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ENGINEERING EVALUATION/COST ANALYSIS FOR NON-TIME-CRITICAL REMOVAL ACTION FOR UXO 4 INCINERATOR DISPOSAL SITE, NAS CORPUS CHRISTI TX

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RESOLUTION CONSULTANTS

ENGINEERING EVALUATION/COST ANALYSIS FOR NON-TIME-CRITICAL REMOVAL ACTION

UXO 4 INCINERATOR DISPOSAL SITE
NAVAL AUXILIARY LANDING FIELD CABANISS
CORPUS CHRISTI, TEXAS

Version Number: 1

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Table of Contents

List of Acronyms iii

EXECUTIVE SUMMARY iv

1.0 INTRODUCTION 1-1
- 1.1 Purpose and Objectives 1-1
- 1.2 Regulatory Framework 1-2
- 1.3 EE/CA Organization 1-4

2.0 SITE CHARACTERIZATION AND BACKGROUND 2-1
- 2.1 Site Location 2-1
- 2.2 Site Background 2-2
- 2.3 Site Description 2-2
- 2.4 Installation and Site Setting 2-3
  - 2.4.1 Topography 2-3
  - 2.4.2 Climate 2-3
  - 2.4.3 Geology 2-3
  - 2.4.4 Hydrogeology 2-4
  - 2.4.5 Vegetation, Endangered Species, and Ecological Habitat 2-5
  - 2.4.6 Surface Water 2-6
- 2.5 Current and Future Land Use 2-6
- 2.6 Previous Investigations and Removal Actions 2-7
- 2.7 Source, Nature, and Extent of Contamination 2-9
  - 2.7.1 Source of Contamination 2-9
  - 2.7.2 Nature and Extent of Contamination 2-9
- 2.8 Streamlined Risk Evaluation 2-10
  - 2.8.1 Nature and Extent of Release 2-10
  - 2.8.2 Pertinent Exposure Pathways 2-11
  - 2.8.3 Potential Receptors 2-11

3.0 IDENTIFICATION OF REMOVAL ACTION OBJECTIVES 3-1
- 3.1 Statutory Limits on Removal Actions 3-1
- 3.2 Determination of Removal Scope 3-1
  - 3.2.1 Development of Removal Action Objectives 3-1
  - 3.2.2 Identification of Applicable or Relevant and Appropriate Requirements 3-1
  - 3.2.3 Removal Action Scope 3-3
- 3.3 Determination of Removal Action Schedule 3-4

4.0 IDENTIFICATION AND ANALYSIS OF REMOVAL ACTION ALTERNATIVES 4-1
- 4.1 Alternatives Description 4-1
  - 4.1.1 Alternative 1 — No Action 4-1
  - 4.1.2 Alternative 2 — Surface Clearance of MEC/MPPEH and Engineering/Institutional Land Use Controls 4-1
  - 4.1.3 Alternative 3 — Surface and Subsurface Clearance of MEC/MPPEH and Institutional Land Use Controls 4-4

4.2 Analysis of Removal Action Alternatives 4-5
4.2.1 Effectiveness 4-6
4.2.2 Implementability 4-11
4.2.3 Cost 4-12

5.0 COMPARATIVE ANALYSIS OF ALTERNATIVES 5-1
5.1 Effectiveness 5-1
5.2 Implementability 5-1
5.3 Cost 5-2

6.0 RECOMMENDED REMOVAL ACTION ALTERNATIVE 6-1

7.0 REFERENCES 7-1

Tables

Table 2-1 Known Threatened or Endangered Species in Nueces County, Texas 2-5
Table 4-1 Evaluation Criteria 4-6
Table 4-2 Detailed Analysis of Alternatives for Effectiveness 4-7
Table 4-3 MEC HA Scoring Summary for Current Use Activities 4-10
Table 4-4 Detailed Analysis of Alternatives for Implementability 4-12
Table 4-5 Summary of Alternative Present Worth Costs 4-13

Appendices

Appendix A Figures
Appendix B Applicable or Relevant and Appropriate Requirements
Appendix C Munitions and Explosives Concern Hazard Assessment
Appendix D Cost Estimates
Appendix E SiteWise Evaluation

List of Acronyms

AICUZ	Air Installation Compatible Use Zone
AM	Action Memorandum
ARARs	Applicable or Relevant and Appropriate Requirements
bgs	Below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DGM	Digital geophysical mapping
EE/CA	Engineering Evaluation/Cost Analysis
EZ	Exclusion Zone
°F	Degrees Fahrenheit
GHG	Greenhouse gas
GSR	Green and Sustainable Remediation
IAS	Initial Assessment Study
IRA	Interim Removal Action
lbs	Pounds
MC	Munitions Constituents
MEC	Munitions and Explosives of Concern
MEC HA	Munitions and Explosives of Concern Hazard Assessment
mm	Millimeter
MPPEH	Material Potentially Presenting an Explosive Hazard
NALF	Naval Auxiliary Landing Field
NAS	Naval Air Station
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
NOx	Nitrogen oxides
NTCRA	Non-Time-Critical Removal Action
O&M	Operation and Maintenance
PA	Preliminary Assessment
PM	Particulate matter
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
SARA	Superfund Amendments and Reauthorization Act
SI	Site Inspection
SOx	Sulfur oxides
U.S. EPA	United States Environmental Protection Agency
UXO	Unexploded Ordnance

EXECUTIVE SUMMARY

This document presents an Engineering Evaluation and Cost Analysis (EE/CA) for a Non-Time-Critical Removal Action (NTCRA) for munitions and explosives of concern (MEC)/material potentially presenting an explosive hazard (MPPEH) present at Munitions Response Site Unexploded Ordnance 4 (Incinerator Disposal Site) at Naval Auxiliary Landing Field Cabaniss in Corpus Christi, Texas. The MEC/MPPEH at this site presents an explosive hazard to human health.

The remedial action objective (RAO) for the Incinerator Disposal Site is to prevent or minimize the hazards associated with physical contact with MEC/MPPEH by trespassers and Naval Auxiliary Landing Field Cabaniss personnel and contractors under current and future land use scenarios. The purpose of this EE/CA is to present and evaluate the removal action alternatives designed to meet the site's RAO. The selected removal action based on this EE/CA will be an interim action; a final remedy to address contaminants of concern associated with munitions constituents and residual MEC/MPPEH will be selected at a later date. The Incinerator Disposal Site incorporates a former onsite sanitary landfill of unspecified dimensions located southwest of Runway 31. The interim action alternatives will each need to address maintenance of existing land use controls related to MEC/MPPEH. The final remedy will also address long-term land use controls for the underlying landfill materials.

This EE/CA is being completed as part of an NTCRA as required by Title 40 Code of Federal Regulations Part 300.415(b)(4)(i) of the National Oil and Hazardous Substance Pollution Contingency Plan. Submittal of this document fulfills the requirements for NTCRAs defined by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 and the Superfund Amendments and Reauthorization Act of 1986. This EE/CA has been prepared in general accordance with the United States Environmental Protection Agency guidance document *Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA*, PB93-963402 (United States Environmental Protection Agency 1993) and guidelines provided in *EPA Munitions Response Guidlelines, OSWER Directive 9200.1-101, Interim Final* (U.S. EPA 2010).

The EE/CA was made available for public review and comment for a 30-day period from 1 to 30 September 2014. Notice of the Navy's invitation for public comment was placed in the *Corpus Christi Caller Times* on 31 August 2014 and the EE/CA was available for public review at the Dr. Clotilde P. Garcia Public Library in Corpus Christi, Texas. No public comments on the EE/CA were received.

To reduce the MEC/MPPEH explosive hazard, the following three alternatives were developed and evaluated for potential implementation at the site:

- Alternative 1 — No Action

- Alternative 2 — Surface Clearance of MEC/MPPEH and Engineering/Institutional Land Use Controls

- Alternative 3 — Surface and Subsurface Clearance of MEC/MPPEH and Engineering/Institutional Land Use Controls

Through a comparative analysis of the alternatives, Alternative 2 is the recommended removal action alternative for the Incinerator Disposal Site. Alternative 2 provides the most protection to human health and the environment during implementation of the alternative, fully meets the RAO, and is the most practical solution in the long term. Alternative 1 is not viable because it does not reduce the site's MEC/MPPEH hazard. Alternative 3 reduces the toxicity, mobility, and volume of MEC/MPPEH, which is not fully achieved under Alternatives 1 or 2. However, because landfill material is present beneath the MEC/MPPEH contaminated soil, intrusive activities proposed under Alternative 3 are not practical, as landfill material would interfere with MEC/MPPEH geophysical data collection. Alternative 2 is the most implementable alternative since no intrusive activities will take place within the landfill. The estimated cost of Alternative 2 is significantly lower than Alternative 3, and given that land use controls will be required to restrict future intrusive activities from occurring in the landfill over the long term, the cost-benefit of Alternative 2 is higher than Alternative 3. Furthermore, Alternative 2 has substantially lower adverse effects compared to Alternative 3 relative to sustainability metrics inclusive of production of greenhouse gases and criteria air pollutants, energy consumption, resource usage, and worker accident risk.

1.0 INTRODUCTION

This Engineering Evaluation/Cost Analysis (EE/CA) was prepared by Resolution Consultants under the Naval Facilities Engineering Command Comprehensive Long-term Environmental Action — Navy Contract N62470-11-D-8013, Contract Task Order JM67. The purpose of this EE/CA is to present and evaluate removal action alternatives to address a munitions and explosives of concern (MEC)/material potentially presenting an explosive hazard (MPPEH) hazard as part of a Non-Time-Critical Removal Action (NTCRA). The NTCRA will address MEC, a potential explosive hazard, present at Munitions Response Site Unexploded Ordnance (UXO) 04 (Incinerator Disposal Site) at Naval Auxiliary Landing Field (NALF) Cabaniss in Corpus Christi, Texas. Removal of MEC/MPPEH from the Incinerator Disposal Site is necessary to reduce the explosive hazards posed to potential trespassers and site workers (e.g., maintenance or landscaping personnel), as well as those associated with future site investigation and closure activities.

1.1 Purpose and Objectives

This EE/CA provides the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) documentation to support an interim removal action (IRA) at the Incinerator Disposal Site. The purpose of the EE/CA is to present the Navy's intent to reduce the hazard to human health from the MEC/MPPEH, and identify and evaluate removal alternatives to reduce this hazard for current and future use scenarios.

Submittal of this document fulfills the requirements for NTCRAs defined by CERCLA, the Superfund Amendments and Reauthorization Act (SARA), and the National Oil and Hazardous Substance Pollution Contingency Plan (NCP). This document follows the United States Environmental Protection Agency's (U.S. EPA's) Office of Solid Waste and Emergency Response Directive 9360.0-32 *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (U.S. EPA 1993) and guidelines provided in *EPA Munitions Response Guidlelines, OSWER Directive 9200.1-101, Interim Final* (U.S. EPA 2010).

The benefits of using the NTCRA process include promptly addressing health threats and accelerating sites more quickly through the CERCLA response process. The goals of an EE/CA are to identify the objectives of the removal action and to analyze effectiveness, implementability, and cost of various alternatives that may satisfy these objectives. An EE/CA documents the removal action alternatives and the evaluation and recommendation process.

An EE/CA serves an analogous function to, but is more streamlined than, the remedial investigation/feasibility study conducted for remedial actions. The results of the EE/CA and the selected removal alternative will be summarized in an Action Memorandum (AM) as discussed in *Use of Non-Time-Critical Removal in Superfund Response Actions* (U.S. EPA 2000).

1.2 Regulatory Framework and Guidance

This EE/CA is issued by the Department of the Navy under Section 104 of CERCLA and SARA. Section 104 allows an authorized agency to remove the risk of hazardous substances, pollutants, or contaminants at any time, or to take other response measures consistent with the NCP as deemed necessary to protect public health or welfare and the environment. The Navy is delegated the authority to conduct the removal action on Navy properties by Executive Order 12580, which delegates this authority to all federal agencies. The Texas Commission on Environmental Quality has the lead role in regulatory oversight for this munitions response program IRA at NALF Cabaniss.

The NCP, Title 40 Code of Federal Regulations (CFR) §300, provides regulations for implementing CERCLA and SARA, and regulations specific to removal actions. The NCP defines a removal action as:

> *…cleanup or removal of released hazardous substances from the environment, such actions as may be necessary to monitor, assess, and evaluate the threat of release of hazardous substances; the disposal of removed material; or the taking of such other actions as may be necessary to prevent, minimize, or mitigate damage to the public health or welfare or to the environment, which may otherwise result from a release or threat of a release.*

This removal action is non-time-critical due to the availability of a 6-month planning period from the time the removal action is determined to be necessary (when AM comments are resolved) to the time of initiation of the action. Title 400 CFR §300.415 requires the lead agency to conduct an EE/CA when an NTCRA is planned for a site.

As presented in in the *EPA Munitions Response Guidelines* (EPA 2010), if it is determined that an immediate response is necessary to address an explosives hazard, it may be appropriate to conduct an emergency response. U.S. EPA gives considerable deference to explosives or munitions emergency response specialists (e.g., explosive ordnance disposal and other UXO-qualified personnel) with regard to explosives safety considerations. An explosives or munitions emergency response generally should be used when an immediate or imminent and substantial threat to

public health or the environment is present and may require immediate and expeditious action to eliminate the threat. The Military Munitions Rule provides that explosives or munitions emergency response specialists base any determination of the need for an emergency action upon an actual or potential immediate threat to human health, including safety, or the environment, including property. Significantly, the Resource Conservation and Recovery Act (RCRA) Munitions Rule assigns to the explosives or munitions emergency response specialists the responsibility for making this determination, which will ordinarily be a judgment call by the specialist. The RCRA Munitions Rule exempts explosives or munitions emergency or time critical responses from the RCRA Subtitle C hazardous waste regulatory requirements, including notifications, except that a record of the response must be kept.

Many MEC may be corroded, encased, or otherwise degraded, making it difficult or impossible to determine their actual condition and the explosives hazard they present. When such uncertainty is involved, response personnel ordinarily assume the item presents a potentially acute explosive hazard. Deference should be given to this judgment, but the explosive emergency response specialist should be able to describe and document afterwards the basis for this determination. Explosives or munitions emergency responses are normally appropriate for discrete emergency situations, and may be appropriate during planned munitions responses.

The Department of Defense is required to afford an adequate opportunity for timely review and comment to U.S. EPA, State, and local officials before commencement of a response action, except where such consultation would be impractical. Additionally, the Navy will select the removal action alternative to be implemented after fulfilling all community involvement requirements. Public participation is essential to developing a sound, credible, and publicly acceptable removal action. Communication with all parties often will help educate the public on the hazards associated with a site, facilitate understanding, and answer community concerns often generated by the discovery of MEC/munitions constituents (MC) or by the initiation of a munitions response. Community involvement requirements for NTCRAs include making the EE/CA available for public review and comment for a period of 30 days. An announcement of the 30-day public comment period for the EE/CA is required in a local newspaper. Written responses to significant comments will be summarized in the AM and will be included in the Administrative Record.

1.3 EE/CA Organization

This EE/CA is organized into the following sections:

- Section 1 Introduction
- Section 2 Site Characterization and Background
- Section 3 Identification of Removal Action Objectives
- Section 4 Identification and Analysis of Removal Action Alternatives
- Section 5 Comparative Analysis of Alternatives
- Section 6 Recommended Removal Action Alternative
- Section 7 References

Referenced tables are incorporated in each section respectively; referenced figures are in Appendix A.

2.0 SITE CHARACTERIZATION AND BACKGROUND

This section presents available information on the location, background, description, physical setting, land use, previous investigations and removal actions, and source, nature, and extent of MEC/MPPEH at the Incinerator Disposal Site.

2.1 Site Location

NALF Cabaniss is on the eastern side of Nueces County, Texas, and lies approximately 8 miles west of Naval Air Station (NAS) Corpus Christi. The installation is bound on the east by Brezina Road, on the west by Ayers Street and Farm-to-Market 286, on the north by Saratoga Road, and on the south by Oso Creek (Figure 2-1). The installation encompasses 923 acres and lies just outside the corporate boundary of the city of Corpus Christi.

The installation boundary area includes Air Installation Compatible Use Zone (AICUZ) lands that extend northwest and southeast from the main acreage of the installation. These AICUZ lands are Navy property acquired to encompass noise zones and Accident Potential Zones in the event an accident were to occur on approach to or departing from the runways at NALF Cabaniss. The Incinerator Disposal Site is just outside of the Navy Clear Zone most recently established in the 2013 *NAS Corpus Christi Joint Land Use Study* (Matrix Design Group 2013); however, the perimeter road forming the northeast boundary is adjacent to the Navy Clear Zone. Oso Creek, the south boundary of NALF Cabaniss, is a perennial water body that ultimately flows into Oso Bay. Beyond Oso Creek are agricultural and industrial properties. The area east of the installation is composed of mixed agricultural, industrial, and residential areas. North of the current boundary are former buildings and recreational areas that were once a part of the installation. The Navy transferred these areas to the General Services Administration for disposal in 1958, and the local school district now owns these areas. Residential zones lie beyond these buildings to the north. A former landfill (closed) is directly west of the installation.

The Incinerator Disposal Site investigation area includes a former landfill area of uncertain dimensions and debris associated with the remains of an exploded boiler previously used for the destruction of confiscated drugs, ordnance, and firearms. The investigation area is in the southern portion of the installation, 750 feet southwest of the eastern end of Runway 31, and bound by Oso Creek on the south. Figure 2-2 shows the boundaries of the 22-acre Incinerator Disposal Site investigation area at NALF Cabaniss as determined by the geophysical investigations performed during the Remedial Investigation (RI) (Tetra Tech 2013a). Perimeter Road runs along the northern boundary of the site; dense vegetation bounds the site on the east and west. Most of the site is covered in dense vegetation, with open sections of wetlands on the south end near Oso Creek.

2.2 Site Background

A February 1984 Initial Assessment Study (IAS) for the Naval Energy and Environmental Support Activity identified the Incinerator Disposal Site, which was used to incinerate small arms and ordnance items. The Incinerator Disposal Site is within the footprint of a former onsite sanitary landfill of unspecified dimensions located southwest of Runway 31. Investigations since the IAS have expanded the Incinerator Disposal Site study area to a parcel of approximately 24-acres, but the initial designation was an area less than 200 square feet in the immediate vicinity of the former boiler unit.

No property records describing the opening, operations, closure, or demolition of the sanitary landfill or incineration site were found during the IAS or subsequent investigations. Aerial photographs indicate that the site was disturbed as early as 1942, and an area identified as "sanitary fill" appears on the Master Shore Station Development Plan as early as 1958. The period of time that the area was used for munitions incineration is unknown. Munitions and confiscated drug materials were batch-incinerated in an 8-foot long by 5-foot diameter boiler present onsite. No aerials or plans were available for the period during which the boiler was used. Currently, the Incinerator Disposal Site is not used for any military purpose, and the area is covered in dense vegetation (Tetra Tech 2013a). Land use in the area is designated as open space; land use is not expected to change. There are no currently operating ordnance/munitions storage facilities at NALF Cabaniss.

The RI conducted at the Incinerator Disposal Site consisted of two distinctly different investigations conducted in two phases: a MEC investigation followed by an MC investigation (Tetra Tech 2013a). Section 2.6 of this report summarizes the details of the MEC investigation. The MC investigation resulted in additional data needs that require investigation within areas suspected to contain MEC.

2.3 Site Description

The Incinerator Disposal Site is a former sanitary landfill that also contained a boiler used to incinerate small arms, ordnance items, and confiscated drug material. The boiler is currently lying on its side with a large hole in the bottom. Based on inference from geophysical data obtained during the RI conducted by Tetra Tech (Tetra Tech 2013b), the landfill appears to have occupied approximately 5 acres of the site; see Figure 2-2. The entire investigation area, however, is approximately 24 acres. RI investigations have reported assessments that MEC and MPPEH distribution is probably limited to approximately 17 acres within the 24-acre investigation area (Tetra Tech 2013a); however, additional data is required over the entire 24-acre area to confirm this assessment. Over 80% of the MEC/MPPEH encountered during the RI was located on the ground surface (Tetra Tech 2013a).

Geophysical investigations during the RI identified multiple potential surface and subsurface MEC/MPPEH targets along 24 survey transects, only some of which were confirmed during the field activities (Tetra Tech 2013b). RI results suggest that subsurface MEC/MPPEH may remain both along some of the investigated transects where identified anomalies have not yet been intrusively confirmed, as well as in areas between the transects that have not yet been investigated (see Section 2.7).

2.4 Installation and Site Setting

2.4.1 Topography

The general topography of mainland Nueces County around Corpus Christi Bay is a low-lying coastal area consisting of flat coastal prairies, chaparral pastures, and farmland. Elevations range between 15 and 30 feet above mean sea level. The topographic profile of NALF Cabaniss is generally flat with a mean elevation of 30 feet above mean sea level, with some steep downward slopes near Oso Creek.

2.4.2 Climate

The climate at NALF Cabaniss is a moderate to semi-tropical marine climate with hot, humid, breezy summers and mild winters. The wind direction is predominantly from the southeast during the warmer months and from the northwest and north during periods of higher pressure and cold fronts during cooler months. Average low and high temperatures are 51 degrees Fahrenheit (°F) (January) and 92°F (July and August), respectively. Annually, there are more than 100 days with high temperatures of 90°F or higher, and fewer than 7 days with low temperatures at or below 32°F. The number of clear days averages 114 days per year. Annual rainfall average is 33.4 inches.

2.4.3 Geology

The coastal plain of the Corpus Christi area is underlain by Pleistocene river, delta, and shoreline sediments deposited during the interglacial periods. NALF Cabaniss is underlain by the Beaumont Formation, characterized by barrier islands and beach deposits composed of fine-grained sands. Numerous pimple mounds and poorly defined relict beach ridges characterize the land surface. Locally active sand dunes are present in undisturbed areas. The barrier island and beach deposits of the Beaumont Formation are typically less than 60 feet thick. Other stratigraphic units, in order of increasing age, include the Montgomery Formation, Lissie Formation, Willis Formation, and the Goliad Sand. RI Figures 2-3, 2-4, 2-5, and 2-6 (Tetra Tech 2013a) depict the regional geology and site-specific cross sections of the local geology, including the local water table.

In general, as determined during the RI, the site geologic section consists of an upper fine-grained unit and a lower coarse-grained unit. The upper fine-grained unit consists of a gray to tan lean clay with a varying amount of silt. The silt content generally increased with depth. Caliche nodules were present in the upper portions of the section. The thickness of the unit was between 5 and 18 feet (Tetra Tech 2013a).

The lower coarse-grained unit was the first unit in which saturated sediments were encountered during the RI. The contact between the upper fine-grained unit and lower coarse-grained unit was generally well defined. The lower coarse-grained unit consisted of a gray to tan very fine-grained silty sand. In the soil borings at the Incinerator Disposal Site, a tan hard clay was encountered beneath the saturated sand (Tetra Tech 2013a).

NALF Cabaniss is underlain by Victorian Association soils. The Victorian series soils are dark, clayey sand, calcareous, crumbly soils that are referred to as blackland. These soils are deep, nearly level, and have developed over clayey materials of the coastal terrace. The soils exhibit very slow internal drainage when wet and crack to depths of several feet when dry. Surface drainage from these soils flows into Oso Creek (Tetra Tech 2013a).

2.4.4 Hydrogeology

The site is underlain by low permeability clays, which causes the majority of precipitation to run off with only a small percentage recharging the groundwater. The regional aquifer, the Gulf Coast Aquifer, is predominantly sandy material overlying a clay zone with low permeability. Regional groundwater flow in the Corpus Christi area is generally to the northeast toward Corpus Christi Bay and ultimately the Gulf of Mexico; local flow paths at NALF Cabaniss are unknown. Artesian aquifers located 250 to 2,800 feet below ground surface (bgs) in the Corpus Christi area are moderately to highly saline, and have limited potential use. Therefore, potable water for NALF Cabaniss and the City of Corpus Christi is supplied from Lake Corpus Christi, 38 miles northwest of the field.

Groundwater at the site appears to be under water table to slightly semi-confined conditions, as water was measured in some wells at a higher level than was encountered during drilling. Depth to static groundwater was measured at approximately 6 to 15 feet bgs in the three temporary wells installed at the former Incinerator Disposal Site during the RI; groundwater flow is generally to the south toward Oso Creek (Tetra Tech 2013a).

2.4.5 Vegetation, Endangered Species, and Ecological Habitat

Local wildlife at NALF Cabaniss includes birds, reptiles, and small mammals. Some wetland areas in the vicinity of the airfield may support threatened or endangered species. Table 2-1 summarizes known threatened or endangered species within Nueces County. Habitat for some of these species may be present at or near NALF Cabaniss, however, based on the Integrated Natural Resources

Table 2-1
Known Threatened or Endangered Species in Nueces County, Texas

Group	Name	Status
Birds	Whooping crane (*Grus americana*)	Endangered
Birds	Brown pelican (*Pelecanus occidentalis*)	Recovery
Birds Birds	Yellow-billed Cuckoo (*Coccyzus americanus*) Northern aplomado falcon (*Falco femoralis septentrionalis*)	Proposed Threatened Endangered
Birds	Piping Plover (*Charadrius melodus*)	Threatened
Birds	Red knot (*Calidris canutus rufa*)	Proposed Threatened
Birds	Sprague's pipit (*Anthus spragueii*)	Candidate
Flowering plants	South Texas ambrosia (*Ambrosia cheiranthifolia*)	Endangered
Flowering plants	Slender rush-pea (*Hoffmannseggia tenella*)	Endangered
Mammals	West Indian Manatee (*Trichechus manatus*)	Endangered
Mammals	Gulf Coast jaguarondi (*Herpailurus yagouaroundi cacomitli*)	Endangered
Mammals	Ocelot (*Leopardus pardalis*)	Endangered
Reptiles	Hawksbill sea turtle (*Eretmochelys imbricata*)	Endangered
Reptiles	Leatherback sea turtle (*Dermochelys coriacea*)	Endangered
Reptiles	Kemp's Ridley sea turtle (*Lepidochelys kempii*)	Endangered
Reptiles	Green sea turtle (*Chelonia mydas*)	Threatened
Reptiles	Loggerhead sea turtle (*Caretta caretta*)	Threatened

Source: U.S. Fish & Wildlife Service. 2013. *Environmental Conservation Online System*. Retrieved on 18 November 2013, from Species By County Report: http://www.fws.gov/endangered/

Management Plan Five Year Update (Navy 2006) no threatened or endangered species are known to occur on or near the Incinerator Disposal Site. Appendix C of the RI presents an ecological survey report describing the flora and fauna observed at the Incinerator Disposal Site during the RI field investigation in Spring 2011 (Tetra Tech 2013a).

Vegetation in the NALF Cabaniss area consists primarily of tall grasses and copses of shrubs, trees, and other low-lying vegetation. Original vegetation at the site likely consisted of mid- to tall grass in prairie grassland with minimal tree coverage. However, agricultural use and later development of the installation have left no native grasslands and natural vegetation; only disturbance-related species remain. During the RI, approximately 70% of the study area was heavily vegetated with a mix of upland woody shrubs and small trees typical of early to mid-successional woodlands in the

southern plains. An open, emergent marsh occupied approximately 20% of the eastern and southern sections of the site at the time of the RI. The remaining land consisted of a riparian woodland present along Oso Creek (Tetra Tech 2013a). Based on the Integrated Natural Resources Management Plan for NAS Corpus Christi and its outlying airfields, fauna include large mammals such as deer, small mammals such as rabbits, reptiles/amphibians, and bird species (Navy 2006).

2.4.6 Surface Water

Surface water resources at NALF Cabaniss include open drainage ditches, which drain south and southeast into Oso Creek. An abandoned drainage ditch is present east of the Incinerator Disposal Site, but contained no water during the RI. An unnamed pond associated with the former Sewage Disposal Plant is present 100 feet southeast of the NALF Cabaniss property (Tetra Tech 2013a).

Oso Creek forms the southern border of NALF Cabaniss. Oso Creek is listed as Segment 2485A in the Texas Water Quality Inventory; it is an unclassified tidal stream with water body uses listed as aquatic life, contact recreation, and fish consumption. Oso Creek empties into Oso Bay, Corpus Christi Bay, and ultimately the Gulf of Mexico (Tetra Tech 2013a).

Freshwater and brackish water jurisdictional wetlands have been delineated at NALF Cabaniss, primarily concentrated at the southern end of the installation along Oso Creek. The wetlands at NALF Cabaniss encompass approximately 28-acres (Tetra Tech 2013a).

2.5 Current and Future Land Use

NALF Cabaniss is currently active. Air training occurs on two runways; other areas of the installation are no longer used. The Incinerator Disposal Site is closed and overgrown with vegetation (MEC operations ceased in 1980); the reported (closed) landfill onsite will remain in place. The Incinerator Disposal Site is immediately adjacent to the Navy Clear Zone for Runway 31, as established during the 2009 Joint Land Use Study (Matrix Design Group 2013).

Current institutional and engineering controls include:

- Fencing and site security
- Signage
- Mandatory UXO escort for personnel accessing the site

Depending on decisions resulting from the RI and upcoming feasibility study, permanent land use controls may be imposed to prevent exposure of trespassers and activity personnel/contractors to MEC and MC, or further investigation and removal of MC along with land use controls may occur (Tetra Tech 2013). Permanent land use controls are anticipated to be a part of the long-term site management strategy due to the presence of the former sanitary landfill, and safety concerns associated with ensuring complete identification and removal of all MEC/MPPEH.

2.6 Previous Investigations and Removal Actions

As described in Section 2.2, the 1984 IAS identified the Incinerator Disposal Site and subsequent investigation identified MEC and MC at the Incinerator Disposal Site.

The IAS report indicated that the Army had used an 8-foot long by 5-foot diameter boiler for the incineration of small ordnance items, including .30 and .50 caliber small arms, flares, explosive cartridges from ejection seats, and possibly 80-millimeter (mm) rockets at the site of the former sanitary landfill facility. The IAS report indicated that the City of Corpus Christi also burned confiscated drug material in the boiler, operations at the site ceased by 1980, and burned remains of ordnance cover an area less than 200 square feet. Subsequent investigations resulted in an expanded interpretation of the former landfill site boundaries and potential impacts from the incinerator operations.

In 2005, Malcolm Pirnie, Inc. conducted a Preliminary Assessment (PA) of the former Incinerator Disposal Site at NALF Cabaniss. The PA provided an assessment of the conditions with respect to MEC and MC. The PA concluded that, based upon historical operations and visual observations made at the site, MEC and MC were confirmed at two discrete locations at the former Incinerator Disposal Site — around the boiler and near Perimeter Road. The PA also concluded that MEC and MC were suspected to be present at other locations within the former Incinerator Disposal Site.

Tetra Tech performed a Site Inspection (SI) in 2008, and numerous MEC/MPPEH items were discovered (Tetra Tech 2009). As part of the SI, Tetra Tech conducted a Time-Critical Removal Action to address MEC/MPPEH in 2008. The following munitions debris was observed inside and around the boiler that is currently lying on its side with a large hole in the bottom:

- 7.62-mm small arms ammunition
- 20-mm projectiles
- 30-mm projectiles
- 40-mm projectiles
- 5-pound practice bombs
- Flares/pyrotechnics (cartridge-actuated devices and propellant-actuated devices)

The following munitions items were discovered near Perimeter Road approximately 450 feet west of the boiler:

- 20-mm projectiles
- 5-pound practice bombs
- 2.75-inch rockets
- Thermally treated munitions scrap, including rocket base plates and fins

Four detonation shots were needed to destroy the MEC items discovered onsite so that the MEC hazards to personnel passing near or through the area were removed or reduced. Based on these discoveries, it is likely that more MEC and MPPEH are present in areas that were not surveyed during the SI. The *After Action Report* (Tetra Tech 2009) presents the results of the Time-Critical Removal Action.

Between 2010 and 2013, Tetra Tech performed an RI to define the nature and extent of MEC and MC impacts (Tetra Tech 2013a). RI field activities associated with MEC were performed in 2010 and 2011. MEC geophysical survey investigations using digital geophysical mapping (DGM) were performed along 24 north-to-south trending transects on 50-foot spacing that covered the entire Incinerator Disposal Site. Along these 24 transects, detector-aided surface surveys were used to search for, and if detected, remove MEC/MPPEH and other metal from the transects.

Numerous surface MEC and material documented as safe items were discovered during the RI in the northern portion of the site along eight transects (Figure 2-3). These items were primarily located within the interpreted footprint of the 5-acre landfill. A total of 468 anomalies met the DGM target selection criteria. Eighty of these anomalies were subsequently re-acquired and intrusively investigated. Anomalies within the footprint of the landfill were investigated to a maximum depth of 2 feet. Anomalies outside the landfill footprint were investigated to a maximum depth of 6 feet.

The RI reported that the MEC and MPPEH distribution is probably limited to approximately 17 acres within the 24-acre investigation area (Tetra Tech 2013a); however additional data is required over the entire 24-acre area to confirm this assessment. Over 80% of the MEC/MPPEH encountered during the RI was located on the ground surface (Tetra Tech 2013a).

Follow-up confirmation of DGM was limited to the densest distribution of anomalies inside an approximately 1.5-acre burial area within the landfill boundaries. The results of the subsequent intrusive investigation yielded numerous subsurface MEC/MPPEH items in the northwestern portion of the site in a burial area in the vicinity of transects 5 through 9 (Tetra Tech 2013b). However, not all identified subsurface anomalies were intrusively investigated and intrusive investigations were limited to a depth of 2 feet bgs within the landfill footprint. Therefore, subsurface MEC/MPPEH may be present outside the identified 1.5-acre burial area.

2.7 Source, Nature, and Extent of Contamination

2.7.1 Source of Contamination

No property records were found describing the opening, operations, closure, or demolition of the sanitary landfill or incineration site. The period that the area was used for munitions incineration is unknown. Aerial photographs indicate that the site was disturbed as early as 1942, and an area identified as “sanitary fill” appears on the Master Shore Station Development Plan as early as 1958. No aerials or plans were available for the period during which the boiler was used to incinerate munitions and confiscated drug material. Information collected the 2005 PA indicated that munitions had been buried in or near an old sanitary landfill at NALF Cabaniss; however, a map showing the general location of the landfill did not provide specific burial locations.

2.7.2 Nature and Extent of Contamination

As described in Section 2.6, MEC/MPPEH items previously encountered on the Incinerator Disposal Site include:

- 40-mm grenades (practice and high explosive)
- 37-mm projectile
- 7.62-mm small arms ammunition
- AN-M23 practice bombs
- 2.75-inch rocket components (fins and warheads)
- 2.25-inch rocket components (nose and motor)
- 3.5-inch rockets
- 20-mm projectiles

- 30-mm projectiles
- 5-pound practice bombs
- Flares/pyrotechnics (cartridge-actuated devices and propellant-actuated devices)

MEC/MPPEH has been observed near the perimeter road, near the former boiler, and in the vicinity of 8 of 24 transects within the northern portion of the site (Figure 2-3); however, there is not a clear understanding of the density and distribution of MEC/MPPEH within the 24-acre site. MEC/MPPEH may be present in uninvestigated areas between transects. The majority of the MEC encountered at the site has been on the ground surface.

Subsurface MEC/MPPEH was encountered in a 1.5-acre area within the vicinity of the 5-acre landfill, but the boundaries of the MEC/MPEH were not fully delineated. Therefore, it is possible additional subsurface MEC/MPPEH may be present in the 24-acre investigation area. Based on the spatial distribution of DGM anomalies, MEC/MPPEH is not anticipated to extend beyond the approximately 24-acre investigation area.

2.8 Streamlined Risk Evaluation

A streamlined risk evaluation summarizes the threats at a site by identifying the nature and extent of the contaminant release, the pertinent exposure pathways, and the receptors that may be exposed.

2.8.1 Nature and Extent of Release

As previously indicated, MEC/MPPEH has been observed at the Incinerator Disposal Site. MEC/MPPEH is anticipated to extend beyond the 5-acre landfill site, but not beyond the 24-acre surface and 17-acre subsurface investigation areas. However, there is not a clear understanding of the nature and extent of the release. The primary mechanism associated with MEC/MPPEH migration at the Incinerator Disposal Site is storm water-induced erosion, which may mobilize MEC to downstream locations within the nearby wetlands or to Oso Creek.

RI findings indicate that MEC/MPPEH is present at the surface; no characterization has been performed between the transects. MEC/MPPEH occurrence is expected to be high in the northern portion of the site. Limited clearance has occurred onsite, and only 17% of the identified anomalies were investigated; the site is not secure enough to enter without a UXO escort. Since there are insufficient data to statistically estimate the MEC density of the residual area, the Incinerator Disposal Site cannot be considered free of surface/subsurface MEC/MPPEH hazards. MEC/MPPEH will continue to present a hazard until future assessment and removal actions are performed (Tetra Tech 2013a).

2.8.2 Pertinent Exposure Pathways

Based on current/future land use, potentially complete exposure pathways include direct contact with MEC/MPPEH in surface soil/sediment via trespasser access (from Oso Creek and other unfenced boundaries), traversing the site during maintenance activities, and conducting intrusive activities that may disturb subsurface MEC/MPPEH.

2.8.3 Potential Receptors

Given the current/future land use, potential receptors who may come into contact with MEC/MPPEH include:

- Trespassers
- Installation personnel and contractors conducting further investigations in support of site cleanup and closure (e.g., intrusive soil and groundwater sampling)
- Site maintenance workers controlling vegetation (e.g., mowing and grubbing)

Following implementation of the selected remedy, a hazard assessment of the Incinerator Disposal Site will be conducted using the MEC Hazard Assessment (MEC HA) protocol.

3.0 IDENTIFICATION OF REMOVAL ACTION OBJECTIVES

As discussed in Section 2, MEC/MPPEH in the Incinerator Disposal Site presents an explosive hazard. Based on available information, evaluation of the hazard, and current/future use plans for the site, appropriate remedial action objectives (RAOs) have been developed for this NTCRA and are presented in this section. In addition, this section discusses the identification of Applicable or Relevant and Appropriate Requirements (ARARs), tabulated in Appendix B, and the removal action scope and schedule.

3.1 Statutory Limits on Removal Actions

The NCP (40 CFR §300.415) dictates statutory limits of $2 million and 12 months of U.S. EPA fund-financed removal actions, with statutory exemptions for emergencies and actions consistent with the remedial action to be taken. This removal action will be financed by the Navy rather than being U.S. EPA fund-financed. The Navy/Marine Corps Installation Restoration Program Manual does not limit the cost or duration of the removal action. However, cost-effectiveness is a recommended criterion for the evaluation of removal action alternatives.

3.2 Determination of Removal Scope

3.2.1 Development of Removal Action Objectives

General requirements of the NCP were considered in the development of RAOs. The NCP requires that the selected action ensures protection of human health and the environment and is consistent with current and future land use. The RAO for the Incinerator Disposal Site was developed to reduce the explosive hazard associated with MEC described in Section 2. Based on these considerations, the site-specific proposed RAO for the Incinerator Disposal Site is:

> *Prevent or minimize contact with MEC in soil/sediment, which presents an explosive hazard to trespassers, NALF Cabaniss personnel, and contractors under current and future land use scenarios.*

3.2.2 Identification of Applicable or Relevant and Appropriate Requirements

The NCP also requires that the selected action must also attain ARARs. This section presents a summary of the identified ARARs.

The Navy has primary responsibility for identifying potential ARARs at the site. The removal action will, to the extent practicable, comply with ARARs under federal law and the laws of the State of Texas. Summaries of potential related environmental and munitions regulations are in Appendix B.

ARAR evaluation is a two-step process: (1) determination of applicability, and (2) if not applicable, determination of relevance and appropriateness. Applicable requirements are those requirements specific to the conditions at the Incinerator Disposal Site and the surrounding airfield that satisfy all jurisdictional prerequisites of the law or requirement. Relevant and appropriate requirements are those that do not have jurisdictional authority over the particular circumstances at the Incinerator Disposal Site, but are meant to address similar situations and are thus suitable for use at this site. Only requirements that are both relevant and appropriate are considered ARARs. As outlined in 40 CFR §300.415(j), the lead agency may consider the urgency of the situation and the scope of the removal action to be conducted in determining whether compliance with ARARs is practicable. The final determination of federal ARARs will be made when the Navy issues the AM.

The NCP (40 CFR §300.400[g][2]) specifies the following criteria to be used in the determination of what requirements of environmental laws are relevant and appropriate:

- Purpose of the requirement in relation to the purpose of CERCLA
- Medium or media regulated or affected by the requirement
- Substance(s) regulated by the requirement
- Actions or activities regulated by the requirement
- Variances, waivers, or exemptions of the requirement
- Type of place regulated and the type of place affected by the release or CERCLA action
- Type and size of the facility or structure regulated by the requirement or affected by the release
- Consideration of the use or potential use of affected resources in the requirement

Under CERCLA, only substantive provisions of requirements are considered to be ARARs. Procedural or administrative requirements (e.g., permits) are not considered ARARs. The CERCLA exemption in Section 121(e)(1) states that “No Federal, State, or local permit shall be required for the portion of any removal or remedial action conducted entirely onsite, where such

remedial action is selected and carried out in compliance with this section."[1] This exemption applies to all administrative requirements, but substantive requirements of the permits must still be attained.

ARARs are divided into three classifications pursuant to U.S. EPA guidance on the ARAR determination process: chemical-specific, location-specific, and action-specific.

Chemical-specific ARARs are health or risk management-based criteria or methodologies applied to site-specific conditions that result in the establishment of a cleanup level. These requirements generally set protective cleanup concentrations for each of the chemicals of concern in the designated media or set safe concentrations of discharge for remedial activity. Because this IRA is only intended to address MEC/MPPEH hazards, MC concerns identified at the site will be addressed as a separate munitions response action following the reduction of the explosive hazard by the removal of munitions. Thus, chemical-specific ARARs are not addressed as part of this EE/CA.

Location-specific ARARs restrict remedial activities based on the characteristics of the surrounding environments. Location-specific ARARs may include restrictions on actions within wetlands or floodplains, the protection of known endangered species, or restrictions for protected waterways. Federal and Texas location-specific regulations that have been reviewed are summarized in Appendix B.

Action-specific ARARs are requirements that define acceptable treatment and disposal procedures for munitions to ensure the protection of public health and safety. Federal and Texas action-specific ARARs that may affect the procedural aspects of removal alternatives are summarized in Appendix B.

3.2.3 Removal Action Scope

The IRA will address the explosive hazard associated with MEC/MPPEH under current and future use scenarios, but is not intended to be the final remedy for the site.. The extent of activities will be limited to the 24 acres designated as Munitions Response Site UXO 4 (Incinerator Disposal Site). Removal of MEC/MPPEH from the Incinerator Disposal Site is necessary to reduce the explosive hazards posed to potential trespassers and site workers (e.g., maintenance or landscaping personnel), as well as those associated with future site investigation and closure activities. The IRA will stabilize the site until further remedial investigation/feasibility study activities are completed to delineate and otherwise address MC hazards.

[1] *42 USC, Section 9621(e)(1).*

Other important considerations in determining the removal action scope include:

- Selecting an efficient and cost-effective removal action approach
- Implementing safe and proven munitions response procedures
- Minimizing impacts to ongoing NALF Cabaniss operations
- Minimizing disturbance of sensitive environments (e.g., wetlands or identified endangered species)

3.3 Determination of Removal Action Schedule

The EE/CA was made available for public review and comment for a 30-day period from 1 to 30 September 2014. Notice of the Navy's invitation for public comment was placed in the *Corpus Christi Caller Times* on 31 August 2014 and the EE/CA was available at the Dr. Clotilde P. Garcia Public Library in Corpus Christi, Texas. No public comments on the EE/CA were received. Appendix F presents a copy of the public notice and proof of publication.

This removal action is non-time-critical due to the availability of a 6-month planning period starting from finalization of the AM to initiation of the action. Following the AM finalization, the project period is anticipated to span approximately 10 months, from initiation of the planning documents preparation through completion of the IRA after action reporting. This is an estimated schedule for project completion; should critical milestones not be met, the total project timeframe would be extended. Critical milestone periods related to the removal action schedule are summarized as follows:

- Preparation of planning documents — 4 months
- Performance of field removal action activities — 1 month (Alternative 2), 2 months (Alternative 3)
- Preparation of after-action report — 4 months

4.0 IDENTIFICATION AND ANALYSIS OF REMOVAL ACTION ALTERNATIVES

4.1 Alternatives Description

Three removal action alternatives were identified for evaluation in this EE/CA to reduce the MEC/MPPEH explosive hazard for current and future use scenarios at the Incinerator Disposal Site. These alternatives are:

- Alternative 1 — No Action
- Alternative 2 — Surface Clearance of MEC/MPPEH and Engineering/Institutional Land Use Controls
- Alternative 3 — Surface and Subsurface Clearance of MEC/MPPEH and Engineering/Institutional Land Use Controls

The alternatives were evaluated to determine whether they met the site-specific RAO developed in Section 3 as well as NCP criteria of effectiveness, implementability, and cost. A description of each of these alternatives is in the following sections.

4.1.1 Alternative 1 — No Action

The No Action alternative is included and used solely for comparison to other alternatives as required by the NCP in 40 CFR 300.430(e)(6). Under this alternative, no action would be taken to limit or prevent contact with MEC/MPPEH in soil/sediment. Existing controls, as described in Section 4.1.2, would remain.

As a consequence of implementing Alternative 1, potential MC-related impacts to site soil and groundwater would not be investigated due to site hazards. Remedial investigation/feasibility study documents would be completed based on existing data and recommendations would be made to manage site hazards (both MEC/MPPEH and MC) appropriately.

4.1.2 Alternative 2 — Surface Clearance of MEC/MPPEH and Engineering/Institutional Land Use Controls

Alternative 2 includes the physical removal of MEC/MPPEH from the ground surface within the 24-acre site; Figure 4-1 shows the proposed removal area. Clearance activities would be limited to MEC/MPPEH items located on the ground surface or partially buried (i.e., typically within the top few inches of the soil column). The following elements of work are included:

- Limited vegetation removal
- Land surveying
- MEC/MPPEH surface removal
- MEC and material documented as safe disposal activities

Vegetation clearance would involve the limited removal of vegetation deadfall or other obstacles that would inhibit the UXO team's ability to conduct an instrument-assisted surface clearance. After vegetation clearing, a Texas-licensed Professional Land Surveyor would establish the clearance boundary and 100-foot by 100-foot grid system across the site.

Following the survey, a UXO clearance team would conduct surface sweeps across the grids using hand-held all-metal detectors to assist in the identification and removal of all surface and partially buried MEC/MPPEH with a minimum dimension measuring 20 mm in diameter or length.

During surface clearance operations, a safety exclusion zone (EZ) would be established based on the hazardous fragmentation distance associated with the munition having the greatest fragmentation distance. Based on munitions identified to date, the EZ would be based on the 2.75-inch (M229) Rocket Warhead, with a net explosives weight of 4.8 pounds. Based on this item, the safety EZ or arc to be established around the removal area would be approximately 308 feet for exclusion of nonessential personnel from manual operations.

UXO-qualified personnel on the UXO clearance team would determine the safest approach to addressing the explosives hazards presented by recovered MEC. As indicated in Section 1.2, an emergency response situation may be present when an immediate or imminent and substantial threat to public health or the environment is present and may require immediate and expeditious action to eliminate the threat. The UXO-qualified personnel have the responsibility for making this determination, which will ordinarily be a judgment call.

The RCRA Munitions Rule exempts an explosives or munitions emergency from the RCRA Subtitle C hazardous waste regulatory requirements. Recovered MEC would be disposed by detonation within the site boundary using donor explosives. Engineering controls (i.e., sandbag mitigation) would be used for intentional detonation activities to reduce the maximum fragmentation distance EZ of 1,434 feet, and ensure fragmentation does not extend off Navy-controlled property.

Following the surface clearance, land use controls would be implemented to limit/prevent human contact with residual (e.g., subsurface) MEC/MPPEH within the suspected source area in the Incinerator Disposal Site. The identified land use controls would serve as interim measures until the final remedy is selected. The land use controls would include physical and administrative mechanisms to restrict the use of, or limit access to, the property to prevent exposure to MEC/MPPEH as described below:

- Physical mechanisms (i.e., engineering controls) — The existing fence would be repaired or replaced to limit/prevent potential receptors access to the site and from coming into contact with MEC/MPPEH (Figure 4-1). Warning signs indicating the presence of buried munitions/explosive hazards that are in place would be repaired and maintained on the fence and added as necessary, every 100 linear feet. Fence installation would require implementation of the administrative mechanisms discussed below.

- Administrative mechanisms (i.e., institutional land use controls) — Administrative requirements would include requiring all intrusive work (e.g., excavation, soil sampling, etc.) on the site be performed using anomaly avoidance procedures provided by UXO-qualified personnel.

Once surface clearance is complete, potential MC-related impacts to soil and groundwater would be investigated using anomaly avoidance procedures. Risk assessment, RI, and feasibility study documents would be completed and recommendations would be made to manage site risks appropriately. Under this alternative, land use controls would remain in effect until they are either incorporated into or superseded by the final remedial design.

The following assumptions were used for developing the Alternative 2 cost, which is presented in Section 4.2.3:

- Area of surface clearance — 24 acres
- Quantity of MPPEH encountered — 500 pounds (lbs)
- Quantity of non-munitions metal debris encountered — 500 lbs
- Chain link fence repaired/installed — 1,150 feet
- Number of gates in fence — 2
- Number of signs installed — 10
- Duration of fieldwork — 9 working days

- UXO Team size — 6 technicians
- Onsite supervisory personnel — 3 people
- Equipment utilization requirements:

  — Gas-powered vegetation removal tools — 3 days
  — Handheld detectors — 9 days

4.1.3 Alternative 3 — Surface and Subsurface Clearance of MEC/MPPEH and Institutional Land Use Controls

Alternative 3 includes the physical removal of MEC/MPPEH from the surface of the suspected source area (approximately 24 acres), and from the suspected subsurface source area (approximately 17 acres within the overall 24-acre Incinerator Disposal Site). Figure 4-2 shows the proposed surface and subsurface removal areas. Vegetation removal, land surveying, and a geophysical survey are also required to support the surface/subsurface removal action. Subsurface clearance would be completed to the depth of detection of industry-standard geophysical sensors (typically 11 times the diameter of the subsurface item). Based on the RI results, munitions items are expected to be encountered within the top 24 inches of the soil column.

Vegetation removal, surveying, and surface sweep procedures would be similar to the methods discussed in Alternative 2; however, significantly more vegetation would be cleared to facilitate the geophysical survey. This would involve removing trees less than 4 inches in diameter, tree limbs and branches to a height of 7 feet above ground, and any underbrush or deadfall that presents a tripping hazard to the DGM teams.

A geophysical survey would be conducted to locate potential subsurface MEC/MPPEH. Full coverage DGM survey techniques would be used throughout the established grids. Following the DGM survey, anomalies selected as targets would be reacquired and intrusively investigated.

UXO technicians would manually excavate shallow discrete anomalies. Deeper anomalies and areas of dense anomaly response (if encountered) would be mechanically excavated. Excavated soil/sediment from areas of dense anomaly response would be excavated from the landfill and spread on the ground surface in approximately 1 foot lifts. UXO technicians would survey and clear the deposited spoils of MEC/MPPEH to determine the safest approach to addressing the explosives hazards presented by recovered MEC. Following excavation of anomalies, the locations/areas would be resurveyed with geophysical sensors to verify that all potential MEC/MPPEH meeting the minimum 20 mm diameter or length performance criterion has been removed.

The same EZs would be applied as discussed in Alternative 2.

Following the MEC/MPPEH removal action, institutional land use controls, legal mechanisms for imposing restrictions and conditions on land use, would be required to prevent ground disturbance and intrusive activities deeper than 2 feet without anomaly avoidance procedures provided by a UXO-qualified Technician. Additionally, the same fence repairs outlined for Alternative 2 would be constructed to serve as an engineering control that would prevent access to the site.

The following assumptions were used for developing the Alternative 3 cost, which is presented in Section 4.2.3:

- Area of surface clearance — 24 acres
- Area of subsurface clearance — 17 acres
- Quantity of MPPEH encountered — 1,500 lbs
- Quantity of non-munitions metal debris encountered — 5,000 lbs
- Chain link fence repaired/installed — 1,150 feet
- Number of gates in fence — 2
- Number of signs installed — 10
- Duration of fieldwork — 25 working days
- UXO Team size — 6 technicians
- Onsite supervisory personnel — 4 people
- Equipment utilization requirements:

    — Gas-powered vegetation removal tools — 10 days
    — DGM sensor — 10 days
    — Handheld detectors — 25 days
    — Mini-excavator — 15 days

4.2 Analysis of Removal Action Alternatives

Each of the three removal action alternatives were evaluated using the effectiveness, implementability, and cost criteria set forth in the NCP and the U.S. EPA guidance for conducting EE/CAs. Table 4-1 describes the evaluation criteria.

Table 4-1
Evaluation Criteria

Effectiveness	
Protection of human health and the environment	The assessment describes how the action achieves and maintains protection of human health and the environment and achieves site-specific RAOs both during and after implementation.
Compliance with ARARs	An alternative is assessed in terms of its compliance with ARARs, or if a waiver is required, how it is justified.
Short-term effectiveness	An action is assessed in terms of its effectiveness in protecting human health and the environment during the implementation of a remedy before RAOs have been met. The time duration until the RAOs are met is also factored into this criterion.
Long-term effectiveness and permanence	An action is assessed in terms of its long-term effectiveness in maintaining protection of human health and the environment after RAOs have been met. The magnitude of residual risk and adequacy and reliability of post-remedial site controls are taken into consideration.
Reduction of toxicity, mobility or volume	An action is assessed in terms of anticipated performance of the specific remedial technologies it employs. Factors such as volume of MEC removed or destroyed and the degree of expected reductions in exposure to hazards within the removal action site are considered.
Implementability	
Technical feasibility	The availability of technology to implement the remedy is evaluated.
Administrative feasibility	The administrative feasibility factor evaluates requirements for permits, zoning variances, impacts on adjoining property, and the ability to impose institutional control.
Availability of services and materials	The availability of offsite treatment, storage, and disposal capacity, personnel, services, and materials, and other resources necessary to implement the alternative is evaluated.
State and community acceptance	The acceptability of an alternative to the state agency and the community is evaluated.
Cost	
Direct and indirect capital costs	Includes capital costs for fence installation, MEC/MPPEH clearance, equipment and materials, munitions storage and services, engineering and design, and permit/licenses.
Operations and maintenance costs	Includes ongoing operating, monitoring and maintenance costs for a specific period.

Notes:
ARARs = Applicable or Relevant and Appropriate Requirements
RAO = Remedial Action Objective
MEC = Munitions and Explosives of Concern
MPPEH = Material Potentially Presenting an Explosive Hazard

4.2.1 Effectiveness

The effectiveness of a technology refers to its capability of removing the specific items in the volumes required; the degree to which the technology achieves the RAO; and the reliability and performance of the technology over time, including protection of human health and the environment; compliance with ARARs to the extent practical; long-term effectiveness and permanence; reduction in explosive safety hazard; and short-term effectiveness.

Table 4-2 provides the detailed analysis of each alternative by the effectiveness criteria.

Table 4-2
Detailed Analysis of Alternatives for Effectiveness

Criterion	Alternative 1: No Action	Alternative 2: Surface Clearance of MEC/MPPEH and Engineering/ Institutional Land Use Controls	Alternative 3: Surface/Subsurface Clearance of MEC/MPPEH and Engineering/Institutional Land Use Controls
Protection of human health and the environment	Does not provide protection of human health and the environment. Does not meet RAO.	Provides protection of human health by limiting access to MEC/MPPEH by surface removal, installation and/or repair of site fencing and warning signs, and requiring UXO escort and anomaly avoidance for any intrusive activities within the site. Meets RAO.	Provides highest level of protection of human health and the environment by MEC/MPPEH surface and subsurface removal. Meets RAO.
Compliance with ARARs	Compliant with ARARs since no action taken.	Munitions containing an explosive hazard would be detonated onsite and munitions with no explosive hazard would be disposed of offsite in accordance with appropriate ARARS and Department of Navy guidance. The IRA is anticipated to be compliant with ARARs.	Munitions containing an explosive hazard would be detonated onsite and munitions with no explosive hazard would be disposed of offsite in accordance with appropriate ARARS and Department of Navy guidance. The IRA is anticipated to be compliant with ARARs.
Short-term effectiveness	Protective of human health and environment during implementation since no action taken. However, RAOs are not achieved under this alternative.	NALF Cabaniss personnel and contractor protection would be assured during implementation through use of UXO-qualified personnel and implementation of MEC safety standards and procedures. Engineering controls (i.e., sandbag mitigation) would be used for intentional detonation activities to reduce the maximum fragmentation distance EZ of 1,434 feet, and ensure fragmentation does not extend off Navy-controlled property. Limited disturbance of the topsoil would minimize the potential for storm water pollution during MEC/MPPEH removal activities. Construction and travel related emissions of greenhouse gases and related priority pollutants would result in a larger environmental footprint over Alternative 1. Time until RAO is completed: 2 weeks.	NALF Cabaniss personnel and contractor protection would be assured during implementation through use of UXO-qualified personnel and implementation of MEC safety standards and procedures. Engineering controls (i.e., sandbag mitigation) would be used for intentional detonation activities to reduce the maximum fragmentation distance EZ of 1,434 feet, and ensure fragmentation does not extend off Navy-controlled property. Soil disturbance would require the construction of storm water controls to prevent the migration of soil/sediment to the adjacent Oso Creek. Construction and travel related emissions of greenhouse gases and related priority pollutants would result in a larger environmental footprint over Alternatives 1 and 2. Time until RAO is completed: 5 weeks.
Long-term effectiveness and permanence	Does not provide long-term effectiveness and permanence. MEC HA results indicate the highest potential for Explosive Hazard.	MEC/MPPEH clearance would be limited to surface removal; MEC/MPPEH would remain in the subsurface. Long-term effectiveness would be provided as long as engineering and institutional land use controls remain in place and are heeded during life of alternative. MEC HA results indicate a moderate potential for Explosive Hazard.	MEC/MPPEH removal would be limited to 2 feet bgs; some MEC/MPPEH may remain below this depth. Long-term effectiveness and permanence would be provided by MEC/MPPEH removal. Institutional land use controls would be required to prevent intrusive activities. MEC HA results indicate a low potential for Explosive Hazard.
Reduction of toxicity, mobility or volume	Does not reduce toxicity, mobility, or volume of MEC/MPPEH.	Reduces toxicity, mobility, and volume of surface MEC/MPPEH by removal/treatment.	Reduces toxicity, mobility, and volume of MEC/MPPEH by surface and subsurface removal/ treatment.

Notes:

MEC = Munitions and Explosives of Concern
MPPEH = Material Potentially Presenting an Explosive Hazard
RAO = Remedial Action Objective
UXO = Unexploded Ordinance
ARARs = Applicable or Relevant and Appropriate Requirements
IRA = Interim Removal Action
NALF = Naval Auxiliary Landing Field
EZ = Exclusion Zone

As described in Section 2, the site-specific RAO is to prevent or minimize contact with soil/sediment containing MEC/MPPEH, which presents an explosive hazard to trespassers, NALF Cabaniss personnel, and contractors under current and future land use scenarios. Levels of effectiveness were assessed based on the MEC HA and Green and Sustainable Remediation (GSR) assessments performed for each alternative, as discussed further in the following sections.

Munitions and Explosives of Concern Hazard Assessment

A MEC HA was conducted further support the effectiveness evaluation criteria, and to establish a current site baseline to be compared to the possible future outcome of completing a MEC/MPPEH clearance. The MEC HA calculates a numerical score for each alternative that represents the hazard level that will result from implementation of that alternative. The hazard levels reflect the interaction between the current or future human activities within the site, and the types, amounts, and conditions of MEC items within the site. The ranges for each of the hazard levels are based on the results of a large number of sensitivity runs (conducted during development of the MEC HA framework) designed to ensure that the appropriate site conditions are associated with each hazard level (U.S. EPA 2008). The methodology used in the MEC HA is structured around three components of potential explosive hazard incidents (U.S. EPA 2008):

MEC HA Methodology General Hazard Level Definitions		
Hazard Level	**Maximum MEC HA Score**	**Minimum MEC HA Score**
1 — Highest Potential for Explosive Hazard Conditions	1,000	840
2 — High Potential for Explosive Hazard Conditions	835	725
3 — Moderate Explosive Hazard Conditions	720	530
4 — Low Potential for Explosive Hazard Conditions	525	125

- Severity, which addresses the potential consequences of the effect on a human receptor should a MEC item detonate.
- Accessibility, which addresses the likelihood that a human receptor will be able to come in contact with a MEC item.
- Sensitivity, which addresses the likelihood that a human receptor will be able to interact with a MEC item such that it will detonate.

MEC HA Input Factors

- Severity:
  - (I) Energetic Material Type
  - (II) Location of Additional Human Receptors
- Accessibility:
  - (III) Site Accessibility
  - (IV) Total Contact Hours
  - (V) Amount of MEC
  - (VI) Minimum MEC Depth/Maximum Intrusive Depth
  - (VII) Migration Potential
- Sensitivity:
  - (VIII) MEC Classification
  - (IX) MEC Size

Each of these components is assessed in the MEC HA by input factors, which were determined from the RI results. Each input factor has two or more categories, which the MEC HA user selects based on known information about the parcel. Each input factor category is associated with a numeric score that reflects the relative contributions of the different input factors to the MEC HA.

The MEC HA for the Incinerator Disposal Site was completed using conditions under the three remedial alternatives. The hazard level scores generated from the MEC HA represent a probable relative measure of the reduced explosive hazard that would be achieved through implementation of each alternative.

The results of the MEC HA scores represent characterization of the severity, accessibility, and sensitivity components of explosive hazards, based on known information about the site. Scores are selected for the input factor category that is most appropriate for each remedial alternative being evaluated. Each input factor has a different maximum score, representing the weighted contribution of that factor to the overall score. These weights reflect the relative importance of each input factor to overall explosive hazard (U.S. EPA 2008).

Table 4-3 summarizes the alternatives scoring for the Incinerator Disposal Site for the three response alternatives. The rationale for selection of each input factor category is in Appendix C.

The baseline score of 840 indicates that the hazard potential at the Incinerator Disposal Site currently has the highest potential for explosive hazard conditions (Hazard Level 1). Characteristics of the site contributing to a high explosive hazard include:

- The characteristics of munitions encountered on the site include High Explosive filler in fragmenting rounds.
- The site is moderately accessible (specifically to trespassers).
- The site previously was used as an open burning/open detonation area.
- MEC is located at depths that receptors may feasibly encounter during future site activities.
- MEC items previously encountered included the 40mm rifle grenade, which contains a high likelihood of detonation based on its sensitivity to movement.
- The small size of some MEC items previously encountered may make them difficult to discern by untrained personnel during future site activities.

Table 4-3
MEC HA Scoring Summary for Response Alternatives

Input Factor	MEC HA Score: Baseline/Alternative 1 — No Action	MEC Score: Alternative 2 — Surface Clearance of MEC/MPPEH and Engineering/ Institutional Land Use Controls	MEC Score: Alternative 3 — Surface/Subsurface Clearance of MEC/MPPEH and Institutional Land Use Controls
I. Energetic Material Type	100	100	100
II. Location of Additional Human Receptors	0	0	0
III. Site Accessibility	55	15	15
IV. Potential Contact Hours	15	10	5
V. Amount of MEC	180	110	30
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth	240	150	95
VII. Migration Potential	30	30	10
VIII. MEC Classification	180	180	180
IX. MEC Size	40	40	40
Total Score	**840**	**635**	**475**
Hazard Level Category	**1**	**3**	**4**

Notes:

MEC = Munitions and Explosives of Concern
MEC HA = Munitions and Explosives of Concern Hazard Assessment
MPPEH = Material Potentially Presenting an Explosive Hazard

The Alternative 2 score of 635 represents a reduction of 205 points and indicates that the site would have a moderate potential for explosive hazard conditions (Hazard Level 3) following a future surface MEC/MPPEH removal action. In comparison to the baseline conditions, the MEC removal and establishment of engineering/institutional controls at the site will reduce the receptor exposure (contact hours) to MEC, limit accessibility to the site, and limit amount of MEC present at the site.

The Alternative 3 score of 475 represents a reduction of 365 points and indicates that the site have a low potential for explosive hazard conditions (Hazard Level 4) following a future surface and subsurface MEC/MPPEH removal action. The drivers for the score reduction compared to Alternative 2 are primarily the reduced amount of MEC and the increased depth of clearance.

Green and Sustainable Remediation Evaluation

The SiteWise application was used to calculate and evaluate environmental footprints of each of the proposed alternatives relative to the GSR metrics including: greenhouse gases (GHGs); energy usage; criteria air pollutants that include sulfur oxides (SOx), oxides of nitrogen (NOx), and particulate matter (PM); water usage; resource consumption, and accident risk.[2] The remedial actions of each alternative were broken down into major components based on assumptions presented in Appendix D (cost estimates) and entered into the SiteWise application for comparison. Transportation (equipment and personnel), Equipment Use (earthwork), Residual Handling (waste disposal), Resource Use (soil and water) are the distinctive major component groupings among the alternatives in this evaluation. The relative impacts to GHG emissions, energy usage, NOx emissions, SOx emissions, and PM emissions indicate Alternative 3 has the largest environmental footprint, followed by Alternative 2, then Alternative 1. The SiteWise application also provides an estimate for relative accidental fatality or injury based on transportation, equipment used, and duration of effort. The results indicate Alternative 3 has the highest risk for injury or fatality; however, the MEC HA provides a better evaluation of the implementation and residual risks involved at this site. The details of the SiteWise analysis are in Appendix E.

4.2.2 Implementability

The ease of implementation of a technology refers to the availability of commercial services to support it, the constructability of the technology under specific site conditions, and the acceptability of the technology to all parties involved (e.g., regulators, public, airfield operations). These criteria

[2] SiteWiseT^{M} has been developed by Battelle, US Navy and US Army Corps jointly and is available online on Navy's ER Technology Transfer portal (www.ert2.org/t2gsrportal).

include technical feasibility, administrative feasibility, availability of services, support agency acceptance, and community acceptance. Implementability was assessed using the criteria summarized in Table 4-1 and discussed in Table 4-4.

Table 4-4
Detailed Analysis of Alternatives for Implementability

Criterion	Alternative 1: No Action	Alternative 2: Surface Clearance of MEC/MPPEH and Engineering/Institutional Land Use Controls	Alternative 3: Surface/Subsurface Clearance of MEC/MPPEH and Engineering/Institutional Land Use Controls
Technical feasibility	Technically implementable.	Technically implementable.	Technically implementable.
Administrative feasibility	Administratively implementable.	Administratively implementable.	Administratively implementable.
Availability of services and materials	Available services and materials.	Available services and materials.	Available services and materials.
State and community acceptance	Not evaluated at this time pending regulator and community review. However, anticipate acceptance is not likely.	Not evaluated at this time pending regulator and community review. However, anticipate acceptance.	Not evaluated at this time pending regulator and community review. However, anticipate acceptance to be only moderately likely.

Notes:
MEC = Munitions and Explosives of Concern
MPPEH = Material Potentially Presenting an Explosive Hazard

4.2.3 Cost

For the cost analysis of alternatives, the expenditures required to complete each alternative were estimated in terms of capital costs and operation and maintenance (O&M) costs. Capital costs include costs to complete initial removal activities. O&M costs would be incurred to ensure the integrity of the land use controls. Indirect costs include engineering expenses. By combining the different costs associated with each alternative, a present worth calculation for each alternative can be made for comparison.

The alternative cost estimates are in 2013 dollars and are based on information from past and ongoing MEC removal actions. Previous removal action costs, quotes, and engineering estimates have been used for unit pricing. Table 4-5 provides a summary of the present worth costs for each alternative; costing backup for Alternatives 2 and 3 is in Appendix D. There are no costs associated with Alternative 1, No Action.

Table 4-5
Summary of Alternative Present Worth Costs

Cost Item	Alternative 1: No Action	Alternative 2: Surface Clearance of MEC/MPPEH and Engineering/Institutional Land Use Controls	Alternative 3: Surface/Subsurface Clearance of MEC/MPPEH and Engineering/Institutional Land Use Controls
Capital Costs (direct and indirect)	$0	$678,000	$1,751,800
Post-Removal Site Closure Costs (30 years) (inflation-adjusted interest rate 4%)	$0	$242,100	$138,300
Total Project Costs	**$0**	**$920,100**	**$1,890,100**

Notes:
MEC = Munitions and Explosives of Concern
MPPEH = Material Potentially Presenting an Explosive Hazard

Relating the alternatives' costs to their resulting MEC HA hazard level categories allows for a comparison of the three alternatives' marginal costs. Alternative 2 will reduce the MEC HA hazard level category from a 1 to a 3 at a cost of approximately $455,000 per hazard level reduction. Alternative 3 will reduce the MEC HA hazard level category from a 3 to a 4 at an additional cost of nearly $980,000 per hazard level reduction. Therefore, the reduction in the hazard level achieved through implementation of Alternative 3 costs substantially more than the hazard level reductions achieved through implementation of Alternative 2.

5.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

This section provides a comparative evaluation of the removal action alternatives in terms of effectiveness, implementability, and cost.

5.1 Effectiveness

Based on the Section 4 analysis, the overall effectiveness of Alternatives 1, 2, and 3 are low, moderate, and high, respectively. Alternative 1 provides no protection to human health and the environment and does not achieve the RAO. The MEC/MPPEH clearance and subsequent land use controls proposed in Alternative 2 provide protection to human health and fully achieve the RAO. Alternative 3 achieves the RAO while providing the highest level of protection to human health and the environment with less cumbersome land use controls; however, because the site is a landfill and removal of all MEC cannot be achieved with 100% certainty using currently available technologies, future land use controls will be required regardless of the clearance depth. As such, in terms of protecting human health and the environment, Alternative 3 is only slightly more effective than Alternative 2 in the long term. The results of the GSR evaluation indicate Alternative 3 has the largest environmental footprint regarding short-term releases of GHGs and related priority pollutant emissions based on the longer duration of the effort, greater disturbances to site soil, and increased construction equipment use. As such, in terms of protecting human health and the environment, Alternative 2 is only slightly more effective than Alternative 3 in the short term. Alternatives 2 and 3 are anticipated to be compliant with ARARs. Alternative 2 reduces the toxicity, mobility, and volume of MEC/MPPEH. Alternative 3 is the most permanent solution in the long term, and reduces the toxicity, mobility, and volume of MEC/MPPEH to a greater extent than Alternatives 1 or 2.

5.2 Implementability

Based on the Section 4.2.2 analysis, all three of the alternatives are implementable from technical, administrative, and services/materials perspectives. However, Alternative 2 is the most implementable alternative since it does not involve the disturbance of underlying landfilled material, which may interfere with the geophysical sensors used to conduct the subsurface MEC/MPPEH removal and complicate the IRA from a technical perspective. Compared to Alternative 3, implementation of Alternative 2 will involve fewer disturbances of site soil and will likely result in the encountering of fewer MEC/MPPEH items requiring detonation. This makes Alternative 2 more implementable in terms of the short-term effectiveness because the potential for storm water pollution and noise pollution associated with onsite detonations is less than if Alternative 3 is selected. Therefore, Alternative 2 is anticipated to be the most acceptable alternative to regulators and the community.

5.3 Cost

Table 4-5 summarizes the present worth costs of each alternative. The cost breakdown for each alternative is in Appendix D. Although Alternative 2 is a less permanent solution than Alternative 3, it has a significantly lower total cost, smaller environmental footprint, as well as a significantly lower marginal cost per hazard level reduction. Because Alternative 2 fully meets the RAO, the additional costs associated with achieving a more permanent interim remedy are not justifiable.

6.0 RECOMMENDED REMOVAL ACTION ALTERNATIVE

This EE/CA was performed in accordance with current U.S. EPA guidance documents for an NTCRA under CERCLA. Three alternatives were analyzed based on evaluation of the effectiveness, implementability, and cost. The effectiveness evaluation included reviewing the protectiveness of human health and the environment, the short- and long-term effectiveness of the alternative, and its ability to meet the RAO and ARARs. Implementability included assessing the technical feasibility, administrative feasibility, availability of services/equipment, and state/community acceptance of the alternative. The cost evaluation included a review of capital costs, O&M costs, and present worth costs.

Alternative 2, Surface Clearance of MEC/MPPEH and Engineering/Institutional Land Use Controls at the Incinerator Disposal Site, is the recommended alternative. The following factors were considered in making the recommendation:

- Alternative 2 is the alternative that provides protection to human health and the environment in the most practical and cost effective way. Alternative 2 meets the RAO, and is anticipated to meet ARARs. Alternative 2 prevents access to the site and to MEC/MPPEH, and reduces the toxicity, mobility, and volume of surface MEC/MPPEH, which is not achieved under Alternative 1.

- All three of the alternatives are implementable from technical, administrative, and services/materials perspectives. However, Alternative 2 is the most practical and implementable alternative because it will not involve the disturbance of the landfill material and will have a smaller environmental footprint than Alternative 3 relative to GSR metrics, including GHG and priority pollutant emissions and energy consumption.

- The estimated total and marginal costs of Alternative 2 are significantly lower than Alternative 3.

Implementation of Alternative 2 should address the MEC/MPPEH in surface soils/sediment at the Incinerator Disposal Site, and will limit future access to subsurface MEC/MPPEH that will remain at the site. To ensure continued safety at the Incinerator Disposal Site, language prohibiting any intrusive activities within the site without qualified UXO Technician anomaly avoidance support will be included in a deed restriction at the site. The results of the NTCRA will be incorporated into a supplemental RI and will be evaluated in the Feasibility Study.

7.0 REFERENCES

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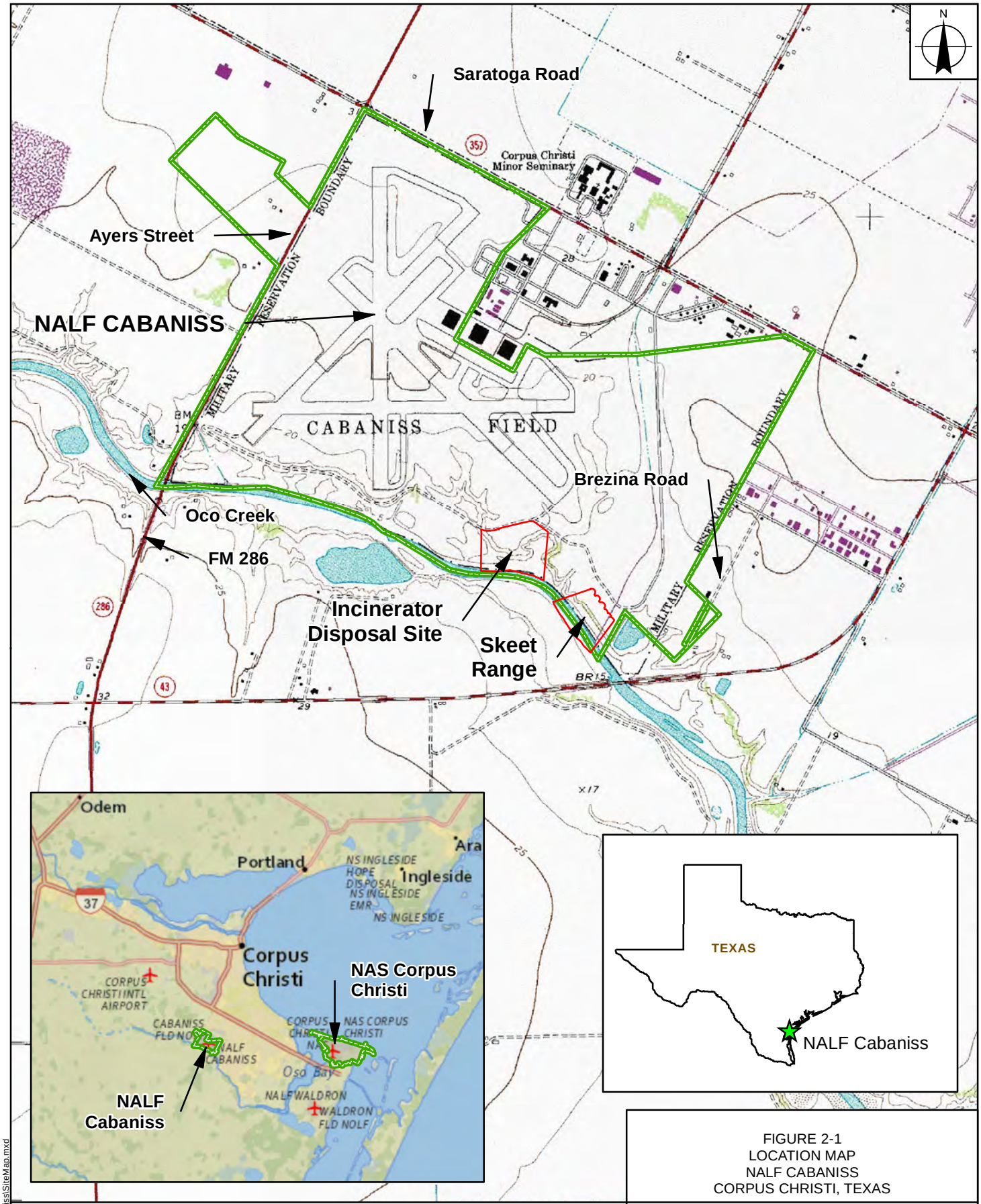
Appendix A
Figures



MRP Sites/Ranges

Installation Boundary

1 inch = 2,000 feet

0 1,000 2,000 3,000 4,000 Feet

Basemap Source: Oso Creek NW, Texas (1977) Quadrangle Topographic Map
USGS Topographic Map derived from USDA-NRCS-NCGC

FIGURE 2-1
LOCATION MAP
NALF CABANISS
CORPUS CHRISTI, TEXAS

NAVFAC Naval Facilities Engineering Command

RESOLUTION CONSULTANTS

REQUESTED BY: B. ELLIOTT	DATE: 12/19/2013
DRAWN BY: N. RINEHART	TASK ORDER NUMBER: JM67

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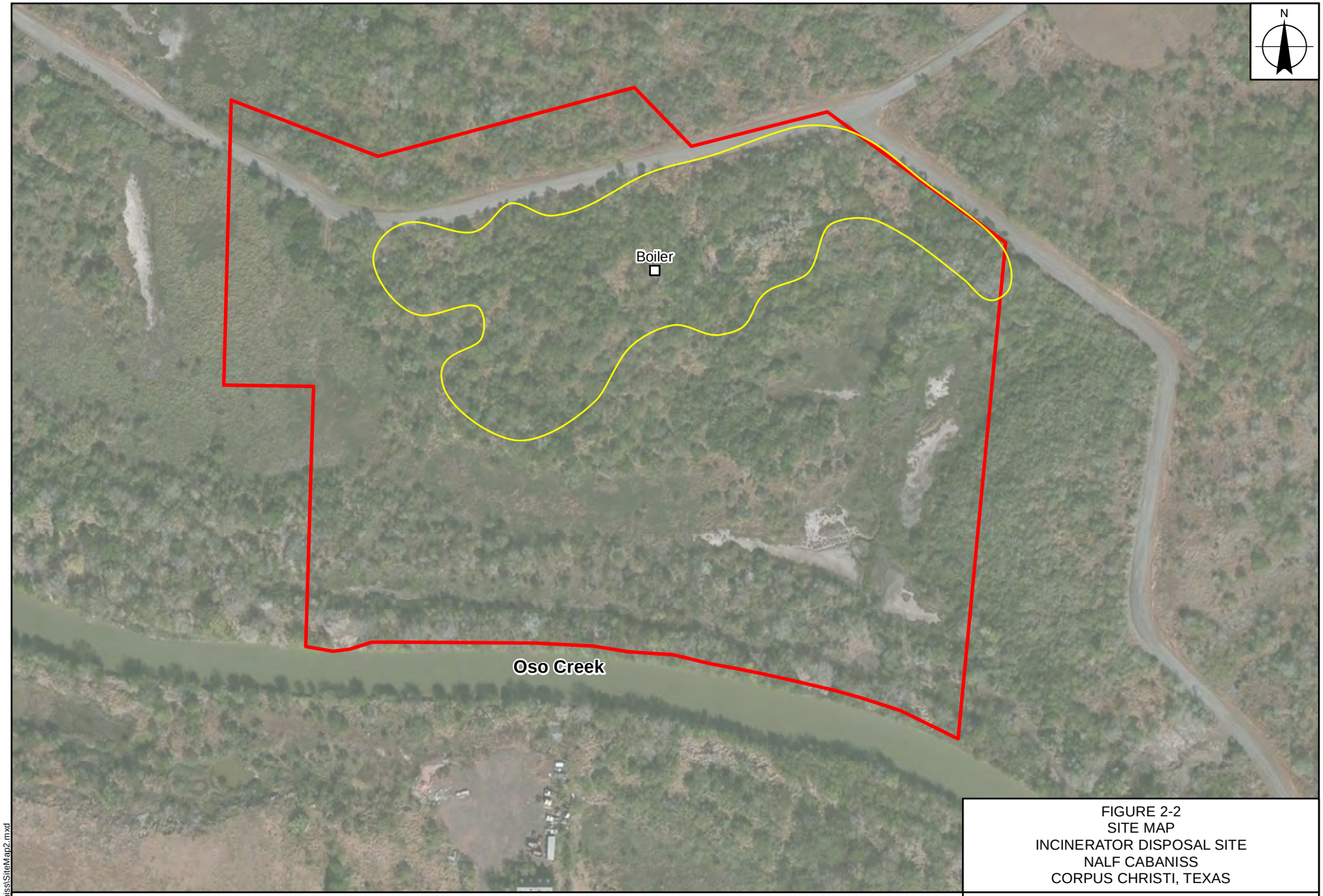

FIGURE 2-2
SITE MAP
INCINERATOR DISPOSAL SITE
NALF CABANISS
CORPUS CHRISTI, TEXAS

Approximate Landfill/Debris Area

Approximate Study Area

1 inch = 200 feet

0 50 100 150 200 Feet

NAVFAC Naval Facilities Engineering Command

RESOLUTION CONSULTANTS

REQUESTED BY: B. ELLIOTT	DATE: 12/19/2013
DRAWN BY: N. RINEHART	TASK ORDER NUMBER: JM67

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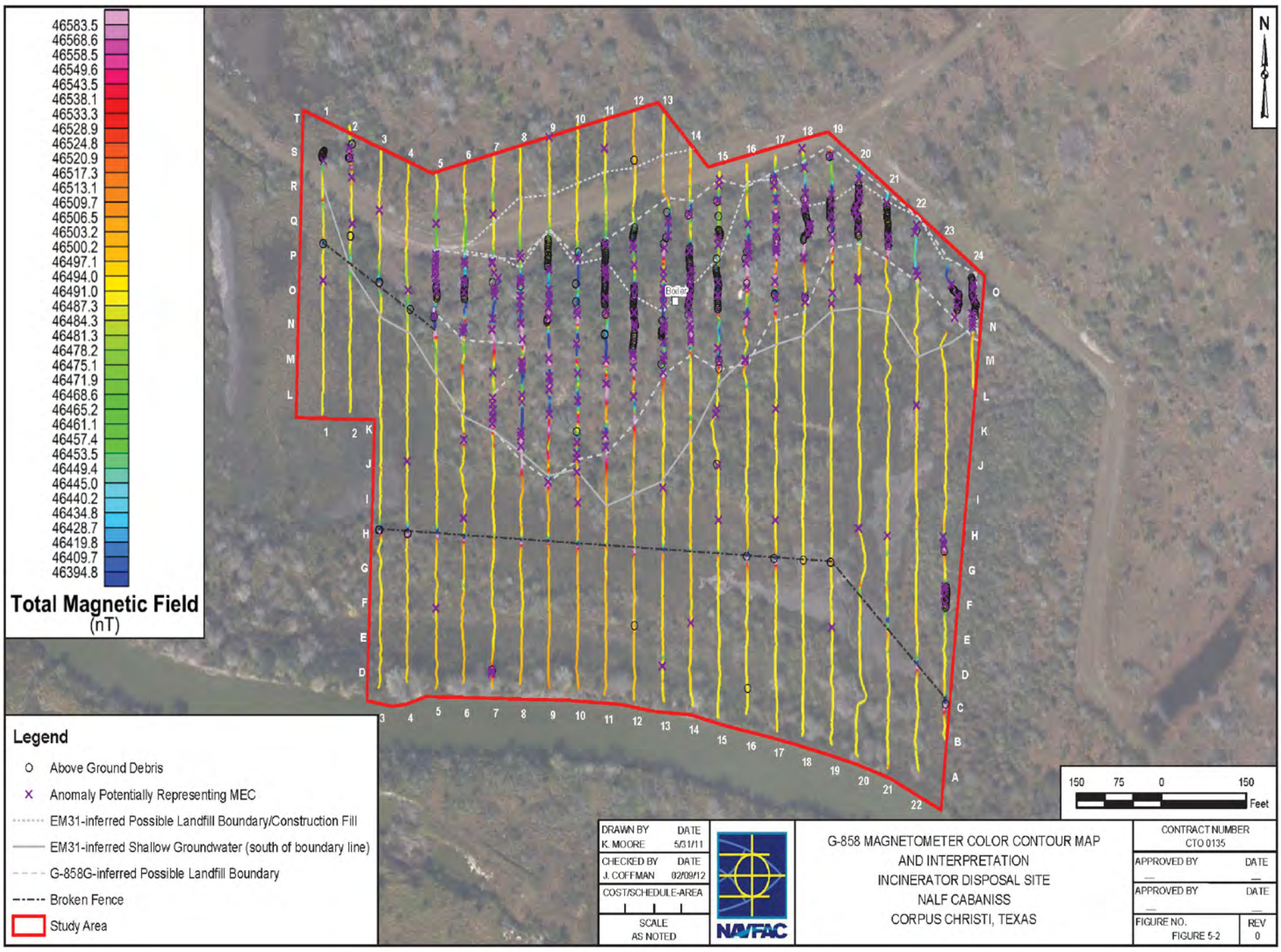

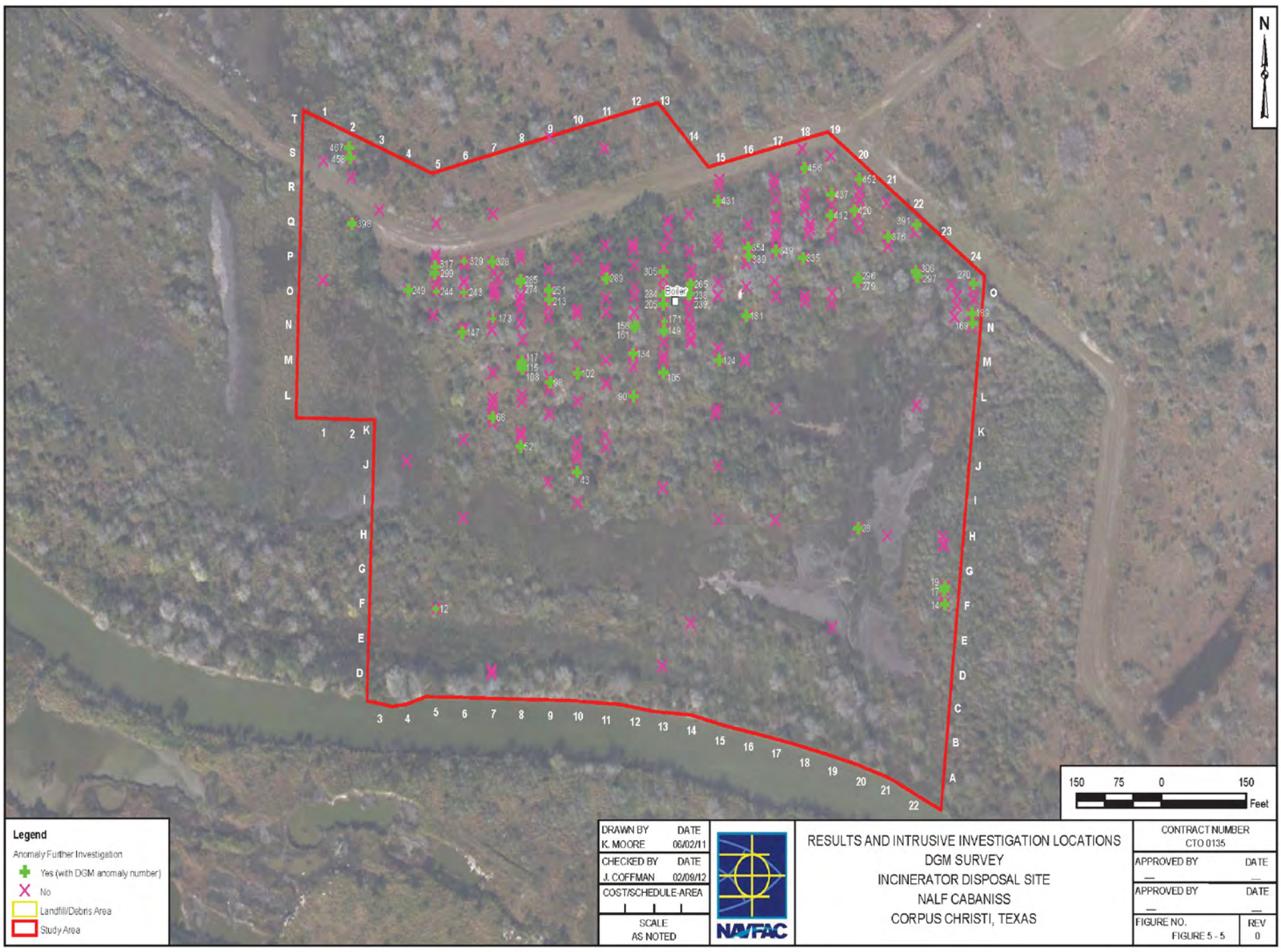

FIGURE 2-3
HISTORICAL GEOPHYSICAL DATA
INCINERATOR DIPOSAL SITE
NALF CABANISS
CORPUS CHRISTI, TEXAS

NAVFAC Naval Facilities Engineering Command
RESOLUTION CONSULTANTS

REQUESTED BY: C. BARNETT	DATE: 6/12/2014
DRAWN BY: B. LIPSCOMB	TASK ORDER NUMBER: XXXXX

Maps provided by TetraTech.

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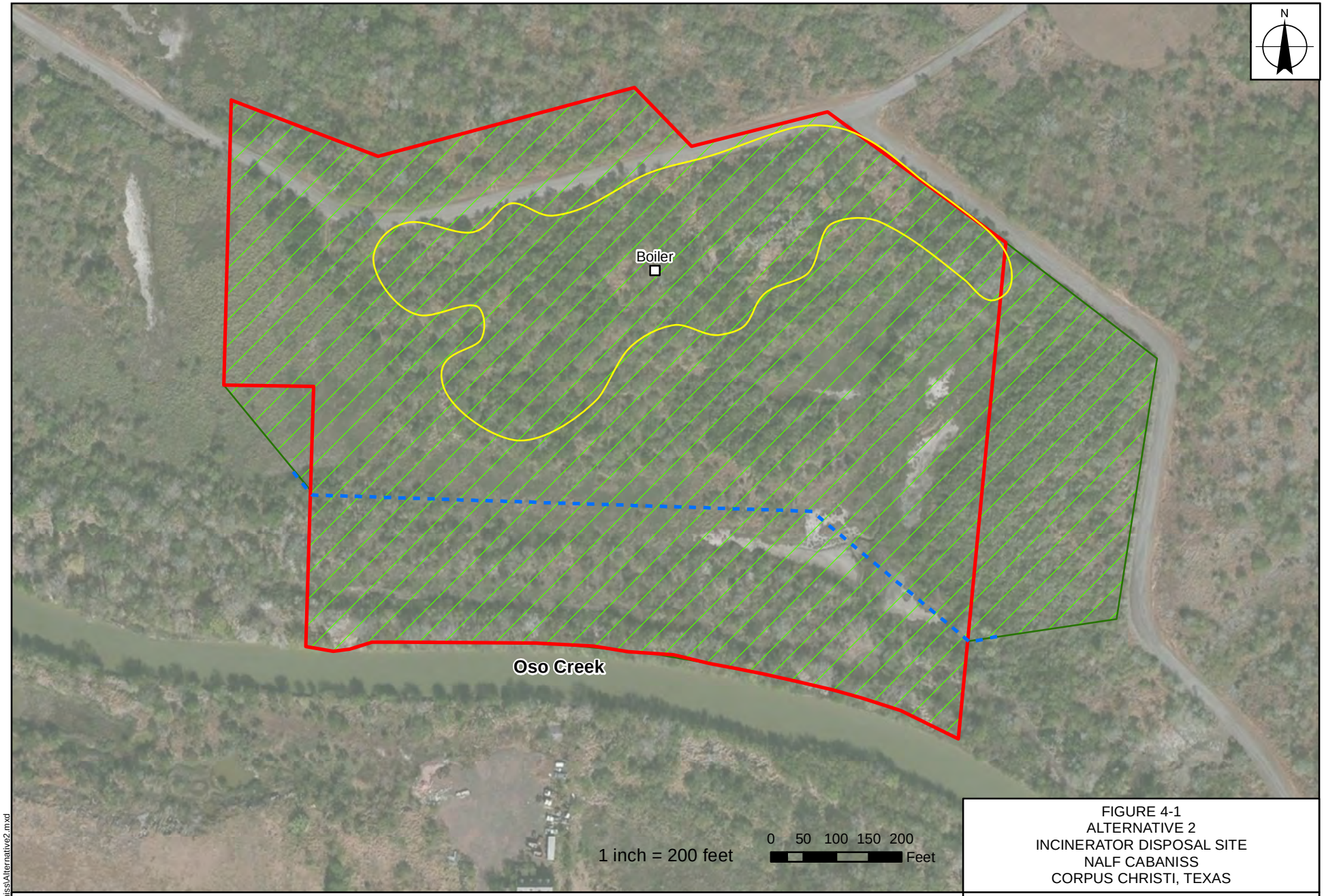

FIGURE 4-1
ALTERNATIVE 2
INCINERATOR DISPOSAL SITE
NALF CABANISS
CORPUS CHRISTI, TEXAS

Approximate Landfill/Debris Area

Approximate Study Area

Surface MEC/MPPEH Removal Area (24 acres)

Proposed Fencing Repairs (1150 linear feet)

NAVFAC Naval Facilities Engineering Command

RESOLUTION CONSULTANTS

REQUESTED BY: B. ELLIOTT	DATE: 12/27/2013
DRAWN BY: N. RINEHART	TASK ORDER NUMBER: JM67

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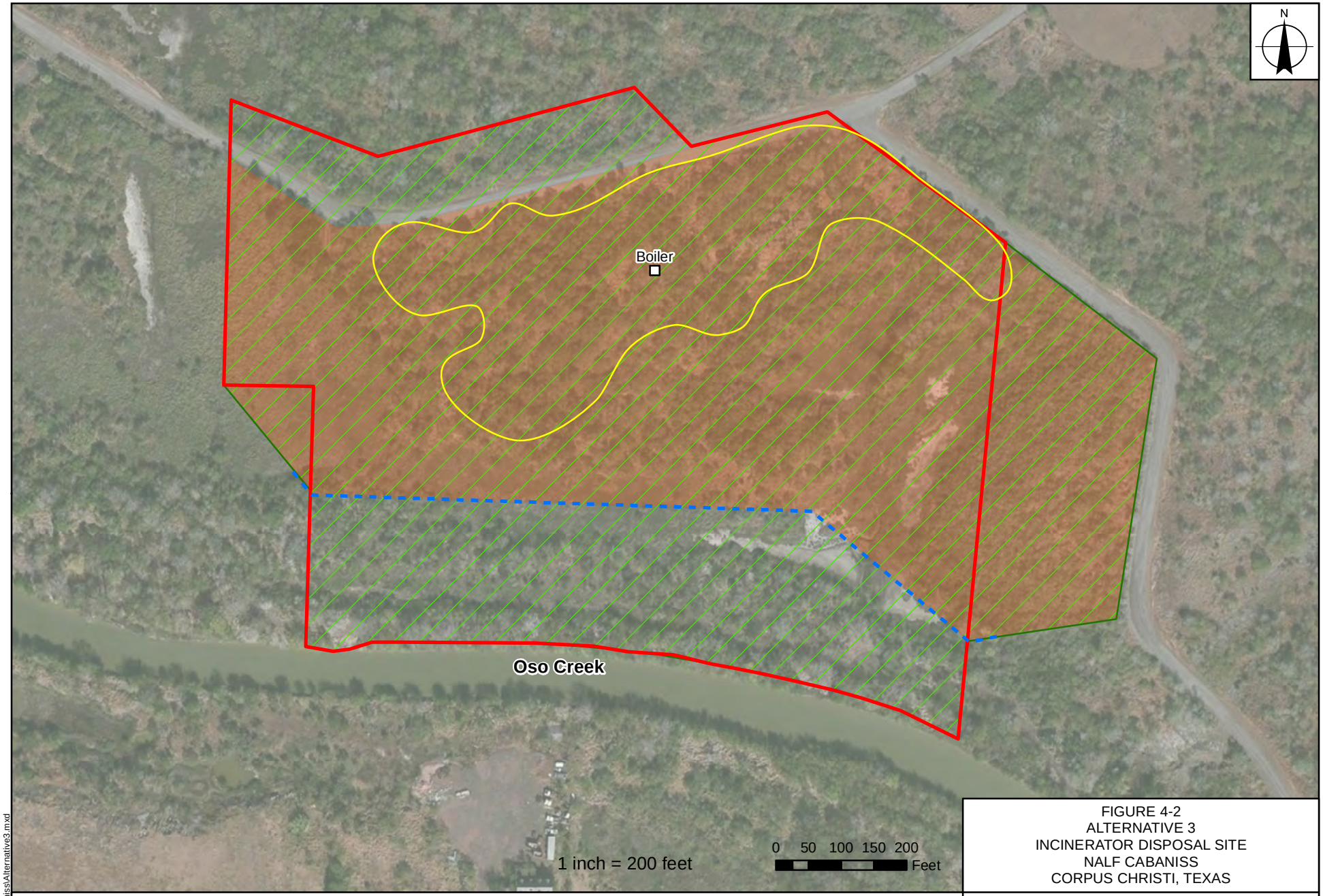

FIGURE 4-2
ALTERNATIVE 3
INCINERATOR DISPOSAL SITE
NALF CABANISS
CORPUS CHRISTI, TEXAS

- Proposed Fencing Repairs (1150 linear feet)
- Approximate Landfill/Debris Area
- Approximate Study Area
- Surface MEC/MPPEH Removal Area (24 acres)
- Subsurface MEC/MPPEH Removal Area (17 acres)

NAVFAC Naval Facilities Engineering Command
RESOLUTION CONSULTANTS

REQUESTED BY: B. ELLIOTT	DATE: 2/24/2014
DRAWN BY: N. RINEHART	TASK ORDER NUMBER: JM67

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Appendix B
Applicable or Relevant and Appropriate Requirements

Table B-1
Action-Specific ARARs
UXO 4 Incinerator Disposal Site MRS, NALF Cabaniss, Corpus Christi, Texas

Action/Media	Requirement	Prerequisite	Citation(s)
Control of Dust, Visible Emissions and Particulate Matter	Shall not discharge air contaminants in such concentration(s) and of such duration(s) as may adversely affect human health, welfare, or environment. Visible emissions are limited to an opacity of 30% per 6-minute period. If the area of land affected by construction or clearing operations is more than 1 acre in size, water or a suitable chemical shall be used for control of dust emissions	If generate qualifying dust, emissions, and/or disturb more than 1 acre of land this is **Applicable**.	Title 30, TAC 101.4 and 30 TAC 111.111
Managing of storm water runoff from land disturbing activities	Must comply with substantive requirements for storm water management and sediment control under National Pollutant Discharge Elimination System (NPDES) program as reflected in TPDES General Stormwater Permit No. TXR1500000, including preparation and implementation of a site-specific SWPPP to minimize pollution in runoff including, but not limited to, erosion and sediment controls and soil stabilization measures.	If removal activities disturb 1 acre or more of land, these permit requirements are **Applicable.**	40 CFR 122.44(k)(2) and (4)

Table B-1
Action-Specific ARARs
UXO 4 Incinerator Disposal Site MRS, NALF Cabaniss, Corpus Christi, Texas

Action/Media	Requirement	Prerequisite	Citation(s)
Management of Military Munitions	Identification, treatment, and storage requirements for the management of "Military Munitions" as defined under 40 CFR 260.10.	If Military Munitions discovered onsite qualify as solid waste which is also hazardous under cited subpart or 40 CFR Part 261, then U.S. EPA's Military Munitions Rule is **Applicable.**	40 CFR Part 266, Subpart M
	Criteria for determining when unused, used, or fired Military Munitions constitute solid waste subject to potential RCRA hazardous waste regulation.	While used or fired Military Munitions are solid waste potentially subject to RCRA Subtitle C requirements if not on an active or inactive range, unused Military Munitions are not unless the criteria specified in this subpart apply. **Applicable**	40 CFR 266.202
	Criteria for the application of, or exemption from, hazardous waste regulations for Waste Military Munitions (WMM) being transported.	Military Munitions transported offsite for reclamation, treatment, or disposal constitute WMM subject to these RCRA Subtitle C requirements. **Applicable**	40 CFR 266.203
	Criteria for hazardous waste regulation of WMM placed into storage.	Should any WMM found onsite be placed into storage, RCRA Subtitle C requirements will apply unless the conditional exemption set forth in this subpart applies. **Applicable**	40 CFR 266.205

Table B-1
Action-Specific ARARs
UXO 4 Incinerator Disposal Site MRS, NALF Cabaniss, Corpus Christi, Texas

Action/Media	Requirement	Prerequisite	Citation(s)
Military Munitions Emergency Response (Exemptions)	Certain exemptions from RCRA waste management requirements apply to qualifying explosives and military munitions emergency responses.	If nature and/or condition of explosives or military munitions found onsite warrant undertaking emergency response during NTCRA. **Applicable**	40 CFR 266.204
	Persons conducting a qualifying explosives or military munitions emergency response not required to satisfy 40 CFR 262 hazardous waste generator requirements.	If conducting explosives or munitions emergency response activities, exemption is **Applicable.**	40 CFR 262.10; 264.1(g)(8)(i)(D) or (iv); 265.1(c)(11)(i)(D) or (iv); 270.1(c)(3)(i)(D) or (iii)
	Persons conducting a qualifying explosives or military munitions emergency response not required to satisfy hazardous waste transporter requirements.	If conducting explosives or munitions emergency response activities, exemption is **Applicable.**	40 CFR 263.10(e); 264.1(g)(8)(i)(D) or (iv); 265.1(c)(11)(i)(D) or (iv); 270.1(c)(3)(i)(D) or (iii)
	If an explosives or munitions response specialist determines that immediate threat exists to public health or safety, may authorize waste removal without use of a manifest or transporter possessing an EPA ID number.	If conducting explosives or munitions emergency response activities, exemption is **Applicable.**	40 CFR 264.1(g)(8); 265.1(c)(11)
	If during conduct of NTCRA, it becomes necessary to conduct military munitions emergency response, those activities would be exempt from substantive requirements of RCRA TSD permit.	If conducting explosives or munitions emergency response activities, exemption is **Applicable.**	40 CFR 270.1(c)(3)(i)(D)
Characterization of solid wastes (hazardous or non-hazardous)	Persons who generate a solid waste must determine if that waste is a characteristic or listed hazardous waste and whether it may be excluded from RCRA regulation.	If solid waste is to be generated and RCRA generator exemption not afforded by application of MMR regulations to site activities. **Applicable**	40 CFR 262.11(a), (b), (c) and (d); 264.13(a)(1)

Table B-1
Action-Specific ARARs
UXO 4 Incinerator Disposal Site MRS, NALF Cabaniss, Corpus Christi, Texas

Action/Media	Requirement	Prerequisite	Citation(s)
Determinations required when managing hazardous waste	Must determine if the waste has to be treated before it can be land disposed offsite. Can be done by determining if the hazardous waste meets treatment standards in 40 CFR 268.40, 268.45, or 268.49. This determination can be made concurrently with the hazardous waste determination required in 40 CFR 262.11 in one of two ways: testing the waste or using generator knowledge of the waste.	If hazardous waste is generated and planned for land disposal offsite. **Applicable**	40 CFR 268.7(a)
	For characteristic hazardous wastes, the underlying hazardous constituents must be determined before the wastes can be land disposed offsite.	If characteristic hazardous waste is generated and planned for land disposal offsite. **Applicable**	40 CFR 268.2(i); 268.9(a)
Temporary storage of hazardous waste in containers	May temporarily accumulate hazardous waste in containers onsite without a permit or interim status provided certain labeling and container condition requirements are met.	If 55 gallons or less of hazardous waste, or 1 quart of acutely hazardous waste, is accumulated onsite for 90 days or less this is **Applicable**.	40 CFR 262.34(a)(1)(i), (a)(2) and (a)(3); 262(c)(1)(ii); 265.171; 265.172 and 265.173(a) and (b)
Transportation of hazardous waste offsite	Must comply with the hazardous waste generator standards in 40 CFR 262 for manifesting, packaging, labeling, marking, and placarding of hazardous waste for offsite shipment.	If transporting hazardous waste on a public or private right-of-way within or along the border of contiguous property under control of the same person, even if such contiguous property is divided by a public or private right-of-way, this is **Applicable**.	40 CFR 262.12; 262.20-3;262.30-33;262.40-41(a)
Transportation of hazardous materials	Must comply with applicable portions of the Hazardous Materials Transportation Act and DOT Hazardous Material Regulations at 49 CFR 171-180.	Any person under contract with federal government who ships or causes to be shipped "in commerce" hazardous materials. **Applicable**	40 CFR 171.1(c)
Scrap Metal Recycling	Processed scrap metals may be excluded from regulation as solid or hazardous wastes if recycled.	Scrap metals should be processed for recycling so this exclusion can be met. **Potentially Applicable**	40 CFR 261.4(a)(13)

Table B-2
Location-Specific ARARs
UXO 4 Incinerator Disposal Site MRS, NALF Cabaniss, Corpus Christi, Texas

Location	Requirement	Prerequisite	Citation(s)	Comment(s)
Floodplains (Protection)	Action to avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial values of areas qualifying as floodplains.	Actions that will occur in a floodplain (i.e., lowlands and relatively flat areas adjoining inland and coastal waters and other flood prone areas). **Relevant and Appropriate**	Executive Order 11988 Section 2(a)(2); 40 CFR Part 6 and Appendix A	None
Wetlands (Protection)	Action to minimize the destruction of, loss, or degradation of wetlands.	If wetlands as defined by Executive Order are present and will be affected. **Applicable**	Executive Order 11990	No requirement to obtain a permit for onsite CERCLA actions. However, Navy will comply with substantive requirements of the U.S. Army Corps of Engineers (USACE) Nationwide Permit 38, which allows for activities in wetlands to remove hazardous or toxic materials to include notification to USACE District Engineer and compliance with other specified requirements.
Wetlands Protection (continued)	Prohibits discharge of dredged or fill materials into wetlands without a permit.	Actions that would entail or otherwise may allow for prohibited discharges to any qualifying wetlands. **Applicable**	33 U.S.C. Section 1344; 40 CFR 230-232	Although CERCLA actions exempt from procedural requirement to obtain permit for onsite actions, if wetlands discharge to occur, actions must comply with substantive requirements as if Clean Water Act Section 404 permit had been obtained from the USACE.
Endangered Species (Habitat Protection)	Federal agencies may not jeopardize continued existence of federally listed species or destroy or adversely modify critical habitat upon which they depend.	Determination of effect upon threatened or endangered species or their habitat. **Applicable**	16 USC 1536(a) and (h)(1)(B); 50 CFR 17.11	Although no endangered or threatened species are known to inhabit the site, some species may be present at or near NALF Cabaniss.
Migratory Bird (protection)	Protects many species of native birds from unregulated "take" that can include poisoning at hazardous waste sites.	Presence of migratory birds. **Relevant and Appropriate**	16 USC 703	Depending upon rainfall events and site conditions, Incinerator Disposal Site could be used by migratory species during period of response activities.
Historic Artifacts Preservation	To recover and preserve archaeologically significant artifacts	Such artifacts are found onsite during excavation activities. **Applicable**	16 USC 470aa; 32 CFR 229	No known artifacts are present onsite but may be present outside the former landfill boundaires.

Appendix C
Munitions and Explosives of Concern
Hazard Assessment

MEC HA Summary Information

Comments

Site ID: NALF Cabaniss, UXO 4 Incinerator Disposal Site

Date: 6/12/2014

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:

CTOJM67

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	Malcolm Pirnie, Inc., Preliminary Assessment (PA), 01 Apr 2005
2	Tetra Tech, After Action Report (AAR), 21 May 2009
3	Tetra Tech, Site Inspection (SI), 01 Sep 2009
4	Tetra Tech, Sampling and Analysis Plan (SAP), 01 Oct 2010
5	Tetra Tech, AAR, Jan 2012
6	Tetra Tech, Remedial Investigation (RI), 01 Jul 2013a
7	Tetra Tech, MEC Geophysical Report, 01 Jul 2013b
8	Resolution Consultants, Remedeal Alternatives Analysis, 11 Nov 2013
9	Resolution Consultants, EE/CA, June 2014
10	
11	
12	

B. Briefly describe the site:

1. Area (include units): 24 acres
2. Past munitions-related use:

Explosive-Related Industrial Facility

3. Current land-use activities (list all that occur):

Restricted to site study

4. Are changes to the future land-use planned? Yes
5. What is the basis for the site boundaries?

The boundary is identified by a perennial water body to the south, a road to the north, and dense vegetation to the east and west.

6. How certain are the site boundaries?

Very certain.

Reference(s) for Part B:

Tetra Tech, Remedial Investigation (RI), 01 Jul 2013a [redacted]

C. Historical Clearances

1. Have there been any historical clearances at the site? Yes, subsurface clearance
2. If a clearance occurred:
   a. What year was the clearance performed? 2008; 2010-2013
   b. Provide a description of the clearance activity (e.g., extent, depth, amount of munitions-related items removed, types and sizes of removed items, and whether metal detectors were used):

2008: Time-Critical Removal Action performed by Tetra Tech as a result of an SI.
2010-2013: MEC clearance performed by Tetra Tech as a result of an RI. Surface and subsurface MEC was recovered from a depth of 2 feet over an existing landfill, and 6 feet outside of the footprint of the landfill using detector-aided, and digital geophysical mapping yielding numerous MEC items.
The following MEC and thermally treated munitions debris were found during the removals: 7.62-mm small arms ammunition, 20-mm projectiles, 30-mm projectiles, 37-mm projectiles, 40-mm projectiles, 5-pound practice bombs, AN-M23 practice bombs, 2.25-inch rockets, 2.75-inch rockets, 3.5-inch rockets, thermally treated munitions scrap, including rocket base plates and fins,flares/pyrotechnics (cartridge-actuated devices and propellant-actuated devices).

Reference(s) for Part C:

Tetra Tech, After Action Report (AAR), 21 May 2009
Tetra Tech, Site Inspection (SI), 01 Sep 2009
Tetra Tech, Remedial Investigation (RI), 01 Jul 2013a
Tetra Tech, MEC Geophysical Report, 01 Jul 2013b

[redacted]

D. Attach maps of the site below (select 'Insert/Picture' on the menu bar.)

Maps included in EE/CA Report.

Site ID: **NALF Cabaniss, UXO 4 Incinerator Disposal Site**
Date: **6/12/2014**

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	Rockets	2.75	inches	M229	High Explosive	Yes	UNK	UNK	0	Surface and Subsurface	
2	Rockets	3.5	inches	M28A2	High Explosive	Yes	Impact	UNK	0	Surface and Subsurface	
3	Grenades	40	mm	M381/386	High Explosive	Yes	Graze	Armed	0	Surface and Subsurface	
4	Bombs	4	lb	AN-MK23	Spotting Charge	UNK	UNK	UNK	0	Surface and Subsurface	
5	Bombs	5	lb	Mk 106	Spotting Charge	UNK	UNK	UNK	0	Surface and Subsurface	
6	Cartridge-actuated devices	37	mm		High Explosive	Yes	Impact	Armed	0	Surface and Subsurface	
7	Cartridge-actuated devices	30	mm		High Explosive	Yes	Impact	Armed	0	Surface and Subsurface	
8	Cartridge-actuated devices	20	mm		High Explosive	Yes	Impact	Armed	0	Surface and Subsurface	
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

Reference(s) for table above:

Tetra Tech, Remedial Investigation (RI), 01 Jul 2013a [redacted]

Bulk Explosive Information

Item No.	Explosive Type	Comments
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Reference(s) for table above:

[redacted]

Site ID: **NALF Cabaniss, UXO 4 Incinerator Disposal Site**
Date: **6/12/2014**

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	Current Site Study/Removal Actions	15	130	**1,950**	2	Intrusive activities consist of fence installation.
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
			Total Potential Contact Time (receptor hrs/yr):	**1,950**		
			Maximum intrusive depth at site (ft):		**2**	

Reference(s) for table above:
Resolution Consultants, Remedial Alternatives Analysis, 11 Nov 2013
Resolution Consultants, EE/CA, June 2014

[redacted]

Activities Planned for the Future at the Site (If any are planned: see 'Summary Info' Worksheet, Question 4)

Activity No.		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	Future investigation in support of site cleanup and closure	6	60		20	Intrusive activities consist of soil and groundwater sampling
2	Future site maintenance	2	24		0	Vegetation maintenance
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr):

Maximum intrusive depth at site (ft): **20**

Reference(s) for table above:

Resolution Consultants, Remedial Alternatives Analysis, 11 Nov 2013

Resolution Consultants, Engineering Evaluation/Cost Analysis, June 2014

[redacted]

Site ID: **NALF Cabaniss, UXO 4 Incinerator Disposal Site**
Date: **6/12/2014**

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	Moderate Accessibility	No	No MEC cleanup	Nothing would change with No Action.
2	Surface Clearance with ECs/ICs	0.01	Limited Accessibility	Yes	cleanup of MECs located on the surface only	ECs consisting of fencing and signage repair and installation would deter trespassers from entering site; and ICs would require all future instrusive work to be done with UXO escort.
3	Surface and Subsurface Clearance with ICs	2.01	Limited Accessibility	Yes	cleanup of MECs located both on the surface and subsurface	ICs would require all future instrusive work to be done with UXO escort.
4						
5						
6						

For those alternatives where you answered 'No' in Column E, are land-use activities to be assessed against current or future land uses?	Current	

Reference(s) for table above:
Resolution Consultants, Remedial Alternatives Analysis, 11 Nov 2013
Resolution Consultants, EE/CA, June 2014

[redacted]

Site ID: **NALF Cabaniss, UXO 4 Incinerator Disposal Site**
Date: **6/12/2014**

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:

[redacted]

Land Use Activities Planned After Response Alternative #2: Surface Clearance with ECs/ICs

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	Future investigations in support of site cleanup and closure	6	60	360	20	Intrusive activities consist of soil and groundwater sampling.
2	Future site maintenance	2	24	48	0	Vegetation maintenacne
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
	Total Potential Contact Time (receptor hrs/yr):			408		
	Maximum intrusive depth at site (ft):				20	

Reference(s) for table above:

Resolution Consultants, EE/CA, June 2014

[redacted]

Land Use Activities Planned After Response Alternative #3: Surface and Subsurface Clearance with ICs

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	Future investigations in support of site cleanup and closure	6	60	360	20	Intrusive activities consist of soil and groundwater sampling.
2	Future site maintenance	2	24	48	0	Vegetation maintenacne
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
	Total Potential Contact Time (receptor hrs/yr):			408		
	Maximum intrusive depth at site (ft):				20	

Reference(s) for table above:

Resolution Consultants, EE/CA, June 2014

[redacted]

Site ID: NALF Cabaniss, UXO 4 Incinerator Disposal Site

Date: 6/12/2014

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 '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? 308 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

[redacted]

Item #1. Rockets (2.75inches, 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? No
6. Please describe the facility or feature.

MEC Item(s) used to calculate the ESQD for future use activities

[redacted]

Item #1. Rockets (2.75inches, High Explosive)

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. Future use activities are 'Outside of the ESQD arc', based on Question 5.'

	Score
Baseline Conditions:	0
Surface Cleanup:	0
Subsurface Cleanup:	0

Comments

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:

Moderate Accessibility

Baseline Conditions:	**55**
Surface Cleanup:	**55**
Subsurface Cleanup:	**55**

Future Use Activities

Select the category that best describes the site accessibility under the future use scenario:

Limited Accessibility

Baseline Conditions:	**15**
Surface Cleanup:	**15**
Subsurface Cleanup:	**15**

Reference(s) for above information:

Resolution Consultants, Remedial Alternatives Analysis, 11 Nov 2013
Resolution Consultants, Engineering Evaluation/Cost Analysis, June 2014

[redacted]

Response Alternative No. 1: No Action

Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Moderate Accessibility'.

Baseline Conditions:	**55**
Surface Cleanup:	**55**
Subsurface Cleanup:	**55**

Response Alternative No. 2: Surface Clearance with ECs/ICs

Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Limited Accessibility'.

Baseline Conditions:	**15**
Surface Cleanup:	**15**
Subsurface Cleanup:	**15**

Response Alternative No. 3: Surface and Subsurface Clearance with ICs

Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Limited Accessibility'.

Baseline Conditions:	**15**
Surface Cleanup:	**15**
Subsurface Cleanup:	**15**

Response Alternative No. 4:

Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

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: **1,950** 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) **1,950**

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: Surface Clearance with ECs/ICs

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will change if this alternative is implemented.

Total Potential Contact Time, based on the contact time listed for this alternative (see 'Post-Response Land Use' Worksheet) **408**

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: Surface and Subsurface Clearance with ICs

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will change if this alternative is implemented.

Total Potential Contact Time, based on the contact time listed for this alternative (see 'Post-Response Land Use' Worksheet) **408**

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:

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. 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
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: **2** 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: **20** 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.'. For 'Future Use Activities', only Baseline Conditions are considered.

240 ***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) **2** 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: Surface Clearance with ECs/ICs

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): **0.01** ft

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will change if this alternative is implemented.

Maximum Intrusive Depth, based on the maximum intrusive depth listed for this alternative (see 'Post-Response Land Use' Worksheet) **20** 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:

Surface Cleanup: **150**

Subsurface Cleanup:

Response Alternative No. 3: Surface and Subsurface Clearance with ICs

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): **2.01** ft

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will change if this alternative is implemented.

Maximum Intrusive Depth, based on the maximum intrusive depth listed for this alternative (see 'Post-Response Land Use' Worksheet) **20** 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:

Surface Cleanup:

Subsurface Cleanup: **95**

Response Alternative No. 4:

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. 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).

The primary mechanism associated with surface migration is surface water transportation due to significant rainfall events, which may mobilize MECs.

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:

Resolution Consultants, Remedial Alternatives Analysis, 11 Nov 2013
Resolution Consultants, EE/CA, June 2014

[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:	NALF Cabaniss, UXO 4 Incinerator Disposal Site	a. Scoring Summary for Current Use Activities	
Date:	6/12/2014	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		Moderate Accessibility	55
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	840
		Hazard Level Category	1

Site ID:	NALF Cabaniss, UXO 4 Incinerator	b. Scoring Summary for Future Use Activities	
Date:	6/12/2014	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		Limited Accessibility	15
IV. Potential Contact Hours			
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	785
		Hazard Level Category	2

Site ID:	NALF Cabaniss, UXO 4 Incinerator Disposal Site	c. Scoring Summary for Response Alternative 1: No Action	
Date:	6/12/2014	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		Moderate Accessibility	55
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	840
		Hazard Level Category	1

Site ID:	NALF Cabaniss, UXO 4 Incinerator Disposal Site	d. Scoring Summary for Response Alternative 2: Surface Clearance with ECs/ICs	
Date:	6/12/2014	Response Action Cleanup:	cleanup of MECs located on the surface only
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		Limited Accessibility	15
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	10
V. Amount of MEC		OB/OD Area	110
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	150
VII. Migration Potential		Possible	30
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	635
		Hazard Level Category	3

Site ID:	NALF Cabaniss, UXO 4 Incinerator Disposal Site	e. Scoring Summary for Response Alternative 3: Surface and Subsurface Clearance with ICs	
Date:	6/12/2014	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		Limited Accessibility	15
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 overlaps with subsurface MEC.	95
VII. Migration Potential		Possible	10
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	475
		Hazard Level Category	4

Site ID:	NALF Cabaniss, UXO 4 Incinerator	f. Scoring Summary for Response Alternative 4:	
Date:	6/12/2014	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: NALF Cabaniss, UXO 4 Incinerator Disposal Site Date: 6/12/2014		
	Hazard Level Category	Score
a. Current Use Activities	1	840
b. Future Use Activities	2	785
c. Response Alternative 1: No Action	1	840
d. Response Alternative 2: Surface Clearance with ECs/ICs	3	635
e. Response Alternative 3: Surface and Subsurface Clearance with ICs	4	475
f. Response Alternative 4:		
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?	Yes

Appendix D
Cost Estimates

Table D-1
Cost Estimate
lternative 2 (Surface Clearance of MEC/MPPEH and Engineering/Institutional Land Use Controls
UXO 4 Incinerator Disposal Site
NALF Cabaniss, Texas

Task Description	Unit	Quantity	Cost	Total
CAPITAL COSTS				
1.0 Planning documents				**$103,500**
1.1 Work Plan	LS	1	$18,000	$18,000
1.2 HASP	LS	1	$20,000	$20,000
1.3 MEC Mgmt & Contingency Plan	LS	1	$40,000	$40,000
1.4 SOP Development	LS	1	$3,000	$3,000
1.5 Siting Plan	LS	1	$6,200	$6,200
1.6 Safety Submission	LS	1	$16,300	$16,300
2.0 Implementation				**$536,650**
2.1 Mobilization/Demobilization	EA	1	$140,000	$140,000
2.2 Vegetation Removal	DAY	3	$22,000	$66,000
2.3 Surface Removal	DAY	6	$28,000	$168,000
2.4 Scrap (MDAS and non-MEC) disposal	1,000 Lbs*	1	$850	$850
2.5 Oversight/Supervision	DAY	11	$5,000	$55,000
2.6 Mapping & Surveying	LS	1	$15,000	$15,000
2.7 Fence Installation and Signage	DAY	9	$10,200	$91,800
3.0 Reporting	LS	1	$20,000	**$20,000**
4.0 Per diem				**$7,800**
4.1 M&IE	DAY	13	$225	$2,925
4.2 Lodging	DAY	13	$375	$4,875
Total Capital Costs				**$667,950**
PRSC COSTS				
5.0 O&M Costs				**$34,584**
5.1 Annual Fence/Sign Maintenance	YR	30	$2,000	$34,584.07
6.0 Support Costs				**$207,504**
6.1 Anomaly Avoidance Costs	YR	30	$12,000	$207,504.40
Total PRSC Costs				**$242,088**
TOTAL COST				**$910,038**

Table D-2
Cost Estimate
Alternative 3 (Surface/Subsurface Clearance of MEC/MPPEH and Institutional Land Use Controls)
UXO 4 Incinerator Disposal Site
NALF Cabaniss, Texas

Task Description	Unit	Quantity	Cost	Total
CAPITAL COSTS				
1.0 Planning documents				**$122,500**
1.1 Work Plan	LS	1	$25,000	$25,000
1.2 HASP	LS	1	$20,000	$20,000
1.3 MEC Mgmt & Contingency Plan	LS	1	$50,000	$50,000
1.4 SOP Development	LS	1	$5,000	$5,000
1.5 Siting Plan	LS	1	$6,200	$6,200
1.6 Safety Submission	LS	1	$16,300	$16,300
2.0 Implementation				**$1,581,300**
2.1 Mobilization/Demobilization	EA	1	$185,100	$185,100
2.2 Vegetation Removal	DAY	10	$22,000	$220,000
2.3 Geophysical Survey	DAY	10	$8,600	$86,000
2.4 Excavation and Removal	DAY	19	$42,000	$798,000
2.5 Scrap (MDAS and non-MEC) disposal	6,500 Lbs*	1	$2,900	$2,900
2.6 Oversight/Supervision	DAY	35	$5,000	$175,000
2.7 Mapping & Surveying	LS	1	$22,500	$22,500
2.8 Fence Installation and Signage	DAY	9	$10,200	$91,800
3.0 Reporting	LS	1	$20,000	**$20,000**
4.0 Per diem				**$28,000**
4.1 M&IE	DAY	35	$300	$10,500
4.2 Lodging	DAY	35	$500	$17,500
Total Capital Costs				**$1,751,800**
PRSC COSTS				
5.0 O&M Costs				**$34,584**
5.1 Annual Fence/Sign Maintenance	YR	30	$2,000	$34,584.07
6.0 Support Costs				**$103,752**
6.1 Anomaly Avoidance Costs	Yr	30	$6,000	$103,752.20
Total PRSC Costs				**$138,336**
TOTAL COST				**$1,890,136**

Appendix E
SiteWise Evaluation

SiteWise Analysis
Engineering Evaluation / Cost Analysis
UXO 4 Incinerator Disposal Site MRS
NALF Cabaniss, Corpus Christi, Texas

Remedial Alternatives	GHG Emissions	Total energy Used	Water Consumption	Electricity Usage	Onsite NO_x Emissions	Onsite SO_x Emissions	Onsite PM_{10} Emissions	Total NO_x Emissions	Total SO_x Emissions	Total PM_{10} Emissions	Accident Risk Fatality	Accident Risk Injury
	metric ton	MMBTU	gallons	MWH	metric ton	metric ton	metric ton	metric ton	metric ton	metric ton		
Alt 1 - No Action	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Alt 2 - Surface Clearing	631.54	9.31E+03	0.00E+00	0.00E+00	3.59E+00	8.20E-01	2.67E-01	4.13E+00	1.02E+00	3.23E-01	1.81E-03	3.36E-01
Alt 3 - Surface & Subsurface Clearing	7955.27	1.30E+05	0.00E+00	0.00E+00	4.89E+01	1.17E+01	3.44E+00	5.52E+01	1.47E+01	4.31E+00	1.23E-02	2.91E+00

Additional Sustainability Metrics

Remedial Alternatives	Non-Hazardous Waste Landfill Space	Hazardous Waste Landfill Space	Topsoil Consumption	Costing	Lost Hours - Injury	Percent Electricity from Renewable Sources	Final Cost with Footprint Reduction
	tons	tons	cubic yards	$		%	$
Alt 1 - No Action	0.00	0.00E+00	0.00E+00	$ -	0.00E+00	0.0%	$ -
Alt 2 - Surface Clearing	0.00	0.00E+00	5.23E+05	$ 910,038	2.69E+00	0.0%	$ 910,038
Alt 3 - Surface & Subsurface Clearing	0.00	0.00E+00	1.68E+06	$ 1,855,552	2.33E+01	0.0%	$ 1,763,752

Relative Impact

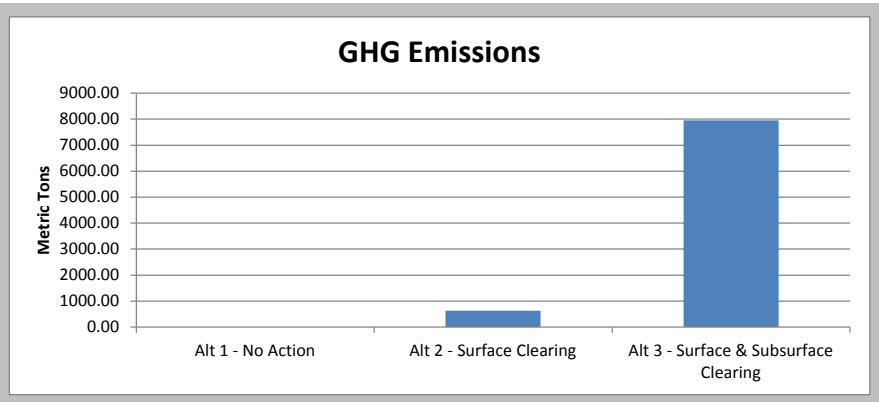
Remedial Alternatives	GHG Emissions	Energy Usage	Water Usage	Electricity Usage	Onsite NOx Emissions	Onsite SOx Emissions	Onsite PM10 Emissions	Total NOx emissions	Total SOx Emissions	Total PM10 Emissions	*Accident Risk Fatality	*Accident Risk Injury
Alt 1 - No Action	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Alt 2 - Surface Clearing	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Alt 3 - Surface & Subsurface Clearing	High	High	Low	Low	High	High	High	High	High	High	Low	Low

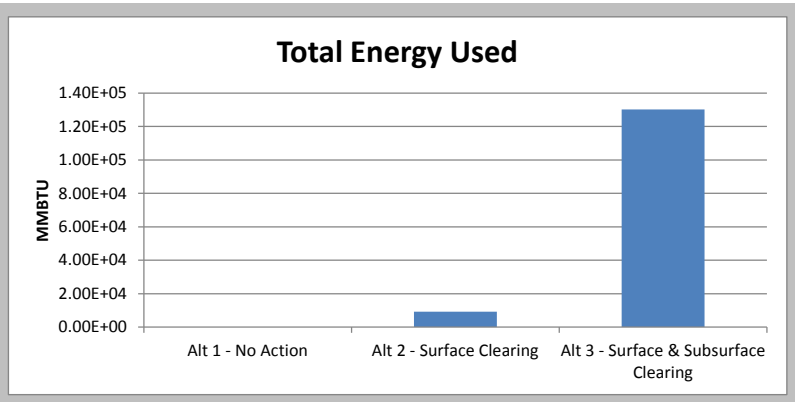
Relative Impact (User Override)

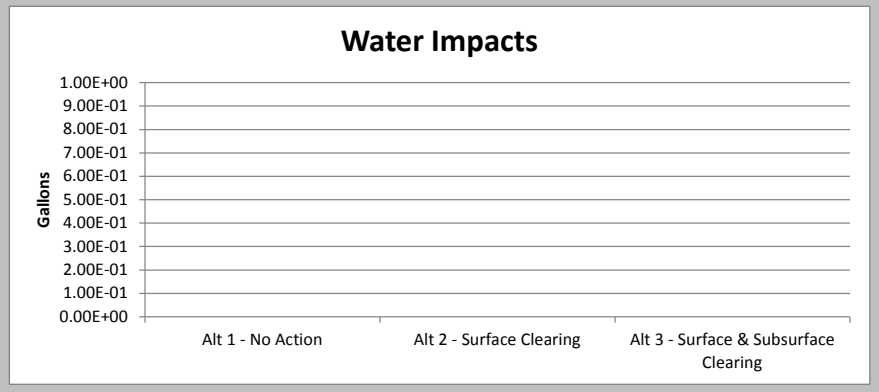
Remedial Alternatives	GHG Emissions	Energy Usage	Water Usage	Electricity Usage	Onsite NOx Emissions	Onsite SOx Emissions	Onsite PM10 Emissions	Total NOx Emissions	Total SOx Emissions	Total PM10 Emissions	*Accident Risk Fatality	*Accident Risk Injury
Alt 1 - No Action	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	High	High
Alt 2 - Surface Clearing	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Medium	Medium
Alt 3 - Surface & Subsurface Clearing	High	High	Low	Low	High	High	High	High	High	High	Low	Low

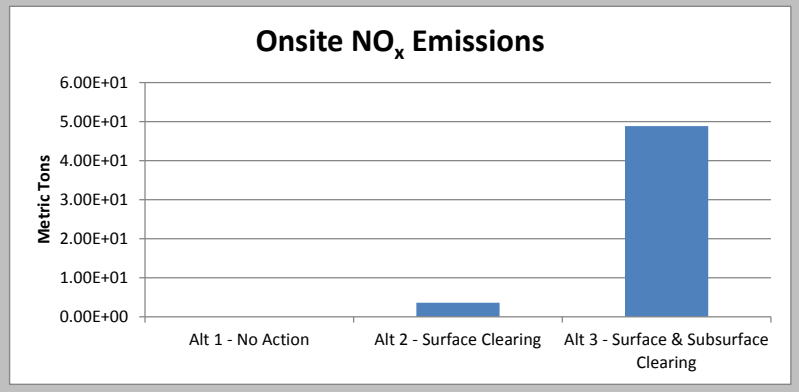
*Accident Risk is an estimate of how many accidents may occur. This risk is not the same as Cancer Risk, which is the probablity (for a single person) of getting cancer. Accident risk is not comparable to Cancer Risk due to inherent fundamental differences.

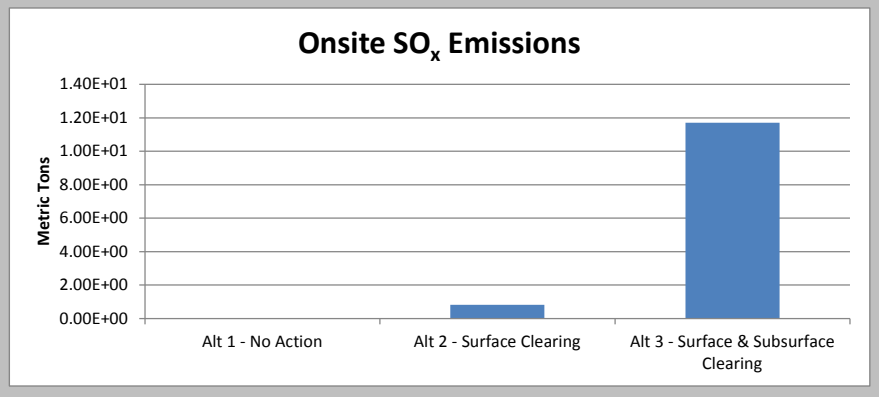
SiteWise Analysis
Engineering Evaluation / Cost Analysis
UXO 4 Incinerator Disposal Site MRS
NALF Cabaniss, Corpus Christi, Texas

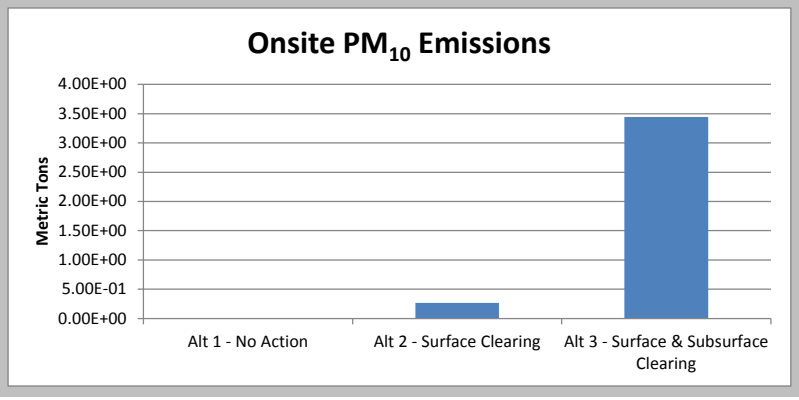




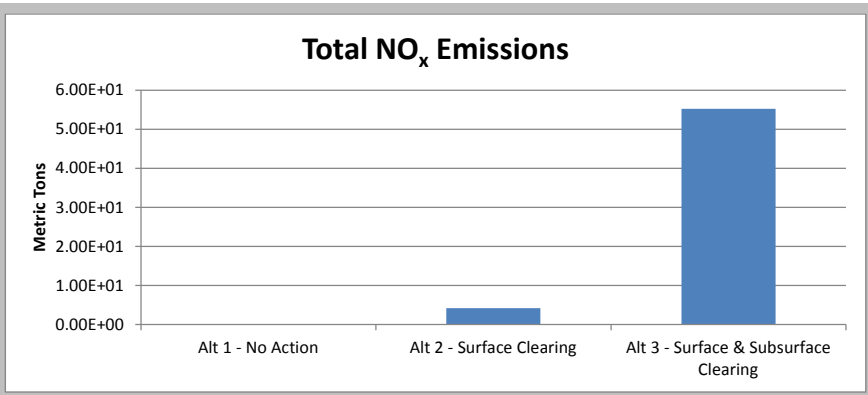


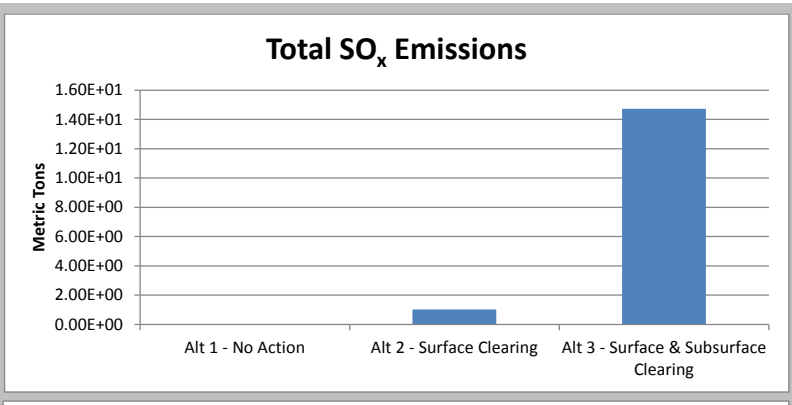


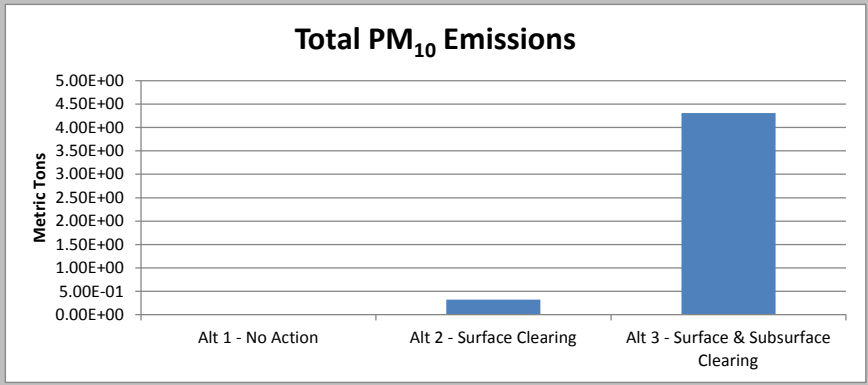


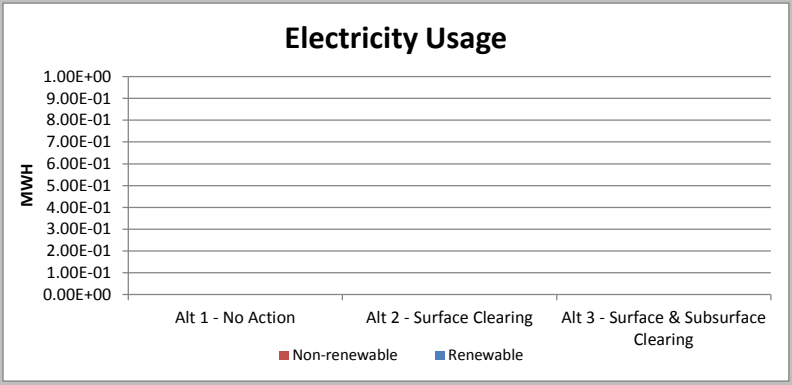


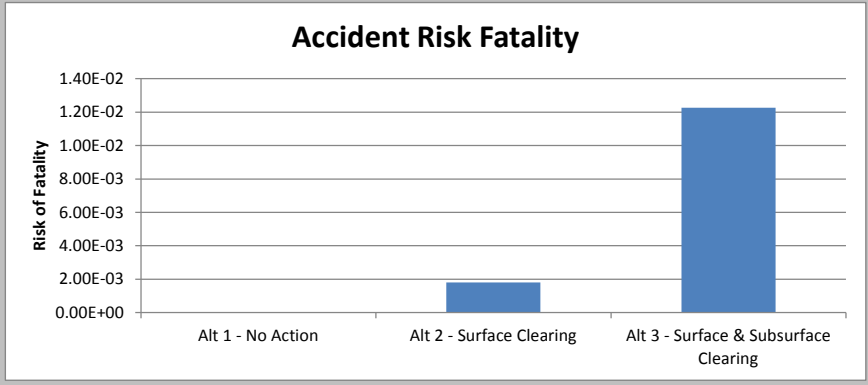
SiteWise Analysis
Engineering Evaluation / Cost Analysis
UXO 4 Incinerator Disposal Site MRS
NALF Cabaniss, Corpus Christi, Texas

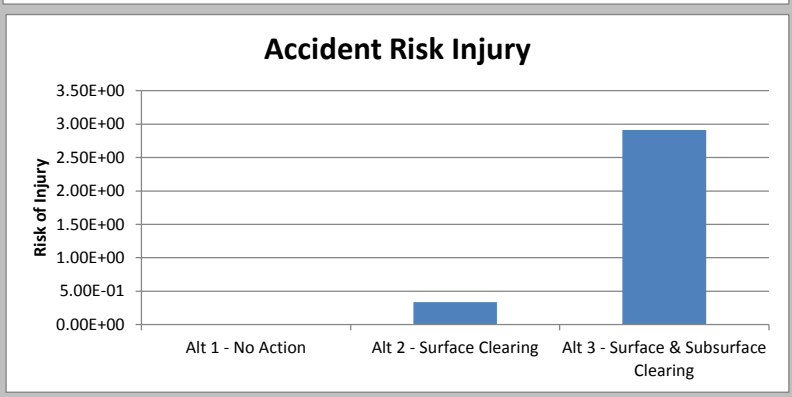




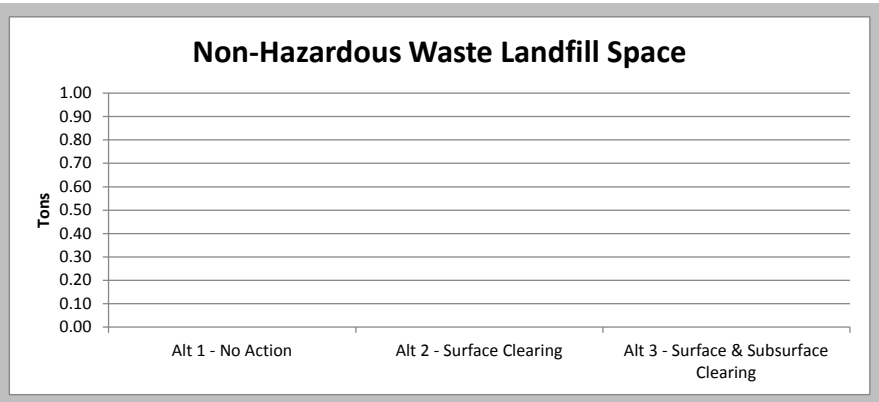


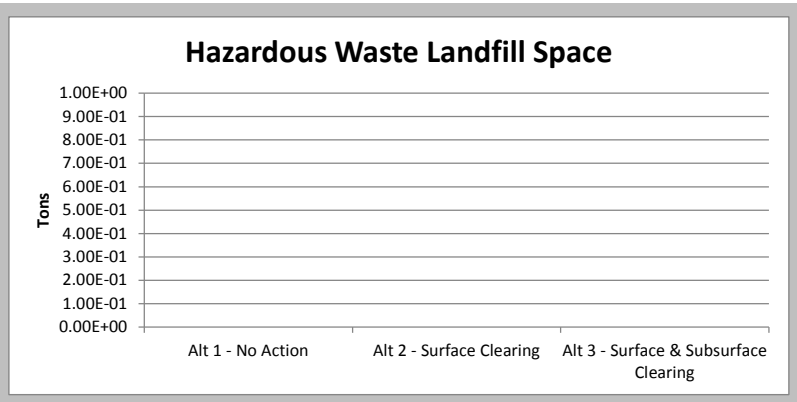


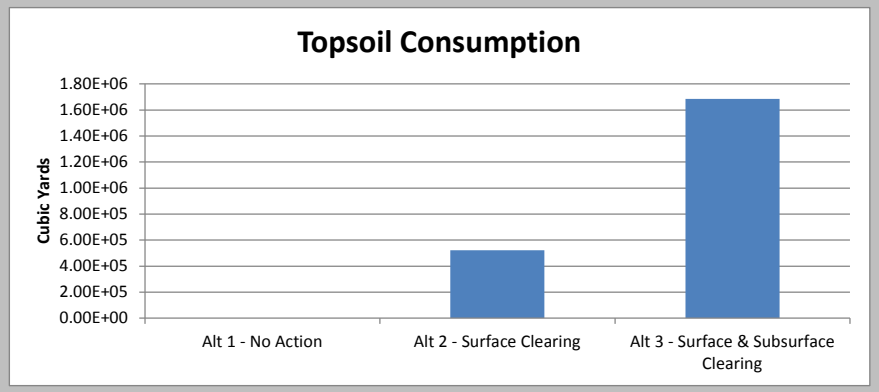


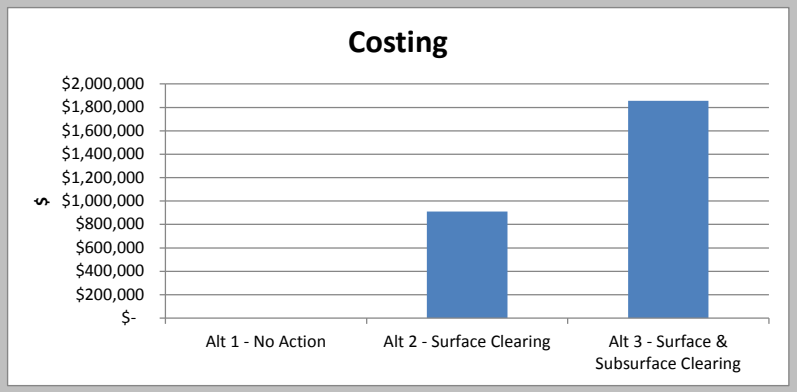


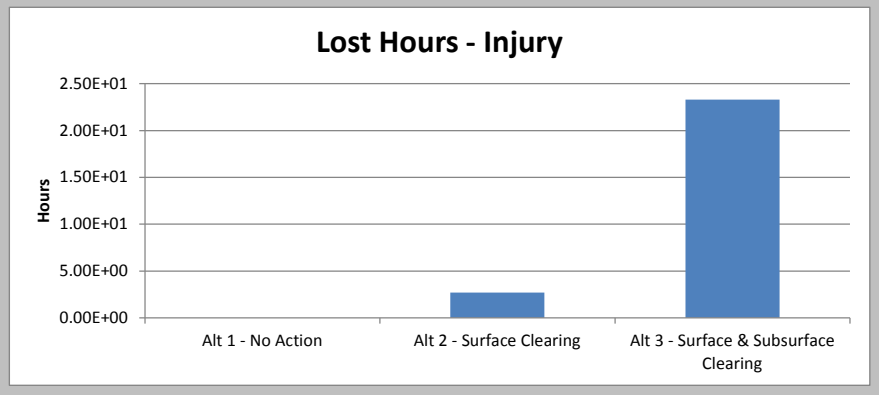
SiteWise Analysis
Engineering Evaluation / Cost Analysis
UXO 4 Incinerator Disposal Site MRS
NALF Cabaniss, Corpus Christi, Texas

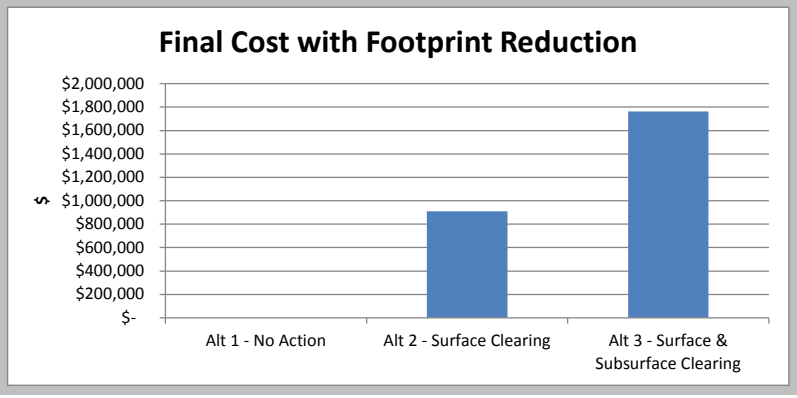




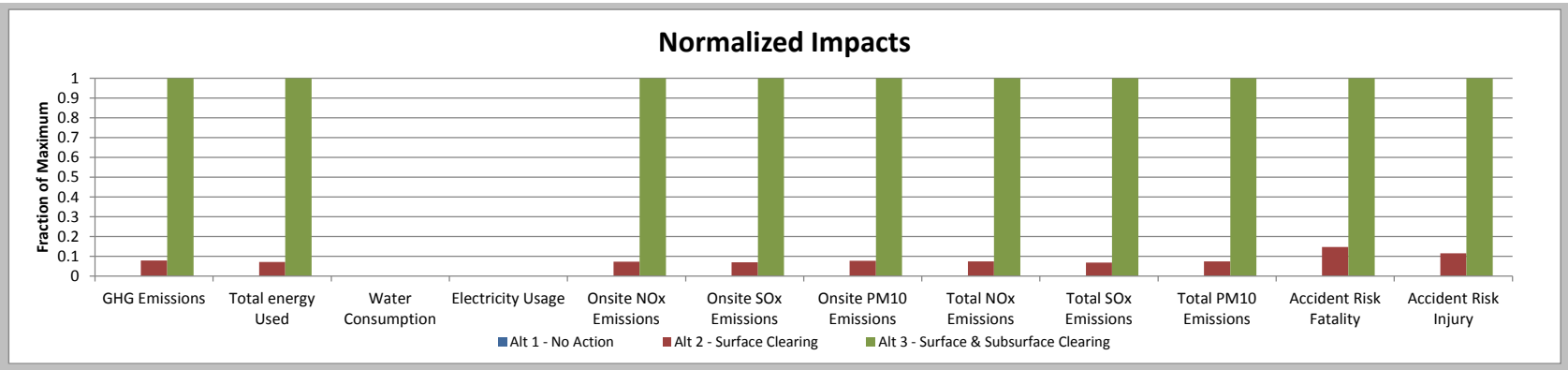








SiteWise Analysis
Engineering Evaluation / Cost Analysis
UXO 4 Incinerator Disposal Site MRS
NALF Cabaniss, Corpus Christi, Texas

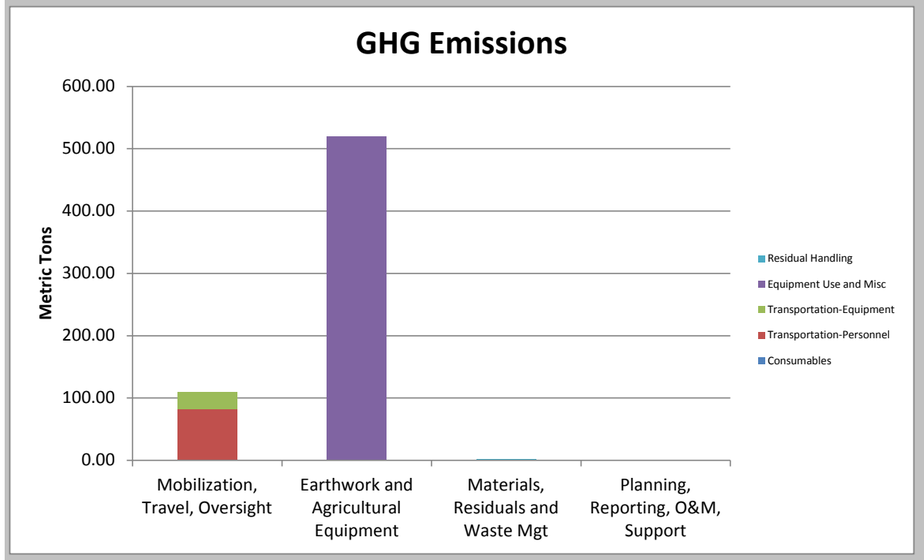


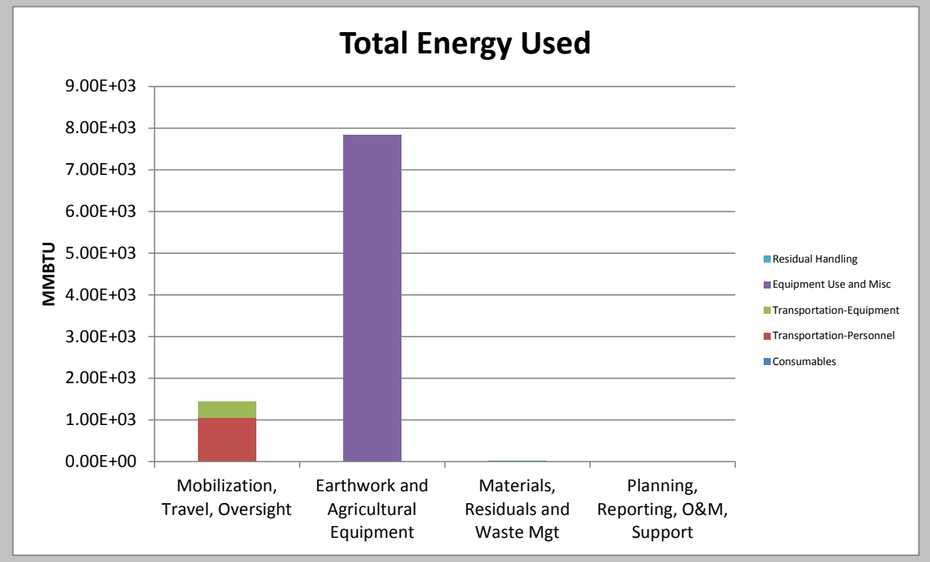
Sustainable Remediation - Environmental Footprint Summary
SiteWise_Input_NALF_Cabaniss_Alt2

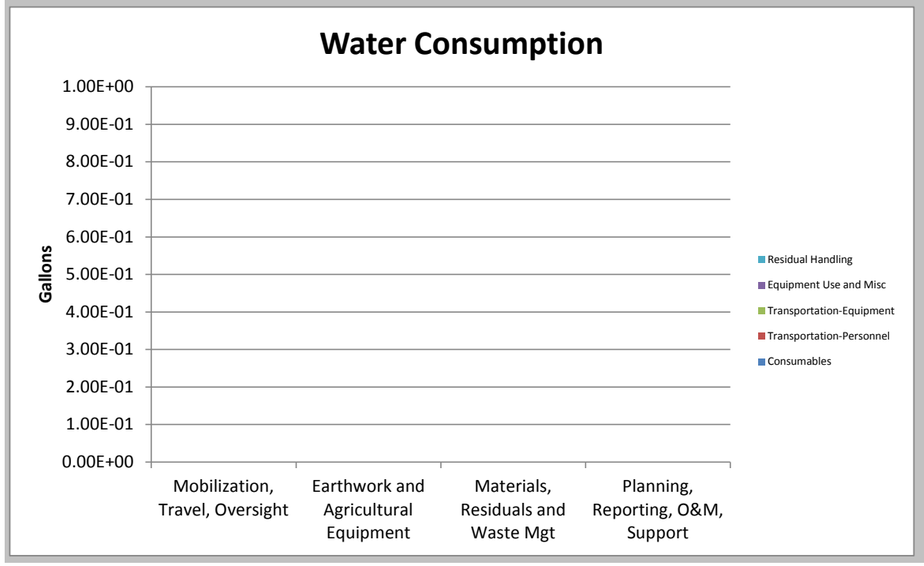
Phase	Activities	GHG Emissions	Total Energy Used	Water Consumption	Electricity Usage	Onsite NOx Emissions	Onsite SOx Emissions	Onsite PM10 Emissions	Total NOx Emissions	Total SOx Emissions	Total PM10 Emissions	Accident Risk Fatality	Accident Risk Injury
		metric ton	MMBTU	gallons	MWH	metric ton	metric ton	metric ton	metric ton	metric ton	metric ton		
Mobilization, Travel, Oversight	Consumables	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA
	Transportation-Personnel	81.74	1.1E+03	NA	NA	NA	NA	NA	1.8E-01	1.6E-02	2.4E-03	6.5E-04	5.0E-02
	Transportation-Equipment	27.66	3.8E+02	NA	NA	NA	NA	NA	8.9E-03	3.6E-04	7.2E-04	1.6E-04	1.2E-02
	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	0.0E+00	0.0E+00	2.3E-05	2.8E-02
	Residual Handling	0.00	0.0E+00	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Sub-Total	109.40	1.44E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.85E-01	1.66E-02	3.12E-03	8.26E-04	9.03E-02
Earthwork and Agricultural Equipment	Consumables	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA
	Transportation-Personnel	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Transportation-Equipment	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Equipment Use and Misc	520.02	7.8E+03	0.0E+00	0.0E+00	3.6E+00	8.2E-01	2.7E-01	3.9E+00	1.0E+00	3.2E-01	9.7E-04	2.4E-01
	Residual Handling	0.00	0.0E+00	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Sub-Total	520.02	7.84E+03	0.00E+00	0.00E+00	3.59E+00	8.20E-01	2.67E-01	3.95E+00	1.01E+00	3.20E-01	9.74E-04	2.45E-01
Materials, Residuals and Waste Mgt	Consumables	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA
	Transportation-Personnel	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Transportation-Equipment	0.00	0.0E+00	NA	NA	NA	NA	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	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Residual Handling	2.12	2.8E+01	NA	NA	0.0E+00	0.0E+00	0.0E+00	6.7E-04	1.2E-05	5.9E-05	1.2E-05	9.4E-04
	Sub-Total	2.12	2.77E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.68E-04	1.18E-05	5.94E-05	1.17E-05	9.42E-04
Planning, Reporting, O&M, Support	Consumables	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA
	Transportation-Personnel	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Transportation-Equipment	0.00	0.0E+00	NA	NA	NA	NA	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	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Residual Handling	0.00	0.0E+00	NA	NA	0.0E+00	0.0E+00	0.0E+00	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	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total		**6.3E+02**	**9.3E+03**	**0.0E+00**	**0.0E+00**	**3.6E+00**	**8.2E-01**	**2.7E-01**	**4.1E+00**	**1.0E+00**	**3.2E-01**	**1.8E-03**	**3.4E-01**

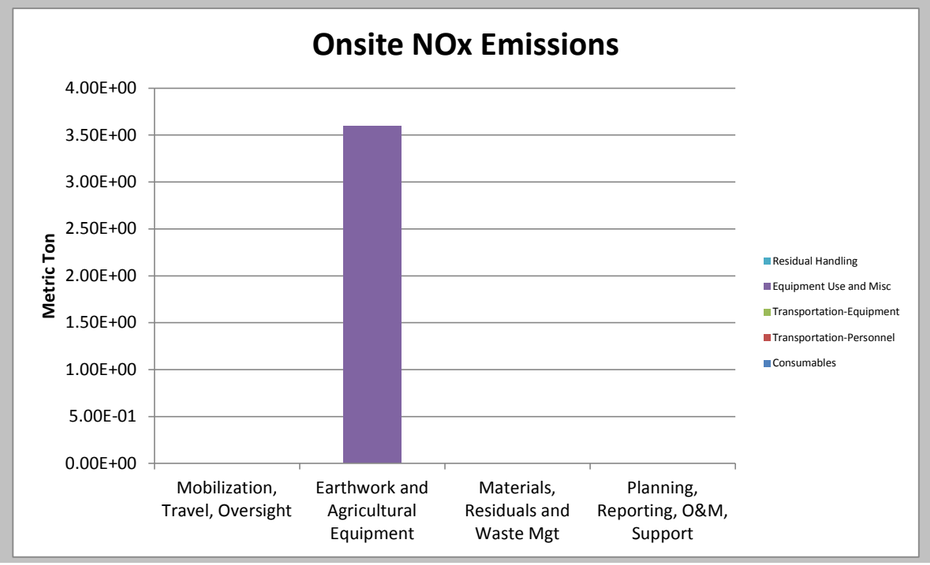
Remedial Alternative Phase	Non-Hazardous Waste Landfill Space	Hazardous Waste Landfill Space	Topsoil Consumption	Costing	Lost Hours - Injury	Percent electricity from renewable sources	Total Cost with Footprint Reduction
	tons	tons	cubic yards	$		%	
Mobilization, Travel,	0.0E+00	0.0E+00	0.0E+00	217,800	7.2E-01	0.0%	$910,038
Earthwork and Agricultural Equipment	0.0E+00	0.0E+00	5.2E+05	234,000	2.0E+00	0.0%	
Materials, Residuals and Waste Mgt	0.0E+00	0.0E+00	0.0E+00	92,650	7.5E-03	0.0%	
Planning, Reporting, O&M, Support	0.0E+00	0.0E+00	0.0E+00	365,588	0.0E+00	0.0%	
Total	**0.0E+00**	**0.0E+00**	**5.2E+05**	**$910,038**	**2.7E+00**	**0.0%**	

Sustainable Remediation - Environmental Footprint Summary
SiteWise_Input_NALF_Cabaniss_Alt2

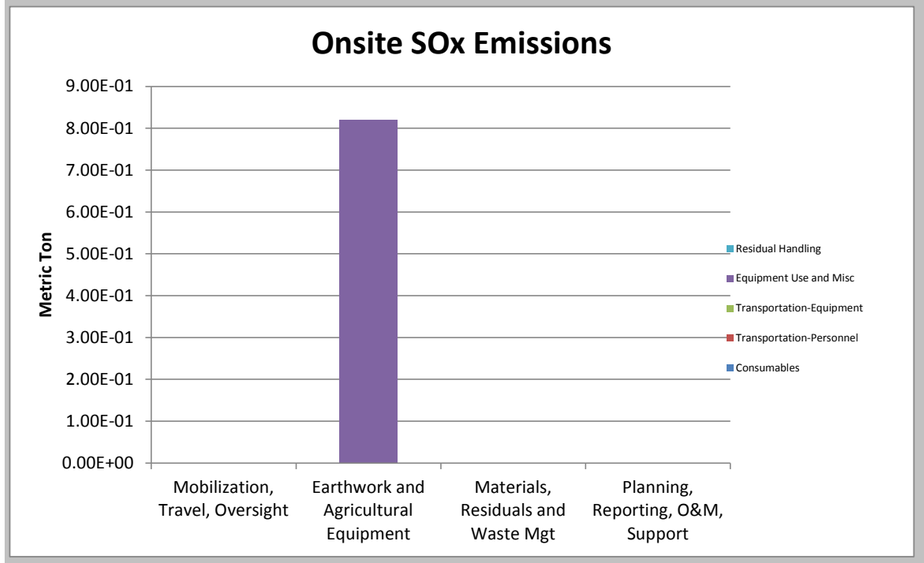


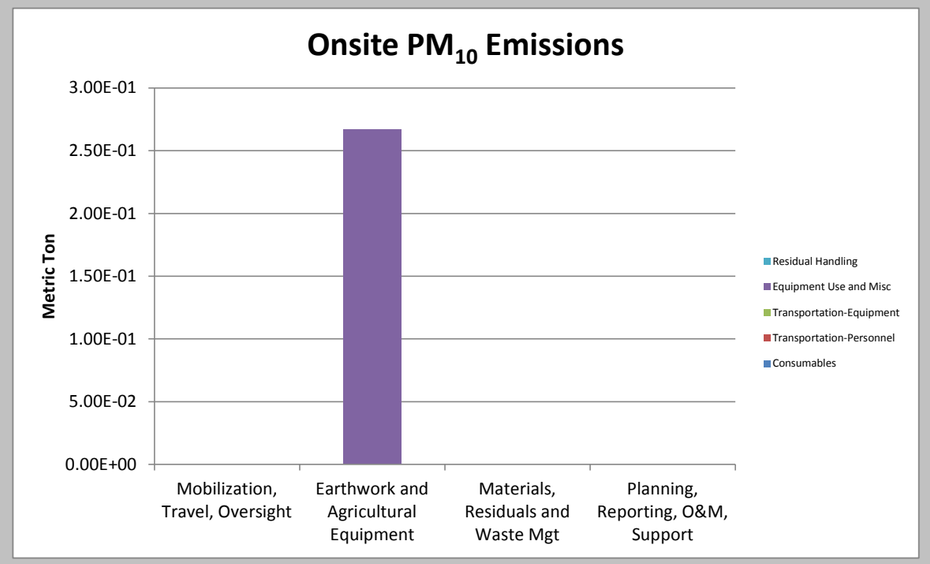


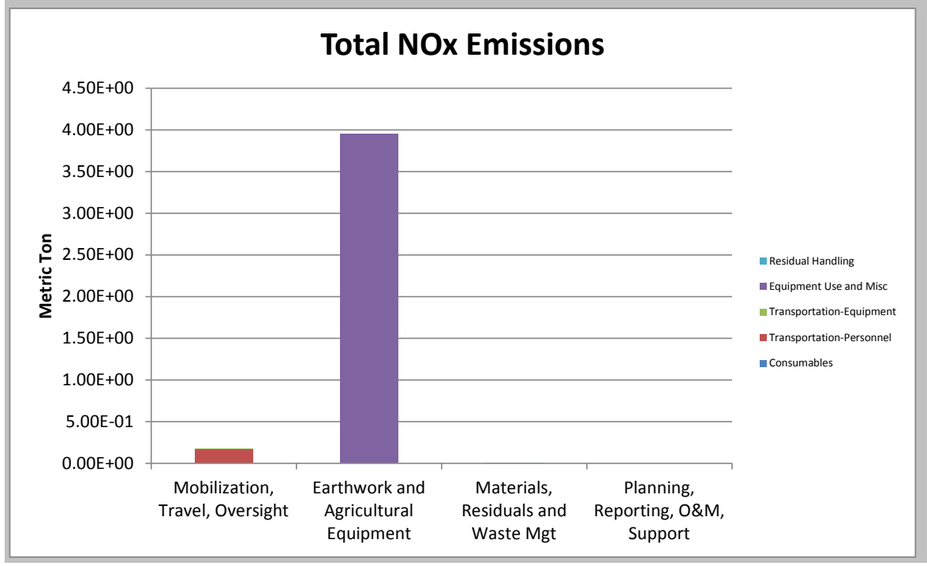


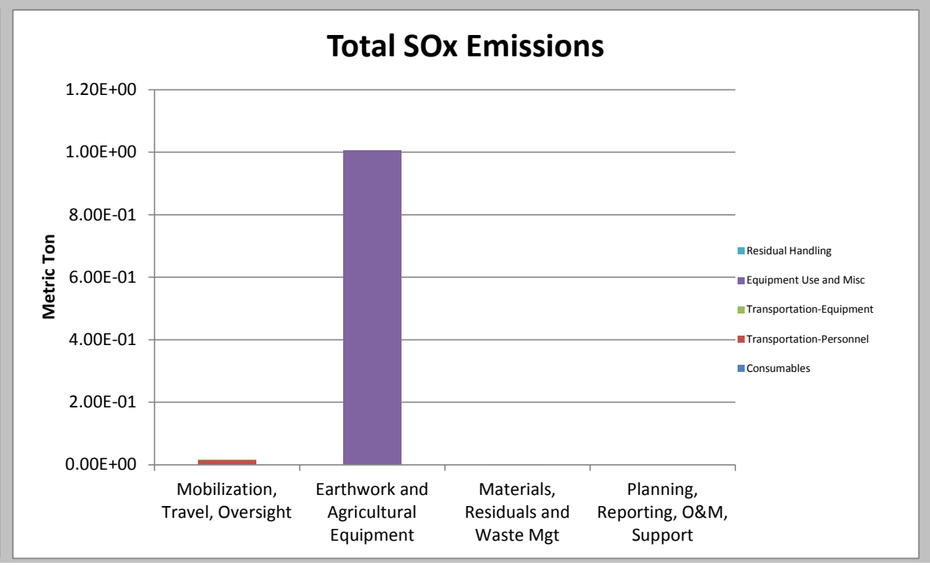


Sustainable Remediation - Environmental Footprint Summary
SiteWise_Input_NALF_Cabaniss_Alt2

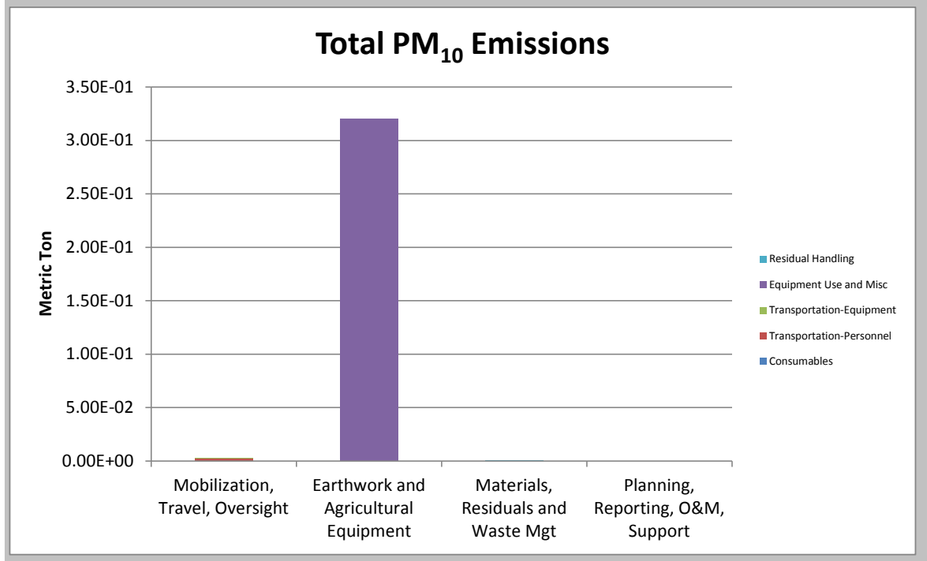


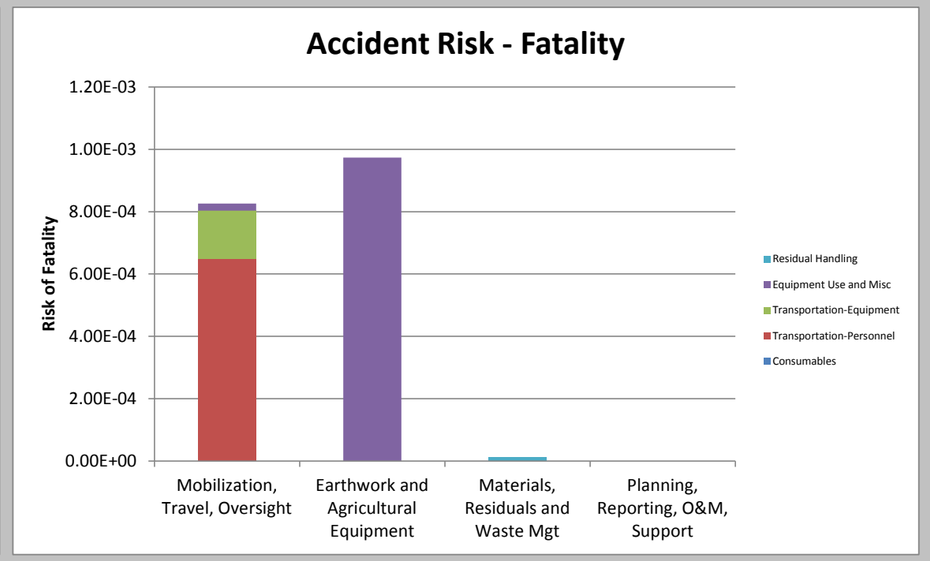


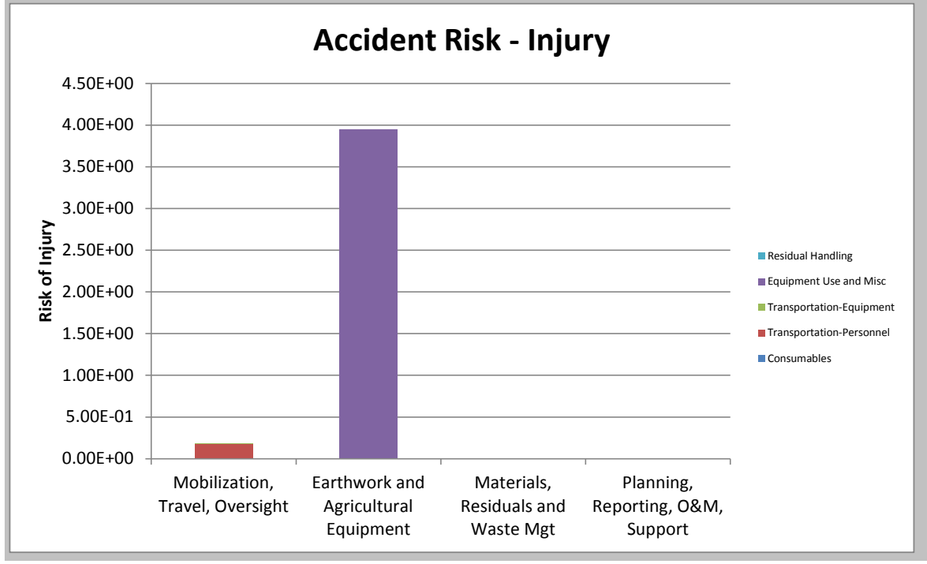


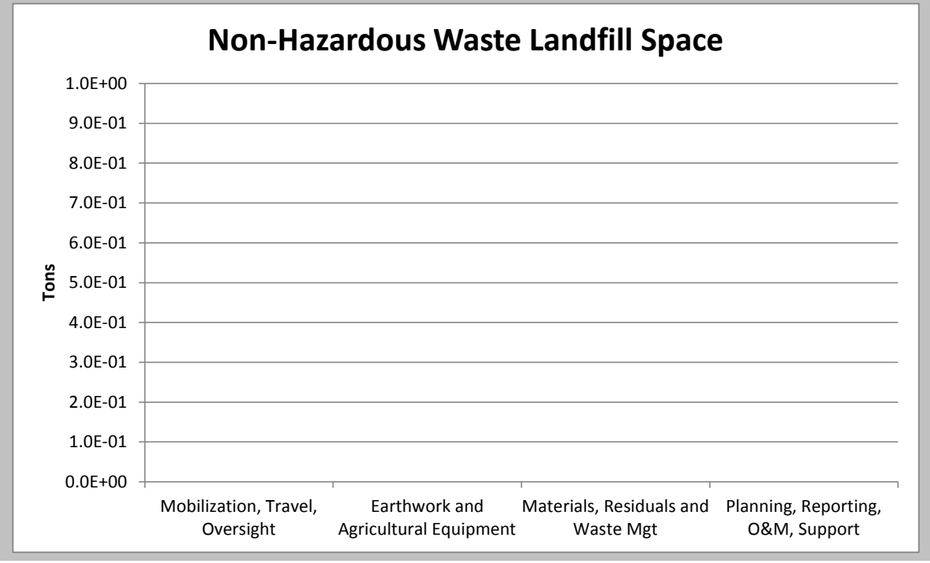


Sustainable Remediation - Environmental Footprint Summary
SiteWise_Input_NALF_Cabaniss_Alt2

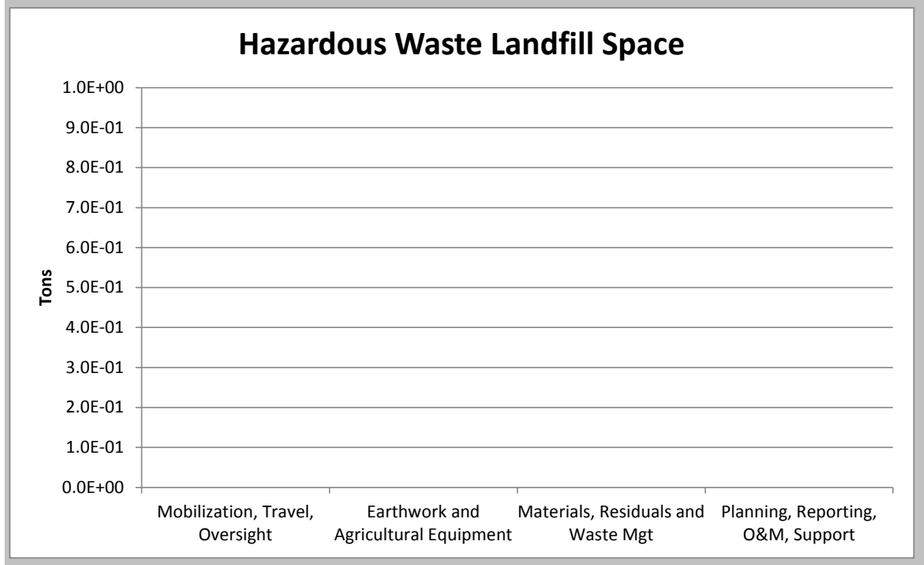


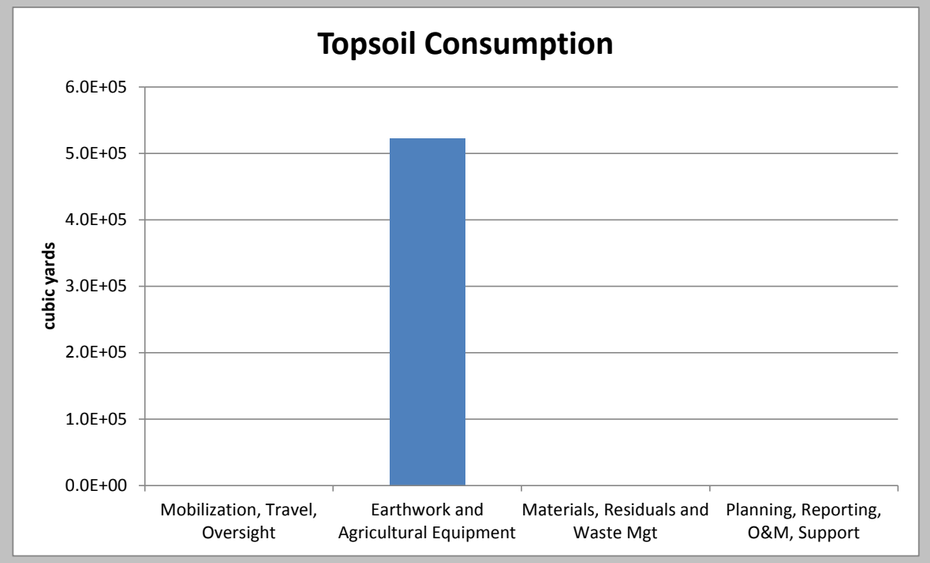


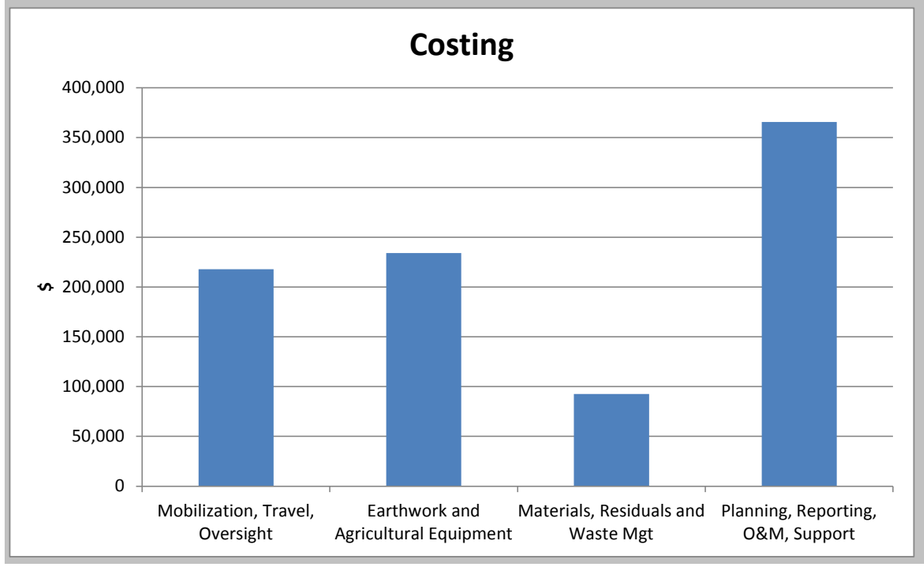


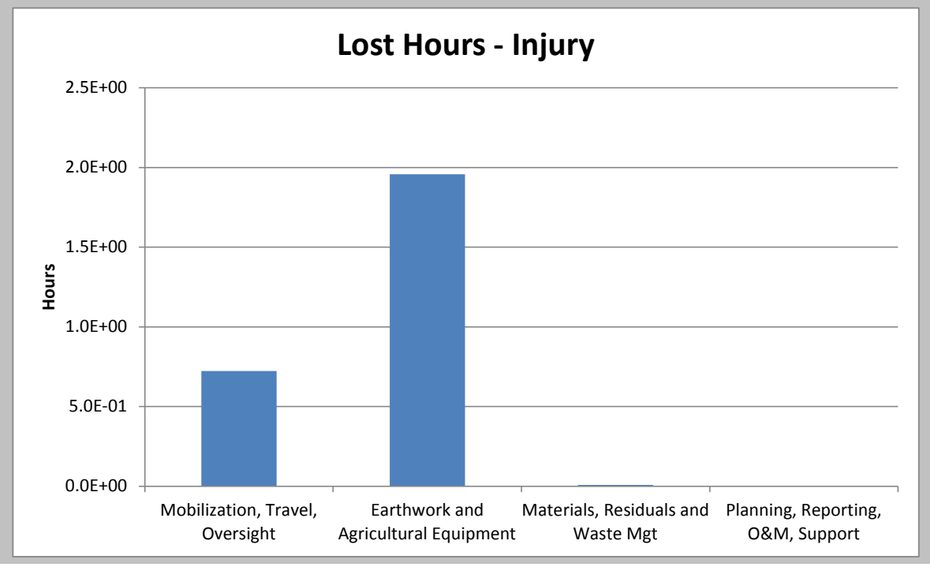


Sustainable Remediation - Environmental Footprint Summary
SiteWise_Input_NALF_Cabaniss_Alt2







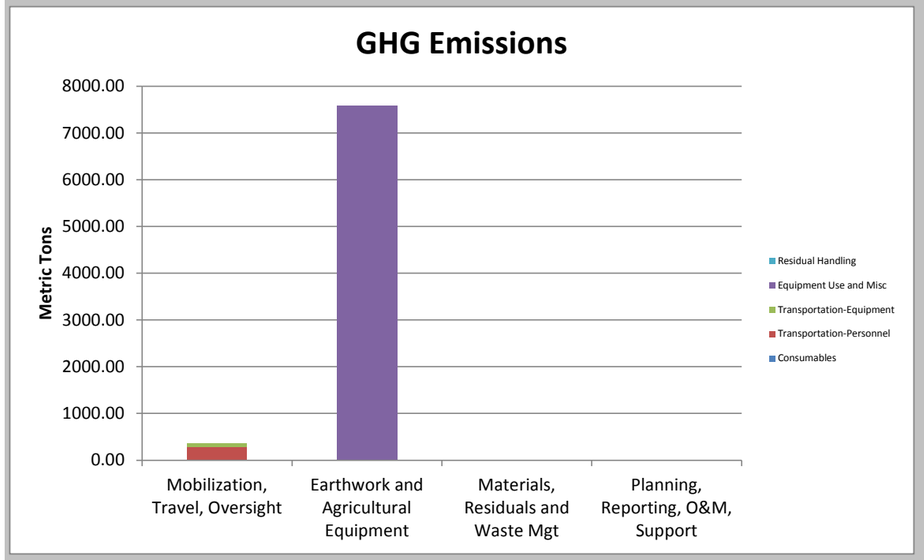


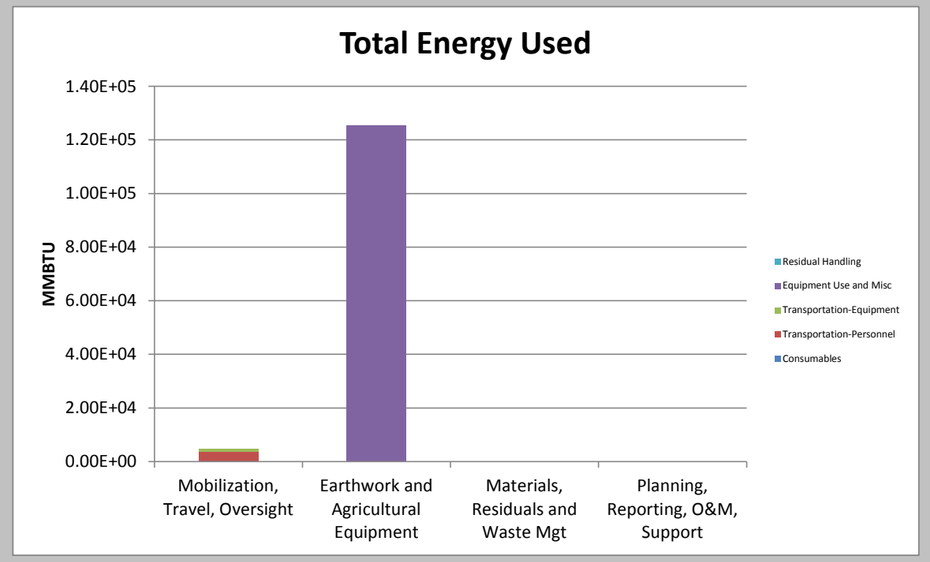
Sustainable Remediation - Environmental Footprint Summary
SiteWise_Input_NALF_Cabaniss_Alt3

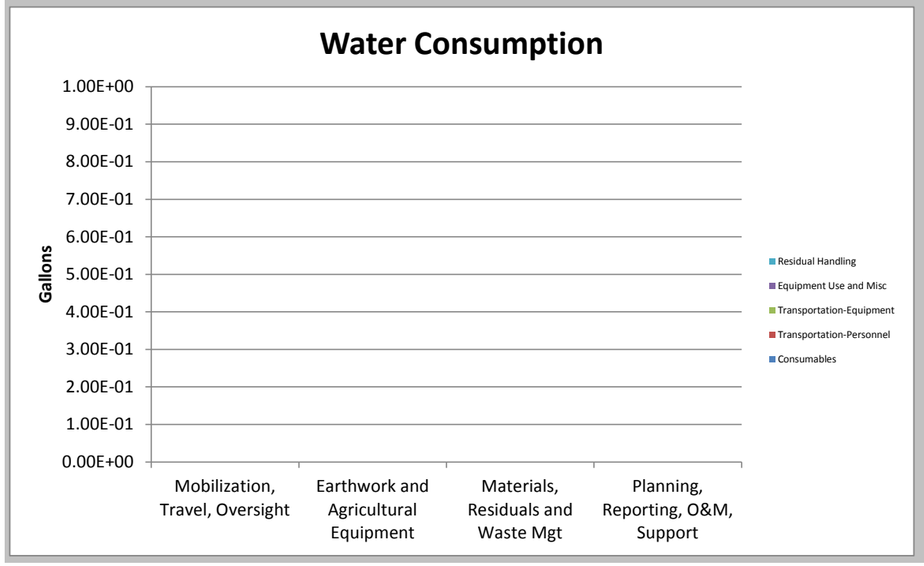
Phase	Activities	GHG Emissions	Total Energy Used	Water Consumption	Electricity Usage	Onsite NOx Emissions	Onsite SOx Emissions	Onsite PM10 Emissions	Total NOx Emissions	Total SOx Emissions	Total PM10 Emissions	Accident Risk Fatality	Accident Risk Injury
		metric ton	MMBTU	gallons	MWH	metric ton	metric ton	metric ton	metric ton	metric ton	metric ton		
Mobilization, Travel, Oversight	Consumables	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA
	Transportation-Personnel	288.46	3.8E+03	NA	NA	NA	NA	NA	6.6E-01	6.2E-02	7.6E-03	1.8E-03	1.3E-01
	Transportation-Equipment	74.46	1.0E+03	NA	NA	NA	NA	NA	2.4E-02	9.8E-04	1.9E-03	4.2E-04	3.4E-02
	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	0.0E+00	0.0E+00	2.2E-04	2.7E-01
	Residual Handling	0.00	0.0E+00	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Sub-Total	362.92	4.79E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.87E-01	6.34E-02	9.59E-03	2.42E-03	4.38E-01
Earthwork and Agricultural Equipment	Consumables	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA
	Transportation-Personnel	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Transportation-Equipment	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Equipment Use and Misc	7,590.35	1.3E+05	0.0E+00	0.0E+00	4.9E+01	1.2E+01	3.4E+00	5.5E+01	1.5E+01	4.3E+00	9.8E-03	2.5E+00
	Residual Handling	0.00	0.0E+00	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Sub-Total	7,590.35	1.25E+05	0.00E+00	0.00E+00	4.89E+01	1.17E+01	3.44E+00	5.45E+01	1.47E+01	4.30E+00	9.85E-03	2.47E+00
Materials, Residuals and Waste Mgt	Consumables	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA
	Transportation-Personnel	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Transportation-Equipment	0.00	0.0E+00	NA	NA	NA	NA	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	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Residual Handling	1.99	2.6E+01	NA	NA	0.0E+00	0.0E+00	0.0E+00	6.2E-04	1.1E-05	5.6E-05	1.1E-05	8.5E-04
	Sub-Total	1.99	2.59E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.25E-04	1.11E-05	5.56E-05	1.05E-05	8.48E-04
Planning, Reporting, O&M, Support	Consumables	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	NA	NA
	Transportation-Personnel	0.00	0.0E+00	NA	NA	NA	NA	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Transportation-Equipment	0.00	0.0E+00	NA	NA	NA	NA	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	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Residual Handling	0.00	0.0E+00	NA	NA	0.0E+00	0.0E+00	0.0E+00	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	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total		**8.0E+03**	**1.3E+05**	**0.0E+00**	**0.0E+00**	**4.9E+01**	**1.2E+01**	**3.4E+00**	**5.5E+01**	**1.5E+01**	**4.3E+00**	**1.2E-02**	**2.9E+00**

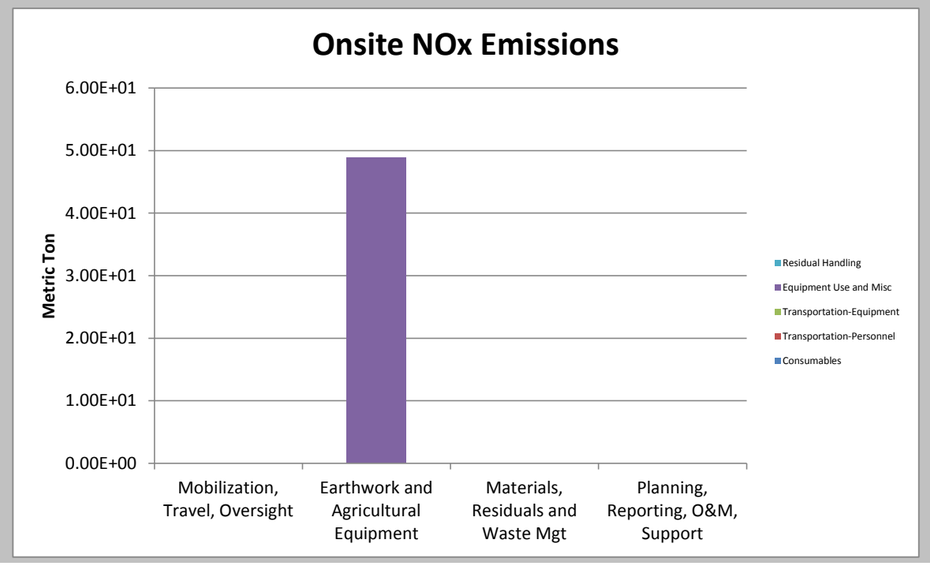
Remedial Alternative Phase	Non-Hazardous Waste Landfill Space	Hazardous Waste Landfill Space	Topsoil Consumption	Costing	Lost Hours - Injury	Percent electricity from renewable sources	Total Cost with Footprint Reduction
	tons	tons	cubic yards	$		%	
Mobilization, Travel, Oversight	0.0E+00	0.0E+00	0.0E+00	410,600	3.5E+00	0.0%	**$1,763,752**
Earthwork and Agricultural Equipment	0.0E+00	0.0E+00	1.7E+06	1,104,000	2.0E+01	0.0%	
Materials, Residuals and Waste Mgt	0.0E+00	0.0E+00	0.0E+00	94,700	6.8E-03	0.0%	
Planning, Reporting, O&M, Support	0.0E+00	0.0E+00	0.0E+00	246,252	0.0E+00	0.0%	
Total	**0.0E+00**	**0.0E+00**	**1.7E+06**	**$1,855,552**	**2.3E+01**	**0.0%**	

Sustainable Remediation - Environmental Footprint Summary
SiteWise_Input_NALF_Cabaniss_Alt3

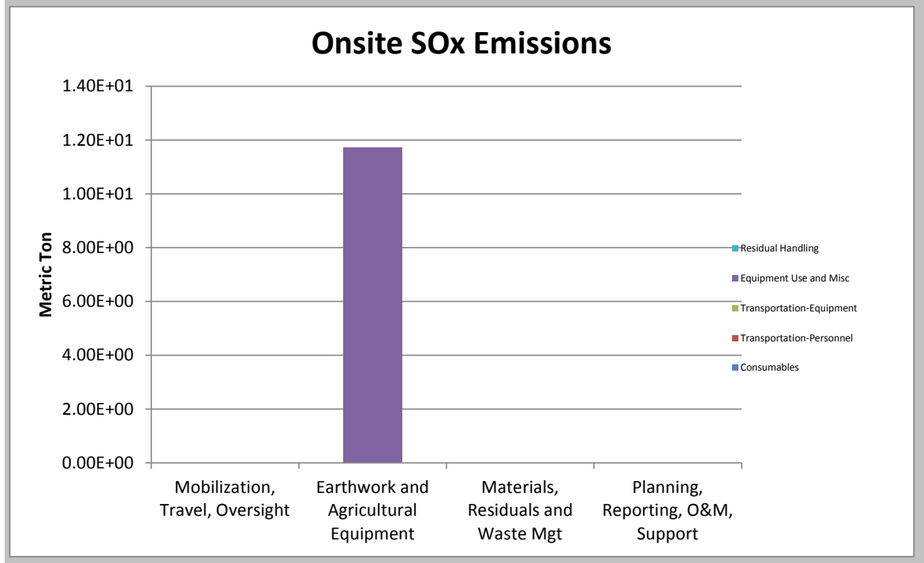


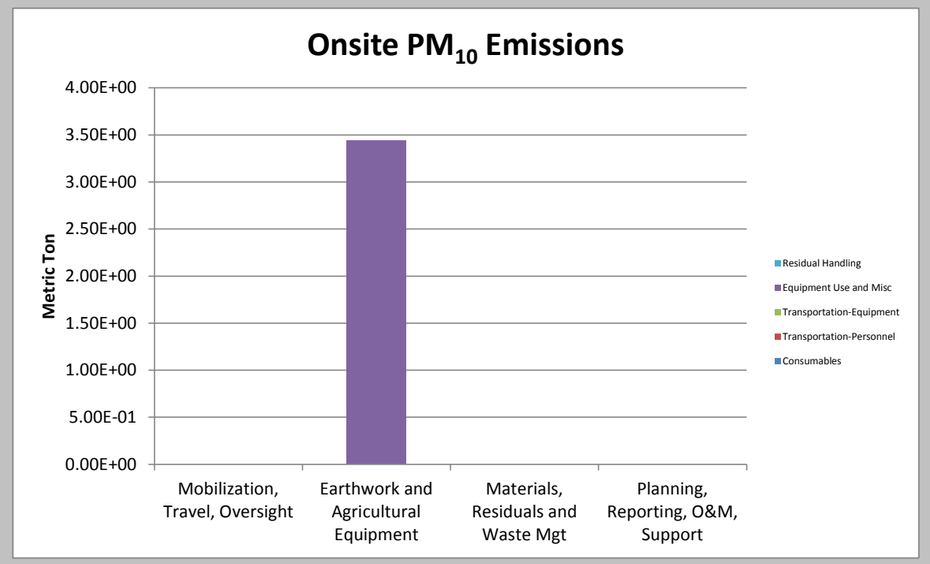


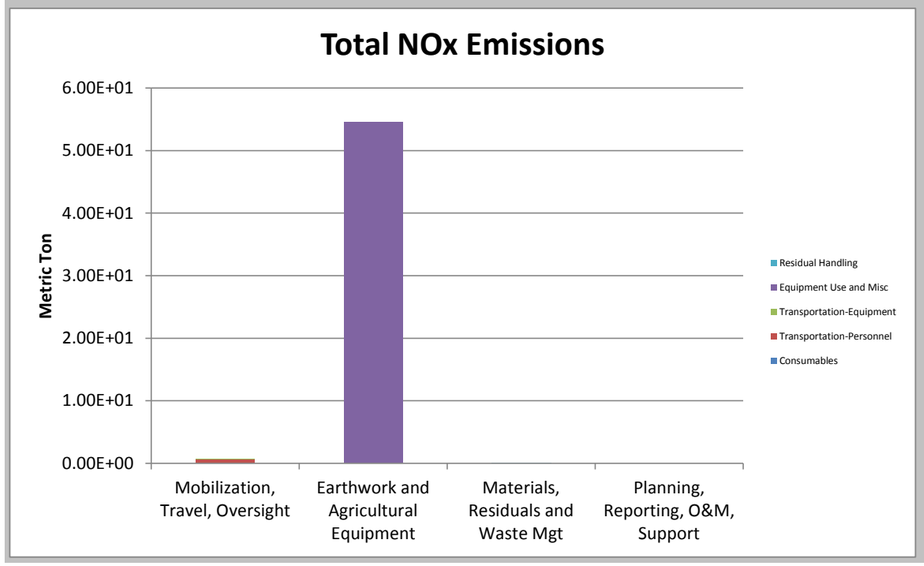


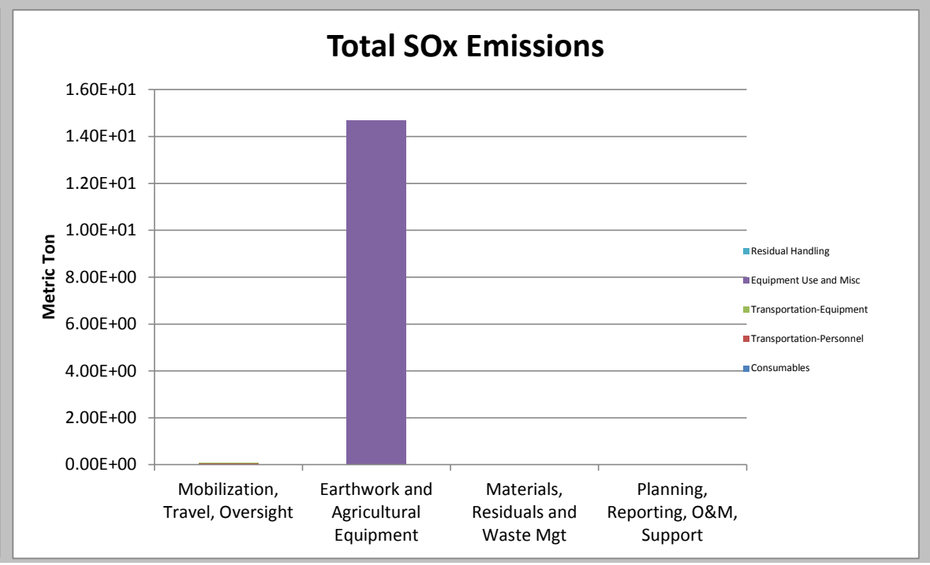


Sustainable Remediation - Environmental Footprint Summary
SiteWise_Input_NALF_Cabaniss_Alt3

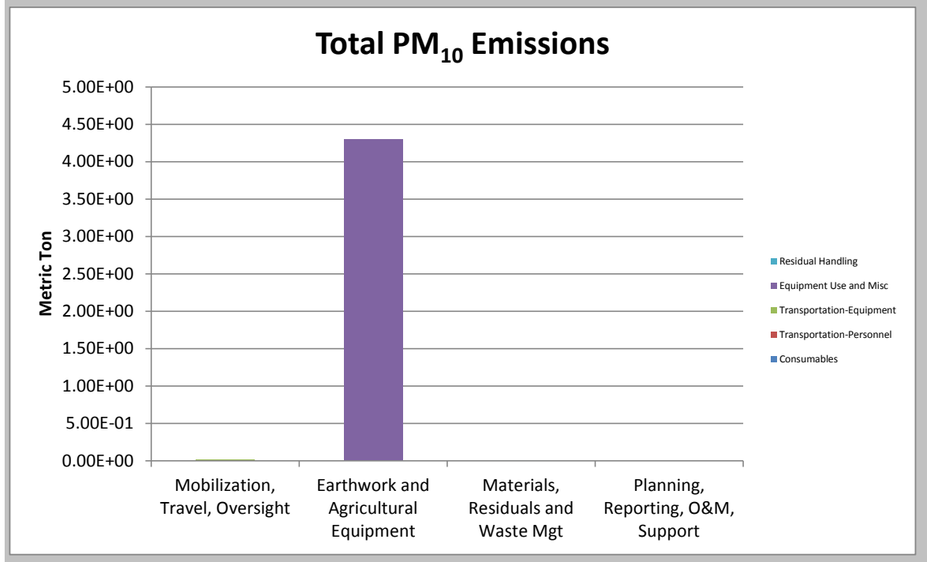


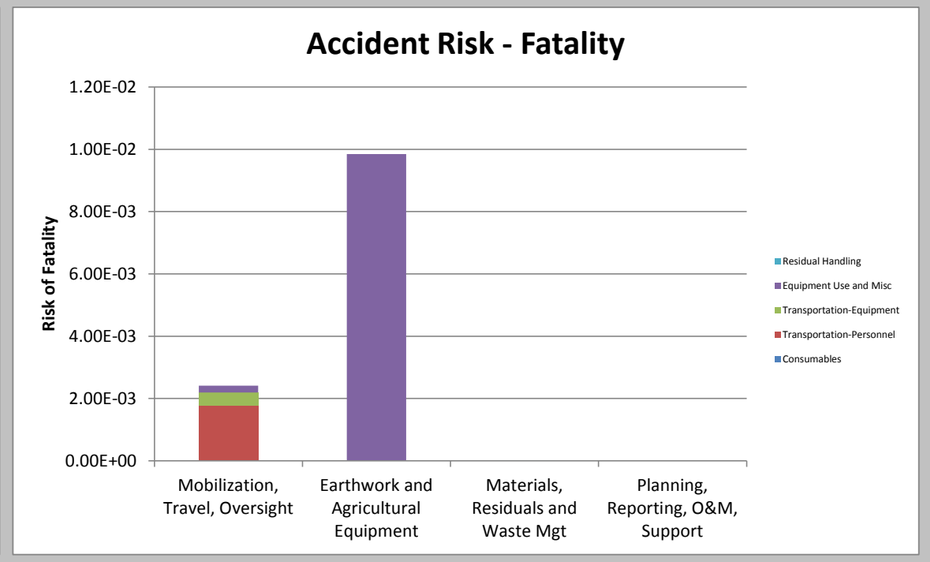


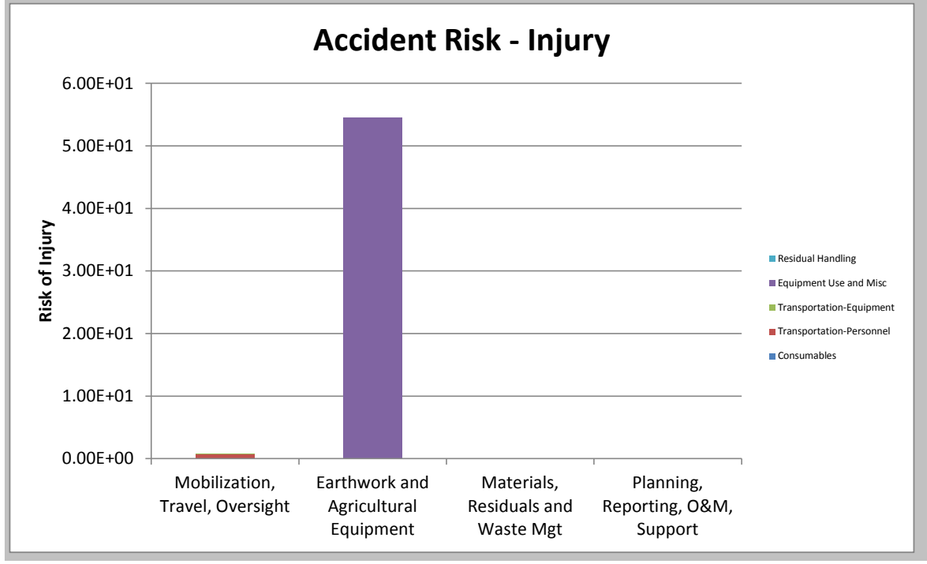


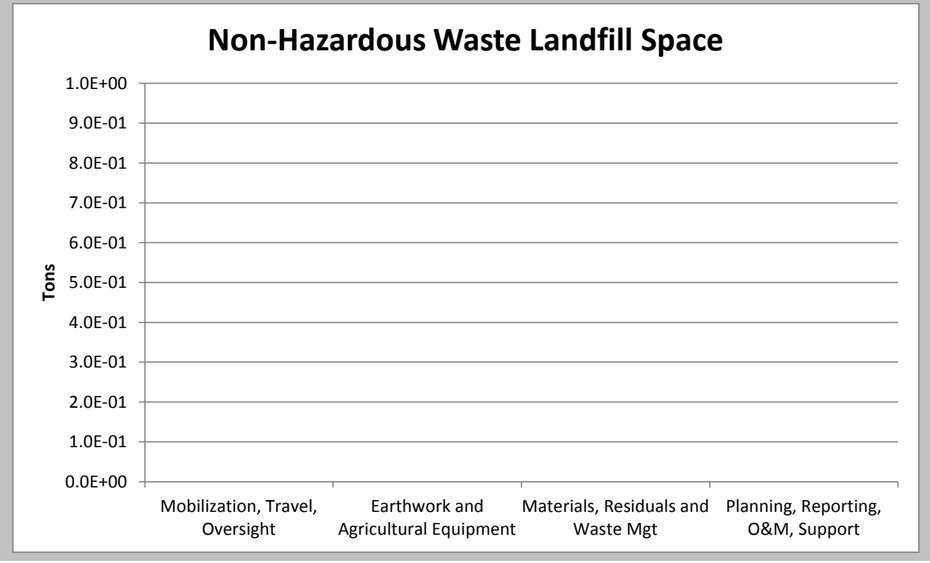


Sustainable Remediation - Environmental Footprint Summary
SiteWise_Input_NALF_Cabaniss_Alt3









Sustainable Remediation - Environmental Footprint Summary
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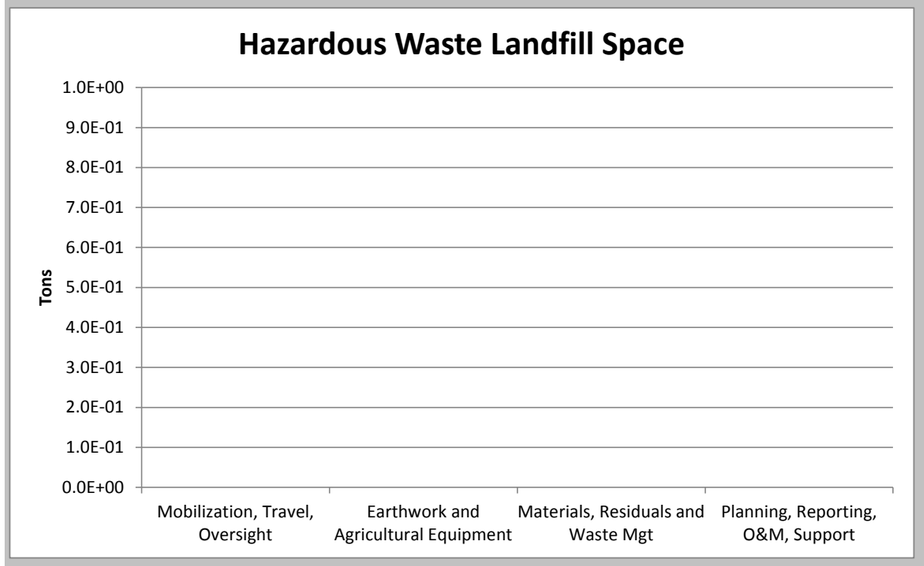

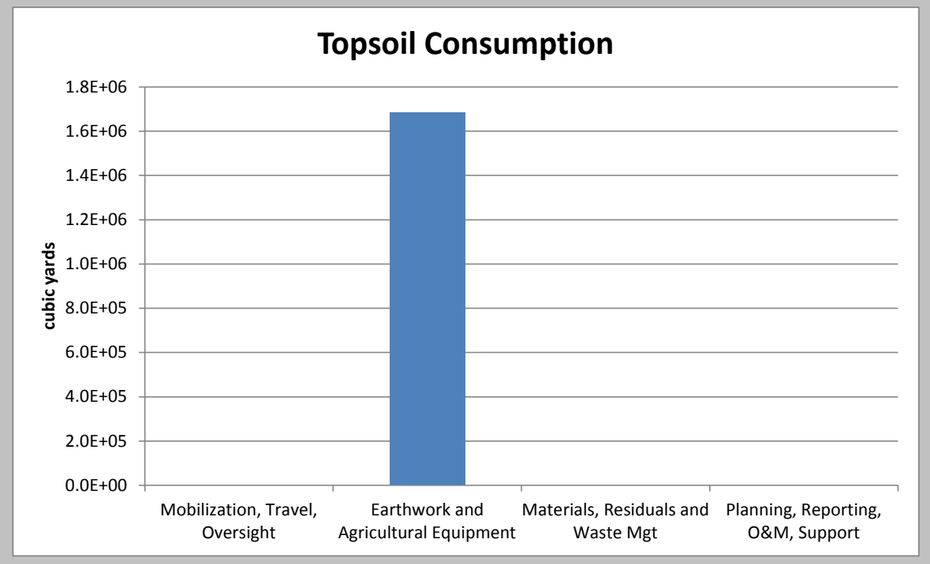

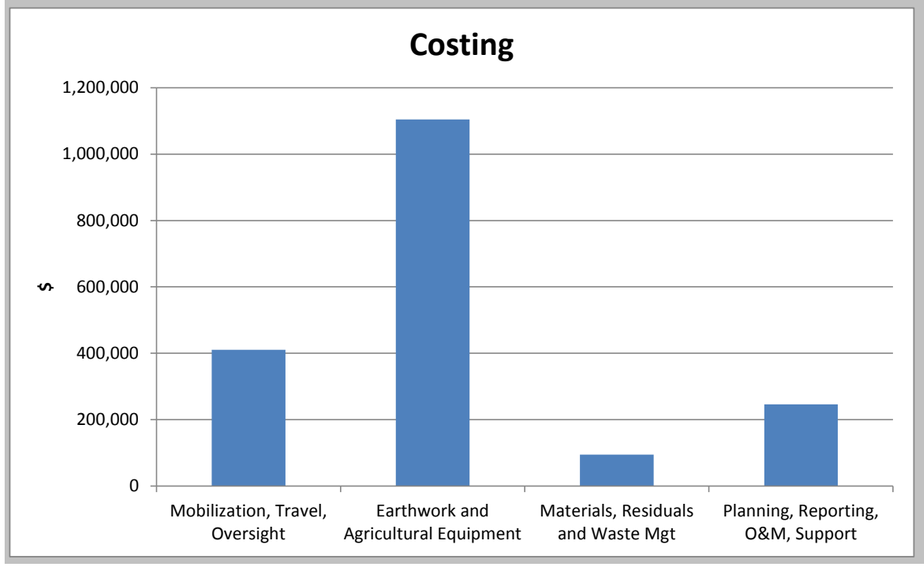

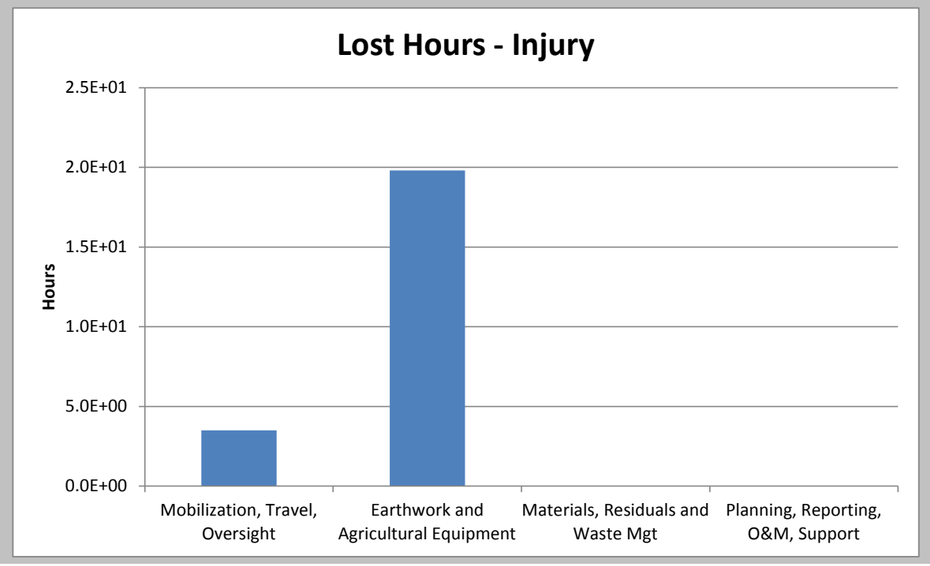

Appendix F
Public Notice and Proof of Publication

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ts, produce small pup- beautiful, 7wks, $1000
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HAMP LINES: See web-
r available PUPS & con-
www.pamcrump.com

FUL SMALL POMERANIAN
M, 7wks old, 1st shots,
rmed, vet ck'd, papers,
0firm (361)389-1545

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s $650, Females $750.
y to go! (361)774-7785

REGISTERED PUG PUPPIES - Fawn Females, $400. (361)288-9769

SIBERIAN HUSKIES - Solid wht and Red&wht pups. 6wks, Males & Females. AKC papers. call/Text anytime $500. (361)876-2302

Cats

Adorable

$5 ADORABLE -M & F KITTENS & CATS Persian mix. Call 361-816-9757 or 361-816-4747

Adorable

CFA PERSIAN KITTENS Flat faces & lots of fur $400-600, Adults $200-$300 Layaways (361)937-2287

KITTENS, 6wks, very cute! White, cream, & orange. $35. (361)558-1167

Other Pets

Adorable

Sugar Glider Shack Licensed Breeder of Sugar Gliders **www.sugarglidershack.com (361)215-9482**

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BURIAL PLOTS (2) - Seaside Memorial, $3900 worth $7800. Section J, plot 416 spaces 1 & 2 (830)570-6670

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ESTATE SALE OF 3 - SEASIDE MEMORIAL PARK BURIAL SPACES. Plot 49, Sect.S, spaces 4-6, full monument rights. $3500ea. or $9000. for all three. **Fred Davis, attorney. (512)615-9963**

SEASIDE MEMORIAL PARK Rose Garden section, plot 65, spaces 1, 2 & 3. Up right monument row, discounted price $7500 ($2500ea). Flat spaces 4, 5 &6 (individual) discounted price of $2000ea. (361)815-0867

LOOK!

SEASIDE COMPANION PLOTS & Vaults & Marker, worth $11,590. Great location. Best Offer. **(361)510-9588**

20 GOOD YOUNG CROSSBRED COWS & 200 CHOICE BRANGUS HEFFERS. ALL COWS ARE PALPATED BRED AND VERY GENTLE. (361)368-9005 or (361)442-6132

CALL TODAY!

FRESH QUALITY JIGGS round bales, $70-$105, net wrapped fertilized square $8.00. Sinton (361)537-4231

WOW!

PASTURE IMPROVEMENT - Coastal, Jiggs & Tifton-85, Bermuda grass (979)533-2554

PREMIUM COASTAL HAY IN BISHOP square $9, round $70-$110
(361)739-2366

QUALITY REGISTERED HORSES All Colors! Under 4yrs old, Well mannered **www.doneritefarms.com (361)739-2366**

Merchandise - Misc.

Homes to be Moved See our ad under Homes/Bldgs to be moved

Storage Sheds

CALL TODAY!

2 SHEDS - log cabin style, 12.5' x 8.5' x 9'H $1400. 15 1/4'x 10 1/4' x 11'H $1000 (361)960-0311

Tools

19" RYOBI - Band Saw, Like New, $125. (361)510-4740

CHECK THIS OUT!

COMPLETE ROTO BRUSH - Duct cleaning system includes cameras. $3000. obo. **(361)463-6957**

s/ M. Scott Neeley
Chief Executive Officer

U. S DEPARTMENT OF THE NAVY REQUEST FOR PUBLIC COMMENT Engineering Evaluation/Cost Analysis UXO 4 Incinerator Disposal Site Naval Auxiliary Landing Field Cabaniss Corpus Christi, Texas

The U.S. Department of the Navy (Navy) invites public comment on the Engineering Evaluation/Cost Analysis (EE/CA) for Unexploded Ordnance (UXO) Site 4, the Former Incinerator Disposal Site at the Naval Auxiliary Landing Field (NALF), Corpus Christi, Texas. The EE/CA identifies and discusses the preferred alternative for a non-time-critical removal action at this former UXO disposal site.

The purpose of the removal action is to remove munitions and explosives of concern (MEC)/material potentially presenting explosive hazard (MPPEH) in soil at UXO 4 the Former Incinerator Disposal Site at NALF Cabaniss. Pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Navy will remediate this site to protect human health and the environment. The Navy's preferred alternative, as presented in the EE/CA, is Alternative 2 – Surface Clearance of MEC/MPPEH and Engineering/Institutional Land Use Controls. The Navy is seeking public and stakeholder review and comment on this document with regard to safety and environmental concerns.

The EE/CA is available for public review at the following address:

Dr. Clotilde P. Garcia Public Library
Kaffie Middle School Campus
5930 Brockhampton Street
Corpus Christi, TX 78414
(361) 826-2360

Oral, facsimile, and email comments can be provided, on or before September 30, 2014, at the phone number, facsimile number, or email addresses below.

Phone (901) 372-7962/Fax (901) 372-2454
cbarnett@ensafe.com or arne.olsen@navy.mil

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Before me, the undersigned, a Notary Public, this day personally came GEORGIA LAWSON, who being first duly sworn, according to law, says that she is LEGAL SALES REPRESENTATIVE AND EMPLOYEE OF THE PUBLISHER, namely, the *Corpus Christi Caller-Times*, a daily newspaper published at Corpus Christi in said City and State, generally circulated in Aransas, Bee, Brooks, Duval, Jim Hogg, Jim Wells, Kleberg, Live Oak, Nueces, Refugio, and San Patricio, Counties, and that the publication of U. S DEPARTMENT OF THE NAVY REQUEST which the annexed is a true copy,

was inserted in the *Corpus Christi Caller-Times* on:

CC-Corpus Christi Caller-Times	08/31/14 Sun
CC-Internet - caller.com	08/31/14 Sun

LEGAL SALES REPRESENTATIVE

On this 15th day of September, 2014 I certify that the attached document is a true and exact copy made by publisher.

Sylvia P. Perez
Notary Public, State of Texas

SYLVIA P. PEREZ
MY COMMISSION EXPIRES
February 27, 2017

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