

# Engineering Evaluation/Cost Analysis for the Explosive Ordnance Disposal Range and Lead Contaminated Soils Area

## Final

**Site:**

Military Munitions Response Program  
Duluth Air National Guard Base  
148<sup>th</sup> Fighter Wing  
Duluth, Minnesota

**Prepared for:**

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## Executive Summary

This Engineering Evaluation/Cost Analysis (EE/CA) has been prepared in support of ongoing Military Munitions Response Program (MMRP) activities at the 148<sup>th</sup> Fighter Wing (148 FW), Duluth Air National Guard Base (ANGB), located in Duluth, Minnesota. Specifically, this EE/CA has been prepared to evaluate potential removal actions at both the Explosive Ordnance Disposal (EOD) Range (SR502) and Lead Contaminated Soils Area (SR739) munitions response areas (MRAs).

A Comprehensive Site Evaluation (CSE) (Phase I and II) was performed at the Duluth ANGB from 2005–2010. The CSE identified and investigated five MRAs at the Duluth ANGB where munitions and explosives of concern (MEC) /munitions constituents (MC) was confirmed or likely present. At the conclusion of the CSE Phase II, two of the MRAs, the EOD Range and the Lead Contaminated Soils Area (LCSA), were each recommended for a non-time critical removal action (NTCRA) to address explosive safety, human health, or environmental risks presented by MEC or MC. The EOD Range removal action will address potential subsurface MEC and the LCSA removal action will address elevated metals concentrations (primarily lead) in soil.

The EE/CA identifies the objectives of the removal action and analyzes the effectiveness, implementability, and cost of various alternatives that may satisfy these objectives. Thus, an EE/CA serves an analogous function to, but is more streamlined than, the RI/FS conducted for remedial actions. The results of an EE/CA and the selected removal alternative are subsequently summarized in an Action Memorandum.

The former EOD Range is located west of the main base, northeast of the Duluth ANGB active Munitions Storage Area on property owned by the Duluth Airport Authority. This range consists of a rectangular shaped parcel that is approximately 0.3 acres in size and was used by the United States Air Force (USAF) from 1960 to 1994 for open burning/open detonation (OB/OD) training activities and to detonate and dispose of munitions. Munitions that may have been used for training or disposed of at the EOD Range include detonators, blasting caps, fuzes, boosters, bursters, primers, squibs, bulk high explosives, demolition charges, and pyrotechnics (flares, signals, simulators, etc.). The LCSA is located west of the main base, northeast of the EOD Range on property owned by the Duluth Airport Authority (Figure 1-2). The area is irregularly shaped and covers approximately 0.3 acres. During the construction of the Northwest Airlines Maintenance Facility in 1991/1992, the soil removed from the Small Arms Range target berm was transported and placed in piles at what is now known as the LCSA.

At the 0.3-acre EOD Range, digital geophysical mapping (DGM) was conducted using electromagnetic (EM) sensing equipment to identify the extent and density of any subsurface anomalies. The DGM effort resulted in the identification of 19 subsurface geophysical anomalies representing potential locations of buried MEC. If MEC, these items present a potential explosive hazard and risk to human health. Potential current/future human receptor (including workers, recreational users, and residents) contact or exposure to this explosive hazard could occur through excavation activities or eventual exposure at the ground surface due to natural migration of the items upward from frost heave or erosion processes.

At the 0.3-acre LCSA, in-situ x-ray fluorescence (XRF) surface soil screening was initially performed around the perimeter of the soil piles originating from the Small Arms Range target berm to delineate the lateral extent of metals contamination. Additionally, soil borings were conducted at six locations within the piles to collect samples of the pile soils and the native soils beneath the piles. Arsenic, copper, iron, and lead were detected in one or more of the soil piles samples at concentrations above both background and Minnesota Pollution Control Agency (MPCA) Tier I Soil Reference Value (SRV) screening values. However, no metals were detected above screening values in the native subsurface soils beneath the soil piles. The surface soil piles at the LCSA are considered to provide a complete pathway for MC exposure to human and ecological receptors. Potential current/future human receptors include workers,

recreational users, and residents. Potential ecological receptors include plants, invertebrates, herbivores, omnivores, and carnivores.

Three alternatives each were considered in the EE/CA to address the hazards present at both the EOD Range and LCSA. These alternatives were evaluated using the alternative technology selection criteria established by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) for evaluating alternatives (effectiveness, implementability, and cost) and then subsequently evaluated in a comparative analysis.

The alternatives considered for the EOD Range included:

- Alternative One: No Action;
- Alternative Two: Institutional Controls; and
- Alternative Three: MEC Removal.

The alternatives considered for the LCSA included:

- Alternative One: No Action;
- Alternative Two: Soil Cover and Institutional Controls; and
- Alternative Three: Soil Removal.

A summary of the comparative analysis of alternatives for the EOD Range and LCSA are presented in Tables ES-1 and ES-2.

**Table ES-1: EOD Range: Comparative Analysis Summary by Alternative**

Criterion	Alternative		
	No Action	Institutional Controls	MEC Removal
<b>Effectiveness</b>			
Protection of Human Health and the Environment	□ Not protective of human health; does not meet removal action objectives.	■ Protective of human health; meets removal action objectives.	■ Protective of human health; meets removal action objectives.
Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)	■ Meets some action or location-specific ARARs.	■ Meets some action and location-specific ARARs.	■ Meets all action and location-specific ARARs.
Long-term Effectiveness and Permanence	□ Not effective or permanent in the long-term.	■ Effective in the long-term as long as deed restrictions are complied with in the future. Not permanent.	■ Effective and permanent in the long-term because MEC hazards are removed from the site.
Short-Term Effectiveness	■ Because no action is taken, workers and the community would not be adversely affected in the short-term.	■ Deed restriction would not adversely affect workers and the community in the short-term.	■ MEC removal would not adversely affect workers and the community in the short-term.
Reduction of Toxicity, Mobility, or Volume	□ There is no reduction of toxicity, mobility, or volume.	□ There is no reduction of toxicity, mobility, or volume.	■ Toxicity, mobility, and volume of MEC is reduced as on-site treatment would occur.



**Table ES-1: EOD Range: Comparative Analysis Summary by Alternative (Continued)**

Criterion	Alternative		
	No Action	Institutional Controls	MEC Removal
<b>Implementability</b>			
Technical Feasibility	■ There are no technical feasibility concerns.	□ The technical feasibility of institutional controls is diminished since the property is not owned by the ANG.	■ There are no technical feasibility concerns.
Administrative Feasibility	■ There are no administrative feasibility concerns.	□ The administrative feasibility of institutional controls is diminished since the property is not owned by the ANG. .	■ There are no administrative feasibility concerns.
Availability of Services and Materials	■ There are no availability concerns.	□ The DAA would have to voluntarily implement and enforce institutional controls.	■ There are no availability concerns.
Regulatory Acceptance	■ MPCA has reviewed and accepted these alternatives.	■ MPCA has reviewed and accepted these alternatives.	■ MPCA has reviewed and accepted these alternatives.
Community Acceptance	NE	NE	NE
<b>Cost</b>			
Capital	\$0	\$13,800	\$93,840
O&M (annual)	\$0	\$8,280	\$0
Present Worth	\$0	\$21,686	\$93,840

**Notes:**

ARAR – Applicable or Relevant and Appropriate Requirements

O&amp;M – Operations and Maintenance

NE – Not evaluated at this time pending comments from the regulatory agencies and community.

Legend:

- Meets Criteria
- ▣ Somewhat Meets Criteria
- Does Not Meet Criteria

Based on this comparative analysis, the recommended removal alternative for the MEC explosive hazard at the EOD Range is MEC Removal since it will provide a permanent remedy for the site by physically treating (via explosive detonation) and removing the hazard.

**Table ES-2: LCSA: Comparative Analysis Summary by Alternative**

Criterion	Alternative		
	No Action	Soil Cover and Institutional Controls	Soil Removal
<b>Effectiveness</b>			
Protection of Human Health and the Environment	<ul style="list-style-type: none"> <li>□ Not protective of human health and environment; does not meet removal action objectives.</li> </ul>	<ul style="list-style-type: none"> <li>■ Somewhat protective of human health and environment by reducing contact with metals.</li> </ul>	<ul style="list-style-type: none"> <li>■ Protective of human health and environment; meets removal action objectives.</li> </ul>
Compliance with ARARs	<ul style="list-style-type: none"> <li>■ Meets some action and location-specific ARARs.</li> </ul>	<ul style="list-style-type: none"> <li>■ Meets some action and location-specific ARARs.</li> </ul>	<ul style="list-style-type: none"> <li>■ Meets all action and location-specific ARARs.</li> </ul>
Long-term Effectiveness and Permanence	<ul style="list-style-type: none"> <li>□ Not effective or permanent in the long-term.</li> </ul>	<ul style="list-style-type: none"> <li>■ Effective in the long-term as long as contamination does not migrate to groundwater and deed restrictions are complied with in the future. Not permanent.</li> </ul>	<ul style="list-style-type: none"> <li>■ Effective and permanent in the long-term because metals hazards are removed from the site.</li> </ul>
Short-Term Effectiveness	<ul style="list-style-type: none"> <li>■ Because no action is taken, workers and the community would not be adversely affected in the short-term.</li> </ul>	<ul style="list-style-type: none"> <li>■ Soil cover would not adversely affect workers and the community in the short-term.</li> </ul>	<ul style="list-style-type: none"> <li>■ Safe operating procedures will reduce short term risks to workers, the environment, and the community.</li> </ul>
Reduction of Toxicity, Mobility, or Volume	<ul style="list-style-type: none"> <li>□ There is no reduction of toxicity, mobility, or volume.</li> </ul>	<ul style="list-style-type: none"> <li>■ There is no reduction of toxicity, or volume. By limiting infiltration, mobility would be reduced.</li> </ul>	<ul style="list-style-type: none"> <li>■ Toxicity, mobility, and volume of metals is reduced as on-site treatment and off-site disposal would occur.</li> </ul>
<b>Implementability</b>			
Technical Feasibility	<ul style="list-style-type: none"> <li>■ There are no technical feasibility concerns.</li> </ul>	<ul style="list-style-type: none"> <li>■ The technical feasibility of institutional controls is diminished since the property is not owned by the ANG.</li> </ul>	<ul style="list-style-type: none"> <li>■ There are no technical feasibility concerns.</li> </ul>
Administrative Feasibility	<ul style="list-style-type: none"> <li>■ There are no administrative feasibility concerns.</li> </ul>	<ul style="list-style-type: none"> <li>■ The administrative feasibility of institutional controls is diminished since the property is not owned by the ANG.</li> </ul>	<ul style="list-style-type: none"> <li>■ There are no administrative feasibility concerns.</li> </ul>
Availability of Services and Materials	<ul style="list-style-type: none"> <li>■ There are no availability concerns.</li> </ul>	<ul style="list-style-type: none"> <li>■ The DAA would have to voluntarily implement and enforce institutional controls.</li> </ul>	<ul style="list-style-type: none"> <li>■ There are no availability concerns.</li> </ul>
Regulatory Acceptance	<ul style="list-style-type: none"> <li>■ MPCA has reviewed and accepted these alternatives.</li> </ul>	<ul style="list-style-type: none"> <li>■ MPCA has reviewed and accepted these alternatives.</li> </ul>	<ul style="list-style-type: none"> <li>■ MPCA has reviewed and accepted these alternatives.</li> </ul>
Community Acceptance	NE	NE	NE

**Table ES-2: LCSA: Comparative Analysis Summary by Alternative**

Criterion	Alternative		
	No Action	Soil Cover and Institutional Controls	Soil Removal
<b>Cost</b>			
Capital	\$0	\$118,680	\$382,260
O&M (annual)	\$0	\$11,730	\$0
Present Worth	\$0	\$130,509	\$382,260

**Notes:**

ARAR – Applicable or Relevant and Appropriate Requirements

O&amp;M – Operations and Maintenance

NE – Not evaluated at this time pending comments from the regulatory agencies and community.

Legend: ■ Meets Criteria

■ Somewhat Meets Criteria

□ Does Not Meet Criteria

Based on this comparative analysis, the recommended removal alternative for the metals contaminated soil hazard at the LCSA is Soil Removal since it will provide a permanent remedy for the site by physically treating and removing the metals hazard at the site.

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## 1.0 Introduction

This Engineering Evaluation/Cost Analysis (EE/CA) has been prepared in support of ongoing Military Munitions Response Program (MMRP) activities at the 148<sup>th</sup> Fighter Wing (148 FW), Duluth Air National Guard Base (ANGB), located in Duluth, Minnesota (see Figure 1-1). Specifically, this EE/CA has been prepared to evaluate potential removal actions at both the Explosive Ordnance Disposal (EOD) Range (SR502) and Lead Contaminated Soils Area (SR739) munitions response areas (MRAs). The overall goal of the MMRP is to make the Duluth ANGB MRAs safe in accordance with their anticipated future land use (AFLU) and to protect human health and the environment in the process. Under the MMRP, munitions response actions are conducted to address known or suspected munitions and explosives of concern (MEC), munitions constituents (MC), and other contaminants of concern at MRAs.

### 1.1 Background

A Comprehensive Site Evaluation (CSE) (Phase I and II) was performed at the Duluth ANGB from 2005-2010. The CSE identified and investigated five MRAs at the Duluth ANGB where MEC/MC was confirmed or likely present. At the conclusion of the CSE Phase II, two of the MRAs, the EOD Range and the Lead Contaminated Soils Area (LCSA), were each recommended for a non-time critical removal action (NTCRA) to address explosive safety, human health, or environmental risks presented by MEC or MC. The EOD Range removal action will address potential subsurface MEC and the LCSA removal action will address elevated metals (primarily lead) concentrations in soil.

This EE/CA was prepared in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) which requires an EE/CA for all NTCRAs. Although the Duluth ANGB is not a National Priorities List site, all work is being performed consistent with United States Environmental Protection Agency (USEPA) *Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA* (USEPA, 1993).

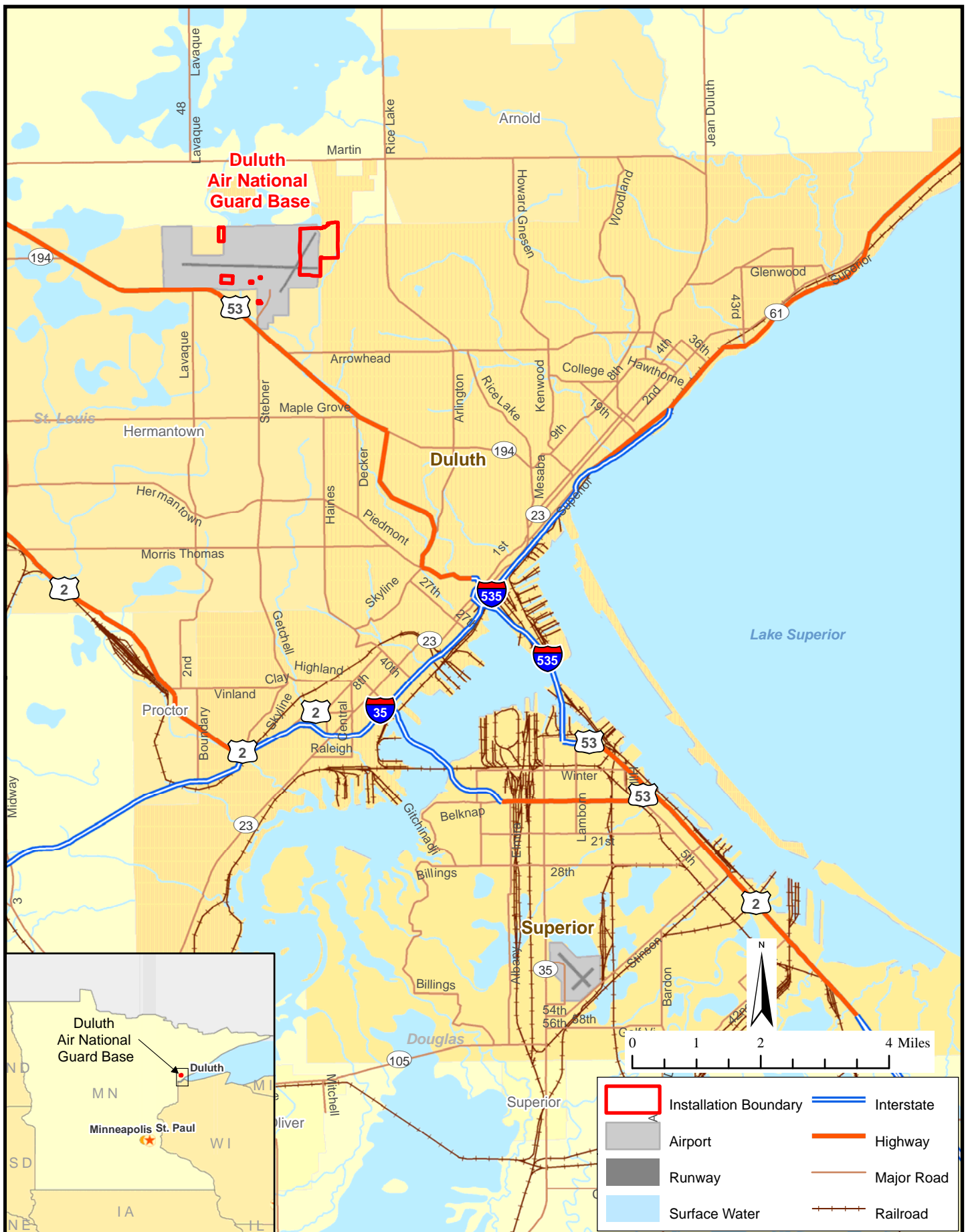
The benefits of using the NTCRA process for these sites includes promptly addressing health and/or environmental threats and accelerating the sites more quickly through the CERCLA response process. This EE/CA is intended to:

- Satisfy environmental review requirements for removal actions;
- Satisfy administrative record requirements for proper documentation of removal action selection; and,
- Provide a framework for evaluating and selecting alternative technologies.

In meeting these intentions, the EE/CA identifies the objectives of the removal action and analyzes the effectiveness, implementability, and cost of various alternatives that may satisfy these objectives. Thus, an EE/CA serves an analogous function to, but is more streamlined than, the RI/FS conducted for remedial actions. The results of an EE/CA and the selected removal alternative are subsequently summarized in an Action Memorandum as discussed in *Use of Non-Time Critical Removal in Superfund Response Actions* (USEPA, 2000).

This EE/CA has been prepared by AECOM for the Air National Guard (ANG) under the National Guard Bureau (NGB) Environmental Engineering, Professional, Technical and Remediation Support Services Contract Number DAHA92-02-D-0012, Task Order (TO) 0077.

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Duluth ANGB EE/CA

FIGURE I-1

Duluth Air National Guard Base Location

CONTRACT NO DAHA92-02-D-0012		TASK NO 0077	
DESIGNED BY K. Weber	DRAWN BY K. Weber		
CHECKED BY A. Dellens	DATE March 2009		
SCALE 1" = 2 miles	SHEET 1 of 1		
Fig1-1_Base_Location.mxd			

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## 1.2 Previous Investigations

A summary of the previous CSE Phase I and II investigations conducted at the Duluth ANGB EOD Range and LCSA MRAs are presented below.

### 1.2.1 Comprehensive Site Evaluation Phase I

The CSE Phase I investigation at Duluth ANGB identified five MRAs for evaluation (see Figure 1-2). These five MRAs include the EOD Range (SR502), Small Arms Range (SR736), Trap Range (TS737), Skeet Range (TS738), and LCSA (SR739). The purpose of the CSE Phase I was to characterize MRAs for the actual or potential presence of MEC and to evaluate actual or potential release(s) of MC to migration/exposure pathways from the MRAs. Analogous to the CERCLA Preliminary Assessment (PA), the CSE Phase I consisted of the review of on- and off-site historical records, visual surveys, and interviews.

The investigation results and recommendations of the CSE Phase I for the EOD Range and LCSA MRAs are presented in the report *Comprehensive Site Investigation Phase I, Duluth Air National Guard Base, Minnesota* (URS, 2007). The investigation results identified potentially impacted soil and groundwater media at the EOD Range from former open burning/open detonation (OB/OD) activities and potentially impacted soil, surface water, and sediment at the LCSA due to the deposition of potentially contaminated soil piles from the Small Arms Range target berm. The CSE Phase I recommendations for the EOD Range and LCSA MRAs included sampling of potentially impacted media within each of the MRAs to determine if MC has been released to the environment. Also recommended was geophysical mapping to assess the extent and density of subsurface anomalies across each MRA. Except for the geophysical mapping of the LCSA, these recommendations were implemented during CSE Phase II activities as discussed below.

### 1.2.2 Comprehensive Site Evaluation Phase II

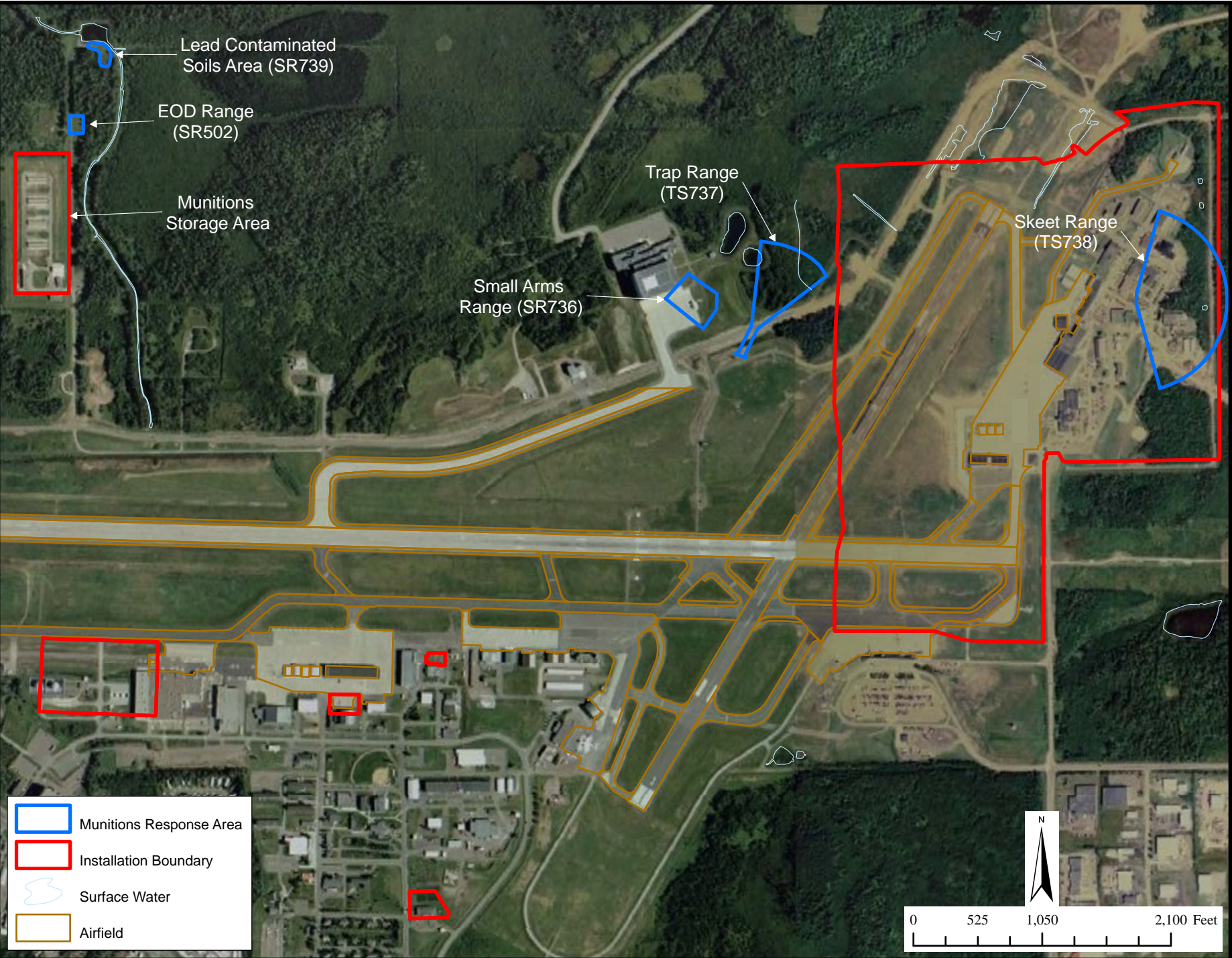
The CSE Phase II investigation, analogous to the CERCLA Site Inspection (SI), consisted of environmental media sampling and geophysical mapping based on CSE Phase I recommendations for further investigation. The objective of the CSE Phase II was to obtain sufficient data to determine whether further munitions response actions were required at each of the MRAs. The following sections summarize the Phase CSE Phase II investigation results and recommendations for the EOD Range and LCSA. Additional details on these investigations can be found in the report *Military Munitions Response Program, Comprehensive Site Evaluation Phase II* (AECOM, 2010).

#### 1.2.2.1 Explosive Ordnance Disposal Range

The CSE Phase II investigation results and recommendations for the EOD Range were as follows:

- **Digital Geophysical Mapping (DGM).** Following a visual survey confirming no MEC is present on the ground surface, DGM of the 0.3-acre EOD Range was conducted using electromagnetic (EM) sensing equipment to identify the extent and density of any subsurface anomalies. The DGM effort resulted in the identification of 19 subsurface geophysical anomalies representing potential locations of buried MEC. Based on these DGM results, a NTCRA was recommended to investigate the anomalies and dispose of any MEC that may be encountered.
- **Environmental Media Sampling.** Soil and groundwater samples for MC analysis were collected from borings and temporary well points within the EOD Range. Additionally, surface and subsurface composite soil samples were collected and analyzed from around the perimeter of the former OB/OD detonation pit located in the center of the range. In summary, based on the low level of site-related MC encountered in soil and groundwater at the EOD Range, MC was not identified as a concern at the site requiring further action.

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DESIGNED BY K. Weber	DRAWN BY K. Weber
CHECKED BY A. DeBelen	DATE March 2009
SCALE 1" = 1,000'	SHEET 1 of 1

Duluth ANGB BE/CA

FIGURE 1-2

Duluth ANGB MRA Locations

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Fig 1-2 MRA Locations.mxd

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### 1.2.2.2 Lead Contaminated Soils Area

The CSE Phase II investigation results and recommendations for the LCSA were as follows:

- **Environmental Media Sampling.** In-situ x-ray fluorescence (XRF) surface soil screening was initially performed around the perimeter of LCSA soil piles to delineate the lateral extent of contamination. Additionally, soil borings were conducted at six locations within the piles to collect samples of the pile soils and the native soils beneath the piles. Arsenic, copper, iron, and lead were detected in one or more of the soil piles samples at concentrations above both background and Minnesota Pollution Control Agency (MPCA) Tier I Soil Reference Value (SRV) screening values. However, no metals were detected above screening values in the native subsurface soils beneath the soil piles. This lack of subsurface contamination was attributed to the plastic sheeting encountered under the soil piles. Sediment and surface water samples were also collected from the nearby drainage ditch and retention basin for metals analysis. Similar to the native soils results, no metals were detected above screening values in the nearby sediment or surface water. Based on the environmental media sampling results at the LCSA, a NTCRA was recommended to remove and properly dispose of the metals contaminated soil piles at the LCSA.

## 1.3 Purpose and Stakeholders

The purpose of this EE/CA is to evaluate cleanup alternatives and associated costs to accomplish the removal of potential subsurface MEC at the EOD Range and metals contaminated soil piles at the LCSA that present immediate or acute threats to human health and the environment. If not addressed by implementing the response action selected in this EE/CA, these hazards may present an unnecessary and avoidable risk to public health or welfare in the future.

The ANG is the lead agency for the EOD Range and LCSA removal actions. Participation of and cooperation with Federal, State, and local authorities and the local public will be actively pursued for the duration of these activities and for all environmental restoration activities at this facility. Participation of these agencies is required for the environmental restoration process and aids in ensuring the protection of human health and the environment. Federal, State, and local authorities will have input into the actions implemented at the facility through pre-planning meetings, plan review, and the public comment process. The concerns of the Federal, State, and local authorities and citizens will be solicited and the provisions of Federal, State, and local regulations will be given full consideration for all actions taken at this facility.

This EE/CA complies with the requirements of the Removal Action Procedures contained in 40 Code of Federal Regulations (CFR) 300.410 and 300.415, the Office of Solid Waste and Emergency Response Directive numbers 9318-0-05 and 93650-0-038, and other related guidance.

## 1.4 Report Organization

This EE/CA is composed of the following six sections:

- **Section 1.0 – Introduction:** This section presents the site background, previous investigations, purpose, and stakeholders for the EE/CA.
- **Section 2.0 – Site Characterization:** This section describes the physical, demographic, and other characteristics of the installation/MRAs and the surrounding areas.
- **Section 3.0 – Identification of Removal Action Objectives:** This section describes the removal action scope, schedule, planned removal activities, and associated Applicable or Relevant and Appropriate Requirements (ARARs) for the EOD Range and LCSA.

- **Section 4.0 – Identification and Analysis of Removal Action Alternatives:** This section presents the removal action alternatives and evaluates them against the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) alternative evaluation selection criteria.
- **Section 5.0 – Comparative Analysis of Removal Action Alternatives:** This section presents the relative comparison of advantages and disadvantage of removal action alternatives.
- **Section 6.0 – Recommendations:** This section describes the recommended removal action alternatives for the EOD Range and LCSA.

## 2.0 Site Characterization

This section summarizes available data on the physical, demographic, and other characteristics of the installation, MRAs, and surrounding areas.

### 2.1 Site Description and Background

#### 2.1.1 Site Location

The Duluth ANGB is co-located with Duluth International Airport in St. Louis County, Minnesota, approximately 7 miles northwest of the City of Duluth, Minnesota (Figure 1-1). The main base occupies 153.3 acres on the northeast corner of the airport. Additionally, the Munitions Storage Area (physically separated from the main base) occupies 16.71 acres north of Runway 09/27. The base has a total of 37 buildings – 18 industrial and 19 administrative. The normal base population is 420 personnel, but surges to 1,100 personnel occur once each month during drill sessions.

The main base portion of Duluth ANGB is a secure facility that is fenced on the north, east, and south sides. Security personnel from the 148<sup>th</sup> FW and the Duluth International Airport Authority patrol the base/airport at all times.

#### 2.1.2 Explosive Ordnance Disposal Range Description

The former EOD Range is located west of the main base, northeast of the Duluth ANGB active Munitions Storage Area on property owned by the Duluth Airport Authority (Figure 1-2). This range consists of a rectangular shaped parcel that is approximately 0.3 acres in size and was used by the USAF from 1960 to 1994 for OB/OD training activities, and to detonate and dispose of munitions. The range is currently a grassy field. The terrain at the range is generally flat, and is bordered to the west by a gravel road and wooded areas to the north, east, and south (Figure 2-1). The nearest surface water feature is a drainage ditch approximately 250 feet to the east that is associated with a detention basin (located approximately 750 feet to the north) that is part of the Duluth International Airport storm water drainage system.

The EOD Range is located on a restrictive easement owned by the Duluth Airport Authority, outside of the airport security fencing. Access from the south is through a locked gate controlled by Duluth Airport Authority personnel. There are no access restrictions from the north.

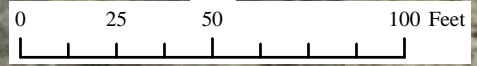
Visual reconnaissance during the CSE Phase I and II investigations at the EOD range identified two potential OB/OD detonation pits at the range. The larger pit, located in the center of the range, is approximately 4 feet in diameter and 3 feet deep. The smaller pit, located in the northern quarter of the site, is approximately 1-foot in diameter and 1-foot deep.



#### 2.1.3 Lead Contaminated Soils Area Description

The LCSA is located west of the main base, northeast of the EOD Range on property owned by the Duluth Airport Authority (Figure 1-2). The area is irregularly shaped and covers approximately 0.3 acres. During the construction of the Northwest Airlines Maintenance Facility in 1991/92, the soil removed from the Small Arms Range target berm was transported and placed in piles at what is now known as the LCSA. The area is primarily grass covered and partially wooded. The area is bordered to the west by a gravel road, to the south by a wooded area, to the north by a detention basin, and to the east by a drainage ditch (Figure 2-2). The detention basin and drainage ditch are associated with the Duluth International Airport storm water drainage system.

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	EOD Range
	Road

CONTRACT NO.	TASK NO.
DAHA92-02-D-0012	0077
DESIGNED BY	DRAWN BY
K. Weber	K. Weber
CHECKED BY	DATE
A. Daniels	March 2009
SCALE	SHEET
1"=50'	1 of 1

Duluth ANGB EE/CA  
FIGURE 2-1  
EOD Range Aerial Photograph

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


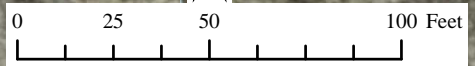
CONTRACT NO.	DAHA92-02-D-0012	TASK NO.	0077
DESIGNED BY	K. Weber	DRAWN BY	K. Weber
CHECKED BY	A. DeBuss	DATE	March 2009
SCALE	1"=50'	SHEET	1 of 1

Duluth ANGB BE/CA  
FIGURE 2-2  
Lead Contaminated Soils Area Aerial Photograph

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	Lead Contaminated Soils Area
	Soil Pile
	Surface Water
	Road



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Similar to the EOD Range, the LCSA is located on a restrictive easement owned by the Duluth Airport Authority, outside of the airport security fencing. Access from the south is through a locked gate controlled by Duluth Airport Authority personnel. There are no access restrictions from the north.

#### **2.1.4 Installation Mission and Operational History**

The Duluth ANGB is the home of the 148<sup>th</sup> FW. The 148<sup>th</sup> FW flies the F-16 ADF Fighting Falcon. The current mission of the 148<sup>th</sup> FW is to “provide the best trained personnel to defeat America’s adversaries with speed and precision in war and respond to state and local emergencies in times of peace.”

Initially in 1948, the ANG 179<sup>th</sup> Fighter Squadron was formed at Duluth municipal airport. The unit was under control of the 133<sup>rd</sup> FW located in Minneapolis/St. Paul, Minnesota until the 148<sup>th</sup> Fighter Group was formed in 1960. During this time, the unit was housed in temporary Works Project Administration (WPA) shacks and portions of the Duluth Armory. In 1960, the mission of the 148<sup>th</sup> Fighter Group was to support of the Air Defense Command in Duluth until 1976 when it became the 148<sup>th</sup> Tactical Reconnaissance Group. In 1983, the mission again returned to Air Defense and the unit renamed to the 148<sup>th</sup> Fighter Interceptor Group.

In 1992, the 148<sup>th</sup> Fighter Interceptor Group and the 179<sup>th</sup> Flying Squadron were renamed in accordance with USAF policy to the 148<sup>th</sup> Fighter Group and the 179<sup>th</sup> Fighter Squadron, respectively. In 1995, the unit was officially designated as the 148<sup>th</sup> FW. In 1999, the 148<sup>th</sup> FW transitioned from a mission in Air Superiority to the General Purpose mission, training in all essentials of air to ground tactics and in the delivery of guided and unguided bombs. The General Purpose Mission included air superiority and air defense functions and officially covered “any mission the aircraft can accomplish, anywhere in the world.”

#### **2.1.5 Summary of Munitions and Explosives of Concern-Related Activities**

##### **2.1.5.1 Explosive Ordnance Disposal Range**

The USAF used the EOD Range from 1960 to 1994 for OB/OD training activities, and to detonate and dispose of munitions. Interviews and a search of historical records conducted during the CSE Phase I did not reveal a detailed listing of munitions or explosives used or disposed of at the EOD Range. Munitions that may have been used for training or disposed of at the EOD Range include detonators, blasting caps, fuzes, boosters, bursters, primers, squibs, bulk high explosives, demolition charges, and pyrotechnics (flares, signals, simulators, etc.). The range was closed in 1994.

##### **2.1.5.2 Lead Contaminated Soils Area**

During the construction of the Northwest Airlines Maintenance Facility in 1995/96, berm soil from the Small Arms Range was removed during redevelopment, and transported and placed in piles on plastic sheeting in what is now known as the LCSA. Due to the use of the Small Arms Range for pistol and rifle training, the soil in the LCSA may contain spent small caliber rounds; however, none were encountered during CSE Phase II soil pile boring operations. MC sampling and analysis during the CSE Phase II field investigations confirmed the suspected presence of metals contamination in the soil piles.

#### **2.1.6 Topography**

The area around Duluth ANGB lies at an approximate elevation of 1,400 feet above mean sea level (msl), which is slightly higher than Minnesota’s average elevation of 1,200 feet above msl. Several small hills and valleys surround the installation, but the area is relatively flat, with a relief of less than 50 feet within the installation. Elevations gradually decline toward Wild Rice Lake, located approximately 2 miles to the north at an elevation of approximately 1,375 feet above msl. Elevations steeply decline toward Lake Superior, located approximately 6 miles to the southeast, near downtown Duluth, at an elevation of approximately 602 feet above msl (United States Geological Survey [USGS], 1993).

### **2.1.7 Geology**

Glaciation formed the geology in the vicinity of Duluth ANGB. The facility is located in the Duluth Complex, which is primarily composed of metamorphic and igneous rock dating to the Mesoproterozoic Era. The facility itself is located over a large section of rock with intrusions of trochilotic and gabbroic rocks. Immediately to the southeast, these formations give way to anorthositic gabbro and other related rocks. Near the coast of Lake Superior, the Beaver Bay Complex and related subvolcanic mafic rocks (including olivine gabbro in dikes and sills) take over with influence from the North Shore Volcanic Group, which includes basalt, andesitic basalt, rhyolite, and related volcanogenic interflow sedimentary rocks. This formation also includes basal quartz arenite in the vicinity of Duluth (Morey and Meints, 2000).

### **2.1.8 Hydrogeology**

During advance and retreat of glaciers, at least three phases of Lake Superior existed, giving rise to stratigraphy consisting of thin shallow water lacustrine sequences four to seven meters thick. These sequences are interbedded with layers of lacustrine clays or clayey tills up to 40 meters thick. Shallow-water sands are hydraulically connected to sediments of a large moraine complex that is primarily composed of coarse outwash; recharge and conductivity in the area are sufficient to result in artesian conditions in the Lake Duluth sedimentary sequences. The potentiometric surface of the confined aquifers exceeds surface elevations (which slope toward the axis of the Lake Duluth Basin) throughout much of the central portions of the former lake basin. Groundwater seeps are common in this area, concentrated where the potentiometric surface intersects the ground surface (Mooers, 2005). The depth to groundwater in the vicinity of Duluth ANGB varies from 2 feet to 35 feet.

### **2.1.9 Surface Water Hydrology**

Hydrology in the vicinity of Duluth ANGB was evaluated as part of CSE Phase I investigation. No previous detailed reports regarding surface water features in the area were identified. Wild Rice Lake is the largest body of water near the facility and is located approximately 2 miles to the north. During CSE Phase I activities, more than 15 small lakes within 2 miles of the facility were identified through aerial photographs (URS, 2007).

Surface runoff to the north and west of Duluth ANGB enters a manmade storm-water drainage system, which discharges into a large detention basin pond on the north side of the main east-west runway. The detention pond discharges to Beaver Creek, a tributary of Wild Rice Lake. Surface runoff from the south and east flows southeast towards Lake Superior.

### **2.1.10 Current and Future Land Use**

Both the EOD Range and the LSCA are currently flat, primarily grassy areas located on a restrictive easement owned by the Duluth Airport Authority, outside of the airport security fencing. The restrictive easement prevents development at the EOD Range and LCSA due to their close proximity to the active Munitions Storage Area. These areas will continue to function as buffer area around the Munitions Storage Area in the future with land use restrictions under which no development can occur.

## **2.2 Previous Removal Actions**

No previous removal actions are known to have occurred at the EOD Range or LCSA.

## **2.3 Source, Nature, and Extent of Contamination**

Investigation of the source, nature, and extent of potential MEC and MC present at the EOD Range and LCSA were completed during the CSE Phase I and II investigation efforts and results presented in the *CSE Phase I and II Reports* (URS, 2007 and AECOM, 2010). The reader is referred to these documents for

detailed information on the field investigation programs and results obtained during these investigations. The following subsections summarize the available source, nature and extent information for the EOD Range and LCSA.

### 2.3.1 Explosive Ordnance Disposal Range

Interviews and a search of historical records conducted during the CSE Phase I did not reveal a detailed record of munitions or explosives used or disposed of at the EOD Range during OB/OD activities. Potential MEC materials used at this range may have included detonators, blasting caps, fuzes, boosters, bursters, primers, squibs, bulk high explosives, demolition charges, and pyrotechnics (flares, signals, simulators, etc.) (URS, 2007). Special consideration MEC (i.e., chemical warfare materiel [CWM], depleted uranium, etc.) was not used at Duluth ANGB.

During the CSE Phase II, DGM was conducted across the 0.3-acre EOD Range and located a total of 19 anomalies as potential MEC items. These target anomalies were identified on the EM survey results shown in Figure 2-3. MEC may exist in subsurface soils at the former range due to past burial practices or detonation events. Two data gaps were identified in the EM survey results. These data gaps are labeled on Figure 2-3 and include the OB/OD detonation pit feature in the center of the survey area that was circumvented during the EM survey and an area masked by a significant EM survey response from a buried metal culvert on the west side of the survey area. These data gaps can be filled/surveyed using real-time analog survey equipment when removal activities are implemented.

### 2.3.2 Lead Contaminated Soils Area

Soils from the Duluth ANGB Small Arms Range target berm were removed, transported, and staged in piles on plastic sheeting in the southern portion of the LCSA. The Small Arms Range was used for pistol and rifle training. During the CSE Phase II, both XRF screening and laboratory analysis of soil samples collected from in and around the LCSA soil piles were used to evaluate the nature and extent of potential MC contamination. Investigation results found arsenic, copper, iron, and lead concentrations present in one or more LCSA soil pile samples above regional background and MPCA Tier I SRV screening levels (Table 2-1). The background concentrations listed in Table 2-1 are regional values; site-specific background concentrations could be higher. Sampling results for detected metals from the soil piles are presented in Figure 2-4. As shown on the figure, lead was found to be the primary metal of concern. No metals concentrations were found above screening levels in the native soils below the soil piles likely due to the plastic sheeting under the soil piles. Based on the CSE Phase II characterization results, the lateral extent of metals contaminated soil at the LCSA corresponds to the limits of the soil piles located within the LCSA boundary (see Figure 2-4). The estimated total volume of metals contaminated soil in the soil piles at the LCSA is approximately 980 cubic yards.

**Table 2-1: Minnesota Pollution Control Agency Tier I Soil Reference Values (SRVs) and Background Concentrations**

Metal	MPCA Tier I SRV (mg/kg)	Regional Background Concentration <sup>1</sup> (mg/kg)
Arsenic	9	4.1
Copper	100	20
Iron	9,000	30,000
Lead	300	15

**Notes:**

MPCA = Minnesota Pollution Control Agency

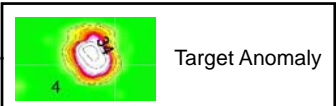
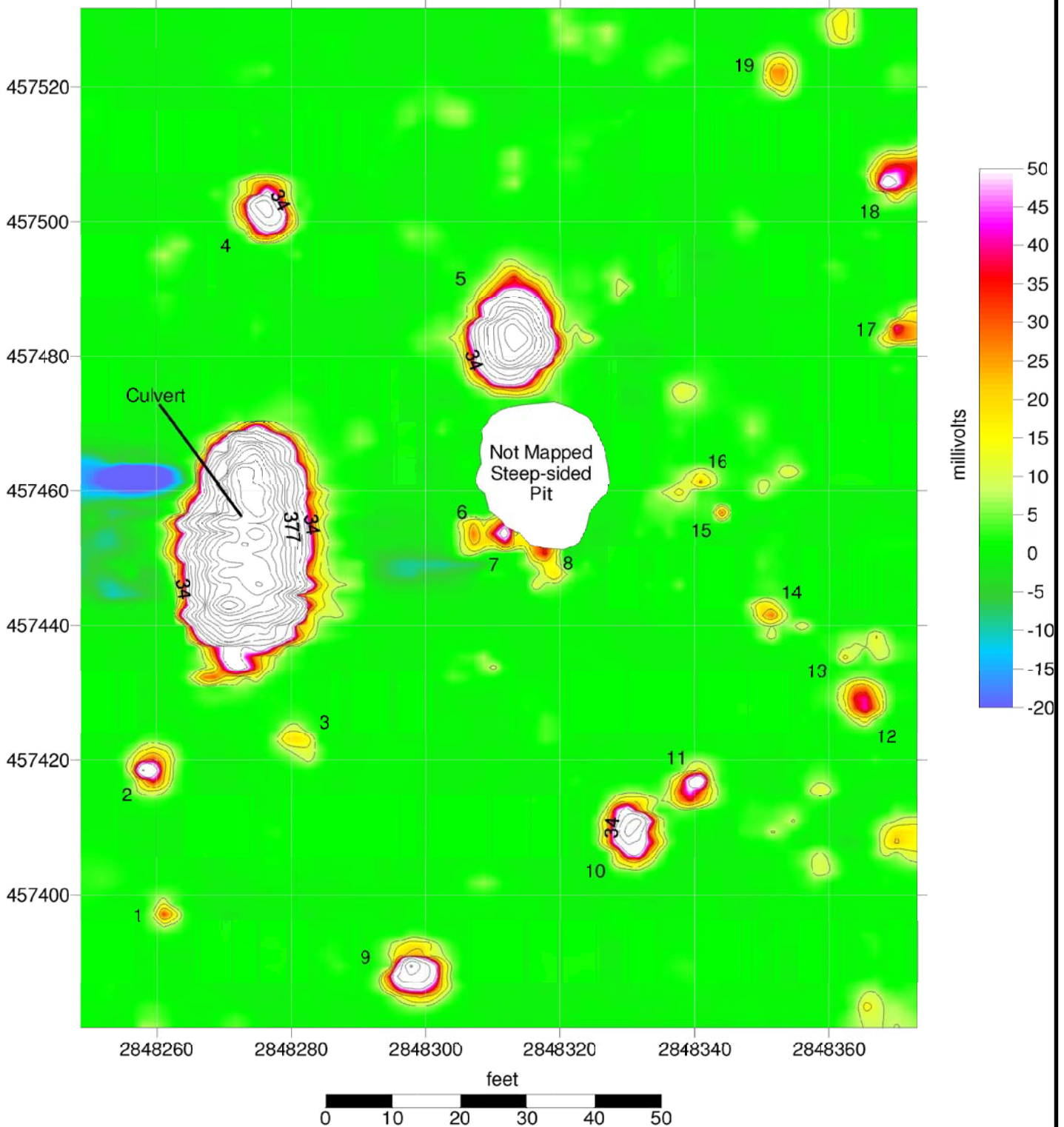
SRV = Soil Reference Value

mg/kg = milligrams per kilogram

<sup>1</sup>Source: Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States (Shacklette et al., 1984)

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. Geophysical Survey Results  
(SR502) - Electromagnetic Data



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Duluth ANGB EE/CA  
FIGURE 2-3  
EOD Range EM Results Data, December 2008

CONTRACT NO DAHA92-02-D-0012	TASK NO 0077
DESIGNED BY K. Weber	DRAWN BY K. Weber
CHECKED BY A. Dellens	DATE March 2009
SCALE see figure	SHEET 1 of 1

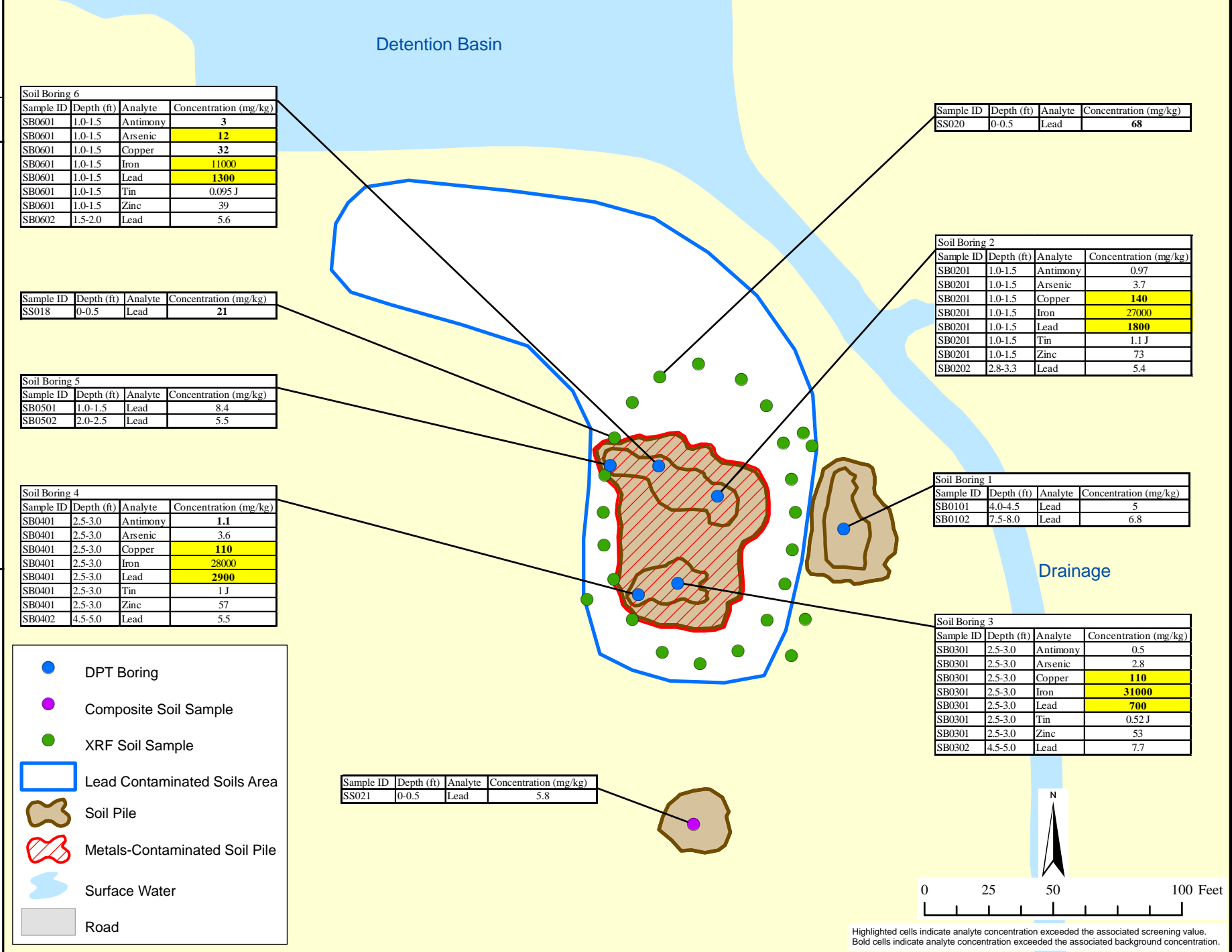
Fig2-3\_Geophys\_Survey\_Results.mxd

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CONTRACT NO. DAHA92-02-D-0012  
 DESIGNED BY K. Weber  
 CHECKED BY A. DeBari  
 SCALE 1"=50'  
 SHEET 1 of 1

FIGURE 2-4  
 December 2008

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Highlighted cells indicate analyte concentration exceeded the associated screening value.  
 Bold cells indicate analyte concentration exceeded the associated background concentration.

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## **2.4 Analytical Data**

XRF, laboratory, and/or geophysical data were collected at the EOD Range and LCSA during the CSE Phase II investigation. The sampling and survey programs, laboratory and geophysical data, data validation reports, and summary of data results are presented in the CSE Phase II Report (AECOM, 2010). The reader is referred to this document for a detailed discussion of the field investigations and resulting data.

## **2.5 Streamlined Risk Evaluation**

The following streamlined risk evaluation summarizes the existing threats for the EOD Range and LCSA by identifying the nature, extent, and location of the release, the pertinent exposure pathways of contamination migration, and the human and/or ecological receptors that may be exposed to the contamination.

### **2.5.1 Explosive Ordnance Range**

Due to historical OB/OD operations at the EOD Range, there is the potential for subsurface MEC to be present in the former 0.3-acre range area. Based on the CSE Phase II EM geophysical survey, a total of 19 subsurface anomalies were identified within the site as potential MEC items (see Figure 2-3). If MEC, these items present a potential explosive hazard and risk to human health. Potential current/future human receptor (including workers, recreational users, and residents) contact or exposure to this explosive hazard could occur through excavation activities or eventual exposure at the ground surface due to natural migration of the items upward from frost heave or erosion processes.

### **2.5.2 Lead Contaminated Soils Area**

The LCSA soil piles contain metals concentrations above MPCA Tier I SRVs including arsenic, copper, iron, and lead. Figure 2-4 illustrates the soil sample locations and detected metals results, and the estimated lateral extent of the impacted soil piles. The surface soil piles at the LCSA are considered to provide a complete pathway for MC exposure to human and ecological receptors. Potential current/future human receptors include workers, recreational users, and residents. Potential ecological receptors include plants, invertebrates, herbivores, omnivores, and carnivores.

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### 3.0 Identification of Removal Action Objectives

This section identifies the removal action scope, schedule, planned removal activities, and associated ARARs for the EOD Range and LCSA.

#### 3.1 Removal Action Scope and Goals

The scope of work for this proposed action consists of the removal of potential subsurface MEC hazards at the EOD Range and removal of soil hazards at the LCSA. The nature and extent of these hazards have been defined based on site data collected during the CSE Phase II, as shown in Figures 2-3 and 2-4. The removal action goal is to effect a reduction in hazards associated with contact with unexploded ordnance (UXO) or contaminated soil.

#### 3.2 Removal Schedule

The tentative schedule for the EOD Range and LCSA removal actions is presented as follows:

Activity	Schedule Completion Date
Final EE/CA	10-Nov-2010
EE/CA Public Notice and 30-Day Comment Period	22-Nov-2010 to 21-Dec-2010
Signed Action Memorandum	21-Jan-2010
Final Explosives Safety Submission	11-Feb-2011
Final NTCRA Work Plan	8-March-2011
Perform NTCRA Field Activities	2-May-2011 to 10-Jun-2011
Final NTCRA Report	24-Jun-2011

These dates may be adjusted based on the public review and comment process and cold weather restrictions.

#### 3.3 Planned Removal Activities

Any removal activities at the EOD Range that involve the physical removal of MEC will be conducted in accordance with approved Department of Defense (DoD) and Air Force procedures. Any removal activities at the LCSA that involve the physical removal of soil will be performed utilizing conventional excavation techniques. Details concerning removal action operating procedures will be provided in the NTCRA Work Plan for review and approval.

#### 3.4 Applicable or Relevant and Appropriate Requirements

The ARARs addressing the EOD Range and LCSA removal activities are identified in this section. ARARs include standards, requirements, criteria, or limitations established under federal environmental law or any more stringent standards, requirements, criteria, or limitations promulgated in accordance with a state environmental statute.

The NCP (40 CFR 300.5) defines “applicable” requirements as: “those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility citing laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA

site.” Only those promulgated State standards that are identified by a State in a timely manner and that are equally or more stringent than Federal requirements may be applicable.

The NCP, (40 CFR 300.5) further defines “relevant and appropriate” requirements as: “those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility citing laws that, while not ‘applicable’ to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.” Like “applicable” requirements, the NCP also provides that only those promulgated State requirements that are identified in a timely manner and are more stringent than corresponding Federal requirements may be relevant and appropriate.

ARARs can be classified into the following three categories:

- Chemical-specific ARARs are generally health- or risk-based values which, when applied to site-specific conditions, result in numerical values. These values establish the acceptable concentration of a chemical that may be found in, or discharged to, the ambient environment.
- Location-specific ARARs set restrictions on the types of activities that can be performed based on site-specific characteristics or location. Alternative actions may be restricted or precluded based on proximity to wetlands or floodplains, presence of natural or cultural resources, or to man-made features such as local historic buildings.
- Action-specific ARARs are generally technology or activity-based requirements on actions taken with respect to hazardous substances or pollutants. These requirements are triggered by the particular activities that are selected to accomplish a remedy. Thus, action-specific requirements in themselves do not determine the removal alternative; rather, they indicate how a selected alternative must be achieved (through design, operation, or management).

In addition to ARARs, to-be-considered (TBC) guidance associated with proposed future activities will also be considered. TBC guidance includes non-promulgated advisories, proposed rules, and criteria or guidance documents issued by Federal or State entities. This guidance is to be considered when determining protective cleanup levels where no ARARs exist or where ARARs are not sufficiently protective of human health and the environment.

Based on the contaminants present, the locations of the removal actions, and the potential removal actions themselves, the potential ARARs and TBCs for removal activities at the EOD Range and LCSA are identified in the following subsections.

### **3.4.1 Chemical-Specific Applicable or Relevant and Appropriate Requirements**

No chemical-specific ARARs have been identified for MEC or metals in soils for the EOD Range and LCSA removal actions. Since no chemical-specific ARARs have been identified, chemical-specific TBC guidance for soils has been considered (see Subsection 3.4.4).

### **3.4.2 Location-Specific Applicable or Relevant and Appropriate Requirements**

The following location-specific Federal and State ARARs have been identified:

- Endangered Species Act of 1973; 16 USC 1533; 50 CFR 17.11, 40 CFR 6.302(h);
- Fish and Wildlife Coordination Act; 16 USC 662-664; 33 CFR 323; 40 CFR 6.302(g);
- Clean Water Act; 33 USC 1341, Section 401; 40 CFR 230-231;



- Floodplain Management; 40 CFR 6.302 9(b) and Appendix A;
- Executive Order on Floodplain Management; Executive Order 11988, Section 2;
- Executive Order Protecting of Wetlands; Executive Order 11990, Section 2; 40 CFR 6.302(a); and
- Statement of Procedures on Floodplain Management and Wetlands Protection; 40 CFR Part 6, Appendix A.
- Minnesota Surface Water Rules; Minnesota Rules Chapter 7050

Final location-specific ARARs will be determined in consultation with the MPCA and other appropriate Federal and State agencies that are responsible for administration of programs that implement the ARARs.

### **3.4.3 Action-Specific Applicable or Relevant and Appropriate Requirements**

The following potential action-specific Federal and State ARARs have been identified:

- CERCLA; 42 USC 9601
- NCP; 40 CFR 300
- Hazardous Waste Management; 40 CFR 260-276;
- United States Department of Transportation Hazardous Materials Regulations; 49 CFR 171-173 and 177;
- Clean Air Act; Sections 107 - 112
- Occupational Safety and Health Standards for General Industry; 29 CFR 1910;
- Occupational Safety and Health Regulations for Construction; 29 CFR 1926;
- Water Pollution Control Act; Minnesota Statute 115;
- Onsite Hazardous Waste Generation; Minnesota Rules Ch. 7045.0102-.0155;
- General Requirements for Management of Solid Waste; Minnesota Rules Ch. 7035.0300-.0605;
- Certification of Environmental Laboratories; Minnesota Statute 144.97-.98; Minnesota Rules Ch. 4740;
- Worker Protection; Minnesota Rules Ch. 5205;
- DoD Ammunition and Explosives Safety Standards; DoD 6055.09-STD;
- Air Force Manual 91-201, Explosives Safety Standards;
- United States Army Corps of Engineers (USACE) Safety and Health Requirements Manual, EM 385-1-1;
- USACE Explosives Safety and Health Requirements Manual, EM 385-1-97;
- USACE Safety and Health Requirements for MEC Operations, ER 385-1-95;
- Minnesota Environmental Response and Liability Act (MERLA); Minnesota Rules Chapter 7044;
- Minnesota Groundwater Control Act; Minnesota Statute 103H;

- Minnesota Underground Waters; Minnesota Rules Chapter 7060;
- Minnesota Solid Waste Rules; Minnesota Rules Chapter 7035; and
- Minnesota Hazardous Waste Rules; Minnesota Rules Chapter 7045.

Final action-specific ARARs will be determined in consultation with the MPCA and other appropriate Federal and State agencies that are responsible for administration of programs that implement the ARARs.

#### **3.4.4 To-Be-Considered Guidance**

The following TBC guidance has been identified:

- MPCA Tier I and II SRVs (MPCA, 1999);
- MPCA Tier I and II Soil Leaching Values (SLVs) (MPCA, 2005);
- Minnesota Health Risk Limits; Minnesota Rules Part 4717;
- MPCA Risk Based Site Evaluation Guidance Documents;
- USACE Military Munitions Response Actions, EM 1110-1-4009; and
- USACE Basic Safety Concepts and Considerations for OE Operations, EP 385-1-95a.

Identification and evaluation of additional ARARs and TBC guidance will be an iterative process, which will be performed throughout the life of the project and particularly when evaluating and recommending an appropriate removal/remedial response.

## 4.0 Identification and Analysis of Removal Action Alternatives

This section identifies the alternatives considered to address the hazards present at the Duluth ANGB EOD Range and LCSA sites. These alternatives are evaluated in this section using the alternative technology selection criteria established by the NCP for evaluating alternatives (effectiveness, implementability, and cost).

The alternatives considered for the EOD Range consist of the following:

- Alternative One: No Action;
- Alternative Two: Institutional Controls; and
- Alternative Three: MEC Removal.

The alternatives considered for the LCSA consist of the following:

- Alternative One: No Action;
- Alternative Two: Soil Cover and Institutional Controls; and
- Alternative Three: Soil Removal.

### 4.1 Explosive Ordnance Disposal Range Alternative Identification and Analysis

#### 4.1.1 Alternative One: No Action

The No Action Alternative involves no action to be performed under current or future land-use scenarios. No removal action is performed at the site and no institutional controls such as fencing, warning signs, or land use restrictions are included in the No Action Alternative. This alternative is included as a baseline of comparison to other alternatives.

#### 4.1.2 Alternative Two: Institutional Controls

The Institutional Controls Alternative includes a land use restriction specified in the property deed. The deed restriction would state that no access to or development of the property is allowed unless it can be shown that the risk to receptors is within an acceptable range as approved by State and Federal agencies. A description of the institutional controls for the EOD Range is discussed below.

**Access and Land-Use Restrictions.** Under this alternative, land-use restrictions would include the prohibition of access to the MRA without escort by a qualified UXO technician due to potential MEC hazards. Additionally, no development or excavation in the MRA would be permitted without acceptable risk mitigation measures, including remediation of impacted soils, since MEC-impacted soils would be left in place. A description of the potential MEC present at the site and these site restrictions would be incorporated into any real property documents if the property were to transfer ownership.

**Five-Year Reviews.** Since MEC hazards would remain at the site, 5-year reviews are included to ensure that the deed restrictions remain effective in the future. Five-year reviews are required by CERCLA for sites in which hazardous substances, pollutants, or contaminants that may pose a threat to human health or the environment would remain. While MEC has not been defined as a hazardous waste and the cleanup at the EOD Range does not fall directly under the jurisdiction of CERCLA, the ANG has elected to evaluate the site in a manner consistent with CERCLA. Therefore, it is assumed that 5-year reviews would be necessary. Although this alternative does not allow for unrestricted use and exposure, all

available data would be analyzed as part of the 5-year review process to determine whether additional remedial actions or site controls are required.

#### **4.1.3 Alternative Three: Munitions and Explosives of Concern Removal**

In this alternative, all 19 target anomalies identified during the CSE Phase II geophysical mapping as potential MEC items would be removed from the subsurface. In addition to removal of these DGM target anomalies, a real-time analog geophysical survey using a hand-held magnetometer (aka “mag and dig” approach) would also be conducted to remove any potential MEC anomalies at the OB/OD pit area and the drainage culvert where DGM was not performed or effective. A description of the MEC Removal Alternative components for the EOD Range is discussed below.

**Work Plans/Reporting.** The contractor would prepare site-specific work plans prior to excavation activities that would include technical and field procedures, quality control, and health and safety components. The plans would be reviewed and approved by the ANG, Duluth ANGB, and regulatory agencies prior to removal activities. The estimated time for completion of these plans is 3 months. This includes incorporation of review comments and revisions.

After the removal action has been completed and the final inspection approved by the ANG and regulatory agencies, an After Action Report would be completed. The report would include site drawings, MEC data, geographic information system (GIS) information, geophysical data, copies of all manifests, and a detailed narrative of the removal action. The completed draft Report would be submitted to the ANG, Duluth ANGB, and regulatory agencies for review and comment. Once all regulatory agency comments have either been resolved or incorporated into the report, the Final After Action Report would be issued.

**Site Mobilization and Set-up.** To enable the startup of MEC removal operations at the EOD Range, site mobilization and set-up would consist of the following activities:

- Mobilization of personnel, equipment, and supplies to the project site. A total of five personnel will mobilize to the site including the following: Project Engineer, Project Geophysicist, UXO Safety Officer (UXOSO)/Quality Control (QC) Officer, Senior UXO Supervisor (SUXOS), UXO Technician III, and UXO Technician II. All UXO personnel will meet Department of Defense Explosives Safety Board (DDESB) Technical Paper (TP) 18 qualifications. Equipment and supplies will include, but not be limited to, geophysical and survey equipment, mini excavator, hand tools, and health and safety supplies.
- Site orientation, training, and equipment inspection and testing.
- Reacquisition and marking of target anomalies and areas requiring mag and dig.

**MEC Excavation and Disposal.** After the target anomalies and areas requiring mag and dig are located and marked in the field, removal activities will begin. MEC removal operations will be conducted in accordance with applicable DoD, Air Force, and Army requirements and guidance including, but not limited to, DDESB 6055.09-STD, Air Force Manual 91-201, EM385-1-1, EM 385-1-97, ER385-1-95, EM 1110-1-4009, and EP 385-1-95a previously identified in Section 3.4, ARARs.

Prior to intrusive activities, a safety exclusion zone will be established based on the munition with greatest fragmentation distance (MGFD) that could be reasonably encountered at the site. This MGFD will be identified in the approved Explosive Safety Submission (ESS) for the removal action. Only essential personnel will be allowed within the exclusion zone during intrusive and disposal operations.

Excavation of anomalies will be performed manually by the UXO team consisting of a UXO Technician III and Technician II using hand shovels. For anomalies deeper than 2 feet below ground surface,

mechanical excavation using a mini excavator may be used to excavate to within 1 foot of anomalies after which hand excavation will be performed.

Once the anomaly source is located, it will be inspected to determine its identity and the hazards associated with the item, if any. If material potentially presenting an explosive hazard (MPPEH) is identified, the item will be left in place, marked, and location recorded. The contractor will inspect and explosively dispose of all MPPEH in accordance with applicable DoD/Army requirements.

All munitions debris (MD) that is inspected and certified free of explosives hazards and cultural debris recovered during the removal action will be staged daily at a central collection area. MD will be stored in a lockable container until it is removed from the base.

To confirm that MC have not been released to the environment at the locations of recovered MPPEH/MD items, the contractor will collect soil samples from beneath each recovered munitions-related item for metals and explosives analyses. Details of this sampling and analysis program will be presented in the Work Plan.

**Site Restoration and Demobilization.** All excavation holes will be backfilled to the pre-existing grade with excavated soils. Additional soils may be brought on-site for backfill if required. If areas of significant disturbance occur, sediment and erosion control measures will be installed. Following successful site restoration, personnel and equipment will be demobilized from the site. The certified hazard-free MD and the cultural debris will be transported to a local scrap dealer for recycling.

#### **4.1.4 Evaluation of Effectiveness**

This section of the EE/CA evaluates each of the EOD Range alternatives for effectiveness. The effectiveness of an alternative refers to its ability to meet the remedial action objectives (RAOs). The effectiveness of the removal actions are discussed in the following subsections in terms of the overall protectiveness; compliance with ARARs; long-term effectiveness; reduction in toxicity, mobility, and volume; and short-term effectiveness.

##### **4.1.4.1 Overall Protection of Human Health and the Environment**

The No Action Alternative involves no action to prevent unacceptable human exposure to MEC, and therefore, does not meet the RAOs.

The Institutional Controls Alternative reduces the potential for human exposure to MEC by preventing access to the area without a qualified escort. Therefore, the Institutional Controls Alternative meets the RAOs.

The MEC Removal Alternative removes MEC from the EOD Range, and therefore reduces the explosive hazard to human receptors.

##### **4.1.4.2 Compliance with Applicable or Relevant and Appropriate Requirements**

The discussion of the compliance with ARARs evaluates the degree to which each alternative complies with chemical-, location- and action-specific ARARs discussed in Section 3.4.

Chemical-specific ARARs do not exist for MEC so alternative compliance is not applicable.

Location-specific ARARs that must be addressed are discussed in Section 3.4.2. All three alternatives would comply with the location-specific ARARs.

Action-specific ARARs that must be addressed are discussed in Section 3.4.3. The proposed design and operation of all three alternatives would meet these ARARs.

#### **4.1.4.3 Long-Term Effectiveness and Permanence**

The long-term effectiveness and permanence criterion evaluates the effectiveness of the alternative and assesses the risk from waste and residuals remaining at the conclusion of site activities. This criterion also evaluates whether the alternative contributes to future remedial objectives.

Over the long-term, the No Action Alternative would not be effective in reducing hazards associated with human contact with MEC present at the EOD Range.

For the Institutional Controls Alternative, the actions implemented would be effective in preventing human contact with MEC as long as the deed restrictions are enforced and complied with.

The MEC Removal Alternative would be effective in eliminating detectable subsurface MEC hazards from the EOD Range. The removal of MEC would significantly reduce or potentially eliminate receptor exposure to MEC hazards.

#### **4.1.4.4 Reduction of Toxicity, Mobility, or Volume through Treatment**

This criterion evaluates the treatment process employed and the materials it will treat. In addition, the quantity of materials treated, the degree to which the toxicity, mobility, and volume are reduced, and the degree to which the treatment is irreversible are evaluated.

Since no treatment process is performed for the No Action or Institutional Controls Alternatives, there is no reduction in the toxicity, mobility, or volume of contaminants. The MEC Removal Alternative provides for the reduction of the MEC hazard through excavation, explosive destruction, and off-site MD disposal.

#### **4.1.4.5 Short-Term Effectiveness**

The short-term effectiveness criterion addresses the effects of the alternative during implementation before the RAOs have been met. Alternatives are also evaluated with respect to their effects on human health and the environment following implementation. Lastly, the time until the response action is complete is also evaluated.

The short-term effectiveness of the No Action and Institutional Controls Alternatives is not applicable because there are no site activities performed, other than administrative activities for the Institutional Controls Alternative.

Potential short-term risks to workers, the environment, and the community during implementation of the MEC Removal Alternative would be reduced by the use of safe operating procedures consistent with applicable DoD, Air Force, and Army requirements and guidance. The methodologies to safely perform these activities will be described in site-specific work plan and health and safety plan. Short-term risks to the public will be minimized through the implementation of safety exclusion zones during intrusive and disposal activities.

#### **4.1.5 Evaluation of Implementability**

This section of the EE/CA evaluates each of the EOD Range alternatives for implementability. The implementability criterion addresses the technical and administrative feasibility of implementing an alternative, the availability of various services and materials required during its implementation, and regulatory and community acceptance.

#### **4.1.5.1 Technical Feasibility**

There are no technical feasibility concerns associated with the No Action Alternative because there are no site activities performed.

The administrative feasibility of the Institutional Controls Alternative is diminished since the property is owned by the Duluth Airport Authority and not the ANG. The Duluth Airport Authority would have to voluntarily implement and enforce the institutional controls.

The MEC Removal Alternative employs proven technologies and approaches that are routinely implemented for munitions response projects. Therefore, this alternative is technically feasible.

#### **4.1.5.2 Administrative Feasibility**

There are no administrative feasibility concerns associated with the No Action Alternative because there are no actions performed.

The administrative feasibility of the Institutional Controls Alternative is diminished since the property is owned by the Duluth Airport Authority and not the ANG. The Duluth Airport Authority would have to voluntarily implement and enforce the institutional controls.

The MEC Clearance Alternative is administratively feasible.

#### **4.1.5.3 Availability of Services and Materials**

There are no availability of services and materials concerns associated with the No Action Alternatives because there are no site activities performed.

Services and materials for the Institutional Controls Alternative may be somewhat limited since the property is owned by the Duluth Airport Authority and not the ANG. The Duluth Airport Authority would have to voluntarily implement and enforce the institutional controls.

Services and materials for the MEC Removal Alternative are readily available.

#### **4.1.5.4 Regulatory Acceptance**

Regulatory representatives have reviewed the analysis of removal alternatives and provided formal comments and acceptance of the EE/CA. This regulatory review is a required component of the CERCLA cleanup process.

#### **4.1.5.5 Community Acceptance**

Consistent with the CERCLA process, a 30-day public comment period and public meeting is planned to seek community review and acceptance of the recommended removal actions that are presented in the final EE/CA. An EE/CA notice of availability, which includes the identification of the public comment period and meeting, will be prepared and published in the Duluth Tribune.

#### **4.1.6 Evaluation of Cost**

This section of the EE/CA identifies the implementation cost of each of the EOD Range alternatives. Alternatives were costed based on a 12-month duration, assuming an annual cost for the 5-year review required for the Institutional Controls Alternative is equal to one fifth of the total cost. The No Action Alternative is the baseline against which the other alternatives were compared. As such, no costs are associated with the No Action Alternative. An interest rate of 5 percent was used to discount future costs in the 12-month present worth cost calculations.

#### 4.1.6.1 Institutional Controls Alternative Cost Estimate

- Capital Costs:
    - Access and Land-Use Restrictions = \$10,000
    - Total Capital Costs (including 8% Project Management and 30% Contingency) = \$13,800
  - Operations and Maintenance (O&M) Costs:
    - Annual Reporting = \$500
    - 5-Year Reviews (annual cost) = \$6,000
    - Total O&M Costs (including 8% Project Management and 30% Contingency) = \$8,970
- Total 12-Month Present Worth Costs: \$21,686

#### 4.1.6.2 MEC Removal Alternative Cost Estimate

- Capital Costs:
    - Work Plans/Reporting = \$21,000
    - Site Mobilization and Set-Up = \$8,000
    - MEC Clearance (including verification sampling and waste, transport, and disposal) = \$30,000
    - Site Restoration and Demobilization = \$9,000
    - Total Capital Costs (including 8% Project Management and 30% Contingency) = \$93,840
  - O&M Costs:
    - None (\$0)
- Total 12-Month Present Worth Costs: \$93,840

## 4.2 Lead Contaminated Soils Area Alternative Identification and Analysis

### 4.2.1 Alternative One: No Action

The No Action Alternative involves no action to be performed under current or future land-use scenarios. No removal action is performed at the site and no institutional controls such as fencing, warning signs, or land use restrictions are included in the No Action Alternative. This alternative is included as a baseline of comparison to other alternatives.

### 4.2.2 Alternative Two: Soil Cover and Institutional Controls

The Soil Cover and Institutional Controls Alternative includes the placement of a soil cover over the contaminated soil piles (including monitoring well installation) and a land use restriction specified in the property deed. The deed restriction would state that no access to or development of the property is allowed unless it can be shown that the risk to receptors is within an acceptable range as approved by State and Federal agencies. A description of the soil cover and institutional controls for the LCSA are discussed below.



**Work Plans/Reporting.** The contractor would prepare site-specific work plans prior to soil cover and monitoring well installation that would include technical and field procedures, quality control, and health and safety components. The plans would be reviewed and approved by the ANG, Duluth ANGB, and regulatory agencies prior to removal activities. The estimated time for completion of these plans is 3 months. This includes incorporation of review comments and revisions.

After the removal action has been completed and the final inspection approved by the ANG and regulatory agencies, an After Action Report would be completed. The report would include site drawings, soil data, GIS information, copies of all manifests, and a detailed narrative of the removal action. The completed draft report would be submitted to the ANG, Duluth ANGB, and regulatory agencies for review and comment. Once all regulatory agency comments have either been resolved or incorporated into the report, the Final After Action Report would be issued.

**Site Mobilization and Set-up.** To enable the startup of soil cover and well installation field operations at the LCSA, site mobilization and set-up would consist of the following activities:

- Mobilization of personnel, equipment, and supplies to the project site. A total of five personnel will mobilize to the site including the following: Project Engineer, Site Superintendent, Equipment Operator, Laborer, and Sampling Technician. Equipment and supplies will include, but not be limited to, an excavator, hand tools, and health and safety supplies.
- Site orientation, training, and equipment inspection and testing.
- Marking of contaminated soils areas requiring cover.

**Soil Cover.** A 3-foot-thick soil cover would be placed over top of the metals contaminated soil piles and vegetated with native grasses to prevent soil pile erosion and overland contaminant migration. Clean topsoil cover material would be obtained from an offsite source. Prior to soil cover placement, steel netting (e.g. chain-link fencing) would first be placed over the soil piles as a barrier to future ecological exposure [i.e., burrowing animals]).

**Access and Land-Use Restrictions.** Land-use restrictions would include the prohibition of access to the LCSA. Additionally, no development or excavation in the LCSA will be permitted without acceptable risk mitigation measures including remediation of impacted soils, since contaminated soils would be left in place. A description of the contamination present at the site and the site restrictions would be incorporated into any real property documents if the property were to transfer ownership.

**Groundwater Monitoring.** Installation and sampling of monitoring wells would be necessary to evaluate whether or not the residual metals in the soil piles would leach into groundwater over time. A total of three monitoring wells would be installed down- and cross-gradient of the LCSA soil piles and sampled annually for metals.

**Five-year Reviews.** Since contaminated soils would remain at the site, 5-year reviews are included to ensure that the soil cover and deed restrictions remain effective in the future. Five-year reviews are required by CERCLA for sites in which hazardous substances, pollutants, or contaminants that may pose a threat to human health or the environment would remain. While the cleanup at the LCSA does not fall directly under the jurisdiction of CERCLA, the ANG has elected to evaluate the site in a manner consistent with CERCLA. Therefore, it is assumed that 5-year reviews would be necessary. Although this alternative does not allow for unrestricted use and exposure, all available data would be analyzed as part of the 5-year review process to determine whether additional remedial actions or site controls are required.

### 4.2.3 Alternative Three: Soil Removal

In this alternative, all metals contaminated soil identified during the CSE Phase II would be removed from the site. A description of the Soil Removal Alternative components for the LCSA is discussed below.

**Work Plans/Reporting.** The contractor would prepare site-specific work plans prior to excavation activities that would include technical and field procedures, quality control, and health and safety components. The plans would be reviewed and approved by the ANG, Duluth ANGB, and regulatory agencies prior to removal activities. The estimated time for completion of these plans is 3 months. This includes incorporation of review comments and revisions.

After the removal action has been completed and the final inspection approved by the ANG and regulatory agencies, an After Action Report would be completed. The report would include site drawings, soil data, GIS information, copies of all manifests, and a detailed narrative of the removal action. The completed draft Report would be submitted to the ANG, Duluth ANGB, and regulatory agencies for review and comment. Once all regulatory agency comments have either been resolved or incorporated into the report, the Final After Action Report would be issued.

**Site Mobilization and Set-up.** To enable the startup of soil removal operations at the LCSA, site mobilization and set-up would consist of the following activities:

- Mobilization of personnel, equipment, and supplies to the project site. A total of five personnel will mobilize to the site including the following: Project Engineer, Site Superintendent, Equipment Operator, Laborer, and Sampling Technician. Equipment and supplies will include, but not be limited to, an excavator, hand tools, and health and safety supplies.
- Site orientation, training, and equipment inspection and testing.
- Marking of contaminated soils areas requiring removal.
- Installation of sediment and erosion control measures

**Soil Removal.** After the contaminated soil areas are located and marked in the field, removal of the soil piles will begin. Initially, due to the elevated leachable lead level in the soils based on toxicity characteristic leaching procedure analysis, the soils will be treated by mixing in a stabilizing additive at the site to bind the lead in the soil matrix. After stabilization of the LCSA soils, confirmation samples will be submitted confirm that stabilized soils meet non-hazardous waste disposal requirements. The frequency of samples will be included in the NTCRA Work Plan. Following receipt of analytical results confirming that the stabilized soil meets non-hazardous waste criteria, the stabilized soil (approximately 980 cubic yards) will be direct loaded into a truck or a roll-off box for offsite transport as a solid waste to a local Subtitle D landfill. Proper manifesting of the waste will be coordinated with the base. After the metals contaminated soils have been removed, soil confirmation sampling for metals will be conducted from within the footprint of the former piles to ensure all contamination has been removed.

**Site Restoration and Demobilization.** All excavation areas will be backfilled to the existing grade, as needed, using soils from adjacent clean soil piles. Following successful site restoration, personnel and equipment will be demobilized from the site.

### 4.2.4 Evaluation of Effectiveness

This section of the EE/CA evaluates each of the LCSA alternatives for effectiveness. The effectiveness of an alternative refers to its ability to meet the RAOs. The effectiveness of the removal actions are discussed in the following subsections in terms of the overall protectiveness; compliance with ARARs; long-term effectiveness; reduction in toxicity, mobility and volume; and short-term effectiveness.

#### **4.2.4.1 Overall Protection of Human Health and the Environment**

The No Action Alternative involves no action to prevent unacceptable human and ecological exposure to metals contaminated soil, and therefore, does not meet the RAOs.

The Soil Cover and Institutional Controls Alternative reduces the potential for human and ecological exposure to metals contaminated soil by preventing exposure to the soil piles.

The Soil Removal Alternative removes metals contaminated soil from the LCSA, and therefore reduces hazards to human and ecological receptors.

#### **4.2.4.2 Compliance with Applicable or Relevant and Appropriate Requirements**

The discussion of the compliance with ARARs evaluates the degree to which each alternative complies with chemical-, location- and action-specific ARARs discussed in Section 3.4.

Chemical-specific ARARs do not exist for metals in soils so alternative compliance is not applicable.

Location-specific ARARs that must be addressed are discussed in Section 3.4.2. All three alternatives would comply with the location-specific ARARs.

Action-specific ARARs that must be addressed are discussed in Section 3.4.3. The proposed design and operation of all three alternatives would meet these ARARs.

#### **4.2.4.3 Long-Term Effectiveness and Permanence**

The long-term effectiveness and permanence criterion evaluates the effectiveness of the alternative and assesses the risk from waste and residuals remaining at the conclusion of site activities. This criterion also evaluates whether the alternative contributes to future remedial objectives.

Over the long term, the No Action Alternative would not be effective in reducing hazards associated with human and ecological contact with metals contamination present at the LCSA.

For the Soil Cover and Institutional Controls Alternative, the actions implemented would be effective in preventing human and ecological contact with metals contamination as long as contamination did not migrate to groundwater and the deed restrictions are enforced and complied with.

The Soil Removal Alternative would be effective in eliminating metals contamination at the LCSA. The removal of metals contaminated soil would eliminate potential receptor exposure to metals contamination.

#### **4.2.4.4 Reduction of Toxicity, Mobility, or Volume through Treatment**

This criterion evaluates the treatment process employed and the materials it will treat. In addition, the quantity of materials treated, the degree to which the toxicity, mobility, and volume are reduced, and the degree to which the treatment is irreversible are evaluated.

Since no treatment process is performed for the No Action Alternative, there is no reduction in the toxicity, mobility, or volume of contaminants.

For the No Action or Soil Cover and Institutional Controls Alternative, there would be a reduction in the mobility of metals contamination by reducing infiltration. However, there would be no reduction in the toxicity or volume of contaminants.

The Soil Removal Alternative provides for the reduction in toxicity, mobility, and volume of the metals contamination at the LCSA through treatment and offsite disposal.

#### **4.2.4.5 Short-Term Effectiveness**

The short-term effectiveness criterion addresses the effects of the alternative during implementation before the RAOs have been met. Alternatives are also evaluated with respect to their effects on human health and the environment following implementation. Lastly, the time until the response action is complete is also evaluated.

The short-term effectiveness of the No Action Alternative is not applicable because there are no site activities.

Potential short-term risks to workers, the environment, and the community during implementation of the Soil Cover and Institutional Controls, and Soil Removal Alternatives would be reduced by the use of safe operating procedures. The methodologies to safely perform these activities will be described in the site-specific work plan and health and safety plan.

#### **4.2.5 Evaluation of Implementability**

This section of the EE/CA evaluates each of the LCSA alternatives for implementability. The implementability criterion addresses the technical and administrative feasibility of implementing an alternative, the availability of various services and materials required during its implementation, and regulatory and community acceptance.

##### **4.2.5.1 Technical Feasibility**

There are no technical feasibility concerns associated with the No Action Alternative because there are no site activities performed.

The administrative feasibility of the Soil Cover and Institutional Controls Alternative is diminished since the property is owned by the Duluth Airport Authority and not the ANG. The Duluth Airport Authority would have to voluntarily implement and enforce the institutional controls.

The Soil Removal Alternative employs proven technologies and approaches that are routinely implemented for cover, and dig and haul removal projects. Therefore, this alternative is technically feasible.

##### **4.2.5.2 Administrative Feasibility**

There are no administrative feasibility concerns associated with the No Action Alternative because there are no actions performed.

The administrative feasibility of the Soil Cover and Institutional Controls Alternative is diminished since the property is owned by the Duluth Airport Authority and not the ANG. The Duluth Airport Authority would have to voluntarily implement and enforce the institutional controls.

The Soil Removal Alternative is administratively feasible.

##### **4.2.5.3 Availability of Services and Materials**

There are no availability of services and materials concerns associated with the No Action Alternative because there are no site activities performed.

Services and materials for the Soil Cover and Institutional Controls Alternative may be somewhat limited since the property is owned by the Duluth Airport Authority and not the ANG. The Duluth Airport Authority would have to voluntarily implement and enforce the institutional controls.

Services and materials for the Soil Removal Alternative are readily available.

#### **4.2.5.4 Regulatory Acceptance**

Regulatory representatives have reviewed the analysis of removal alternatives and provided formal comments and acceptance of the EE/CA. This regulatory review is a required component of the CERCLA cleanup process.

#### **4.2.5.5 Community Acceptance**

Consistent with the CERCLA process, a 30-day public comment period and public meeting is planned to seek community review and acceptance of the recommended removal actions that are presented in the final EE/CA. An EE/CA notice of availability, which includes the identification of the public comment period and meeting, will be prepared and published in the Duluth Tribune.

#### **4.2.6 Evaluation of Cost**

This section of the EE/CA identifies the implementation cost of each of the LCSA alternatives. Alternatives were costed based on a 12-month duration, assuming an annual cost for the 5-year review required for the Institutional Controls Alternative is equal to one-fifth of the total cost. The No Action Alternative is the baseline against which the other alternatives were compared. As such, no costs are associated with the No Action Alternative. An interest rate of 5 percent was used to discount future costs in the 12-month present worth cost calculations.

##### **4.2.6.1 Soil Cover and Institutional Controls Alternative Cost**

- Capital Costs:
  - Work Plans/Reporting = \$18,000
  - Site Mobilization and Set-Up = \$6,000
  - Install Soil Cover (including brush/tree clearing and consolidating/ shaping the fill area) = \$12,000
  - Access and Land-Use Restrictions = \$10,000
  - Groundwater Monitoring Well Installation = \$35,000
  - Site Restoration and Demobilization = \$5,000
  - Total Capital Costs (including 8% Project Management and 30% Contingency) = \$118,680
- O&M Costs:
  - Annual Groundwater Monitoring = \$2,500
  - Annual Reporting = \$500
  - 5-Year Reviews (annual cost) = \$6,000
  - Total O&M Costs (including 8% Project Management and 30% Contingency) = \$12,420

Total 12-Month Present Worth Costs (5% interest rate): \$130,509

#### 4.2.6.2 Soil Removal Alternative Cost

- Capital Costs:
  - Work Plans/Reporting = \$18,000
  - Site Mobilization and Set-Up = \$10,000
  - Soil Removal (excavation and on-site treatment of 980 cubic yards, including waste characterization and verification sampling) = \$239,000
  - Site Restoration and Demobilization = \$10,000
  - Total Capital Costs (including 8% Project Management and 30% Contingency) = \$382,260
- O&M Costs:
  - None (\$0)

Total 12-Month Present Worth Costs: \$382,260

## 5.0 Comparative Analysis of Removal Action Alternatives

The information presented on Tables 5-1 and 5-2 summarizes the relative advantages and disadvantages of each removal action alternative, as well as relative costs, for the EOD Range and LCSA, respectively. The data presented on these tables should be sufficient to make conclusions concerning the most appropriate alternatives for the EOD Range and LCSA.

**Table 5-1: EOD Range: Comparative Analysis Summary by Alternative**

Criterion	Alternative		
	No Action	Institutional Controls	MEC Removal
<b>Effectiveness</b>			
Protection of Human Health and the Environment	□ Not protective of human health; does not meet removal action objectives.	■ Protective of human health; meets removal action objectives.	■ Protective of human health; meets removal action objectives.
Compliance with ARARs	■ Meets some action or location-specific ARARs.	■ Meets some action and location-specific ARARs.	■ Meets all action and location-specific ARARs.
Long-term Effectiveness and Permanence	□ Not effective or permanent in the long-term.	■ Effective in the long-term as long as deed restrictions are complied with in the future. Not permanent.	■ Effective and permanent in the long-term because MEC hazards are removed from the site.
Short-Term Effectiveness	■ Because no action is taken, workers and the community would not be adversely affected in the short-term.	■ Deed restriction would not adversely affect workers and the community in the short-term.	■ MEC removal would not adversely affect workers and the community in the short-term.
Reduction of Toxicity, Mobility, or Volume	□ There is no reduction of toxicity, mobility, or volume.	□ There is no reduction of toxicity, mobility, or volume.	■ Toxicity, mobility, and volume of MEC is reduced as on-site treatment would occur.
<b>Implementability</b>			
Technical Feasibility	■ There are no technical feasibility concerns.	■ The technical feasibility of institutional controls is diminished since the property is not owned by the ANG.	■ There are no technical feasibility concerns.
Administrative Feasibility	■ There are no administrative feasibility concerns.	■ The administrative feasibility of institutional controls is diminished since the property is not owned by the ANG.	■ There are no administrative feasibility concerns.
Availability of Services and Materials	■ There are no availability concerns.	■ The DAA would have to voluntarily implement and enforce institutional controls.	■ There are no availability concerns.
Regulatory Acceptance	■ MPCA has reviewed and accepted these alternatives.	■ MPCA has reviewed and accepted these alternatives.	■ MPCA has reviewed and accepted these alternatives.
Community Acceptance	NE	NE	NE

**Table 5-1: EOD Range: Comparative Analysis Summary by Alternative (Continued)**

Criterion	Alternative		
	No Action	Institutional Controls	MEC Removal
<b>Cost</b>			
Capital	\$0	\$13,800	\$93,840
O&M (annual)	\$0	\$8,280	\$0
Present Worth	\$0	\$21,686	\$93,840

**Notes:**

ARAR – Applicable or Relevant and Appropriate Requirements

O&M – Operations and Maintenance

NE – Not evaluated at this time pending comments from the regulatory agencies and community.

O&M Costs were discounted using a 5 percent interest rate in the present worth calculations

- Legend:
- Meets Criteria
  - ▣ Somewhat Meets Criteria
  - Does Not Meet Criteria



Table 5-2: LCSA: Comparative Analysis Summary by Alternative

Criterion	Alternative		
	No Action	Soil Cover and Institutional Controls	Soil Removal
<b>Effectiveness</b>			
Protection of Human Health and the Environment	<ul style="list-style-type: none"> <li>□ Not protective of human health and environment; does not meet removal action objectives.</li> </ul>	<ul style="list-style-type: none"> <li>■ Somewhat protective of human health and environment by reducing contact with metals.</li> </ul>	<ul style="list-style-type: none"> <li>■ Protective of human health and environment; meets removal action objectives.</li> </ul>
Compliance with ARARs	<ul style="list-style-type: none"> <li>■ Meets some action and location-specific ARARs.</li> </ul>	<ul style="list-style-type: none"> <li>■ Meets some action and location-specific ARARs.</li> </ul>	<ul style="list-style-type: none"> <li>■ Meets all action and location-specific ARARs.</li> </ul>
Long-term Effectiveness and Permanence	<ul style="list-style-type: none"> <li>□ Not effective or permanent in the long-term.</li> </ul>	<ul style="list-style-type: none"> <li>■ Effective in the long-term as long as contamination does not migrate to groundwater and deed restrictions are complied with in the future. Not permanent.</li> </ul>	<ul style="list-style-type: none"> <li>■ Effective and permanent in the long-term because metals hazards are removed from the site.</li> </ul>
Short-Term Effectiveness	<ul style="list-style-type: none"> <li>■ Because no action is taken, workers and the community would not be adversely affected in the short-term.</li> </ul>	<ul style="list-style-type: none"> <li>■ Soil cover would not adversely affect workers and the community in the short-term.</li> </ul>	<ul style="list-style-type: none"> <li>■ Soil removal would not adversely affect workers and the community in the short-term.</li> </ul>
Reduction of Toxicity, Mobility, or Volume	<ul style="list-style-type: none"> <li>□ There is no reduction of toxicity, mobility, or volume.</li> </ul>	<ul style="list-style-type: none"> <li>■ There is no reduction of toxicity or volume. By limiting infiltration, mobility would be reduced.</li> </ul>	<ul style="list-style-type: none"> <li>■ Toxicity, mobility, and volume of metals is reduced as on-site treatment and off-site disposal would occur.</li> </ul>
<b>Implementability</b>			
Technical Feasibility	<ul style="list-style-type: none"> <li>■ There are no technical feasibility concerns.</li> </ul>	<ul style="list-style-type: none"> <li>■ The technical feasibility of institutional controls is diminished since the property is not owned by the ANG.</li> </ul>	<ul style="list-style-type: none"> <li>■ There are no technical feasibility concerns.</li> </ul>
Administrative Feasibility	<ul style="list-style-type: none"> <li>■ There are no administrative feasibility concerns.</li> </ul>	<ul style="list-style-type: none"> <li>■ There administrative feasibility of institutional controls is diminished since the property is not owned by the ANG.</li> </ul>	<ul style="list-style-type: none"> <li>■ There are no administrative feasibility concerns.</li> </ul>
Availability of Services and Materials	<ul style="list-style-type: none"> <li>■ There are no availability concerns.</li> </ul>	<ul style="list-style-type: none"> <li>■ The DAA would have to voluntarily implement and enforce institutional controls.</li> </ul>	<ul style="list-style-type: none"> <li>■ There are no availability concerns.</li> </ul>
Regulatory Acceptance	<ul style="list-style-type: none"> <li>■ MPCA has reviewed and accepted these alternatives.</li> </ul>	<ul style="list-style-type: none"> <li>■ MPCA has reviewed and accepted these alternatives.</li> </ul>	<ul style="list-style-type: none"> <li>■ MPCA has reviewed and accepted these alternatives.</li> </ul>
Community Acceptance	NE	NE	NE

**Table 5-2: LCSA: Comparative Analysis Summary by Alternative (Continued)**

Criterion	Alternative		
	No Action	Soil Cover and Institutional Controls	Soil Removal
<b>Cost</b>			
Capital	\$0	\$118,680	\$382,260
O&M (annual)	\$0	\$12,420	\$0
Present Worth	\$0	\$130,509	\$382,260

**Notes:**

ARAR – Applicable or Relevant and Appropriate Requirements

O&amp;M – Operations and Maintenance

NE – Not evaluated at this time pending comments from the regulatory agencies and community.

O&amp;M Costs were discounted using a 5 percent interest rate in the present worth calculations

Legend: ■ Meets Criteria  
 ■ Somewhat Meets Criteria  
 □ Does Not Meet Criteria

## **6.0 Recommendations**

### **6.1 Explosive Ordnance Disposal Range**

The recommended removal alternative for the MEC explosive hazard at the EOD Range is MEC Removal since it will provide a permanent remedy for the site by physically treating (via explosive detonation) and removing the hazard. This decision is based on the Administrative Record for the site and the comparative analysis presented in Section 5.

Conditions at the site meet the NCP Section 300.415(b)(2) criteria for a removal action and approval of the proposed removal action is recommended. The total project cost, if approved, is estimated to be \$93,840.

### **6.2 Lead Contaminated Soils Area**

The recommended removal alternative for the metals contaminated soil hazard at the LCSA is Soil Removal since it will provide a permanent remedy for the site by physically treating and removing the metals hazard at the site. This decision is based on the Administrative Record for the site and the comparative analysis presented in Section 5.

Conditions at the site meet the NCP Section 300.415(b)(2) criteria for a removal action and approval of the proposed removal action is recommended. The total project cost, if approved, is estimated to be \$382,260.

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# **Appendix A**

## **Definitions**

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## APPENDIX A– DEFINITIONS

**Anomaly** – Any identified subsurface mass that may be geologic in origin, unexploded ordnance (UXO), or some other man-made material. Such identification is made through geophysical investigation and reflects the response of the sensor used to conduct the investigation. (Handbook on the Management of Munitions Response Actions, Interim Final, EPA, May 2005)

**Anomaly Avoidance** – Techniques employed on property known or suspected to contain unexploded ordnance, other munitions that may have experienced abnormal environments (e.g., discarded military munitions), munitions constituents in high enough concentrations to pose an explosive hazard, or chemical agents, regardless of configuration, to avoid contact with potential surface or subsurface explosive or chemical agent hazards, to allow entry to the area for the performance of required operations. (AF Manual 91-201 and DOD 6055.9-STD)

**Applicable or Relevant and Appropriate Requirements** – Applicable requirements are cleanup standards, standards of control, and other substantive environmental protection requirements promulgated under Federal or state environmental law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at a CERCLA site. Relevant and appropriate requirements are cleanup standards that, while not “applicable,” address situations sufficiently similar to those encountered at a CERCLA site where their use is well suited to the particular site. (NCP, 40 CFR Part 300, July 2005)

**Chemical Agent** – An agent that, through its chemical properties, produces lethal or other damaging effects on human beings, except that such term does not include riot control agents, chemical herbicides, smoke, and other obscuration materials. This definition is based on the definition of “chemical agent and munition” in 50 U.S.C. 1521(j)(1).

**Chemical Warfare Materiel (CWM)** – Items generally configured as a munition containing a chemical compound that is intended to kill, seriously injure, or incapacitate a person through its physiological effects. CWM includes V- and G-series nerve agents or H-series (mustard) and L-series (lewisite) blister agents in other-than-munition configurations; and certain industrial chemicals (e.g., hydrogen cyanide [AC], cyanogen chloride [CK], or carbonyl dichloride [called phosgene or CG]) configured as a military munition. CWM does not include riot control devices, chemical defoliants and herbicides, industrial chemicals (e.g., AC, CK, or CG) not configured as a munition, smoke and other obscuration producing items, flame and incendiary producing items, or soil, water, debris or other media contaminated with low concentrations of chemical agents where no chemical agent hazards exist. (MRSPP, 32 CFR Part 179, October 2005)

CWM contains the following four subcategories:

- 1) CWM, explosively configured – All UXO or discarded military munitions (DMM) that contain a chemical agent fill and any explosive component. Examples are M55 rockets with CHEMICAL AGENT, the M23 VX mine, and the M360 105-mm GB artillery cartridge.
- 2) CWM, nonexplosively configured – All UXO or DMM that contain a CHEMICAL AGENT fill but that do not contain any explosive components. Examples are any chemical munitions that do not contain explosive components and VX or mustard agent spray canisters.
- 3) CWM, bulk container – All discarded (e.g., buried) non-munitions-configured containers of CHEMICAL AGENT (e.g., a ton container) and Chemical Agent Identification Sets (CAIS) K941, toxic gas set M-1 and K942, toxic gas set M-2/E11.
- 4) Chemical Agent Identification Sets (CAIS) – Military training aids containing small quantities of various CHEMICAL AGENT and other chemicals. All forms of CAIS are scored the same in this

rule, except CAIS K941, toxic gas set M-1; and CAIS K942, toxic gas set M-2/E1, which are considered forms of CWM, bulk container, due to the relatively large quantities of agent contained in those types of sets.

**Closed Range** – A military range that has been taken out of service as a range and that either has been put to new uses that are incompatible with range activities or is not considered by the military to be a potential range area. A closed range is still under the control of a Component. (MGDERP, September 2001)

**Defense Sites** – Locations that are or were owned by, leased to, or otherwise possessed or used by the Department of Defense. The term does not include any operational range, operating storage or manufacturing facility, or facility that is used for or was permitted for the treatment or disposal of military munitions. (10 U.S.C. 2710(e)(1))

**Department of Defense Components** – The Office of the Secretary of Defense, the Military Departments, the Defense Agencies, the Department Field Activities, and any other Department organizational entity or instrumentality established to perform a government function. (MRSP, 32 CFR Part 179, October 2005)

**Discarded Military Munitions (DMM)** – Military munitions that have been abandoned without proper disposal or removed from storage in a military magazine or other storage area for the purpose of disposal. The term does not include unexploded ordnance, military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed of consistent with applicable environmental laws and regulations. (10 U.S.C. 2710(e)(2))

**Explosive Ordnance Disposal (EOD) Personnel** – Active duty military personnel of any military service branch that are trained in the detection, identification, field evaluation, safe rendering, recovery, and final disposal of explosive ordnance and of other munitions that have become an imposing danger, for example, by damage or deterioration. (Handbook on the Management of Munitions Response Actions, Interim Final, EPA, May 2005)

**Facility** – A building, structure, or other improvement to real property, in relation to work classification. (10 U.S.C. 2801)

**Formerly Used Defense Site (FUDS)** – Facility or site (property) that was under the jurisdiction of the Secretary of Defense and owned by, leased to, or otherwise possessed by the United States at the time of actions leading to the contamination by hazardous substances. By the DoD Environmental Restoration Program policy, the FUDS program is limited to those real properties that were transferred from DoD control prior to 17 October 1986. FUDS properties can be located within the 50 States, District of Columbia, Territories, Commonwealths, and possessions of the United States. (FUDS Program Policy, ER 200 3-1, May 2004)

**Hazardous Substance** – (A) Any substance designated pursuant to Section 1321(b)(2)(A) of title 33, (B) any element, compound, mixture, solution, or substance designated pursuant to Section 9602 of this title, (C) any hazardous waste having the characteristics identified under or listed pursuant to Section 3001 of the Solid Waste Disposal Act [42 U.S.C. 6921] (but not including any waste the regulation of which under the Solid Waste Disposal Act [42 U.S.C. 6901 et seq.] has been suspended by Act of Congress), (D) any toxic pollutant listed under section 1317(a) of title 33, (E) any hazardous air pollutant listed under Section 112 of the Clean Air Act [42 U.S.C. 7412], and (F) any imminently hazardous chemical substance or mixture with respect to which the Administrator has taken action pursuant to Section 2606 of Title 15. The term does not include petroleum, including crude oil or any fraction thereof, which is not otherwise specifically listed or designated as a hazardous substance under subparagraphs (A) through (F) of this paragraph, and the term does not include natural gas, natural gas liquids, liquefied natural gas, or



synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas). (CERCLA, 42 U.S.C. § 9601 et seq.)

**Installation** (as defined by the RMIS Data Element Dictionary for a Federal Facility Identification [FFID]) – The FFID number is a unique identifier, assigned to an installation/property in RMIS. The 14-character aggregate string is used in RMIS as the key column for each data table and is used to track all associated records for each installation. An installation may have a single range or multiple ranges (and each range may have more than one site contained within its boundaries) and a single or multiple sites, not associated with a range. (Management Guidance for the Defense Environmental Restoration Program, September 2001)

**Land Use Controls (LUCs)** – Physical, legal, or administrative mechanisms that restrict the use of, or limit access to, contaminated property in order to reduce risk to human health and the environment. Physical mechanisms encompass a variety of engineered remedies to contain or reduce contamination and/or physical barriers to limit access to property, such as fences or signs. The legal mechanisms are generally the same as those used for institutional controls (ICs) as discussed in the NCP. ICs are a subset of LUCs and are primarily legal mechanisms imposed to ensure the continued effectiveness of land use restrictions imposed as part of a remedial decision. Legal mechanisms include restrictive covenants, negative easements, equitable servitudes, and deed notices. Administrative mechanisms include notices, adopted local land use plans and ordinances, construction permitting, or other existing land use management systems that may be used to ensure compliance with use restrictions. (MGDERP, September 2001)

**Material Potentially Presenting an Explosive Hazard (MPPEH)** – Material potentially containing explosives or munitions (e.g., munitions containers and packaging material; munitions debris remaining after munitions use, demilitarization, or disposal; and range-related debris), or material potentially containing a high enough concentration of explosives such that the material presents an explosive hazard (e.g., equipment, drainage systems, holding tanks, piping, or ventilation ducts that were associated with munitions production, demilitarization or disposal operations). Excluded from MPPEH are munitions within DoD's established munitions management system and other hazardous items that may present explosion hazards (e.g., gasoline cans, compressed gas cylinders) that are not munitions and are not intended for use as munitions. (DoD Instruction 4140.62, Management and Disposition of MPPEH, December 2004)

**Military Installation** – A base, camp, post, station, yard, center, or other activity under the jurisdiction of the Secretary of a Military Department, or, in the case of an activity in a foreign country, under the operational control of the Secretary of a military department or the Secretary of Defense, without regard to the duration of operational control. (10 U.S.C. 2801)

**Military Munitions** – All ammunition products and components produced for or used by the Armed Forces for national defense and security, including ammunition products or components under the control of the Department of Defense, the Coast Guard, the Department of Energy, and the National Guard. The term includes confined gaseous, liquid, and solid propellants; explosives, pyrotechnics, chemical and riot control agents, smokes, and incendiaries, including bulk explosives and chemical warfare agents; chemical munitions, rockets, guided and ballistic missiles, bombs, warheads, mortar rounds, artillery ammunition, small arms ammunition, grenades, mines, torpedoes, depth charges, cluster munitions and dispensers, and demolition charges; and devices and components of any item thereof. The term does not include wholly inert items, improvised explosive devices, and nuclear weapons, nuclear devices, nuclear components, other than non-nuclear components of nuclear devices that are managed under the nuclear weapons program of the Department of Energy after all required sanitization operations under the Atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.) have been completed. (10 U.S.C. 101(e)(4))

**Military Range** – Designated land and water areas set aside, managed, and used to research, develop, test, and evaluate military munitions, other ordnance, or weapon systems, or to train military personnel in their use and handling. Ranges include firing lines and positions, maneuver areas, firing lanes, test pads,

detonation pads, impact areas, and buffer zones with restricted access and exclusionary areas. (40 CFR 266.201)

**Munitions and Explosives of Concern (MEC)** – Military munitions that are 1) unexploded ordnance, as defined in 10 U.S.C. 101(e)(5); 2) abandoned or discarded, as defined in 10 U.S.C. 2710(e)(2); 3) MC (e.g., TNT, RDX) present in soil, facilities, equipment, or other materials in high enough concentrations so as to pose an explosive hazard. (MRSPP, 32 CFR Part 179, October 2005)

**Munitions Constituent (MC)** – Any material that originates from UXO, DMM, or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions. (10 U.S.C. 2710(e)(4))

**Munitions Debris (MD)** – Remnants of munitions (e.g., fragments, penetrators, projectiles, shell casings, links, fins) remaining after munitions use, demilitarization, or disposal. (DoD 6055.9- STD)

**Munitions Response** – Response actions, including investigation, removal actions, and remedial actions, to address the explosives safety, human health, or environmental risks presented by UXO, DMM, or MC or to support a determination that no removal or remedial action is required. (MRSPP, 32 CFR Part 179, October 2005)

**Munitions Response Area (MRA)** – Any area on a defense site that is known or suspected to contain UXO, DMM, or MC. Examples include former ranges and munitions burial areas. A munitions response area is comprised of one or more munitions response sites. (MRSPP, 32 CFR Part 179, October 2005)

**Munitions Response Site (MRS)** – A discrete location within an MRA that is known to require a munitions response. (MRSPP, 32 CFR Part 179, October 2005)

**Operational Range** – A range that is under the jurisdiction, custody, or control of the Secretary of Defense and that is used for range activities, or although not currently being used for range activities, that is still considered by the Secretary to be a range and has not been put to a new use that is incompatible with range activities. (10 U.S.C. 101(e)(3))

**Outlier** – An outlier is an observation that lies an abnormal distance from other values in a random sample from a population. In a sense, this definition leaves it up to the analyst (or a consensus process) to decide what will be considered abnormal. Before abnormal observations can be singled out, it is necessary to characterize normal observations.

**Pollutant and Contaminant** – These terms include, but are not be limited to, any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction) or physical deformations, in such organisms or their offspring; except that the term pollutant or contaminant shall not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under subparagraphs (A) through (F) of paragraph (14) and shall not include natural gas, liquefied natural gas, or synthetic gas of pipeline quality (or mixtures of natural gas and such synthetic gas). (CERCLA, 42 U.S.C. § 9601 et seq)

**Range Activities** – Research, development, testing, and evaluation of military munitions, other ordnance, and weapons systems; and the training of members of the Armed Forces in the use and handling of military munitions, other ordnance, and weapons systems. (10 U.S.C. 101(3)(2))

**Range-Related Debris** – Debris, other than munitions debris, collected from operational ranges or from former ranges (e.g., targets, military munitions packaging and crating material). (DoD 6055.9-STD)

**Range Residue** – Material, including but not limited to, parts and sections of practice bombs, artillery, small arms, mortars, projectiles, bombs, missiles, rockets, rocket mortars, targets, grenades, incendiary devices, experimental items, demolition devices, and any other material fired on or discovered on a range. (AFI 13-212, Range Planning and Operations, August 2001)

**Real Property** – Real estate owned by the United States and under the control of the DoD. Includes lands, buildings, structures, utilities systems, improvements, and appurtenances thereto. Includes equipment attached to and made part of buildings and structures (such as heating systems) but not moveable equipment (such as plant equipment). (MGDERP, September 2001)

**Relative Risk** – The evaluation of individual sites to determine high, medium, or low relative risk to human health and the environment, based on contaminant hazards, migration pathways and receptors, in accordance with the DoD's *Risk-Based Site Evaluation Primer*. (MGDERP, September 2001)

**Removal** – The cleanup or removal of released hazardous substances from the environment. Such actions may be taken in the event of the threat of release of hazardous substances into the environment, such actions as may be necessary to monitor, assess, and evaluate the release or 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 release. The term includes, in addition, without being limited to, security fencing or other measures to limit access, provision of alternative water supplies, temporary evacuation and housing of threatened individuals not otherwise provided for, action taken under Section 9604(b) of this title, and any emergency assistance which may be provided under the Disaster Relief and Emergency Assistance Act [42 U.S.C. 5121 et seq.] The requirements for removal actions are addressed in 40 CFR §§300.410 and 300.415. The three types of removals are emergency, time critical, and non-time critical removals. (CERCLA, 42 U.S.C. § 9601 et seq.) There are three types of removals:

- 1) **Emergency** – Emergency removal or response is performed when an immediate or imminent danger to public health or the environment is present and action is required within hours. Trained responders identify the explosive threat and make the decision as to whether the MEC should be moved or blown in place and ensure the threat is removed safely and expeditiously.
- 2) **Time-critical** – A response to a release or threat of release that poses such a risk to public health (serious injury or death), or the environment, that cleanup or stabilization actions must be initiated within 6 months.
- 3) **Non-time critical** – An action initiated in response to a release or threat of a release that poses a risk to human health and welfare, or the environment. Initiation of removal cleanup actions may be delayed for 6 months or more.

**Risk Reduction** – The movement of any site from a higher to lower relative risk category as a result of natural attenuation, interim remedial, remedial, or removal actions taken. (DoD Instruction 4715.7, Environmental Restoration Program, April 1996)

**Site (as defined in the Restoration Management Information System Data Element Dictionary for a SITE\_ID)** – A unique name given to a distinct area of an installation containing one or more releases or threatened releases of hazardous substances treated as a discreet entity or consolidated grouping for response purposes. Includes any building, structure, impoundment, landfill, storage container, or other site or area where a hazardous substance was or has come to be located, including formerly used sites

eligible for building demolition/debris removal. Installations and ranges may have more than one site. (MGDERP, September 2001)

**Stakeholder** – Groups or individuals who were interested in, concerned about, affected by, who had a vested interest in, or would be involved in the munitions response at an MRA/MRS.

**Transferred Range** – A property formerly used as a military range that is no longer under military control and had been leased by the DoD, transferred, or returned from the DoD to another entity, including federal entities. This includes a military range that is no longer under military control but was used under the terms of a withdrawal, executive order, special-use permit or authorization, right-of-way, public land order, or other instrument issued by the federal land manager. (MGDERP, September 2001)

**Transferring Range** – A military range that is proposed to be transferred or returned from the DoD to another entity, including federal entities. This includes a military range that is used under the terms of a withdrawal, executive order, act of Congress, public land order, special-use permit or authorization, right-of-way, or other instrument issued by the federal land manager or property owner. An operational or closed range will not be considered a “transferring range” until the transfer is imminent. (MGDERP, September 2001)

**Unexploded Ordnance (UXO)** – Military munitions that have been primed, fuzed, armed, or otherwise prepared for action and have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material, and remain unexploded either by malfunction, design, or any other cause. (10 U.S.C. 101(e)(5))

**UXO Technicians** – Personnel who are qualified for and filling Department of Labor, Service Contract Act, Directory of Occupations, contractor positions of UXO Technician I, UXO Technician II, and UXO Technician III. (Department of Defense Explosive Safety Board TP18, December 2004)

## **Appendix B**

### **Acronyms and Abbreviations**

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**APPENDIX B – ACRONYMS AND ABBREVIATIONS**

ANG	Air National Guard
ANGB	Air National Guard Base
ARAR	Applicable or Relevant and Appropriate Requirement
AFLU	Anticipated Future Land Use
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CSE	Comprehensive Site Evaluation
CWM	Chemical Warfare Materiel
DDESB	Department of Defense Explosives Safety Board
DGM	Digital Geophysical Mapping
DMM	Discarded Military Munitions
DoD	Department of Defense
EE/CA	Engineering Evaluation/Cost Analysis
EM	Electromagnetic
EOD	Explosive Ordnance Disposal
ESS	Explosive Safety Submission
FFID	Federal Facility Identification
FUDS	Formerly Used Defense Site
FW	Fighter Wing
GIS	Geographic Information System
IC	Institutional Control
LCSA	Lead Contaminated Soils Area
LUC	Land Use Control
MC	Munitions Constituents
MD	Munitions Debris
MEC	Munitions and Explosives of Concern
MGFD	Munition with the Greatest Fragmentation Distance
MMRP	Military Munitions Response Program
MN	Minnesota
MPCA	Minnesota Pollution Control Agency
MPPEH	Material Potentially Presenting an Explosive Hazard
MRA	Munitions Response Area
MRS	Munitions Response Site
msl	Mean Sea Level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NGB	National Guard Bureau
NTCRA	Non-Time Critical Removal Action
OB/OD	Open Burning/Open Detonation

PA	Preliminary Assessment
QC	Quality Control
RAO	Remedial Action Objective
SI	Site Inspection
SLV	Soil Leaching Value
SRV	Soil Reference Value
SUXOS	Senior Unexploded Ordnance Supervisor
TBC	To Be Considered
TO	Task Order
TP	Technical Paper
URS	URS Group, Inc.
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UXO	Unexploded Ordnance
UXOSO	Unexploded Ordnance Safety Officer
WPA	Works Project Administration
XRF	X-Ray Fluorescence



## **Appendix C**

### **References**

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## APPENDIX C – REFERENCES

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