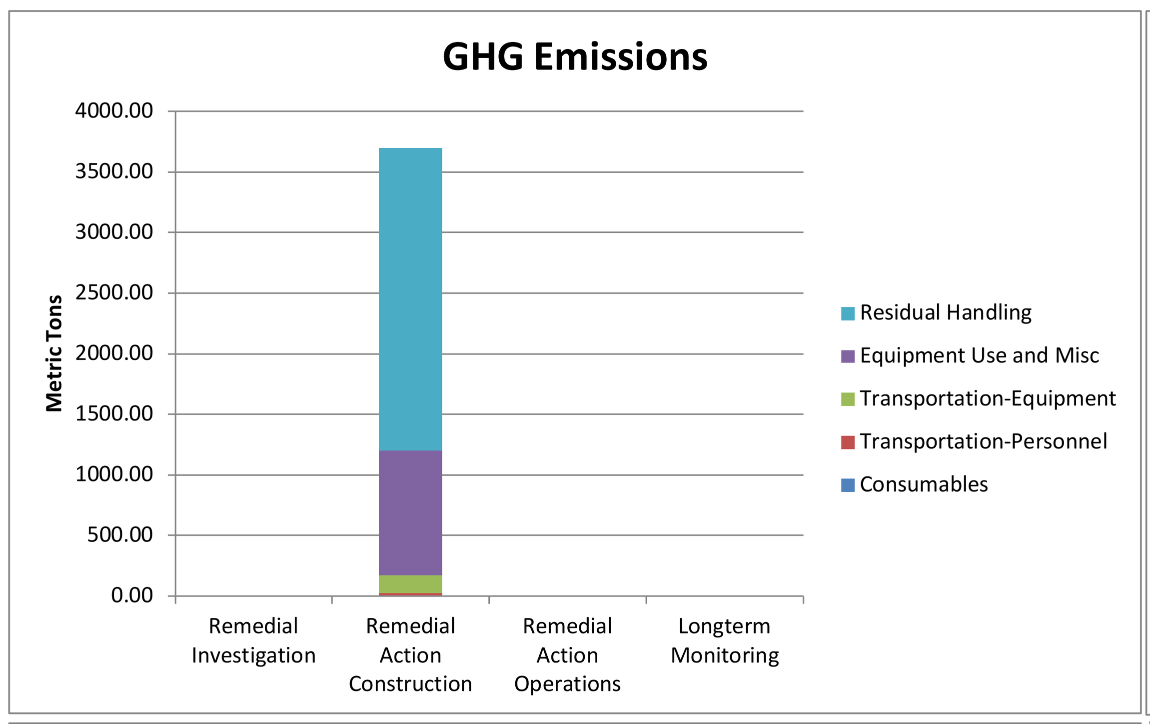

NOx Emissions
0.00%
0.21%
0.98%
31.33%
67.49%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

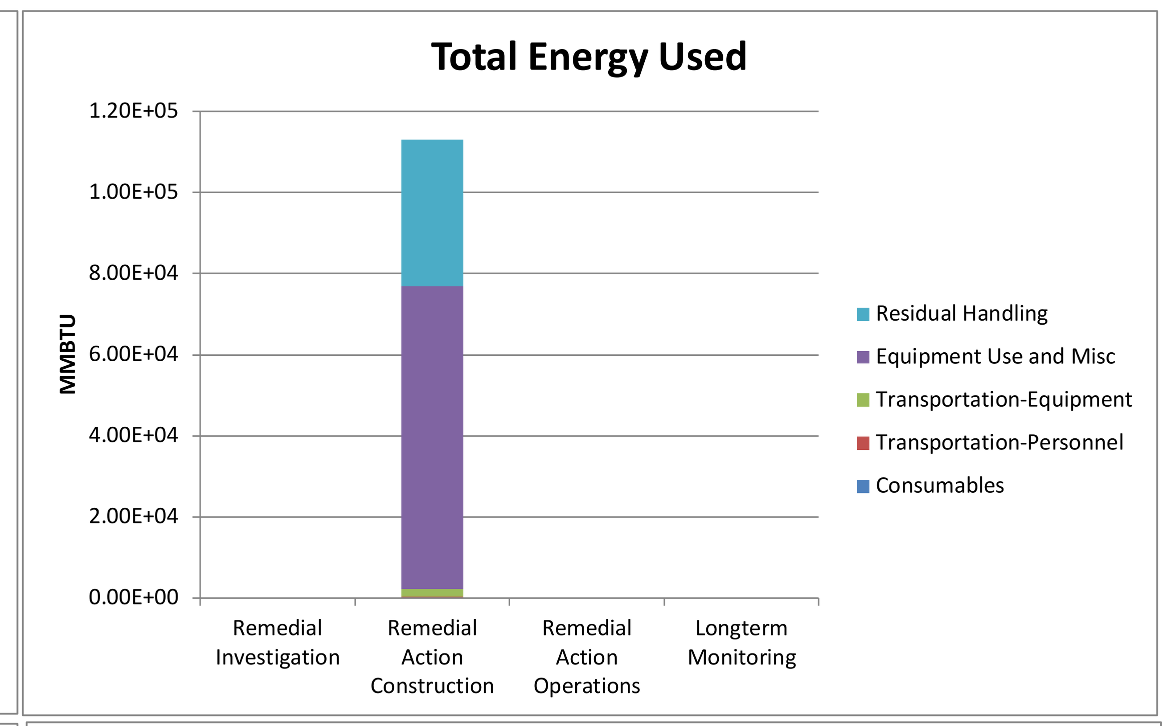

SOx Emissions
0.05%
0.02%
24.46%
75.47%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

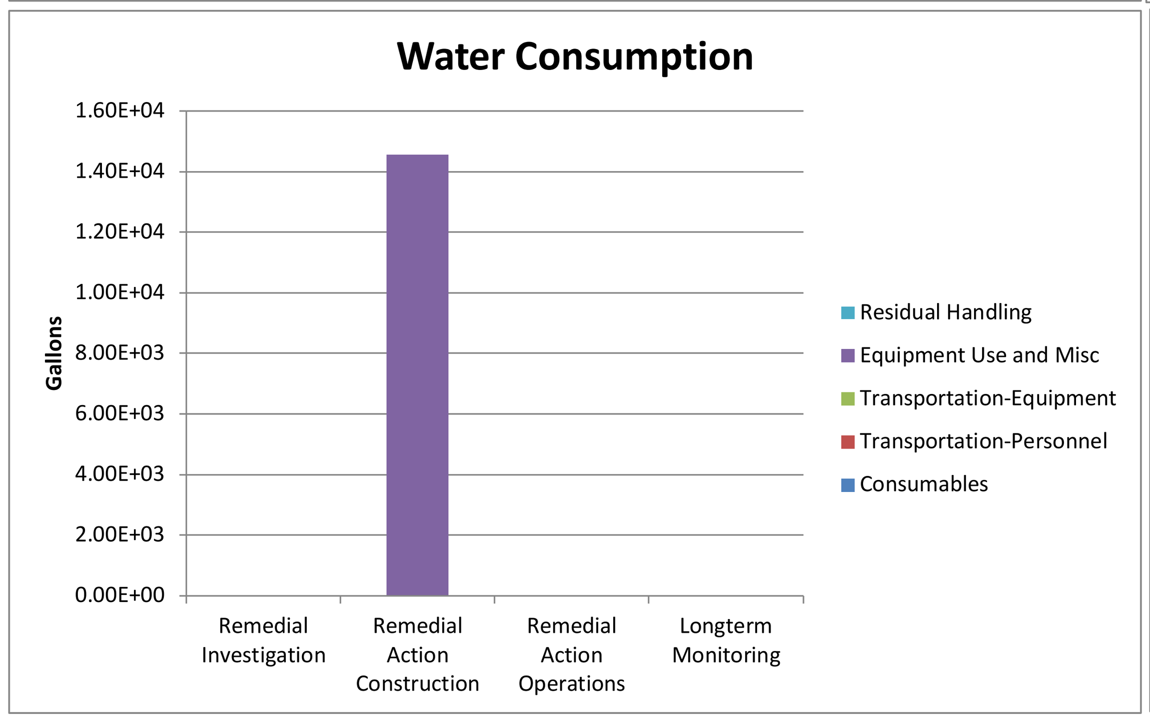

PM10 Emissions
0.06%
0.03%
1.96%
0.00%
97.96%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

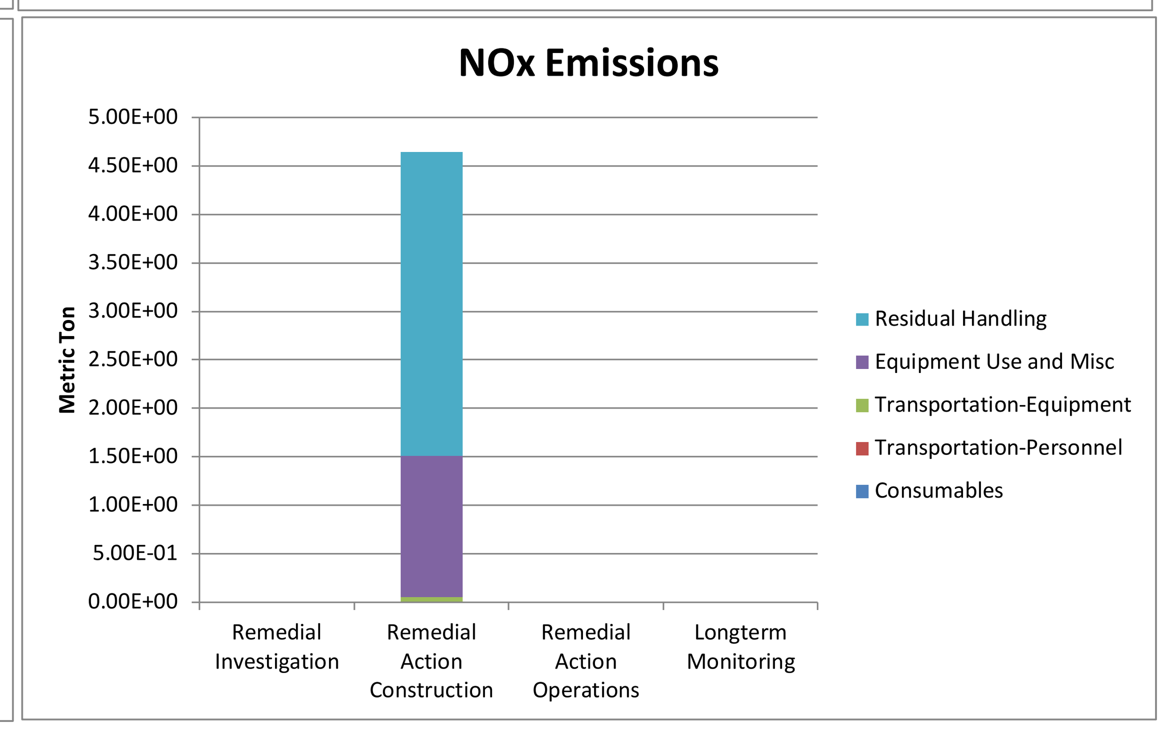

Accident Risk - Fatality
6%
0%
8%
4%
82%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

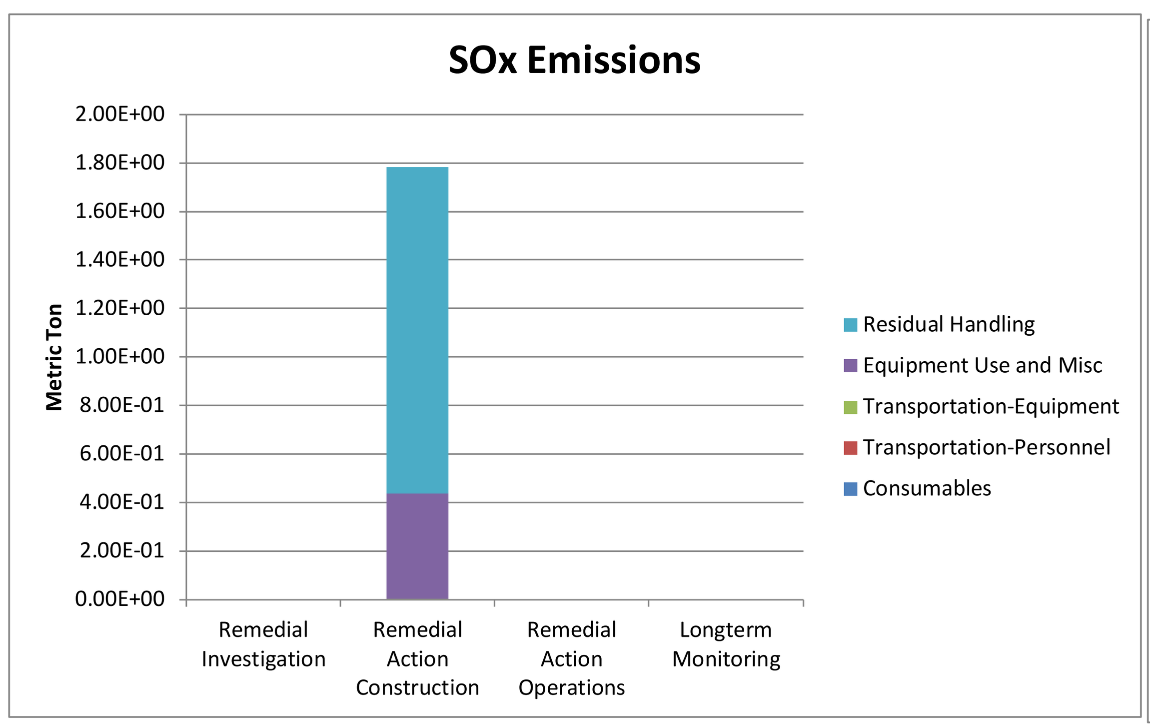

Accident Risk - Injury
0%
8%
5%
11%
76%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

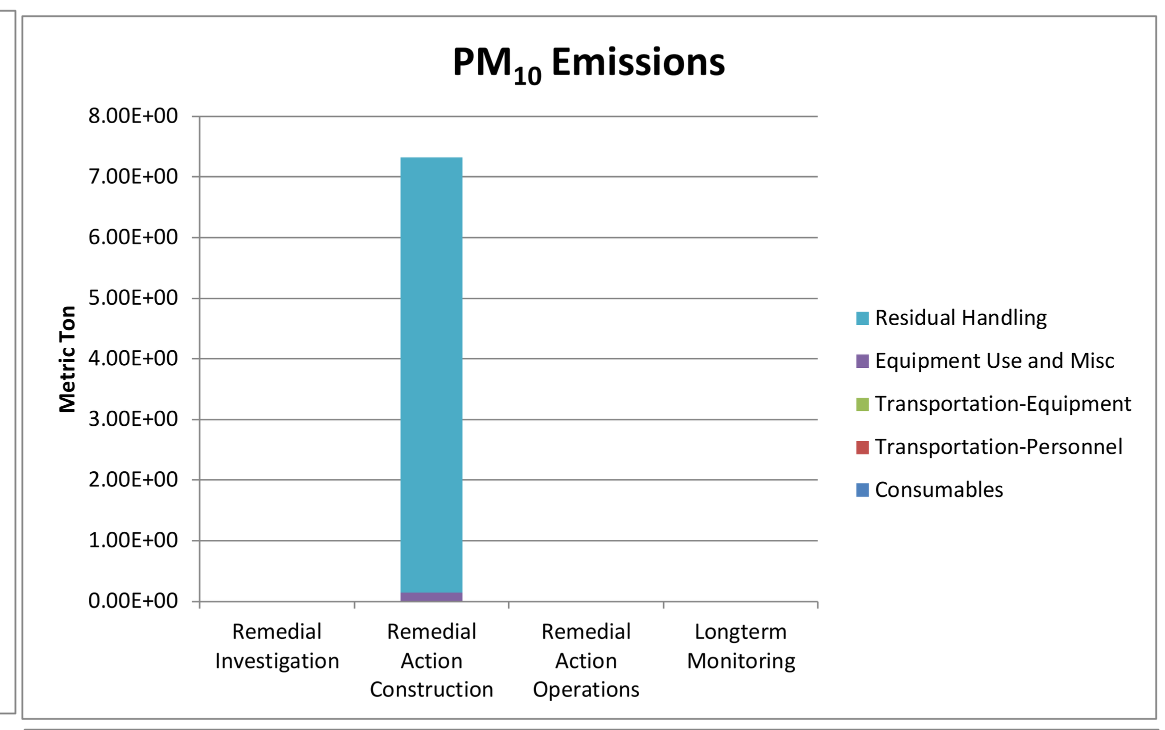

GHG Emissions
Metric Tons
4000.00
3500.00
3000.00
2500.00
2000.00
1500.00
1000.00
500.00
0.00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

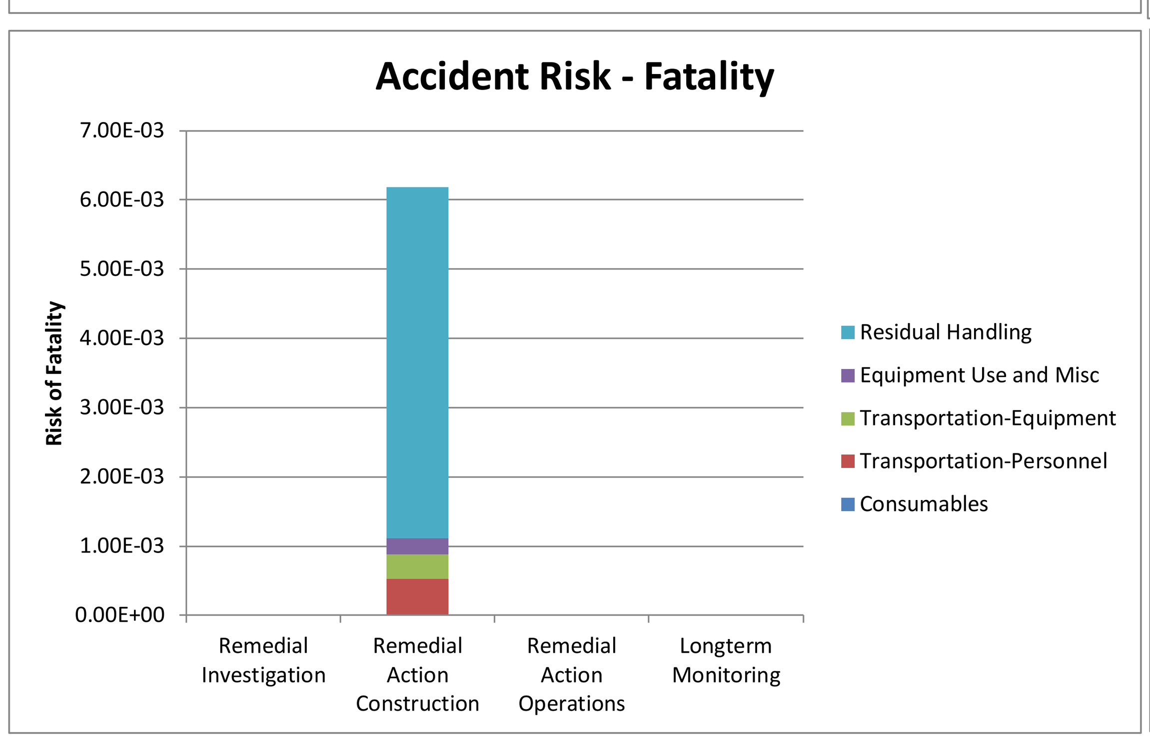

Total Energy Used
MMBTU
1.20E+05
1.00E+05
8.00E+04
6.00E+04
4.00E+04
2.00E+04
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

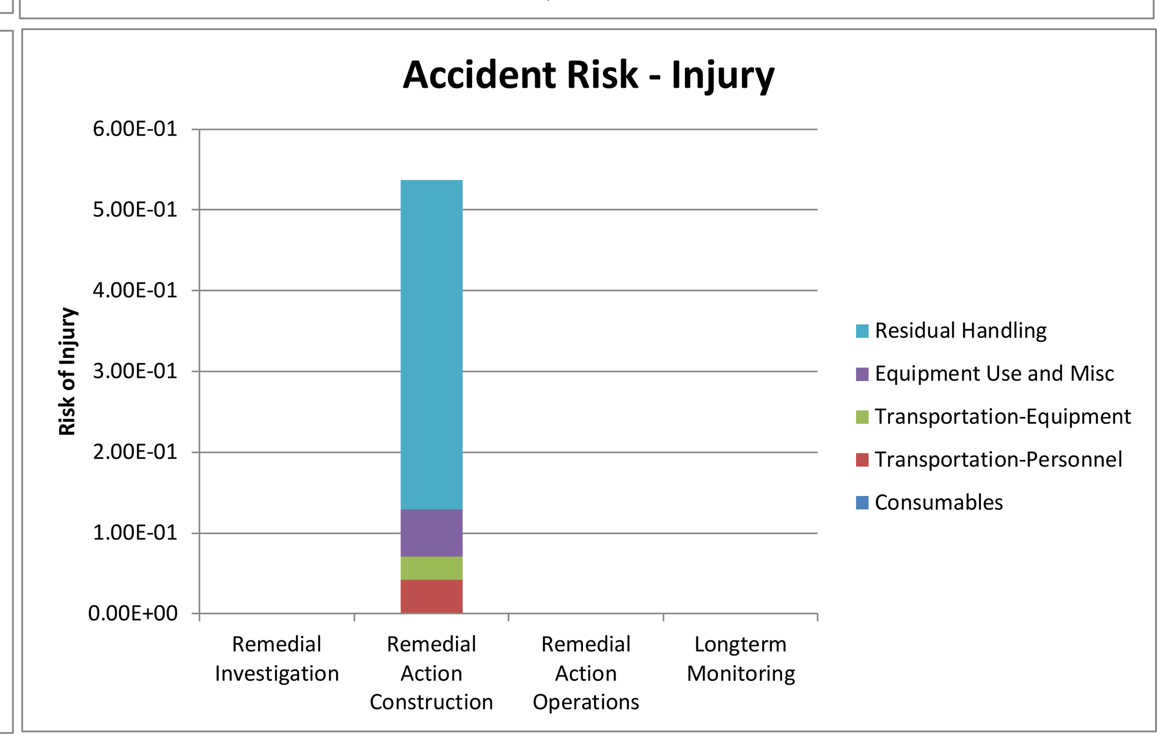

Water Consumption
Gallons
1.60E+04
1.40E+04
1.20E+04
1.00E+04
8.00E+03
6.00E+03
4.00E+03
2.00E+03
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

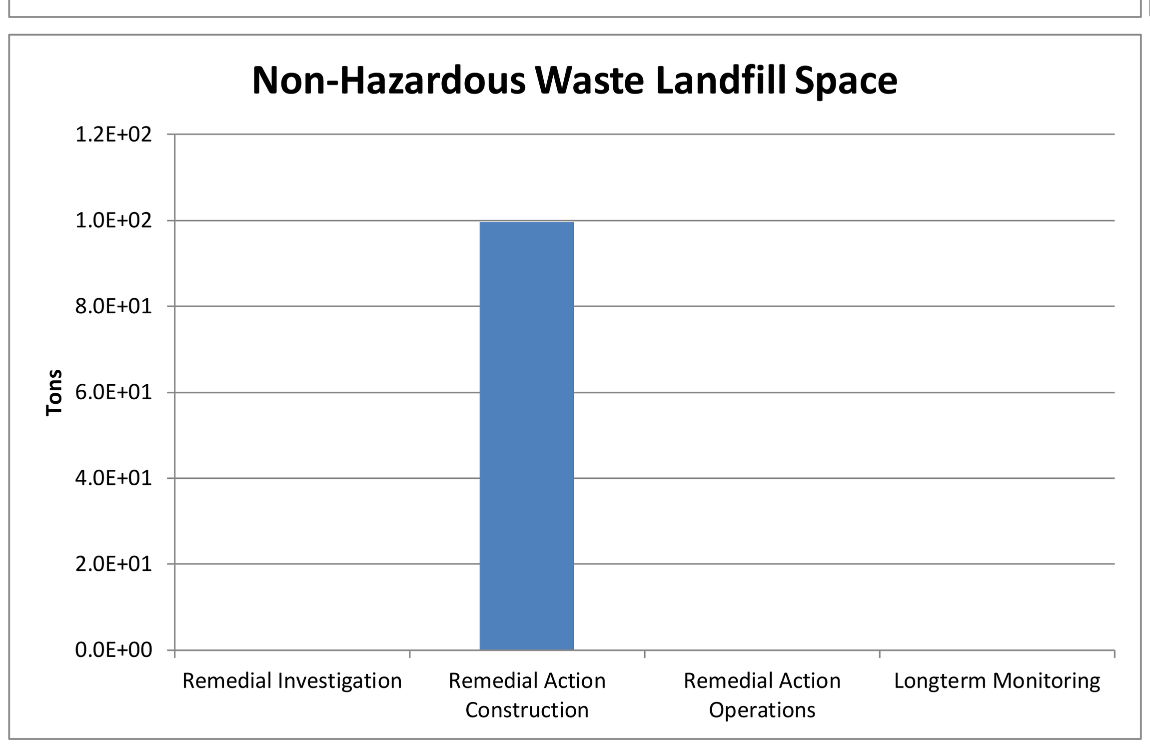

NOx Emissions
Metric Ton
5.00E+00
4.50E+00
4.00E+00
3.50E+00
3.00E+00
2.50E+00
2.00E+00
1.50E+00
1.00E+00
5.00E-01
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

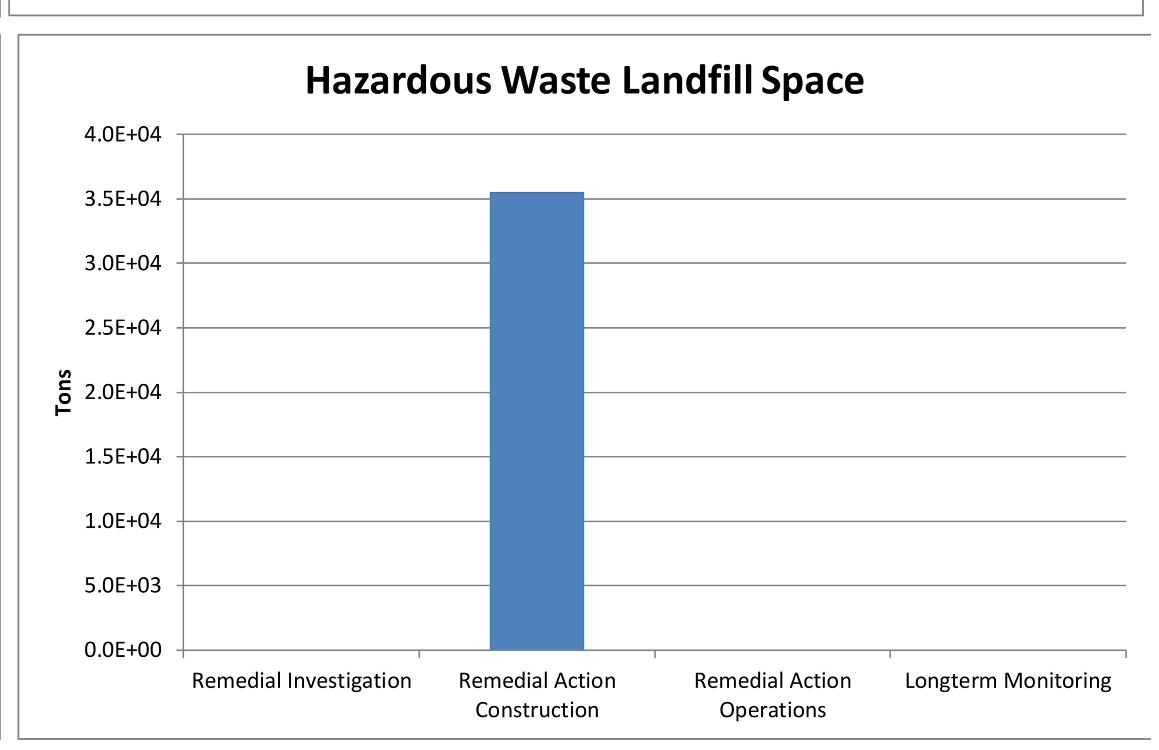

SOx Emissions
Metric Ton
2.00E+00
1.80E+00
1.60E+00
1.40E+00
1.20E+00
1.00E+00
8.00E-01
6.00E-01
4.00E-01
2.00E-01
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

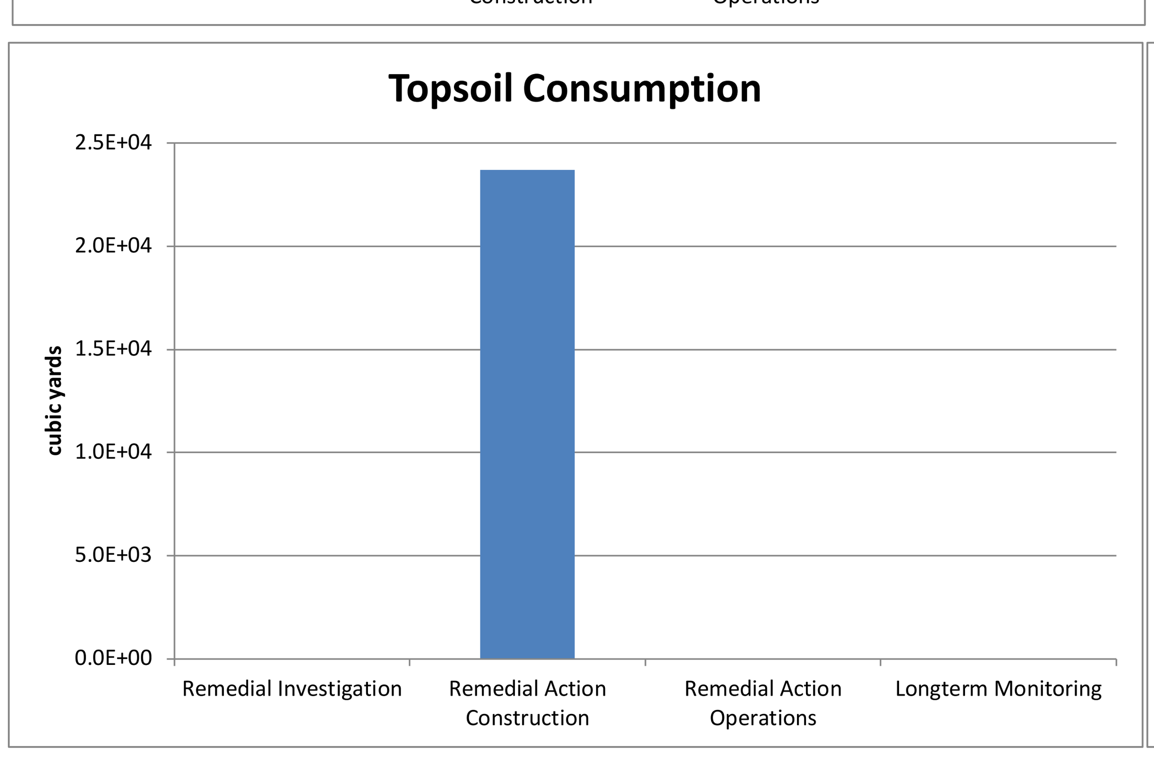

$PM_{10}$ Emissions
Metric Ton
8.00E+00
7.00E+00
6.00E+00
5.00E+00
4.00E+00
3.00E+00
2.00E+00
1.00E+00
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

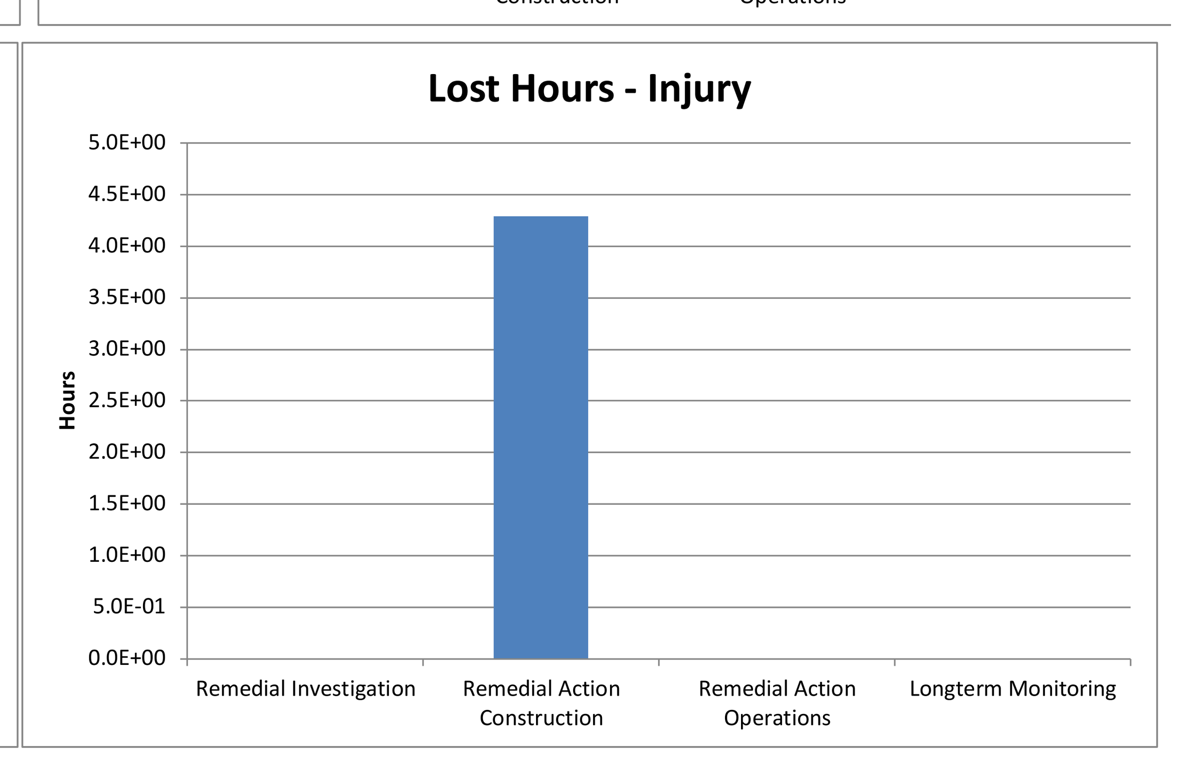

Accident Risk - Fatality
Risk of Fatality
7.00E-03
6.00E-03
5.00E-03
4.00E-03
3.00E-03
2.00E-03
1.00E-03
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables


Accident Risk - Injury
Risk of Injury
6.00E-01
5.00E-01
4.00E-01
3.00E-01
2.00E-01
1.00E-01
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables


Non-Hazardous Waste Landfill Space
Tons
1.2E+02
1.0E+02
8.0E+01
6.0E+01
4.0E+01
2.0E+01
0.0E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring


Hazardous Waste Landfill Space
Tons
4.0E+04
3.5E+04
3.0E+04
2.5E+04
2.0E+04
1.5E+04
1.0E+04
5.0E+03
0.0E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring


Topsoil Consumption
cubic yards
2.5E+04
2.0E+04
1.5E+04
1.0E+04
5.0E+03
0.0E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring


Lost Hours - Injury
Hours
5.0E+00
4.5E+00
4.0E+00
3.5E+00
3.0E+00
2.5E+00
2.0E+00
1.5E+00
1.0E+00
5.0E-01
0.0E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring

| | Technology Module / Phase | Module Components | Comments / Assumptions | Quantity | (Units) | Greenhouse Gas Emissions | | | | Criteria Pollutant Emission | | | Energy Consumption | Water Consumption |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $CO_2e$ | $CO_2$ | $N_20$ | $CH_4$ | $NO_x$ | $SO_x$ | $PM_{10}$ | | |
| **Stage** | **Materials** | | | | | | **Tonnes** | | | | | | **MWhr** | **gal x 1000** |
| RAC | Decon Pad | General Concrete | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 | 43,500.0 | lbs | 2.56 | 2.56 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 25.31 | 0.00 |
| RAC | Clean backfill | Soil | Assume Soil, 23,704 cy, 1.5 ton/cy, 2000 lb/ton | 71,112,000.0 | lbs | 741.76 | 741.76 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 19,601.81 | 0.00 |
| RAC | Revegetation, soil nutrients | Fertilizer | Assume fertilizer, 1609 msf (thousand square feet), 3 lb of sed per 1.2 msf | 4,022.5 | lbs | 5.02 | 5.02 | 6.60E-09 | 0.00E+00 | 0.00E+00 | 1.82E-03 | 3.67E-06 | 90.92 | 1.82 |
| RAC | Revegetation, hydroseed | Fertilizer | Assume fertilizer, 1609 msf (thousand square feet), 10 lb of seed per 1 msf | 16,090.0 | lbs | 20.07 | 20.07 | 2.64E-08 | 0.00E+00 | 0.00E+00 | 7.30E-03 | 1.47E-05 | 363.68 | 7.27 |
| RAC | Revegetation, hydroseed | Mulch | Assume wood mulch, 1609 msf (thousand square feet), 50 lb of mulch per 1 msf | 80,450.0 | lbs | 25.42 | 8.90 | 5.14E-02 | 2.74E-02 | 1.51E-05 | 8.68E-02 | 6.57E-03 | 287.79 | 0.00 |
| RAC | Revegetation, hydroseed | Fertilizer | Assume fertilizer, 1609 msf (thousand square feet), 2 lb per 1 msf | 3,218.0 | lbs | 4.01 | 4.01 | 5.28E-09 | 0.00E+00 | 0.00E+00 | 1.46E-03 | 2.93E-06 | 72.74 | 1.45 |
| RAC | Revegetation, wetland nutrients | Fertilizer | Assume fertilizer, 87 msf (thousand square feet), 1 lb of seed per 2500 sf, transportation disntance 50 miles | 34.8 | lbs | 0.04 | 0.04 | 5.71E-11 | 0.00E+00 | 0.00E+00 | 1.58E-05 | 3.17E-08 | 0.79 | 0.02 |
| RAC | wetland soil | Soil | Assume soil, 400 cy, 1.5 ton/cy, 2000 lb/ton | 1,200,000.0 | lbs | 12.52 | 12.52 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 330.78 | 0.00 |
| | **Subtotal** | | | | | **811.40** | **794.88** | **0.05** | **0.03** | **0.00** | **0.10** | **0.01** | **20773.82** | **10.55** |
| **Stage** | **Construction Equipment** | | | | | | **Tonnes** | | | | | | **MWhr** | **gal x 1000** |
| RAC | Brush mowing | Tractor, 250 hp, diesel | 20.4 acres, mediom density area, uses a tractor, Assume 8 hours per day, 0.5 acres per day | 326.4 | hrs | 24.39 | 24.39 | 0.00E+00 | 0.00E+00 | 2.04E-01 | 0.00E+00 | 1.54E-02 | 87.78 | |
| RAC | Chipping tree | WOOD CHIPPER | 20.4 acres, mediom density area, uses a woodchipper, 130 hp, assume 8 hours per day, 0.5 acres per day | 326.4 | hrs | 14.21 | 14.21 | 0.00E+00 | 0.00E+00 | 1.11E-01 | 0.00E+00 | 9.41E-03 | 62.36 | |
| RAC | Chipping tree | Chainsaw, gasoline, 3<hp<=6, 2 stroke | 20.4 acres, medium density area, uses a 2 chain saws, gasoline, 18" , assume 3 days or work, 8 hours per day, 80%efficiency | 89.6 | hrs | 0.17 | 0.17 | 0.00E+00 | 0.00E+00 | 3.25E-04 | 0.00E+00 | 2.39E-03 | 0.83 | |
| RAC | Dozer, 200 hp | Dozer, 200 HP (D7) w/U Blade (diesel) | 1 units, 60 days, 8 hours per day, 80% efficiency | 384 | hrs | 42.19 | 42.19 | 0.00 | 0.00 | 2.59E-01 | 7.61E-02 | 2.57E-02 | 258.11 | |
| RAC | Excavator 2.5 CY | Excavator, Hydraulic, 2 CY (diesel) | 2 units, 60 days, 8 hours per day, 80%efficiency | 768 | hrs | 74.43 | 74.43 | 0.00 | 0.00 | 4.68E-01 | 1.38E-01 | 4.45E-02 | 337.89 | |
| RAC | Dozer, 200 hp | Dozer, 200 HP (D7) w/U Blade (diesel) | 1 units, 64 days, 8 hours per day, 80% efficiency | 409.6 | hrs | 45.00 | 45.00 | 0.00 | 0.00 | 2.77E-01 | 8.11E-02 | 2.74E-02 | 275.32 | |
| RAC | Excavator 2.5 CY | Excavator, Hydraulic, 2 CY (diesel) | 32 days, 8 hours per day, 80%efficiency | 204.8 | hrs | 19.85 | 19.85 | 0.00 | 0.00 | 1.25E-01 | 3.68E-02 | 1.19E-02 | 90.10 | |
| | **Subtotal** | | | | | **220.24** | **220.24** | **0.00** | **0.00** | **1.44** | **0.33** | **0.14** | **1112.39** | **0.00** |
| | | | | **Total** | | **1,032** | **1,015** | **0.05** | **0.03** | **1.44** | **0.43** | **0.14** | **21,886** | **11** |

**Alternative 1**
**Values Input into SiteWise as "Other"**

| Module | Greenhouse Gas Emissions | | | | Criteria Pollutant Emission | | | Energy Consumption | Water Consumption |
|---|---|---|---|---|---|---|---|---|---|
| | $CO_2e$ | $CO_2$ | $N_20$ ($CO_2e$) | $CH_4$ ($CO_2e$) | $NO_x$ | $SO_x$ | $PM_{10}$ | | |
| | | **Tonnes** | | | | | | **MMBTU** | **gal** |
| RI | - | - | - | - | - | - | - | - | - |
| RAC | 1,031.64 | 1,015.12 | 15.95 | 0.57 | 1.44 | 0.43 | 0.14 | 74,675.77 | 10,554.51 |
| RAO | - | - | - | - | - | - | - | - | - |
| LTM | - | - | - | - | - | - | - | - | - |

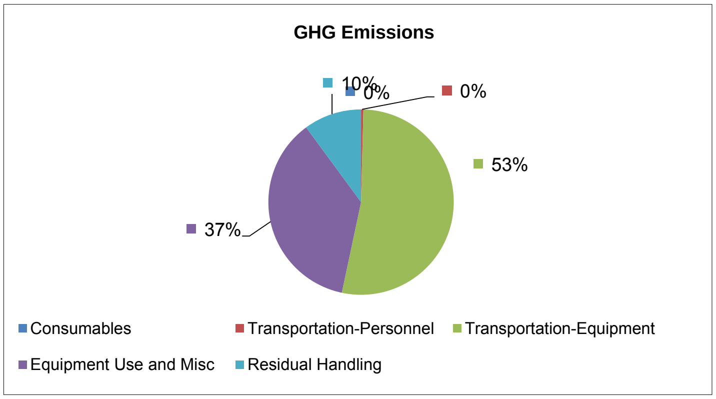
Note: 1 MWhr = 3412141.4799 BTU, 1MMTBU = 10^6 BTU

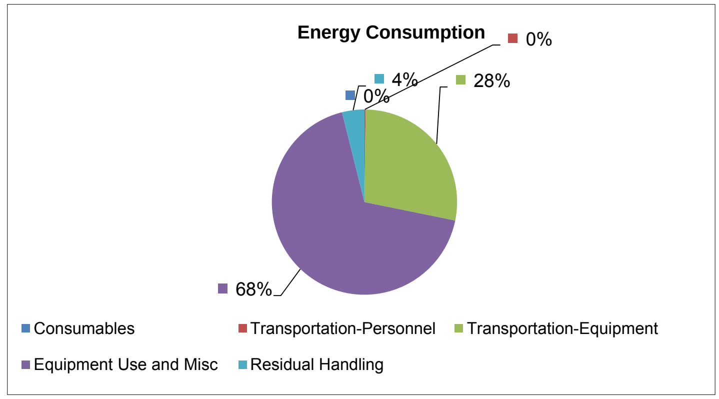
## Sustainable Remediation - Environmental Footprint Summary 4b

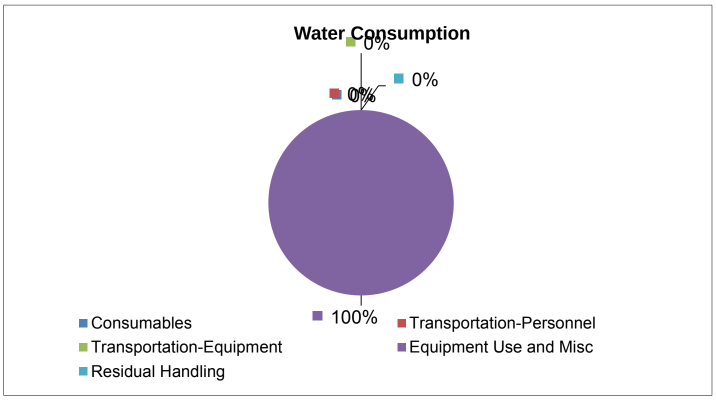
| Phase | Activities | GHG Emissions | Total energy Used | Water Consumption | NOx emissions | SOx Emissions | PM10 Emissions | Accident Risk Fatality | Accident Risk Injury |
|---|---|---|---|---|---|---|---|---|---|
| | | metric ton | MMBTU | gallons | metric ton | metric ton | metric ton | | |
| Remedial Investigation | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Sub-Total | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Remedial Action Construction | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 28.14 | 3.5E+02 | NA | 1.0E-02 | 3.7E-04 | 2.1E-03 | 5.8E-04 | 4.6E-02 |
| | Transportation-Equipment | 3,593.40 | 4.7E+04 | NA | 1.1E+00 | 2.0E-02 | 1.0E-01 | 8.9E-03 | 7.2E-01 |
| | Equipment Use and Misc | 2,483.63 | 1.1E+05 | 1.5E+04 | 1.7E+00 | 8.7E-01 | 4.3E-01 | 3.0E-04 | 7.5E-02 |
| | Residual Handling | 685.32 | 6.5E+03 | NA | 2.4E+00 | 1.2E+00 | 6.5E+00 | 7.0E-04 | 5.6E-02 |
| | Sub-Total | 6,790.49 | 1.68E+05 | 1.46E+04 | 5.22E+00 | 2.10E+00 | 7.01E+00 | 1.05E-02 | 8.94E-01 |
| Remedial Action Operations | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Sub-Total | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Longterm Monitoring | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Sub-Total | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Total** | | **6.8E+03** | **1.7E+05** | **1.5E+04** | **5.2E+00** | **2.1E+00** | **7.0E+00** | **1.0E-02** | **8.9E-01** |

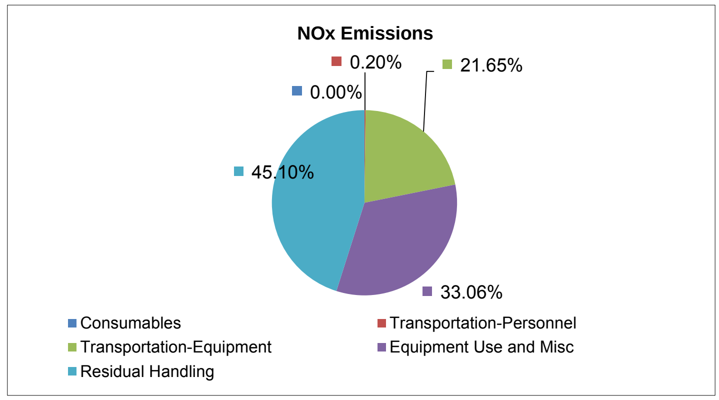
| Remedial Alternative Phase | Non-Hazardous Waste Landfill Space | Hazardous Waste Landfill Space | Topsoil Consumption | Costing | Lost Hours - Injury |
|---|---|---|---|---|---|
| | tons | tons | cubic yards | $ | |
| **Remedial Investigation** | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 | 0.0E+00 |
| **Remedial Action Construction** | 3.6E+04 | 0.0E+00 | 0.0E+00 | 0 | 7.2E+00 |
| **Remedial Action Operations** | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 | 0.0E+00 |
| **Longterm Monitoring** | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 | 0.0E+00 |
| **Total** | **3.6E+04** | **0.0E+00** | **0.0E+00** | **$0** | **7.2E+00** |

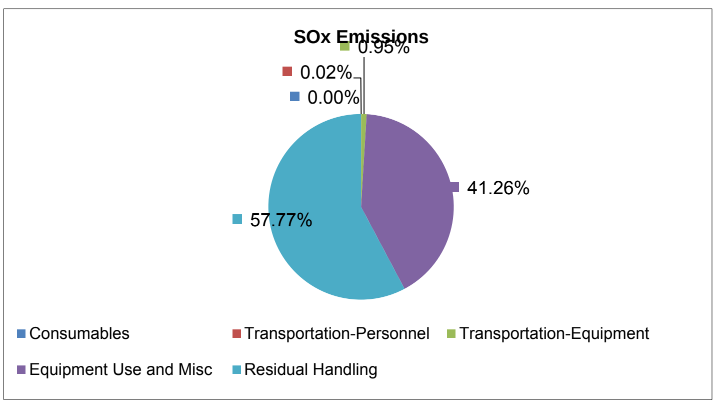
| Total Cost with Footprint Reduction |
|---|
| **$0** |

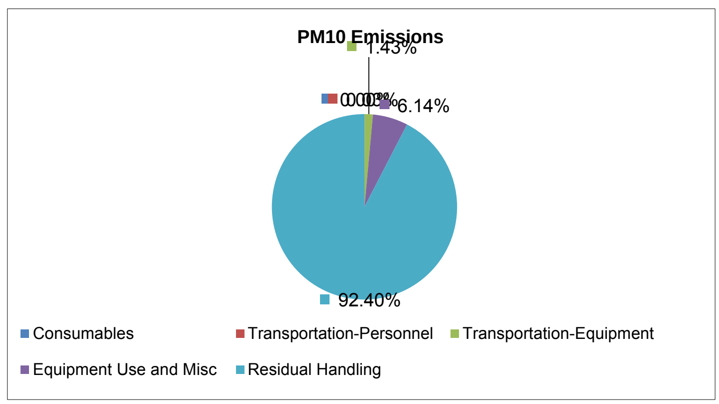

GHG Emissions
10%
0%
0%
53%
37%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

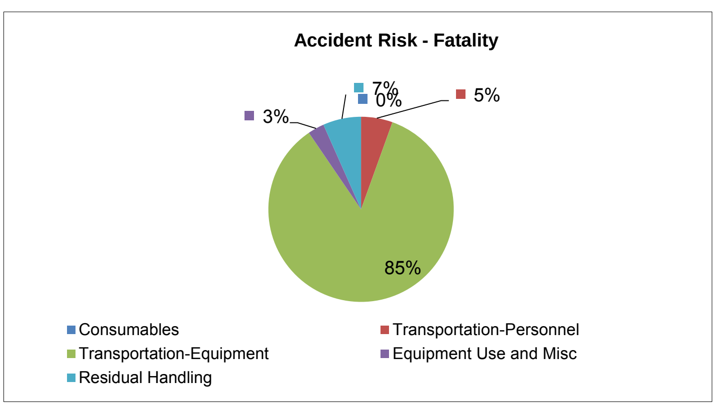

Energy Consumption
0%
4%
0%
28%
68%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

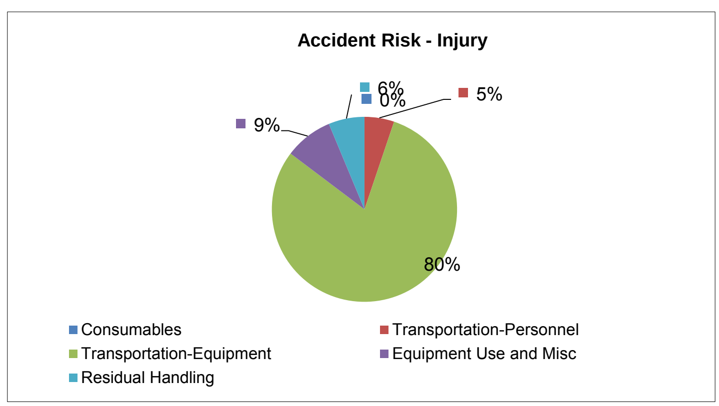

Water Consumption
0%
0%
100%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

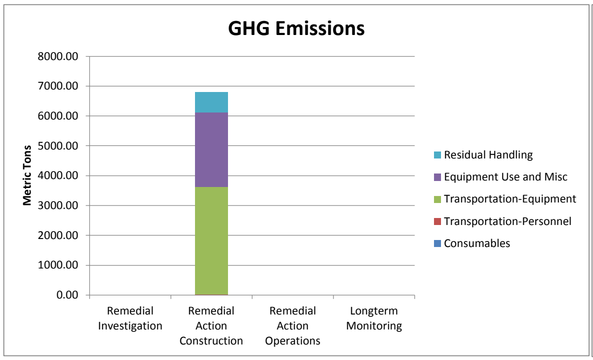

NOx Emissions
0.20%
21.65%
0.00%
45.10%
33.06%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

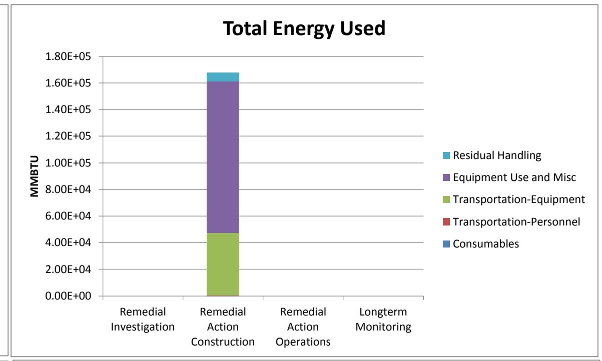

SOx Emissions
0.95%
0.02%
0.00%
41.26%
57.77%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

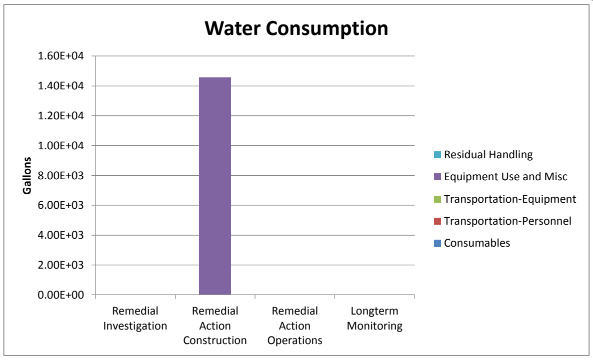

PM10 Emissions
1.43%
6.14%
92.40%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

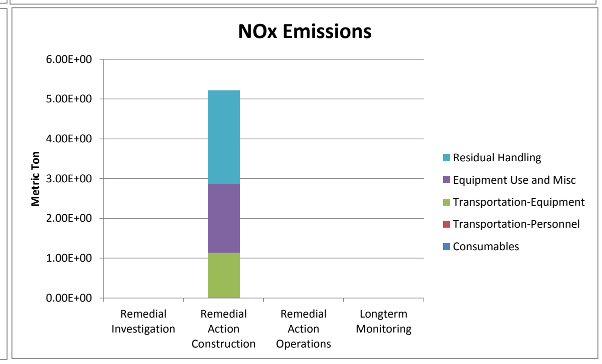

Accident Risk - Fatality
7%
0%
5%
3%
85%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

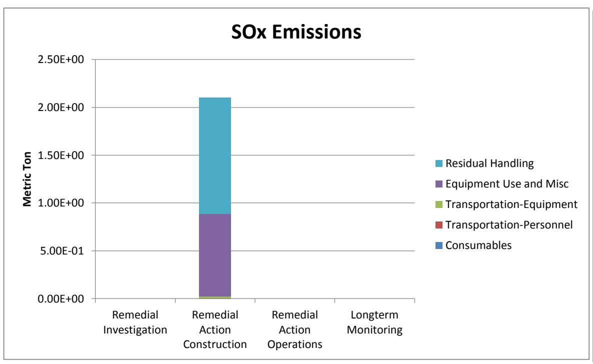

Accident Risk - Injury
6%
0%
5%
9%
80%
Consumables
Transportation-Personnel
Transportation-Equipment
Equipment Use and Misc
Residual Handling

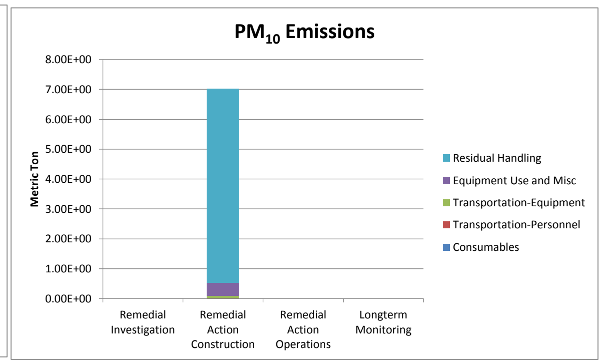

GHG Emissions
Metric Tons
8000.00
7000.00
6000.00
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

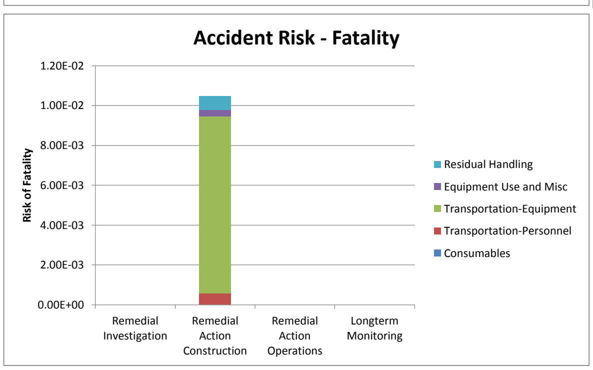

Total Energy Used
MMBTU
1.80E+05
1.60E+05
1.40E+05
1.20E+05
1.00E+05
8.00E+04
6.00E+04
4.00E+04
2.00E+04
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

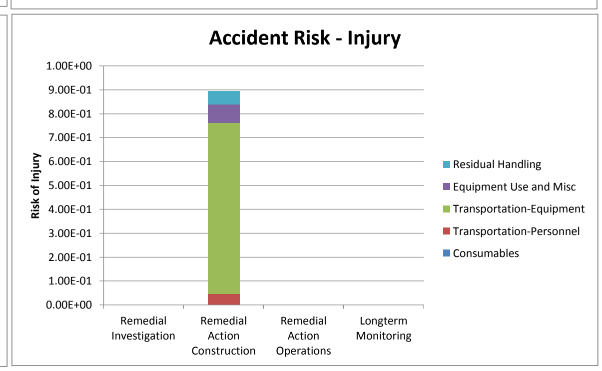

Water Consumption
Gallons
1.60E+04
1.40E+04
1.20E+04
1.00E+04
8.00E+03
6.00E+03
4.00E+03
2.00E+03
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

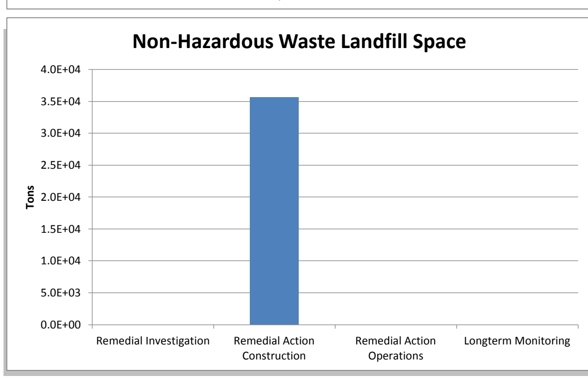

NOx Emissions
Metric Ton
6.00E+00
5.00E+00
4.00E+00
3.00E+00
2.00E+00
1.00E+00
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

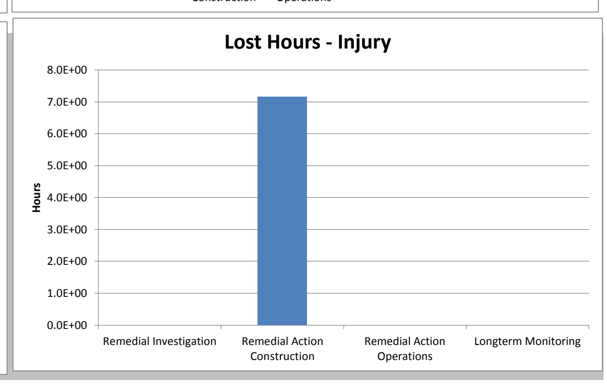

SOx Emissions
Metric Ton
2.50E+00
2.00E+00
1.50E+00
1.00E+00
5.00E-01
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables


$PM_{10}$ Emissions
Metric Ton
8.00E+00
7.00E+00
6.00E+00
5.00E+00
4.00E+00
3.00E+00
2.00E+00
1.00E+00
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables


Accident Risk - Fatality
Risk of Fatality
1.20E-02
1.00E-02
8.00E-03
6.00E-03
4.00E-03
2.00E-03
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables


Accident Risk - Injury
Risk of Injury
1.00E+00
9.00E-01
8.00E-01
7.00E-01
6.00E-01
5.00E-01
4.00E-01
3.00E-01
2.00E-01
1.00E-01
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables


Non-Hazardous Waste Landfill Space
Tons
4.0E+04
3.5E+04
3.0E+04
2.5E+04
2.0E+04
1.5E+04
1.0E+04
5.0E+03
0.0E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring


Lost Hours - Injury
Hours
8.0E+00
7.0E+00
6.0E+00
5.0E+00
4.0E+00
3.0E+00
2.0E+00
1.0E+00
0.0E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring

SiteWise Resulst Alternative 4b
OU5 Site 15, NAS Cecil Field
Jacksonville, FL


| | Technology Module / Phase | Module Components | Comments / Assumptions | Quantity | (Units) | Greenhouse Gas Emissions | | | | Criteria Pollutant Emission | | | Energy Consumption | Water Consumption |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $CO_2e$ | $CO_2$ | $N_20$ | $CH_4$ | $NO_x$ | $SO_x$ | $PM_{10}$ | | |
| **Stage** | **Materials** | | | | | | | | **Tonnes** | | | | **MWhr** | **gal x 1000** |
| RAC | Decon Pad | General Concrete | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 | 43,500.00 | lbs | 2.56 | 2.56 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 25.31 | 0.00 |
| RAC | Revegetation, soil nutrients | Fertilizer | Assume fertilizer, 1609 msf (thousand square feet), 3 lb of sed per 1.2 msf | 4,022.50 | lbs | 5.02 | 5.02 | 6.60E-09 | 0.00E+00 | 0.00E+00 | 1.82E-03 | 3.67E-06 | 90.92 | 1.82 |
| RAC | Revegetation, hydroseed | Fertilizer | Assume fertilizer, 1609 msf (thousand square feet), 10 lb of sed per 1 msf | 16,090.00 | lbs | 20.07 | 20.07 | 2.64E-08 | 0.00E+00 | 0.00E+00 | 7.30E-03 | 1.47E-05 | 363.68 | 7.27 |
| RAC | Revegetation, hydroseed | Mulch | Assume wood mulch, 1609 msf (thousand square feet), 50 lb of mulch per 1 msf | 80,450.00 | lbs | 25.42 | 8.90 | 5.14E-02 | 2.74E-02 | 1.51E-05 | 8.68E-02 | 6.57E-03 | 287.79 | 0.00 |
| RAC | Revegetation, hydroseed | Fertilizer | Assume fertilizer, 1609 msf (thousand square feet), 2 lb per 1 msf | 3,218.00 | lbs | 4.01 | 4.01 | 5.28E-09 | 0.00E+00 | 0.00E+00 | 1.46E-03 | 2.93E-06 | 72.74 | 1.45 |
| RAC | Revegetation, wetland nutrients | Fertilizer | Assume fertilizer, 87 msf (thousand square feet), 1 lb of seed per 2500 sf, transportation disntance 50 miles | 34.80 | lbs | 0.04 | 0.04 | 5.71E-11 | 0.00E+00 | 0.00E+00 | 1.58E-05 | 3.17E-08 | 0.79 | 0.02 |
| RAC | Clean Backfill | Soil | 23,704 CY, 1.5 ton/cy, 2000 lb/ft | 71,112,000.00 | lbs | 741.76 | 741.76 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 19,601.81 | 0.00 |
| RAC | wetland soil | Soil | Assume soil, 400 cy, 1.5 ton/cy, 2000 lb/ton | 1,200,000.00 | lbs | 12.52 | 12.52 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 330.78 | 0.00 |
| RAC | Stabilization Material | Typical Cement | Assume cement, 1780 ton, Assume 2/3 of 1780 to be cement | 2,373,333.33 | lbs | 893.36 | 893.36 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 6,687.40 | 0.00 |
| RAC | Stabilization Material | Lime | Assume lime, 1780 ton, Assume 1/3 of 1780 to be lime | 1,186,666.67 | lbs | 518.90 | 444.53 | 2.02E-01 | 5.54E-01 | 4.33E-05 | 3.71E-01 | 2.55E-01 | 4,572.15 | 0.00 |
| | **Subtotal** | | | | | **2223.67** | **2132.77** | **0.25** | **0.58** | **0.00** | **0.47** | **0.26** | **32033.37** | **10.55** |
| **Stage** | **Construction Equipment** | | | | | | | | **Tonnes** | | | | **MWhr** | **gal x 1000** |
| RAC | Brush mowing | Tractor, 250 hp, diesel | 20.4 acres, mediom density area, uses a tractor, Assume 8 hours per day, 0.5 acres per day | 326.4 | hrs | 24.39 | 24.39 | 0.00E+00 | 0.00E+00 | 2.04E-01 | 0.00E+00 | 1.54E-02 | 87.78 | |
| RAC | Chipping tree | WOOD CHIPPER | 20.4 acres, mediom density area, uses a woodchipper, 130 hp, assume 8 hours per day, 0.5 acres per day | 326.4 | hrs | 14.21 | 14.21 | 0.00E+00 | 0.00E+00 | 1.11E-01 | 0.00E+00 | 9.41E-03 | 62.36 | |
| RAC | Chipping tree | Chainsaw, gasoline, 3<hp<=6, 2 stroke | 20.4 acres, medium density area, uses a 2 chain saws, gasoline, 18" , assume 3 days or work, 8 hours per day, 80%efficiency | 89.6 | hrs | 0.17 | 0.17 | 0.00E+00 | 0.00E+00 | 3.25E-04 | 0.00E+00 | 2.39E-03 | 0.83 | |
| RAC | Front End Loader, 4 CY | Loader, 200 HP, 4 CY (diesel) | 1 unit, 40 days, 80% efficiency, 8 hours per day | 256 | hrs | 8.29 | 8.29 | 0.00 | 0.00 | 7.55E-02 | 1.57E-02 | 9.08E-03 | 30.24 | |
| RAC | Dozer, 200 hp | Dozer, 200 HP (D7) w/U Blade (diesel) | 1 units, 40 days, 8 hours per day, 80% efficiency | 256 | hrs | 28.13 | 28.13 | 0.00 | 0.00 | 1.73E-01 | 5.07E-02 | 1.71E-02 | 172.07 | |
| RAC | Skid-steer, 78 hp | Skid Steer (diesel) | 40 days, 8 hours per day, 80% of efficiency | 256 | hrs | 3.30 | 3.13 | 0.00 | 8.10E-03 | 3.16E-02 | 6.73E-04 | 6.06E-03 | 15.64 | |
| RAC | Dozer, 200 hp | Dozer, 200 HP (D7) w/U Blade (diesel) | 60 days, 8 hours per day, 80% efficiency | 384 | hrs | 42.19 | 42.19 | 0.00 | 0.00 | 2.59E-01 | 7.61E-02 | 2.57E-02 | 258.11 | |
| RAC | Excavator 2.5 cy (2) | Excavator, Hydraulic, 2 CY (diesel) | 60 days, 8 hours per day, 80% efficiency | 768 | hrs | 74.43 | 74.43 | 0.00 | 0.00 | 4.68E-01 | 1.38E-01 | 4.45E-02 | 337.89 | |
| RAC | Excavator 2.5 cy | Excavator, Hydraulic, 2 CY (diesel) | 32 days, 8 hours per day, 80% efficiency | 204.8 | hrs | 19.85 | 19.85 | 0.00 | 0.00 | 1.25E-01 | 3.68E-02 | 1.19E-02 | 90.10 | |
| RAC | Dozer, 200 hp | Dozer, 200 HP (D7) w/U Blade (diesel) | 1 units, 32 days, 8 hours per day, 80% efficiency | 409.6 | hrs | 45.00 | 45.00 | 0.00 | 0.00 | 2.77E-01 | 8.11E-02 | 2.74E-02 | 275.32 | |
| | **Subtotal** | | | | | **259.95** | **259.78** | **0.00** | **0.01** | **1.72** | **0.40** | **0.17** | **1330.35** | **0.00** |
| | | | | **Total** | | **2,484** | **2,393** | **0.25** | **0.59** | **1.72** | **0.87** | **0.43** | **33,364** | **11** |

**Alternative 1**
**Values Input into SiteWise as "Other"**

| Module | Greenhouse Gas Emissions | | | | Criteria Pollutant Emission | | | Energy Consumption | Water Consumption |
|---|---|---|---|---|---|---|---|---|---|
| | $CO_2e$ | $CO_2$ | $N_20$ ($CO_2e$) | $CH_4$ ($CO_2e$) | $NO_x$ | $SO_x$ | $PM_{10}$ | | |
| | | **Tonnes** | | | | | | **MMBTU** | **gal** |
| RI | - | - | - | - | - | - | - | - | - |
| RAC | 2,483.62 | 2,392.56 | 78.68 | 12.39 | 1.72 | 0.87 | 0.43 | 113,837.03 | 10,554.51 |
| RAO | - | - | - | - | - | - | - | - | - |
| LTM | - | - | - | - | - | - | - | - | - |

Note: 1 MWhr = 3412141.4799 BTU, 1MMTBU = 10^6 BTU

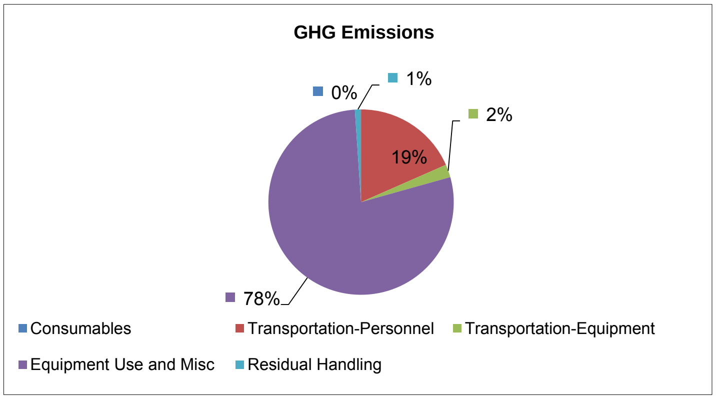
## Sustainable Remediation - Environmental Footprint Summary 4c

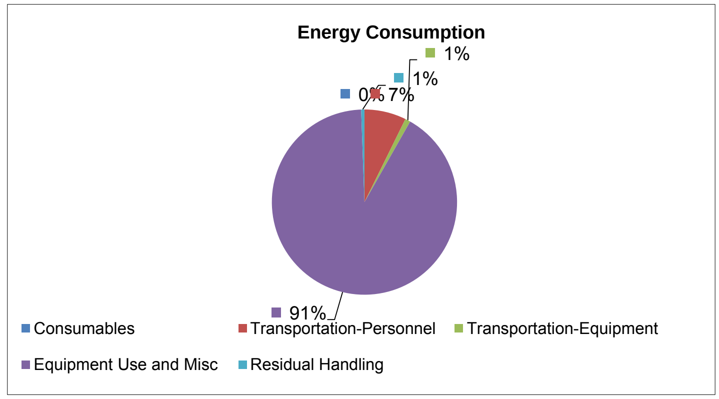
| Phase | Activities | GHG Emissions (metric ton) | Total energy Used (MMBTU) | Water Consumption (gallons) | NOx emissions (metric ton) | SOx Emissions (metric ton) | PM10 Emissions (metric ton) | Accident Risk Fatality | Accident Risk Injury |
|---|---|---|---|---|---|---|---|---|---|
| Remedial Investigation | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Sub-Total | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Remedial Action Construction | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 32.60 | 4.1E+02 | NA | 1.2E-02 | 4.2E-04 | 2.4E-03 | 6.7E-04 | 5.4E-02 |
| | Transportation-Equipment | 3.97 | 5.2E+01 | NA | 1.2E-03 | 2.2E-05 | 1.1E-04 | 9.8E-06 | 7.9E-04 |
| | Equipment Use and Misc | 138.61 | 5.1E+03 | 1.4E+04 | 5.1E-01 | 1.5E-01 | 5.3E-02 | 8.6E-05 | 2.2E-02 |
| | Residual Handling | 1.89 | 3.2E+01 | NA | 5.6E-03 | 2.9E-03 | 1.5E-02 | 3.1E-06 | 2.5E-04 |
| | Sub-Total | 177.07 | 5.62E+03 | 1.36E+04 | 5.26E-01 | 1.55E-01 | 7.10E-02 | 7.66E-04 | 7.63E-02 |
| Remedial Action Operations | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Sub-Total | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Longterm Monitoring | Consumables | 0.00 | 0.0E+00 | NA | NA | NA | NA | NA | NA |
| | Transportation-Personnel | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Transportation-Equipment | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Equipment Use and Misc | 0.00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Residual Handling | 0.00 | 0.0E+00 | NA | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0.0E+00 |
| | Sub-Total | 0.00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Total** | | **1.8E+02** | **5.6E+03** | **1.4E+04** | **5.3E-01** | **1.6E-01** | **7.1E-02** | **7.7E-04** | **7.6E-02** |

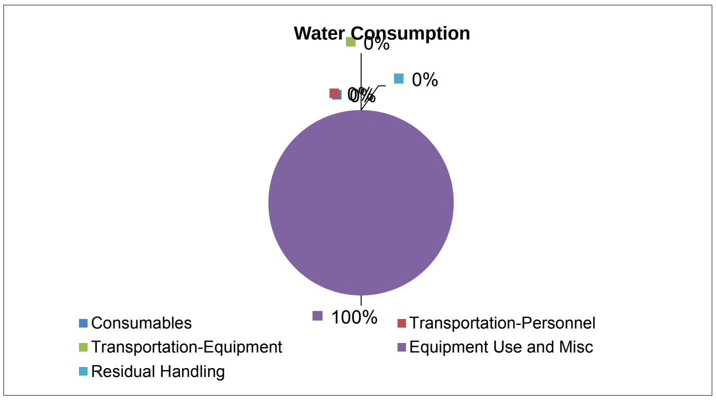
| Remedial Alternative Phase | Non-Hazardous Waste Landfill Space (tons) | Hazardous Waste Landfill Space (tons) | Topsoil Consumption (cubic yards) | Costing ($) | Lost Hours - Injury |
|---|---|---|---|---|---|
| Remedial Investigation | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 | 0.0E+00 |
| Remedial Action Construction | 8.4E+01 | 0.0E+00 | 4.0E+02 | 0 | 6.1E-01 |
| Remedial Action Operations | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 | 0.0E+00 |
| Longterm Monitoring | 0.0E+00 | 0.0E+00 | 0.0E+00 | 0 | 0.0E+00 |
| **Total** | **8.4E+01** | **0.0E+00** | **4.0E+02** | **$0** | **6.1E-01** |

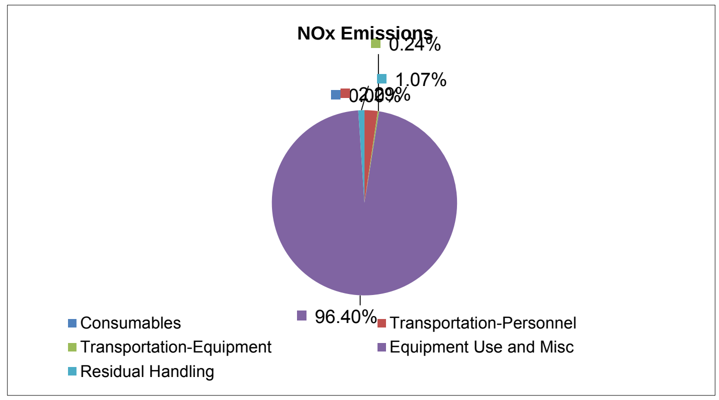
| Total Cost with Footprint Reduction |
|---|
| $0 |

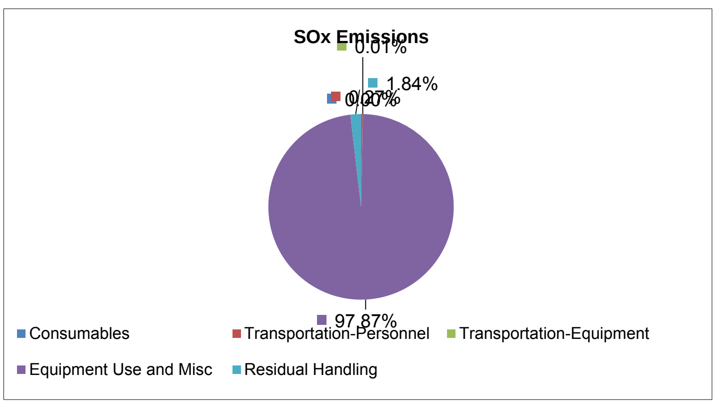
SiteWise™ Results Alternative 4c
Remedial Action Construction Stage
Site, Place
Place, State

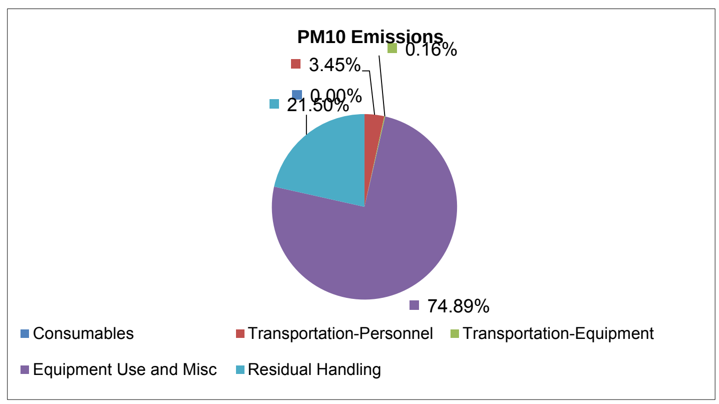



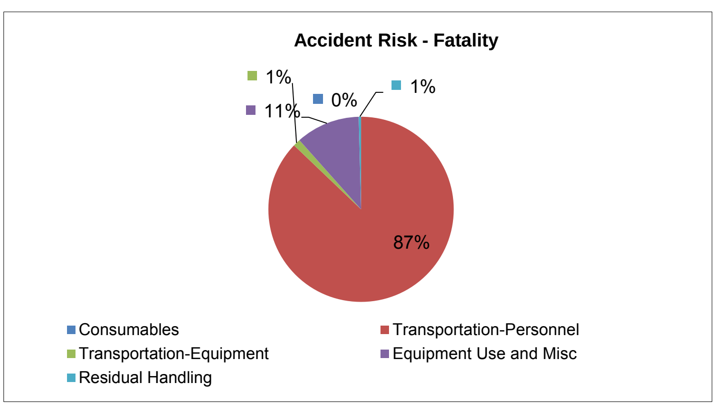



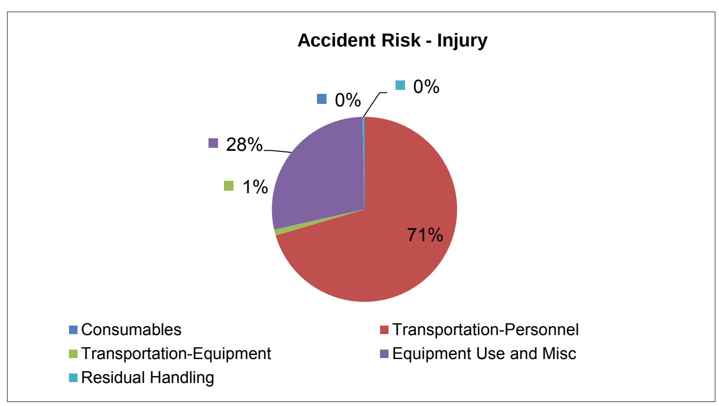



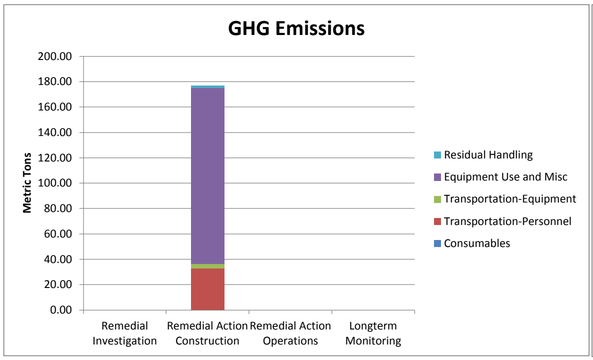



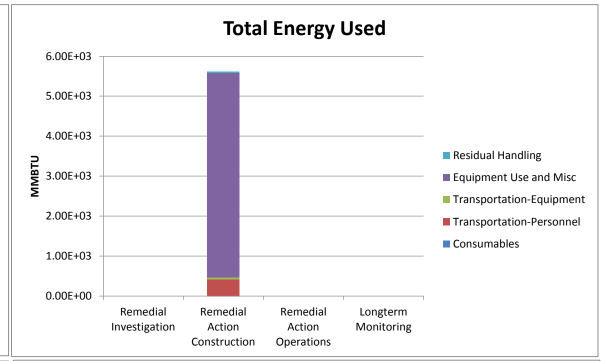



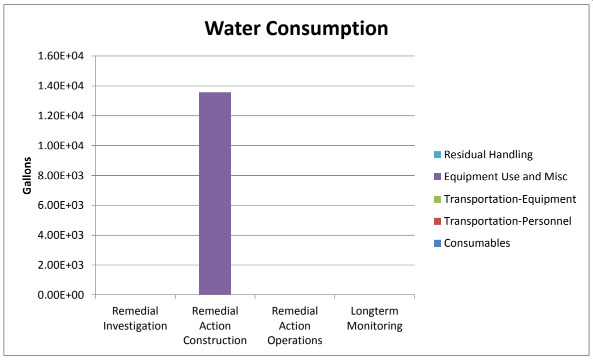



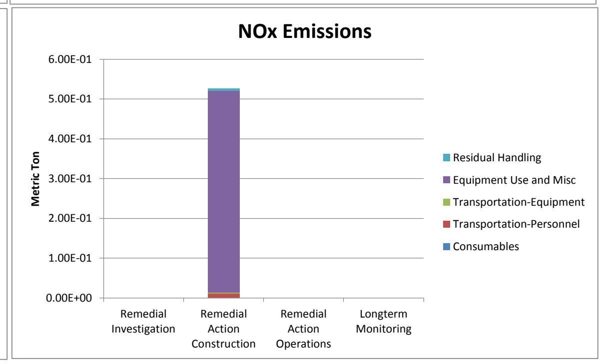



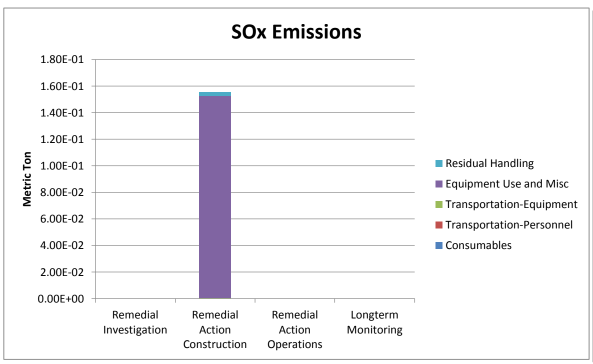



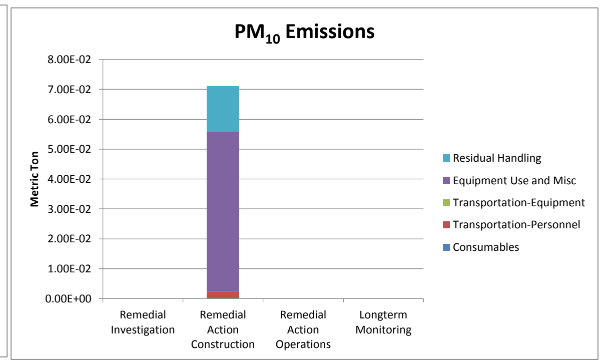

GHG Emissions
Metric Tons
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring

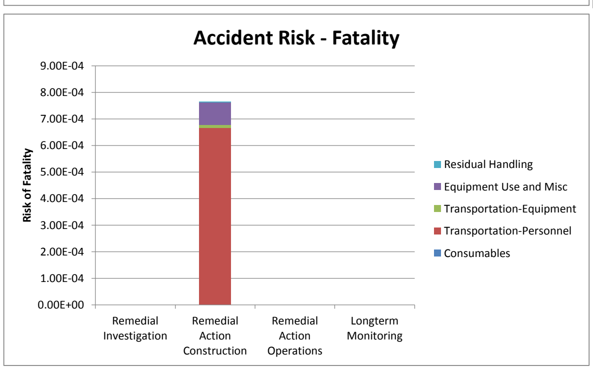

Total Energy Used
MMBTU
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring

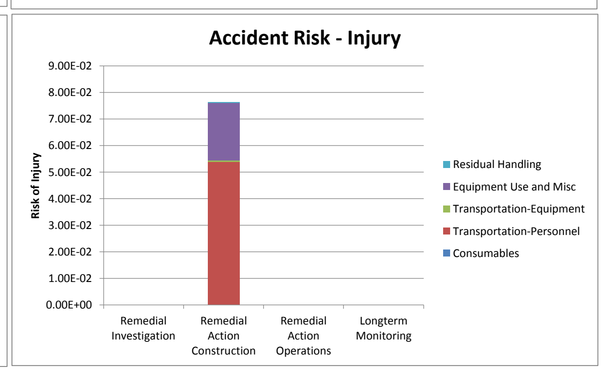

Water Consumption
Gallons
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring

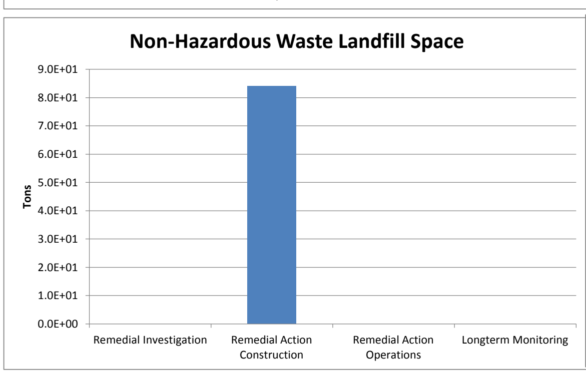

NOx Emissions
Metric Ton
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring

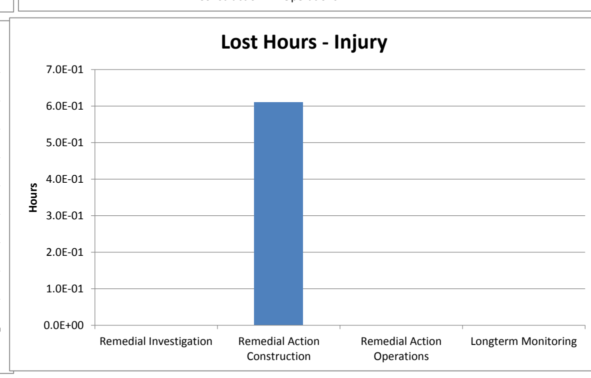

SOx Emissions
Metric Ton
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring


PM10 Emissions
Metric Ton
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring


Accident Risk - Fatality
Risk of Fatality
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring


Accident Risk - Injury
Risk of Injury
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring


Non-Hazardous Waste Landfill Space
Tons
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring


Lost Hours - Injury
Hours
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring

| | Technology Module / Phase | Module Components | Comments / Assumptions | Quantity | (Units) | Greenhouse Gas Emissions | | | | Criteria Pollutant Emission | | | Energy Consumption | Water Consumption |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $CO_2e$ | $CO_2$ | $N_20$ | $CH_4$ | $NO_x$ | $SO_x$ | $PM_{10}$ | | |
| Stage | Materials | | | | | Tonnes | | | | | | | MWhr | gal x 1000 |
| RAC | Decon Pad | General Concrete | Assume general concrete, assume 30 ft x20 ft x 0.5 ft, 145 lb/ft3 | 43,500.0 | lbs | 2.56 | 2.56 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 25.31 | 0.00 |
| RAC | Revegetation, soil nutrients | Fertilizer | Assume fertilizer, 1609 msf (thousand square feet), 3 lb of sed per 1.2 msf | 4,022.5 | lbs | 5.02 | 5.02 | 6.60E-09 | 0.00E+00 | 0.00E+00 | 1.82E-03 | 3.67E-06 | 90.92 | 1.82 |
| RAC | Revegetation, hydroseed | Fertilizer | Assume fertilizer, 1609 msf (thousand square feet), 10 lb of sed per 1 msf | 16,090.0 | lbs | 20.07 | 20.07 | 2.64E-08 | 0.00E+00 | 0.00E+00 | 7.30E-03 | 1.47E-05 | 363.68 | 7.27 |
| RAC | Revegetation, hydroseed | Mulch | Assume wood mulch, 1609 msf (thousand square feet), 50 lb of mulch per 1 msf | 80,450.0 | lbs | 25.42 | 8.90 | 5.14E-02 | 2.74E-02 | 1.51E-05 | 8.68E-02 | 6.57E-03 | 287.79 | 0.00 |
| RAC | Revegetation, hydroseed | Fertilizer | Assume fertilizer, 1609 msf (thousand square feet), 2 lb per 1 msf | 3,218.0 | lbs | 4.01 | 4.01 | 5.28E-09 | 0.00E+00 | 0.00E+00 | 1.46E-03 | 2.93E-06 | 72.74 | 1.45 |
| RAC | Revegetation, wetland nutrients | Fertilizer | Assume fertilizer, 87 msf (thousand square feet), 1 lb of seed per 2500 sf, transportation disntance 50 miles | 34.8 | lbs | 0.04 | 0.04 | 5.71E-11 | 0.00E+00 | 0.00E+00 | 1.58E-05 | 3.17E-08 | 0.79 | 0.02 |
| RAC | wetland soil | Soil | Assume soil, 400 cy, 1.5 ton/cy, 2000 lb/ton | 1,200,000.0 | lbs | 12.52 | 12.52 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 330.78 | 0.00 |
| | **Subtotal** | | | | | **69.65** | **53.12** | **0.05** | **0.03** | **0.00** | **0.10** | **0.01** | **1172.01** | **10.55** |
| Stage | Construction Equipment | | | | | Tonnes | | | | | | | MWhr | gal x 1000 |
| RAC | Brush mowing | Tractor, 250 hp, diesel | 20.4 acres, mediom density area, uses a tractor, Assume 8 hours per day, 0.5 acres per day | 326.4 | hrs | 24.39 | 24.39 | 0.00E+00 | 0.00E+00 | 2.04E-01 | 0.00E+00 | 1.54E-02 | 87.78 | |
| RAC | Chipping tree | WOOD CHIPPER | 20.4 acres, medium density area, uses a woodchipper, 130 hp, assume 8 hours per day, 0.5 acres per day | 326.4 | hrs | 14.21 | 14.21 | 0.00E+00 | 0.00E+00 | 1.11E-01 | 0.00E+00 | 9.41E-03 | 62.36 | |
| RAC | Chipping tree | Chainsaw, gasoline, 3<hp<=6, 2 stroke | 20.4 acres, medium density area, uses a 2 chain saws, gasoline, 18" , assume 3 days or work, 8 hours per day, 80%efficiency | 89.6 | hrs | 0.17 | 0.17 | 0.00E+00 | 0.00E+00 | 3.25E-04 | 0.00E+00 | 2.39E-03 | 0.83 | |
| RAC | Dozer, 200 hp | Dozer, 200 HP (D7) w/U Blade (diesel) | 2 units, 10 days, 8 hours per day, 80% efficiency | 256 | hrs | 28.13 | 28.13 | 0.00 | 0.00 | 1.73E-01 | 5.07E-02 | 1.71E-02 | 172.07 | |
| RAC | Front End Loader (185 hp) | Loader, 200 HP, 4 CY (diesel) | 10 days, 8 hours per day, 80%efficiency | 64 | hrs | 2.07 | 2.07 | 0.00 | 0.00 | 1.89E-02 | 3.92E-03 | 2.27E-03 | 7.56 | |
| | **Subtotal** | | | | | **68.97** | **68.97** | **0.00** | **0.00** | **0.51** | **0.05** | **0.05** | **330.61** | **0.00** |
| | | | | **Total** | | **139** | **122** | **0.05** | **0.03** | **0.51** | **0.15** | **0.05** | **1,503** | **11** |

**Alternative 1**
**Values Input into SiteWise as "Other"**

| Module | Greenhouse Gas Emissions | | | | Criteria Pollutant Emission | | | Energy Consumption | Water Consumption |
|---|---|---|---|---|---|---|---|---|---|
| | $CO_2e$ | $CO_2$ | $N_20$ ($CO_2e$) | $CH_4$ ($CO_2e$) | $NO_x$ | $SO_x$ | $PM_{10}$ | | |
| | Tonnes | | | | | | | MMBTU | gal |
| RI | - | - | - | - | - | - | - | - | - |
| RAC | 138.61 | 122.09 | 15.95 | 0.57 | 0.51 | 0.15 | 0.05 | 5,126.94 | 10,554.51 |
| RAO | - | - | - | - | - | - | - | - | - |
| LTM | - | - | - | - | - | - | - | - | - |

Note: 1 MWhr = 3412141.4799 BTU, 1MMTBU = 10^6 BTU

# APPENDIX C

# COST ESTIMATES

**ALTERNATIVE 2A**

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**ALTERNATIVE 2A: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal**
**CAPITAL COST**



| Item | Quantity | Unit | Unit Cost | | | | Extended Cost | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Subcontract | Material | Labor | Equipment | Subcontract | Material | Labor | Equipment | Subtotal |
| **1 PROJECT PLANNING & DOCUMENTS** | | | | | | | | | | | |
| 1.1 Prepare Documents & Plans | 200 | hr | | | $39.00 | | $0 | $0 | $7,800 | $0 | $7,800 |
| 1.2 Prepare Permits | 300 | hr | | | $39.00 | | $0 | $0 | $11,700 | $0 | $11,700 |
| 1.3 Tortoise Survey | 1 | ls | | $2,620.00 | $4,680.00 | $500.00 | $0 | $2,620 | $4,680 | $500 | $7,800 |
| 1.4 Tortoise Relocation | 1 | ls | | $6,240.00 | $6,240.00 | $500.00 | $0 | $6,240 | $6,240 | $500 | $12,980 |
| 1.5 Wetland Verification | 1 | ls | | $3,120.00 | $1,011.00 | $250.00 | $0 | $3,120 | $1,011 | $250 | $4,381 |
| **2 MOBILIZATION AND DEMOBILIZATION** | | | | | | | | | | | |
| 2.1 Site Support Facilities (trailers, phone, electric, etc.) | 1 | ls | | $1,000.00 | | $3,500.00 | $0 | $1,000 | $0 | $3,500 | $4,500 |
| 2.2 Equipment Mobilization/Demobilization | 11 | ea | | | $183.00 | $518.00 | $0 | $0 | $2,013 | $5,698 | $7,711 |
| **3 FIELD SUPPORT AND SITE ACCESS** | | | | | | | | | | | |
| 3.1 Office Trailer | 3.0 | mo | | | | $360.00 | $0 | $0 | $0 | $1,080 | $1,080 |
| 3.2 Field Office Equipment, Utilities, & Support | 3.0 | mo | | $519.00 | | | $0 | $1,557 | $0 | $0 | $1,557 |
| 3.3 Storage Trailer | 3.0 | mo | | | | $94.00 | $0 | $0 | $0 | $282 | $282 |
| 3.4 Survey Support | 10 | day | $1,125.00 | | | | $11,250 | $0 | $0 | $0 | $11,250 |
| 3.5 Site Superintendent | 55 | day | | $131.00 | $420.00 | | $0 | $7,205 | $23,100 | $0 | $30,305 |
| 3.6 Site Health & Safety and QA/QC | 55 | day | | $131.00 | $370.00 | | $0 | $7,205 | $20,350 | $0 | $27,555 |
| 3.7 Truck Scale | 1 | mo | $2,895.00 | | | | $2,895 | $0 | $0 | $0 | $2,895 |
| **4 DECONTAMINATION** | | | | | | | | | | | |
| 4.1 Decontamination Services | 1.0 | mo | | $1,220.00 | $2,245.00 | $1,550.00 | $0 | $1,220 | $2,245 | $1,550 | $5,015 |
| 4.2 Equipment Decon Pad | 1 | ls | | $4,500.00 | $3,000.00 | $725.00 | $0 | $4,500 | $3,000 | $725 | $8,225 |
| 4.3 Decon Water | 1,000 | gal | | $0.20 | | | $0 | $200 | $0 | $0 | $200 |
| 4.4 Decon Water Storage Tank, 6,000 gallon | 1.0 | mo | | | | $780.00 | $0 | $0 | $0 | $780 | $780 |
| 4.5 Clean Water Storage Tank, 4,000 gallon | 1.0 | mo | | | | $702.00 | $0 | $0 | $0 | $702 | $702 |
| 4.6 Disposal of Decon Waste (liquid & solid) | 1.0 | mo | $985.00 | | | | $985 | $0 | $0 | $0 | $985 |
| **5 SITE PREPARATION** | | | | | | | | | | | |
| 5.1 Clearing - Brush Mowing (medium density) | 1.2 | ac | | | $242.00 | $196.00 | $0 | $0 | $290 | $235 | $526 |
| 5.2 Clearing/Chipping - Tree Removal - 12" dia. | 1.2 | ac | | | $2,500.00 | $1,875.00 | $0 | $0 | $3,000 | $2,250 | $5,250 |
| 5.3 Chipping Stumps | 230 | ea | | | $18.50 | $8.45 | $0 | $0 | $4,255 | $1,944 | $6,199 |
| 5.4 UXO Technician | 5 | day | | $131.00 | $370.00 | | $0 | $655 | $1,850 | $0 | $2,505 |
| **6 EXCAVATION, TRANSPORTATION AND DISPOSAL** | | | | | | | | | | | |
| 6.1 Dozer, 200 hp | 20 | day | | | $211.36 | $1,051.00 | $0 | $0 | $4,227 | $21,020 | $25,247 |
| 6.2 Excavator, 2.5 cy (2) | 40 | day | | | $211.36 | $1,613.00 | $0 | $0 | $8,454 | $64,520 | $72,974 |
| 6.3 Site Labor, (3 laborers) | 60 | day | | | $102.64 | | $0 | $0 | $6,158 | $0 | $6,158 |
| 6.4 Soil T & D Hazardous (subtitle C) | 10,000 | ton | $200.00 | | | | $2,000,000 | $0 | $0 | $0 | $2,000,000 |
| 6.5 Waste Characterization Test, 1 per 1000 cy | 7 | ea | $800.00 | $6.00 | $35.00 | | $5,600 | $42 | $245 | $0 | $5,887 |
| 6.6 Debris T & D, 11,200 lbs metal | 1 | ls | $400.00 | | | | $400 | $0 | $0 | $0 | $400 |
| **7 COVER AND RESTORATION** | | | | | | | | | | | |
| 7.1 Clean Backfill | 6,667 | cy | | $12.50 | | | $0 | $83,338 | $0 | $0 | $83,338 |
| 7.2 Dozer, 200 hp (2) | 20 | day | | | $211.36 | $1,051.00 | $0 | $0 | $4,227 | $21,020 | $25,247 |
| 7.3 Excavator, 2.5 cy | 10 | day | | | $211.36 | $1,613.00 | $0 | $0 | $2,114 | $16,130 | $18,244 |
| 7.4 Site Labor, (3 laborers) | 30 | day | | | $102.64 | | $0 | $0 | $3,079 | $0 | $3,079 |
| 7.5 Revegetation - soil nutrients | 309 | msf | $12.10 | | | | $3,739 | $0 | $0 | $0 | $3,739 |
| 7.6 Revegetation, hydro seed (grasses) | 309 | msf | $117.00 | | | | $36,153 | $0 | $0 | $0 | $36,153 |
| 7.7 Revegetation - wetland nutrients | 0.0 | msf | $14.55 | | | | $0 | $0 | $0 | $0 | $0 |
| 7.8 Wetland Soil | 0 | cy | | $23.00 | | | $0 | $0 | $0 | $0 | $0 |
| 7.9 Wetland Restoration | 0 | csf | $35.96 | | | | $0 | $0 | $0 | $0 | $0 |
| 7.10 Perimeter Signs | 6 | ea | | $69.50 | | | $0 | $417 | $0 | $0 | $417 |
| **8 POST CONSTRUCTION COST** | | | | | | | | | | | |
| 8.1 Contractor Completion Report | 150 | hr | | | $39.00 | | $0 | $0 | $5,850 | $0 | $5,850 |
| 8.2 Remedial Action Closeout Report | 200 | hr | | | $39.00 | | $0 | $0 | $7,800 | $0 | $7,800 |

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**ALTERNATIVE 2A: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal**
**CAPITAL COST**

| Item | Quantity | Unit | Unit Cost Subcontract | Unit Cost Material | Unit Cost Labor | Unit Cost Equipment | Extended Cost Subcontract | Extended Cost Material | Extended Cost Labor | Extended Cost Equipment | Subtotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Subtotal** | | | | | | | $2,061,022 | $119,319 | $133,689 | $142,686 | $2,456,716 |
| Overhead on Labor Cost @ 30% | | | | | | | | | $40,107 | | $40,107 |
| G & A on Labor, Material, Equipment, & Subs Cost @ 10% | | | | | | | $206,102 | $11,932 | $13,369 | $14,269 | $245,672 |
| Tax on Materials and Equipment Cost @ 6% | | | | | | | | $7,159 | | $8,561 | $15,720 |
| **Total Direct Cost** | | | | | | | $2,267,124 | $138,409 | $187,165 | $165,515 | $2,758,214 |
| Indirects on Total Direct Cost @ 25% | | | (excluding transportation and disposal cost) | | | | | | | | $189,207 |
| Profit on Total Direct Cost @ 10% | | | | | | | | | | | $275,821 |
| **Total Field Cost** | | | | | | | | | | | $3,223,243 |
| Contingency on Total Field Cost @ 10% | | | | | | | | | | | $322,324 |
| Engineering on Total Field Cost @ 4% | | | | | | | | | | | $128,930 |
| **TOTAL COST** | | | | | | | | | | | **$3,674,497** |

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 15
ALTERNATIVE 2A: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal

**Alternative 2A and 2B**

| | | | | | Days | Hours | Man/Items | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Site Setup; Establish Grids | 39 Grids | Minor Brush | UXO | 3 | 10 | 2 | | | |
| | RTK GPS | Sub meter accuracy | | Includes shipping | 5 | | 1 | 5 | | $750.00 |
| | UXO Equipment | Magnetometer | | Includes shipping | 5 | | 1 | 5 | | $187.50 |
| | GPS Operator | | | Includes Travel | 5 | 10 | 1 | 50 | | $3,206.00 |
| | UXO Escort | | | Includes Travel | 5 | 10 | 1 | 50 | | $3,706.00 |
| | | | | | | | | 100 | hours total field time | |
| | | | | | | | | 30 | management hours | $3,000.00 |
| | | | | | | | | | | **$10,849.50** |
| | | | | | Days | Hours | Man/Items | | | |
| 2 | Site Setup; Establish Transects on Access Way | 1,800 Ft. | Minor Brush | UXO | 1 | 10 | 2 | | | |
| | RTK GPS | Sub meter accuracy | | Shipping Included Above | 1 | | 1 | 1 | | $150.00 |
| | UXO Equipment | Magnetometer | | Shipping Included Above | 1 | | 1 | 1 | | $37.50 |
| | GPS Operator | | | Travel Included Above | 1 | 10 | 1 | 10 | | $641.20 |
| | UXO Escort | | | Travel Included Above | 1 | 10 | 1 | 10 | | $741.20 |
| | | | | | | | | 20 | hours total field time | |
| | | | | | | | | 10 | management hours | $1,000.00 |
| | | | | | | | | | | **$2,569.90** |
| | | | | | Days | Hours | Man/Items | | | |
| 3 | Site Setup; Brush Cutting | 34 Grids | Minor Brush | UXO | 5 | 10 | 6 | | | |
| | Chain Saw | Trees 2 Inch and smaller | | Includes Shipping | 7 | | 2 | 14 | | $854.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | | Includes Shipping | 7 | | 2 | 14 | | $644.00 |
| | Bush Hog | Majority of Area | | Includes Shipping | 7 | | 1 | 7 | | $2,415.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 7 | | 2 | 14 | | $525.00 |
| | UXO Technician | | | Includes Travel | 7 | 10 | 6 | 420 | | $31,130.40 |
| | | | | | | | | 420 | hours total field time | |
| | | | | | | | | 50 | management hours | $5,000.00 |
| | | | | | | | | | | **$40,568.40** |
| | | | | | Days | Hours | Man/Items | | | |
| | Site Setup; Brush Cutting | 1,800 Ft | Minor Brush | UXO | 1 | 10 | 6 | | | |
| | Chain Saw | Trees 2 Inch and smaller | | Shipping Included Above | 1 | | 2 | 2 | | $122.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | | Shipping Included Above | 1 | | 2 | 2 | | $92.00 |
| | Bush Hog | Majority of Area | | Shipping Included Above | 1 | | 1 | 1 | | $345.00 |
| | UXO Equipment | Magnetometer | | Shipping Included Above | 1 | | 2 | 2 | | $75.00 |
| | UXO Technician | | | Travel Included Above | 1 | 10 | 6 | 60 | | $4,447.20 |
| | | | | | | | | 60 | hours total field time | |
| | | | | | | | | 10 | management hours | $1,000.00 |
| | | | | | | | | | | **$6,081.20** |
| | | | | | Days | Hours | Man/Items | | | |
| 4 | Visual & Detector Surveyes | 39 Grids | | UXO | 5 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 7 | | 2 | 14 | | $525.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 7 | | 4 | 28 | | $1,050.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 7 | | 1 | 7 | | $1,050.00 |
| | UXO Technician | | | Includes Travel | 7 | 10 | 9 | 630 | | $46,695.60 |
| | | | | | | | | 630 | hours total field time | |
| | | | | | | | | 50 | management hours | $5,000.00 |
| | | | | | | | | | | **$54,320.60** |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Days | Hours | Man/Items | | | |
| | Visual & Detector Surveyes | 1,800 Ft | UXO | 2 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Shipping Included Above | 2 | | 2 | 4 | | $150.00 |
| | UXO Equipment | Magnetometer | Shipping Included Above | 2 | | 4 | 8 | | $300.00 |
| | Hand Held GPS | Sub Meter | Shipping Included Above | 2 | | 1 | 2 | | $300.00 |
| | UXO Technician | | Travel Included Above | 2 | 10 | 9 | 180 | | $13,341.60 |
| | | | | | | | 180 | hours total field time | |
| | | | | | | | 20 | management hours | $2,000.00 |
| | | | | | | | | | **$16,091.60** |
| | | | | Days | Hours | Man/Items | | | |
| 5 | Manual Remove & Treat Surf | 39 Grids & 1,800 ft | UXO | 9 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 4 | | 2 | 8 | | $300.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 4 | | 4 | 16 | | $600.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 4 | | 1 | 4 | | $2,000.00 |
| | MDAS Certification | Drums | Includes Shipping | 5 | | 6 | 30 | | $20,750.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 4 | | 1 | 4 | | $600.00 |
| | UXO Technician | | Includes Travel | 9 | 10 | 9 | 810 | | $60,037.20 |
| | | | | | | | 810 | hours total field time | |
| | | | | | | | 90 | management hours | $9,000.00 |
| | | | | | | | | | **$93,287.20** |
| | | | | Days | Hours | Man/Items | | | |
| 6 | Intrusive Investigation | 200 Digs | UXO | 4 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Shipping Included Above | 4 | | 2 | 8 | | $300.00 |
| | UXO Equipment | Magnetometer | Shipping Included Above | 4 | | 4 | 16 | | $600.00 |
| | UXO Supplies | Shovels etc. | Shipping Included Above | 4 | | 1 | 4 | | $100.00 |
| | Hand Held GPS | Sub Meter | Shipping Included Above | 4 | | 1 | 4 | | $600.00 |
| | UXO Technician | | Travel Included Above | 4 | 10 | 9 | 360 | | $26,683.20 |
| | | | | | | | 360 | hours total field time | |
| | | | | | | | 20 | management hours | $2,000.00 |
| | | | | | | | | | **$30,283.20** |
| | | | | Days | Hours | Man/Items | | | |
| 7 | Remove & Treat Subsurface | 200 Digs | UXO | 4 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 4 | | 2 | 8 | | $300.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 4 | | 4 | 16 | | $600.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 4 | | 1 | 4 | | $2,000.00 |
| | MDAS Certification | Drums | Included in 5 above | 0 | | 0 | 0 | | $0.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 4 | | 1 | 4 | | $600.00 |
| | UXO Technician | | Includes Travel | 4 | 10 | 9 | 360 | | $26,683.20 |
| | | | | | | | 360 | hours total field time | |
| | | | | | | | 40 | management hours | $4,000.00 |
| | | | | | | | | | **$34,183.20** |
| | | | | Days | Hours | Man/Items | | | |
| 8 | Mechanical Excavation | 39 Grids | UXO | 8 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 8 | | 1 | 8 | | $300.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 8 | | 2 | 16 | | $600.00 |
| | Screeening Plant | Sift, Excavate, etc. | Includes Shipping | 1 | | 390,000 | 390000 | | $980,330.00 |
| | Backfill after sifting | Dozor, etc | Includes Shipping | 1 | | 8 | 8 | | $14,946.64 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Construct Decon Pad | PPE, etc. | | Includes Shipping | 1 | | 1 | 1 | $2,000.00 |
| | UXO Technician | | | Includes Travel | 8 | 10 | 3 | 240 | $17,788.80 |
| | | | | | | | | 240 hours total field time | |
| | | | | | | | | 40 management hours | $4,000.00 |
| | | | | | | | | | **$1,019,965.44** |
| | | | | | Days | Hours | Man/Items | | |
| 9 | Remove & Treat Excavtion | 39 Grids | | UXO | 9 | 10 | 9 | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 10 | | 1 | 10 | $375.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 10 | | 2 | 20 | $750.00 |
| | MEC/MDEH Treatment | Donar Charge | | Includes Shipping | 10 | | 1 | 10 | $5,000.00 |
| | MDAS Certification | Drums | | Includes Shipping | 5 | | 6 | 30 | $20,750.00 |
| | Non-munitions Debris | Roll-off | | Includes Shipping | 1 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 4 | | 1 | 4 | $600.00 |
| | UXO Technician | | | Includes Travel | 9 | 10 | 3 | 270 | $20,012.40 |
| | | | | | | | | 270 hours total field time | |
| | | | | | | | | 90 management hours | $9,000.00 |
| | | | | | | | | | **$56,487.40** |
| | | | | | Days | Hours | Man/Items | | |
| 10 | Backfill After Sifting | 21 Grids | | UXO | 4 | 10 | 9 | | |
| | 210,000 Cubic Ft. | Dozor, etc | | See 8 Above | 1 | | 21 | 21 | $39,234.93 |
| | Construct Decon Pad | PPE, etc. | | Includes Shipping | 1 | | 1 | 1 | $2,000.00 |
| | UXO Technician | | | Includes Travel | 4 | 10 | 3 | 120 | $8,894.40 |
| | | | | | | | | 120 hours total field time | |
| | | | | | | | | 40 management hours | $4,000.00 |
| | | | | | | | | | **$54,129.33** |
| | | | | | Days | Hours | Man/Items | | |
| 11 | Step-out; Brush Cutting | 4 Grids | Minor Brush | UXO | 2 | 10 | 6 | | |
| | Chain Saw | Trees 2 Inch and smaller | | Includes Shipping | 2 | | 2 | 4 | $244.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | | Includes Shipping | 2 | | 2 | 4 | $184.00 |
| | Bush Hog | Majority of Area | | Includes Shipping | 2 | | 1 | 2 | $690.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 2 | | 2 | 4 | $150.00 |
| | UXO Technician | | | Includes Travel | 2 | 10 | 6 | 120 | $8,894.40 |
| | | | | | | | | 120 hours total field time | |
| | | | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | | | **$12,162.40** |
| | | | | | Days | Hours | Man/Items | | |
| | Visual & Detector Surveyes | 4 Grids | | UXO | 2 | 10 | 9 | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 2 | | 2 | 4 | $150.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 2 | | 4 | 8 | $300.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 2 | | 1 | 2 | $300.00 |
| | UXO Technician | | | Includes Travel | 2 | 10 | 9 | 180 | $13,341.60 |
| | | | | | | | | 180 hours total field time | |
| | | | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | | | **$16,091.60** |
| | | | | | Days | Hours | Man/Items | | |
| | Manual Remove & Treat Surf | 4 Grids | | UXO | 3 | 10 | 9 | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 2 | | 2 | 4 | $150.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 2 | | 4 | 8 | $300.00 |
| | MEC/MDEH Treatment | Donar Charge | | Includes Shipping | 1 | | 1 | 1 | $500.00 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | MDAS Certification | Drums | Includes Shipping | 0 | | 6 | 0 | | $0.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 1 | | 1 | 1 | | $150.00 |
| | UXO Technician | | Includes Travel | 3 | 10 | 9 | 270 | | $20,012.40 |
| | | | | | | | 270 | hours total field time | |
| | | | | | | | 30 | management hours | $3,000.00 |
| | | | | | | | | | **$24,112.40** |
| | | | | Days | Hours | Man/Items | | | |
| | Intrusive Investigation | 100 Digs | UXO | 2 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Shipping Included Above | 2 | | 2 | 4 | | $150.00 |
| | UXO Equipment | Magnetometer | Shipping Included Above | 2 | | 4 | 8 | | $300.00 |
| | UXO Supplies | Shovels etc. | Shipping Included Above | 2 | | 1 | 2 | | $50.00 |
| | Hand Held GPS | Sub Meter | Shipping Included Above | 2 | | 1 | 2 | | $300.00 |
| | UXO Technician | | Travel Included Above | 2 | 10 | 9 | 180 | | $13,341.60 |
| | | | | | | | 180 | hours total field time | |
| | | | | | | | 20 | management hours | $2,000.00 |
| | | | | | | | | | **$16,141.60** |
| | | | | Days | Hours | Man/Items | | | |
| | Remove & Treat Subsurface | 100 Digs | UXO | 1 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 1 | | 2 | 2 | | $75.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 1 | | 4 | 4 | | $150.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 1 | | 1 | 1 | | $500.00 |
| | MDAS Certification | Drums | Included above | 0 | | 0 | 0 | | $0.00 |
| | Non-munitions Debris | Roll-off | Included above | 0 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 1 | | 1 | 1 | | $150.00 |
| | UXO Technician | | Includes Travel | 1 | 10 | 9 | 90 | | $6,670.80 |
| | | | | | | | 90 | hours total field time | |
| | | | | | | | 10 | management hours | $1,000.00 |
| | | | | | | | | | **$8,545.80** |
| | | | | Days | Hours | Man/Items | | | |
| 12 | MEC/MDEH Treatment | 50 Items | UXO | 6 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 6 | | 2 | 12 | | $450.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 6 | | 4 | 24 | | $900.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 6 | | 1 | 6 | | $3,000.00 |
| | MDAS Certification | Drums | Included above | 0 | | 0 | 0 | | $0.00 |
| | Non-munitions Debris | Roll-off | Included above | 0 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 6 | | 1 | 6 | | $900.00 |
| | UXO Technician | | Includes Travel | 6 | 10 | 9 | 540 | | $40,024.80 |
| | | | | | | | 540 | hours total field time | |
| | | | | | | | 60 | management hours | $6,000.00 |
| | | | | | | | | | **$51,274.80** |
| | | | | Days | Hours | Man/Items | | | |
| 13 | MDAS Certification | 60 Drums | UXO | 6 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 0 | | 2 | 0 | | $0.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 0 | | 4 | 0 | | $0.00 |
| | MDAS Transportation | Drums | Include below | 10 | | 6 | 60 | | $0.00 |
| | MDAS Certification | Drums | Includes Shipping | 10 | | 6 | 60 | | $38,750.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 0 | | 1 | 0 | | $0.00 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | UXO Technician | | Includes Travel | 6 | 10 | 3 | 180 | $13,341.60 |
| | | | | | | | 180 hours total field time | |
| | | | | | | | 30 management hours | $3,000.00 |
| | | | | | | | | **$55,091.60** |
| 14 | MC Sampling | | N/A | | | | | |
| 15 | Site Resteration | | N/A | | | | | |

| | |
|---|---|
| Initial Inspection Total Field Cost | $1,602,237.17 |
| Contingency on Total Field Cost @ 10% | $160,223.72 |
| Engineering on Total Field Cost @ 4% | $64,089.49 |
| **TOTAL COST** | **$1,826,550.37** |

| | | | | Days | Hours | Man/Items | | |
|---|---|---|---|---|---|---|---|---|
| | **Annual Inspections (years 1, 2, 3, 4, and 5)** | | | | | | | |
| 16 | Annual Inspections | Transects Minor Brush | UXO | 2 | 10 | 6 | | |
| | Chain Saw | Trees 2 Inch and smaller | Includes Shipping | 2 | | 2 | 4 | $244.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | Includes Shipping | 2 | | 2 | 4 | $184.00 |
| | Bush Hog | Majority of Area | Includes Shipping | 2 | | 1 | 2 | $690.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 2 | | 2 | 4 | $150.00 |
| | UXO Technician | | Includes Travel | 2 | 10 | 6 | 120 | $8,894.40 |
| | | | | | | | 120 hours total field time | |
| | | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | | **$12,162.40** |
| | | | | Days | Hours | Man/Items | | |
| | Visual & Detector Surveyes | Transects | UXO | 3 | 10 | 6 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 3 | | 2 | 6 | $225.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 3 | | 4 | 12 | $450.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 3 | | 1 | 3 | $450.00 |
| | UXO Technician | | Includes Travel | 3 | 10 | 6 | 180 | $13,341.60 |
| | | | | | | | 180 hours total field time | |
| | | | | | | | 30 management hours | $3,000.00 |
| | | | | | | | | **$17,466.60** |
| | | | | Days | Hours | Man/Items | | |
| | Manual Remove & Treat Surf | Transects | UXO | 1 | 10 | 3 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 0 | | 2 | 0 | $0.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 0 | | 4 | 0 | $0.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| | MDAS Certification | Drums | Includes Shipping | 1 | | 1 | 1 | $3,350.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 0 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| | UXO Technician | | Includes Travel | 1 | 10 | 3 | 30 | $2,223.60 |
| | | | | | | | 30 hours total field time | |
| | | | | | | | 10 management hours | $1,000.00 |
| | | | | | | | | **$6,573.60** |

| | |
|---|---|
| Annual Inspection Total Field Cost | $36,202.60 |
| Contingency on Total Field Cost @ 10% | $3,620.26 |

| | | |
|---|---|---|
| Engineering on Total Field Cost @ 4% | $1,448.10 |
| TOTAL COST | **$41,270.96** |

| | | | | | Days | Hours | Man/Items | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Five Year Inspections (year 10)** | | | | | | | | | |
| 17 | 5 Year Inspection | Transects | Minor Brush | UXO | 2 | 10 | 6 | | | |
| | Chain Saw | Trees 2 Inch and smaller | | Includes Shipping | 2 | | 2 | 4 | | $244.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | | Includes Shipping | 2 | | 2 | 4 | | $184.00 |
| | Bush Hog | Majority of Area | | Includes Shipping | 2 | | 1 | 2 | | $690.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 2 | | 2 | 4 | | $150.00 |
| | UXO Technician | | | Includes Travel | 2 | 10 | 6 | 120 | | $8,894.40 |
| | | | | | | | | 120 | hours total field time | |
| | | | | | | | | 20 | management hours | $2,000.00 |
| | | | | | | | | | | **$12,162.40** |
| | | | | | Days | Hours | Man/Items | | | |
| | Visual & Detector Surveyes | Transects | | UXO | 3 | 10 | 6 | | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 3 | | 2 | 6 | | $225.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 3 | | 4 | 12 | | $450.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 3 | | 1 | 3 | | $450.00 |
| | UXO Technician | | | Includes Travel | 3 | 10 | 6 | 180 | | $13,341.60 |
| | | | | | | | | 180 | hours total field time | |
| | | | | | | | | 30 | management hours | $3,000.00 |
| | | | | | | | | | | **$17,466.60** |
| | | | | | Days | Hours | Man/Items | | | |
| | Manual Remove & Treat Surf | Transects | | UXO | 1 | 10 | 3 | | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 0 | | 2 | 0 | | $0.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 0 | | 4 | 0 | | $0.00 |
| | MEC/MDEH Treatment | Donar Charge | | Includes Shipping | 0 | | 1 | 0 | | $0.00 |
| | MDAS Certification | Drums | | Includes Shipping | 1 | | 1 | 1 | | $3,350.00 |
| | Non-munitions Debris | Roll-off | | Includes Shipping | 0 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 0 | | 1 | 0 | | $0.00 |
| | UXO Technician | | | Includes Travel | 1 | 10 | 3 | 30 | | $2,223.60 |
| | | | | | | | | 30 | hours total field time | |
| | | | | | | | | 10 | management hours | $1,000.00 |
| | | | | | | | | | | **$6,573.60** |

| | |
|---|---|
| Five Year Inspection Total Field Cost | $36,202.60 |
| Contingency on Total Field Cost @ 10% | $3,620.26 |
| Engineering on Total Field Cost @ 4% | $1,448.10 |
| **TOTAL COST** | **$41,270.96** |

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**Public Education Program**
**Annual Costs**

| Item | Quantity | Unit | Unit Cost Subcontract | Unit Cost Material | Unit Cost Labor | Unit Cost Equipment | Extended Cost Subcontract | Extended Cost Material | Extended Cost Labor | Extended Cost Equipment | Subtotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1 PLANNING & REPORTS** | | | | | | | | | | | |
| 1.1 Prepare Documents & Plans | 10 | hr | | | $39.00 | | $0 | $0 | $390 | $0 | $390 |
| 1.2 Reports & Handouts | 1 | ls | | $225.00 | | | $0 | $225 | $0 | $0 | $225 |
| **2 MEETING IN JACKSONVILLE, FLORIDA** | | | | | | | | | | | |
| 2.1 Travel, air | 1 | ls | | $650.00 | | | $0 | $650 | $0 | $0 | $650 |
| 2.2 Per-diem | 1 | day | | $131.00 | | | $0 | $131 | $0 | $0 | $131 |
| 2.3 Car | 1 | day | | | | $100.00 | $0 | $0 | $0 | $100 | $100 |
| 2.4 Meeting | 12 | hr | | | $39.00 | | $0 | $0 | $468 | $0 | $468 |
| **Subtotal** | | | | | | | $0 | $1,006 | $858 | $100 | $1,964 |
| Overhead on Labor Cost @ 30% | | | | | | | | | $257 | | $257 |
| G & A on Labor, Material, Equipment, & Subs Cost @ 10% | | | | | | | $0 | $101 | $86 | $10 | $196 |
| Tax on Materials and Equipment Cost @ 6% | | | | | | | | $60 | | $6 | $66 |
| **Total Direct Cost** | | | | | | | $0 | $1,167 | $1,201 | $116 | $2,484 |
| Indirects on Total Direct Cost @ 0% | | | | | | | | | | | $0 |
| Profit on Total Direct Cost @ 10% | | | | | | | | | | | $248 |
| **Subtotal** | | | | | | | | | | | $2,733 |
| Contingency on Total Field Cost @ 0% | | | | | | | | | | | $0 |
| Engineering on Total Field Cost @ 0% | | | | | | | | | | | $0 |
| **TOTAL COST** | | | | | | | | | | | **$2,733** |

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**ALTERNATIVE 2A: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal**
**Present Worth Analysis**

| Year | Capital Cost | Annual Cost | Total Year Cost | Annual Discount Rate 2.3% | Present Worth |
|---|---|---|---|---|---|
| 0 | $5,501,047 | | $5,501,047 | 1.000 | $5,501,047 |
| 1 | $41,271 | $2,733 | $44,004 | 0.978 | $43,014 |
| 2 | $41,271 | $2,733 | $44,004 | 0.956 | $42,047 |
| 3 | $41,271 | $2,733 | $44,004 | 0.934 | $41,102 |
| 4 | $41,271 | $2,733 | $44,004 | 0.913 | $40,178 |
| 5 | $41,271 | $2,733 | $44,004 | 0.893 | $39,274 |
| 6 | | $2,733 | $2,733 | 0.872 | $2,384 |
| 7 | | $2,733 | $2,733 | 0.853 | $2,330 |
| 8 | | $2,733 | $2,733 | 0.834 | $2,278 |
| 9 | | $2,733 | $2,733 | 0.815 | $2,227 |
| 10 | $41,271 | $2,733 | $44,004 | 0.797 | $35,053 |
| 11 | | $2,733 | $2,733 | 0.779 | $2,128 |
| 12 | | $2,733 | $2,733 | 0.761 | $2,080 |
| 13 | | $2,733 | $2,733 | 0.744 | $2,033 |
| 14 | | $2,733 | $2,733 | 0.727 | $1,988 |
| 15 | | $2,733 | $2,733 | 0.711 | $1,943 |
| 16 | | $2,733 | $2,733 | 0.695 | $1,899 |
| 17 | | $2,733 | $2,733 | 0.679 | $1,856 |
| 18 | | $2,733 | $2,733 | 0.664 | $1,815 |
| 19 | | $2,733 | $2,733 | 0.649 | $1,774 |
| 20 | | $2,733 | $2,733 | 0.635 | $1,734 |
| 21 | | $2,733 | $2,733 | 0.620 | $1,695 |
| 22 | | $2,733 | $2,733 | 0.606 | $1,657 |
| 23 | | $2,733 | $2,733 | 0.593 | $1,620 |
| 24 | | $2,733 | $2,733 | 0.579 | $1,583 |
| 25 | | $2,733 | $2,733 | 0.566 | $1,548 |
| 26 | | $2,733 | $2,733 | 0.554 | $1,513 |
| 27 | | $2,733 | $2,733 | 0.541 | $1,479 |
| 28 | | $2,733 | $2,733 | 0.529 | $1,446 |
| 29 | | $2,733 | $2,733 | 0.517 | $1,413 |
| 30 | | $2,733 | $2,733 | 0.506 | $1,381 |
| | | | | **TOTAL PRESENT WORTH** | **$5,785,520** |

**ALTERNATIVE 2B**

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**ALTERNATIVE 2B: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal**
**CAPITAL COST**

| Item | Quantity | Unit | Unit Cost Subcontract | Unit Cost Material | Unit Cost Labor | Unit Cost Equipment | Extended Cost Subcontract | Extended Cost Material | Extended Cost Labor | Extended Cost Equipment | Subtotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1 PROJECT PLANNING & DOCUMENTS** | | | | | | | | | | | |
| 1.1 Prepare Documents & Plans | 200 | hr | | | $39.00 | | $0 | $0 | $7,800 | $0 | $7,800 |
| 1.2 Prepare Permits | 300 | hr | | | $39.00 | | $0 | $0 | $11,700 | $0 | $11,700 |
| 1.3 Tortoise Survey | 1 | ls | | $2,620.00 | $4,680.00 | $500.00 | $0 | $2,620 | $4,680 | $500 | $7,800 |
| 1.4 Tortoise Relocation | 1 | ls | | $6,240.00 | $6,240.00 | $500.00 | $0 | $6,240 | $6,240 | $500 | $12,980 |
| 1.5 Wetland Verification | 1 | ls | | $3,120.00 | $1,011.00 | $250.00 | $0 | $3,120 | $1,011 | $250 | $4,381 |
| **2 MOBILIZATION AND DEMOBILIZATION** | | | | | | | | | | | |
| 2.1 Site Support Facilities (trailers, phone, electric, etc.) | 1 | ls | | $1,000.00 | | $3,500.00 | $0 | $1,000 | $0 | $3,500 | $4,500 |
| 2.2 Equipment Mobilization/Demobilization | 11 | ea | | | $183.00 | $518.00 | $0 | $0 | $2,013 | $5,698 | $7,711 |
| **3 FIELD SUPPORT AND SITE ACCESS** | | | | | | | | | | | |
| 3.1 Office Trailer | 3.0 | mo | | | | $360.00 | $0 | $0 | $0 | $1,080 | $1,080 |
| 3.2 Field Office Equipment, Utilities, & Support | 3.0 | mo | | $519.00 | | | $0 | $1,557 | $0 | $0 | $1,557 |
| 3.3 Storage Trailer | 3.0 | mo | | | | $94.00 | $0 | $0 | $0 | $282 | $282 |
| 3.4 Survey Support | 5 | day | $1,125.00 | | | | $5,625 | $0 | $0 | $0 | $5,625 |
| 3.5 Site Superintendent | 60 | day | | $131.00 | $420.00 | | $0 | $7,860 | $25,200 | $0 | $33,060 |
| 3.6 Site Health & Safety and QA/QC | 60 | day | | $131.00 | $370.00 | | $0 | $7,860 | $22,200 | $0 | $30,060 |
| 3.7 Truck Scale | 1 | mo | $2,895.00 | | | | $2,895 | $0 | $0 | $0 | $2,895 |
| **4 DECONTAMINATION** | | | | | | | | | | | |
| 4.1 Decontamination Services | 2.0 | mo | | $1,220.00 | $2,245.00 | $1,550.00 | $0 | $2,440 | $4,490 | $3,100 | $10,030 |
| 4.2 Equipment Decon Pad | 1 | ls | | $4,500.00 | $3,000.00 | $725.00 | $0 | $4,500 | $3,000 | $725 | $8,225 |
| 4.3 Decon Water | 2,000 | gal | | $0.20 | | | $0 | $400 | $0 | $0 | $400 |
| 4.4 Decon Water Storage Tank, 6,000 gallon | 2.0 | mo | | | | $780.00 | $0 | $0 | $0 | $1,560 | $1,560 |
| 4.5 Clean Water Storage Tank, 4,000 gallon | 2.0 | mo | | | | $702.00 | $0 | $0 | $0 | $1,404 | $1,404 |
| 4.6 Disposal of Decon Waste (liquid & solid) | 2.0 | mo | $985.00 | | | | $1,970 | $0 | $0 | $0 | $1,970 |
| **5 SITE PREPARATION** | | | | | | | | | | | |
| 5.1 Clearing - Brush Mowing (medium density) | 1.2 | ac | | | $242.00 | $196.00 | $0 | $0 | $290 | $235 | $526 |
| 5.2 Clearing/Chipping - Tree Removal - 12" dia. | 1.2 | ac | | | $2,500.00 | $1,875.00 | $0 | $0 | $3,000 | $2,250 | $5,250 |
| 5.3 Chipping Stumps | 230 | ea | | | $18.50 | $8.45 | $0 | $0 | $4,255 | $1,944 | $6,199 |
| 5.4 UXO Technician | 5 | day | | $131.00 | $370.00 | | $0 | $655 | $1,850 | $0 | $2,505 |
| **6 IN-PLACEMENT TREATMENT AND DISPOSAL** | | | | | | | | | | | |
| 6.1 Front End Loader, 4 cy | 10 | day | | | $211.36 | $598.60 | $0 | $0 | $2,114 | $5,986 | $8,100 |
| 6.2 Dozer, 200 hp | 10 | day | | | $211.36 | $1,051.00 | $0 | $0 | $2,114 | $10,510 | $12,624 |
| 6.3 Mixing Disc | 10 | day | | | | $110.00 | $0 | $0 | $0 | $1,100 | $1,100 |
| 6.4 Skid-Steer, 78 hp | 10 | day | | | | $261.20 | $0 | $0 | $0 | $2,612 | $2,612 |
| 6.5 Tiller | 10 | day | | | | $115.00 | $0 | $0 | $0 | $1,150 | $1,150 |
| 6.6 Site Labor, (3 laborers) | 30 | day | | | $102.64 | | $0 | $0 | $3,079 | $0 | $3,079 |
| 6.7 Stabilization Material (FF-100) | 500 | ton | | $430.00 | | | $0 | $215,000 | $0 | $0 | $215,000 |
| 6.8 Vendor's Assistance, 3 days | 1 | ls | $3,190.00 | | | | $3,190 | $0 | $0 | $0 | $3,190 |
| 6.9 Dozer, 200 hp | 20 | day | | | $211.36 | $1,051.00 | $0 | $0 | $4,227 | $21,020 | $25,247 |
| 6.10 Excavator, 2.5 cy (2) | 40 | day | | | $211.36 | $1,613.00 | $0 | $0 | $8,454 | $64,520 | $72,974 |
| 6.11 Site Labor, (3 laborers) | 60 | day | | | $102.64 | | $0 | $0 | $6,158 | $0 | $6,158 |
| 6.12 Soil T & D Non-Hazardous (subtitle D) | 10,000 | ton | $85.00 | | | | $850,000 | $0 | $0 | $0 | $850,000 |
| 6.13 Waste Characterization Test, 1 per 1000 cy | 7 | ea | $800.00 | $6.00 | $35.00 | | $5,600 | $42 | $245 | $0 | $5,887 |
| 6.14 Debris T & D, 11,200 lbs metal | 1 | ls | $400.00 | | | | $400 | $0 | $0 | $0 | $400 |
| **7 BACKFILL AND RESTORATION** | | | | | | | | | | | |
| 7.1 Clean Backfill | 6,667 | cy | | $12.50 | | | $0 | $83,338 | $0 | $0 | $83,338 |
| 7.2 Dozer, 200 hp (2) | 20 | day | | | $211.36 | $1,051.00 | $0 | $0 | $4,227 | $21,020 | $25,247 |
| 7.3 Excavator, 2.5 cy | 10 | day | | | $211.36 | $1,613.00 | $0 | $0 | $2,114 | $16,130 | $18,244 |
| 7.4 Site Labor, (3 laborers) | 30 | day | | | $102.64 | | $0 | $0 | $3,079 | $0 | $3,079 |

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**ALTERNATIVE 2B: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal**
**CAPITAL COST**

| Item | Quantity | Unit | Unit Cost Subcontract | Unit Cost Material | Unit Cost Labor | Unit Cost Equipment | Extended Cost Subcontract | Extended Cost Material | Extended Cost Labor | Extended Cost Equipment | Subtotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.5 Revegetation - soil nutrients | 309 | msf | $12.10 | | | | $3,739 | $0 | $0 | $0 | $3,739 |
| 7.6 Revegetation, hydro seed (grasses) | 309 | msf | $117.00 | | | | $36,153 | $0 | $0 | $0 | $36,153 |
| 7.7 Revegetation - wetland nutrients | 0.0 | msf | $14.55 | | | | $0 | $0 | $0 | $0 | $0 |
| 7.8 Wetland Soil | 0 | cy | | $23.00 | | | $0 | $0 | $0 | $0 | $0 |
| 7.9 Wetland Restoration | 0 | csf | $35.96 | | | | $0 | $0 | $0 | $0 | $0 |
| 7.10 Perimeter Signs | 6 | ea | | $69.50 | | | $0 | $417 | $0 | $0 | $417 |
| **8 POST CONSTRUCTION COST** | | | | | | | | | | | |
| 8.1 Contractor Completion Report | 150 | hr | | | $39.00 | | $0 | $0 | $5,850 | $0 | $5,850 |
| 8.2 Remedial Action Closeout Report | 200 | hr | | | $39.00 | | $0 | $0 | $7,800 | $0 | $7,800 |
| **Subtotal** | | | | | | | $909,572 | $337,049 | $147,191 | $167,076 | $1,560,887 |
| Overhead on Labor Cost @ 30% | | | | | | | | | $44,157 | | $44,157 |
| G & A on Labor, Material, Equipment, & Subs Cost @ 10% | | | | | | | $90,957 | $33,705 | $14,719 | $16,708 | $156,089 |
| Tax on Materials and Equipment Cost @ 6% | | | | | | | | $20,223 | | $10,025 | $30,247 |
| **Total Direct Cost** | | | | | | | $1,000,529 | $390,976 | $206,067 | $193,808 | $1,791,380 |
| Indirects on Total Direct Cost @ 35% | | | (excluding transportation and disposal cost) | | | | | | | | $328,654 |
| Profit on Total Direct Cost @ 10% | | | | | | | | | | | $179,138 |
| **Total Field Cost** | | | | | | | | | | | $2,299,172 |
| Contingency on Total Field Cost @ 20% | | | | | | | | | | | $459,834 |
| Engineering on Total Field Cost @ 6% | | | | | | | | | | | $137,950 |
| **TOTAL COST** | | | | | | | | | | | **$2,896,957** |

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 15
ALTERNATIVE 2B: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal

**Alternative 2A and 2B**

| | | | | | Days | Hours | Man/Items | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Site Setup; Establish Grids | 39 Grids | Minor Brush | UXO | 3 | 10 | 2 | | | |
| | RTK GPS | Sub meter accuracy | | Includes shipping | 5 | | 1 | 5 | | $750.00 |
| | UXO Equipment | Magnetometer | | Includes shipping | 5 | | 1 | 5 | | $187.50 |
| | GPS Operator | | | Includes Travel | 5 | 10 | 1 | 50 | | $3,206.00 |
| | UXO Escort | | | Includes Travel | 5 | 10 | 1 | 50 | | $3,706.00 |
| | | | | | | | | 100 | hours total field time | |
| | | | | | | | | 30 | management hours | $3,000.00 |
| | | | | | | | | | | **$10,849.50** |
| | | | | | Days | Hours | Man/Items | | | |
| 2 | Site Setup; Establish Transects on Access Ways | 1,800 Ft. | Minor Brush | UXO | 1 | 10 | 2 | | | |
| | RTK GPS | Sub meter accuracy | | Shipping Included Above | 1 | | 1 | 1 | | $150.00 |
| | UXO Equipment | Magnetometer | | Shipping Included Above | 1 | | 1 | 1 | | $37.50 |
| | GPS Operator | | | Travel Included Above | 1 | 10 | 1 | 10 | | $641.20 |
| | UXO Escort | | | Travel Included Above | 1 | 10 | 1 | 10 | | $741.20 |
| | | | | | | | | 20 | hours total field time | |
| | | | | | | | | 10 | management hours | $1,000.00 |
| | | | | | | | | | | **$2,569.90** |
| | | | | | Days | Hours | Man/Items | | | |
| 3 | Site Setup; Brush Cutting | 34 Grids | Minor Brush | UXO | 5 | 10 | 6 | | | |
| | Chain Saw | Trees 2 Inch and smaller | | Includes Shipping | 7 | | 2 | 14 | | $854.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | | Includes Shipping | 7 | | 2 | 14 | | $644.00 |
| | Bush Hog | Majority of Area | | Includes Shipping | 7 | | 1 | 7 | | $2,415.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 7 | | 2 | 14 | | $525.00 |
| | UXO Technician | | | Includes Travel | 7 | 10 | 6 | 420 | | $31,130.40 |
| | | | | | | | | 420 | hours total field time | |
| | | | | | | | | 50 | management hours | $5,000.00 |
| | | | | | | | | | | **$40,568.40** |
| | | | | | Days | Hours | Man/Items | | | |
| | Site Setup; Brush Cutting | 1,800 Ft | Minor Brush | UXO | 1 | 10 | 6 | | | |
| | Chain Saw | Trees 2 Inch and smaller | | Shipping Included Above | 1 | | 2 | 2 | | $122.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | | Shipping Included Above | 1 | | 2 | 2 | | $92.00 |
| | Bush Hog | Majority of Area | | Shipping Included Above | 1 | | 1 | 1 | | $345.00 |
| | UXO Equipment | Magnetometer | | Shipping Included Above | 1 | | 2 | 2 | | $75.00 |
| | UXO Technician | | | Travel Included Above | 1 | 10 | 6 | 60 | | $4,447.20 |
| | | | | | | | | 60 | hours total field time | |
| | | | | | | | | 10 | management hours | $1,000.00 |
| | | | | | | | | | | **$6,081.20** |
| | | | | | Days | Hours | Man/Items | | | |
| 4 | Visual & Detector Surveyes | 39 Grids | | UXO | 5 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 7 | | 2 | 14 | | $525.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 7 | | 4 | 28 | | $1,050.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 7 | | 1 | 7 | | $1,050.00 |
| | UXO Technician | | | Includes Travel | 7 | 10 | 9 | 630 | | $46,695.60 |
| | | | | | | | | 630 | hours total field time | |
| | | | | | | | | 50 | management hours | $5,000.00 |
| | | | | | | | | | | **$54,320.60** |
| | | | | | Days | Hours | Man/Items | | | |
| | Visual & Detector Surveyes | 1,800 Ft | | UXO | 2 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | | Shipping Included Above | 2 | | 2 | 4 | | $150.00 |
| | UXO Equipment | Magnetometer | | Shipping Included Above | 2 | | 4 | 8 | | $300.00 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Hand Held GPS | Sub Meter | Shipping Included Above | 2 | | 1 | 2 | $300.00 |
| | UXO Technician | | Travel Included Above | 2 | 10 | 9 | 180 | $13,341.60 |
| | | | | | | | 180 hours total field time | |
| | | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | | **$16,091.60** |
| | | | | Days | Hours | Man/Items | | |
| 5 | Manual Remove & Treat Surf | 39 Grids & 1,800 ft | UXO | 9 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 4 | | 2 | 8 | $300.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 4 | | 4 | 16 | $600.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 4 | | 1 | 4 | $2,000.00 |
| | MDAS Certification | Drums | Includes Shipping | 5 | | 6 | 30 | $20,750.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 4 | | 1 | 4 | $600.00 |
| | UXO Technician | | Includes Travel | 9 | 10 | 9 | 810 | $60,037.20 |
| | | | | | | | 810 hours total field time | |
| | | | | | | | 90 management hours | $9,000.00 |
| | | | | | | | | **$93,287.20** |
| | | | | Days | Hours | Man/Items | | |
| 6 | Intrusive Investigation | 200 Digs | UXO | 4 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Shipping Included Above | 4 | | 2 | 8 | $300.00 |
| | UXO Equipment | Magnetometer | Shipping Included Above | 4 | | 4 | 16 | $600.00 |
| | UXO Supplies | Shovels etc. | Shipping Included Above | 4 | | 1 | 4 | $100.00 |
| | Hand Held GPS | Sub Meter | Shipping Included Above | 4 | | 1 | 4 | $600.00 |
| | UXO Technician | | Travel Included Above | 4 | 10 | 9 | 360 | $26,683.20 |
| | | | | | | | 360 hours total field time | |
| | | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | | **$30,283.20** |
| | | | | Days | Hours | Man/Items | | |
| 7 | Remove & Treat Subsurface | 200 Digs | UXO | 4 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 4 | | 2 | 8 | $300.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 4 | | 4 | 16 | $600.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 4 | | 1 | 4 | $2,000.00 |
| | MDAS Certification | Drums | Included in 5 above | 0 | | 0 | 0 | $0.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 4 | | 1 | 4 | $600.00 |
| | UXO Technician | | Includes Travel | 4 | 10 | 9 | 360 | $26,683.20 |
| | | | | | | | 360 hours total field time | |
| | | | | | | | 40 management hours | $4,000.00 |
| | | | | | | | | **$34,183.20** |
| | | | | Days | Hours | Man/Items | | |
| 8 | Mechanical Excavation | 39 Grids | UXO | 8 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 8 | | 1 | 8 | $300.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 8 | | 2 | 16 | $600.00 |
| | Screeening Plant | Sift, Excavate, etc. | Includes Shipping | 1 | | 390,000 | 390000 | $980,330.00 |
| | Backfill after sifting | Dozor, etc | Includes Shipping | 1 | | 8 | 8 | $14,946.64 |
| | Construct Decon Pad | PPE, etc. | Includes Shipping | 1 | | 1 | 1 | $2,000.00 |
| | UXO Technician | | Includes Travel | 8 | 10 | 3 | 240 | $17,788.80 |
| | | | | | | | 240 hours total field time | |
| | | | | | | | 40 management hours | $4,000.00 |
| | | | | | | | | **$1,019,965.44** |
| | | | | Days | Hours | Man/Items | | |
| 9 | Remove & Treat Excavtion | 39 Grids | UXO | 9 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 10 | | 1 | 10 | $375.00 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | UXO Equipment | Magnetometer | | Includes Shipping | 10 | | 2 | 20 | $750.00 |
| | MEC/MDEH Treatment | Donar Charge | | Includes Shipping | 10 | | 1 | 10 | $5,000.00 |
| | MDAS Certification | Drums | | Includes Shipping | 5 | | 6 | 30 | $20,750.00 |
| | Non-munitions Debris | Roll-off | | Includes Shipping | 1 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 4 | | 1 | 4 | $600.00 |
| | UXO Technician | | | Includes Travel | 9 | 10 | 3 | 270 | $20,012.40 |
| | | | | | | | | 270 hours total field time | |
| | | | | | | | | 90 management hours | $9,000.00 |
| | | | | | | | | | **$56,487.40** |
| | | | | | Days | Hours | Man/Items | | |
| 10 | Backfill After Sifting | 21 Grids | | UXO | 4 | 10 | 9 | | |
| | 210,000 Cubic Ft. | Dozor, etc | | See 8 Above | 1 | | 21 | 21 | $39,234.93 |
| | Construct Decon Pad | PPE, etc. | | Includes Shipping | 1 | | 1 | 1 | $2,000.00 |
| | UXO Technician | | | Includes Travel | 4 | 10 | 3 | 120 | $8,894.40 |
| | | | | | | | | 120 hours total field time | |
| | | | | | | | | 40 management hours | $4,000.00 |
| | | | | | | | | | **$54,129.33** |
| | | | | | Days | Hours | Man/Items | | |
| 11 | Step-out; Brush Cutting | 4 Grids | Minor Brush | UXO | 2 | 10 | 6 | | |
| | Chain Saw | Trees 2 Inch and smaller | | Includes Shipping | 2 | | 2 | 4 | $244.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | | Includes Shipping | 2 | | 2 | 4 | $184.00 |
| | Bush Hog | Majority of Area | | Includes Shipping | 2 | | 1 | 2 | $690.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 2 | | 2 | 4 | $150.00 |
| | UXO Technician | | | Includes Travel | 2 | 10 | 6 | 120 | $8,894.40 |
| | | | | | | | | 120 hours total field time | |
| | | | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | | | **$12,162.40** |
| | | | | | Days | Hours | Man/Items | | |
| | Visual & Detector Surveyes | 4 Grids | | UXO | 2 | 10 | 9 | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 2 | | 2 | 4 | $150.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 2 | | 4 | 8 | $300.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 2 | | 1 | 2 | $300.00 |
| | UXO Technician | | | Includes Travel | 2 | 10 | 9 | 180 | $13,341.60 |
| | | | | | | | | 180 hours total field time | |
| | | | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | | | **$16,091.60** |
| | | | | | Days | Hours | Man/Items | | |
| | Manual Remove & Treat Surf | 4 Grids | | UXO | 3 | 10 | 9 | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 2 | | 2 | 4 | $150.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 2 | | 4 | 8 | $300.00 |
| | MEC/MDEH Treatment | Donar Charge | | Includes Shipping | 1 | | 1 | 1 | $500.00 |
| | MDAS Certification | Drums | | Includes Shipping | 0 | | 6 | 0 | $0.00 |
| | Non-munitions Debris | Roll-off | | Includes Shipping | 1 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 1 | | 1 | 1 | $150.00 |
| | UXO Technician | | | Includes Travel | 3 | 10 | 9 | 270 | $20,012.40 |
| | | | | | | | | 270 hours total field time | |
| | | | | | | | | 30 management hours | $3,000.00 |
| | | | | | | | | | **$24,112.40** |
| | | | | | Days | Hours | Man/Items | | |
| | Intrusive Investigation | 100 Digs | | UXO | 2 | 10 | 9 | | |
| | UXO Equipment | All-Metals | | Shipping Included Above | 2 | | 2 | 4 | $150.00 |
| | UXO Equipment | Magnetometer | | Shipping Included Above | 2 | | 4 | 8 | $300.00 |
| | UXO Supplies | Shovels etc. | | Shipping Included Above | 2 | | 1 | 2 | $50.00 |

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 15
ALTERNATIVE 2B: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Hand Held GPS | Sub Meter | Shipping Included Above | 2 | | 1 | 2 | $300.00 |
| | UXO Technician | | Travel Included Above | 2 | 10 | 9 | 180 | $13,341.60 |
| | | | | | | | 180 hours total field time | |
| | | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | | **$16,141.60** |
| | | | | Days | Hours | Man/Items | | |
| | Remove & Treat Subsurface | 100 Digs | UXO | 1 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 1 | | 2 | 2 | $75.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 1 | | 4 | 4 | $150.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 1 | | 1 | 1 | $500.00 |
| | MDAS Certification | Drums | Included above | 0 | | 0 | 0 | $0.00 |
| | Non-munitions Debris | Roll-off | Included above | 0 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 1 | | 1 | 1 | $150.00 |
| | UXO Technician | | Includes Travel | 1 | 10 | 9 | 90 | $6,670.80 |
| | | | | | | | 90 hours total field time | |
| | | | | | | | 10 management hours | $1,000.00 |
| | | | | | | | | **$8,545.80** |
| | | | | Days | Hours | Man/Items | | |
| 12 | MEC/MDEH Treatment | 50 Items | UXO | 6 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 6 | | 2 | 12 | $450.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 6 | | 4 | 24 | $900.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 6 | | 1 | 6 | $3,000.00 |
| | MDAS Certification | Drums | Included above | 0 | | 0 | 0 | $0.00 |
| | Non-munitions Debris | Roll-off | Included above | 0 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 6 | | 1 | 6 | $900.00 |
| | UXO Technician | | Includes Travel | 6 | 10 | 9 | 540 | $40,024.80 |
| | | | | | | | 540 hours total field time | |
| | | | | | | | 60 management hours | $6,000.00 |
| | | | | | | | | **$51,274.80** |
| | | | | Days | Hours | Man/Items | | |
| 13 | MDAS Certification | 60 Drums | UXO | 6 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 0 | | 2 | 0 | $0.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 0 | | 4 | 0 | $0.00 |
| | MDAS Transportation | Drums | Include below | 10 | | 6 | 60 | $0.00 |
| | MDAS Certification | Drums | Includes Shipping | 10 | | 6 | 60 | $38,750.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| | UXO Technician | | Includes Travel | 6 | 10 | 3 | 180 | $13,341.60 |
| | | | | | | | 180 hours total field time | |
| | | | | | | | 30 management hours | $3,000.00 |
| | | | | | | | | **$55,091.60** |
| 14 | MC Sampling | | N/A | | | | | |
| 15 | Site Resteration | | N/A | | | | | |

| | |
|---|---|
| Initial Inspection Total Field Cost | $1,602,237.17 |
| Contingency on Total Field Cost @ 10% | $160,223.72 |
| Engineering on Total Field Cost @ 4% | $64,089.49 |
| **TOTAL COST** | **$1,826,550.37** |

| | | | | | Days | Hours | Man/Items | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Annual Inspections (years 1, 2, 3, 4, and 5)** | | | | | | | | |
| 16 | Annual Inspections | Transects | Minor Brush | UXO | 2 | 10 | 6 | | |
| | Chain Saw | Trees 2 Inch and smaller | | Includes Shipping | 2 | | 2 | 4 | $244.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | | Includes Shipping | 2 | | 2 | 4 | $184.00 |
| | Bush Hog | Majority of Area | | Includes Shipping | 2 | | 1 | 2 | $690.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 2 | | 2 | 4 | $150.00 |
| | UXO Technician | | | Includes Travel | 2 | 10 | 6 | 120 | $8,894.40 |
| | | | | | | | | 120 hours total field time | |
| | | | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | | | **$12,162.40** |
| | | | | | Days | Hours | Man/Items | | |
| | Visual & Detector Surveyes | Transects | | UXO | 3 | 10 | 6 | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 3 | | 2 | 6 | $225.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 3 | | 4 | 12 | $450.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 3 | | 1 | 3 | $450.00 |
| | UXO Technician | | | Includes Travel | 3 | 10 | 6 | 180 | $13,341.60 |
| | | | | | | | | 180 hours total field time | |
| | | | | | | | | 30 management hours | $3,000.00 |
| | | | | | | | | | **$17,466.60** |
| | | | | | Days | Hours | Man/Items | | |
| | Manual Remove & Treat Surf | Transects | | UXO | 1 | 10 | 3 | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 0 | | 2 | 0 | $0.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 0 | | 4 | 0 | $0.00 |
| | MEC/MDEH Treatment | Donar Charge | | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| | MDAS Certification | Drums | | Includes Shipping | 1 | | 1 | 1 | $3,350.00 |
| | Non-munitions Debris | Roll-off | | Includes Shipping | 0 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| | UXO Technician | | | Includes Travel | 1 | 10 | 3 | 30 | $2,223.60 |
| | | | | | | | | 30 hours total field time | |
| | | | | | | | | 10 management hours | $1,000.00 |
| | | | | | | | | | **$6,573.60** |
| | Annual Inspection Total Field Cost | $36,202.60 | | | | | | | |
| | Contingency on Total Field Cost @ 10% | $3,620.26 | | | | | | | |
| | Engineering on Total Field Cost @ 4% | $1,448.10 | | | | | | | |
| | **TOTAL COST** | **$41,270.96** | | | | | | | |
| | **Five Year Inspections (year 10)** | | | | Days | Hours | Man/Items | | |
| 17 | 5 Year Inspection | Transects | Minor Brush | UXO | 2 | 10 | 6 | | |
| | Chain Saw | Trees 2 Inch and smaller | | Includes Shipping | 2 | | 2 | 4 | $244.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | | Includes Shipping | 2 | | 2 | 4 | $184.00 |
| | Bush Hog | Majority of Area | | Includes Shipping | 2 | | 1 | 2 | $690.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 2 | | 2 | 4 | $150.00 |
| | UXO Technician | | | Includes Travel | 2 | 10 | 6 | 120 | $8,894.40 |
| | | | | | | | | 120 hours total field time | |
| | | | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | | | **$12,162.40** |
| | | | | | Days | Hours | Man/Items | | |
| | Visual & Detector Surveyes | Transects | | UXO | 3 | 10 | 6 | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 3 | | 2 | 6 | $225.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 3 | | 4 | 12 | $450.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 3 | | 1 | 3 | $450.00 |
| | UXO Technician | | | Includes Travel | 3 | 10 | 6 | 180 | $13,341.60 |
| | | | | | | | | 180 hours total field time | |

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 15
ALTERNATIVE 2B: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | 30 management hours | $3,000.00 |
| | | | | | | | **$17,466.60** |
| | | | Days | Hours | Man/Items | | |
| Manual Remove & Treat Surf | Transects | UXO | 1 | 10 | 3 | | |
| UXO Equipment | All-Metals | Includes Shipping | 0 | | 2 | 0 | $0.00 |
| UXO Equipment | Magnetometer | Includes Shipping | 0 | | 4 | 0 | $0.00 |
| MEC/MDEH Treatment | Donar Charge | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| MDAS Certification | Drums | Includes Shipping | 1 | | 1 | 1 | $3,350.00 |
| Non-munitions Debris | Roll-off | Includes Shipping | 0 | | 0 | 0 | $0.00 |
| Hand Held GPS | Sub Meter | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| UXO Technician | | Includes Travel | 1 | 10 | 3 | 30 | $2,223.60 |
| | | | | | | 30 hours total field time | |
| | | | | | | 10 management hours | $1,000.00 |
| | | | | | | | **$6,573.60** |

| | |
|---|---|
| Five Year Inspection Total Field Cost | $36,202.60 |
| Contingency on Total Field Cost @ 10% | $3,620.26 |
| Engineering on Total Field Cost @ 4% | $1,448.10 |
| **TOTAL COST** | **$41,270.96** |

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**Public Education Program**
**Annual Costs**

| | | | Unit Cost | | | | Extended Cost | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Item | Quantity | Unit | Subcontract | Material | Labor | Equipment | Subcontract | Material | Labor | Equipment | Subtotal |
| **1 PLANNING & REPORTS** | | | | | | | | | | | |
| 1.1 Prepare Documents & Plans | 10 | hr | | | $39.00 | | $0 | $0 | $390 | $0 | $390 |
| 1.2 Reports & Handouts | 1 | ls | | $225.00 | | | $0 | $225 | $0 | $0 | $225 |
| **2 MEETING IN JACKSONVILLE, FLORIDA** | | | | | | | | | | | |
| 2.1 Travel, air | 1 | ls | | $650.00 | | | $0 | $650 | $0 | $0 | $650 |
| 2.2 Per-diem | 1 | day | | $131.00 | | | $0 | $131 | $0 | $0 | $131 |
| 2.3 Car | 1 | day | | | | $100.00 | $0 | $0 | $0 | $100 | $100 |
| 2.4 Meeting | 12 | hr | | | $39.00 | | $0 | $0 | $468 | $0 | $468 |
| **Subtotal** | | | | | | | $0 | $1,006 | $858 | $100 | $1,964 |
| Overhead on Labor Cost @ 30% | | | | | | | | | $257 | | $257 |
| G & A on Labor, Material, Equipment, & Subs Cost @ 10% | | | | | | | $0 | $101 | $86 | $10 | $196 |
| Tax on Materials and Equipment Cost @ 6% | | | | | | | | $60 | | $6 | $66 |
| **Total Direct Cost** | | | | | | | $0 | $1,167 | $1,201 | $116 | $2,484 |
| Indirects on Total Direct Cost @ 0% | | | | | | | | | | | $0 |
| Profit on Total Direct Cost @ 10% | | | | | | | | | | | $248 |
| **Subtotal** | | | | | | | | | | | $2,733 |
| Contingency on Total Field Cost @ 0% | | | | | | | | | | | $0 |
| Engineering on Total Field Cost @ 0% | | | | | | | | | | | $0 |
| **TOTAL COST** | | | | | | | | | | | **$2,733** |

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**ALTERNATIVE 2B: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal**
**Present Worth Analysis**

| Year | Capital Cost | Annual Cost | Total Year Cost | Annual Discount Rate 2.3% | Present Worth |
|---|---|---|---|---|---|
| 0 | $4,723,507 | | $4,723,507 | 1.000 | $4,723,507 |
| 1 | $41,271 | $2,733 | $44,004 | 0.978 | $43,014 |
| 2 | $41,271 | $2,733 | $44,004 | 0.956 | $42,047 |
| 3 | $41,271 | $2,733 | $44,004 | 0.934 | $41,102 |
| 4 | $41,271 | $2,733 | $44,004 | 0.913 | $40,178 |
| 5 | $41,271 | $2,733 | $44,004 | 0.893 | $39,274 |
| 6 | | $2,733 | $2,733 | 0.872 | $2,384 |
| 7 | | $2,733 | $2,733 | 0.853 | $2,330 |
| 8 | | $2,733 | $2,733 | 0.834 | $2,278 |
| 9 | | $2,733 | $2,733 | 0.815 | $2,227 |
| 10 | $41,271 | $2,733 | $44,004 | 0.797 | $35,053 |
| 11 | | $2,733 | $2,733 | 0.779 | $2,128 |
| 12 | | $2,733 | $2,733 | 0.761 | $2,080 |
| 13 | | $2,733 | $2,733 | 0.744 | $2,033 |
| 14 | | $2,733 | $2,733 | 0.727 | $1,988 |
| 15 | | $2,733 | $2,733 | 0.711 | $1,943 |
| 16 | | $2,733 | $2,733 | 0.695 | $1,899 |
| 17 | | $2,733 | $2,733 | 0.679 | $1,856 |
| 18 | | $2,733 | $2,733 | 0.664 | $1,815 |
| 19 | | $2,733 | $2,733 | 0.649 | $1,774 |
| 20 | | $2,733 | $2,733 | 0.635 | $1,734 |
| 21 | | $2,733 | $2,733 | 0.620 | $1,695 |
| 22 | | $2,733 | $2,733 | 0.606 | $1,657 |
| 23 | | $2,733 | $2,733 | 0.593 | $1,620 |
| 24 | | $2,733 | $2,733 | 0.579 | $1,583 |
| 25 | | $2,733 | $2,733 | 0.566 | $1,548 |
| 26 | | $2,733 | $2,733 | 0.554 | $1,513 |
| 27 | | $2,733 | $2,733 | 0.541 | $1,479 |
| 28 | | $2,733 | $2,733 | 0.529 | $1,446 |
| 29 | | $2,733 | $2,733 | 0.517 | $1,413 |
| 30 | | $2,733 | $2,733 | 0.506 | $1,381 |

**TOTAL PRESENT WORTH $5,007,979**

ALTERNATIVE 2C

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**ALTERNATIVE 2C: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal**
**CAPITAL COST**



| | | | Unit Cost | | | | Extended Cost | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Item | Quantity | Unit | Subcontract | Material | Labor | Equipment | Subcontract | Material | Labor | Equipment | Subtotal |
| **1 PROJECT PLANNING & DOCUMENTS** | | | | | | | | | | | |
| 1.1 Prepare Documents & Plans | 100 | hr | | | $39.00 | | $0 | $0 | $3,900 | $0 | $3,900 |
| 1.2 Prepare Permits | 150 | hr | | | $39.00 | | $0 | $0 | $5,850 | $0 | $5,850 |
| 1.3 Tortoise Survey | 1 | ls | | $2,620.00 | $4,680.00 | $500.00 | $0 | $2,620 | $4,680 | $500 | $7,800 |
| 1.4 Tortoise Relocation | 1 | ls | | $6,240.00 | $6,240.00 | $500.00 | $0 | $6,240 | $6,240 | $500 | $12,980 |
| 1.5 Wetland Verification | 1 | ls | | $3,120.00 | $1,011.00 | $250.00 | $0 | $3,120 | $1,011 | $250 | $4,381 |
| **2 MOBILIZATION AND DEMOBILIZATION** | | | | | | | | | | | |
| 2.1 Site Support Facilities (trailers, phone, electric, etc.) | 1 | ls | | $1,000.00 | | $3,500.00 | $0 | $1,000 | $0 | $3,500 | $4,500 |
| 2.2 Equipment Mobilization/Demobilization | 9 | ea | | | $183.00 | $518.00 | $0 | $0 | $1,647 | $4,662 | $6,309 |
| **3 FIELD SUPPORT AND SITE ACCESS** | | | | | | | | | | | |
| 3.1 Office Trailer | 2.0 | mo | | | | $360.00 | $0 | $0 | $0 | $720 | $720 |
| 3.2 Field Office Equipment, Utilities, & Support | 2.0 | mo | | $519.00 | | | $0 | $1,038 | $0 | $0 | $1,038 |
| 3.3 Storage Trailer | 2.0 | mo | | | | $94.00 | $0 | $0 | $0 | $188 | $188 |
| 3.4 Survey Support | 2 | day | $1,125.00 | | | | $2,250 | $0 | $0 | $0 | $2,250 |
| 3.5 Site Superintendent | 35 | day | | $131.00 | $420.00 | | $0 | $4,585 | $14,700 | $0 | $19,285 |
| 3.6 Site Health & Safety and QA/QC | 35 | day | | $131.00 | $370.00 | | $0 | $4,585 | $12,950 | $0 | $17,535 |
| **4 DECONTAMINATION** | | | | | | | | | | | |
| 4.1 Decontamination Services | 1.0 | mo | | $1,220.00 | $2,245.00 | $1,550.00 | $0 | $1,220 | $2,245 | $1,550 | $5,015 |
| 4.2 Equipment Decon Pad | 1 | ls | | $4,500.00 | $3,000.00 | $725.00 | $0 | $4,500 | $3,000 | $725 | $8,225 |
| 4.3 Decon Water | 1,000 | gal | | $0.20 | | | $0 | $200 | $0 | $0 | $200 |
| 4.4 Decon Water Storage Tank, 6,000 gallon | 1.0 | mo | | | | $780.00 | $0 | $0 | $0 | $780 | $780 |
| 4.5 Clean Water Storage Tank, 4,000 gallon | 1.0 | mo | | | | $702.00 | $0 | $0 | $0 | $702 | $702 |
| 4.6 Disposal of Decon Waste (liquid & solid) | 1.0 | mo | $985.00 | | | | $985 | $0 | $0 | $0 | $985 |
| **5 SITE PREPARATION** | | | | | | | | | | | |
| 5.1 Clearing - Brush Mowing (medium density) | 1.2 | ac | | | $242.00 | $196.00 | $0 | $0 | $290 | $235 | $526 |
| 5.2 Clearing/Chipping - Tree Removal - 12" dia. | 1.2 | ac | | | $2,500.00 | $1,875.00 | $0 | $0 | $3,000 | $2,250 | $5,250 |
| 5.3 Chipping Stumps | 230 | ea | | | $18.50 | $8.45 | $0 | $0 | $4,255 | $1,944 | $6,199 |
| 5.4 UXO Technician | 5 | day | | $131.00 | $370.00 | | $0 | $655 | $1,850 | $0 | $2,505 |
| **6 SITE CLEANUP AND RESTORATION** | | | | | | | | | | | |
| 6.1 Debris T & D, 11,200 lbs metal | 1 | ls | $400.00 | | | | $400 | $0 | $0 | $0 | $400 |
| 6.2 FE Loader, 185 hp | 5 | day | | | $211.36 | $588.60 | $0 | $0 | $1,057 | $2,943 | $4,000 |
| 6.3 Dozer, 200 hp (2) | 10 | day | | | $211.36 | $1,051.00 | $0 | $0 | $2,114 | $10,510 | $12,624 |
| 6.4 Site Labor, (3 laborers) | 15 | day | | | $102.64 | | $0 | $0 | $1,540 | $0 | $1,540 |
| 6.5 Revegetation - soil nutrients | 309 | msf | $12.10 | | | | $3,739 | $0 | $0 | $0 | $3,739 |
| 6.6 Revegetation, hydro seed (grasses) | 309 | msf | $117.00 | | | | $36,153 | $0 | $0 | $0 | $36,153 |
| 6.7 Revegetation - wetland nutrients | 0.0 | msf | $14.55 | | | | $0 | $0 | $0 | $0 | $0 |
| 6.8 Wetland Soil | 0 | cy | | $23.00 | | | $0 | $0 | $0 | $0 | $0 |
| 6.9 Wetland Restoration | 0 | csf | $35.96 | | | | $0 | $0 | $0 | $0 | $0 |
| 6.10 Perimeter Signs | 6 | ea | | $69.50 | | | $0 | $417 | $0 | $0 | $417 |
| **7 POST CONSTRUCTION COST** | | | | | | | | | | | |
| 7.1 Contractor Completion Report | 100 | hr | | | $39.00 | | $0 | $0 | $3,900 | $0 | $3,900 |
| 7.2 Remedial Action Closeout Report | 150 | hr | | | $39.00 | | $0 | $0 | $5,850 | $0 | $5,850 |
| **Subtotal** | | | | | | | $43,527 | $30,180 | $80,078 | $31,959 | $185,744 |
| Overhead on Labor Cost @ 30% | | | | | | | | | $24,024 | | $24,024 |
| G & A on Labor, Material, Equipment, & Subs Cost @ 10% | | | | | | | $4,353 | $3,018 | $8,008 | $3,196 | $18,574 |
| Tax on Materials and Equipment Cost @ 6% | | | | | | | | $1,811 | | $1,918 | $3,728 |
| **Total Direct Cost** | | | | | | | $47,880 | $35,009 | $112,110 | $37,072 | $232,070 |

| Item | Quantity | Unit | Unit Cost Subcontract | Unit Cost Material | Unit Cost Labor | Unit Cost Equipment | Extended Cost Subcontract | Extended Cost Material | Extended Cost Labor | Extended Cost Equipment | Subtotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Indirects on Total Direct Cost @ 25% | | | | | | | | | | | $58,018 |
| Profit on Total Direct Cost @ 10% | | | | | | | | | | | $23,207 |
| **Total Field Cost** | | | | | | | | | | | $313,295 |
| Contingency on Total Field Cost @ 20% | | | | | | | | | | | $62,659 |
| Engineering on Total Field Cost @ 20% | | | | | | | | | | | $62,659 |
| **TOTAL COST** | | | | | | | | | | | **$438,613** |

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 15
ALTERNATIVE 2C: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal

**Alternative 2C**

| | | | | | Days | Hours | Man/Items | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Site Setup; Establish Grids | 39 Grids | Minor Brush | UXO | 3 | 10 | 2 | | |
| | RTK GPS | Sub meter accuracy | | Includes shipping | 5 | | 1 | 5 | $750.00 |
| | UXO Equipment | Magnetometer | | Includes shipping | 5 | | 1 | 5 | $187.50 |
| | GPS Operator | | | Includes Travel | 5 | 10 | 1 | 50 | $3,206.00 |
| | UXO Escort | | | Includes Travel | 5 | 10 | 1 | 50 | $3,706.00 |
| | | | | | | | | 100 hours total field time | |
| | | | | | | | | 30 management hours | $3,000.00 |
| | | | | | | | | | **$10,849.50** |
| | | | | | Days | Hours | Man/Items | | |
| 2 | Site Setup; Establish Transects on Access Wa| | 1,800 Ft. | Minor Brush | UXO | 1 | 10 | 2 | | |
| | RTK GPS | Sub meter accuracy | | Shipping Included Above | 1 | | 1 | 1 | $150.00 |
| | UXO Equipment | Magnetometer | | Shipping Included Above | 1 | | 1 | 1 | $37.50 |
| | GPS Operator | | | Travel Included Above | 1 | 10 | 1 | 10 | $641.20 |
| | UXO Escort | | | Travel Included Above | 1 | 10 | 1 | 10 | $741.20 |
| | | | | | | | | 20 hours total field time | |
| | | | | | | | | 10 management hours | $1,000.00 |
| | | | | | | | | | **$2,569.90** |
| | | | | | Days | Hours | Man/Items | | |
| 3 | Site Setup; Brush Cutting | 34 Grids | Minor Brush | UXO | 5 | 10 | 6 | | |
| | Chain Saw | Trees 2 Inch and smaller | | Includes Shipping | 7 | | 2 | 14 | $854.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | | Includes Shipping | 7 | | 2 | 14 | $644.00 |
| | Bush Hog | Majority of Area | | Includes Shipping | 7 | | 1 | 7 | $2,415.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 7 | | 2 | 14 | $525.00 |
| | UXO Technician | | | Includes Travel | 7 | 10 | 6 | 420 | $31,130.40 |
| | | | | | | | | 420 hours total field time | |
| | | | | | | | | 50 management hours | $5,000.00 |
| | | | | | | | | | **$40,568.40** |
| | | | | | Days | Hours | Man/Items | | |
| | Site Setup; Brush Cutting | 1,800 Ft | Minor Brush | UXO | 1 | 10 | 6 | | |
| | Chain Saw | Trees 2 Inch and smaller | | Shipping Included Above | 1 | | 2 | 2 | $122.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | | Shipping Included Above | 1 | | 2 | 2 | $92.00 |
| | Bush Hog | Majority of Area | | Shipping Included Above | 1 | | 1 | 1 | $345.00 |
| | UXO Equipment | Magnetometer | | Shipping Included Above | 1 | | 2 | 2 | $75.00 |
| | UXO Technician | | | Travel Included Above | 1 | 10 | 6 | 60 | $4,447.20 |
| | | | | | | | | 60 hours total field time | |
| | | | | | | | | 10 management hours | $1,000.00 |
| | | | | | | | | | **$6,081.20** |
| | | | | | Days | Hours | Man/Items | | |
| 4 | Visual & Detector Surveyes | 39 Grids | | UXO | 5 | 10 | 9 | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 7 | | 2 | 14 | $525.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 7 | | 4 | 28 | $1,050.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 7 | | 1 | 7 | $1,050.00 |
| | UXO Technician | | | Includes Travel | 7 | 10 | 9 | 630 | $46,695.60 |
| | | | | | | | | 630 hours total field time | |
| | | | | | | | | 50 management hours | $5,000.00 |
| | | | | | | | | | **$54,320.60** |

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 15
ALTERNATIVE 2C: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal

| | | | | Days | Hours | Man/Items | | |
|---|---|---|---|---|---|---|---|---|
| | Visual & Detector Surveyes | 1,800 Ft | UXO | 2 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Shipping Included Above | 2 | | 2 | 4 | $150.00 |
| | UXO Equipment | Magnetometer | Shipping Included Above | 2 | | 4 | 8 | $300.00 |
| | Hand Held GPS | Sub Meter | Shipping Included Above | 2 | | 1 | 2 | $300.00 |
| | UXO Technician | | Travel Included Above | 2 | 10 | 9 | 180 | $13,341.60 |
| | | | | | | | 180 hours total field time | |
| | | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | | **$16,091.60** |
| | | | | Days | Hours | Man/Items | | |
| 5 | Manual Remove & Treat Surf | 39 Grids & 1,800 ft | UXO | 9 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 4 | | 2 | 8 | $300.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 4 | | 4 | 16 | $600.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 4 | | 1 | 4 | $2,000.00 |
| | MDAS Certification | Drums | Includes Shipping | 5 | | 6 | 30 | $20,750.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 4 | | 1 | 4 | $600.00 |
| | UXO Technician | | Includes Travel | 9 | 10 | 9 | 810 | $60,037.20 |
| | | | | | | | 810 hours total field time | |
| | | | | | | | 90 management hours | $9,000.00 |
| | | | | | | | | **$93,287.20** |
| | | | | Days | Hours | Man/Items | | |
| 6 | Intrusive Investigation | 200 Digs | UXO | 4 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Shipping Included Above | 4 | | 2 | 8 | $300.00 |
| | UXO Equipment | Magnetometer | Shipping Included Above | 4 | | 4 | 16 | $600.00 |
| | UXO Supplies | Shovels etc. | Shipping Included Above | 4 | | 1 | 4 | $100.00 |
| | Hand Held GPS | Sub Meter | Shipping Included Above | 4 | | 1 | 4 | $600.00 |
| | UXO Technician | | Travel Included Above | 4 | 10 | 9 | 360 | $26,683.20 |
| | | | | | | | 360 hours total field time | |
| | | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | | **$30,283.20** |
| | | | | Days | Hours | Man/Items | | |
| 7 | Remove & Treat Subsurface | 200 Digs | UXO | 4 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 4 | | 2 | 8 | $300.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 4 | | 4 | 16 | $600.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 4 | | 1 | 4 | $2,000.00 |
| | MDAS Certification | Drums | Included in 5 above | 0 | | 0 | 0 | $0.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 4 | | 1 | 4 | $600.00 |
| | UXO Technician | | Includes Travel | 4 | 10 | 9 | 360 | $26,683.20 |
| | | | | | | | 360 hours total field time | |
| | | | | | | | 40 management hours | $4,000.00 |
| | | | | | | | | **$34,183.20** |
| | | | | Days | Hours | Man/Items | | |
| 8 | Mechanical Excavation | 39 Grids | UXO | 8 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 8 | | 2 | 16 | $600.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 8 | | 6 | 48 | $1,800.00 |
| | Excavator | Excavate, etc. | Includes Shipping | 1 | | 390,000 | 390000 | $494,065.00 |
| | Backfill after screening | Dozor, etc | Includes Shipping | 1 | | 8 | 8 | $14,946.64 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Construct Decon Pad | PPE, etc. | Includes Shipping | 1 | | 1 | 1 | | $2,000.00 |
| | UXO Technician | | Includes Travel | 8 | 10 | 9 | 720 | | $53,366.40 |
| | | | | | | | 720 | hours total field time | |
| | | | | | | | 72 | management hours | $7,200.00 |
| | | | | | | | | | **$573,978.04** |
| | | | | Days | Hours | Man/Items | | | |
| 9 | Remove & Treat Excavtion | 39 Grids | UXO | 9 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 10 | | 1 | 10 | | $375.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 10 | | 2 | 20 | | $750.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 10 | | 1 | 10 | | $5,000.00 |
| | MDAS Certification | Drums | Includes Shipping | 5 | | 6 | 30 | | $20,750.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 4 | | 1 | 4 | | $600.00 |
| | UXO Technician | | Includes Travel | 9 | 10 | 3 | 270 | | $20,012.40 |
| | | | | | | | 270 | hours total field time | |
| | | | | | | | 90 | management hours | $9,000.00 |
| | | | | | | | | | **$56,487.40** |
| | | | | Days | Hours | Man/Items | | | |
| 10 | Backfill After Sifting | 21 Grids | UXO | 4 | 10 | 9 | | | |
| | 210,000 Cubic Ft. | Dozor, etc | See 8 Above | 1 | | 21 | 21 | | $39,234.93 |
| | Construct Decon Pad | PPE, etc. | Includes Shipping | 1 | | 1 | 1 | | $2,000.00 |
| | UXO Technician | | Includes Travel | 4 | 10 | 3 | 120 | | $8,894.40 |
| | | | | | | | 120 | hours total field time | |
| | | | | | | | 40 | management hours | $4,000.00 |
| | | | | | | | | | **$54,129.33** |
| | | | | Days | Hours | Man/Items | | | |
| 11 | Step-out; Brush Cutting | 4 Grids Minor Brush | UXO | 2 | 10 | 6 | | | |
| | Chain Saw | Trees 2 Inch and smaller | Includes Shipping | 2 | | 2 | 4 | | $244.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | Includes Shipping | 2 | | 2 | 4 | | $184.00 |
| | Bush Hog | Majority of Area | Includes Shipping | 2 | | 1 | 2 | | $690.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 2 | | 2 | 4 | | $150.00 |
| | UXO Technician | | Includes Travel | 2 | 10 | 6 | 120 | | $8,894.40 |
| | | | | | | | 120 | hours total field time | |
| | | | | | | | 20 | management hours | $2,000.00 |
| | | | | | | | | | **$12,162.40** |
| | | | | Days | Hours | Man/Items | | | |
| | Visual & Detector Surveyes | 4 Grids | UXO | 2 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 2 | | 2 | 4 | | $150.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 2 | | 4 | 8 | | $300.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 2 | | 1 | 2 | | $300.00 |
| | UXO Technician | | Includes Travel | 2 | 10 | 9 | 180 | | $13,341.60 |
| | | | | | | | 180 | hours total field time | |
| | | | | | | | 20 | management hours | $2,000.00 |
| | | | | | | | | | **$16,091.60** |
| | | | | Days | Hours | Man/Items | | | |
| | Manual Remove & Treat Surf | 4 Grids | UXO | 3 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 2 | | 2 | 4 | | $150.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 2 | | 4 | 8 | | $300.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 1 | | 1 | 1 | | $500.00 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | MDAS Certification | Drums | Includes Shipping | 0 | | 6 | 0 | | $0.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 1 | | 1 | 1 | | $150.00 |
| | UXO Technician | | Includes Travel | 3 | 10 | 9 | 270 | | $20,012.40 |
| | | | | | | | 270 | hours total field time | |
| | | | | | | | 30 | management hours | $3,000.00 |
| | | | | | | | | | **$24,112.40** |
| | | | | Days | Hours | Man/Items | | | |
| | Intrusive Investigation | 100 Digs | UXO | 2 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Shipping Included Above | 2 | | 2 | 4 | | $150.00 |
| | UXO Equipment | Magnetometer | Shipping Included Above | 2 | | 4 | 8 | | $300.00 |
| | UXO Supplies | Shovels etc. | Shipping Included Above | 2 | | 1 | 2 | | $50.00 |
| | Hand Held GPS | Sub Meter | Shipping Included Above | 2 | | 1 | 2 | | $300.00 |
| | UXO Technician | | Travel Included Above | 2 | 10 | 9 | 180 | | $13,341.60 |
| | | | | | | | 180 | hours total field time | |
| | | | | | | | 20 | management hours | $2,000.00 |
| | | | | | | | | | **$16,141.60** |
| | | | | Days | Hours | Man/Items | | | |
| | Remove & Treat Subsurface | 100 Digs | UXO | 1 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 1 | | 2 | 2 | | $75.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 1 | | 4 | 4 | | $150.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 1 | | 1 | 1 | | $500.00 |
| | MDAS Certification | Drums | Included above | 0 | | 0 | 0 | | $0.00 |
| | Non-munitions Debris | Roll-off | Included above | 0 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 1 | | 1 | 1 | | $150.00 |
| | UXO Technician | | Includes Travel | 1 | 10 | 9 | 90 | | $6,670.80 |
| | | | | | | | 90 | hours total field time | |
| | | | | | | | 10 | management hours | $1,000.00 |
| | | | | | | | | | **$8,545.80** |
| | | | | Days | Hours | Man/Items | | | |
| 12 | MEC/MDEH Treatment | 50 Items | UXO | 6 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 6 | | 2 | 12 | | $450.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 6 | | 4 | 24 | | $900.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 6 | | 1 | 6 | | $3,000.00 |
| | MDAS Certification | Drums | Included above | 0 | | 0 | 0 | | $0.00 |
| | Non-munitions Debris | Roll-off | Included above | 0 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 6 | | 1 | 6 | | $900.00 |
| | UXO Technician | | Includes Travel | 6 | 10 | 9 | 540 | | $40,024.80 |
| | | | | | | | 540 | hours total field time | |
| | | | | | | | 60 | management hours | $6,000.00 |
| | | | | | | | | | **$51,274.80** |
| | | | | Days | Hours | Man/Items | | | |
| 13 | MDAS Certification | 60 Drums | UXO | 6 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 0 | | 2 | 0 | | $0.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 0 | | 4 | 0 | | $0.00 |
| | MDAS Transportation | Drums | Include below | 10 | | 6 | 60 | | $0.00 |
| | MDAS Certification | Drums | Includes Shipping | 10 | | 6 | 60 | | $38,750.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 0 | | 1 | 0 | | $0.00 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | UXO Technician | | Includes Travel | 6 | 10 | 3 | 180 | $13,341.60 |
| | | | | | | | 180 hours total field time | |
| | | | | | | | 30 management hours | $3,000.00 |
| | | | | | | | | **$55,091.60** |
| 14 | MC Sampling | | N/A | | | | | |
| 15 | Site Resteration | | N/A | | | | | |

Initial Inspection Total Field Cost $1,156,249.77
Contingency on Total Field Cost @ 10% $115,624.98
Engineering on Total Field Cost @ 4% $46,249.99
**TOTAL COST** **$1,318,124.74**

| | | | | Days | Hours | Man/Items | | |
|---|---|---|---|---|---|---|---|---|
| | **Annual Inspections (years 1, 2, 3, 4, and 5)** | | | | | | | |
| 16 | Annual Inspections | Transects Minor Brush | UXO | 2 | 10 | 6 | | |
| | Chain Saw | Trees 2 Inch and smaller | Includes Shipping | 2 | | 2 | 4 | $244.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | Includes Shipping | 2 | | 2 | 4 | $184.00 |
| | Bush Hog | Majority of Area | Includes Shipping | 2 | | 1 | 2 | $690.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 2 | | 2 | 4 | $150.00 |
| | UXO Technician | | Includes Travel | 2 | 10 | 6 | 120 | $8,894.40 |
| | | | | | | | 120 hours total field time | |
| | | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | | **$12,162.40** |
| | | | | Days | Hours | Man/Items | | |
| | Visual & Detector Surveyes | Transects | UXO | 3 | 10 | 6 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 3 | | 2 | 6 | $225.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 3 | | 4 | 12 | $450.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 3 | | 1 | 3 | $450.00 |
| | UXO Technician | | Includes Travel | 3 | 10 | 6 | 180 | $13,341.60 |
| | | | | | | | 180 hours total field time | |
| | | | | | | | 30 management hours | $3,000.00 |
| | | | | | | | | **$17,466.60** |
| | | | | Days | Hours | Man/Items | | |
| | Manual Remove & Treat Surf | Transects | UXO | 1 | 10 | 3 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 0 | | 2 | 0 | $0.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 0 | | 4 | 0 | $0.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| | MDAS Certification | Drums | Includes Shipping | 1 | | 1 | 1 | $3,350.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 0 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| | UXO Technician | | Includes Travel | 1 | 10 | 3 | 30 | $2,223.60 |
| | | | | | | | 30 hours total field time | |
| | | | | | | | 10 management hours | $1,000.00 |
| | | | | | | | | **$6,573.60** |

Annual Inspection Total Field Cost $36,202.60
Contingency on Total Field Cost @ 10% $3,620.26

| | |
|---|---|
| Engineering on Total Field Cost @ 4% | $1,448.10 |
| **TOTAL COST** | **$41,270.96** |

| | | | | | Days | Hours | Man/Items | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Five Year Inspections (year 10)** | | | | | | | | | |
| 17 | 5 Year Inspection | Transects | Minor Brush | UXO | 2 | 10 | 6 | | | |
| | Chain Saw | Trees 2 Inch and smaller | | Includes Shipping | 2 | | 2 | 4 | | $244.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | | Includes Shipping | 2 | | 2 | 4 | | $184.00 |
| | Bush Hog | Majority of Area | | Includes Shipping | 2 | | 1 | 2 | | $690.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 2 | | 2 | 4 | | $150.00 |
| | UXO Technician | | | Includes Travel | 2 | 10 | 6 | 120 | | $8,894.40 |
| | | | | | | | | 120 | hours total field time | |
| | | | | | | | | 20 | management hours | $2,000.00 |
| | | | | | | | | | | **$12,162.40** |
| | | | | | Days | Hours | Man/Items | | | |
| | Visual & Detector Surveyes | Transects | | UXO | 3 | 10 | 6 | | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 3 | | 2 | 6 | | $225.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 3 | | 4 | 12 | | $450.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 3 | | 1 | 3 | | $450.00 |
| | UXO Technician | | | Includes Travel | 3 | 10 | 6 | 180 | | $13,341.60 |
| | | | | | | | | 180 | hours total field time | |
| | | | | | | | | 30 | management hours | $3,000.00 |
| | | | | | | | | | | **$17,466.60** |
| | | | | | Days | Hours | Man/Items | | | |
| | Manual Remove & Treat Surf | Transects | | UXO | 1 | 10 | 3 | | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 0 | | 2 | 0 | | $0.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 0 | | 4 | 0 | | $0.00 |
| | MEC/MDEH Treatment | Donar Charge | | Includes Shipping | 0 | | 1 | 0 | | $0.00 |
| | MDAS Certification | Drums | | Includes Shipping | 1 | | 1 | 1 | | $3,350.00 |
| | Non-munitions Debris | Roll-off | | Includes Shipping | 0 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 0 | | 1 | 0 | | $0.00 |
| | UXO Technician | | | Includes Travel | 1 | 10 | 3 | 30 | | $2,223.60 |
| | | | | | | | | 30 | hours total field time | |
| | | | | | | | | 10 | management hours | $1,000.00 |
| | | | | | | | | | | **$6,573.60** |

| | |
|---|---|
| Five Year Inspection Total Field Cost | $36,202.60 |
| Contingency on Total Field Cost @ 10% | $3,620.26 |
| Engineering on Total Field Cost @ 4% | $1,448.10 |
| **TOTAL COST** | **$41,270.96** |

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**Public Education Program**
**Annual Costs**

| Item | Quantity | Unit | Unit Cost Subcontract | Unit Cost Material | Unit Cost Labor | Unit Cost Equipment | Extended Cost Subcontract | Extended Cost Material | Extended Cost Labor | Extended Cost Equipment | Subtotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1 PLANNING & REPORTS** | | | | | | | | | | | |
| 1.1 Prepare Documents & Plans | 10 | hr | | | $39.00 | | $0 | $0 | $390 | $0 | $390 |
| 1.2 Reports & Handouts | 1 | ls | | $225.00 | | | $0 | $225 | $0 | $0 | $225 |
| **2 MEETING IN JACKSONVILLE, FLORIDA** | | | | | | | | | | | |
| 2.1 Travel, air | 1 | ls | | $650.00 | | | $0 | $650 | $0 | $0 | $650 |
| 2.2 Per-diem | 1 | day | | $131.00 | | | $0 | $131 | $0 | $0 | $131 |
| 2.3 Car | 1 | day | | | | $100.00 | $0 | $0 | $0 | $100 | $100 |
| 2.4 Meeting | 12 | hr | | | $39.00 | | $0 | $0 | $468 | $0 | $468 |
| **Subtotal** | | | | | | | $0 | $1,006 | $858 | $100 | $1,964 |
| Overhead on Labor Cost @ 30% | | | | | | | | | $257 | | $257 |
| G & A on Labor, Material, Equipment, & Subs Cost @ 10% | | | | | | | $0 | $101 | $86 | $10 | $196 |
| Tax on Materials and Equipment Cost @ 6% | | | | | | | | $60 | | $6 | $66 |
| **Total Direct Cost** | | | | | | | $0 | $1,167 | $1,201 | $116 | $2,484 |
| Indirects on Total Direct Cost @ 0% | | | | | | | | | | | $0 |
| Profit on Total Direct Cost @ 10% | | | | | | | | | | | $248 |
| **Subtotal** | | | | | | | | | | | $2,733 |
| Contingency on Total Field Cost @ 0% | | | | | | | | | | | $0 |
| Engineering on Total Field Cost @ 0% | | | | | | | | | | | $0 |
| **TOTAL COST** | | | | | | | | | | | **$2,733** |

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**ALTERNATIVE 2C: Areas of Concern, Select Surface and Shallow Subsurface MEC and Anomaly Removal**
**Present Worth Analysis**

| Year | Capital Cost | Annual Cost | Total Year Cost | Annual Discount Rate 2.3% | Present Worth |
|---|---|---|---|---|---|
| 0 | $1,756,737 | | $1,756,737 | 1.000 | $1,756,737 |
| 1 | $41,271 | $2,733 | $44,004 | 0.978 | $43,014 |
| 2 | $41,271 | $2,733 | $44,004 | 0.956 | $42,047 |
| 3 | $41,271 | $2,733 | $44,004 | 0.934 | $41,102 |
| 4 | $41,271 | $2,733 | $44,004 | 0.913 | $40,178 |
| 5 | $41,271 | $2,733 | $44,004 | 0.893 | $39,274 |
| 6 | | $2,733 | $2,733 | 0.872 | $2,384 |
| 7 | | $2,733 | $2,733 | 0.853 | $2,330 |
| 8 | | $2,733 | $2,733 | 0.834 | $2,278 |
| 9 | | $2,733 | $2,733 | 0.815 | $2,227 |
| 10 | $41,271 | $2,733 | $44,004 | 0.797 | $35,053 |
| 11 | | $2,733 | $2,733 | 0.779 | $2,128 |
| 12 | | $2,733 | $2,733 | 0.761 | $2,080 |
| 13 | | $2,733 | $2,733 | 0.744 | $2,033 |
| 14 | | $2,733 | $2,733 | 0.727 | $1,988 |
| 15 | | $2,733 | $2,733 | 0.711 | $1,943 |
| 16 | | $2,733 | $2,733 | 0.695 | $1,899 |
| 17 | | $2,733 | $2,733 | 0.679 | $1,856 |
| 18 | | $2,733 | $2,733 | 0.664 | $1,815 |
| 19 | | $2,733 | $2,733 | 0.649 | $1,774 |
| 20 | | $2,733 | $2,733 | 0.635 | $1,734 |
| 21 | | $2,733 | $2,733 | 0.620 | $1,695 |
| 22 | | $2,733 | $2,733 | 0.606 | $1,657 |
| 23 | | $2,733 | $2,733 | 0.593 | $1,620 |
| 24 | | $2,733 | $2,733 | 0.579 | $1,583 |
| 25 | | $2,733 | $2,733 | 0.566 | $1,548 |
| 26 | | $2,733 | $2,733 | 0.554 | $1,513 |
| 27 | | $2,733 | $2,733 | 0.541 | $1,479 |
| 28 | | $2,733 | $2,733 | 0.529 | $1,446 |
| 29 | | $2,733 | $2,733 | 0.517 | $1,413 |
| 30 | | $2,733 | $2,733 | 0.506 | $1,381 |
| | | | | **TOTAL PRESENT WORTH** | **$2,041,210** |

# ALTERNATIVE 3A

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 15
ALTERNATIVE 3A: All, Surface and Shallow Subsurface MEC and Anomaly Removal
CAPITAL COST

10/27/2011 11:23 AM

| Item | Quantity | Unit | Unit Cost Subcontract | Unit Cost Material | Unit Cost Labor | Unit Cost Equipment | Extended Cost Subcontract | Extended Cost Material | Extended Cost Labor | Extended Cost Equipment | Subtotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1 PROJECT PLANNING & DOCUMENTS** | | | | | | | | | | | |
| 1.1 Prepare Documents & Plans | 200 | hr | | | $39.00 | | $0 | $0 | $7,800 | $0 | $7,800 |
| 1.2 Prepare Permits | 300 | hr | | | $39.00 | | $0 | $0 | $11,700 | $0 | $11,700 |
| 1.3 Tortoise Survey | 1 | ls | | $2,620.00 | $4,680.00 | $500.00 | $0 | $2,620 | $4,680 | $500 | $7,800 |
| 1.4 Tortoise Relocation | 1 | ls | | $6,240.00 | $6,240.00 | $500.00 | $0 | $6,240 | $6,240 | $500 | $12,980 |
| 1.5 Wetland Verification | 1 | ls | | $3,120.00 | $1,011.00 | $250.00 | $0 | $3,120 | $1,011 | $250 | $4,381 |
| **2 MOBILIZATION AND DEMOBILIZATION** | | | | | | | | | | | |
| 2.1 Site Support Facilities (trailers, phone, electric, etc.) | 1 | ls | | $1,000.00 | | $3,500.00 | $0 | $1,000 | $0 | $3,500 | $4,500 |
| 2.2 Equipment Mobilization/Demobilization | 11 | ea | | | $183.00 | $518.00 | $0 | $0 | $2,013 | $5,698 | $7,711 |
| **3 FIELD SUPPORT AND SITE ACCESS** | | | | | | | | | | | |
| 3.1 Office Trailer | 3.0 | mo | | | | $360.00 | $0 | $0 | $0 | $1,080 | $1,080 |
| 3.2 Field Office Equipment, Utilities, & Support | 3.0 | mo | | $519.00 | | | $0 | $1,557 | $0 | $0 | $1,557 |
| 3.3 Storage Trailer | 3.0 | mo | | | | $94.00 | $0 | $0 | $0 | $282 | $282 |
| 3.4 Survey Support | 10 | day | $1,125.00 | | | | $11,250 | $0 | $0 | $0 | $11,250 |
| 3.5 Site Superintendent | 55 | day | | $131.00 | $420.00 | | $0 | $7,205 | $23,100 | $0 | $30,305 |
| 3.6 Site Health & Safety and QA/QC | 55 | day | | $131.00 | $370.00 | | $0 | $7,205 | $20,350 | $0 | $27,555 |
| 3.7 Truck Scale | 1 | mo | $2,895.00 | | | | $2,895 | $0 | $0 | $0 | $2,895 |
| **4 DECONTAMINATION** | | | | | | | | | | | |
| 4.1 Decontamination Services | 1.0 | mo | | $1,220.00 | $2,245.00 | $1,550.00 | $0 | $1,220 | $2,245 | $1,550 | $5,015 |
| 4.2 Equipment Decon Pad | 1 | ls | | $4,500.00 | $3,000.00 | $725.00 | $0 | $4,500 | $3,000 | $725 | $8,225 |
| 4.3 Decon Water | 1,000 | gal | | $0.20 | | | $0 | $200 | $0 | $0 | $200 |
| 4.4 Decon Water Storage Tank, 6,000 gallon | 1.0 | mo | | | | $780.00 | $0 | $0 | $0 | $780 | $780 |
| 4.5 Clean Water Storage Tank, 4,000 gallon | 1.0 | mo | | | | $702.00 | $0 | $0 | $0 | $702 | $702 |
| 4.6 Disposal of Decon Waste (liquid & solid) | 1.0 | mo | $985.00 | | | | $985 | $0 | $0 | $0 | $985 |
| **5 SITE PREPARATION** | | | | | | | | | | | |
| 5.1 Clearing - Brush Mowing (medium density) | 1.2 | ac | | | $242.00 | $196.00 | $0 | $0 | $290 | $235 | $526 |
| 5.2 Clearing/Chipping - Tree Removal - 12" dia. | 1.2 | ac | | | $2,500.00 | $1,875.00 | $0 | $0 | $3,000 | $2,250 | $5,250 |
| 5.3 Chipping Stumps | 230 | ea | | | $18.50 | $8.45 | $0 | $0 | $4,255 | $1,944 | $6,199 |
| 5.4 UXO Technician | 5 | day | | $131.00 | $370.00 | | $0 | $655 | $1,850 | $0 | $2,505 |
| **6 EXCAVATION, TRANSPORTATION AND DISPOSAL** | | | | | | | | | | | |
| 6.1 Dozer, 200 hp | 20 | day | | | $211.36 | $1,051.00 | $0 | $0 | $4,227 | $21,020 | $25,247 |
| 6.2 Excavator, 2.5 cy (2) | 40 | day | | | $211.36 | $1,613.00 | $0 | $0 | $8,454 | $64,520 | $72,974 |
| 6.3 Site Labor, (3 laborers) | 60 | day | | | $102.64 | | $0 | $0 | $6,158 | $0 | $6,158 |
| 6.4 Soil T & D Hazardous (subtitle C) | 10,000 | ton | $200.00 | | | | $2,000,000 | $0 | $0 | $0 | $2,000,000 |
| 6.5 Waste Characterization Test, 1 per 1000 cy | 7 | ea | $800.00 | $6.00 | $35.00 | | $5,600 | $42 | $245 | $0 | $5,887 |
| 6.6 Debris T & D, 13,100 lbs metal | 1 | ls | $425.00 | | | | $425 | $0 | $0 | $0 | $425 |
| **7 COVER AND RESTORATION** | | | | | | | | | | | |
| 7.1 Clean Backfill | 6,667 | cy | | $12.50 | | | $0 | $83,338 | $0 | $0 | $83,338 |
| 7.2 Dozer, 200 hp (2) | 20 | day | | | $211.36 | $1,051.00 | $0 | $0 | $4,227 | $21,020 | $25,247 |
| 7.3 Excavator, 2.5 cy | 10 | day | | | $211.36 | $1,613.00 | $0 | $0 | $2,114 | $16,130 | $18,244 |
| 7.4 Site Labor, (3 laborers) | 30 | day | | | $102.64 | | $0 | $0 | $3,079 | $0 | $3,079 |
| 7.5 Revegetation - soil nutrients | 309 | msf | $12.10 | | | | $3,739 | $0 | $0 | $0 | $3,739 |
| 7.6 Revegetation, hydro seed (grasses) | 309 | msf | $117.00 | | | | $36,153 | $0 | $0 | $0 | $36,153 |
| 7.7 Revegetation - wetland nutrients | 0.0 | msf | $14.55 | | | | $0 | $0 | $0 | $0 | $0 |
| 7.8 Wetland Soil | 0 | cy | | $23.00 | | | $0 | $0 | $0 | $0 | $0 |
| 7.9 Wetland Restoration | 0 | csf | $35.96 | | | | $0 | $0 | $0 | $0 | $0 |
| 7.10 Perimeter Signs | 6 | ea | | $69.50 | | | $0 | $417 | $0 | $0 | $417 |
| **8 POST CONSTRUCTION COST** | | | | | | | | | | | |
| 8.1 Contractor Completion Report | 150 | hr | | | $39.00 | | $0 | $0 | $5,850 | $0 | $5,850 |
| 8.2 Remedial Action Closeout Report | 200 | hr | | | $39.00 | | $0 | $0 | $7,800 | $0 | $7,800 |

| Item | Quantity | Unit | Unit Cost Subcontract | Unit Cost Material | Unit Cost Labor | Unit Cost Equipment | Extended Cost Subcontract | Extended Cost Material | Extended Cost Labor | Extended Cost Equipment | Subtotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Subtotal** | | | | | | | $2,061,047 | $119,319 | $133,689 | $142,686 | $2,456,741 |
| Overhead on Labor Cost @ 30% | | | | | | | | | $40,107 | | $40,107 |
| G & A on Labor, Material, Equipment, & Subs Cost @ 10% | | | | | | | $206,105 | $11,932 | $13,369 | $14,269 | $245,674 |
| Tax on Materials and Equipment Cost @ 6% | | | | | | | | $7,159 | | $8,561 | $15,720 |
| **Total Direct Cost** | | | | | | | $2,267,152 | $138,409 | $187,165 | $165,515 | $2,758,242 |
| Indirects on Total Direct Cost @ 25% | | | (excluding transportation and disposal cost) | | | | | | | | $189,208 |
| Profit on Total Direct Cost @ 10% | | | | | | | | | | | $275,824 |
| **Total Field Cost** | | | | | | | | | | | $3,223,274 |
| Contingency on Total Field Cost @ 10% | | | | | | | | | | | $322,327 |
| Engineering on Total Field Cost @ 4% | | | | | | | | | | | $128,931 |
| **TOTAL COST** | | | | | | | | | | | **$3,674,532** |

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 15
ALTERNATIVE 3A: All, Surface and Shallow Subsurface MEC and Anomaly Removal

**Alternative 3A and 3B**

| | | | | | Days | Hours | Man/Items | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Site Setup; Establish Grids | 169 Grids | Minor Brush | UXO | 6 | 10 | 2 | | |
| | RTK GPS | Sub meter accuracy | | Includes shipping | 8 | | 1 | 8 | $1,200.00 |
| | UXO Equipment | Magnetometer | | Includes shipping | 8 | | 1 | 8 | $300.00 |
| | GPS Operator | | | Includes Travel | 8 | 10 | 1 | 80 | $5,129.60 |
| | UXO Escort | | | Includes Travel | 8 | 10 | 1 | 80 | $5,929.60 |
| | | | | | | | | 160 hours total field time | |
| | | | | | | | | 30 management hours | $3,000.00 |
| | | | | | | | | | **$15,559.20** |
| | | | | | Days | Hours | Man/Items | | |
| 2 | Site Setup; Brush Cutting | 169 Grids | Minor Brush | UXO | 18 | 10 | 6 | | |
| | Chain Saw | Trees 2 Inch and smaller | | Includes Shipping | 20 | | 2 | 40 | $2,440.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | | Includes Shipping | 20 | | 2 | 40 | $1,840.00 |
| | Bush Hog | Majority of Area | | Includes Shipping | 20 | | 1 | 20 | $6,900.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 20 | | 2 | 40 | $1,500.00 |
| | UXO Technician | | | Includes Travel | 20 | 10 | 6 | 1200 | $88,944.00 |
| | | | | | | | | 1200 hours total field time | |
| | | | | | | | | 75 management hours | $7,500.00 |
| | | | | | | | | | **$109,124.00** |
| | | | | | Days | Hours | Man/Items | | |
| 3 | Visual & Detector Surveyes | 169 Grids | | UXO | 20 | 10 | 9 | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 22 | | 2 | 44 | $1,650.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 22 | | 4 | 88 | $3,300.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 22 | | 1 | 22 | $3,300.00 |
| | UXO Technician | | | Includes Travel | 22 | 10 | 9 | 1980 | $146,757.60 |
| | | | | | | | | 1980 hours total field time | |
| | | | | | | | | 75 management hours | $7,500.00 |
| | | | | | | | | | **$162,507.60** |
| | | | | | Days | Hours | Man/Items | | |
| 4 | Manual Remove & Treat Surf | 169 Grids | | UXO | 10 | 10 | 9 | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 5 | | 2 | 10 | $375.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 5 | | 4 | 20 | $750.00 |
| | MEC/MDEH Treatment | Donar Charge | | Includes Shipping | 5 | | 1 | 5 | $2,500.00 |
| | MDAS Certification | Drums | | Includes Shipping | 5 | | 7 | 35 | $23,750.00 |
| | Non-munitions Debris | Roll-off | | Includes Shipping | 1 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 5 | | 1 | 5 | $750.00 |
| | UXO Technician | | | Includes Travel | 10 | 10 | 9 | 900 | $66,708.00 |
| | | | | | | | | 900 hours total field time | |
| | | | | | | | | 100 management hours | $10,000.00 |
| | | | | | | | | | **$104,833.00** |
| | | | | | Days | Hours | Man/Items | | |
| 5 | Intrusive Investigation | 5070 Digs | | UXO | 85 | 10 | 9 | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | UXO Equipment | All-Metals | Shipping Included Above | 85 | | 2 | 170 | | $6,375.00 |
| | UXO Equipment | Magnetometer | Shipping Included Above | 85 | | 4 | 340 | | $12,750.00 |
| | UXO Supplies | Shovels etc. | Shipping Included Above | 85 | | 1 | 85 | | $2,125.00 |
| | Hand Held GPS | Sub Meter | Shipping Included Above | 85 | | 1 | 85 | | $12,750.00 |
| | UXO Technician | | Travel Included Above | 85 | 10 | 9 | 7650 | | $567,018.00 |
| | | | | | | | 7650 | hours total field time | |
| | | | | | | | 100 | management hours | $10,000.00 |
| | | | | | | | | | **$611,018.00** |
| | | | | Days | Hours | Man/Items | | | |
| 6 | Remove & Treat Subsurface | 5070 Digs | UXO | 4 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 4 | | 2 | 8 | | $300.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 4 | | 4 | 16 | | $600.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 4 | | 1 | 4 | | $2,000.00 |
| | MDAS Certification | Drums | Includes Shipping | 1 | | 2 | 2 | | $3,950.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 4 | | 1 | 4 | | $600.00 |
| | UXO Technician | | Includes Travel | 4 | 10 | 3 | 120 | | $8,894.40 |
| | | | | | | | 120 | hours total field time | |
| | | | | | | | 20 | management hours | $2,000.00 |
| | | | | | | | | | **$18,344.40** |
| | | | | Days | Hours | Man/Items | | | |
| 7 | Mechanical Excavation | 39 Grids | UXO | 8 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 8 | | 1 | 8 | | $300.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 8 | | 2 | 16 | | $600.00 |
| | Screeening Plant | Sift, Excavate, etc. | Includes Shipping | 1 | | 390,000 | 390000 | | $980,330.00 |
| | Backfill after sifting | Dozor, etc | Includes Shipping | 1 | | 8 | 8 | | $14,946.64 |
| | Construct Decon Pad | PPE, etc. | Includes Shipping | 1 | | 1 | 1 | | $2,000.00 |
| | UXO Technician | | Includes Travel | 8 | 10 | 3 | 240 | | $17,788.80 |
| | | | | | | | 240 | hours total field time | |
| | | | | | | | 40 | management hours | $4,000.00 |
| | | | | | | | | | **$1,019,965.44** |
| | | | | Days | Hours | Man/Items | | | |
| 8 | Remove & Treat Excavtion | 39 Grids | UXO | 9 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 10 | | 2 | 20 | | $750.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 10 | | 4 | 40 | | $1,500.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 10 | | 1 | 10 | | $5,000.00 |
| | MDAS Certification | Drums | Includes Shipping | 5 | | 6 | 30 | | $20,750.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 10 | | 1 | 10 | | $1,500.00 |
| | UXO Technician | | Includes Travel | 16 | 10 | 9 | 1440 | | $54,000.00 |
| | | | | | | | 1440 | hours total field time | |
| | | | | | | | 90 | management hours | $9,000.00 |
| | | | | | | | | | **$92,500.00** |
| | | | | Days | Hours | Man/Items | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 9 | Backfill After Sifting | 21 Grids | UXO | 4 | 10 | 9 | | | |
| | 210,000 Cubic Ft. | Dozor, etc | See 7 Above | 1 | | 21 | 21 | | $14,946.64 |
| | Construct Decon Pad | PPE, etc. | Includes Shipping | 1 | | 100 | 100 | | $2,000.00 |
| | UXO Technician | | Includes Travel | 4 | 10 | 3 | 120 | | $8,894.40 |
| | | | | | | | 120 | hours total field time | |
| | | | | | | | 40 | management hours | $4,000.00 |
| | | | | | | | | | **$29,841.04** |
| | | | | Days | Hours | Man/Items | | | |
| 10 | Step-out; Brush Cutting | 4 Grids Minor Brush | UXO | 2 | 10 | 6 | | | |
| | Chain Saw | Trees 2 Inch and smaller | Includes Shipping | 2 | | 2 | 4 | | $244.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | Includes Shipping | 2 | | 2 | 4 | | $184.00 |
| | Bush Hog | Majority of Area | Includes Shipping | 2 | | 1 | 2 | | $690.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 2 | | 2 | 4 | | $600.00 |
| | UXO Technician | | Includes Travel | 2 | 10 | 6 | 120 | | $4,500.00 |
| | | | | | | | 120 | hours total field time | |
| | | | | | | | 20 | management hours | $2,000.00 |
| | | | | | | | | | **$8,218.00** |
| | | | | Days | Hours | Man/Items | | | |
| | Visual & Detector Surveyes | 4 Grids | UXO | 2 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 2 | | 2 | 4 | | $150.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 2 | | 4 | 8 | | $300.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 2 | | 1 | 2 | | $300.00 |
| | UXO Technician | | Includes Travel | 2 | 10 | 9 | 180 | | $13,341.60 |
| | | | | | | | 180 | hours total field time | |
| | | | | | | | 20 | management hours | $2,000.00 |
| | | | | | | | | | **$16,091.60** |
| | | | | Days | Hours | Man/Items | | | |
| | Manual Remove & Treat Surf | 4 Grids | UXO | 3 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 2 | | 2 | 4 | | $150.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 2 | | 4 | 8 | | $300.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 1 | | 1 | 1 | | $500.00 |
| | MDAS Certification | Drums | Includes Shipping | 0 | | 6 | 0 | | $0.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 1 | | 1 | 1 | | $150.00 |
| | UXO Technician | | Includes Travel | 3 | 10 | 9 | 270 | | $20,012.40 |
| | | | | | | | 270 | hours total field time | |
| | | | | | | | 30 | management hours | $3,000.00 |
| | | | | | | | | | **$24,112.40** |
| | | | | Days | Hours | Man/Items | | | |
| | Intrusive Investigation | 100 Digs | UXO | 2 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Shipping Included Above | 2 | | 2 | 4 | | $150.00 |
| | UXO Equipment | Magnetometer | Shipping Included Above | 2 | | 4 | 8 | | $300.00 |
| | UXO Supplies | Shovels etc. | Shipping Included Above | 2 | | 1 | 2 | | $50.00 |
| | Hand Held GPS | Sub Meter | Shipping Included Above | 2 | | 1 | 2 | | $300.00 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | UXO Technician | | Travel Included Above | 2 | 10 | 9 | 180 | $13,341.60 |
| | | | | | | | 180 hours total field time | |
| | | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | | **$16,141.60** |
| | | | | Days | Hours | Man/Items | | |
| | Remove & Treat Subsurface | 100 Digs | UXO | 1 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 1 | | 2 | 2 | $75.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 1 | | 4 | 4 | $150.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 1 | | 1 | 1 | $500.00 |
| | MDAS Certification | Drums | Included above | 0 | | 0 | 0 | $0.00 |
| | Non-munitions Debris | Roll-off | Included above | 0 | | 100 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 1 | | 1 | 1 | $150.00 |
| | UXO Technician | | Includes Travel | 1 | 10 | 9 | 90 | $6,670.80 |
| | | | | | | | 90 hours total field time | |
| | | | | | | | 10 management hours | $1,000.00 |
| | | | | | | | | **$8,545.80** |
| | | | | Days | Hours | Man/Items | | |
| 11 | MEC/MDEH Treatment | 50 Items | UXO | 6 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 6 | | 2 | 12 | $450.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 6 | | 4 | 24 | $900.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 6 | | 1 | 6 | $3,000.00 |
| | MDAS Certification | Drums | Included above | 0 | | 0 | 0 | $0.00 |
| | Non-munitions Debris | Roll-off | Included above | 0 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 6 | | 1 | 6 | $900.00 |
| | UXO Technician | | Includes Travel | 6 | 10 | 9 | 540 | $40,024.80 |
| | | | | | | | 540 hours total field time | |
| | | | | | | | 60 management hours | $6,000.00 |
| | | | | | | | | **$51,274.80** |
| | | | | Days | Hours | Man/Items | | |
| 12 | MDAS Certification | 60 Drums | UXO | 11 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 0 | | 2 | 0 | $0.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 0 | | 4 | 0 | $0.00 |
| | MDAS Transportation | Drums | Includes Shipping | 11 | | 6 | 66 | $42,350.00 |
| | MDAS Certification | Drums | Includes Shipping | 11 | | 6 | 66 | $0.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| | UXO Technician | | Includes Travel | 11 | 10 | 3 | 330 | $24,459.60 |
| | | | | | | | 330 hours total field time | |
| | | | | | | | 30 management hours | $3,000.00 |
| | | | | | | | | **$69,809.60** |
| 13 | MC Sampling | | N/A | | | | | |

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 15
ALTERNATIVE 3A: All, Surface and Shallow Subsurface MEC and Anomaly Removal

| | | |
|---|---|---|
| 14 | Site Resteration | N/A |

| | |
|---|---|
| Initial Inspection Total Field Cost | $2,357,886.48 |
| Contingency on Total Field Cost @ 10% | $235,788.65 |
| Engineering on Total Field Cost @ 4% | $94,315.46 |
| **TOTAL COST** | **$2,687,990.59** |

| | | | | Days | Hours | Man/Items | | |
|---|---|---|---|---|---|---|---|---|
| | **Annual Inspections (years 1, 2, 3, 4, and 5)** | | | | | | | |
| 15 | Annual Inspections (Times 5) | Transects Minor Brush | UXO | 2 | 10 | 6 | | |
| | Chain Saw | Trees 2 Inch and smaller | Includes Shipping | 2 | | 2 | 4 | $244.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | Includes Shipping | 2 | | 2 | 4 | $184.00 |
| | Bush Hog | Majority of Area | Includes Shipping | 2 | | 1 | 2 | $690.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 2 | | 2 | 4 | $150.00 |
| | UXO Technician | | Includes Travel | 2 | 10 | 6 | 120 | $8,894.40 |
| | | | | | | | 120 hours total field time | |
| | | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | | **$12,162.40** |
| | | | | Days | Hours | Man/Items | | |
| | Visual & Detector Surveyes | Transects | UXO | 3 | 10 | 6 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 3 | | 2 | 6 | $225.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 3 | | 4 | 12 | $450.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 3 | | 1 | 3 | $450.00 |
| | UXO Technician | | Includes Travel | 3 | 10 | 6 | 180 | $13,341.60 |
| | | | | | | | 180 hours total field time | |
| | | | | | | | 30 management hours | $3,000.00 |
| | | | | | | | | **$17,466.60** |
| | | | | Days | Hours | Man/Items | | |
| | Manual Remove & Treat Surf | Transects | UXO | 1 | 10 | 3 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 0 | | 2 | 0 | $0.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 0 | | 4 | 0 | $0.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| | MDAS Certification | Drums | Includes Shipping | 1 | | 1 | 1 | $3,350.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 0 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| | UXO Technician | | Includes Travel | 1 | 10 | 3 | 30 | $2,223.60 |
| | | | | | | | 30 hours total field time | |
| | | | | | | | 10 management hours | $1,000.00 |
| | | | | | | | | **$6,573.60** |

| | |
|---|---|
| Annual Inspection Total Field Cost | $36,202.60 |
| Contingency on Total Field Cost @ 10% | $3,620.26 |
| Engineering on Total Field Cost @ 4% | $1,448.10 |
| **TOTAL COST** | **$41,270.96** |

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 15
ALTERNATIVE 3A: All, Surface and Shallow Subsurface MEC and Anomaly Removal

| | | | | | Days | Hours | Man/Items | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Five Year Inspections (year 10)** | | | | | | | | |
| 16 | 5 Year Inspection (Times 1) | Transects | Minor Brush | UXO | 2 | 10 | 6 | | |
| | Chain Saw | Trees 2 Inch and smaller | | Includes Shipping | 2 | | 2 | 4 | $244.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | | Includes Shipping | 2 | | 2 | 4 | $184.00 |
| | Bush Hog | Majority of Area | | Includes Shipping | 2 | | 1 | 2 | $690.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 2 | | 2 | 4 | $150.00 |
| | UXO Technician | | | Includes Travel | 2 | 10 | 6 | 120 | $8,894.40 |
| | | | | | | | | 120 hours total field time | |
| | | | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | | | **$12,162.40** |
| | | | | | Days | Hours | Man/Items | | |
| | Visual & Detector Surveyes | Transects | | UXO | 3 | 10 | 6 | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 3 | | 2 | 6 | $225.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 3 | | 4 | 12 | $450.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 3 | | 1 | 3 | $450.00 |
| | UXO Technician | | | Includes Travel | 3 | 10 | 6 | 180 | $13,341.60 |
| | | | | | | | | 180 hours total field time | |
| | | | | | | | | 30 management hours | $3,000.00 |
| | | | | | | | | | **$17,466.60** |
| | | | | | Days | Hours | Man/Items | | |
| | Manual Remove & Treat Surf | Transects | | UXO | 1 | 10 | 3 | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 0 | | 2 | 0 | $0.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 0 | | 4 | 0 | $0.00 |
| | MEC/MDEH Treatment | Donar Charge | | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| | MDAS Certification | Drums | | Includes Shipping | 1 | | 1 | 1 | $3,350.00 |
| | Non-munitions Debris | Roll-off | | Includes Shipping | 0 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| | UXO Technician | | | Includes Travel | 1 | 10 | 3 | 30 | $2,223.60 |
| | | | | | | | | 30 hours total field time | |
| | | | | | | | | 10 management hours | $1,000.00 |
| | | | | | | | | | **$6,573.60** |

| | |
|---|---|
| Five Year Inspection Total Field Cost | $36,202.60 |
| Contingency on Total Field Cost @ 10% | $3,620.26 |
| Engineering on Total Field Cost @ 4% | $1,448.10 |
| **TOTAL COST** | **$41,270.96** |

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**Public Education Program**
**Annual Costs**

| Item | Quantity | Unit | Unit Cost Subcontract | Unit Cost Material | Unit Cost Labor | Unit Cost Equipment | Extended Cost Subcontract | Extended Cost Material | Extended Cost Labor | Extended Cost Equipment | Subtotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1 PLANNING & REPORTS** | | | | | | | | | | | |
| 1.1 Prepare Documents & Plans | 10 | hr | | | $39.00 | | $0 | $0 | $390 | $0 | $390 |
| 1.2 Reports & Handouts | 1 | ls | | $225.00 | | | $0 | $225 | $0 | $0 | $225 |
| **2 MEETING IN JACKSONVILLE, FLORIDA** | | | | | | | | | | | |
| 2.1 Travel, air | 1 | ls | | $650.00 | | | $0 | $650 | $0 | $0 | $650 |
| 2.2 Per-diem | 1 | day | | $131.00 | | | $0 | $131 | $0 | $0 | $131 |
| 2.3 Car | 1 | day | | | | $100.00 | $0 | $0 | $0 | $100 | $100 |
| 2.4 Meeting | 12 | hr | | | $39.00 | | $0 | $0 | $468 | $0 | $468 |
| **Subtotal** | | | | | | | $0 | $1,006 | $858 | $100 | $1,964 |
| Overhead on Labor Cost @ 30% | | | | | | | | | $257 | | $257 |
| G & A on Labor, Material, Equipment, & Subs Cost @ 10% | | | | | | | $0 | $101 | $86 | $10 | $196 |
| Tax on Materials and Equipment Cost @ 6% | | | | | | | | $60 | | $6 | $66 |
| **Total Direct Cost** | | | | | | | $0 | $1,167 | $1,201 | $116 | $2,484 |
| Indirects on Total Direct Cost @ 0% | | | | | | | | | | | $0 |
| Profit on Total Direct Cost @ 10% | | | | | | | | | | | $248 |
| **Subtotal** | | | | | | | | | | | $2,733 |
| Contingency on Total Field Cost @ 0% | | | | | | | | | | | $0 |
| Engineering on Total Field Cost @ 0% | | | | | | | | | | | $0 |
| **TOTAL COST** | | | | | | | | | | | **$2,733** |

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**ALTERNATIVE 3A: All, Surface and Shallow Subsurface MEC and Anomaly Removal**
**Present Worth Analysis**

| Year | Capital Cost | Annual Cost | Total Year Cost | Annual Discount Rate 2.3% | Present Worth |
|---|---|---|---|---|---|
| 0 | $6,362,523 | | $6,362,523 | 1.000 | $6,362,523 |
| 1 | $41,271 | $2,733 | $44,004 | 0.978 | $43,014 |
| 2 | $41,271 | $2,733 | $44,004 | 0.956 | $42,047 |
| 3 | $41,271 | $2,733 | $44,004 | 0.934 | $41,102 |
| 4 | $41,271 | $2,733 | $44,004 | 0.913 | $40,178 |
| 5 | $41,271 | $2,733 | $44,004 | 0.893 | $39,274 |
| 6 | | $2,733 | $2,733 | 0.872 | $2,384 |
| 7 | | $2,733 | $2,733 | 0.853 | $2,330 |
| 8 | | $2,733 | $2,733 | 0.834 | $2,278 |
| 9 | | $2,733 | $2,733 | 0.815 | $2,227 |
| 10 | $41,271 | $2,733 | $44,004 | 0.797 | $35,053 |
| 11 | | $2,733 | $2,733 | 0.779 | $2,128 |
| 12 | | $2,733 | $2,733 | 0.761 | $2,080 |
| 13 | | $2,733 | $2,733 | 0.744 | $2,033 |
| 14 | | $2,733 | $2,733 | 0.727 | $1,988 |
| 15 | | $2,733 | $2,733 | 0.711 | $1,943 |
| 16 | | $2,733 | $2,733 | 0.695 | $1,899 |
| 17 | | $2,733 | $2,733 | 0.679 | $1,856 |
| 18 | | $2,733 | $2,733 | 0.664 | $1,815 |
| 19 | | $2,733 | $2,733 | 0.649 | $1,774 |
| 20 | | $2,733 | $2,733 | 0.635 | $1,734 |
| 21 | | $2,733 | $2,733 | 0.620 | $1,695 |
| 22 | | $2,733 | $2,733 | 0.606 | $1,657 |
| 23 | | $2,733 | $2,733 | 0.593 | $1,620 |
| 24 | | $2,733 | $2,733 | 0.579 | $1,583 |
| 25 | | $2,733 | $2,733 | 0.566 | $1,548 |
| 26 | | $2,733 | $2,733 | 0.554 | $1,513 |
| 27 | | $2,733 | $2,733 | 0.541 | $1,479 |
| 28 | | $2,733 | $2,733 | 0.529 | $1,446 |
| 29 | | $2,733 | $2,733 | 0.517 | $1,413 |
| 30 | | $2,733 | $2,733 | 0.506 | $1,381 |

**TOTAL PRESENT WORTH $6,646,995**

# ALTERNATIVE 3B

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**ALTERNATIVE 3B: All, Surface and Shallow Subsurface MEC and Anomaly Removal**
**CAPITAL COST**

4/30/2012 11:06 AM

| | | | Unit Cost | | | | Extended Cost | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Item | Quantity | Unit | Subcontract | Material | Labor | Equipment | Subcontract | Material | Labor | Equipment | Subtotal |
| **1 PROJECT PLANNING & DOCUMENTS** | | | | | | | | | | | |
| 1.1 Prepare Documents & Plans | 200 | hr | | | $39.00 | | $0 | $0 | $7,800 | $0 | $7,800 |
| 1.2 Prepare Permits | 300 | hr | | | $39.00 | | $0 | $0 | $11,700 | $0 | $11,700 |
| 1.3 Tortoise Survey | 1 | ls | | $2,620.00 | $4,680.00 | $500.00 | $0 | $2,620 | $4,680 | $500 | $7,800 |
| 1.4 Tortoise Relocation | 1 | ls | | $6,240.00 | $6,240.00 | $500.00 | $0 | $6,240 | $6,240 | $500 | $12,980 |
| 1.5 Wetland Verification | 1 | ls | | $3,120.00 | $1,011.00 | $250.00 | $0 | $3,120 | $1,011 | $250 | $4,381 |
| **2 MOBILIZATION AND DEMOBILIZATION** | | | | | | | | | | | |
| 2.1 Site Support Facilities (trailers, phone, electric, etc.) | 1 | ls | | $1,000.00 | | $3,500.00 | $0 | $1,000 | $0 | $3,500 | $4,500 |
| 2.2 Equipment Mobilization/Demobilization | 11 | ea | | | $183.00 | $518.00 | $0 | $0 | $2,013 | $5,698 | $7,711 |
| **3 FIELD SUPPORT AND SITE ACCESS** | | | | | | | | | | | |
| 3.1 Office Trailer | 3.0 | mo | | | | $360.00 | $0 | $0 | $0 | $1,080 | $1,080 |
| 3.2 Field Office Equipment, Utilities, & Support | 3.0 | mo | | $519.00 | | | $0 | $1,557 | $0 | $0 | $1,557 |
| 3.3 Storage Trailer | 3.0 | mo | | | | $94.00 | $0 | $0 | $0 | $282 | $282 |
| 3.4 Survey Support | 5 | day | $1,125.00 | | | | $5,625 | $0 | $0 | $0 | $5,625 |
| 3.5 Site Superintendent | 60 | day | | $131.00 | $420.00 | | $0 | $7,860 | $25,200 | $0 | $33,060 |
| 3.6 Site Health & Safety and QA/QC | 60 | day | | $131.00 | $370.00 | | $0 | $7,860 | $22,200 | $0 | $30,060 |
| 3.7 Truck Scale | 1 | mo | $2,895.00 | | | | $2,895 | $0 | $0 | $0 | $2,895 |
| **4 DECONTAMINATION** | | | | | | | | | | | |
| 4.1 Decontamination Services | 2.0 | mo | | $1,220.00 | $2,245.00 | $1,550.00 | $0 | $2,440 | $4,490 | $3,100 | $10,030 |
| 4.2 Equipment Decon Pad | 1 | ls | | $4,500.00 | $3,000.00 | $725.00 | $0 | $4,500 | $3,000 | $725 | $8,225 |
| 4.3 Decon Water | 2,000 | gal | | $0.20 | | | $0 | $400 | $0 | $0 | $400 |
| 4.4 Decon Water Storage Tank, 6,000 gallon | 2.0 | mo | | | | $780.00 | $0 | $0 | $0 | $1,560 | $1,560 |
| 4.5 Clean Water Storage Tank, 4,000 gallon | 2.0 | mo | | | | $702.00 | $0 | $0 | $0 | $1,404 | $1,404 |
| 4.6 Disposal of Decon Waste (liquid & solid) | 2.0 | mo | $985.00 | | | | $1,970 | $0 | $0 | $0 | $1,970 |
| **5 SITE PREPARATION** | | | | | | | | | | | |
| 5.1 Clearing - Brush Mowing (medium density) | 1.2 | ac | | | $242.00 | $196.00 | $0 | $0 | $290 | $235 | $526 |
| 5.2 Clearing/Chipping - Tree Removal - 12" dia. | 1.2 | ac | | | $2,500.00 | $1,875.00 | $0 | $0 | $3,000 | $2,250 | $5,250 |
| 5.3 Chipping Stumps | 230 | ea | | | $18.50 | $8.45 | $0 | $0 | $4,255 | $1,944 | $6,199 |
| 5.4 UXO Technician | 5 | day | | $131.00 | $370.00 | | $0 | $655 | $1,850 | $0 | $2,505 |
| **6 IN-PLACEMENT TREATMENT AND DISPOSAL** | | | | | | | | | | | |
| 6.1 Front End Loader, 4 cy | 10 | day | | | $211.36 | $598.60 | $0 | $0 | $2,114 | $5,986 | $8,100 |
| 6.2 Dozer, 200 hp | 10 | day | | | $211.36 | $1,051.00 | $0 | $0 | $2,114 | $10,510 | $12,624 |
| 6.3 Mixing Disc | 10 | day | | | | $110.00 | $0 | $0 | $0 | $1,100 | $1,100 |
| 6.4 Skid-Steer, 78 hp | 10 | day | | | | $261.20 | $0 | $0 | $0 | $2,612 | $2,612 |
| 6.5 Tiller | 10 | day | | | | $115.00 | $0 | $0 | $0 | $1,150 | $1,150 |
| 6.6 Site Labor, (3 laborers) | 30 | day | | | $102.64 | | $0 | $0 | $3,079 | $0 | $3,079 |
| 6.7 Stabilization Material (FF-100) | 500 | ton | | $430.00 | | | $0 | $215,000 | $0 | $0 | $215,000 |
| 6.8 Vendor's Assistance, 3 days | 1 | ls | $3,190.00 | | | | $3,190 | $0 | $0 | $0 | $3,190 |
| 6.9 Dozer, 200 hp | 20 | day | | | $211.36 | $1,051.00 | $0 | $0 | $4,227 | $21,020 | $25,247 |
| 6.10 Excavator, 2.5 cy (2) | 40 | day | | | $211.36 | $1,613.00 | $0 | $0 | $8,454 | $64,520 | $72,974 |
| 6.11 Site Labor, (3 laborers) | 60 | day | | | $102.64 | | $0 | $0 | $6,158 | $0 | $6,158 |
| 6.12 Soil T & D Non-Hazardous (subtitle D) | 10,000 | ton | $85.00 | | | | $850,000 | $0 | $0 | $0 | $850,000 |
| 6.13 Waste Characterization Test, 1 per 1000 cy | 7 | ea | $800.00 | $6.00 | $35.00 | | $5,600 | $42 | $245 | $0 | $5,887 |
| 6.14 Debris T & D, 11,200 lbs metal | 1 | ls | $400.00 | | | | $400 | $0 | $0 | $0 | $400 |
| **7 BACKFILL AND RESTORATION** | | | | | | | | | | | |
| 7.1 Clean Backfill | 6,667 | cy | | $12.50 | | | $0 | $83,338 | $0 | $0 | $83,338 |
| 7.2 Dozer, 200 hp (2) | 20 | day | | | $211.36 | $1,051.00 | $0 | $0 | $4,227 | $21,020 | $25,247 |
| 7.3 Excavator, 2.5 cy | 10 | day | | | $211.36 | $1,613.00 | $0 | $0 | $2,114 | $16,130 | $18,244 |
| 7.4 Site Labor, (3 laborers) | 30 | day | | | $102.64 | | $0 | $0 | $3,079 | $0 | $3,079 |

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**ALTERNATIVE 3B: All, Surface and Shallow Subsurface MEC and Anomaly Removal**
**CAPITAL COST**

| Item | Quantity | Unit | Unit Cost Subcontract | Unit Cost Material | Unit Cost Labor | Unit Cost Equipment | Extended Cost Subcontract | Extended Cost Material | Extended Cost Labor | Extended Cost Equipment | Subtotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.5 Revegetation - soil nutrients | 309 | msf | $12.10 | | | | $3,739 | $0 | $0 | $0 | $3,739 |
| 7.6 Revegetation, hydro seed (grasses) | 309 | msf | $117.00 | | | | $36,153 | $0 | $0 | $0 | $36,153 |
| 7.7 Revegetation - wetland nutrients | 0.0 | msf | $14.55 | | | | $0 | $0 | $0 | $0 | $0 |
| 7.8 Wetland Soil | 0 | cy | | $23.00 | | | $0 | $0 | $0 | $0 | $0 |
| 7.9 Wetland Restoration | 0 | csf | $35.96 | | | | $0 | $0 | $0 | $0 | $0 |
| 7.10 Perimeter Signs | 6 | ea | | $69.50 | | | $0 | $417 | $0 | $0 | $417 |
| **8 POST CONSTRUCTION COST** | | | | | | | | | | | |
| 8.1 Contractor Completion Report | 150 | hr | | | $39.00 | | $0 | $0 | $5,850 | $0 | $5,850 |
| 8.2 Remedial Action Closeout Report | 200 | hr | | | $39.00 | | $0 | $0 | $7,800 | $0 | $7,800 |
| **Subtotal** | | | | | | | $909,572 | $337,049 | $147,191 | $167,076 | $1,560,887 |
| Overhead on Labor Cost @ 30% | | | | | | | | | $44,157 | | $44,157 |
| G & A on Labor, Material, Equipment, & Subs Cost @ 10% | | | | | | | $90,957 | $33,705 | $14,719 | $16,708 | $156,089 |
| Tax on Materials and Equipment Cost @ 6% | | | | | | | | $20,223 | | $10,025 | $30,247 |
| **Total Direct Cost** | | | | | | | $1,000,529 | $390,976 | $206,067 | $193,808 | $1,791,380 |
| Indirects on Total Direct Cost @ 35% | | | (excluding transportation and disposal cost) | | | | | | | | $328,654 |
| Profit on Total Direct Cost @ 10% | | | | | | | | | | | $179,138 |
| **Total Field Cost** | | | | | | | | | | | $2,299,172 |
| Contingency on Total Field Cost @ 20% | | | | | | | | | | | $459,834 |
| Engineering on Total Field Cost @ 6% | | | | | | | | | | | $137,950 |
| **TOTAL COST** | | | | | | | | | | | **$2,896,957** |

**Alternative 3A and 3B**

| | | | | | Days | Hours | Man/Items | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Site Setup; Establish Grids | 169 Grids | Minor Brush | UXO | 6 | 10 | 2 | | | |
| | RTK GPS | Sub meter accuracy | | Includes shipping | 8 | | 1 | 8 | | $1,200.00 |
| | UXO Equipment | Magnetometer | | Includes shipping | 8 | | 1 | 8 | | $300.00 |
| | GPS Operator | | | Includes Travel | 8 | 10 | 1 | 80 | | $5,129.60 |
| | UXO Escort | | | Includes Travel | 8 | 10 | 1 | 80 | | $5,929.60 |
| | | | | | | | | 160 | hours total field time | |
| | | | | | | | | 30 | management hours | $3,000.00 |
| | | | | | | | | | | **$15,559.20** |
| | | | | | Days | Hours | Man/Items | | | |
| 2 | Site Setup; Brush Cutting | 169 Grids | Minor Brush | UXO | 18 | 10 | 6 | | | |
| | Chain Saw | Trees 2 Inch and smaller | | Includes Shipping | 20 | | 2 | 40 | | $2,440.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | | Includes Shipping | 20 | | 2 | 40 | | $1,840.00 |
| | Bush Hog | Majority of Area | | Includes Shipping | 20 | | 1 | 20 | | $6,900.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 20 | | 2 | 40 | | $1,500.00 |
| | UXO Technician | | | Includes Travel | 20 | 10 | 6 | 1200 | | $88,944.00 |
| | | | | | | | | 1200 | hours total field time | |
| | | | | | | | | 75 | management hours | $7,500.00 |
| | | | | | | | | | | **$109,124.00** |
| | | | | | Days | Hours | Man/Items | | | |
| 3 | Visual & Detector Surveyes | 169 Grids | | UXO | 20 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 22 | | 2 | 44 | | $1,650.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 22 | | 4 | 88 | | $3,300.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 22 | | 1 | 22 | | $3,300.00 |
| | UXO Technician | | | Includes Travel | 22 | 10 | 9 | 1980 | | $146,757.60 |
| | | | | | | | | 1980 | hours total field time | |
| | | | | | | | | 75 | management hours | $7,500.00 |
| | | | | | | | | | | **$162,507.60** |
| | | | | | Days | Hours | Man/Items | | | |
| 4 | Manual Remove & Treat Surf | 169 Grids | | UXO | 10 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 5 | | 2 | 10 | | $375.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 5 | | 4 | 20 | | $750.00 |
| | MEC/MDEH Treatment | Donar Charge | | Includes Shipping | 5 | | 1 | 5 | | $2,500.00 |
| | MDAS Certification | Drums | | Includes Shipping | 5 | | 7 | 35 | | $23,750.00 |
| | Non-munitions Debris | Roll-off | | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 5 | | 1 | 5 | | $750.00 |
| | UXO Technician | | | Includes Travel | 10 | 10 | 9 | 900 | | $66,708.00 |
| | | | | | | | | 900 | hours total field time | |
| | | | | | | | | 100 | management hours | $10,000.00 |
| | | | | | | | | | | **$104,833.00** |
| | | | | | Days | Hours | Man/Items | | | |
| 5 | Intrusive Investigation | 5070 Digs | | UXO | 85 | 10 | 9 | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | UXO Equipment | All-Metals | Shipping Included Above | 85 | | 2 | 170 | | $6,375.00 |
| | UXO Equipment | Magnetometer | Shipping Included Above | 85 | | 4 | 340 | | $12,750.00 |
| | UXO Supplies | Shovels etc. | Shipping Included Above | 85 | | 1 | 85 | | $2,125.00 |
| | Hand Held GPS | Sub Meter | Shipping Included Above | 85 | | 1 | 85 | | $12,750.00 |
| | UXO Technician | | Travel Included Above | 85 | 10 | 9 | 7650 | | $567,018.00 |
| | | | | | | | 7650 | hours total field time | |
| | | | | | | | 100 | management hours | $10,000.00 |
| | | | | | | | | | **$611,018.00** |
| | | | | Days | Hours | Man/Items | | | |
| 6 | Remove & Treat Subsurface | 5070 Digs | UXO | 4 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 4 | | 2 | 8 | | $300.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 4 | | 4 | 16 | | $600.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 4 | | 1 | 4 | | $2,000.00 |
| | MDAS Certification | Drums | Includes Shipping | 1 | | 2 | 2 | | $3,950.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 4 | | 1 | 4 | | $600.00 |
| | UXO Technician | | Includes Travel | 4 | 10 | 3 | 120 | | $8,894.40 |
| | | | | | | | 120 | hours total field time | |
| | | | | | | | 20 | management hours | $2,000.00 |
| | | | | | | | | | **$18,344.40** |
| | | | | Days | Hours | Man/Items | | | |
| 7 | Mechanical Excavation | 39 Grids | UXO | 8 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 8 | | 1 | 8 | | $300.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 8 | | 2 | 16 | | $600.00 |
| | Screeening Plant | Sift, Excavate, etc. | Includes Shipping | 1 | | 390,000 | 390000 | | $980,330.00 |
| | Backfill after sifting | Dozor, etc | Includes Shipping | 1 | | 8 | 8 | | $14,946.64 |
| | Construct Decon Pad | PPE, etc. | Includes Shipping | 1 | | 1 | 1 | | $2,000.00 |
| | UXO Technician | | Includes Travel | 8 | 10 | 3 | 240 | | $17,788.80 |
| | | | | | | | 240 | hours total field time | |
| | | | | | | | 40 | management hours | $4,000.00 |
| | | | | | | | | | **$1,019,965.44** |
| | | | | Days | Hours | Man/Items | | | |
| 8 | Remove & Treat Excavtion | 39 Grids | UXO | 9 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 10 | | 2 | 20 | | $750.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 10 | | 4 | 40 | | $1,500.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 10 | | 1 | 10 | | $5,000.00 |
| | MDAS Certification | Drums | Includes Shipping | 5 | | 6 | 30 | | $20,750.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 10 | | 1 | 10 | | $1,500.00 |
| | UXO Technician | | Includes Travel | 16 | 10 | 9 | 1440 | | $54,000.00 |
| | | | | | | | 1440 | hours total field time | |
| | | | | | | | 90 | management hours | $9,000.00 |
| | | | | | | | | | **$92,500.00** |
| | | | | Days | Hours | Man/Items | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 9 | Backfill After Sifting | 21 Grids | UXO | 4 | 10 | 9 | | | |
| | 210,000 Cubic Ft. | Dozor, etc | See 7 Above | 1 | | 21 | 21 | | $14,946.64 |
| | Construct Decon Pad | PPE, etc. | Includes Shipping | 1 | | 100 | 100 | | $2,000.00 |
| | UXO Technician | | Includes Travel | 4 | 10 | 3 | 120 | | $8,894.40 |
| | | | | | | | 120 | hours total field time | |
| | | | | | | | 40 | management hours | $4,000.00 |
| | | | | | | | | | **$29,841.04** |
| | | | | Days | Hours | Man/Items | | | |
| 10 | Step-out; Brush Cutting | 4 Grids Minor Brush | UXO | 2 | 10 | 6 | | | |
| | Chain Saw | Trees 2 Inch and smaller | Includes Shipping | 2 | | 2 | 4 | | $244.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | Includes Shipping | 2 | | 2 | 4 | | $184.00 |
| | Bush Hog | Majority of Area | Includes Shipping | 2 | | 1 | 2 | | $690.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 2 | | 2 | 4 | | $600.00 |
| | UXO Technician | | Includes Travel | 2 | 10 | 6 | 120 | | $4,500.00 |
| | | | | | | | 120 | hours total field time | |
| | | | | | | | 20 | management hours | $2,000.00 |
| | | | | | | | | | **$8,218.00** |
| | | | | Days | Hours | Man/Items | | | |
| | Visual & Detector Surveyes | 4 Grids | UXO | 2 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 2 | | 2 | 4 | | $150.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 2 | | 4 | 8 | | $300.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 2 | | 1 | 2 | | $300.00 |
| | UXO Technician | | Includes Travel | 2 | 10 | 9 | 180 | | $13,341.60 |
| | | | | | | | 180 | hours total field time | |
| | | | | | | | 20 | management hours | $2,000.00 |
| | | | | | | | | | **$16,091.60** |
| | | | | Days | Hours | Man/Items | | | |
| | Manual Remove & Treat Surf | 4 Grids | UXO | 3 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 2 | | 2 | 4 | | $150.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 2 | | 4 | 8 | | $300.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 1 | | 1 | 1 | | $500.00 |
| | MDAS Certification | Drums | Includes Shipping | 0 | | 6 | 0 | | $0.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 1 | | 1 | 1 | | $150.00 |
| | UXO Technician | | Includes Travel | 3 | 10 | 9 | 270 | | $20,012.40 |
| | | | | | | | 270 | hours total field time | |
| | | | | | | | 30 | management hours | $3,000.00 |
| | | | | | | | | | **$24,112.40** |
| | | | | Days | Hours | Man/Items | | | |
| | Intrusive Investigation | 100 Digs | UXO | 2 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Shipping Included Above | 2 | | 2 | 4 | | $150.00 |
| | UXO Equipment | Magnetometer | Shipping Included Above | 2 | | 4 | 8 | | $300.00 |
| | UXO Supplies | Shovels etc. | Shipping Included Above | 2 | | 1 | 2 | | $50.00 |
| | Hand Held GPS | Sub Meter | Shipping Included Above | 2 | | 1 | 2 | | $300.00 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | UXO Technician | | Travel Included Above | 2 | 10 | 9 | 180 | $13,341.60 |
| | | | | | | | 180 hours total field time | |
| | | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | | **$16,141.60** |
| | | | | Days | Hours | Man/Items | | |
| | Remove & Treat Subsurface | 100 Digs | UXO | 1 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 1 | | 2 | 2 | $75.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 1 | | 4 | 4 | $150.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 1 | | 1 | 1 | $500.00 |
| | MDAS Certification | Drums | Included above | 0 | | 0 | 0 | $0.00 |
| | Non-munitions Debris | Roll-off | Included above | 0 | | 100 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 1 | | 1 | 1 | $150.00 |
| | UXO Technician | | Includes Travel | 1 | 10 | 9 | 90 | $6,670.80 |
| | | | | | | | 90 hours total field time | |
| | | | | | | | 10 management hours | $1,000.00 |
| | | | | | | | | **$8,545.80** |
| | | | | Days | Hours | Man/Items | | |
| 11 | MEC/MDEH Treatment | 50 Items | UXO | 6 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 6 | | 2 | 12 | $450.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 6 | | 4 | 24 | $900.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 6 | | 1 | 6 | $3,000.00 |
| | MDAS Certification | Drums | Included above | 0 | | 0 | 0 | $0.00 |
| | Non-munitions Debris | Roll-off | Included above | 0 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 6 | | 1 | 6 | $900.00 |
| | UXO Technician | | Includes Travel | 6 | 10 | 9 | 540 | $40,024.80 |
| | | | | | | | 540 hours total field time | |
| | | | | | | | 60 management hours | $6,000.00 |
| | | | | | | | | **$51,274.80** |
| | | | | Days | Hours | Man/Items | | |
| 12 | MDAS Certification | 60 Drums | UXO | 11 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 0 | | 2 | 0 | $0.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 0 | | 4 | 0 | $0.00 |
| | MDAS Transportation | Drums | Includes Shipping | 11 | | 6 | 66 | $42,350.00 |
| | MDAS Certification | Drums | Includes Shipping | 11 | | 6 | 66 | $0.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| | UXO Technician | | Includes Travel | 11 | 10 | 3 | 330 | $24,459.60 |
| | | | | | | | 330 hours total field time | |
| | | | | | | | 30 management hours | $3,000.00 |
| | | | | | | | | **$69,809.60** |
| 13 | MC Sampling | | N/A | | | | | |

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 15
ALTERNATIVE 3B: All, Surface and Shallow Subsurface MEC and Anomaly Removal

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 14 | Site Resteration | | N/A | | | | | |

| | |
|---|---|
| Initial Inspection Total Field Cost | $2,357,886.48 |
| Contingency on Total Field Cost @ 10% | $235,788.65 |
| Engineering on Total Field Cost @ 4% | $94,315.46 |
| **TOTAL COST** | **$2,687,990.59** |

| | | | | Days | Hours | Man/Items | | |
|---|---|---|---|---|---|---|---|---|
| | **Annual Inspections (years 1, 2, 3, 4, and 5)** | | | | | | | |
| 15 | Annual Inspections (Times 5) | Transects Minor Brush | UXO | 2 | 10 | 6 | | |
| | Chain Saw | Trees 2 Inch and smaller | Includes Shipping | 2 | | 2 | 4 | $244.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | Includes Shipping | 2 | | 2 | 4 | $184.00 |
| | Bush Hog | Majority of Area | Includes Shipping | 2 | | 1 | 2 | $690.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 2 | | 2 | 4 | $150.00 |
| | UXO Technician | | Includes Travel | 2 | 10 | 6 | 120 | $8,894.40 |
| | | | | | | | 120 hours total field time | |
| | | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | | **$12,162.40** |
| | | | | Days | Hours | Man/Items | | |
| | Visual & Detector Surveyes | Transects | UXO | 3 | 10 | 6 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 3 | | 2 | 6 | $225.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 3 | | 4 | 12 | $450.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 3 | | 1 | 3 | $450.00 |
| | UXO Technician | | Includes Travel | 3 | 10 | 6 | 180 | $13,341.60 |
| | | | | | | | 180 hours total field time | |
| | | | | | | | 30 management hours | $3,000.00 |
| | | | | | | | | **$17,466.60** |
| | | | | Days | Hours | Man/Items | | |
| | Manual Remove & Treat Surf | Transects | UXO | 1 | 10 | 3 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 0 | | 2 | 0 | $0.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 0 | | 4 | 0 | $0.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| | MDAS Certification | Drums | Includes Shipping | 1 | | 1 | 1 | $3,350.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 0 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| | UXO Technician | | Includes Travel | 1 | 10 | 3 | 30 | $2,223.60 |
| | | | | | | | 30 hours total field time | |
| | | | | | | | 10 management hours | $1,000.00 |
| | | | | | | | | **$6,573.60** |

| | |
|---|---|
| Annual Inspection Total Field Cost | $36,202.60 |
| Contingency on Total Field Cost @ 10% | $3,620.26 |
| Engineering on Total Field Cost @ 4% | $1,448.10 |
| **TOTAL COST** | **$41,270.96** |

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 15
ALTERNATIVE 3B: All, Surface and Shallow Subsurface MEC and Anomaly Removal

| | | | | | Days | Hours | Man/Items | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Five Year Inspections (year 10)** | | | | | | | | |
| 16 | 5 Year Inspection (Times 1) | Transects | Minor Brush | UXO | 2 | 10 | 6 | | |
| | Chain Saw | Trees 2 Inch and smaller | | Includes Shipping | 2 | | 2 | 4 | $244.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | | Includes Shipping | 2 | | 2 | 4 | $184.00 |
| | Bush Hog | Majority of Area | | Includes Shipping | 2 | | 1 | 2 | $690.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 2 | | 2 | 4 | $150.00 |
| | UXO Technician | | | Includes Travel | 2 | 10 | 6 | 120 | $8,894.40 |
| | | | | | | | | 120 hours total field time | |
| | | | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | | | **$12,162.40** |
| | | | | | Days | Hours | Man/Items | | |
| | Visual & Detector Surveyes | Transects | | UXO | 3 | 10 | 6 | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 3 | | 2 | 6 | $225.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 3 | | 4 | 12 | $450.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 3 | | 1 | 3 | $450.00 |
| | UXO Technician | | | Includes Travel | 3 | 10 | 6 | 180 | $13,341.60 |
| | | | | | | | | 180 hours total field time | |
| | | | | | | | | 30 management hours | $3,000.00 |
| | | | | | | | | | **$17,466.60** |
| | | | | | Days | Hours | Man/Items | | |
| | Manual Remove & Treat Surf | Transects | | UXO | 1 | 10 | 3 | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 0 | | 2 | 0 | $0.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 0 | | 4 | 0 | $0.00 |
| | MEC/MDEH Treatment | Donar Charge | | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| | MDAS Certification | Drums | | Includes Shipping | 1 | | 1 | 1 | $3,350.00 |
| | Non-munitions Debris | Roll-off | | Includes Shipping | 0 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| | UXO Technician | | | Includes Travel | 1 | 10 | 3 | 30 | $2,223.60 |
| | | | | | | | | 30 hours total field time | |
| | | | | | | | | 10 management hours | $1,000.00 |
| | | | | | | | | | **$6,573.60** |

| | |
|---|---|
| Five Year Inspection Total Field Cost | $36,202.60 |
| Contingency on Total Field Cost @ 10% | $3,620.26 |
| Engineering on Total Field Cost @ 4% | $1,448.10 |
| **TOTAL COST** | **$41,270.96** |

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**Public Education Program**
**Annual Costs**

| Item | Quantity | Unit | Unit Cost Subcontract | Unit Cost Material | Unit Cost Labor | Unit Cost Equipment | Extended Cost Subcontract | Extended Cost Material | Extended Cost Labor | Extended Cost Equipment | Subtotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1 PLANNING & REPORTS** | | | | | | | | | | | |
| 1.1 Prepare Documents & Plans | 10 | hr | | | $39.00 | | $0 | $0 | $390 | $0 | $390 |
| 1.2 Reports & Handouts | 1 | ls | | $225.00 | | | $0 | $225 | $0 | $0 | $225 |
| **2 MEETING IN JACKSONVILLE, FLORIDA** | | | | | | | | | | | |
| 2.1 Travel, air | 1 | ls | | $650.00 | | | $0 | $650 | $0 | $0 | $650 |
| 2.2 Per-diem | 1 | day | | $131.00 | | | $0 | $131 | $0 | $0 | $131 |
| 2.3 Car | 1 | day | | | | $100.00 | $0 | $0 | $0 | $100 | $100 |
| 2.4 Meeting | 12 | hr | | | $39.00 | | $0 | $0 | $468 | $0 | $468 |
| **Subtotal** | | | | | | | $0 | $1,006 | $858 | $100 | $1,964 |
| Overhead on Labor Cost @ 30% | | | | | | | | | $257 | | $257 |
| G & A on Labor, Material, Equipment, & Subs Cost @ 10% | | | | | | | $0 | $101 | $86 | $10 | $196 |
| Tax on Materials and Equipment Cost @ 6% | | | | | | | | $60 | | $6 | $66 |
| **Total Direct Cost** | | | | | | | $0 | $1,167 | $1,201 | $116 | $2,484 |
| Indirects on Total Direct Cost @ 0% | | | | | | | | | | | $0 |
| Profit on Total Direct Cost @ 10% | | | | | | | | | | | $248 |
| **Subtotal** | | | | | | | | | | | $2,733 |
| Contingency on Total Field Cost @ 0% | | | | | | | | | | | $0 |
| Engineering on Total Field Cost @ 0% | | | | | | | | | | | $0 |
| **TOTAL COST** | | | | | | | | | | | **$2,733** |

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**ALTERNATIVE 3B: All, Surface and Shallow Subsurface MEC and Anomaly Removal**
**Present Worth Analysis**

| Year | Capital Cost | Annual Cost | Total Year Cost | Annual Discount Rate 2.3% | Present Worth |
|---|---|---|---|---|---|
| 0 | $5,584,947 | | $5,584,947 | 1.000 | $5,584,947 |
| 1 | $41,271 | $2,733 | $44,004 | 0.978 | $43,014 |
| 2 | $41,271 | $2,733 | $44,004 | 0.956 | $42,047 |
| 3 | $41,271 | $2,733 | $44,004 | 0.934 | $41,102 |
| 4 | $41,271 | $2,733 | $44,004 | 0.913 | $40,178 |
| 5 | $41,271 | $2,733 | $44,004 | 0.893 | $39,274 |
| 6 | | $2,733 | $2,733 | 0.872 | $2,384 |
| 7 | | $2,733 | $2,733 | 0.853 | $2,330 |
| 8 | | $2,733 | $2,733 | 0.834 | $2,278 |
| 9 | | $2,733 | $2,733 | 0.815 | $2,227 |
| 10 | $41,271 | $2,733 | $44,004 | 0.797 | $35,053 |
| 11 | | $2,733 | $2,733 | 0.779 | $2,128 |
| 12 | | $2,733 | $2,733 | 0.761 | $2,080 |
| 13 | | $2,733 | $2,733 | 0.744 | $2,033 |
| 14 | | $2,733 | $2,733 | 0.727 | $1,988 |
| 15 | | $2,733 | $2,733 | 0.711 | $1,943 |
| 16 | | $2,733 | $2,733 | 0.695 | $1,899 |
| 17 | | $2,733 | $2,733 | 0.679 | $1,856 |
| 18 | | $2,733 | $2,733 | 0.664 | $1,815 |
| 19 | | $2,733 | $2,733 | 0.649 | $1,774 |
| 20 | | $2,733 | $2,733 | 0.635 | $1,734 |
| 21 | | $2,733 | $2,733 | 0.620 | $1,695 |
| 22 | | $2,733 | $2,733 | 0.606 | $1,657 |
| 23 | | $2,733 | $2,733 | 0.593 | $1,620 |
| 24 | | $2,733 | $2,733 | 0.579 | $1,583 |
| 25 | | $2,733 | $2,733 | 0.566 | $1,548 |
| 26 | | $2,733 | $2,733 | 0.554 | $1,513 |
| 27 | | $2,733 | $2,733 | 0.541 | $1,479 |
| 28 | | $2,733 | $2,733 | 0.529 | $1,446 |
| 29 | | $2,733 | $2,733 | 0.517 | $1,413 |
| 30 | | $2,733 | $2,733 | 0.506 | $1,381 |

**TOTAL PRESENT WORTH $5,869,420**

**ALTERNATIVE 3C**

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**ALTERNATIVE 3C: All, Surface and Shallow Subsurface MEC and Anomaly Removal**
**CAPITAL COST**

| Item | Quantity | Unit | Unit Cost Subcontract | Unit Cost Material | Unit Cost Labor | Unit Cost Equipment | Extended Cost Subcontract | Extended Cost Material | Extended Cost Labor | Extended Cost Equipment | Subtotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1 PROJECT PLANNING & DOCUMENTS** | | | | | | | | | | | |
| 1.1 Prepare Documents & Plans | 100 | hr | | | $39.00 | | $0 | $0 | $3,900 | $0 | $3,900 |
| 1.2 Prepare Permits | 150 | hr | | | $39.00 | | $0 | $0 | $5,850 | $0 | $5,850 |
| 1.3 Tortoise Survey | 1 | ls | | $2,620.00 | $4,680.00 | $500.00 | $0 | $2,620 | $4,680 | $500 | $7,800 |
| 1.4 Tortoise Relocation | 1 | ls | | $6,240.00 | $6,240.00 | $500.00 | $0 | $6,240 | $6,240 | $500 | $12,980 |
| 1.5 Wetland Verification | 1 | ls | | $3,120.00 | $1,011.00 | $250.00 | $0 | $3,120 | $1,011 | $250 | $4,381 |
| **2 MOBILIZATION AND DEMOBILIZATION** | | | | | | | | | | | |
| 2.1 Site Support Facilities (trailers, phone, electric, etc.) | 1 | ls | | $1,000.00 | | $3,500.00 | $0 | $1,000 | $0 | $3,500 | $4,500 |
| 2.2 Equipment Mobilization/Demobilization | 9 | ea | | | $183.00 | $518.00 | $0 | $0 | $1,647 | $4,662 | $6,309 |
| **3 FIELD SUPPORT AND SITE ACCESS** | | | | | | | | | | | |
| 3.1 Office Trailer | 2.0 | mo | | | | $360.00 | $0 | $0 | $0 | $720 | $720 |
| 3.2 Field Office Equipment, Utilities, & Support | 2.0 | mo | | $519.00 | | | $0 | $1,038 | $0 | $0 | $1,038 |
| 3.3 Storage Trailer | 2.0 | mo | | | | $94.00 | $0 | $0 | $0 | $188 | $188 |
| 3.4 Survey Support | 2 | day | $1,125.00 | | | | $2,250 | $0 | $0 | $0 | $2,250 |
| 3.5 Site Superintendent | 35 | day | | $131.00 | $420.00 | | $0 | $4,585 | $14,700 | $0 | $19,285 |
| 3.6 Site Health & Safety and QA/QC | 35 | day | | $131.00 | $370.00 | | $0 | $4,585 | $12,950 | $0 | $17,535 |
| **4 DECONTAMINATION** | | | | | | | | | | | |
| 4.1 Decontamination Services | 1.0 | mo | | $1,220.00 | $2,245.00 | $1,550.00 | $0 | $1,220 | $2,245 | $1,550 | $5,015 |
| 4.2 Equipment Decon Pad | 1 | ls | | $4,500.00 | $3,000.00 | $725.00 | $0 | $4,500 | $3,000 | $725 | $8,225 |
| 4.3 Decon Water | 1,000 | gal | | $0.20 | | | $0 | $200 | $0 | $0 | $200 |
| 4.4 Decon Water Storage Tank, 6,000 gallon | 1.0 | mo | | | | $780.00 | $0 | $0 | $0 | $780 | $780 |
| 4.5 Clean Water Storage Tank, 4,000 gallon | 1.0 | mo | | | | $702.00 | $0 | $0 | $0 | $702 | $702 |
| 4.6 Disposal of Decon Waste (liquid & solid) | 1.0 | mo | $985.00 | | | | $985 | $0 | $0 | $0 | $985 |
| **5 SITE PREPARATION** | | | | | | | | | | | |
| 5.1 Clearing - Brush Mowing (medium density) | 1.2 | ac | | | $242.00 | $196.00 | $0 | $0 | $290 | $235 | $526 |
| 5.2 Clearing/Chipping - Tree Removal - 12" dia. | 1.2 | ac | | | $2,500.00 | $1,875.00 | $0 | $0 | $3,000 | $2,250 | $5,250 |
| 5.3 Chipping Stumps | 230 | ea | | | $18.50 | $8.45 | $0 | $0 | $4,255 | $1,944 | $6,199 |
| 5.4 UXO Technician | 5 | day | | $131.00 | $370.00 | | $0 | $655 | $1,850 | $0 | $2,505 |
| **6 SITE CLEANUP AND RESTORATION** | | | | | | | | | | | |
| 6.1 Debris T & D, 11,200 lbs metal | 1 | ls | $400.00 | | | | $400 | $0 | $0 | $0 | $400 |
| 6.2 FE Loader, 185 hp | 5 | day | | | $211.36 | $588.60 | $0 | $0 | $1,057 | $2,943 | $4,000 |
| 6.3 Dozer, 200 hp (2) | 10 | day | | | $211.36 | $1,051.00 | $0 | $0 | $2,114 | $10,510 | $12,624 |
| 6.4 Site Labor, (3 laborers) | 15 | day | | | $102.64 | | $0 | $0 | $1,540 | $0 | $1,540 |
| 6.5 Revegetation - soil nutrients | 309 | msf | $12.10 | | | | $3,739 | $0 | $0 | $0 | $3,739 |
| 6.6 Revegetation, hydro seed (grasses) | 309 | msf | $117.00 | | | | $36,153 | $0 | $0 | $0 | $36,153 |
| 6.7 Revegetation - wetland nutrients | 0.0 | msf | $14.55 | | | | $0 | $0 | $0 | $0 | $0 |
| 6.8 Wetland Soil | 0 | cy | | $23.00 | | | $0 | $0 | $0 | $0 | $0 |
| 6.9 Wetland Restoration | 0 | csf | $35.96 | | | | $0 | $0 | $0 | $0 | $0 |
| 6.10 Perimeter Signs | 6 | ea | | $69.50 | | | $0 | $417 | $0 | $0 | $417 |
| **7 POST CONSTRUCTION COST** | | | | | | | | | | | |
| 7.1 Contractor Completion Report | 100 | hr | | | $39.00 | | $0 | $0 | $3,900 | $0 | $3,900 |
| 7.2 Remedial Action Closeout Report | 150 | hr | | | $39.00 | | $0 | $0 | $5,850 | $0 | $5,850 |
| **Subtotal** | | | | | | | $43,527 | $30,180 | $80,078 | $31,959 | $185,744 |
| Overhead on Labor Cost @ 30% | | | | | | | | | $24,024 | | $24,024 |
| G & A on Labor, Material, Equipment, & Subs Cost @ 10% | | | | | | | $4,353 | $3,018 | $8,008 | $3,196 | $18,574 |
| Tax on Materials and Equipment Cost @ 6% | | | | | | | | $1,811 | | $1,918 | $3,728 |
| **Total Direct Cost** | | | | | | | $47,880 | $35,009 | $112,110 | $37,072 | $232,070 |

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**ALTERNATIVE 3C: All, Surface and Shallow Subsurface MEC and Anomaly Removal**
**CAPITAL COST**

| Item | Quantity | Unit | Unit Cost Subcontract | Unit Cost Material | Unit Cost Labor | Unit Cost Equipment | Extended Cost Subcontract | Extended Cost Material | Extended Cost Labor | Extended Cost Equipment | Subtotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Indirects on Total Direct Cost @ 25% | | | | | | | | | | | $58,018 |
| Profit on Total Direct Cost @ 10% | | | | | | | | | | | $23,207 |
| **Total Field Cost** | | | | | | | | | | | $313,295 |
| Contingency on Total Field Cost @ 20% | | | | | | | | | | | $62,659 |
| Engineering on Total Field Cost @ 20% | | | | | | | | | | | $62,659 |
| **TOTAL COST** | | | | | | | | | | | **$438,613** |

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 15
ALTERNATIVE 3C: All, Surface and Shallow Subsurface MEC and Anomaly Removal

**Alternative 3C**

| | | | | | Days | Hours | Man/Items | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Site Setup; Establish Grids | 169 Grids | Minor Brush | UXO | 6 | 10 | 2 | | | |
| | RTK GPS | Sub meter accuracy | | Includes shipping | 8 | | 1 | 8 | | $1,200.00 |
| | UXO Equipment | Magnetometer | | Includes shipping | 8 | | 1 | 8 | | $300.00 |
| | GPS Operator | | | Includes Travel | 8 | 10 | 1 | 80 | | $5,129.60 |
| | UXO Escort | | | Includes Travel | 8 | 10 | 1 | 80 | | $5,929.60 |
| | | | | | | | | 160 | hours total field time | |
| | | | | | | | | 30 | management hours | $3,000.00 |
| | | | | | | | | | | **$15,559.20** |
| | | | | | Days | Hours | Man/Items | | | |
| 2 | Site Setup; Brush Cutting | 169 Grids | Minor Brush | UXO | 18 | 10 | 6 | | | |
| | Chain Saw | Trees 2 Inch and smaller | | Includes Shipping | 20 | | 2 | 40 | | $2,440.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | | Includes Shipping | 20 | | 2 | 40 | | $1,840.00 |
| | Bush Hog | Majority of Area | | Includes Shipping | 20 | | 1 | 20 | | $6,900.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 20 | | 2 | 40 | | $1,500.00 |
| | UXO Technician | | | Includes Travel | 20 | 10 | 6 | 1200 | | $88,944.00 |
| | | | | | | | | 1200 | hours total field time | |
| | | | | | | | | 75 | management hours | $7,500.00 |
| | | | | | | | | | | **$109,124.00** |
| | | | | | Days | Hours | Man/Items | | | |
| 3 | Visual & Detector Surveyes | 169 Grids | | UXO | 20 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 22 | | 2 | 44 | | $1,650.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 22 | | 4 | 88 | | $3,300.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 22 | | 1 | 22 | | $3,300.00 |
| | UXO Technician | | | Includes Travel | 22 | 10 | 9 | 1980 | | $146,757.60 |
| | | | | | | | | 1980 | hours total field time | |
| | | | | | | | | 75 | management hours | $7,500.00 |
| | | | | | | | | | | **$162,507.60** |
| | | | | | Days | Hours | Man/Items | | | |
| 4 | Manual Remove & Treat Surf | 169 Grids | | UXO | 10 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 5 | | 2 | 10 | | $375.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 5 | | 4 | 20 | | $750.00 |
| | MEC/MDEH Treatment | Donar Charge | | Includes Shipping | 5 | | 1 | 5 | | $2,500.00 |
| | MDAS Certification | Drums | | Includes Shipping | 5 | | 7 | 35 | | $23,750.00 |
| | Non-munitions Debris | Roll-off | | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 5 | | 1 | 5 | | $750.00 |
| | UXO Technician | | | Includes Travel | 10 | 10 | 9 | 900 | | $66,708.00 |
| | | | | | | | | 900 | hours total field time | |
| | | | | | | | | 100 | management hours | $10,000.00 |
| | | | | | | | | | | **$104,833.00** |
| | | | | | Days | Hours | Man/Items | | | |
| 5 | Intrusive Investigation | 5070 Digs | | UXO | 85 | 10 | 9 | | | |

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 15
ALTERNATIVE 3C: All, Surface and Shallow Subsurface MEC and Anomaly Removal

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | UXO Equipment | All-Metals | Shipping Included Above | 85 | | 2 | 170 | | $6,375.00 |
| | UXO Equipment | Magnetometer | Shipping Included Above | 85 | | 4 | 340 | | $12,750.00 |
| | UXO Supplies | Shovels etc. | Shipping Included Above | 85 | | 1 | 85 | | $2,125.00 |
| | Hand Held GPS | Sub Meter | Shipping Included Above | 85 | | 1 | 85 | | $12,750.00 |
| | UXO Technician | | Travel Included Above | 85 | 10 | 9 | 7650 | | $567,018.00 |
| | | | | | | | 7650 | hours total field time | |
| | | | | | | | 100 | management hours | $10,000.00 |
| | | | | | | | | | **$611,018.00** |
| | | | | Days | Hours | Man/Items | | | |
| 6 | Remove & Treat Subsurface | 5070 Digs | UXO | 4 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 4 | | 2 | 8 | | $300.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 4 | | 4 | 16 | | $600.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 4 | | 1 | 4 | | $2,000.00 |
| | MDAS Certification | Drums | Includes Shipping | 1 | | 2 | 2 | | $3,950.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 4 | | 1 | 4 | | $600.00 |
| | UXO Technician | | Includes Travel | 4 | 10 | 3 | 120 | | $8,894.40 |
| | | | | | | | 120 | hours total field time | |
| | | | | | | | 20 | management hours | $2,000.00 |
| | | | | | | | | | **$18,344.40** |
| | | | | Days | Hours | Man/Items | | | |
| 7 | Mechanical Excavation | 39 Grids | UXO | 8 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 8 | | 2 | 16 | | $600.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 8 | | 6 | 48 | | $1,800.00 |
| | Excavator | Excavate, etc. | Includes Shipping | 1 | | 390,000 | 390000 | | $494,065.00 |
| | Backfill after screening | Dozor, etc | Includes Shipping | 1 | | 8 | 8 | | $14,946.64 |
| | Construct Decon Pad | PPE, etc. | Includes Shipping | 1 | | 1 | 1 | | $2,000.00 |
| | UXO Technician | | Includes Travel | 8 | 10 | 9 | 720 | | $53,366.40 |
| | | | | | | | 720 | hours total field time | |
| | | | | | | | 72 | management hours | $7,200.00 |
| | | | | | | | | | **$573,978.04** |
| | | | | Days | Hours | Man/Items | | | |
| 8 | Remove & Treat Excavtion | 39 Grids | UXO | 9 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 10 | | 2 | 20 | | $750.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 10 | | 4 | 40 | | $1,500.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 10 | | 1 | 10 | | $5,000.00 |
| | MDAS Certification | Drums | Includes Shipping | 5 | | 6 | 30 | | $20,750.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 10 | | 1 | 10 | | $1,500.00 |
| | UXO Technician | | Includes Travel | 16 | 10 | 9 | 1440 | | $54,000.00 |
| | | | | | | | 1440 | hours total field time | |
| | | | | | | | 90 | management hours | $9,000.00 |
| | | | | | | | | | **$92,500.00** |
| | | | | Days | Hours | Man/Items | | | |

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 15
ALTERNATIVE 3C: All, Surface and Shallow Subsurface MEC and Anomaly Removal

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 9 | Backfill After Sifting | 21 Grids | UXO | 4 | 10 | 9 | | |
| | 210,000 Cubic Ft. | Dozor, etc | See 7 Above | 1 | | 21 | 21 | $14,946.64 |
| | Construct Decon Pad | PPE, etc. | Includes Shipping | 1 | | 100 | 100 | $2,000.00 |
| | UXO Technician | | Includes Travel | 4 | 10 | 3 | 120 | $8,894.40 |
| | | | | | | | 120 hours total field time | |
| | | | | | | | 40 management hours | $4,000.00 |
| | | | | | | | | **$29,841.04** |
| | | | | Days | Hours | Man/Items | | |
| 10 | Step-out; Brush Cutting | 4 Grids Minor Brush | UXO | 2 | 10 | 6 | | |
| | Chain Saw | Trees 2 Inch and smaller | Includes Shipping | 2 | | 2 | 4 | $244.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | Includes Shipping | 2 | | 2 | 4 | $184.00 |
| | Bush Hog | Majority of Area | Includes Shipping | 2 | | 1 | 2 | $690.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 2 | | 2 | 4 | $600.00 |
| | UXO Technician | | Includes Travel | 2 | 10 | 6 | 120 | $4,500.00 |
| | | | | | | | 120 hours total field time | |
| | | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | | **$8,218.00** |
| | | | | Days | Hours | Man/Items | | |
| | Visual & Detector Surveyes | 4 Grids | UXO | 2 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 2 | | 2 | 4 | $150.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 2 | | 4 | 8 | $300.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 2 | | 1 | 2 | $300.00 |
| | UXO Technician | | Includes Travel | 2 | 10 | 9 | 180 | $13,341.60 |
| | | | | | | | 180 hours total field time | |
| | | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | | **$16,091.60** |
| | | | | Days | Hours | Man/Items | | |
| | Manual Remove & Treat Surf | 4 Grids | UXO | 3 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 2 | | 2 | 4 | $150.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 2 | | 4 | 8 | $300.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 1 | | 1 | 1 | $500.00 |
| | MDAS Certification | Drums | Includes Shipping | 0 | | 6 | 0 | $0.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 1 | | 1 | 1 | $150.00 |
| | UXO Technician | | Includes Travel | 3 | 10 | 9 | 270 | $20,012.40 |
| | | | | | | | 270 hours total field time | |
| | | | | | | | 30 management hours | $3,000.00 |
| | | | | | | | | **$24,112.40** |
| | | | | Days | Hours | Man/Items | | |
| | Intrusive Investigation | 100 Digs | UXO | 2 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Shipping Included Above | 2 | | 2 | 4 | $150.00 |
| | UXO Equipment | Magnetometer | Shipping Included Above | 2 | | 4 | 8 | $300.00 |
| | UXO Supplies | Shovels etc. | Shipping Included Above | 2 | | 1 | 2 | $50.00 |
| | Hand Held GPS | Sub Meter | Shipping Included Above | 2 | | 1 | 2 | $300.00 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | UXO Technician | | Travel Included Above | 2 | 10 | 9 | 180 | $13,341.60 |
| | | | | | | | 180 hours total field time | |
| | | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | | **$16,141.60** |
| | | | | Days | Hours | Man/Items | | |
| | Remove & Treat Subsurface | 100 Digs | UXO | 1 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 1 | | 2 | 2 | $75.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 1 | | 4 | 4 | $150.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 1 | | 1 | 1 | $500.00 |
| | MDAS Certification | Drums | Included above | 0 | | 0 | 0 | $0.00 |
| | Non-munitions Debris | Roll-off | Included above | 0 | | 100 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 1 | | 1 | 1 | $150.00 |
| | UXO Technician | | Includes Travel | 1 | 10 | 9 | 90 | $6,670.80 |
| | | | | | | | 90 hours total field time | |
| | | | | | | | 10 management hours | $1,000.00 |
| | | | | | | | | **$8,545.80** |
| | | | | Days | Hours | Man/Items | | |
| 11 | MEC/MDEH Treatment | 50 Items | UXO | 6 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 6 | | 2 | 12 | $450.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 6 | | 4 | 24 | $900.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 6 | | 1 | 6 | $3,000.00 |
| | MDAS Certification | Drums | Included above | 0 | | 0 | 0 | $0.00 |
| | Non-munitions Debris | Roll-off | Included above | 0 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 6 | | 1 | 6 | $900.00 |
| | UXO Technician | | Includes Travel | 6 | 10 | 9 | 540 | $40,024.80 |
| | | | | | | | 540 hours total field time | |
| | | | | | | | 60 management hours | $6,000.00 |
| | | | | | | | | **$51,274.80** |
| | | | | Days | Hours | Man/Items | | |
| 12 | MDAS Certification | 60 Drums | UXO | 11 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 0 | | 2 | 0 | $0.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 0 | | 4 | 0 | $0.00 |
| | MDAS Transportation | Drums | Includes Shipping | 11 | | 6 | 66 | $42,350.00 |
| | MDAS Certification | Drums | Includes Shipping | 11 | | 6 | 66 | $0.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| | UXO Technician | | Includes Travel | 11 | 10 | 3 | 330 | $24,459.60 |
| | | | | | | | 330 hours total field time | |
| | | | | | | | 30 management hours | $3,000.00 |
| | | | | | | | | **$69,809.60** |
| 13 | MC Sampling | | N/A | | | | | |

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 15
ALTERNATIVE 3C: All, Surface and Shallow Subsurface MEC and Anomaly Removal

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 14 | Site Resteration | | N/A | | | | | |
| | Initial Inspection Total Field Cost | $1,911,899.08 | | | | | | |
| | Contingency on Total Field Cost @ 10% | $191,189.91 | | | | | | |
| | Engineering on Total Field Cost @ 4% | $76,475.96 | | | | | | |
| | **TOTAL COST** | **$2,179,564.95** | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Annual Inspections (years 1, 2, 3, 4, and 5)** | | | Days | Hours | Man/Items | | |
| 15 | Annual Inspections (Times 5) | Transects Minor Brush | UXO | 2 | 10 | 6 | | |
| | Chain Saw | Trees 2 Inch and smaller | Includes Shipping | 2 | | 2 | 4 | $244.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | Includes Shipping | 2 | | 2 | 4 | $184.00 |
| | Bush Hog | Majority of Area | Includes Shipping | 2 | | 1 | 2 | $690.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 2 | | 2 | 4 | $150.00 |
| | UXO Technician | | Includes Travel | 2 | 10 | 6 | 120 | $8,894.40 |
| | | | | | | | 120 hours total field time | |
| | | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | | **$12,162.40** |
| | | | | Days | Hours | Man/Items | | |
| | Visual & Detector Surveyes | Transects | UXO | 3 | 10 | 6 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 3 | | 2 | 6 | $225.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 3 | | 4 | 12 | $450.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 3 | | 1 | 3 | $450.00 |
| | UXO Technician | | Includes Travel | 3 | 10 | 6 | 180 | $13,341.60 |
| | | | | | | | 180 hours total field time | |
| | | | | | | | 30 management hours | $3,000.00 |
| | | | | | | | | **$17,466.60** |
| | | | | Days | Hours | Man/Items | | |
| | Manual Remove & Treat Surf | Transects | UXO | 1 | 10 | 3 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 0 | | 2 | 0 | $0.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 0 | | 4 | 0 | $0.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| | MDAS Certification | Drums | Includes Shipping | 1 | | 1 | 1 | $3,350.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 0 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| | UXO Technician | | Includes Travel | 1 | 10 | 3 | 30 | $2,223.60 |
| | | | | | | | 30 hours total field time | |
| | | | | | | | 10 management hours | $1,000.00 |
| | | | | | | | | **$6,573.60** |

| | |
|---|---|
| Annual Inspection Total Field Cost | $36,202.60 |
| Contingency on Total Field Cost @ 10% | $3,620.26 |
| Engineering on Total Field Cost @ 4% | $1,448.10 |
| **TOTAL COST** | **$41,270.96** |

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 15
ALTERNATIVE 3C: All, Surface and Shallow Subsurface MEC and Anomaly Removal

| | | | | | Days | Hours | Man/Items | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Five Year Inspections (year 10)** | | | | | | | | |
| 16 | 5 Year Inspection (Times 1) | Transects | Minor Brush | UXO | 2 | 10 | 6 | | |
| | Chain Saw | Trees 2 Inch and smaller | | Includes Shipping | 2 | | 2 | 4 | $244.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | | Includes Shipping | 2 | | 2 | 4 | $184.00 |
| | Bush Hog | Majority of Area | | Includes Shipping | 2 | | 1 | 2 | $690.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 2 | | 2 | 4 | $150.00 |
| | UXO Technician | | | Includes Travel | 2 | 10 | 6 | 120 | $8,894.40 |
| | | | | | | | | 120 hours total field time | |
| | | | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | | | **$12,162.40** |
| | | | | | Days | Hours | Man/Items | | |
| | Visual & Detector Surveyes | Transects | | UXO | 3 | 10 | 6 | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 3 | | 2 | 6 | $225.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 3 | | 4 | 12 | $450.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 3 | | 1 | 3 | $450.00 |
| | UXO Technician | | | Includes Travel | 3 | 10 | 6 | 180 | $13,341.60 |
| | | | | | | | | 180 hours total field time | |
| | | | | | | | | 30 management hours | $3,000.00 |
| | | | | | | | | | **$17,466.60** |
| | | | | | Days | Hours | Man/Items | | |
| | Manual Remove & Treat Surf | Transects | | UXO | 1 | 10 | 3 | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 0 | | 2 | 0 | $0.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 0 | | 4 | 0 | $0.00 |
| | MEC/MDEH Treatment | Donar Charge | | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| | MDAS Certification | Drums | | Includes Shipping | 1 | | 1 | 1 | $3,350.00 |
| | Non-munitions Debris | Roll-off | | Includes Shipping | 0 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| | UXO Technician | | | Includes Travel | 1 | 10 | 3 | 30 | $2,223.60 |
| | | | | | | | | 30 hours total field time | |
| | | | | | | | | 10 management hours | $1,000.00 |
| | | | | | | | | | **$6,573.60** |

| | |
|---|---|
| Five Year Inspection Total Field Cost | $36,202.60 |
| Contingency on Total Field Cost @ 10% | $3,620.26 |
| Engineering on Total Field Cost @ 4% | $1,448.10 |
| **TOTAL COST** | **$41,270.96** |

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**Public Education Program**
**Annual Costs**

| Item | Quantity | Unit | Unit Cost Subcontract | Unit Cost Material | Unit Cost Labor | Unit Cost Equipment | Extended Cost Subcontract | Extended Cost Material | Extended Cost Labor | Extended Cost Equipment | Subtotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1 PLANNING & REPORTS** | | | | | | | | | | | |
| 1.1 Prepare Documents & Plans | 10 | hr | | | $39.00 | | $0 | $0 | $390 | $0 | $390 |
| 1.2 Reports & Handouts | 1 | ls | | $225.00 | | | $0 | $225 | $0 | $0 | $225 |
| **2 MEETING IN JACKSONVILLE, FLORIDA** | | | | | | | | | | | |
| 2.1 Travel, air | 1 | ls | | $650.00 | | | $0 | $650 | $0 | $0 | $650 |
| 2.2 Per-diem | 1 | day | | $131.00 | | | $0 | $131 | $0 | $0 | $131 |
| 2.3 Car | 1 | day | | | | $100.00 | $0 | $0 | $0 | $100 | $100 |
| 2.4 Meeting | 12 | hr | | | $39.00 | | $0 | $0 | $468 | $0 | $468 |
| **Subtotal** | | | | | | | $0 | $1,006 | $858 | $100 | $1,964 |
| Overhead on Labor Cost @ 30% | | | | | | | | | $257 | | $257 |
| G & A on Labor, Material, Equipment, & Subs Cost @ 10% | | | | | | | $0 | $101 | $86 | $10 | $196 |
| Tax on Materials and Equipment Cost @ 6% | | | | | | | | $60 | | $6 | $66 |
| **Total Direct Cost** | | | | | | | $0 | $1,167 | $1,201 | $116 | $2,484 |
| Indirects on Total Direct Cost @ 0% | | | | | | | | | | | $0 |
| Profit on Total Direct Cost @ 10% | | | | | | | | | | | $248 |
| **Subtotal** | | | | | | | | | | | $2,733 |
| Contingency on Total Field Cost @ 0% | | | | | | | | | | | $0 |
| Engineering on Total Field Cost @ 0% | | | | | | | | | | | $0 |
| **TOTAL COST** | | | | | | | | | | | **$2,733** |

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**ALTERNATIVE 3C: All, Surface and Shallow Subsurface MEC and Anomaly Removal**
**Present Worth Analysis**

| Year | Capital Cost | Annual Cost | Total Year Cost | Annual Discount Rate 2.3% | Present Worth |
|---|---|---|---|---|---|
| 0 | $2,618,178 | | $2,618,178 | 1.000 | $2,618,178 |
| 1 | $41,271 | $2,733 | $44,004 | 0.978 | $43,014 |
| 2 | $41,271 | $2,733 | $44,004 | 0.956 | $42,047 |
| 3 | $41,271 | $2,733 | $44,004 | 0.934 | $41,102 |
| 4 | $41,271 | $2,733 | $44,004 | 0.913 | $40,178 |
| 5 | $41,271 | $2,733 | $44,004 | 0.893 | $39,274 |
| 6 | | $2,733 | $2,733 | 0.872 | $2,384 |
| 7 | | $2,733 | $2,733 | 0.853 | $2,330 |
| 8 | | $2,733 | $2,733 | 0.834 | $2,278 |
| 9 | | $2,733 | $2,733 | 0.815 | $2,227 |
| 10 | $41,271 | $2,733 | $44,004 | 0.797 | $35,053 |
| 11 | | $2,733 | $2,733 | 0.779 | $2,128 |
| 12 | | $2,733 | $2,733 | 0.761 | $2,080 |
| 13 | | $2,733 | $2,733 | 0.744 | $2,033 |
| 14 | | $2,733 | $2,733 | 0.727 | $1,988 |
| 15 | | $2,733 | $2,733 | 0.711 | $1,943 |
| 16 | | $2,733 | $2,733 | 0.695 | $1,899 |
| 17 | | $2,733 | $2,733 | 0.679 | $1,856 |
| 18 | | $2,733 | $2,733 | 0.664 | $1,815 |
| 19 | | $2,733 | $2,733 | 0.649 | $1,774 |
| 20 | | $2,733 | $2,733 | 0.635 | $1,734 |
| 21 | | $2,733 | $2,733 | 0.620 | $1,695 |
| 22 | | $2,733 | $2,733 | 0.606 | $1,657 |
| 23 | | $2,733 | $2,733 | 0.593 | $1,620 |
| 24 | | $2,733 | $2,733 | 0.579 | $1,583 |
| 25 | | $2,733 | $2,733 | 0.566 | $1,548 |
| 26 | | $2,733 | $2,733 | 0.554 | $1,513 |
| 27 | | $2,733 | $2,733 | 0.541 | $1,479 |
| 28 | | $2,733 | $2,733 | 0.529 | $1,446 |
| 29 | | $2,733 | $2,733 | 0.517 | $1,413 |
| 30 | | $2,733 | $2,733 | 0.506 | $1,381 |

**TOTAL PRESENT WORTH $2,902,650**

**ALTERNATIVE 4A**

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**ALTERNATIVE 4A: All, Surface and Subsurface MEC Removal**
**CAPITAL COST**

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| Item | Quantity | Unit | Unit Cost Subcontract | Unit Cost Material | Unit Cost Labor | Unit Cost Equipment | Extended Cost Subcontract | Extended Cost Material | Extended Cost Labor | Extended Cost Equipment | Subtotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1 PROJECT PLANNING & DOCUMENTS** | | | | | | | | | | | |
| 1.1 Prepare Documents & Plans | 200 | hr | | | $39.00 | | $0 | $0 | $7,800 | $0 | $7,800 |
| 1.2 Prepare Permits | 300 | hr | | | $39.00 | | $0 | $0 | $11,700 | $0 | $11,700 |
| 1.3 Tortoise Survey | 1 | ls | | $3,930.00 | $7,020.00 | $750.00 | $0 | $3,930 | $7,020 | $750 | $11,700 |
| 1.4 Tortoise Relocation | 1 | ls | | $9,360.00 | $9,360.00 | $750.00 | $0 | $9,360 | $9,360 | $750 | $19,470 |
| 1.5 Wetland Verification | 1 | ls | | $3,120.00 | $1,011.00 | $250.00 | $0 | $3,120 | $1,011 | $250 | $4,381 |
| **2 MOBILIZATION AND DEMOBILIZATION** | | | | | | | | | | | |
| 2.1 Site Support Facilities (trailers, phone, electric, etc.) | 1 | ls | | $1,000.00 | | $3,500.00 | $0 | $1,000 | $0 | $3,500 | $4,500 |
| 2.2 Equipment Mobilization/Demobilization | 11 | ea | | | $183.00 | $518.00 | $0 | $0 | $2,013 | $5,698 | $7,711 |
| **3 FIELD SUPPORT AND SITE ACCESS** | | | | | | | | | | | |
| 3.1 Office Trailer | 8.0 | mo | | | | $360.00 | $0 | $0 | $0 | $2,880 | $2,880 |
| 3.2 Field Office Equipment, Utilities, & Support | 8.0 | mo | | $519.00 | | | $0 | $4,152 | $0 | $0 | $4,152 |
| 3.3 Storage Trailer | 8.0 | mo | | | | $94.00 | $0 | $0 | $0 | $752 | $752 |
| 3.4 Survey Support | 30 | day | $1,125.00 | | | | $33,750 | $0 | $0 | $0 | $33,750 |
| 3.5 Site Superintendent | 150 | day | | $131.00 | $420.00 | | $0 | $19,650 | $63,000 | $0 | $82,650 |
| 3.6 Site Health & Safety and QA/QC | 150 | day | | $131.00 | $370.00 | | $0 | $19,650 | $55,500 | $0 | $75,150 |
| 3.7 Truck Scale | 3 | mo | $2,895.00 | | | | $8,685 | $0 | $0 | $0 | $8,685 |
| **4 DECONTAMINATION** | | | | | | | | | | | |
| 4.1 Decontamination Services | 4.0 | mo | | $1,220.00 | $2,245.00 | $1,550.00 | $0 | $4,880 | $8,980 | $6,200 | $20,060 |
| 4.2 Equipment Decon Pad | 1 | ls | | $4,500.00 | $3,000.00 | $725.00 | $0 | $4,500 | $3,000 | $725 | $8,225 |
| 4.3 Decon Water | 4,000 | gal | | $0.20 | | | $0 | $800 | $0 | $0 | $800 |
| 4.4 Decon Water Storage Tank, 6,000 gallon | 4.0 | mo | | | | $780.00 | $0 | $0 | $0 | $3,120 | $3,120 |
| 4.5 Clean Water Storage Tank, 4,000 gallon | 4.0 | mo | | | | $702.00 | $0 | $0 | $0 | $2,808 | $2,808 |
| 4.6 Disposal of Decon Waste (liquid & solid) | 4.0 | mo | $985.00 | | | | $3,940 | $0 | $0 | $0 | $3,940 |
| **5 SITE PREPARATION** | | | | | | | | | | | |
| 5.1 Clearing - Brush Mowing (medium density) | 20.4 | ac | | | $242.00 | $196.00 | $0 | $0 | $4,937 | $3,998 | $8,935 |
| 5.2 Clearing/Chipping - Tree Removal - 12" dia. | 20.4 | ac | | | $2,500.00 | $1,875.00 | $0 | $0 | $51,000 | $38,250 | $89,250 |
| 5.3 Chipping Stumps | 4,005 | ea | | | $18.50 | $8.45 | $0 | $0 | $74,093 | $33,842 | $107,935 |
| 5.4 UXO Technician | 30 | day | | $131.00 | $370.00 | | $0 | $3,930 | $11,100 | $0 | $15,030 |
| **6 EXCAVATION, TRANSPORTATION AND DISPOSAL** | | | | | | | | | | | |
| 6.1 Dozer, 200 hp | 60 | day | | | $211.36 | $1,051.00 | $0 | $0 | $12,682 | $63,060 | $75,742 |
| 6.2 Excavator, 2.5 cy (2) | 120 | day | | | $211.36 | $1,613.00 | $0 | $0 | $25,363 | $193,560 | $218,923 |
| 6.3 Site Labor, (3 laborers) | 180 | day | | | $102.64 | | $0 | $0 | $18,475 | $0 | $18,475 |
| 6.4 Soil T & D Hazardous (subtitle C) | 35,556 | ton | $200.00 | | | | $7,111,200 | $0 | $0 | $0 | $7,111,200 |
| 6.5 Waste Characterization Test, 1 per 1000 cy | 24 | ea | $800.00 | $6.00 | $35.00 | | $19,200 | $144 | $840 | $0 | $20,184 |
| 6.6 Debris T & D, 12,100 lbs metal | 1 | ls | $425.00 | | | | $425 | $0 | $0 | $0 | $425 |
| **7 COVER AND RESTORATION** | | | | | | | | | | | |
| 7.1 Clean Backfill | 23,704 | cy | | $12.50 | | | $0 | $296,300 | $0 | $0 | $296,300 |
| 7.2 Dozer, 200 hp | 64 | day | | | $211.36 | $1,051.00 | $0 | $0 | $13,527 | $67,264 | $80,791 |
| 7.3 Excavator, 2.5 cy | 32 | day | | | $211.36 | $1,613.00 | $0 | $0 | $6,764 | $51,616 | $58,380 |
| 7.4 Site Labor, (3 laborers) | 96 | day | | | $102.64 | | $0 | $0 | $9,853 | $0 | $9,853 |
| 7.5 Revegetation - soil nutrients | 1,609 | msf | $12.10 | | | | $19,469 | $0 | $0 | $0 | $19,469 |
| 7.6 Revegetation, hydro seed (grasses) | 1,609 | msf | $117.00 | | | | $188,253 | $0 | $0 | $0 | $188,253 |
| 7.7 Revegetation - wetland nutrients | 87.0 | msf | $14.55 | | | | $1,266 | $0 | $0 | $0 | $1,266 |
| 7.8 Wetland Soil | 400 | cy | | $23.00 | | | $0 | $9,200 | $0 | $0 | $9,200 |
| 7.9 Wetland Restoration | 871 | csf | $35.96 | | | | $31,321 | $0 | $0 | $0 | $31,321 |
| 7.10 Perimeter Signs | 12 | ea | | $69.50 | | | $0 | $834 | $0 | $0 | $834 |
| **8 POST CONSTRUCTION COST** | | | | | | | | | | | |
| 8.1 Contractor Completion Report | 150 | hr | | | $39.00 | | $0 | $0 | $5,850 | $0 | $5,850 |
| 8.2 Remedial Action Closeout Report | 200 | hr | | | $39.00 | | $0 | $0 | $7,800 | $0 | $7,800 |
| **Subtotal** | | | | | | | $7,417,509 | $381,450 | $411,667 | $479,024 | $8,689,650 |
| Overhead on Labor Cost @ 30% | | | | | | | | | $123,500 | | $123,500 |
| G & A on Labor, Material, Equipment, & Subs Cost @ 10% | | | | | | | $741,751 | $38,145 | $41,167 | $47,902 | $868,965 |

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**ALTERNATIVE 4A: All, Surface and Subsurface MEC Removal**
**CAPITAL COST**



| Item | Quantity | Unit | Unit Cost Subcontract | Unit Cost Material | Unit Cost Labor | Unit Cost Equipment | Extended Cost Subcontract | Extended Cost Material | Extended Cost Labor | Extended Cost Equipment | Subtotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Tax on Materials and Equipment Cost @ 6% | | | | | | | | $22,887 | | $28,741 | $51,628 |
| **Total Direct Cost** | | | | | | | $8,159,260 | $442,482 | $576,334 | $555,667 | $9,733,743 |
| Indirects on Total Direct Cost @ 25% | | | (excluding transportation and disposal cost) | | | | | | | | $654,545 |
| Profit on Total Direct Cost @ 10% | | | | | | | | | | | $973,374 |
| **Total Field Cost** | | | | | | | | | | | $11,361,662 |
| Contingency on Total Field Cost @ 10% | | | | | | | | | | | $1,136,166 |
| Engineering on Total Field Cost @ 2% | | | | | | | | | | | $227,233 |
| **TOTAL COST** | | | | | | | | | | | **$12,725,062** |

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 15
ALTERNATIVE 4A: All, Surface and Subsurface MEC Removal

**Alternative 4A and 4B**

| | | | | | Days | Hours | Man/Items | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Site Setup; Establish Grids | 169 Grids | Minor Brush | UXO | 6 | 10 | 2 | | | |
| | RTK GPS | Sub meter accuracy | | Includes shipping | 8 | | 1 | 8 | | $1,200.00 |
| | UXO Equipment | Magnetometer | | Includes shipping | 8 | | 1 | 8 | | $300.00 |
| | GPS Operator | | | Includes Travel | 8 | 10 | 1 | 80 | | $5,129.60 |
| | UXO Escort | | | Includes Travel | 8 | 10 | 1 | 80 | | $5,929.60 |
| | | | | | | | | 160 | hours total field time | |
| | | | | | | | | 30 | management hours | $3,000.00 |
| | | | | | | | | | | **$15,559.20** |
| | | | | | Days | Hours | Man/Items | | | |
| 2 | Site Setup; Brush Cutting | 169 Grids | Minor Brush | UXO | 18 | 10 | 6 | | | |
| | Chain Saw | Trees 2 Inch and smaller | | Includes Shipping | 20 | | 2 | 40 | | $2,440.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | | Includes Shipping | 20 | | 2 | 40 | | $1,840.00 |
| | Bush Hog | Majority of Area | | Includes Shipping | 20 | | 1 | 20 | | $6,900.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 20 | | 2 | 40 | | $1,500.00 |
| | UXO Technician | | | Includes Travel | 20 | 10 | 6 | 1200 | | $88,944.00 |
| | | | | | | | | 1200 | hours total field time | |
| | | | | | | | | 75 | management hours | $7,500.00 |
| | | | | | | | | | | **$109,124.00** |
| | | | | | Days | Hours | Man/Items | | | |
| 3 | Visual & Detector Surveyes | 169 Grids | | UXO | 20 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 22 | | 2 | 44 | | $1,650.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 22 | | 4 | 88 | | $3,300.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 22 | | 1 | 22 | | $3,300.00 |
| | UXO Technician | | | Includes Travel | 22 | 10 | 9 | 1980 | | $146,757.60 |
| | | | | | | | | 1980 | hours total field time | |
| | | | | | | | | 75 | management hours | $7,500.00 |
| | | | | | | | | | | **$162,507.60** |
| | | | | | Days | Hours | Man/Items | | | |
| 4 | Manual Remove & Treat Surf | 169 Grids | | UXO | 10 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 5 | | 2 | 10 | | $375.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 5 | | 4 | 20 | | $750.00 |
| | MEC/MDEH Treatment | Donar Charge | | Includes Shipping | 5 | | 1 | 5 | | $2,500.00 |
| | MDAS Certification | Drums | | Includes Shipping | 5 | | 7 | 35 | | $23,750.00 |
| | Non-munitions Debris | Roll-off | | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 5 | | 1 | 5 | | $750.00 |
| | UXO Technician | | | Includes Travel | 10 | 10 | 9 | 900 | | $66,708.00 |
| | | | | | | | | 900 | hours total field time | |
| | | | | | | | | 100 | management hours | $10,000.00 |
| | | | | | | | | | | **$104,833.00** |
| | | | | | Days | Hours | Man/Items | | | |
| 5 | Mechanical Excavation (0-1bgs) | 169 Grids | | UXO | 100 | 10 | 9 | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | UXO Equipment | All-Metals | | Includes Shipping | 100 | | 2 | 200 | | $7,500.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 100 | | 4 | 400 | | $15,000.00 |
| | Screeening Plant | Sift, Excavate, etc. | | Includes Shipping | 1 | | 1,690,000 | 1690000 | | $3,580,330.00 |
| | Backfill after sifting | Dozor, etc | | Includes Shipping | 1 | | 105 | 105 | | $196,174.65 |
| | Construct Decon Pad | PPE, etc. | | Includes Shipping | 1 | | 100 | 100 | | $2,000.00 |
| | UXO Technician | | | Includes Travel | 100 | 10 | 3 | 3000 | | $222,360.00 |
| | | | | | | | | 3000 | hours total field time | |
| | | | | | | | | 40 | management hours | $4,000.00 |
| | | | | | | | | | | **$4,027,364.65** |
| | | | | | Days | Hours | Man/Items | | | |
| 6 | Remove & Treat Excavtion | 169 Grids | | UXO | 9 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 10 | | 2 | 20 | | $750.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 10 | | 4 | 40 | | $1,500.00 |
| | MEC/MDEH Treatment | Donar Charge | | Includes Shipping | 10 | | 1 | 10 | | $5,000.00 |
| | MDAS Certification | Drums | | Includes Shipping | 5 | | 6 | 30 | | $20,750.00 |
| | Non-munitions Debris | Roll-off | | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 10 | | 1 | 10 | | $1,500.00 |
| | UXO Technician | | | Includes Travel | 16 | 10 | 9 | 1440 | | $106,732.80 |
| | | | | | | | | 1440 | hours total field time | |
| | | | | | | | | 90 | management hours | $9,000.00 |
| | | | | | | | | | | **$145,232.80** |
| | | | | | Days | Hours | Man/Items | | | |
| 7 | Backfill After Sifting | 105 Grids | | UXO | 20 | 10 | 9 | | | |
| | 1,050,000 Cubic Ft. | Dozor, etc | | See 5 Above | 1 | | 20 | 20 | | $37,366.60 |
| | Construct Decon Pad | PPE, etc. | | Includes Shipping | 1 | | 100 | 100 | | $2,000.00 |
| | UXO Technician | | | Includes Travel | 4 | 10 | 3 | 120 | | $8,894.40 |
| | | | | | | | | 120 | hours total field time | |
| | | | | | | | | 40 | management hours | $4,000.00 |
| | | | | | | | | | | **$52,261.00** |
| | | | | | Days | Hours | Man/Items | | | |
| 8 | Step-out; Brush Cutting | 4 Grids | Minor Brush | UXO | 2 | 10 | 6 | | | |
| | Chain Saw | Trees 2 Inch and smaller | | Includes Shipping | 2 | | 2 | 4 | | $244.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | | Includes Shipping | 2 | | 2 | 4 | | $46.00 |
| | Bush Hog | Majority of Area | | Includes Shipping | 2 | | 1 | 2 | | $690.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 2 | | 2 | 4 | | $150.00 |
| | UXO Technician | | | Includes Travel | 2 | 10 | 6 | 120 | | $8,894.40 |
| | | | | | | | | 120 | hours total field time | |
| | | | | | | | | 20 | management hours | $2,000.00 |
| | | | | | | | | | | **$12,024.40** |
| | | | | | Days | Hours | Man/Items | | | |
| | Visual & Detector Surveyes | 4 Grids | | UXO | 2 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 2 | | 2 | 4 | | $150.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 2 | | 4 | 8 | | $300.00 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Hand Held GPS | Sub Meter | Includes Shipping | 2 | | 1 | 2 | $300.00 |
| | UXO Technician | | Includes Travel | 2 | 10 | 9 | 180 | $13,341.60 |
| | | | | | | | 180 hours total field time | |
| | | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | | **$16,091.60** |
| | | | | Days | Hours | Man/Items | | |
| | Manual Remove & Treat Surf | 4 Grids | UXO | 3 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 2 | | 2 | 4 | $150.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 2 | | 4 | 8 | $300.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 1 | | 1 | 1 | $500.00 |
| | MDAS Certification | Drums | Includes Shipping | 0 | | 6 | 0 | $0.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 1 | | 1 | 1 | $150.00 |
| | UXO Technician | | Includes Travel | 3 | 10 | 9 | 270 | $20,012.40 |
| | | | | | | | 270 hours total field time | |
| | | | | | | | 30 management hours | $3,000.00 |
| | | | | | | | | **$24,112.40** |
| | | | | Days | Hours | Man/Items | | |
| | Intrusive Investigation | 100 Digs | UXO | 2 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Shipping Included Above | 2 | | 2 | 4 | $150.00 |
| | UXO Equipment | Magnetometer | Shipping Included Above | 2 | | 4 | 8 | $300.00 |
| | UXO Supplies | Shovels etc. | Shipping Included Above | 2 | | 1 | 2 | $50.00 |
| | Hand Held GPS | Sub Meter | Shipping Included Above | 2 | | 1 | 2 | $300.00 |
| | UXO Technician | | Travel Included Above | 2 | 10 | 9 | 180 | $13,341.60 |
| | | | | | | | 180 hours total field time | |
| | | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | | **$16,141.60** |
| | | | | Days | Hours | Man/Items | | |
| | Remove & Treat Subsurface | 100 Digs | UXO | 1 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 1 | | 2 | 2 | $75.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 1 | | 4 | 4 | $150.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 1 | | 1 | 1 | $500.00 |
| | MDAS Certification | Drums | Included above | 0 | | 0 | 0 | $0.00 |
| | Non-munitions Debris | Roll-off | Included above | 0 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 1 | | 1 | 1 | $150.00 |
| | UXO Technician | | Includes Travel | 1 | 10 | 9 | 90 | $6,670.80 |
| | | | | | | | 90 hours total field time | |
| | | | | | | | 10 management hours | $1,000.00 |
| | | | | | | | | **$8,545.80** |
| | | | | Days | Hours | Man/Items | | |
| 9 | MEC/MDEH Treatment | 50 Items | UXO | 6 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 6 | | 2 | 12 | $450.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 6 | | 4 | 24 | $900.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 6 | | 1 | 6 | $3,000.00 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | MDAS Certification | Drums | Included above | 0 | | 0 | 0 | $0.00 |
| | Non-munitions Debris | Roll-off | Included above | 0 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 6 | | 1 | 6 | $900.00 |
| | UXO Technician | | Includes Travel | 6 | 10 | 9 | 540 | $40,024.80 |
| | | | | | | | 540 hours total field time | |
| | | | | | | | 60 management hours | $6,000.00 |
| | | | | | | | | **$51,274.80** |
| | | | | Days | Hours | Man/Items | | |
| 10 | MDAS Certification | 60 Drums | UXO | 12 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 0 | | 2 | 0 | $0.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 0 | | 4 | 0 | $0.00 |
| | MDAS Transportation | Drums | Includes Shipping | 10 | | 7 | 70 | $44,750.00 |
| | MDAS Certification | Drums | Includes Shipping | 11 | | 6 | 66 | $0.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| | UXO Technician | | Includes Travel | 11 | 10 | 3 | 330 | $24,459.60 |
| | | | | | | | 330 hours total field time | |
| | | | | | | | 30 management hours | $3,000.00 |
| | | | | | | | | **$72,209.60** |
| 11 | MC Sampling | | N/A | | | | | |
| 12 | Site Resteration | | N/A | | | | | |

| | |
|---|---|
| Initial Inspection Total Field Cost | $4,817,282.45 |
| Contingency on Total Field Cost @ 10% | $481,728.25 |
| Engineering on Total Field Cost @ 2% | $96,345.65 |
| **TOTAL COST TOTAL COST** | **$5,395,356.34** |

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**Public Education Program**
**Annual Costs**

| Item | Quantity | Unit | Unit Cost Subcontract | Unit Cost Material | Unit Cost Labor | Unit Cost Equipment | Extended Cost Subcontract | Extended Cost Material | Extended Cost Labor | Extended Cost Equipment | Subtotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1 PLANNING & REPORTS** | | | | | | | | | | | |
| 1.1 Prepare Documents & Plans | 10 | hr | | | $39.00 | | $0 | $0 | $390 | $0 | $390 |
| 1.2 Reports & Handouts | 1 | ls | | $225.00 | | | $0 | $225 | $0 | $0 | $225 |
| **2 MEETING IN JACKSONVILLE, FLORIDA** | | | | | | | | | | | |
| 2.1 Travel, air | 1 | ls | | $650.00 | | | $0 | $650 | $0 | $0 | $650 |
| 2.2 Per-diem | 1 | day | | $131.00 | | | $0 | $131 | $0 | $0 | $131 |
| 2.3 Car | 1 | day | | | | $100.00 | $0 | $0 | $0 | $100 | $100 |
| 2.4 Meeting | 12 | hr | | | $39.00 | | $0 | $0 | $468 | $0 | $468 |
| **Subtotal** | | | | | | | $0 | $1,006 | $858 | $100 | $1,964 |
| Overhead on Labor Cost @ 30% | | | | | | | | | $257 | | $257 |
| G & A on Labor, Material, Equipment, & Subs Cost @ 10% | | | | | | | $0 | $101 | $86 | $10 | $196 |
| Tax on Materials and Equipment Cost @ 6% | | | | | | | | $60 | | $6 | $66 |
| **Total Direct Cost** | | | | | | | $0 | $1,167 | $1,201 | $116 | $2,484 |
| Indirects on Total Direct Cost @ 0% | | | | | | | | | | | $0 |
| Profit on Total Direct Cost @ 10% | | | | | | | | | | | $248 |
| **Subtotal** | | | | | | | | | | | $2,733 |
| Contingency on Total Field Cost @ 0% | | | | | | | | | | | $0 |
| Engineering on Total Field Cost @ 0% | | | | | | | | | | | $0 |
| **TOTAL COST** | | | | | | | | | | | **$2,733** |

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**ALTERNATIVE 4A: All, Surface and Subsurface MEC Removal**
**Present Worth Analysis**

| Year | Capital Cost | Annual Cost | Total Year Cost | Annual Discount Rate 2.3% | Present Worth |
|---|---|---|---|---|---|
| 0 | $18,120,418 | | $18,120,418 | 1.000 | $18,120,418 |
| 1 | | $2,733 | $2,733 | 0.978 | $2,671 |
| 2 | | $2,733 | $2,733 | 0.956 | $2,611 |
| 3 | | $2,733 | $2,733 | 0.934 | $2,552 |
| 4 | | $2,733 | $2,733 | 0.913 | $2,495 |
| 5 | | $2,733 | $2,733 | 0.893 | $2,439 |
| 6 | | $2,733 | $2,733 | 0.872 | $2,384 |
| 7 | | $2,733 | $2,733 | 0.853 | $2,330 |
| 8 | | $2,733 | $2,733 | 0.834 | $2,278 |
| 9 | | $2,733 | $2,733 | 0.815 | $2,227 |
| 10 | | $2,733 | $2,733 | 0.797 | $2,177 |
| 11 | | $2,733 | $2,733 | 0.779 | $2,128 |
| 12 | | $2,733 | $2,733 | 0.761 | $2,080 |
| 13 | | $2,733 | $2,733 | 0.744 | $2,033 |
| 14 | | $2,733 | $2,733 | 0.727 | $1,988 |
| 15 | | $2,733 | $2,733 | 0.711 | $1,943 |
| 16 | | $2,733 | $2,733 | 0.695 | $1,899 |
| 17 | | $2,733 | $2,733 | 0.679 | $1,856 |
| 18 | | $2,733 | $2,733 | 0.664 | $1,815 |
| 19 | | $2,733 | $2,733 | 0.649 | $1,774 |
| 20 | | $2,733 | $2,733 | 0.635 | $1,734 |
| 21 | | $2,733 | $2,733 | 0.620 | $1,695 |
| 22 | | $2,733 | $2,733 | 0.606 | $1,657 |
| 23 | | $2,733 | $2,733 | 0.593 | $1,620 |
| 24 | | $2,733 | $2,733 | 0.579 | $1,583 |
| 25 | | $2,733 | $2,733 | 0.566 | $1,548 |
| 26 | | $2,733 | $2,733 | 0.554 | $1,513 |
| 27 | | $2,733 | $2,733 | 0.541 | $1,479 |
| 28 | | $2,733 | $2,733 | 0.529 | $1,446 |
| 29 | | $2,733 | $2,733 | 0.517 | $1,413 |
| 30 | | $2,733 | $2,733 | 0.506 | $1,381 |

**TOTAL PRESENT WORTH $18,179,167**

**ALTERNATIVE 4B**

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 15
ALTERNATIVE 4B: All, Surface and Subsurface MEC Removal
CAPITAL COST



| | | | Unit Cost | | | | Extended Cost | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Item | Quantity | Unit | Subcontract | Material | Labor | Equipment | Subcontract | Material | Labor | Equipment | Subtotal |
| **1 PROJECT PLANNING & DOCUMENTS** | | | | | | | | | | | |
| 1.1 Prepare Documents & Plans | 200 | hr | | | $39.00 | | $0 | $0 | $7,800 | $0 | $7,800 |
| 1.2 Prepare Permits | 300 | hr | | | $39.00 | | $0 | $0 | $11,700 | $0 | $11,700 |
| 1.3 Tortoise Survey | 1 | ls | | $3,930.00 | $7,020.00 | $750.00 | $0 | $3,930 | $7,020 | $750 | $11,700 |
| 1.4 Tortoise Relocation | 1 | ls | | $9,360.00 | $9,360.00 | $750.00 | $0 | $9,360 | $9,360 | $750 | $19,470 |
| 1.5 Wetland Verification | 1 | ls | | $3,120.00 | $1,011.00 | $250.00 | $0 | $3,120 | $1,011 | $250 | $4,381 |
| **2 MOBILIZATION AND DEMOBILIZATION** | | | | | | | | | | | |
| 2.1 Site Support Facilities (trailers, phone, electric, etc.) | 1 | ls | | $1,000.00 | | $3,500.00 | $0 | $1,000 | $0 | $3,500 | $4,500 |
| 2.2 Equipment Mobilization/Demobilization | 11 | ea | | | $183.00 | $518.00 | $0 | $0 | $2,013 | $5,698 | $7,711 |
| **3 FIELD SUPPORT AND SITE ACCESS** | | | | | | | | | | | |
| 3.1 Office Trailer | 9.5 | mo | | | | $360.00 | $0 | $0 | $0 | $3,420 | $3,420 |
| 3.2 Field Office Equipment, Utilities, & Support | 9.5 | mo | | $519.00 | | | $0 | $4,931 | $0 | $0 | $4,931 |
| 3.3 Storage Trailer | 9.5 | mo | | | | $94.00 | $0 | $0 | $0 | $893 | $893 |
| 3.4 Survey Support | 30 | day | $1,125.00 | | | | $33,750 | $0 | $0 | $0 | $33,750 |
| 3.5 Site Superintendent | 190 | day | | $131.00 | $420.00 | | $0 | $24,890 | $79,800 | $0 | $104,690 |
| 3.6 Site Health & Safety and QA/QC | 190 | day | | $131.00 | $370.00 | | $0 | $24,890 | $70,300 | $0 | $95,190 |
| 3.7 Truck Scale | 3 | mo | $2,895.00 | | | | $8,685 | $0 | $0 | $0 | $8,685 |
| **4 DECONTAMINATION** | | | | | | | | | | | |
| 4.1 Decontamination Services | 6.5 | mo | | $1,220.00 | $2,245.00 | $1,550.00 | $0 | $7,930 | $14,593 | $10,075 | $32,598 |
| 4.2 Equipment Decon Pad | 1 | ls | | $4,500.00 | $3,000.00 | $725.00 | $0 | $4,500 | $3,000 | $725 | $8,225 |
| 4.3 Decon Water | 6,500 | gal | | $0.20 | | | $0 | $1,300 | $0 | $0 | $1,300 |
| 4.4 Decon Water Storage Tank, 6,000 gallon | 6.5 | mo | | | | $780.00 | $0 | $0 | $0 | $5,070 | $5,070 |
| 4.5 Clean Water Storage Tank, 4,000 gallon | 6.5 | mo | | | | $702.00 | $0 | $0 | $0 | $4,563 | $4,563 |
| 4.6 Disposal of Decon Waste (liquid & solid) | 6.5 | mo | $985.00 | | | | $6,403 | $0 | $0 | $0 | $6,403 |
| **5 SITE PREPARATION** | | | | | | | | | | | |
| 5.1 Clearing - Brush Mowing (medium density) | 20.4 | ac | | | $242.00 | $196.00 | $0 | $0 | $4,937 | $3,998 | $8,935 |
| 5.2 Clearing/Chipping - Tree Removal - 12" dia. | 20.4 | ac | | | $2,500.00 | $1,875.00 | $0 | $0 | $51,000 | $38,250 | $89,250 |
| 5.3 Chipping Stumps | 4,005 | ea | | | $18.50 | $8.45 | $0 | $0 | $74,093 | $33,842 | $107,935 |
| 5.4 UXO Technician | 30 | day | | $131.00 | $370.00 | | $0 | $3,930 | $11,100 | $0 | $15,030 |
| **6 IN-PLACEMENT TREATMENT AND DISPOSAL** | | | | | | | | | | | |
| 6.1 Front End Loader, 4 cy | 40 | day | | | $211.36 | $598.60 | $0 | $0 | $8,454 | $23,944 | $32,398 |
| 6.2 Dozer, 200 hp | 40 | day | | | $211.36 | $1,051.00 | $0 | $0 | $8,454 | $42,040 | $50,494 |
| 6.3 Mixing Disc | 40 | day | | | | $110.00 | $0 | $0 | $0 | $4,400 | $4,400 |
| 6.4 Skid-Steer, 78 hp | 40 | day | | | | $261.20 | $0 | $0 | $0 | $10,448 | $10,448 |
| 6.5 Tiller | 40 | day | | | | $115.00 | $0 | $0 | $0 | $4,600 | $4,600 |
| 6.6 Site Labor, (3 laborers) | 120 | day | | | $102.64 | | $0 | $0 | $12,317 | $0 | $12,317 |
| 6.7 Stabilization Material (FF-100) | 1,780 | ton | | $430.00 | | | $0 | $765,400 | $0 | $0 | $765,400 |
| 6.8 Vendor's Assistance, 5 days | 1 | ls | $5,155.00 | | | | $5,155 | $0 | $0 | $0 | $5,155 |
| 6.9 Dozer, 200 hp | 60 | day | | | $211.36 | $1,051.00 | $0 | $0 | $12,682 | $63,060 | $75,742 |
| 6.10 Excavator, 2.5 cy (2) | 120 | day | | | $211.36 | $1,613.00 | $0 | $0 | $25,363 | $193,560 | $218,923 |
| 6.11 Site Labor, (3 laborers) | 180 | day | | | $102.64 | | $0 | $0 | $18,475 | $0 | $18,475 |
| 6.12 Soil T & D Non-Hazardous (subtitle D) | 35,556 | ton | $85.00 | | | | $3,022,260 | $0 | $0 | $0 | $3,022,260 |
| 6.13 Waste Characterization Test, 1 per 1000 cy | 24 | ea | $800.00 | $6.00 | $35.00 | | $19,200 | $144 | $840 | $0 | $20,184 |
| 6.14 Debris T & D, 12,100 lbs metal | 1 | ls | $425.00 | | | | $425 | $0 | $0 | $0 | $425 |
| **7 BACKFILL AND RESTORATION** | | | | | | | | | | | |
| 7.1 Clean Backfill | 23,704 | cy | | $12.50 | | | $0 | $296,300 | $0 | $0 | $296,300 |
| 7.2 Dozer, 200 hp (2) | 64 | day | | | $211.36 | $1,051.00 | $0 | $0 | $13,527 | $67,264 | $80,791 |
| 7.3 Excavator, 2.5 cy | 32 | day | | | $211.36 | $1,613.00 | $0 | $0 | $6,764 | $51,616 | $58,380 |
| 7.4 Site Labor, (3 laborers) | 96 | day | | | $102.64 | | $0 | $0 | $9,853 | $0 | $9,853 |

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**ALTERNATIVE 4B: All, Surface and Subsurface MEC Removal**
**CAPITAL COST**



| Item | Quantity | Unit | Unit Cost: Subcontract | Unit Cost: Material | Unit Cost: Labor | Unit Cost: Equipment | Extended Cost: Subcontract | Extended Cost: Material | Extended Cost: Labor | Extended Cost: Equipment | Subtotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.5 Revegetation - soil nutrients | 1,609 | msf | $12.10 | | | | $19,469 | $0 | $0 | $0 | $19,469 |
| 7.6 Revegetation, hydro seed (grasses) | 1,609 | msf | $117.00 | | | | $188,253 | $0 | $0 | $0 | $188,253 |
| 7.7 Revegetation - wetland nutrients | 87.0 | msf | $14.55 | | | | $1,266 | $0 | $0 | $0 | $1,266 |
| 7.8 Wetland Soil | 400 | cy | | $23.00 | | | $0 | $9,200 | $0 | $0 | $9,200 |
| 7.9 Wetland Restoration | 871 | csf | $35.96 | | | | $31,321 | $0 | $0 | $0 | $31,321 |
| 7.10 Perimeter Signs | 12 | ea | | $69.50 | | | $0 | $834 | $0 | $0 | $834 |
| **8 POST CONSTRUCTION COST** | | | | | | | | | | | |
| 8.1 Contractor Completion Report | 150 | hr | | | $39.00 | | $0 | $0 | $5,850 | $0 | $5,850 |
| 8.2 Remedial Action Closeout Report | 200 | hr | | | $39.00 | | $0 | $0 | $7,800 | $0 | $7,800 |
| **Subtotal** | | | | | | | $3,336,186 | $1,161,659 | $478,105 | $572,717 | $5,548,667 |
| Overhead on Labor Cost @ 30% | | | | | | | | | $143,432 | | $143,432 |
| G & A on Labor, Material, Equipment, & Subs Cost @ 10% | | | | | | | $333,619 | $116,166 | $47,811 | $57,272 | $554,867 |
| Tax on Materials and Equipment Cost @ 6% | | | | | | | | $69,700 | | $34,363 | $104,063 |
| **Total Direct Cost** | | | | | | | $3,669,805 | $1,347,524 | $669,348 | $664,351 | $6,351,028 |
| Indirects on Total Direct Cost @ 30% | | | (excluding transportation and disposal cost) | | | | | | | | $996,582 |
| Profit on Total Direct Cost @ 10% | | | | | | | | | | | $635,103 |
| **Total Field Cost** | | | | | | | | | | | $7,982,713 |
| Contingency on Total Field Cost @ 20% | | | | | | | | | | | $1,596,543 |
| Engineering on Total Field Cost @ 4% | | | | | | | | | | | $319,309 |
| **TOTAL COST** | | | | | | | | | | | **$9,898,564** |

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 15
ALTERNATIVE 4B: All, Surface and Subsurface MEC Removal

**Alternative 4A and 4B**

| | | | | | Days | Hours | Man/Items | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Site Setup; Establish Grids | 169 Grids | Minor Brush | UXO | 6 | 10 | 2 | | |
| | RTK GPS | Sub meter accuracy | | Includes shipping | 8 | | 1 | 8 | $1,200.00 |
| | UXO Equipment | Magnetometer | | Includes shipping | 8 | | 1 | 8 | $300.00 |
| | GPS Operator | | | Includes Travel | 8 | 10 | 1 | 80 | $5,129.60 |
| | UXO Escort | | | Includes Travel | 8 | 10 | 1 | 80 | $5,929.60 |
| | | | | | | | | 160 hours total field time | |
| | | | | | | | | 30 management hours | $3,000.00 |
| | | | | | | | | | **$15,559.20** |
| | | | | | Days | Hours | Man/Items | | |
| 2 | Site Setup; Brush Cutting | 169 Grids | Minor Brush | UXO | 18 | 10 | 6 | | |
| | Chain Saw | Trees 2 Inch and smaller | | Includes Shipping | 20 | | 2 | 40 | $2,440.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | | Includes Shipping | 20 | | 2 | 40 | $1,840.00 |
| | Bush Hog | Majority of Area | | Includes Shipping | 20 | | 1 | 20 | $6,900.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 20 | | 2 | 40 | $1,500.00 |
| | UXO Technician | | | Includes Travel | 20 | 10 | 6 | 1200 | $88,944.00 |
| | | | | | | | | 1200 hours total field time | |
| | | | | | | | | 75 management hours | $7,500.00 |
| | | | | | | | | | **$109,124.00** |
| | | | | | Days | Hours | Man/Items | | |
| 3 | Visual & Detector Surveyes | 169 Grids | | UXO | 20 | 10 | 9 | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 22 | | 2 | 44 | $1,650.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 22 | | 4 | 88 | $3,300.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 22 | | 1 | 22 | $3,300.00 |
| | UXO Technician | | | Includes Travel | 22 | 10 | 9 | 1980 | $146,757.60 |
| | | | | | | | | 1980 hours total field time | |
| | | | | | | | | 75 management hours | $7,500.00 |
| | | | | | | | | | **$162,507.60** |
| | | | | | Days | Hours | Man/Items | | |
| 4 | Manual Remove & Treat Surf | 169 Grids | | UXO | 10 | 10 | 9 | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 5 | | 2 | 10 | $375.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 5 | | 4 | 20 | $750.00 |
| | MEC/MDEH Treatment | Donar Charge | | Includes Shipping | 5 | | 1 | 5 | $2,500.00 |
| | MDAS Certification | Drums | | Includes Shipping | 5 | | 7 | 35 | $23,750.00 |
| | Non-munitions Debris | Roll-off | | Includes Shipping | 1 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 5 | | 1 | 5 | $750.00 |
| | UXO Technician | | | Includes Travel | 10 | 10 | 9 | 900 | $66,708.00 |
| | | | | | | | | 900 hours total field time | |
| | | | | | | | | 100 management hours | $10,000.00 |
| | | | | | | | | | **$104,833.00** |
| | | | | | Days | Hours | Man/Items | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5 | Mechanical Excavation (0-1bgs) | 169 Grids | UXO | 100 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 100 | | 2 | 200 | | $7,500.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 100 | | 4 | 400 | | $15,000.00 |
| | Screeening Plant | Sift, Excavate, etc. | Includes Shipping | 1 | | 1,690,000 | 1690000 | | $3,580,330.00 |
| | Backfill after sifting | Dozor, etc | Includes Shipping | 1 | | 105 | 105 | | $196,174.65 |
| | Construct Decon Pad | PPE, etc. | Includes Shipping | 1 | | 100 | 100 | | $2,000.00 |
| | UXO Technician | | Includes Travel | 100 | 10 | 3 | 3000 | | $222,360.00 |
| | | | | | | | 3000 | hours total field time | |
| | | | | | | | 40 | management hours | $4,000.00 |
| | | | | | | | | | **$4,027,364.65** |
| | | | | Days | Hours | Man/Items | | | |
| 6 | Remove & Treat Excavtion | 169 Grids | UXO | 9 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 10 | | 2 | 20 | | $750.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 10 | | 4 | 40 | | $1,500.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 10 | | 1 | 10 | | $5,000.00 |
| | MDAS Certification | Drums | Includes Shipping | 5 | | 6 | 30 | | $20,750.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 10 | | 1 | 10 | | $1,500.00 |
| | UXO Technician | | Includes Travel | 16 | 10 | 9 | 1440 | | $106,732.80 |
| | | | | | | | 1440 | hours total field time | |
| | | | | | | | 90 | management hours | $9,000.00 |
| | | | | | | | | | **$145,232.80** |
| | | | | Days | Hours | Man/Items | | | |
| 7 | Backfill After Sifting | 105 Grids | UXO | 20 | 10 | 9 | | | |
| | 1,050,000 Cubic Ft. | Dozor, etc | See 5 Above | 1 | | 20 | 20 | | $37,366.60 |
| | Construct Decon Pad | PPE, etc. | Includes Shipping | 1 | | 100 | 100 | | $2,000.00 |
| | UXO Technician | | Includes Travel | 4 | 10 | 3 | 120 | | $8,894.40 |
| | | | | | | | 120 | hours total field time | |
| | | | | | | | 40 | management hours | $4,000.00 |
| | | | | | | | | | **$52,261.00** |
| | | | | Days | Hours | Man/Items | | | |
| 8 | Visual & Detector Surveyes | 169 Grids | UXO | 22 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 22 | | 2 | 44 | | $1,650.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 22 | | 4 | 88 | | $3,300.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 22 | | 1 | 22 | | $3,300.00 |
| | UXO Technician | | Includes Travel | 22 | 10 | 9 | 1980 | | $146,757.60 |
| | | | | | | | 1980 | hours total field time | |
| | | | | | | | 40 | management hours | $4,000.00 |
| | | | | | | | | | **$159,007.60** |
| | | | | Days | Hours | Man/Items | | | |
| 9 | Mechanical Excavation (1-2bgs) | 20 Grids | UXO | 12 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 12 | | 2 | 24 | | $900.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 12 | | 4 | 48 | | $1,800.00 |

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 15
ALTERNATIVE 4B: All, Surface and Subsurface MEC Removal

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Screeening Plant | Sift, Excavate, etc. | Includes Shipping | 1 | | 200,000 | 200000 | | $600,330.00 |
| | Backfill after sifting | Dozor, etc | Includes Shipping | 1 | | 6 | 6 | | $11,209.98 |
| | Construct Decon Pad | PPE, etc. | Includes Shipping | 1 | | 100 | 100 | | $2,000.00 |
| | UXO Technician | | Includes Travel | 12 | 10 | 3 | 360 | | $26,683.20 |
| | | | | | | | 360 | hours total field time | |
| | | | | | | | 40 | management hours | $4,000.00 |
| | | | | | | | | | **$646,923.18** |
| | | | | Days | Hours | Man/Items | | | |
| | Remove & Treat Excavtion | 20 Grids | UXO | 4 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 4 | | 2 | 8 | | $300.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 4 | | 4 | 16 | | $600.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 4 | | 1 | 4 | | $2,000.00 |
| | MDAS Certification | Drums | Includes Shipping | 1 | | 3 | 3 | | $4,550.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 4 | | 1 | 4 | | $600.00 |
| | UXO Technician | | Includes Travel | 5 | 10 | 9 | 450 | | $33,354.00 |
| | | | | | | | 450 | hours total field time | |
| | | | | | | | 90 | management hours | $9,000.00 |
| | | | | | | | | | **$50,404.00** |
| | | | | Days | Hours | Man/Items | | | |
| 10 | Visual & Detector Surveyes | 20 Grids | UXO | 3 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 3 | | 2 | 6 | | $225.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 3 | | 4 | 12 | | $450.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 3 | | 1 | 3 | | $450.00 |
| | UXO Technician | | Includes Travel | 3 | 10 | 9 | 270 | | $20,012.40 |
| | | | | | | | 270 | hours total field time | |
| | | | | | | | 40 | management hours | $4,000.00 |
| | | | | | | | | | **$25,137.40** |
| | | | | Days | Hours | Man/Items | | | |
| | Mechanical Excavation (2-3bgs) | 10 Grids | UXO | 6 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 6 | | 2 | 12 | | $450.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 6 | | 4 | 24 | | $900.00 |
| | Screeening Plant | Sift, Excavate, etc. | Includes Shipping | 1 | | 100,000 | 100000 | | $400,330.00 |
| | Backfill after sifting | Dozor, etc | Includes Shipping | 1 | | 3 | 3 | | $5,604.99 |
| | Construct Decon Pad | PPE, etc. | Includes Shipping | 1 | | 100 | 100 | | $2,000.00 |
| | UXO Technician | | Includes Travel | 6 | 10 | 3 | 180 | | $13,341.60 |
| | | | | | | | 180 | hours total field time | |
| | | | | | | | 40 | management hours | $4,000.00 |
| | | | | | | | | | **$426,626.59** |
| | | | | Days | Hours | Man/Items | | | |
| | Remove & Treat Excavtion | 10 Grids | UXO | 1 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 0 | | 2 | 0 | | $0.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 0 | | 4 | 0 | | $0.00 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 0 | | 1 | 0 | | $0.00 |
| | MDAS Certification | Drums | Includes Shipping | 1 | | 1 | 1 | | $3,350.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 0 | | 1 | 0 | | $0.00 |
| | UXO Technician | | Includes Travel | 1 | 10 | 3 | 30 | | $2,223.60 |
| | | | | | | | 30 | hours total field time | |
| | | | | | | | 10 | management hours | $1,000.00 |
| | | | | | | | | | **$6,573.60** |
| | | | | Days | Hours | Man/Items | | | |
| 11 | Visual & Detector Surveyes | 10 Grids | UXO | 2 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 2 | | 2 | 4 | | $150.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 2 | | 4 | 8 | | $300.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 2 | | 1 | 2 | | $300.00 |
| | UXO Technician | | Includes Travel | 2 | 10 | 9 | 180 | | $13,341.60 |
| | | | | | | | 180 | hours total field time | |
| | | | | | | | 20 | management hours | $2,000.00 |
| | | | | | | | | | **$16,091.60** |
| | | | | Days | Hours | Man/Items | | | |
| | Mechanical Excavation (3-4bgs) | 3 Grids | UXO | 2 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 2 | | 2 | 4 | | $150.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 2 | | 4 | 8 | | $300.00 |
| | Screeening Plant | Sift, Excavate, etc. | Includes Shipping | 1 | | 30,000 | 30000 | | $260,330.00 |
| | Backfill after sifting | Dozor, etc | Includes Shipping | 1 | | 2 | 2 | | $3,736.66 |
| | Construct Decon Pad | PPE, etc. | Includes Shipping | 1 | | 100 | 100 | | $2,000.00 |
| | UXO Technician | | Includes Travel | 6 | 10 | 3 | 180 | | $13,341.60 |
| | | | | | | | 180 | hours total field time | |
| | | | | | | | 40 | management hours | $4,000.00 |
| | | | | | | | | | **$283,858.26** |
| | | | | Days | Hours | Man/Items | | | |
| | Remove & Treat Excavtion | 3 Grids | UXO | 1 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 0 | | 2 | 0 | | $0.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 0 | | 4 | 0 | | $0.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 0 | | 1 | 0 | | $0.00 |
| | MDAS Certification | Drums | Includes Shipping | 1 | | 1 | 1 | | $3,350.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 0 | | 1 | 0 | | $0.00 |
| | UXO Technician | | Includes Travel | 1 | 10 | 3 | 30 | | $2,223.60 |
| | | | | | | | 30 | hours total field time | |
| | | | | | | | 10 | management hours | $1,000.00 |
| | | | | | | | | | **$6,573.60** |
| | | | | Days | Hours | Man/Items | | | |
| 12 | Step-out; Brush Cutting | 4 Grids Minor Brush | UXO | 2 | 10 | 6 | | | |
| | Chain Saw | Trees 2 Inch and smaller | Includes Shipping | 2 | | 2 | 4 | | $244.00 |

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 15
ALTERNATIVE 4B: All, Surface and Subsurface MEC Removal

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Blade Weedeater | Areas inaccessible to Brush Hog | Includes Shipping | 2 | | 2 | 4 | $46.00 |
| Bush Hog | Majority of Area | Includes Shipping | 2 | | 1 | 2 | $690.00 |
| UXO Equipment | Magnetometer | Includes Shipping | 2 | | 2 | 4 | $150.00 |
| UXO Technician | | Includes Travel | 2 | 10 | 6 | 120 | $8,894.40 |
| | | | | | | 120 hours total field time | |
| | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | **$12,024.40** |
| | | | Days | Hours | Man/Items | | |
| Visual & Detector Surveyes | 4 Grids | UXO | 2 | 10 | 9 | | |
| UXO Equipment | All-Metals | Includes Shipping | 2 | | 2 | 4 | $150.00 |
| UXO Equipment | Magnetometer | Includes Shipping | 2 | | 4 | 8 | $300.00 |
| Hand Held GPS | Sub Meter | Includes Shipping | 2 | | 1 | 2 | $300.00 |
| UXO Technician | | Includes Travel | 2 | 10 | 9 | 180 | $13,341.60 |
| | | | | | | 180 hours total field time | |
| | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | **$16,091.60** |
| | | | Days | Hours | Man/Items | | |
| Manual Remove & Treat Surf | 4 Grids | UXO | 3 | 10 | 9 | | |
| UXO Equipment | All-Metals | Includes Shipping | 2 | | 2 | 4 | $150.00 |
| UXO Equipment | Magnetometer | Includes Shipping | 2 | | 4 | 8 | $300.00 |
| MEC/MDEH Treatment | Donar Charge | Includes Shipping | 1 | | 1 | 1 | $500.00 |
| MDAS Certification | Drums | Includes Shipping | 0 | | 6 | 0 | $0.00 |
| Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | $0.00 |
| Hand Held GPS | Sub Meter | Includes Shipping | 1 | | 1 | 1 | $150.00 |
| UXO Technician | | Includes Travel | 3 | 10 | 9 | 270 | $20,012.40 |
| | | | | | | 270 hours total field time | |
| | | | | | | 30 management hours | $3,000.00 |
| | | | | | | | **$24,112.40** |
| | | | Days | Hours | Man/Items | | |
| Intrusive Investigation | 100 Digs | UXO | 2 | 10 | 9 | | |
| UXO Equipment | All-Metals | Shipping Included Above | 2 | | 2 | 4 | $150.00 |
| UXO Equipment | Magnetometer | Shipping Included Above | 2 | | 4 | 8 | $300.00 |
| UXO Supplies | Shovels etc. | Shipping Included Above | 2 | | 1 | 2 | $50.00 |
| Hand Held GPS | Sub Meter | Shipping Included Above | 2 | | 1 | 2 | $300.00 |
| UXO Technician | | Travel Included Above | 2 | 10 | 9 | 180 | $13,341.60 |
| | | | | | | 180 hours total field time | |
| | | | | | | 20 management hours | $2,000.00 |
| | | | | | | | **$16,141.60** |
| | | | Days | Hours | Man/Items | | |
| Remove & Treat Subsurface | 100 Digs | UXO | 1 | 10 | 9 | | |
| UXO Equipment | All-Metals | Includes Shipping | 1 | | 2 | 2 | $75.00 |
| UXO Equipment | Magnetometer | Includes Shipping | 1 | | 4 | 4 | $150.00 |
| MEC/MDEH Treatment | Donar Charge | Includes Shipping | 1 | | 1 | 1 | $500.00 |

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 15
ALTERNATIVE 4B: All, Surface and Subsurface MEC Removal

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | MDAS Certification | Drums | Included above | 0 | | 0 | 0 | $0.00 |
| | Non-munitions Debris | Roll-off | Included above | 0 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 1 | | 1 | 1 | $150.00 |
| | UXO Technician | | Includes Travel | 1 | 10 | 9 | 90 | $6,670.80 |
| | | | | | | | 90 hours total field time | |
| | | | | | | | 10 management hours | $1,000.00 |
| | | | | | | | | **$8,545.80** |
| | | | | Days | Hours | Man/Items | | |
| 13 | MEC/MDEH Treatment | 50 Items | UXO | 6 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 6 | | 2 | 12 | $450.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 6 | | 4 | 24 | $900.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 6 | | 1 | 6 | $3,000.00 |
| | MDAS Certification | Drums | Included above | 0 | | 0 | 0 | $0.00 |
| | Non-munitions Debris | Roll-off | Included above | 0 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 6 | | 1 | 6 | $900.00 |
| | UXO Technician | | Includes Travel | 6 | 10 | 9 | 540 | $40,024.80 |
| | | | | | | | 540 hours total field time | |
| | | | | | | | 60 management hours | $6,000.00 |
| | | | | | | | | **$51,274.80** |
| | | | | Days | Hours | Man/Items | | |
| 14 | MDAS Certification | 60 Drums | UXO | 12 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 0 | | 2 | 0 | $0.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 0 | | 4 | 0 | $0.00 |
| | MDAS Transportation | Drums | Includes Shipping | 10 | | 7 | 70 | $44,750.00 |
| | MDAS Certification | Drums | Includes Shipping | 11 | | 6 | 66 | $0.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| | UXO Technician | | Includes Travel | 11 | 10 | 3 | 330 | $24,459.60 |
| | | | | | | | 330 hours total field time | |
| | | | | | | | 30 management hours | $3,000.00 |
| | | | | | | | | **$72,209.60** |
| 15 | MC Sampling | | N/A | | | | | |
| 16 | Site Resteration | | N/A | | | | | |

| | |
|---|---|
| Initial Inspection Total Field Cost | $6,438,478.28 |
| Contingency on Total Field Cost @ 10% | $643,847.83 |
| Engineering on Total Field Cost @ 2% | $128,769.57 |
| **TOTAL COST TOTAL COST** | **$7,211,095.67** |

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**Public Education Program**
**Annual Costs**

| Item | Quantity | Unit | Unit Cost Subcontract | Unit Cost Material | Unit Cost Labor | Unit Cost Equipment | Extended Cost Subcontract | Extended Cost Material | Extended Cost Labor | Extended Cost Equipment | Subtotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1 PLANNING & REPORTS** | | | | | | | | | | | |
| 1.1 Prepare Documents & Plans | 10 | hr | | | $39.00 | | $0 | $0 | $390 | $0 | $390 |
| 1.2 Reports & Handouts | 1 | ls | | $225.00 | | | $0 | $225 | $0 | $0 | $225 |
| **2 MEETING IN JACKSONVILLE, FLORIDA** | | | | | | | | | | | |
| 2.1 Travel, air | 1 | ls | | $650.00 | | | $0 | $650 | $0 | $0 | $650 |
| 2.2 Per-diem | 1 | day | | $131.00 | | | $0 | $131 | $0 | $0 | $131 |
| 2.3 Car | 1 | day | | | | $100.00 | $0 | $0 | $0 | $100 | $100 |
| 2.4 Meeting | 12 | hr | | | $39.00 | | $0 | $0 | $468 | $0 | $468 |
| **Subtotal** | | | | | | | $0 | $1,006 | $858 | $100 | $1,964 |
| Overhead on Labor Cost @ 30% | | | | | | | | | $257 | | $257 |
| G & A on Labor, Material, Equipment, & Subs Cost @ 10% | | | | | | | $0 | $101 | $86 | $10 | $196 |
| Tax on Materials and Equipment Cost @ 6% | | | | | | | | $60 | | $6 | $66 |
| **Total Direct Cost** | | | | | | | $0 | $1,167 | $1,201 | $116 | $2,484 |
| Indirects on Total Direct Cost @ 0% | | | | | | | | | | | $0 |
| Profit on Total Direct Cost @ 10% | | | | | | | | | | | $248 |
| **Subtotal** | | | | | | | | | | | $2,733 |
| Contingency on Total Field Cost @ 0% | | | | | | | | | | | $0 |
| Engineering on Total Field Cost @ 0% | | | | | | | | | | | $0 |
| **TOTAL COST** | | | | | | | | | | | **$2,733** |

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**ALTERNATIVE 4B: All, Surface and Subsurface MEC Removal**
**Present Worth Analysis**

| Year | Capital Cost | Annual Cost | Total Year Cost | Annual Discount Rate 2.3% | Present Worth |
|---|---|---|---|---|---|
| 0 | $17,109,659 | | $17,109,659 | 1.000 | $17,109,659 |
| 1 | | $2,733 | $2,733 | 0.978 | $2,671 |
| 2 | | $2,733 | $2,733 | 0.956 | $2,611 |
| 3 | | $2,733 | $2,733 | 0.934 | $2,552 |
| 4 | | $2,733 | $2,733 | 0.913 | $2,495 |
| 5 | | $2,733 | $2,733 | 0.893 | $2,439 |
| 6 | | $2,733 | $2,733 | 0.872 | $2,384 |
| 7 | | $2,733 | $2,733 | 0.853 | $2,330 |
| 8 | | $2,733 | $2,733 | 0.834 | $2,278 |
| 9 | | $2,733 | $2,733 | 0.815 | $2,227 |
| 10 | | $2,733 | $2,733 | 0.797 | $2,177 |
| 11 | | $2,733 | $2,733 | 0.779 | $2,128 |
| 12 | | $2,733 | $2,733 | 0.761 | $2,080 |
| 13 | | $2,733 | $2,733 | 0.744 | $2,033 |
| 14 | | $2,733 | $2,733 | 0.727 | $1,988 |
| 15 | | $2,733 | $2,733 | 0.711 | $1,943 |
| 16 | | $2,733 | $2,733 | 0.695 | $1,899 |
| 17 | | $2,733 | $2,733 | 0.679 | $1,856 |
| 18 | | $2,733 | $2,733 | 0.664 | $1,815 |
| 19 | | $2,733 | $2,733 | 0.649 | $1,774 |
| 20 | | $2,733 | $2,733 | 0.635 | $1,734 |
| 21 | | $2,733 | $2,733 | 0.620 | $1,695 |
| 22 | | $2,733 | $2,733 | 0.606 | $1,657 |
| 23 | | $2,733 | $2,733 | 0.593 | $1,620 |
| 24 | | $2,733 | $2,733 | 0.579 | $1,583 |
| 25 | | $2,733 | $2,733 | 0.566 | $1,548 |
| 26 | | $2,733 | $2,733 | 0.554 | $1,513 |
| 27 | | $2,733 | $2,733 | 0.541 | $1,479 |
| 28 | | $2,733 | $2,733 | 0.529 | $1,446 |
| 29 | | $2,733 | $2,733 | 0.517 | $1,413 |
| 30 | | $2,733 | $2,733 | 0.506 | $1,381 |

**TOTAL PRESENT WORTH $17,168,408**

**ALTERNATIVE 4C**

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**ALTERNATIVE 4C: All, Surface and Subsurface MEC Removal**
**CAPITAL COST**



| | | | Unit Cost | | | | Extended Cost | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Item | Quantity | Unit | Subcontract | Material | Labor | Equipment | Subcontract | Material | Labor | Equipment | Subtotal |
| **1 PROJECT PLANNING & DOCUMENTS** | | | | | | | | | | | |
| 1.1 Prepare Documents & Plans | 100 | hr | | | $39.00 | | $0 | $0 | $3,900 | $0 | $3,900 |
| 1.2 Prepare Permits | 150 | hr | | | $39.00 | | $0 | $0 | $5,850 | $0 | $5,850 |
| 1.3 Tortoise Survey | 1 | ls | | $3,930.00 | $7,020.00 | $750.00 | $0 | $3,930 | $7,020 | $750 | $11,700 |
| 1.4 Tortoise Relocation | 1 | ls | | $9,360.00 | $9,360.00 | $750.00 | $0 | $9,360 | $9,360 | $750 | $19,470 |
| 1.5 Wetland Verification | 1 | ls | | $3,120.00 | $1,011.00 | $250.00 | $0 | $3,120 | $1,011 | $250 | $4,381 |
| **2 MOBILIZATION AND DEMOBILIZATION** | | | | | | | | | | | |
| 2.1 Site Support Facilities (trailers, phone, electric, etc.) | 1 | ls | | $1,000.00 | | $3,500.00 | $0 | $1,000 | $0 | $3,500 | $4,500 |
| 2.2 Equipment Mobilization/Demobilization | 9 | ea | | | $183.00 | $518.00 | $0 | $0 | $1,647 | $4,662 | $6,309 |
| **3 FIELD SUPPORT AND SITE ACCESS** | | | | | | | | | | | |
| 3.1 Office Trailer | 4.0 | mo | | | | $360.00 | $0 | $0 | $0 | $1,440 | $1,440 |
| 3.2 Field Office Equipment, Utilities, & Support | 4.0 | mo | | $519.00 | | | $0 | $2,076 | $0 | $0 | $2,076 |
| 3.3 Storage Trailer | 4.0 | mo | | | | $94.00 | $0 | $0 | $0 | $376 | $376 |
| 3.4 Survey Support | 5 | day | $1,125.00 | | | | $5,625 | $0 | $0 | $0 | $5,625 |
| 3.5 Site Superintendent | 85 | day | | $131.00 | $420.00 | | $0 | $11,135 | $35,700 | $0 | $46,835 |
| 3.6 Site Health & Safety and QA/QC | 85 | day | | $131.00 | $370.00 | | $0 | $11,135 | $31,450 | $0 | $42,585 |
| **4 DECONTAMINATION** | | | | | | | | | | | |
| 4.1 Decontamination Services | 3.0 | mo | | $1,220.00 | $2,245.00 | $1,550.00 | $0 | $3,660 | $6,735 | $4,650 | $15,045 |
| 4.2 Equipment Decon Pad | 1 | ls | | $4,500.00 | $3,000.00 | $725.00 | $0 | $4,500 | $3,000 | $725 | $8,225 |
| 4.3 Decon Water | 3,000 | gal | | $0.20 | | | $0 | $600 | $0 | $0 | $600 |
| 4.4 Decon Water Storage Tank, 6,000 gallon | 3.0 | mo | | | | $780.00 | $0 | $0 | $0 | $2,340 | $2,340 |
| 4.5 Clean Water Storage Tank, 4,000 gallon | 3.0 | mo | | | | $702.00 | $0 | $0 | $0 | $2,106 | $2,106 |
| 4.6 Disposal of Decon Waste (liquid & solid) | 3.0 | mo | $985.00 | | | | $2,955 | $0 | $0 | $0 | $2,955 |
| **5 SITE PREPARATION** | | | | | | | | | | | |
| 5.1 Clearing - Brush Mowing (medium density) | 20.4 | ac | | | $242.00 | $196.00 | $0 | $0 | $4,937 | $3,998 | $8,935 |
| 5.2 Clearing/Chipping - Tree Removal - 12" dia. | 20.4 | ac | | | $2,500.00 | $1,875.00 | $0 | $0 | $51,000 | $38,250 | $89,250 |
| 5.3 Chipping Stumps | 4,005 | ea | | | $18.50 | $8.45 | $0 | $0 | $74,093 | $33,842 | $107,935 |
| 5.4 UXO Technician | 30 | day | | $131.00 | $370.00 | | $0 | $3,930 | $11,100 | $0 | $15,030 |
| **6 SITE CLEANUP AND RESTORATION** | | | | | | | | | | | |
| 6.1 Debris T & D, 11,200 lbs metal | 1 | ls | $400.00 | | | | $400 | $0 | $0 | $0 | $400 |
| 6.2 FE Loader, 185 hp | 10 | day | | | $211.36 | $588.60 | $0 | $0 | $2,114 | $5,886 | $8,000 |
| 6.3 Dozer, 200 hp (2) | 20 | day | | | $211.36 | $1,051.00 | $0 | $0 | $4,227 | $21,020 | $25,247 |
| 6.4 Site Labor, (3 laborers) | 30 | day | | | $102.64 | | $0 | $0 | $3,079 | $0 | $3,079 |
| 6.5 Revegetation - soil nutrients | 1,609 | msf | $12.10 | | | | $19,469 | $0 | $0 | $0 | $19,469 |
| 6.6 Revegetation, hydro seed (grasses) | 1,609 | msf | $117.00 | | | | $188,253 | $0 | $0 | $0 | $188,253 |
| 6.7 Revegetation - wetland nutrients | 87.0 | msf | $14.55 | | | | $1,266 | $0 | $0 | $0 | $1,266 |
| 6.8 Wetland Soil | 400 | cy | | $23.00 | | | $0 | $9,200 | $0 | $0 | $9,200 |
| 6.9 Wetland Restoration | 871 | csf | $35.96 | | | | $31,321 | $0 | $0 | $0 | $31,321 |
| 6.10 Perimeter Signs | 12 | ea | | $69.50 | | | $0 | $834 | $0 | $0 | $834 |
| **7 POST CONSTRUCTION COST** | | | | | | | | | | | |
| 7.1 Contractor Completion Report | 100 | hr | | | $39.00 | | $0 | $0 | $3,900 | $0 | $3,900 |
| 7.2 Remedial Action Closeout Report | 150 | hr | | | $39.00 | | $0 | $0 | $5,850 | $0 | $5,850 |
| **Subtotal** | | | | | | | $249,289 | $64,480 | $265,972 | $124,546 | $704,287 |
| Overhead on Labor Cost @ 30% | | | | | | | | | $79,792 | | $79,792 |
| G & A on Labor, Material, Equipment, & Subs Cost @ 10% | | | | | | | $24,929 | $6,448 | $26,597 | $12,455 | $70,429 |
| Tax on Materials and Equipment Cost @ 6% | | | | | | | | $3,869 | | $7,473 | $11,342 |
| **Total Direct Cost** | | | | | | | $274,218 | $74,797 | $372,361 | $144,473 | $865,849 |

| Item | Quantity | Unit | Unit Cost Subcontract | Unit Cost Material | Unit Cost Labor | Unit Cost Equipment | Extended Cost Subcontract | Extended Cost Material | Extended Cost Labor | Extended Cost Equipment | Subtotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Indirects on Total Direct Cost @ 25% | | | | | | | | | | | $216,462 |
| Profit on Total Direct Cost @ 10% | | | | | | | | | | | $86,585 |
| **Total Field Cost** | | | | | | | | | | | $1,168,896 |
| Contingency on Total Field Cost @ 20% | | | | | | | | | | | $233,779 |
| Engineering on Total Field Cost @ 10% | | | | | | | | | | | $116,890 |
| **TOTAL COST** | | | | | | | | | | | **$1,519,565** |

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 15
ALTERNATIVE 4C: All, Surface and Subsurface MEC Removal

**Alternative 4C**

| | | | | | Days | Hours | Man/Items | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Site Setup; Establish Grids | 169 Grids | Minor Brush | UXO | 6 | 10 | 2 | | | |
| | RTK GPS | Sub meter accuracy | | Includes shipping | 8 | | 1 | 8 | | $1,200.00 |
| | UXO Equipment | Magnetometer | | Includes shipping | 8 | | 1 | 8 | | $300.00 |
| | GPS Operator | | | Includes Travel | 8 | 10 | 1 | 80 | | $5,129.60 |
| | UXO Escort | | | Includes Travel | 8 | 10 | 1 | 80 | | $5,929.60 |
| | | | | | | | | 160 | hours total field time | |
| | | | | | | | | 30 | management hours | $3,000.00 |
| | | | | | | | | | | **$15,559.20** |
| | | | | | Days | Hours | Man/Items | | | |
| 2 | Site Setup; Brush Cutting | 169 Grids | Minor Brush | UXO | 18 | 10 | 6 | | | |
| | Chain Saw | Trees 2 Inch and smaller | | Includes Shipping | 20 | | 2 | 40 | | $2,440.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | | Includes Shipping | 20 | | 2 | 40 | | $1,840.00 |
| | Bush Hog | Majority of Area | | Includes Shipping | 20 | | 1 | 20 | | $6,900.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 20 | | 2 | 40 | | $1,500.00 |
| | UXO Technician | | | Includes Travel | 20 | 10 | 6 | 1200 | | $88,944.00 |
| | | | | | | | | 1200 | hours total field time | |
| | | | | | | | | 75 | management hours | $7,500.00 |
| | | | | | | | | | | **$109,124.00** |
| | | | | | Days | Hours | Man/Items | | | |
| 3 | Visual & Detector Surveyes | 169 Grids | | UXO | 20 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 22 | | 2 | 44 | | $1,650.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 22 | | 4 | 88 | | $3,300.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 22 | | 1 | 22 | | $3,300.00 |
| | UXO Technician | | | Includes Travel | 22 | 10 | 9 | 1980 | | $146,757.60 |
| | | | | | | | | 1980 | hours total field time | |
| | | | | | | | | 75 | management hours | $7,500.00 |
| | | | | | | | | | | **$162,507.60** |
| | | | | | Days | Hours | Man/Items | | | |
| 4 | Manual Remove & Treat Surf | 169 Grids | | UXO | 10 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 5 | | 2 | 10 | | $375.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 5 | | 4 | 20 | | $750.00 |
| | MEC/MDEH Treatment | Donar Charge | | Includes Shipping | 5 | | 1 | 5 | | $2,500.00 |
| | MDAS Certification | Drums | | Includes Shipping | 5 | | 7 | 35 | | $23,750.00 |
| | Non-munitions Debris | Roll-off | | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 5 | | 1 | 5 | | $750.00 |
| | UXO Technician | | | Includes Travel | 10 | 10 | 9 | 900 | | $66,708.00 |
| | | | | | | | | 900 | hours total field time | |
| | | | | | | | | 100 | management hours | $10,000.00 |
| | | | | | | | | | | **$104,833.00** |
| | | | | | Days | Hours | Man/Items | | | |
| 5 | Mechanical Excavation (0-1bgs) | 169 Grids | | UXO | 100 | 10 | 9 | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | UXO Equipment | All-Metals | Includes Shipping | 100 | | 2 | 200 | | $7,500.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 100 | | 6 | 600 | | $22,500.00 |
| | Excavator | Excavate, etc. | Includes Shipping | 1 | | 1,690,000 | 1690000 | | $1,807,065.00 |
| | Backfill after screening | Dozor, etc | Includes Shipping | 1 | | 105 | 105 | | $196,174.65 |
| | Construct Decon Pad | PPE, etc. | Includes Shipping | 1 | | 100 | 100 | | $2,000.00 |
| | UXO Technician | | Includes Travel | 100 | 10 | 9 | 9000 | | $667,080.00 |
| | | | | | | | 9000 | hours total field time | |
| | | | | | | | 90 | management hours | $9,000.00 |
| | | | | | | | | | **$2,711,319.65** |
| | | | | Days | Hours | Man/Items | | | |
| 6 | Remove & Treat Excavtion | 169 Grids | UXO | 9 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 10 | | 2 | 20 | | $750.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 10 | | 4 | 40 | | $1,500.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 10 | | 1 | 10 | | $5,000.00 |
| | MDAS Certification | Drums | Includes Shipping | 5 | | 6 | 30 | | $20,750.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 10 | | 1 | 10 | | $1,500.00 |
| | UXO Technician | | Includes Travel | 16 | 10 | 9 | 1440 | | $106,732.80 |
| | | | | | | | 1440 | hours total field time | |
| | | | | | | | 90 | management hours | $9,000.00 |
| | | | | | | | | | **$145,232.80** |
| | | | | Days | Hours | Man/Items | | | |
| 7 | Backfill After Sifting | 105 Grids | UXO | 20 | 10 | 9 | | | |
| | 1,050,000 Cubic Ft. | Dozor, etc | See 5 Above | 1 | | 20 | 20 | | $37,366.60 |
| | Construct Decon Pad | PPE, etc. | Includes Shipping | 1 | | 100 | 100 | | $2,000.00 |
| | UXO Technician | | Includes Travel | 4 | 10 | 3 | 120 | | $8,894.40 |
| | | | | | | | 120 | hours total field time | |
| | | | | | | | 40 | management hours | $4,000.00 |
| | | | | | | | | | **$52,261.00** |
| | | | | Days | Hours | Man/Items | | | |
| 8 | Visual & Detector Surveyes | 169 Grids | UXO | 22 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 22 | | 2 | 44 | | $1,650.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 22 | | 4 | 88 | | $3,300.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 22 | | 1 | 22 | | $3,300.00 |
| | UXO Technician | | Includes Travel | 22 | 10 | 9 | 1980 | | $146,757.60 |
| | | | | | | | 1980 | hours total field time | |
| | | | | | | | 40 | management hours | $4,000.00 |
| | | | | | | | | | **$159,007.60** |
| | | | | Days | Hours | Man/Items | | | |
| 9 | Mechanical Excavation (1-2bgs) | 20 Grids | UXO | 12 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 12 | | 2 | 24 | | $900.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 12 | | 4 | 48 | | $1,800.00 |
| | Screeening Plant | Sift, Excavate, etc. | Includes Shipping | 1 | | 200,000 | 200000 | | $600,330.00 |
| | Backfill after sifting | Dozor, etc | Includes Shipping | 1 | | 6 | 6 | | $11,209.98 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Construct Decon Pad | PPE, etc. | Includes Shipping | 1 | | 100 | 100 | | $2,000.00 |
| | UXO Technician | | Includes Travel | 12 | 10 | 3 | 360 | | $26,683.20 |
| | | | | | | | 360 | hours total field time | |
| | | | | | | | 40 | management hours | $4,000.00 |
| | | | | | | | | | **$646,923.18** |
| | | | | Days | Hours | Man/Items | | | |
| | Remove & Treat Excavtion | 20 Grids | UXO | 4 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 4 | | 2 | 8 | | $300.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 4 | | 4 | 16 | | $600.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 4 | | 1 | 4 | | $2,000.00 |
| | MDAS Certification | Drums | Includes Shipping | 1 | | 3 | 3 | | $4,550.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 4 | | 1 | 4 | | $600.00 |
| | UXO Technician | | Includes Travel | 5 | 10 | 9 | 450 | | $33,354.00 |
| | | | | | | | 450 | hours total field time | |
| | | | | | | | 90 | management hours | $9,000.00 |
| | | | | | | | | | **$50,404.00** |
| | | | | Days | Hours | Man/Items | | | |
| 10 | Visual & Detector Surveyes | 20 Grids | UXO | 3 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 3 | | 2 | 6 | | $225.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 3 | | 4 | 12 | | $450.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 3 | | 1 | 3 | | $450.00 |
| | UXO Technician | | Includes Travel | 3 | 10 | 9 | 270 | | $20,012.40 |
| | | | | | | | 270 | hours total field time | |
| | | | | | | | 40 | management hours | $4,000.00 |
| | | | | | | | | | **$25,137.40** |
| | | | | Days | Hours | Man/Items | | | |
| | Mechanical Excavation (2-3bgs) | 10 Grids | UXO | 6 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 6 | | 2 | 12 | | $450.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 6 | | 4 | 24 | | $900.00 |
| | Screeening Plant | Sift, Excavate, etc. | Includes Shipping | 1 | | 100,000 | 100000 | | $400,330.00 |
| | Backfill after sifting | Dozor, etc | Includes Shipping | 1 | | 3 | 3 | | $5,604.99 |
| | Construct Decon Pad | PPE, etc. | Includes Shipping | 1 | | 100 | 100 | | $2,000.00 |
| | UXO Technician | | Includes Travel | 6 | 10 | 3 | 180 | | $13,341.60 |
| | | | | | | | 180 | hours total field time | |
| | | | | | | | 40 | management hours | $4,000.00 |
| | | | | | | | | | **$426,626.59** |
| | | | | Days | Hours | Man/Items | | | |
| | Remove & Treat Excavtion | 10 Grids | UXO | 1 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | Includes Shipping | 0 | | 2 | 0 | | $0.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 0 | | 4 | 0 | | $0.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 0 | | 1 | 0 | | $0.00 |
| | MDAS Certification | Drums | Includes Shipping | 1 | | 1 | 1 | | $3,350.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | | $0.00 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Hand Held GPS | Sub Meter | | Includes Shipping | 0 | | 1 | 0 | | $0.00 |
| | UXO Technician | | | Includes Travel | 1 | 10 | 3 | 30 | | $2,223.60 |
| | | | | | | | | 30 | hours total field time | |
| | | | | | | | | 10 | management hours | $1,000.00 |
| | | | | | | | | | | **$6,573.60** |
| | | | | | Days | Hours | Man/Items | | | |
| 11 | Visual & Detector Surveyes | 10 Grids | | UXO | 2 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 2 | | 2 | 4 | | $150.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 2 | | 4 | 8 | | $300.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 2 | | 1 | 2 | | $300.00 |
| | UXO Technician | | | Includes Travel | 2 | 10 | 9 | 180 | | $13,341.60 |
| | | | | | | | | 180 | hours total field time | |
| | | | | | | | | 20 | management hours | $2,000.00 |
| | | | | | | | | | | **$16,091.60** |
| | | | | | Days | Hours | Man/Items | | | |
| | Mechanical Excavation (3-4bgs) | 3 Grids | | UXO | 2 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 2 | | 2 | 4 | | $150.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 2 | | 4 | 8 | | $300.00 |
| | Screeening Plant | Sift, Excavate, etc. | | Includes Shipping | 1 | | 30,000 | 30000 | | $260,330.00 |
| | Backfill after sifting | Dozor, etc | | Includes Shipping | 1 | | 2 | 2 | | $3,736.66 |
| | Construct Decon Pad | PPE, etc. | | Includes Shipping | 1 | | 100 | 100 | | $2,000.00 |
| | UXO Technician | | | Includes Travel | 6 | 10 | 3 | 180 | | $13,341.60 |
| | | | | | | | | 180 | hours total field time | |
| | | | | | | | | 40 | management hours | $4,000.00 |
| | | | | | | | | | | **$283,858.26** |
| | | | | | Days | Hours | Man/Items | | | |
| | Remove & Treat Excavtion | 3 Grids | | UXO | 1 | 10 | 9 | | | |
| | UXO Equipment | All-Metals | | Includes Shipping | 0 | | 2 | 0 | | $0.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 0 | | 4 | 0 | | $0.00 |
| | MEC/MDEH Treatment | Donar Charge | | Includes Shipping | 0 | | 1 | 0 | | $0.00 |
| | MDAS Certification | Drums | | Includes Shipping | 1 | | 1 | 1 | | $3,350.00 |
| | Non-munitions Debris | Roll-off | | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| | Hand Held GPS | Sub Meter | | Includes Shipping | 0 | | 1 | 0 | | $0.00 |
| | UXO Technician | | | Includes Travel | 1 | 10 | 3 | 30 | | $2,223.60 |
| | | | | | | | | 30 | hours total field time | |
| | | | | | | | | 10 | management hours | $1,000.00 |
| | | | | | | | | | | **$6,573.60** |
| | | | | | Days | Hours | Man/Items | | | |
| 12 | Step-out; Brush Cutting | 4 Grids | Minor Brush | UXO | 2 | 10 | 6 | | | |
| | Chain Saw | Trees 2 Inch and smaller | | Includes Shipping | 2 | | 2 | 4 | | $244.00 |
| | Blade Weedeater | Areas inaccessible to Brush Hog | | Includes Shipping | 2 | | 2 | 4 | | $46.00 |
| | Bush Hog | Majority of Area | | Includes Shipping | 2 | | 1 | 2 | | $690.00 |
| | UXO Equipment | Magnetometer | | Includes Shipping | 2 | | 2 | 4 | | $150.00 |
| | UXO Technician | | | Includes Travel | 2 | 10 | 6 | 120 | | $8,894.40 |

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 15
ALTERNATIVE 4C: All, Surface and Subsurface MEC Removal

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 120 | hours total field time | |
| | | | | | | 20 | management hours | $2,000.00 |
| | | | | | | | | **$12,024.40** |
| | | | Days | Hours | Man/Items | | | |
| Visual & Detector Surveyes | 4 Grids | UXO | 2 | 10 | 9 | | | |
| UXO Equipment | All-Metals | Includes Shipping | 2 | | 2 | 4 | | $150.00 |
| UXO Equipment | Magnetometer | Includes Shipping | 2 | | 4 | 8 | | $300.00 |
| Hand Held GPS | Sub Meter | Includes Shipping | 2 | | 1 | 2 | | $300.00 |
| UXO Technician | | Includes Travel | 2 | 10 | 9 | 180 | | $13,341.60 |
| | | | | | | 180 | hours total field time | |
| | | | | | | 20 | management hours | $2,000.00 |
| | | | | | | | | **$16,091.60** |
| | | | Days | Hours | Man/Items | | | |
| Manual Remove & Treat Surf | 4 Grids | UXO | 3 | 10 | 9 | | | |
| UXO Equipment | All-Metals | Includes Shipping | 2 | | 2 | 4 | | $150.00 |
| UXO Equipment | Magnetometer | Includes Shipping | 2 | | 4 | 8 | | $300.00 |
| MEC/MDEH Treatment | Donar Charge | Includes Shipping | 1 | | 1 | 1 | | $500.00 |
| MDAS Certification | Drums | Includes Shipping | 0 | | 6 | 0 | | $0.00 |
| Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | | $0.00 |
| Hand Held GPS | Sub Meter | Includes Shipping | 1 | | 1 | 1 | | $150.00 |
| UXO Technician | | Includes Travel | 3 | 10 | 9 | 270 | | $20,012.40 |
| | | | | | | 270 | hours total field time | |
| | | | | | | 30 | management hours | $3,000.00 |
| | | | | | | | | **$24,112.40** |
| | | | Days | Hours | Man/Items | | | |
| Intrusive Investigation | 100 Digs | UXO | 2 | 10 | 9 | | | |
| UXO Equipment | All-Metals | Shipping Included Above | 2 | | 2 | 4 | | $150.00 |
| UXO Equipment | Magnetometer | Shipping Included Above | 2 | | 4 | 8 | | $300.00 |
| UXO Supplies | Shovels etc. | Shipping Included Above | 2 | | 1 | 2 | | $50.00 |
| Hand Held GPS | Sub Meter | Shipping Included Above | 2 | | 1 | 2 | | $300.00 |
| UXO Technician | | Travel Included Above | 2 | 10 | 9 | 180 | | $13,341.60 |
| | | | | | | 180 | hours total field time | |
| | | | | | | 20 | management hours | $2,000.00 |
| | | | | | | | | **$16,141.60** |
| | | | Days | Hours | Man/Items | | | |
| Remove & Treat Subsurface | 100 Digs | UXO | 1 | 10 | 9 | | | |
| UXO Equipment | All-Metals | Includes Shipping | 1 | | 2 | 2 | | $75.00 |
| UXO Equipment | Magnetometer | Includes Shipping | 1 | | 4 | 4 | | $150.00 |
| MEC/MDEH Treatment | Donar Charge | Includes Shipping | 1 | | 1 | 1 | | $500.00 |
| MDAS Certification | Drums | Included above | 0 | | 0 | 0 | | $0.00 |
| Non-munitions Debris | Roll-off | Included above | 0 | | 0 | 0 | | $0.00 |
| Hand Held GPS | Sub Meter | Includes Shipping | 1 | | 1 | 1 | | $150.00 |
| UXO Technician | | Includes Travel | 1 | 10 | 9 | 90 | | $6,670.80 |
| | | | | | | 90 | hours total field time | |

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 15
ALTERNATIVE 4C: All, Surface and Subsurface MEC Removal

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | 10 management hours | $1,000.00 |
| | | | | | | | | **$8,545.80** |
| | | | | Days | Hours | Man/Items | | |
| 13 | MEC/MDEH Treatment | 50 Items | UXO | 6 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 6 | | 2 | 12 | $450.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 6 | | 4 | 24 | $900.00 |
| | MEC/MDEH Treatment | Donar Charge | Includes Shipping | 6 | | 1 | 6 | $3,000.00 |
| | MDAS Certification | Drums | Included above | 0 | | 0 | 0 | $0.00 |
| | Non-munitions Debris | Roll-off | Included above | 0 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 6 | | 1 | 6 | $900.00 |
| | UXO Technician | | Includes Travel | 6 | 10 | 9 | 540 | $40,024.80 |
| | | | | | | | 540 hours total field time | |
| | | | | | | | 60 management hours | $6,000.00 |
| | | | | | | | | **$51,274.80** |
| | | | | Days | Hours | Man/Items | | |
| 14 | MDAS Certification | 60 Drums | UXO | 12 | 10 | 9 | | |
| | UXO Equipment | All-Metals | Includes Shipping | 0 | | 2 | 0 | $0.00 |
| | UXO Equipment | Magnetometer | Includes Shipping | 0 | | 4 | 0 | $0.00 |
| | MDAS Transportation | Drums | Includes Shipping | 10 | | 7 | 70 | $44,750.00 |
| | MDAS Certification | Drums | Includes Shipping | 11 | | 6 | 66 | $0.00 |
| | Non-munitions Debris | Roll-off | Includes Shipping | 1 | | 0 | 0 | $0.00 |
| | Hand Held GPS | Sub Meter | Includes Shipping | 0 | | 1 | 0 | $0.00 |
| | UXO Technician | | Includes Travel | 11 | 10 | 3 | 330 | $24,459.60 |
| | | | | | | | 330 hours total field time | |
| | | | | | | | 30 management hours | $3,000.00 |
| | | | | | | | | **$72,209.60** |
| 15 | MC Sampling | | N/A | | | | | |
| 16 | Site Resteration | | N/A | | | | | |

| | |
|---|---|
| Initial Inspection Total Field Cost | $5,122,433.28 |
| Contingency on Total Field Cost @ 10% | $512,243.33 |
| Engineering on Total Field Cost @ 2% | $102,448.67 |
| **TOTAL COST TOTAL COST** | **$5,737,125.27** |

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**Public Education Program**
**Annual Costs**

| Item | Quantity | Unit | Unit Cost Subcontract | Unit Cost Material | Unit Cost Labor | Unit Cost Equipment | Extended Cost Subcontract | Extended Cost Material | Extended Cost Labor | Extended Cost Equipment | Subtotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1 PLANNING & REPORTS** | | | | | | | | | | | |
| 1.1 Prepare Documents & Plans | 10 | hr | | | $39.00 | | $0 | $0 | $390 | $0 | $390 |
| 1.2 Reports & Handouts | 1 | ls | | $225.00 | | | $0 | $225 | $0 | $0 | $225 |
| **2 MEETING IN JACKSONVILLE, FLORIDA** | | | | | | | | | | | |
| 2.1 Travel, air | 1 | ls | | $650.00 | | | $0 | $650 | $0 | $0 | $650 |
| 2.2 Per-diem | 1 | day | | $131.00 | | | $0 | $131 | $0 | $0 | $131 |
| 2.3 Car | 1 | day | | | | $100.00 | $0 | $0 | $0 | $100 | $100 |
| 2.4 Meeting | 12 | hr | | | $39.00 | | $0 | $0 | $468 | $0 | $468 |
| **Subtotal** | | | | | | | $0 | $1,006 | $858 | $100 | $1,964 |
| Overhead on Labor Cost @ 30% | | | | | | | | | $257 | | $257 |
| G & A on Labor, Material, Equipment, & Subs Cost @ 10% | | | | | | | $0 | $101 | $86 | $10 | $196 |
| Tax on Materials and Equipment Cost @ 6% | | | | | | | | $60 | | $6 | $66 |
| **Total Direct Cost** | | | | | | | $0 | $1,167 | $1,201 | $116 | $2,484 |
| Indirects on Total Direct Cost @ 0% | | | | | | | | | | | $0 |
| Profit on Total Direct Cost @ 10% | | | | | | | | | | | $248 |
| **Subtotal** | | | | | | | | | | | $2,733 |
| Contingency on Total Field Cost @ 0% | | | | | | | | | | | $0 |
| Engineering on Total Field Cost @ 0% | | | | | | | | | | | $0 |
| **TOTAL COST** | | | | | | | | | | | **$2,733** |

**NAVAL AIR STATION CECIL FIELD**
**JACKSONVILLE, FLORIDA**
**SITE 15**
**ALTERNATIVE 4C: All, Surface and Subsurface MEC Removal**
**Present Worth Analysis**

| Year | Capital Cost | Annual Cost | Total Year Cost | Annual Discount Rate 2.3% | Present Worth |
|---|---|---|---|---|---|
| 0 | $7,256,690 | | $7,256,690 | 1.000 | $7,256,690 |
| 1 | | $2,733 | $2,733 | 0.978 | $2,671 |
| 2 | | $2,733 | $2,733 | 0.956 | $2,611 |
| 3 | | $2,733 | $2,733 | 0.934 | $2,552 |
| 4 | | $2,733 | $2,733 | 0.913 | $2,495 |
| 5 | | $2,733 | $2,733 | 0.893 | $2,439 |
| 6 | | $2,733 | $2,733 | 0.872 | $2,384 |
| 7 | | $2,733 | $2,733 | 0.853 | $2,330 |
| 8 | | $2,733 | $2,733 | 0.834 | $2,278 |
| 9 | | $2,733 | $2,733 | 0.815 | $2,227 |
| 10 | | $2,733 | $2,733 | 0.797 | $2,177 |
| 11 | | $2,733 | $2,733 | 0.779 | $2,128 |
| 12 | | $2,733 | $2,733 | 0.761 | $2,080 |
| 13 | | $2,733 | $2,733 | 0.744 | $2,033 |
| 14 | | $2,733 | $2,733 | 0.727 | $1,988 |
| 15 | | $2,733 | $2,733 | 0.711 | $1,943 |
| 16 | | $2,733 | $2,733 | 0.695 | $1,899 |
| 17 | | $2,733 | $2,733 | 0.679 | $1,856 |
| 18 | | $2,733 | $2,733 | 0.664 | $1,815 |
| 19 | | $2,733 | $2,733 | 0.649 | $1,774 |
| 20 | | $2,733 | $2,733 | 0.635 | $1,734 |
| 21 | | $2,733 | $2,733 | 0.620 | $1,695 |
| 22 | | $2,733 | $2,733 | 0.606 | $1,657 |
| 23 | | $2,733 | $2,733 | 0.593 | $1,620 |
| 24 | | $2,733 | $2,733 | 0.579 | $1,583 |
| 25 | | $2,733 | $2,733 | 0.566 | $1,548 |
| 26 | | $2,733 | $2,733 | 0.554 | $1,513 |
| 27 | | $2,733 | $2,733 | 0.541 | $1,479 |
| 28 | | $2,733 | $2,733 | 0.529 | $1,446 |
| 29 | | $2,733 | $2,733 | 0.517 | $1,413 |
| 30 | | $2,733 | $2,733 | 0.506 | $1,381 |
| | | | | **TOTAL PRESENT WORTH** | **$7,315,439** |