FINAL

DECISION DOCUMENT FOR

MILITARY TRAINING BUFFER AREA

MUNITIONS RESPONSE SITE

WITHIN

CAMP BUTNER FORMERLY USED DEFENSE SITE

PROJECT NO. I04NC000904

GRANVILLE, PERSON, AND DURHAM COUNTIES, NORTH CAROLINA

U.S. Army Corps of Engineers
U.S. Army Engineering and Support Center, Huntsville
and
U.S. Army Corps of Engineers, Savannah District

SEPTEMBER 2021

EXECUTIVE SUMMARY

ES 1. This Decision Document is presented by the United States Army Corps of Engineers to describe the selected remedy for the Military Training Buffer Area Munitions Response Site, within the Camp Butner Formerly Used Defense Site, Property Number I04NC0009, in Granville, Person, and Durham counties, North Carolina. The Military Training Buffer Area Munitions Response Site 02 is designated as Formerly Used Defense Site Project I04NC000904 (Project 04).

ES 2. Munitions Response Site 02 consists of two non-contiguous areas that make up 391 acres of the central, north-central, and south-central portions of the Army National Guard property.

ES 3. The remedial action objective established in the Feasibility Study and summarized in the Proposed Plan for Munitions Response Site 02 is to eliminate the unacceptable risk of an incident to occur for Army National Guard users of the 391 acres to the detection depths of the applicable munitions of concern such that a determination can be made that there is a negligible risk of an incident to occur. The selected remedy is chosen to satisfy the remedial action objective. In developing the remedial action objective, current and future land uses were considered.

ES 4. The selected remedy consists of land use controls in the form of public education (fact sheets and educational pamphlets) and signage to limit exposure to Department of Defense military munitions that may be present in the upper 40 inches within the Munitions Response Site 02. Public education will inform the anticipated receptors and surrounding community of potential explosive hazards. Warning signs will reduce the risk of interaction by alerting receptors entering the site to the explosive hazards within Munitions Response Site 02. Implementation of the selected remedy at Munitions Response Site 02 meets the remedial action objective established in the Feasibility Study but does not achieve unlimited use/unrestricted exposure. Therefore, five-year reviews that evaluate the effectiveness of the selected remedy to protect human health are required. The regulator, North Carolina Department of Environmental Quality, concurs with the selected remedy.

ES 5. The selected remedy is protective of human health and the environment by reducing receptor exposure risk to explosive hazards. The estimated total cost to implement the selected remedy is $372,040.

ES 6. Other munitions response actions were considered and evaluated against the National Oil and Hazardous Substances Pollution Contingency Plan nine criteria. The other alternatives included No Action; Surface Clearance of munitions and explosives of concern with Analog Detection Methods and Land Use Controls; Surface and Subsurface Removal of Munitions and Explosives of Concern to Depth of Detection using Digital Geophysical Mapping Methods (UU/UE Method A); and Surface Clearance and Subsurface Removal of Munitions and Explosives of Concern to Depth of Detection with Advanced Geophysical Classification Methods (UU/UE Method B). The No Action alternative was considered but concluded not to be protective of human health. All alternatives were overall protective of human health and the environment, but the land use controls alternative was the most cost effective. Munitions Constituents were determined not to pose an unacceptable risk to human health and the environment. As such, no further action is necessary for munitions constituents.

ES 7. The selected remedy is protective of human health and the environment by reducing receptor exposure risk to explosive hazards. Munitions Response Site 02 contained munitions debris that is indicative of the potential presence of munitions and explosives of concern. The receptors include National Guard trainees and hunters. The selected remedy, land use controls, modifies receptor behavior to reduce receptor exposure interaction with explosive hazards. The selected remedy satisfies the statutory requirements of the Comprehensive Environmental Response, Compensation, and Liability Act § 121(b) regarding the former use of the Buffer Area, Munitions Response Site 02 by the Department of Defense.

TABLE OF CONTENTS

EXECUTIVE SUMMARY **ES-1**

TABLE OF CONTENTS ..... **i**

ACRONYMS AND ABBREVIATIONS ..... **iii**

1.0 PART 1: THE DECLARATION **5**

1.1 MRS NAME AND LOCATION 5
1.2 STATEMENT OF BASIS AND PURPOSE 5
1.3 ASSESSMENT OF PROJECT SITE 6
1.4 DESCRIPTION OF SELECTED REMEDY 6
1.5 STATUTORY DETERMINATIONS 6
1.6 DATA CERTIFICATION CHECKLIST 7
1.7 AUTHORIZING SIGNATURE 7

2.0 PART 2: THE DECISION SUMMARY **10**

2.1 PROJECT NAME, LOCATION, AND BRIEF DESCRIPTION 10
2.2 PROJECT HISTORY 10
2.3 PREVIOUS INVESTIGATIONS AND REMOVAL ACTIONS 11
2.3.1 Archives Search Report, 1993 and Supplement, 2003 11
2.3.2 Historical Photographic Analysis, 2001 11
2.3.3 Remedial Investigation, 2016 12
2.4 CERCLA ENFORCEMENT ACTIVITIES 12
2.5 COMMUNITY PARTICIPATION 12
2.5.1 Information Dissemination 12
2.5.2 Technical Project Planning 13
2.5.3 Community Participation 13
2.6 SCOPE AND ROLE OF RESPONSE ACTION 13
2.7 PROJECT CHARACTERISTICS 13
2.7.1 Conceptual Site Model 13
2.7.2 Site Overview 15
2.7.3 Potential Contamination Sources 15
2.7.4 Sampling Strategy 15
2.8 CURRENT AND POTENTIAL FUTURE LAND AND WATER USES 17
2.8.1 Land Use 17
2.8.2 Groundwater and Surface Water Uses 18
2.9 SUMMARY OF PROJECT RISKS 18
2.9.1 Human Health Risks 18
2.9.2 Ecological Risks 19
2.9.3 Basis for Response Action 19
2.10 REMEDIAL ACTION OBJECTIVES 19
2.11 DESCRIPTION OF ALTERNATIVES 20
2.11.1 Alternative 1: No Action 20
2.11.2 Alternative 2: Land Use Controls (LUCs) 21
2.11.3 Alternative 3: Surface Clearance of MEC with Analog Detection Methods and LUCs 22
2.11.4 Alternative 4: Surface and Subsurface Removal of MEC to a Depth of Detection Using DGM Detection Methods (UU/UE Method A) 23

TABLE OF CONTENTS (CONTINUED)

2.11.5 Alternative 5: Surface and Subsurface Removal of MEC to a Depth of Detection Using Advanced Classification Methods (UU/UE Method B) 23
2.12 COMPARATIVE ANALYSIS OF ALTERNATIVES 24
2.12.1 Overall Protection of Human Health and the Environment 25
2.12.2 Compliance with ARARs 26
2.12.3 Long-Term Effectiveness and Permanence 26
2.12.4 Reduction of Toxicity, Mobility, or Volume through Treatment 26
2.12.5 Short-term Effectiveness 27
2.12.6 Implementability 27
2.12.7 Cost 27
2.12.8 State Acceptance 27
2.12.9 Community Acceptance 27
2.12.10 Evaluation Summary 27
2.13 SELECTED REMEDY 28
2.13.1 Rationale for the Selected Remedy 28
2.13.2 Description of the Selected Remedy 28
2.13.3 Estimated Remedy Costs 29
2.13.4 Estimated Outcomes of the Selected Remedy 29
2.14 STATUTORY DETERMINATIONS 29
2.15 DOCUMENTATION OF SIGNIFICANT CHANGES FROM PREFERRED ALTERNATIVE OF PROPOSED PLAN 30
3.0 PART 3: RESPONSIVENESS SUMMARY 32
3.1 OVERVIEW 32
3.2 PUBLIC COMMENTS AND LEAD AGENCY RESPONSES 32
3.3 TECHNICAL AND LEGAL ISSUES 32
4.0 REFERENCES……..33

LIST OF TABLES

Table 1.1 Former Camp Butner MRA Delineation 5
Table 2.1 MEC Conceptual Site Model Military Training Buffer Area MRS 14
Table 2.2 Summary of RI Field Activities Completed within MRS-02 15
Table 2.3 Summary of RI Intrusive Investigation Results within MRS-02 16
Table 2.4 Evaluation Criteria for Superfund Remedial Alternatives 25
Table 2.5 Cost Estimate Summary Table 29

LIST OF FIGURES

Figure 1 Camp Butner Location 8
Figure 2 Camp Butner Project Locations 9
Figure 3 MRS-02 Remedial Investigation Results 31

ACRONYMS AND ABBREVIATIONS

AGC	Advanced Geophysical Classification
area	Area of Interest
ARAR	Applicable or Relevant and Appropriate Requirement
ARNG	Army National Guard
ASR	Archives Search Report
bgs	Below Ground Surface
BIP	Blow-In-Place
BLRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, And Liability Act
CFR	Code of Federal Regulations
CRP	Community Relations Plan
CSM	Conceptual Site Model
DD	Decision Document
DERP	Defense Environmental Restoration Program
DGM	Digital Geophysical Mapping
DMM	Discarded Military Munitions
DNT	Dinitrotoluene
DoD	Department of Defense
DU	Decision Unit
FS	Feasibility Study
ft	Foot
FUDS	Formerly Used Defense Site
GIS	Geographic Information System
HE	High Explosive
HGL	Hydrogeologic, Inc.
HHRA	Human Health Risk Assessment
IGD	Interim Guidance Document
ISM	Incremental Sampling Methodology
LUC	Land Use Control
MC	Munitions Constituents
MD	Munitions Debris
MDAS	Material Documented as Safe
MEC	Munitions and Explosives of Concern
mm	Millimeter
MMRP	Military Munitions Response Program
MPPEH	Material Potentially Presenting an Explosive Hazard

ACRONYMS AND ABBREVIATIONS

MRA	Munitions Response Area
MRS	Munitions Response Site
NCDEQ	North Carolina Department of Environmental Quality
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
PP	Proposed Plan
QC	Quality Control
RAB	Restoration Advisory Board
RC1	Range Complex 1
RC2	Range Complex 2
RAO	Remedial Action Objective
RI	Remedial Investigation
ROE	Right-Of-Entry
SARA	Superfund Amendments and Reauthorization Act
SLERA	Screening Level Ecological Risk Assessment
SUXOS	Senior Unexploded Ordnance Supervisor
TBD	To Be Determined
TEC	Topographic Engineering Center
TMV	Toxicity, Mobility, or Volume
TNB	Trinitrobenzene
TNT	Trinitrotoluene
TOI	Target of Interest
TPP	Technical Project Planning
TPV	Total Present Value
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
UU/UE	Unlimited Use/Unrestricted Exposure
UXO	Unexploded Ordnance
UXOQCS	UXO Quality Control Specialist
UXOSO	UXO Safety Officer

1.0 PART 1: THE DECLARATION

1.1 MRS NAME AND LOCATION

This Decision Document (DD) was developed for Munitions Response Site 02 (MRS-02) Military Training Buffer Area, which is a portion of the Former Camp Butner Formerly Used Defense Site (FUDS) Property No. I04NC0009 located in Granville, Person, and Durham counties, North Carolina. The Camp Butner FUDS is comprised of 40,384 acres. MRS-02 is also identified as Military Training Buffer Area and is comprised of 391 acres.

Based on the information and recommendations in the Final Remedial Investigation Report, the revised Final Feasibility Study, and the revised Final Proposed Plan, Project 02 was delineated into nine separate projects (revising Project 02 and adding new Projects 04 through 11). This DD addresses the selected remedy for MRS-02. The other projects will be addressed in separate DDs. The names and acreages of the nine projects (MRSs) are described below:

Table 1.1
Former Camp Butner MRA Delineation

MRS	Project	MRS Name	Acreage
MRS-01	11	Military Training MEC Contaminated	1,429
MRS-02	04	Military Training Buffer Area	391
MRS-03	05	Buffer Area	924
MRS-04	06	Central MEC Contaminated	2,202
MRS-05	07	Northern MEC Contaminated	1,807
MRS-06	08	Eastern MEC Contaminated	1,451
MRS-07	09	Western MEC Contaminated	1,385
MRS-08	10	South MEC Contaminated	1,179
MRS-09	02	No Action Area	7,148

MRS denotes munitions response site.
MEC denotes munitions and explosives of concern.

1.2 STATEMENT OF BASIS AND PURPOSE

The U.S. Army is the lead agency on behalf of the United States Department of Defense (DoD), and the United States Army Corps of Engineers (USACE) has mission execution authority for the FUDS Program. This DD is presented by USACE to describe the DoD selected remedy for MRS-02 within the Camp Butner FUDS (Figures 1 and 2).

The USACE selected Land Use Controls (LUCs) consisting of public education and signage as the remedy for MRS-02. The remedy described in this DD was selected in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended, 42 U.S.C. § 9601 et seq., and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) Part 300. The determination presented in this DD is based on information contained in the Administrative Record file for the Camp Butner FUDS.

The regulatory agency for the Former Camp Butner FUDS is the North Carolina Department of Environmental Quality (NCDEQ). In its letter dated 3 November 2020, NCDEQ provided written concurrence with the selected remedy.

1.3 ASSESSMENT OF THE MRS

The response action selected in this DD is necessary to protect the public health and the environment. The sources of contamination at the site include a potential for people to come into contact with munitions and explosives of concern (MEC) potentially present as indicated by munitions debris (MD) identified at MRS-02. The remedial investigation (RI) determined that no unacceptable risk to human or ecological receptors as a result of munitions constituents (MC)-related contamination is present at MRS-02. The most likely exposure scenario is direct interaction between people (i.e., National Guard trainees and hunters) and residual DoD military munitions potentially present at MRS-02. Training and hunting activities, which include the use of shallow intrusive activities, are anticipated to be conducted on the ground surface and to a depth of 12 inches below ground surface (bgs). Based on the results of the RI and previous investigations, MD are present at the ground surface to a maximum depth of 40 inches bgs. No MEC was identified within the MRS during the RI, and only small quantities of MD were present (HGL, 2018a).

The USACE has determined, implementation of the selected remedy, LUCs, at MRS-02 will reduce potential human exposure to residual surface and subsurface explosive hazards within the MRS.

The selected remedy described in this document will minimize exposure to explosive hazards and provide protection of human health and the environment through modification of human receptor behavior to reduce the risk of interaction with explosive hazards to an acceptable level. These determinations are based on an evaluation of site-specific data and a review of this evaluation by stakeholders who have concurred with its conclusions and recommendations.

1.4 DESCRIPTION OF SELECTED REMEDY

The selected remedy consists of LUCs that effectively limit exposure to potential munitions remaining in MRS-02 to a depth of 12-inches. Both warning signs and educational materials (fact sheet and educational pamphlet) would inform people of the hazards present through the "3Rs" (Recognize, Retreat, and Report) munitions safety awareness program. Costs would include initial installation of signs and development of the educational materials, and annual maintenance to replace and repair damaged signs and distribute the educational pamphlets. Five-year reviews, as required by the NCP, would also be conducted. At the completion of each review, a report would be prepared, and a public notice would be placed in the local newspaper concerning the continued effectiveness of the remedy.

1.5 STATUTORY DETERMINATIONS

Based on the information currently available, the selected remedy for MRS-02, LUCs, minimizes explosive hazards, is protective of human health and the environment, and satisfies the statutory requirements of CERCLA § 121(b) with regards to the former use by the DoD. The selected remedy is protective of human health and the environment through modification of receptor behavior, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action, and is cost-effective.

It is anticipated that the selected remedy for MRS-02 will not allow for unlimited use/unrestricted exposure (UU/UE). Therefore, it would be necessary to conduct five-year reviews- a statutory review conducted within five years after initiation of the remedial action to assure that human health and the environment are being protected by the remedial action being implemented.

1.6 DATA CERTIFICATION CHECKLIST

The following information is included or otherwise addressed in this DD. Additional information can be found in the Administrative Record file for this site.

- Information on MD encountered at the project site.
- A summary of the risk assessment for MC-related contamination.
- Explanation of how source materials will be addressed with LUCs.
- Current and reasonably anticipated future land use assumptions for the MRS.
- Estimated costs associated with implementation of the selected remedy, and.
- Key factors that led to the determination of LUCs as the selected remedy.

Previous investigations and risk assessment during the RI concluded that MC-related contamination is not present at the MRS. For this reason, the following information does not apply and is not included in this DD:

- Cleanup levels established for chemicals of concern and the basis for these levels.

1.7 AUTHORIZING SIGNATURE

This DD presents LUCs as the selected remedy for FUDS, Project No. I04NC000904 (MRS-02) Military Training Buffer Area at the Camp Butner FUDS in Granville, Person, and Durham counties, North Carolina. The U.S. Army is the lead agency at the Camp Butner FUDS under the Defense Environmental Restoration Program and USACE has mission execution authority for the Formerly Used Defense Sites (FUDS) Program. USACE has developed this DD consistent with the CERCLA, as amended, and the NCP. This DD will be incorporated into the larger Administrative Record file for the Camp Butner FUDS, which is available for public view at the South Granville Public Library, Creedmoor, NC 27522. This document, presenting the selected remedy of LUCs for MRS-02 with a cost estimate of $372,040 is approved by the undersigned, pursuant to the Memorandum, CEMP-CED (200-1a) (USACE 2019b) and delegation on September 17, 2019, to the Director of Regional Business of FUDS mission execution responsibility for assigned projects, including approval authority on DDs for FUDS response action with an estimated cost of up to $5 million.

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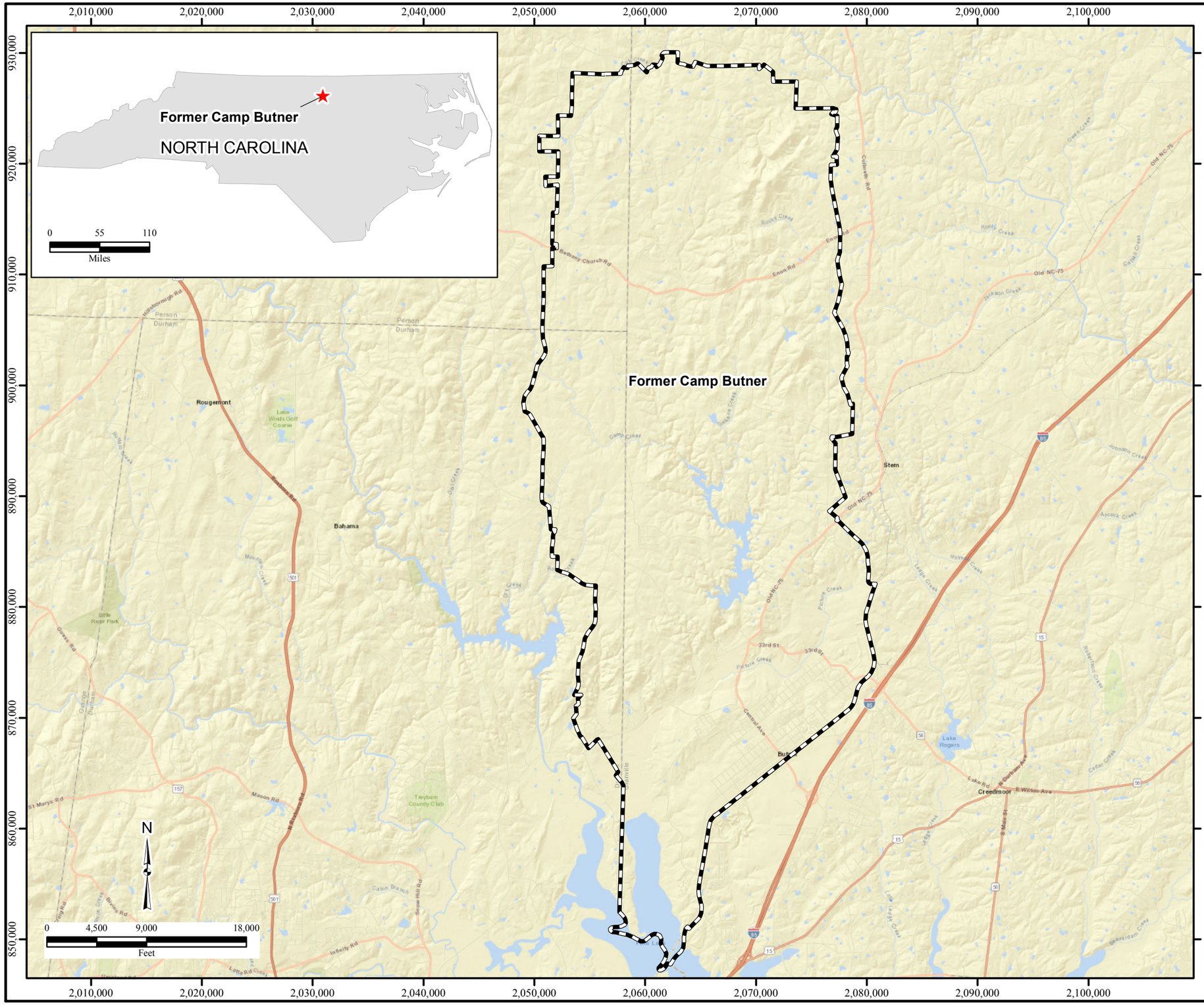
29 SEP 2021

THEODORE A. BROWN, P.E., SES
Director of Regional Business

DATE

Figure 1
Camp Butner Location

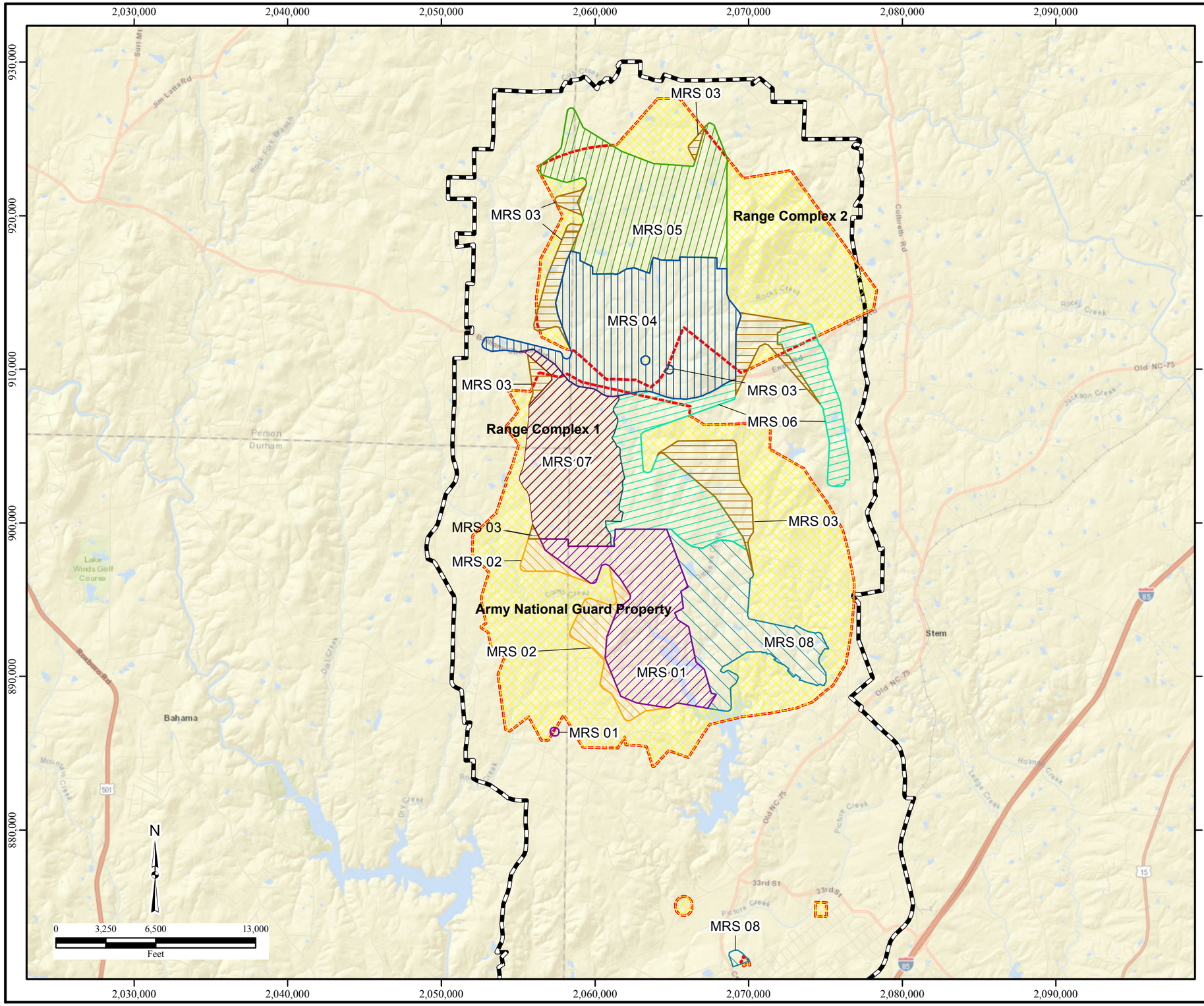


Legend

Former Camp Butner

\\Gst-srv-01\HGLGIS\Camp_Butner_MSIW\Proposal_Plan
(01)Butner_Loc.mxd
11/6/2017 JAR
Source: HGL, USACE
ArcGIS Online Street Map

Figure 2
Project Locations



Legend

PP Recommended MRS

- MRS 01 / Project 11
- MRS 02 / Project 04
- MRS 03 / Project 05
- MRS 04 / Project 06
- MRS 05 / Project 07
- MRS 06 / Project 08
- MRS 07 / Project 09
- MRS 08 / Project 10
- MRS 09 / Project 02
- MRA Boundary, 2014
- Former Camp Butner

Notes:
Areas are calculated using the projection NAD 1983 UTM Zone 17N.
MRS 01 = 1,429.41 acres
MRS 02 = 390.86 acres
MRS 03 = 923.54 acres
MRS 04 = 2,201.77 acres
MRS 05 = 1,806.34 acres
MRS 06 = 1,450.83 acres
MRS 07 = 1,384.52 acres
MRS 08 = 1,178.81 acres
MRS09 = 7,148.15 acres

MRS=Munition Response Site
FUDSMIS=Formerly Used Defense Site Management Information System (data from 2014)

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10/23/2017 JAR
Source: HGL, USACE
ESRI Online Aerial Imagery

2.0 PART 2: THE DECISION SUMMARY

2.1 PROJECT NAME, LOCATION, AND BRIEF DESCRIPTION

The Camp Butner FUDS is located 15 miles north of Durham, North Carolina, and encompasses approximately 40,384 acres in Granville, Person, and Durham counties. Most of the Camp Butner FUDS property is used for agricultural purposes, but also includes residential development, recreational areas, ARNG and North Carolina National Guard training facilities, and undeveloped wooded areas (HGL, 2015). The site addressed in this DD is the Camp Butner FUDS Project No. I04NC000904 (MRS-02), which consists of two non-contiguous areas that make up 391 acres of the central, north-central, and south-central portions of the Army National Guard (ARNG) property as shown in Figure 2. The ARNG area is currently owned by the State of North Carolina and is operated as the Camp Butner Training Center; the FUDS does not contain privately-owned parcels.

Access to the MRS-02 is restricted because the MRS is inside the Camp Butner Training Center. MRS-02 includes buffer areas which are currently used for National Guard small arms training. Current land use includes military training for National Guard trainees and hunting. Future land use, accessibility, and receptors associated with MRS-02 are not expected to change. Potential interactions with MEC are anticipated to consist of surface and near surface interactions only (0 to 12 inches bgs). The RI concluded that MD found in or around MRS-02 in surface and subsurface soils indicate the potential for MEC presence. Therefore, some level of remedial action is necessary to minimize the risk associated with exposure to DoD military munitions potentially present at MRS-02 (HGL, 2018a).

2.2 PROJECT HISTORY

Camp Butner was primarily established to train infantry, artillery, and engineering combat troops for deployment and redeployment overseas during World War II. The installation was active from 1942 until 1946; however, training was only conducted through 1943. Construction of Camp Butner was authorized by the War Department on February 12, 1942. The camp was officially active on August 4, 1942 and occupied approximately 40,384 acres. The various acres compiling the Camp Butner FUDS were acquired by the War Department as follows:

- 40,201 acres acquired in fee.
- 128.4 acres acquired in 82 easements.
- 2.5 acres acquired in licenses.
- 52.4 acres acquired in 26 leased tracts (USACE, 1993).

The acquired acreage was owned by multiple private owners and consisted of rural, agricultural, undeveloped wooded, commercial, and residential land use parcels. Camp Butner was established to train infantry divisions and miscellaneous artillery and engineer units. Camp Butner was declared excess by the War Department on January 31, 1947. The installation included approximately 15 live-fire ammunition training ranges, a grenade range, a 1,000-inch range, a gas chamber, and a flame thrower training pad. Munitions used at the site included small arms, 2.36-inch rockets, rifle and hand grenades, 37 millimeter (mm) through 155 mm high explosive (HE) projectiles, 60 and 81mm mortars, and antipersonnel practice mines. Training activities also included the use of demolition items such as trinitrotoluene (TNT) and various initiating and priming materials. Following World War II, the camp was closed, limited ordnance

clearances were performed, and the property was conveyed to the State of North Carolina, local municipalities, and private owners.

The ARNG area investigated during the RI is located on the western-central area of Butner project site and contained an artillery impact area, two mortar ranges, and several small arms ranges. The range fan for the artillery impact area was confirmed using historical maps during the RI; however, the dimensions of the other range fans were established using standard range fans for the individual type of range. All range fans remain within site boundaries, and some range fans overlap with others within the complex. Munitions found or suspected at the ARNG area include small arms, 2.36-inch rockets; rifle grenades 60 mm and 81 mm mortars; and 37 mm, 105 mm, and 155 mm projectiles. There is no evidence the North Carolina ARNG used explosive munitions at this site. Only small arms ammunition was used by the North Carolina ARNG. Ongoing training being conducted within this area includes small arms ammunition only, as documented by the memorandum for record dated June 14, 2012 (HGL, 2016).

2.3 PREVIOUS INVESTIGATIONS AND REMOVAL ACTIONS

The following sections summarize the findings of historical reports developed for Camp Butner and relate to MRS-02. No Military Munitions Response Program (MMRP) investigations had occurred at the ARNG area, which includes MRS-02, prior to the RI. MRS-02 consists of two non-contiguous areas that make up the central, north-central, and south-central portions of the ARNG area investigated during the RI as shown in Figure 2. This information is presented to summarize current site conditions and historical site investigation activities and findings, and to provide background for the discussion on the implementation of LUCs at MRS-02.

2.3.1 Archives Search Report, 1993 and Supplement, 2003

An Archives Search Report (ASR) was completed by the USACE, Rock Island District for the Camp Butner FUDS in September 1993. The Final ASR summarized the known nature and extent of MEC contamination as of 1993 and identified several areas requiring further evaluation. A supplement to the 1993 ASR was completed in 2003 in support of preparing the Military Munitions Response Range Inventory (HGL, 2016).

The ASR supplement identified the ARNG area situated in the southwestern portion of RC1 Range, which contained an artillery impact area, two mortar ranges, and several small arms ranges. All range fans remain within site boundaries, and some range fans overlap with others within the complex. Munitions types expected and/or identified for the ARNG area included small arms, 2.36-inch rockets; rifle grenades; 37 mm, 57 mm, 105 mm, and 155 mm projectiles; and 60 mm and 81 mm mortars. The ASR Supplement also reported that no known clearances have been conducted within the ARNG area at the time of finalization (HGL, 2012b).

2.3.2 Historical Photographic Analysis, 2001

The Topographic Engineering Center (TEC) conducted a Geographic Information System (GIS)-based historical photographic analysis in 2001 evaluating 1943, 1945, and 1949 aerial photography to identify features related to former military use (e.g., crater fields, targets, ground scars, etc.) and areas potentially contaminated with DoD military munitions and MC-related contamination (TEC, 2001). HydroGeoLogic, Inc. (HGL) generated an Interpreted Impact Area during the work planning phase and investigated these areas during the RI field effort (HGL, 2012b).

2.3.3 Remedial Investigation, 2016

During the RI field investigation, transects of digital geophysical mapping (DGM) data were collected to develop anomaly densities. Based on the identified anomaly densities, full coverage grid surveys were completed within the ARNG area in areas of high, medium, and low anomaly densities over 4.6 acres of the site. A total of 49.3 miles of geophysical transects, 29 miles of reconnaissance transects, and 89 intrusive investigation grids were completed within the ARNG area (which surrounds MRS-02). A total of 1,382 targets were selected for intrusive investigation; six targets were investigated and determined to pose an explosive hazard, and 657 items were classified as MD items (HGL, 2016). The six items determined to be MEC were discovered within the ARNG area and outside of MRS-02 boundary. Only minor quantities of MD were identified within MRS-02 but, although no MEC was identified, it is considered potentially present. There is no risk due to MC-related contamination to human health or the environment at Camp Burner. Figure 3 presents the RI field investigation conducted at the ARNG area as it relates to characterization of MRS-02. An overview of MRS-02 -specific results of items found is in Section 2.7.

Eleven Incremental Sampling Methodology (ISM) surface soil samples were collected within the ARNG area in areas of high anomaly density and analyzed for explosives and metals. Two ISM surface soil sample locations were re-sampled within the ARNG area and re-analyzed for explosives. The original and re-sampled results were pooled into one dataset. The laboratory analysis revealed that surface soil does not pose a threat to human health, and that no unacceptable ecological risk from MC-related contamination exists in surface soil (HGL, 2016).

2.4 CERCLA ENFORCEMENT ACTIVITIES

To date, there have been no CERCLA-related enforcement activities at MRS-02.

2.5 COMMUNITY PARTICIPATION

Community participation in the process leading to this DD falls into three categories: 1) dissemination of information to the community; 2) stakeholder involvement in the technical project planning (TPP) process; and 3) community participation. These three areas are described in more detail below. HGL developed the community relations plan (CRP) on behalf of the USACE for the purposes of managing this effort (HGL, 2012a).

2.5.1 Information Dissemination

The following activities were conducted to disseminate information to the community near the Camp Butner FUDS:

- A public record repository for the Camp Butner Administrative Record was established at the South Granville Public Library.
- A public information session (public meeting) was held simultaneously with the Restoration Advisory Board (RAB) meeting on April 26, 2012, at the Butner Town Hall. The purpose of the public meeting was to provide an overview of the RI/FS work planned for the Camp Butner FUDS areas. A public notice was published in the local newspaper to announce the public information session.
- A CRP was prepared and finalized in August 2012 for the Camp Butner FUDS (HGL, 2012a). The CRP was completed to encourage two-way communication between USACE and the community surrounding the Camp Butner FUDS.

- A second public meeting was held on April 18, 2013 at the Butner Town Hall. The purpose was to discuss the planned activities to be conducted during the RI/FS fieldwork in May of 2013. The meeting allowed for the exchange of information between the Corps and the community regarding site activities. Public notice was provided in the local newspaper announcing the second public meeting.
- The third public meeting was held on April 16, 2018 at the Butner Town Hall to present the findings of the RI Report, FS, and discuss the Preferred Alternative presented in the Proposed Plan (PP). This public meeting encouraged public feedback on the PP in support of the public comment period held from March 26, 2018 to April 30, 2018.
- Five RAB meetings were held on April 26, 2012; April 25, 2013; May 6, 2014; June 1, 2016; and November 28, 2017 at the Butner Town Hall Multi-Purpose Room, to provide the public with a status update and present the results and recommendations of the 2016 Final RI Report (HGL, 2016) and 2017 Final FS Report (HGL, 2017), respectively. The RAB is still active but has not met since 2017.

2.5.2 Technical Project Planning

The initial TPP Meeting was held on November 10, 2011 and during this meeting, the TPP participants (stakeholders) were provided with an overview of the TPP process, site history, project objectives, proposed remedial approach, data quality objectives, and project schedule. Officials from public offices (regulators, law enforcement, fire departments, elected officials, utilities, etc.) whose departments may be affected by the activities at the Camp Butner FUDS were invited to participate in the TPP process for the investigation of the project site. The participants then worked with the USACE and HGL to identify concerns related to ordnance activities at the Camp Butner FUDS, to agree upon a general approach to further investigation(s), and to reach a consensus on a site closeout statement. Further communication with the stakeholders took place during subsequent TPP Meetings held on September 5, 2012 and May 6, 2014.

2.5.3 Community Participation

Public meetings were held on April 26, 2012, April 18, 2013, and April 16, 2018 at the Butner Town Hall. Based on the results and conclusions of the RI, the presence of MD is confirmed and the potential for explosively hazardous DoD military munitions, although unlikely, remains at MRS-02. For these reasons, evaluation of MRS-02 in a FS was necessary. The USACE recommended Alternative 2, LUCs (public education and signage), as the preferred alternative in the PP (HGL, 2018b). The PP was made available to the public between March 26, 2018 and April 30, 2018 for public review and comment. Part 3 of this DD documents the feedback received during the public comment period.

2.6 SCOPE AND ROLE OF RESPONSE ACTION

The selected remedy must be protective of the receptors associated with current and reasonably anticipated future land use. Current and future land use throughout MRS-02 is military training use. The final response action for this site, as described in this DD, is focused on educating and making potential receptors (National Guard trainees and hunters) aware of possible munitions-related hazards within MRS-02.

2.7 PROJECT CHARACTERISTICS

2.7.1 Conceptual Site Model

A conceptual site model (CSM) is a representation of a site and its environment that is used to facilitate understanding of the site and the potential contaminant exposure pathways that might be present. The

CSM describes potential contamination sources and their known or suspected locations, human and/or ecological receptors present, and the possible interactions between the two. The CSM summarizes which potential receptor "exposure pathways" for DoD military munitions and MC-related contamination are (or may be) "complete" and which are (and are likely to remain) "incomplete." An exposure pathway is considered incomplete unless all of the following elements are present: (a) a source of DoD military munitions or MC-related contamination; (b) a receptor that might be affected by that contamination; and (c) a method for the receptor to be exposed to (i.e., come into contact with) the contamination. If all of these elements are present, an exposure pathway is considered complete.

Following completion of the RI, the MEC CSM for the recommended MEC contaminated areas of the Camp Butner FUDS was created to reflect the status of MEC exposure pathways using the results of the investigations. The MEC CSM for the project site indicated that MEC is potentially present in surface and subsurface soil at the MEC contaminated portions of the ARNG area (which includes MRS-02). MEC present at the surface or subsurface soil would provide a source of MEC for a complete exposure pathway (HGL, 2016).

MRS-02 is located within the ARNG area investigated during the RI. Current land use within MRS-02 is military use, as the entire acreage of the MRS is within the Camp Butner Training Center operated by the ARNG. It is anticipated that future land use will remain the same. Based on this land use, the primary receptors at the site are National Guard trainees and hunters. The presence of a known/suspected source of DoD military munitions and possible receptors means that potentially complete exposure pathways are present at the site that could result in these identified current or future receptors being exposed to explosive hazards at the project site.

The MEC exposure pathways are summarized in Table 2.1. Because no significant MC-related contamination was detected during the RI, all MC exposure pathways are incomplete, and are not included in the CSM.

Table 2.1
MEC Conceptual Site Model
Military Training Buffer Area MRS

Primary Source	Munitions Items Identified	Current/Future Land use	Potential Receptors	Receptor/Interaction Exposure Route	Pathway Complete/Incomplete
Military Training Buffer Area MRS	MD: 60 mm mortar (fins, fragmentation, tail, boom, expended fuze) located at 0-12 inches bgs MD: Unknown fragmentation Located at 0-40 inches bgs	Military Training	National Guard trainees and hunters	Handling or stepping on surface munitions; and contacting subsurface munitions during intrusive activities (such as digging), anticipated to depths of 12-inches bgs	Complete

2.7.2 MRS Overview

MRS-02 includes the Military Training Buffer Area which is approximately 391 acres in size within the ARNG property investigated during the RI. The 391 acres associated with the MRS was used for military training as part of the Former Camp Butner according to previous investigations and historical aerial photographic analysis.

Only MD was identified within MRS-02 during the RI, access to the area is controlled, and the current/future site activities consist of military training and hunting. For these reasons, the USACE has determined that LUCs are an appropriate remedial action to eliminate the unacceptable risk of human interaction with MEC at MRS-02.

2.7.3 Potential Contamination Sources

The ARNG area was evaluated for potential contamination sources using past investigation, information of previous land use, munitions found or suspected, and the current land use. MEC and MD were found within the ARNG area (which is within MRS-02) and MD only was found within MRS-02 during the RI field effort (Figure 3). Previous investigations and analysis confirmed the presence of MD and suggest potential MEC contamination within MRS-02.

2.7.4 Sampling Strategy

2.7.4.1 Investigation of Munitions and Explosives of Concern

To support MEC characterization during the RI, DGM transect, reconnaissance surveys, and intrusive investigations were completed within the ARNG area. A total of 7.33 miles of DGM transects, 0.21 miles of reconnaissance transects, and 125 intrusive targets were investigated within the MRS-02. Of the intrusively investigated targets: nine targets resulted in MD items, 82 were classified as miscellaneous cultural debris, and 34 targets were described by the field teams as "same as" another nearby target, or were noted as geology, false positives, QC seeds, or no finds.

RI field activities were conducted at the ARNG area. MRS-02 was created during the FS and is physically located within the ARNG area. Table 2.2 summarizes the RI field activities completed at the ARNG area that lie within MRS-02. Table 2.3 summarizes the intrusive results at the ARNG area that lie within MRS-02.

Table 2.2
Summary of RI Field Activities Completed within MRS-02

Activity Description	Unit	Quantity
Site Acreage	Acres	390.86
DGM Transects	Miles	7.33
Reconnaissance Transects	Miles	0.21
Intrusive Targets	Each	125

Table 2.3
Summary of RI Intrusive Investigation Results within MRS-02

Anomaly Type	No. Items Found	Description
Miscellaneous Debris	82	Farm Debris – Barbed wires, cans, bolts, wires, nails, chain links, etc.
MD	9	60mm Mortar (fins, frag, tail boom, expended fuze) and Unknown Fragments
Other	34	Geology, No Contacts, QC seeds, No Finds

2.7.4.2 Investigation of Munitions Constituents

Following the completion of the DGM surveys and intrusive investigation activities, HGL completed environmental sampling activities in biased locations to determine if MC-related contamination was present. Based on the analytical results, a Baseline Risk Assessment (BLRA) was conducted to characterize the nature and extent of the release and to assess whether the MC present poses a potential risk to human health.

As summarized in the RI Report, the presence of two explosives analytes were reported in all sample locations. Two explosives (2,4-dinitrotoluene [DNT] and 2,6- DNT) were detected in all samples, including the background samples. For data quality control, select sample locations from each MRS and background areas were re-collected as confirmation samples and re-analyzed for explosives using an alternate laboratory (TestAmerica) from the laboratory used in the analyses conducted in July and August 2013 (Microbac). The re-analyzed results were treated as duplicate results of the original samples. Because of anomalous 2,4-DNT and 2,6-DNT results in the background soil samples, all background locations and select sample locations from each MRS were resampled for explosives analysis in October 2013. Based on the evaluation of all analytical data packages, it was determined that both the initial and re-sampled explosives results were usable. The results of the MC investigation at the ARNG area conducted during the RI are described in further detail below.

- May 2013 - 11 ISM soil samples collected; 100-foot (ft) by 100-ft ISM decision units (DU), 36 increments each, analyzed for explosives and select metals.
- October 2013 - Two ISM soil samples; 100-feet by 100-feet ISM DUs, 36 increments each, analyzed for explosives only.
- Explosives analysis was conducted by Method 8330B and select metals analysis for copper, lead, antimony, and zinc was conducted by method 6010B.
- Based on the conclusion that no MC is present on site at levels that present a risk to human health or the environment, there is no MC contamination identified in surface soils. Therefore, no sampling of additional media such as sediment, surface water, subsurface soils, or groundwater was necessary.

Concentrations from the May 2013 sampling exceeded health-based screening values but were either non-detect or below the screening levels for the October 2013 sampling. The screening level risk estimates

were in the middle or the lower end of the target risk range (10^{-6} to 10^{-4}) the uncertainty analysis determined that the anomalous data from the May 2013 sampling event caused an overestimation of the site risk evaluation. Because the October 2013 re-sampling results did not replicate the May 2013 sampling results, it was concluded that explosives contamination at RC1, RC2, and Army National Guard area does not pose an unacceptable risk to human health (HGL, 2018a).

2.7.4.3 Known or Suspected Sources of Contamination

Nine items classified as MD were recovered during the RI within the ARNG area that also lie within the MRS-02 boundary. No items that were recovered within the MRS-02 boundary during intrusive investigations at the ARNG area were determined to pose an explosive hazard (classified as MEC). The MD items recovered were determined to be fragmentation associated with 60 mm mortars and other unidentifiable munitions fragmentation. Historical investigations recovered unidentifiable fragmentation and MD associated with 60 mm mortars were recovered between ground surface and 40 inches bgs. Although not anticipated, explosively hazardous DoD military munitions may remain within MRS-02 in surface and subsurface soils to a maximum depth of 40 inches bgs. During RI activities, ISM and background soil samples were collected throughout the Camp Butner FUDS MRSs. Analytical results and subsequent risk assessment determined that no MC-related contamination at the Camp Butner FUDS MRSs pose a risk to anticipated human or ecological receptors (HGL, 2016).

2.7.4.4 Types of Contamination and Affected Media

Anticipated contamination at MRS-02 consists of MD and, although unlikely, MD presence may indicate explosively hazardous DoD military munitions within MRS-02. The contaminated media include surface and subsurface soils to a depth of 40 inches bgs.

2.7.4.5 Location of Contamination and Exposure Routes

DGM transects, reconnaissance surveys, and subsequent intrusive investigations confirmed the presence of MD within MRS-02 as shown on Figure 3. The maximum suspected depth of munitions contamination anticipated at MRS-02 is 40 inches bgs. Based on the current and future land use as military training, the receptors at MRS-02 include National Guard trainees and hunters. These receptors are anticipated to potentially encounter on DoD military munitions located on the surface, or contact subsurface DoD military munitions during intrusive activities, such as digging (0 to 12 inches bgs). Unless physically moved by human activities, the munitions contamination potentially remaining within the surface and subsurface soils of the MRS is unlikely to migrate from its current location, or to other media.

As described above, no significant MC-related contamination was detected at the Camp Butner FUDS during the RI. For this reason, exposure pathways for MC-related contamination are incomplete for the site.

2.8 CURRENT AND POTENTIAL FUTURE LAND AND WATER USES

2.8.1 Land Use

Current land use within MRS-02 is military training. It is anticipated that future land use will remain consistent with current land use. The presence of a known/suspected source of MD and possible receptors means that a complete exposure pathway for MEC is present at the MRS. The residual munitions at the site result in an unacceptable risk for current or future human receptors being exposed to explosive hazards at MRS-02.

2.8.2 Groundwater and Surface Water Uses

Groundwater and nearby surface water could potentially be used for domestic, irrigation, or drinking water sources for the area; however, no source for MC-related contamination was identified at the Camp Butner FUDS during the RI. Based on the RI conclusions, there are no complete exposure pathways for groundwater or surface water identified for MC-related contamination at MRS-02.

2.9 SUMMARY OF MRS RISKS

2.9.1 Human Health Risks

2.9.1.1 Risks from Munitions and Explosives of Concern

Evaluation of previous investigation findings and data collected during the RI identified an area within the Camp Butner FUDS as MEC contaminated. After completions of the RI, the MEC contaminated area was delineated into nine projects based on land use and munition types. MD from 60 mm mortars (fins, frag, tail boom, expended fuze) and unknown frag were identified within MRS-02. No items classified as MEC were recovered from MRS-02 during the RI. The MD contamination identified suggests the potential presence of MEC. Therefore, an explosive hazard to current and future receptors within the MRS02 was evaluated in the FS (HGL, 2018a).

Based on the presence of MD at the project site, the potential for complete MEC exposure pathways in surface and subsurface soil at MRS-02 is confirmed for current and future receptors. Implementation of LUCs at MRS-02 will reduce the risk of human exposure to explosive hazards by modifying receptor behavior. Since hazards will remain at the MRS after implementation of LUCs, UU/UE will not be achieved. Although there is some potential for DoD military munitions to be present within MRS-02, based on the presence of minor amounts of MD, MEC contamination is unlikely, and a high density of MD is not expected in areas beyond MRS-02 (HGL, 2018a).

Land use at MRS-02 consists of military training, and the expected current and future receptors at the MRS are National Guard trainees and hunters. Receptors would likely be limited to surface and near surface (0 to 12 inches bgs) activity; however, intrusive activities are possible. Examples of intrusive activities by future receptors include incidental disturbance of the surface during Camp Butner Training Center activities for National Guard soldiers and invited trainees (other law enforcement agencies). These can include digging shallow fighting positions and constructing temporary campsites. Camp Butner Training Center activities include training at various small arms ranges, obstacle courses, and field training exercises/maneuvers for Guard personnel. Camp Butner Training Center also allows seasonal hunting with permission by the National Guard, and hunters are required to register with Camp Butner Training Center. Surface intrusive activities include those conducted during military training activities (0 to 12 inches bgs) and incidental treading underfoot. Munitions contamination is not expected to occur at depths greater than 40 inches bgs. Receptors within the sites will remain consistent throughout the foreseeable future, and future land use will potentially include both intrusive and non-intrusive activities (HGL, 2018a).

2.9.1.2 Risks from Munitions Constituents

A BLRA, conducted during the RI in accordance with USACE and U.S. Environmental Protection Agency (USEPA) guidance, included a human health risk assessment (HHRA) and a screening level ecological risk assessment (SLERA). The HHRA evaluated current and potential future receptors that could contact soil at the project site. As discussed in Part 2.9.1.1 of this DD, soil samples were collected throughout the Camp Butner FUDS, and analyzed for explosives and select metals (antimony, copper,

lead, and zinc). The screening level risk estimates were in the middle or on the low end of the target risk range (10^{-6} to 10^{-4}) and the uncertainty analysis determined that the anomalous data from the May 2013 sampling event caused an overestimation of the site risk evaluation. Therefore, all results indicate that MC-related contamination in the Camp Butner FUDS soil does not pose a threat to human health. MC-related contamination exposure pathways are considered incomplete and the baseline HHRA indicates that MC-related contamination does not pose a risk to current or future human receptors.

2.9.2 Ecological Risks

Based on the site history, the potential contaminants of ecological concern include antimony, copper, lead, zinc, and explosives. The SLERA, conducted as a part of the BLRA, evaluated potential threats to terrestrial plants, soil invertebrates, terrestrial wildlife (mammals and birds) to contaminants at the ARNG area. This evaluation considered exposure of upper trophic level receptors through the food web. Conclusions of the SLERA included the following:

- The initial screening of maximum concentrations to benchmark values identified antimony, copper, lead, zinc, 1,3,5-trinitrobenzene (TNB), and 2,6-DNT as contaminants of potential ecological concern.
- Copper, lead, and zinc were retained for food web analysis with respect to birds and mammals.
- Lead contamination in soil at the ARNG area was determined to pose a minimal threat to herbivorous birds, carnivorous birds, and mammals. Lead does not pose a threat to plants or soil invertebrates within the site.
- Antimony, copper, zinc, and explosives do not pose a threat to ecological receptors.

The SLERA evaluated potential threats from exposure to plants, soil invertebrates, mammals, and birds to the contaminants of potential ecological concern identified for the ARNG area. As documented in the Final RI Report, no actionable ecological risk was identified for the ARNG area (HGL, 2016). Based on this conclusion, no ecological risks are anticipated within MRS-02.

2.9.3 Basis for Response Action

The RI results were sufficient to characterize MRS-02. The RI only identified MD within the portions of the ARNG area that compose MRS-02, the delineated Military Training Buffer Area. These results were used to define the MEC contaminated area at the Camp Butner FUDS and to support the development and future execution of a response action within MRS-02. The BLRA for MC identified no unacceptable risk to human or ecological receptors at the ARNG area and therefore MRS-02 (HGL, 2016). The conclusions of the RI and BLRA can be applied to MRS-02 to support the determination that the selected remedy, LUCs (public education and signage), is appropriate to reduce risks posed to human receptors within MRS-02.

2.10 REMEDIAL ACTION OBJECTIVES

RAOs are both site-specific and contaminant-specific and define the conditions determined by the project team to be protective of human health and the environment. The RAO for MRS-02 addresses the goals for reducing exposure to potential MEC within the military training buffer area to ensure protection of human health, safety and the environment. It was determined during the RI that MC-related contamination does not present a risk to human health or the environment. Therefore, no RAO for MC-related contamination has been established.

The RAO established in the FS and summarized in the PP for MRS-02 is to eliminate the unacceptable risk of an incident to occur for ARNG trainees within 391 acres to the detection depths of the applicable munitions of concern such that a determination can be made that there is a negligible risk of an incident to occur. Negligible risk will be achieved by removal of all identified MEC hazards to the detection limit for that particular size of MEC. The detection technology used will demonstrate that the detection depth of intact munitions is greater than or equal to the expected depth of the munition. As established in the FS and summarized in the PP, there were no MEC identified in MRS-02 during the RI. As identified in the FS, 60 mm mortar MD was identified within the MRS to a depth of 12 inches bgs and unidentifiable fragmentation MD was identified to 40 inches bgs. This MRS is military land use, with depth of human activity not likely to exceed 12 inches bgs. The FS determined that implementation of LUCs minimizes the risk of receptor interaction with potential explosive hazards from MEC such that a negligible hazard determination and achievement of response complete can be supported. Remedial actions, such as LUCs, that inform receptors of residual hazards or physically limits a potential receptor's exposure to MEC are appropriate for MRS-02.

No regulatory guidelines have been promulgated specifying an acceptable risk level associated with DoD military munitions contamination. In lieu of such guidelines, the acceptable risk level is defined herein as achieving any one of the acceptable end-states described below. Each is developed for the protection of human health and the environment at the Camp Butner FUDS and is based on the revised RI CSM, which depicts the relationship between potential site hazards, pathways for receptors to encounter hazards, and potential current and future human and ecological receptors. The acceptable end states correspond to the intent of the RAO: to prevent human interaction with surface and subsurface DoD military munitions, to a depth of 12-inches bgs. During the development of this DD, each alternative has been evaluated against the end states to determine if it meets the RAO.

2.11 DESCRIPTION OF ALTERNATIVES

Five remedial alternatives were evaluated during the 2018 FS, based on the nature, extent, and reasonably anticipated future land uses, and RAO. The selected alternative was identified as Alternative 2, Land Use Controls (public education and signage). A description of each of the alternatives developed for consideration is presented below.

Five-year reviews, as outlined in Section 121(c) of CERCLA, as amended, and Section 300.430(f)(ii) of the NCP, are required for sites (at a minimum of every 5 years) where hazardous substances, pollutants, or contaminants remain above levels that allow UU/UE following implementation of the remedy.

2.11.1 Alternative 1: No Action

2.11.1.1 Remedy Components

Under Alternative 1, no action would be taken to address the DoD military munitions that remain at MRS-02.

2.11.1.2 Common Elements and Distinguishing Features

The No Action alternative means that a remedy would not be implemented to reduce DoD military munitions that potentially remain at the site. This alternative, if implemented, would involve continued use of the site in its current condition. Under CERCLA, evaluation of a No Action alternative is required pursuant to the NCP to provide a baseline for comparison with other remedial technologies and

alternatives. Alternative 1 does not implement any remedy to reduce potential risk. Therefore, it does not provide long-term protection of human health and the environment.

Estimated Capital Cost: $0
Estimated Maintenance Cost for 30 years: $0*
Estimated Five-Year Review Costs for 30 years: $0

* Here and elsewhere in this DD, all estimated costs are based on 30 years, consistent with EPA guidance.

2.11.1.3 Expected Outcomes

This alternative would involve continued use of the site in its current condition.

2.11.2 Alternative 2: Land Use Controls (LUCs)

2.11.2.1 Remedy Components

The components of Alternative 2 would include:

- Educational pamphlets, including development and distribution.
- Warning signs, including development and installation.

2.11.2.2 Common Elements and Distinguishing Features

LUCs are composed of enforceable administrative institutional controls and/or physical measures (engineering controls) to prevent or limit exposure of receptors to DoD military munitions. Deed notices, zoning ordinances, special use permits, and restrictions on excavation are examples of institutional controls. Physical barriers and access restrictions (for example, fencing, locked gates, and warning signs) or activity restrictions (prohibiting intrusive activities) are examples of engineering controls. LUCs can be cost effective, reliable, and immediately effective, and can be implemented either alone or in conjunction with other remedial components. Inspections and monitoring typically are required to document the long-term effectiveness of LUCs.

Alternative 2 includes making educational pamphlets available to the receptors that have access to the site (National Guard trainees and hunters). The pamphlet would inform the receptors of potential explosive hazards and safety precautions to be taken to avoid contact with DoD military munitions. Additionally, warning signs would be installed with the intent of limiting exposure to DoD military munitions by informing site users about the potential hazards at the site. Clearance would not be conducted prior to proceeding with this alternative. Costs would include those for purchasing and installing warning signs and developing and distributing an educational pamphlet. There are no applicable or relevant and appropriate requirements (ARAR) identified for this alternative. The period of performance of Alternative 2 is beyond the scope of this document. When the actual length of time cannot be determined, then the EPA allows for 30-year estimates. The estimated timeframe, or period of performance, of Alternative 2 was limited to 30 years. This timeframe limit is utilized for the purposes of cost estimation. Alternative 2 would not allow UU/UE following completion of the remedy; thus, five-year reviews would be required.

Long-term effectiveness of this alternative is limited because of the limited ability to prevent receptors from exposure to DoD military munitions hazards, and the potential for signs to be removed or damaged. This reduced effectiveness can be mitigated. Data may be gathered during the review process to determine if further action needs to be taken to protect public safety and the human environment.

Estimated Capital Cost: $131,339
Estimated Maintenance Cost for 30 years: $39,141
Estimated Five-year Review Costs for 30 years: $201,560

2.11.2.3 Expected Outcomes

This alternative would involve continued use of the site in its current condition; however, it would not allow UU/UE following completion of the remedy and thus would require five-year reviews.

2.11.3 Alternative 3: Surface Clearance of MEC with Analog Detection Methods and LUCs

2.11.3.1 Remedy Components

The components of Alternative 3 would include:

- Conducting a surface clearance of DoD military munitions throughout MRS-02.
- Educational pamphlets, including development and distribution.
- Warning signs, including development and installation.

2.11.3.2 Common Elements and Distinguishing Features

The primary component of Alternative 3 is surface removal of MEC from the MRS. Surface clearance at MRS-02 would result in a reduction in hazards on the ground surface; however, hazards may remain within the subsurface soils of the MRS. Field tasks associated with Alternative 3 would include surveying, vegetation clearance, surface clearance, investigation and removal of anomalies potentially representing MEC using analog magnetometers, and disposal of any MEC, material potentially presenting an explosives hazard (MPPEH), or MD. Vegetation cutting/clearance would only be conducted where necessary to complete surface clearance operations. Surface clearance would be completed by qualified unexploded ordnance (UXO) technicians using analog magnetometers, such as the Schonstedt GA-52Cx, or equivalent. For the purposes of cost estimation, this alternative assumes that there would be seven clearance teams composed of two UXO Technician IIs, and one UXO Technician III (team leader) each, with oversight provided by one Senior UXO Supervisor (SUXOS), one UXO Quality Control Specialist (UXOQCS), and one UXO Safety Officer (UXOSO) completing the work over 40-hour workweeks. Any DoD military munitions encountered during the surface clearance would be blow-in-place (BIP). If acceptable to move, DoD military munitions would potentially be consolidated for demolition. It is assumed that on-call explosives would be used for one demolition event per week of investigation. MEC items would be guarded by an unarmed security guard during nonworking hours. All MD recovered would be inspected, verified, certified as material documented as safe (MDAS), containerized, and shipped to an approved off-site facility for disposal. All areas disturbed during surface clearance activities would be restored and re-seeded. Similar to Alternative 2, educational pamphlets would be developed and distributed, and signs would be installed in and around the MRS. When the actual length of time cannot be determined, then the EPA allows for 30-year estimates.

Estimated Capital Cost: $13,635,888
Estimated Maintenance Cost for 30 years: $39,141
Estimated Five-year Review Costs for 30 years: $201,560

2.11.3.3 Expected Outcomes

This alternative would involve continued use of the site in its current condition; however, it would not allow UU/UE following completion of the remedy and thus would require five-year reviews.

2.11.4 Alternative 4: Surface and Subsurface Removal of MEC to a Depth of Detection Using DGM Detection Methods

2.11.4.1 Remedy Components

The components of Alternative 4 would include:

- Surface clearance and subsurface removal of MEC to a Depth of Detection using DGM Detection Methods.

2.11.4.2 Common Elements and Distinguishing Features

The primary component of Alternative 4 is surface clearance and subsurface removal of DoD military munitions from MRS-02 to a depth of 40 inches bgs. Based on land use, the estimated maximum depth of intrusive activities to potentially occur within MRS-02 is limited to surface and near surface soils (0 to 12 inches bgs). The minimum depth of removal as required to meet the RAO will then be 12-inches bgs. Therefore, surface clearance and subsurface removal of DoD military munitions to a depth 12-inches at MRS-02 would result in a reduction in accessible, potentially explosive hazards.

Field tasks associated with Alternative 4 would include vegetation clearance, surface clearance, DGM surveys, intrusive investigation, and removal of anomalies potentially representing subsurface DoD military munitions to a depth of detection using DGM methods, as well as disposal of any DoD military munitions (i.e., MEC, UXO, discarded military munition [DMM]), MPPEH, or MD. DGM technology has been proven effective at detecting metallic subsurface anomalies; however, these detections do not differentiate between munitions items and harmless metallic debris. DGM methods are technically feasible but extremely difficult based on vegetation, terrain, structures (e.g., buildings, slabs) and infrastructure (e.g., roads, parking lots, utilities). DoD military munitions items encountered during the clearance would be BIP. Post-BIP sampling of soil for explosives residue would be conducted following detonation of DoD military munitions items.

It is anticipated that surface clearance and subsurface removal of DoD military munitions under this alternative would allow UU/UE.

Estimated Capital Cost: $25,525,516
Estimated Maintenance Cost for 30 years: $0
Estimated Five-year Review Costs for 30 years: $0

2.11.4.3 Expected Outcomes

It is anticipated that surface and subsurface removal of DoD military munitions under this alternative would reduce exposure to hazards to a negligible likelihood of a potential DoD military munitions encounter (and that would allow UU/UE). Therefore, additional remedies like LUCs, including warning signs and educational pamphlets, would not be necessary. Five-year reviews would not be required. The depths at which MEC is detected and removed, and the presence of obstruction or data gaps will be evaluated post-remedial action to verify whether UU/UE is achieved.

2.11.5 Alternative 5: Surface and Subsurface Removal of MEC to a Depth of Detection Using Advanced Classification Methods (UU/UE Method B)

2.11.5.1 Remedy Components

The primary component of Alternative 5 would include:

- Surface and subsurface removal of MEC to a depth of detection using advanced geophysical classification methods.

2.11.5.2 Common Elements and Distinguishing Features

Alternative 5 would consist of conducting surface and subsurface removal of MEC to depth of detection using Advanced Geophysical Classification (AGC) methods. Similar to Alternative 4, Alternative 5 would involve DGM surveys; however, subsurface metallic anomalies would be further characterized using AGC methods prior to intrusive investigation. The implementation of AGC will differentiate between munitions items and non-hazardous metallic debris. Implementation of AGC would reduce the required intrusive investigations resulting in lower costs and time to complete the removal action. Similar to DGM, AGC will result in a digital record that can be easily verified. The depth of clearance under this alternative would meet the requirements of the RAO and eliminate the need for educational pamphlets, signage, and five-year reviews. Long-term reliability associated with this alternative is considered high because of the effectiveness of the detection technology, and the permanence associated with subsurface DoD military munitions removal. Alternative 5 would reduce the risk posed by DoD military munitions.

Field tasks associated with Alternative 5 would include vegetation clearance, surface clearance, dynamic survey, classification of anomalies using AGC, and removal of anomalies classified as targets of interest (TOIs) using AGC methods, and disposal of any DoD military munitions and MD. AGC is technically feasible but extremely difficult based on vegetation, terrain, structures (e.g., buildings, slabs) and infrastructure (e.g., roads, parking lots, utilities). If classification was not feasible, standard DGM or analog methods would be used as appropriate.

DoD military munitions items encountered during the clearance would be BIP. Post-BIP sampling of soil for explosives residue would be conducted following demilitarization of DoD military munitions. It is anticipated that surface clearance and subsurface removal of DoD military munitions under this alternative would allow UU/UE.

Estimated Capital Cost: $9,580,661
Estimated Maintenance Cost for 30 years: $0
Estimated Five-year Review Costs for 30 years: $0

2.11.5.3 Expected Outcomes

It is anticipated that surface and subsurface removal of DoD military munitions under this alternative would reduce hazards to a negligible likelihood of a potential DoD military munitions encounter (and that would allow UU/UE). Therefore, additional remedies like LUCs, including warning signs and educational pamphlets, would not be necessary. Five-year reviews would not be required. The depths at which MEC is detected and removed, and the presence of obstruction or data gaps will be evaluated post-remedial action to verify whether UU/UE is achieved.

2.12 COMPARATIVE ANALYSIS OF ALTERNATIVES

The remedial action alternatives were compared and evaluated using nine criteria during the detailed analysis of alternatives in the FS. The nine criteria fall into three groups: threshold criteria, primary balancing criteria, and modifying criteria. A description and purpose of the three groups follows:

- **Threshold criteria -** Requirements that each alternative must meet in order to be eligible for selection.
- **Primary balancing criteria -** which are used to weigh major trade-offs among alternatives.

- **Modifying criteria -** which was fully considered after public comment was received on the PP. In the final balancing of trade-offs between alternatives upon which the final remedy selection is based, modifying criteria, such as community acceptance, are of equal importance to the balancing criteria.

Table 2.4 describes each of these criteria that were used to evaluate the remedial alternatives for MRS-02. In addition, during the development of this DD, the alternatives were evaluated relative to the acceptable end states to determine their effectiveness for achieving the RAO for MRS-02.

Table 2.4
Evaluation Criteria for Superfund Remedial Alternatives

Criteria	**Threshold**	**Overall Protectiveness of Human Health and the Environment** determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
		Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) evaluates whether the alternative meets Federal and State environmental statutes, regulations, and other requirements that have been determined to be applicable or relevant and appropriate to the site, or whether a waiver is justified.
	Primary Balancing	**Long-term Effectiveness and Permanence** considers the ability of an alternative to maintain protection of human health and the environment over time.
		Reduction of Toxicity, Mobility, or Volume (TMV) through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of contaminants, their ability to move in the environment, and the amount of contamination present.
		Short-term Effectiveness considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.
		Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
		Cost includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.
	Modifying	**State/Support Agency Acceptance** considers whether the State agrees with the analyses and recommendations, as described in the FS and PP.
		Community Acceptance considers whether the local community agrees with analyses and preferred alternative. Comments received on the PP are an important indicator of community acceptance.

2.12.1 Overall Protection of Human Health and the Environment

The protectiveness criterion was evaluated in terms of possible future human interaction with DoD military munitions. Each alternative was also evaluated in terms of whether it would reduce the amount of munitions contamination within MRS-02, and the effects it would have on the existing environment.

Alternative 1, No Action, is not protective of human health and the environment. This alternative provides no source reduction, no reduction of future risk, and no protection to human receptors.

Alternative 2, LUCs, would restrict digging and minimize possible receptor interaction by providing warning of MEC contaminated soils, thus reducing the potential for contaminant exposure. Signs can be effective in reducing access to an area but are dependent on the cooperation of landowners, government personnel, contractors, subcontractors, and authorized visitors for implementation. Alternative 2 provides protection to human receptors by modifying behaviors to potentially reduce exposure to MEC at an acceptable level of risk. However, at MRS-02 only MD has been identified; no explosive hazards have been confirmed. Although there would still be risk to potential future receptors conducting intrusive activities, MRS-02 is a restricted access area under ARNG control. Alternative 2 is determined to be overall protective of human health and the environment.

Alternative 3, surface removal and LUCs, provides protection to human receptors at an acceptable level of risk for MEC remaining in the subsurface. However, MRS-02 was confirmed to have only minimal amounts of MD present that is indicative of MEC. Alternative 3 provides overall protection.

Alternatives 4 and 5 would provide surface clearance and subsurface removal of DoD military munitions throughout MRS-02. Complete removal of DoD military munitions under this alternative would eliminate risks associated with residual explosive hazards within MRS-02 to levels that would allow UU/UE. Therefore, Alternatives 4 and 5 would meet the threshold criteria of overall protection of human health and the environment.

2.12.2 Compliance with ARARs

No location-specific or chemical-specific ARARs have been identified for the Camp Butner FUDS. The location-specific ARAR identified for the project areas applies to the open detonation of consolidated MEC (40 CFR 264.601 [Miscellaneous Treatment Units]). This will occur when MEC can be safely moved from the location it was found to a safe area for demolition. MEC that cannot be moved safely will be blown in place. This ARAR would not apply to Alternatives 1 and 2 since no removal activities, and thus no consolidated shot activities, would be conducted. Alternatives 3, 4 and 5 will comply with this ARAR and this criterion will be achieved.

2.12.3 Long-Term Effectiveness and Permanence

The long-term effectiveness and permanence criterion evaluates the degree to which an alternative permanently reduces or eliminates the potential for a MEC exposure hazard. Alternatives 4 and 5 both provide a complete reduction of source area TMV and would warrant no further action. Alternative 2 is likely effective in the short-term; however, long-term effectiveness is considered to be limited. Alternative 3 provides some effectiveness by removing surface MEC; however, long-term effectiveness is considered to be low and is dependent on landowner participation for installation of signage and compliance with public education. Alternatives 4 and 5 were determined to provide the best long-term effectiveness and permanence because they would significantly reduce the risk due to possible MEC. The presence of MD is indicative of possible MEC at MRS-02 and Alternative 2 provides adequate effectiveness and permanence.

2.12.4 Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion addresses the statutory preference for selecting remedies that employ treatment technologies that permanently and significantly reduce TMV of the hazardous substances. Alternatives 4 and 5 provide the greatest reduction of TMV through treatment as a result of subsurface removal of the source to the maximum anticipated depth of MEC contamination. Alternatives 1 and 2 offer no reduction in TMV through treatment of contaminants. Alternative 3 provides a partial reduction of TMV through treatment as a result of surface only removal of MEC.

2.12.5 Short-term Effectiveness

Alternative 1 presents no short-term impacts or adverse impacts on workers and the community. Alternative 2 is considered to be effective in the short-term, and present minimal risk to workers implementing the alternative. Alternative 3 has some short-term effectiveness and also presents risks to workers implementing the removal. Alternatives 4 and 5 are determined to have the least short-term effectiveness because of the risk to workers conducting removal. Due to the increased likelihood of DoD military munitions detonation during implementation of Alternatives 4 and 5, trained technicians must perform the work.

2.12.6 Implementability

There are no implementability limitations associated with Alternatives 1 and 2. Alternatives 3, 4 and 5 are all technically and administratively feasible but require specialized personnel and equipment to implement and require the development of detailed work plans. Steep-sloped areas will affect the implementability of Alternatives 4 and 5.

2.12.7 Cost

The cost criterion evaluates the financial cost to implement the alternative. The cost criterion includes direct, indirect, and long-term operation and maintenance costs. Direct costs are those costs associated with the implementation of the alternative. Indirect costs are those costs associated with administration, oversight, and contingencies. These costs were adapted from costs associated with similar activities on site and cost estimates prepared for other similar sites. These costs do not include government administration and oversight for the respective activities.

The costs associated with Alternative 1 is $0 since no action would be taken at MRS-02. Alternative 2 is less costly than Alternatives 3, 4, and 5. Alternative 4 has the highest cost because it includes surface clearance and subsurface clearance of DoD military munitions throughout the MRS to 40 inches bgs utilizing DGM detection methods. The scope of work for Alternative 5 is identical to Alternative 4; however, AGC methods would be used in Alternative 5. AGC methods reduce the number of subsurface anomalies that require intrusive investigation therefore reducing the labor, time, and cost required to complete the field activities. For this reason, Alternative 5 is considered more cost effective than Alternative 4.

2.12.8 State Acceptance

The regulator, NCDEQ, concurs with the selected remedy, LUCs.

2.12.9 Community Acceptance

The public comment period was held during presentation of the PP to the public has completed and no community comments were received.

2.12.10 Evaluation Summary

The five alternatives were evaluated in terms of the NCP criteria, including threshold factors, balancing factors, and modifying factors. Alternatives 4 and 5 are considered the most effective alternatives for reducing potential risk from explosive hazards within the site. Alternative 2 would potentially reduce exposure to DoD military munitions, but the overall effectiveness is limited because there is no reduction in TMV, and there is still potential for receptors to access MRS-02. Alternative 3 would provide a partial reduction in TMV through treatment and disposal, with MEC remaining in the subsurface; it has a lower cost than Alternatives 4 and 5. Alternatives 4 and 5 would remove DoD military munitions contamination

from the areas where it has the highest probability of being located, mitigating the explosive hazard due to DoD military munitions presence and reducing risk to potential receptors. Both Alternatives 4 and 5 utilize DGM technology proven effective at identifying subsurface metallic anomalies. However, the additional use of AGC methods to differentiate between munitions items and non-hazardous metallic debris further reduces the level of effort associated with intrusive investigation under Alternative 5. The costs associated with Alternatives 4 and 5 are relatively high. Costs associated with Alternative 5 would be minimized by using AGC methods. Completion of Alternatives 4 and 5 would allow UU/UE, warranting no further action for MRS-02. These two alternatives would meet the RAO.

MRS-02 is exclusively within the Camp Butner Training Center and exclusively used for small arms training and maneuver training by the National Guard along with some hunting allowed. As such, access to the MRS is restricted and controlled, and the current and future receptors consist of National Guard trainees and recreational hunters. Following a comparison of all alternatives retained for detailed analysis, Alternative 2 is considered the most effective, cost-efficient, and appropriate alternative for reduction of receptor exposure to DoD military munitions/explosive hazards that may remain at MRS-02. MRS-02 will continue to be operated by the ARNG as an active small arms weapons training center, and there were only small amounts of MD located that are indicative of possible MEC in the MRS. The receptors present within MRS-02 (National Guard trainee and recreational hunters) will be protected from unacceptable risks by the implementation of Alternative 2.

2.13 SELECTED REMEDY

Upon comparison of the retained alternatives in the FS and feedback provided during the public comment period following the PP, Alternative 2, Land Use Controls, has been selected for implementation at MRS-02. LUCs, as described in Alternative 2, will adequately addresses the risk associated with the site, can be completed in a timely manner with a reasonable budget, and can be conducted without causing undue risk to field workers responsible for conducting the work.

2.13.1 Rationale for the Selected Remedy

By implementing LUCs in MRS-02, Alternative 2 would achieve an acceptable level of overall protectiveness of human health and the environment and meet the RAO since only MD has been identified in the MRS. Alternative 2 would mitigate exposure to residual DoD military munitions from the areas where it has the highest probability of being located and achieving a low likelihood the receptor will be injured by interaction with MEC. Completion of Alternative 2 would not allow UU/UE. Therefore, five-year reviews would be required.

The costs associated with Alternative 2 are relatively low; and easily implemented. Following a comparison of all alternatives retained for detailed analysis, Alternative 2 is considered the most effective, cost-efficient, and appropriate alternative for reduction of potential for receptors to come into contact with possibly DoD military munitions that may remain at MRS-02.

2.13.2 Description of the Selected Remedy

The selected remedy (LUCs) would minimize possible receptor interaction by warning of potential explosive hazards present, thus reducing the potential for receptor exposure. Signs can be effective in reducing access to an area and are dependent on the cooperation of the landowners (National Guard) for implementation. An educational pamphlet incorporating the 3Rs (Recognize, Retreat, Report) would be created to inform the National Guard trainees and any hunters that may be allowed access to MRS-02 of potential explosive hazards and safety precautions to be taken to avoid contact with DoD military munitions.

2.13.3 Estimated Remedy Costs

The information in the cost estimate summary table below (Table 2.5) is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost element are likely to accrue as a result of new information. This is an order-of-magnitude cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

Table 2.5
Cost Estimate Summary Table

Alternative 2: Land Use Controls (LUCs)	Cost
Total Implementation Cost	$131,339
Annual Cost	$48,224
Periodic Cost	$201,560
TPV at 7 percent Discount Rate	$221,900
Lower End TPV Range at -30 percent	$144,235
Upper End of TPV Range at +50 percent	$332,850

TPV cost estimates are considered accurate to within -30 percent to +50 percent of actual costs. Time frames vary among alternatives and are based on the projected operation periods for active engineering remedial components and the time required to achieve RAOs. Discount rate of 7 percent per USEPA, 2000 guidance was used to estimate TPV.

2.13.4 Estimated Outcomes of the Selected Remedy

With the implementation of the selected remedy, the outcome achieves the criteria of overall protection of human health and the environment, although there is no source reduction. The RAO is achieved by this remedy by reducing risks through educational pamphlets and warning signs.

2.14 STATUTORY DETERMINATIONS

The results of the RI fieldwork at the ARNG area support the determination that there is an unacceptable risk associated with receptor exposure to DoD military munitions at MRS-02. The selected remedy is protective of human health and the environment by use of LUCs (public education and signage) that minimize possible receptor interaction by warning of potential explosive hazards present, thus reducing the potential for receptor exposure. LUCs are acceptable for MRS-02 because access to the area is restricted (used for National Guard military training and recreational hunting) and only MD has been identified; no explosive hazards have been confirmed. Implementation of Alternative 2 at MRS-02 would meet the RAO of reducing exposure through limiting interaction of human receptors with surface and subsurface MEC. No ARARs were identified and the selected remedy meets the statutory requirements of CERCLA § 121(b) and the NCP regarding the former use of the project site by the DoD. Based on the information currently available, the selected remedy is protective of human health and the environment and cost-effective. Since the selected remedy will not allow for UU/UE it would be necessary to conduct statutory five-year reviews within five years after initiation of the remedy to ensure that the remedy is still protective of human health and the environment.

2.15 DOCUMENTATION OF SIGNIFICANT CHANGES FROM PREFERRED ALTERNATIVE OF PROPOSED PLAN

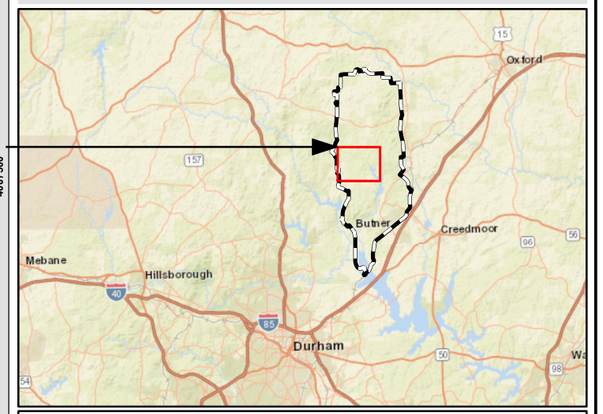
No changes have been made since the presentation of Alternative 2, LUCs, for MRS-02 in the PP.

Figure 3
MRS 02
RI Results

Former Camp Butner, NC

Legend

- Former Camp Butner Boundary
- Parcel Delineation
- MRS 02
- MD
- impact crater



U.S. Army Corps of Engineers, Engineering and Support Center, Huntsville

DISCLAIMER - The data represent the results of data collection/processing for a specific U.S. Army Corps of Engineers activity and indicates the general existing conditions. As such, it is only valid for its intended use, content, time and accuracy specifications. The user is responsible for the results of any application of the data for other than its intended purpose.

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3.0 PART 3: RESPONSIVENESS SUMMARY

3.1 OVERVIEW

In March 2018, the Final PP for the Camp Butner FUDS was issued. A public meeting was held on April 16, 2018 for the nine proposed MRSs evaluated during the RI and presented in the PP, including the MRS-02, Military Training Buffer Area MRS. The public comment period was held from March 26, 2018 to April 30, 2018.

3.2 PUBLIC COMMENTS AND LEAD AGENCY RESPONSES

No comments were received from the public on the PP. NCDEQ submitted no comments and concurs with this DD.

3.3 TECHNICAL AND LEGAL ISSUES

There were no technical or legal issues raised during development of this DD.

4.0 REFERENCES

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USEPA, 2000. A Guide to Developing and Documenting Cost Estimates During the Feasibility Study, Office of Solid Waste and Emergency Response, Washington, D.C., EPA540-R-00-002, July.

USACE, 2019. Final Feasibility Study Range Complex 1, Range Complex 2, Army National Guard and Flame Thrower Range Munitions Response Sites, Former Camp Butner, Granville, Person, and Durham Counties, North Carolina. Revision 1. March.

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