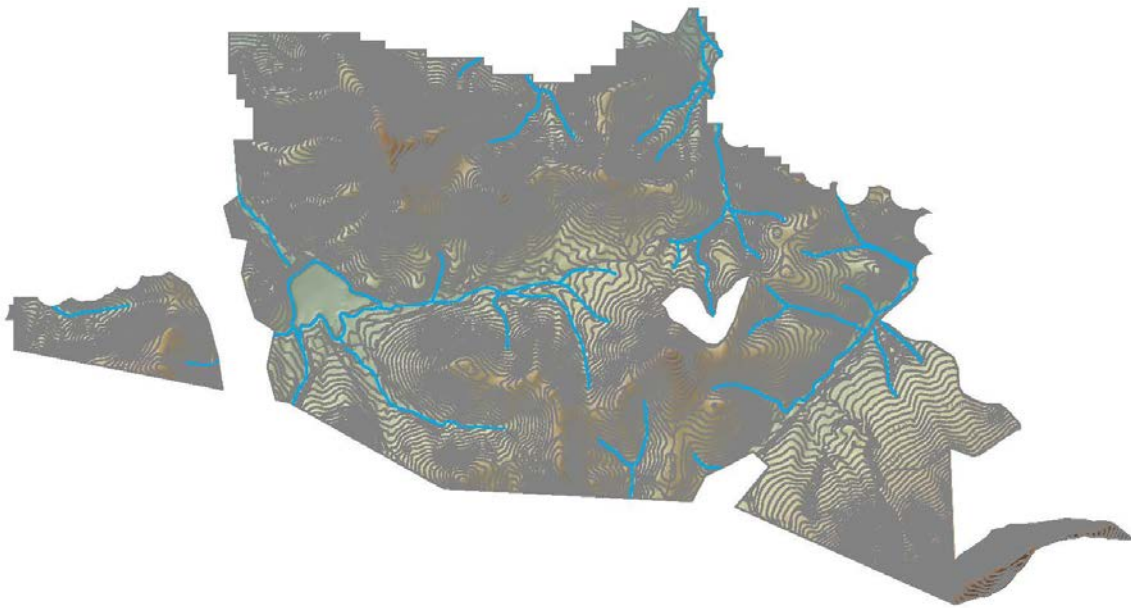


**Munitions Response Site 11
Supplemental Characterization
McClellan, Anniston, Alabama**

**Prepared for:
McClellan Development Authority**



**Prepared by:
Matrix Environmental Services, LLC
283 Rucker Street
Anniston, AL 36205**

Revision 1, June 2013



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Acronyms and Definitions

Acronyms

ADEM	Alabama Department of Environmental Management
ALDOT	Alabama Department of Transportation
AR	Army Regulation
Army	U.S. Army
ASP	Ammunition Supply Point
ASR	Archives Search Report
ATF	Alcohol, Tobacco, and Firearms
BCT	BRAC Cleanup Team
BIP	Blow-in-Place
BRAC	Base Realignment and Closure Act
CD	Compact Disc/Cultural Debris
CSM	Conceptual Site Model
DDESB	Department of Defense Explosives Safety Board
DFW	Definable Feature of Work
DGM	Digital Geophysical Mapping
DMM	Discarded Military Munitions
DNR	Deficiency Notice Report
DoD	Department of Defense
DQO	Data Quality Objective
EBP	Eastern Bypass
EE/CA	Engineering Evaluation/Cost Analysis
EM	Engineer Manual
EM61	Geonics EM61 time domain metal detector
ESP	Explosives Site Plan
FAR	Federal Acquisition Regulation
FCA	Functional Check Area
ft	Foot or Feet
FW	Foster Wheeler, Inc.
GEOQCM	Geophysics Quality Control Manager
GeoQCS	Geophysics Quality Control Specialist
GIS	Geographic Information Systems
GPO	Geophysical Prove-Out
GPS	Global Positioning System
HE	High Explosive
IAR	Industrial Access Road
ID	Identification
lbs	Pounds
in	Inch(es)
LUC	Land Use Control
Matrix	Matrix Environmental Services, LLC
McClellan	The former Fort McClellan
MEC	Munitions and Explosives of Concern
MD	Munitions Debris
MDA	McClellan Development Authority
MDAS	Material Documented as Safe
MDEH	Material Documented as an Explosive Hazard
mm	Millimeter
MMRP	Military Munitions Response Program
MPPEH	Material Potentially Presenting an Explosive Hazard
MRA	Munitions Response Area
MRS	Munitions Response Site

OE	Ordnance and Explosives
OERIA	Ordnance and Explosives Risk Impact Assessment
OSWER	Office of Solid Waste and Emergency Response
PDA	Personal Data Assistant
PWP	Program-Level Work Plan
QA	Quality Assurance
QC	Quality Control
SAA	Small Arms Ammunition
SCR	Supplemental Characterization Report
SOP	Standard Operating Procedure
SSWP	Site-Specific Work Plan
SUXOS	Senior UXO Supervisor
TTFWI	Tetra Tech Foster Wheeler, Inc.
TTEC	Tetra Tech EC, Inc.
UoP	Unit of Production
U.S.	United States
USACE	U.S. Army Corps of Engineers
USAE	USA Environmental, Inc.
USAESCH	U.S. Army Engineering and Support Center, Huntsville
USRADS	Ultra-Sonic Ranging and Data System
UoP	Unit of Production
UXO	Unexploded Ordnance
UXOQCS	UXO Quality Control Specialist
VSP	Visual Sampling Plan

Definitions

Material Documented as Safe (MDAS): MPPEH that has been assessed and documented as not presenting an explosive hazard and for which the chain of custody has been established and maintained. This material is no longer considered to be MPPEH and will be referred to as **Munitions Debris** in this document for consistency with existing McClellan documents.

Material Documented as an Explosive Hazard (MDEH): MPPEH that cannot be documented as MDAS, that has been assessed and documented as to the maximum explosive hazards the material is known or suspected to present, and for which the chain of custody has been established and maintained. MPPEH refers to **Munitions and Explosives of Concern (MEC)** which includes **Unexploded Ordnance (UXO)**, **Discarded Military Munitions (DMM)**, and explosive chemicals in explosively hazardous quantities. MDEH is generally perforated or explosively destroyed by demolition operations, as appropriate.

Material Potentially Presenting an Explosive Hazard (MPPEH): Material owned or controlled by the Department of Defense that, prior to determination of its explosives safety status, potentially contains explosives or munitions (e.g., munitions containers and packaging material; munitions debris remaining after munitions use, demilitarization, or disposal; and range-related debris) or potentially contains a high enough concentration of explosives 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).

Munitions Debris (MD): Remnants of munitions (e.g. fragments, penetrators, projectiles, shell casings, links, fins) remaining after munitions use, demilitarization, or disposal. MD and Range-Related Debris are often referred to as **MEC-scrap**.

Range-Related Debris: Range-related Debris is debris, other than munitions debris, collected from operational ranges or from former ranges (e.g. targets, target debris, military munitions packaging and crating material).

Other Debris: Debris found on ranges or MRSs, which may be removed to facilitate a range clearance or munitions response that is not related to munitions or range operations. Such debris includes, but is not limited to, rebar, household items, vehicle parts and vehicles not associated with range targets, fence posts, wire and fencing. Other Debris, also known as Cultural Debris, will be generally referred to as **Non-MEC Scrap** in this document for consistency with existing McClellan documents. Non-MEC scrap and other materials will be managed in accordance with state and federal solid waste and recycling requirements. Non-MEC scrap metal may be recycled provided the material “must have a metal content of at least 50%” [Office of Solid Waste and Emergency Response (OSWER) Directive 941.1990(09a)] and that it be in “solid, non-dispersible form (61 Federal Register 2362, 25 January 1996).

Small Arms Ammunition (SAA): Ordnance that is .50 caliber and smaller are considered small arms for the purposes of ordnance projects. The determining factor is that caliber .50 and smaller ammunition rarely contains explosive projectiles and present a very low risk to the public (OE-CX 200-1c, USAESCH, April 1999). Army policy is that SAA is not MEC.

1.0 INTRODUCTION

This Munitions and Explosives of Concern (MEC) Supplemental Characterization Report (SCR) was prepared by Matrix Environmental Services, LLC (Matrix) on behalf of the McClellan Development Authority (MDA) to support remedial decisions associated with the transfer of U.S. Army (Army) property to the MDA. The former Fort McClellan (McClellan), which was previously used by the U.S. Department of Defense (DoD) as an active military installation, was closed and most of this property was transferred to the local redevelopment authority (the MDA) under the Base Realignment and Closure (BRAC) program. The cleanup of the BRAC parcels was privatized to the MDA under an Environmental Services Cooperative Agreement with the Army and cleanup is proceeding under a Cleanup Agreement with the Alabama Department of Environmental Management (ADEM).

This SCR documents supplemental MEC characterization activities performed in Munitions Response Site 11 (MRS-11) in the Bravo munitions response area (MRA) at McClellan, AL. MRS-11 is an approximately 1013 acre portion of the Bravo Munitions Response Area (MRA) at McClellan Figure 1-1). This work was performed under the *Munitions Response Site 11 Supplemental Characterization Site-Specific Work Plan (SSWP) Addendum to the Program Level Final Program-Level Work Plan (PWP) Munitions and Explosives of Concern (MEC) Remediation Alpha and Bravo Munitions Response Areas of McClellan, Anniston, Alabama* (Matrix, 2012b). ADEM approved the SSWP in a letter dated March 9, 2012. The SSWP was supported by a DoD Explosives Safety Board (DESB) approved Explosives Site Plan (ESP) (Matrix, 2011a).

This SCR is intended to supplement and verify the MEC characterization performed previously by Tetra Tech-Foster Wheeler, Inc. (TTFWI) for the MRS-11 area in the *Draft Engineering Evaluation/Cost Analysis (EE/CA) Bravo Area of the Redevelopment Area, Fort McClellan, Alabama* (TTFWI, 2004). No MEC was found in the area comprising MRS-11 during the EE/CA (aside from one MEC item which was used to define MRS-10). However ADEM did not concur with the EE/CA recommendation for no further action for MEC for the MRS-11 area, primarily due to ADEM concerns over the documentation of quality control (QC) of the EE/CA. While the EE/CA was never finalized, the EE/CA findings have subsequently been used to support ADEM approved Action Memoranda defining the scope and extent of MEC remediations of the adjacent Bravo MRS-3 (Matrix, 2007b), MRS-6 (Matrix, 2008a), MRS-8 (Matrix, 2010a), MRS-4 (Matrix, 2010b), MRS-9 (Matrix, 2010c), MRS-7 (Matrix, 2012a), and MRS-5 (Matrix, 2012b).

The following appendices are included in this report. Figures and maps are presented in Appendix A. Appendices B-J are included electronically in the attached compact disks (CDs).

- Appendix A – Figures
- Appendix B – Survey Data
- Appendix C – Project Database
- Appendix D – Field Reports and Photos
- Appendix E – Quality Control
- Appendix F – Quality Assurance
- Appendix G – Yalaha Lake Lakebed Assessment
- Appendix H – MRS-11 Construction Support
- Appendix I – Disposal Records

44 **1.1 Project Location**

45 McClellan occupies 18,929 acres in the City of Anniston, in Calhoun County, Alabama. To the
46 west of McClellan are the areas known as Weaver and Blue Mountain and to the north is the
47 City of Jacksonville. The Talladega Forest is located east of McClellan. MRS-11 addressed in
48 this SCR is located in the Bravo MRA. The location of MRS-11 is shown in Figure 1-1
49 (Appendix A). MRS-11 borders MRS-3, MRS-6, and the Eastern Bypass (EBP) area to the
50 west; MRS-7, MRS-9, and MRS-8 to the north; MRS-2 and MRS-5 to the east; and the southern
51 boundary is defined by the boundary of the Bravo MRA. A separate small MRS, MRS-10, is
52 located within MRS-11.

53 **1.2 Site History**

54 McClellan has documented use as a military training area since 1912, when the Alabama
55 National Guard used it for artillery training. However, the Choccolocco Mountains may have
56 been used for artillery training by the units stationed at Camp Shipp in the Blue Mountain Area
57 during the Spanish American War as early as 1898. The 29th Infantry Division used areas of
58 McClellan for training prior to being ordered to France during World War I. In 1917, Congress
59 authorized the establishment of Camp McClellan, and in 1929, the camp was officially
60 designated as Fort McClellan. Prior to World War II, the 27th Infantry Division assembled at
61 McClellan for training, and during the war, many other units used the site for various training
62 purposes. Following World War II, in June 1947, McClellan was put in inactive status.
63 McClellan was reactivated in January 1950 and the site was used for National Guard training
64 and was selected as the site for the Army's Chemical Corps School.

65 The history of McClellan, as described in the Archives Search Report (ASR) Findings [U.S.
66 Army Corps of Engineers (USACE) 1999a] and ASR Conclusions and Recommendations
67 (USACE 1999b), includes training activities and demonstrations that used conventional
68 weapons (i.e., mortars, anti-tank guns, and artillery pieces). McClellan was recommended for
69 closure under the 1995 BRAC Program. McClellan was officially closed in September of 1999
70 and the property was transferred to the MDA (formerly the Joint Powers Authority) and other
71 federal entities.

72 **1.3 Site Description**

73 MRS-11 is approximately 1013 acres in area (after subtraction of previously cleared step-out
74 areas along the MRS border associated with adjacent MEC remediations) and is located across
75 the southern portion of the Bravo MRA (Figure 1-1). MRS-11 is bounded by the other Bravo
76 MRA-MRSs to the north and east. MRS-11 is divided by the EBP right-of way which is not part
77 of the Bravo MRA or MRS-11. The EBP right-of-way was previously cleared to depth of
78 detection by Foster Wheeler, Inc. (FW, 2006). The contiguous areas to the south were
79 previously transferred to the City of Anniston and to the U.S. Fish and Wildlife Service. The
80 westernmost tip of MRS-11 abuts the McClellan boundary and City of Anniston owned land.

81 The MRS is heavily wooded and has large areas of steep terrain with limited access (Figure 1-
82 2). The planned future land use in MRS-11 includes mixed use and McClellan Park System
83 (Figure 1-3). The McClellan Park System will be a wildlife habitat/conservation area. Due to the
84 difficult terrain features and lack of and difficulty of providing supporting infrastructure across the
85 MRS, that any mixed use redevelopment would likely be confined to the flatter areas near
86 Yahou Lake and the IAR. We note also that this SCR recommends a determination of
87 unrestricted use can be made for the vast majority of MRS-11.

88 **1.3.1 Site Features**

89 The MRS is transected by the EBP right-of-way and by the Industrial Access Road. The EBP
90 right-of-way, including a minimum 200-foot buffer zone from the planned edge of the road

91 shoulder, was previously cleared to depth of detection. A six foot chain link fence has been
92 constructed on the boundary of the right-of-way. EBP road building activities proximal to MRS-
93 11 have been completed except for paving, such that final road construction/paving activities will
94 be at least 200 feet from MRS-11.

95 The Industrial Access Road (IAR) is the only paved road within MRS-11. It was previously
96 improved and over-paved using Unexploded Ordnance (UXO) construction support by Matrix
97 following the clearance of MRS-2 in 2008-2009 and is now open to public traffic. Land use
98 controls along the IAR consist of signage and barriers prohibiting parking and trespassing.

99 All other access to MRS-11 is via unimproved dirt tracks through existing MRSs. The only
100 known structures within the MRS are the Yalaha Lake dam and relict wooden picnic structures
101 and foundations located southeast of the lake.

102 **1.3.2 Topography**

103 The topography of MRS-11 is shown on Figure 1-1 and a 2008 aerial photo of the area is shown
104 on Figure 1-2. The generally steep terrain, vegetative cover, and limited road access within
105 MRS-11 make access and fieldwork difficult.

106 The elevation of MRS-11 ranges from approximately 892 feet to 1,769 feet above mean sea
107 level. The highest elevations are in the eastern and northern portions of the site. The terrain in
108 the eastern half of MRS-11 slopes toward a drainage trending southwest to northeast that
109 parallels the IAR. The remainder of the site generally slopes toward the southwest along a
110 series of small streams draining into Yalaha Lake. Slopes are steepest along the eastern and
111 northern portions of the site, but terrain relief (greater than 30% slope) is significant throughout.
112 The EBP and its associated right-of-way bisect the western portion of the MRS. Although a
113 series of unpaved roads crisscross the interior of MRS-11, the majority of the interior is not
114 readily accessible by vehicle. No occupied or operational buildings or structures are located
115 within the MRS. A handful of relict picnic shelters and building foundations/remnants related to
116 the Former Mock Village at Yalaha Lake, Parcel 130Q-X are present southeast of Yalaha Lake.

117 **1.3.3 Hydrology**

118 Yalaha Lake (approximately 12.7 acres) is located in the west central portion of MRS-11 and
119 drains to the northwest into the EBP right-of way and beyond. The majority of surface water in
120 the western half of the MRS is transported by a series of small drainages into the lake. The
121 eastern portion of the MRS is drainage by southwest to northeast trending tributary to Cane
122 Creek that parallels the IAR.

123 **1.3.4 Geology**

124 McClellan is situated near the southern terminus of the Appalachian Mountain chain. All but the
125 easternmost portion of the former Main Post lie within the Valley and Ridge Province of the
126 Appalachian Highlands. The portion of McClellan east of Choccolocco Creek lies within the
127 Piedmont Province. The age of consolidated sedimentary and metamorphic rocks ranges from
128 Precambrian to Pennsylvanian. On a large scale, most of the rocks have been intensely folded
129 into an aggregate of northeast-southwest trending anticlines and synclines with associated
130 thrust faults. The shallow geology in the area is characterized by colluvial deposits. The
131 presence of metamorphic rocks, as well as iron-bearing cements within the sedimentary rocks,
132 increases the potential for minerals such as magnetite and other associated magnetic minerals.

133 **1.3.5 Climate**

134 Calhoun County sits on 611 square miles in the foothills of the Appalachian Mountains in
135 northeastern Alabama. Its western border is the Coosa River. The mean annual temperature is

136 61 degrees Fahrenheit, with seasonal averages of 38 in January and 80 in July. The average
137 annual precipitation is 65 inches and the elevation is 721 ft. above sea level.

138 **1.3.6 Historical MEC Finds**

139 As the final remedy for MRS-11 has not yet been determined, step-outs into MRS-11 were
140 cleared to 1 foot or to the depth of detection resulting from previous clearances of MRS-2, MRS-
141 3, and MRS-8 (Figure 1-1). The following MEC items were found on the periphery of MRS-11:
142 (2) 37 millimeter(mm) High Explosive (HE), (1) 75mm HE, (3) 60mm Mortar HE, and (1) 60mm
143 Mortar white phosphorous, but analysis has shown that these items were associated with the
144 adjacent MRSs, not MRS-11. These peripheral MEC were removed through step-outs
145 conducted during removal activities in the adjoining MRSs and a 200-foot MEC free buffer was
146 established along the relevant portions of the adjacent MRSs. These previously cleared step
147 out areas have been removed from MRS-11.

148 Grids, delineation transects and mountain transects were previously used to characterize this
149 area as documented in the *Draft Engineering Evaluation/Cost Analysis Bravo Area of the*
150 *Redevelopment Area Fort McClellan, Alabama* (Bravo EE/CA)(TTFWI, 2004) which will be
151 discussed in Section 2.1 No explosively hazardous MEC items were recovered during the
152 EE/CA in the Army designated sector (M3 Remainder Area – PR) which corresponds to MRS-
153 11. Munitions debris recovered in the EE/CA consisted of non-explosively hazardous pieces of
154 training items – various grenades, flares, smokes, signals, as well as 37mm projectiles, a 60mm
155 illumination projectile, and 75mm shrapnel rounds.

156 No MEC has been previously found in MRS-11. During the EE/CA, one MEC item, a 37mm HE
157 projectile, was found in a separate 9 acre area within MRS-11 designated as the EE/CA M3-1L
158 Suspect Area 2 – PR area. This 9-acre area was subsequently designated as MRS-10.

159 We note one adjacent historical find. In 2001, during the Eastern Bypass right-of way clearance
160 to depth of detection (FW, 2006) prior to the EE/CA, a 40mm grenade discarded military
161 munition (DMM) was found lying along the side of a road in Grid C85 proximal to the MRS-11
162 boundary. After a February 2004 meeting with ADEM, the Army and ADEM determined that the
163 Army would clear an addition 50x50-foot step-out grid (into MRS-11) with the DMM location as
164 the center of the western border of the grid. No other MEC was found in this step-out grid or
165 within 700 feet from this location. No munitions-related material, 40mm grenade or otherwise,
166 was found in this step-out grid or within 200 feet from this location. Based on the clearance
167 results, the item was determined to be DMM, unrelated to training/firing activities in this area.

168 Based on the EE/CA results, the munitions debris recovered to date and the historical
169 documentation of the (lack of) activities conducted in the Army designated sector (M3
170 Remainder Area – PR) which corresponds to MRS-11, it is expected that a very low density of
171 ordnance and flares/illumination rounds may be present. Several range safety fans overlap
172 MRS-11, but no target areas are known to be present. The Conceptual Site Model (CSM) for
173 MEC in MRS-11 is for randomly located of discarded military munitions (DMM) or non-live fire
174 training and illumination rounds from “man-portable” activities not associated with known
175 ranges.

2.0 PREVIOUS INVESTIGATION

This section describes the results of the Draft Bravo EE/CA for the MRS-11 area and two subsequent MEC-related activities performed within MRS-11 along the EBP right-of-way and at Yahou Lake prior to this SCR. The reader is referred to the Draft Bravo EE/CA (TTFWI, 2004) for a complete summary of work performed prior to the EE/CA.

2.1 Bravo EE/CA

TTFWI performed a site characterization of the Bravo MRA for conventional ordnance during 2001-2002 based on an ADEM approved Work Plan (FW, 2001) which was documented in the Draft Bravo EE/CA (TTFWI, 2004). The EE/CA investigation included geophysical investigations and intrusive investigation and characterization of geophysical anomalies. The Draft Bravo EE/CA recommended no further action for MEC for the MRS-11 area. However, the EE/CA was never finalized. Only those EE/CA efforts for the MRS-11 area will be summarized here.

MRS-11 lies within two EE/CA sampling sectors (Figure 2-1):

- M3-1L comprises the central and eastern portions of the MRS-11 area. This was a low likelihood MEC sector located outside of or at the far ends of known range fans where field reconnaissance indicated very little or no potential for MEC.
- M3-1M comprises the western portion of MRS-11 including the Yahou Lake area. This area was characterized as a medium likelihood MEC sector where the potential for MEC was suspected based on range fans/activities and field reconnaissance results, but was outside of known impact/target areas.

Based on the EE/CA field results, this area was subsequently divided into two areas which subsequently became MRS-10 and MRS-11.

- M3-Remainder Area-PR (MRS-11) - an approximately 1030-acre area where no MEC was encountered.
- M3-1M Suspect Area 2-PR (MRS-10) - an approximately 14-acre included area containing the only EE/CA MEC find.

2.1.1 EE/CA Conceptual Site Model for M3-Remainder Area-PR

A preliminary CSM was developed for potential exposures to MEC (called ordnance and Explosives (OE) at the time) in Risk Sector M3-Remainder Area-PR in the EE/CA (see EE/CA Figure 4-6). The CSM was developed in recognition of multiple uses of this area over time, although target or impact areas are not believed to be present. The density of MEC present is believed to be (very) low. The primary sources of potential exposures to MEC (small arms are not considered to be MEC) were various range safety fans, firing points and ground training areas located in or over the sector. MEC would have been deposited into the range safety fans by (mis)firing. MEC may also be present in the ground training areas or firing points as a result of firing or poor housekeeping, mishandling, or loss. These releases likely result in MEC being present on the ground surface or in the subsurface soils of the sector. Additionally, there is a potential for release to surface water or sediments. This CSM also indicates the principal mechanisms by which ordnance items may migrate or move from one location to another in the sector or shift from one depth in the soil to another. These potential transport and migration mechanisms include mechanical redistribution and human activity, precipitation run-off, and erosion and frost heave (in limited, specific locations). The original deposition of the ordnance items and the localized transport and migration processes results in a new distribution of MEC items in the soil, surface water, or sediments which may be locations of direct contact exposure by current or reasonably foreseeable future receptors associated with reuse of the area.

49 Potential receptors evaluated included site workers, construction workers, hunters, visitors, and
50 passive recreational users of the area.

51 **2.1.2 EE/CA Field Activities**

52 Following a review and compilation of historical range and ordnance information, documents,
53 and aerial photographs, TTFWI performed a ground reconnaissance of the areas thought to
54 contain MEC prior to finalizing the sampling strategies for the EE/CA sampling sectors with the
55 concurrence of the BRAC Cleanup Team (BCT) which included ADEM. Using UXO Estimator
56 (July 2001), it was determined that a minimum of 143.5 acres of intrusive sampling were
57 required to adequately characterize the 10 sampling sectors comprising the Bravo MRA.

58
59 For the low to medium MEC density sampling sectors comprising MRS-11, geophysically-based
60 intrusive sampling was designed to demonstrate, with a 90% confidence level, that a MEC
61 density of 0.1 MEC/acre was not exceeded if no MEC were found. Per USACE UXO Calculator
62 Guidance (v. 1.4.2), 0.1 MEC/acre was selected as appropriate for future land use where public
63 usage of the area is significant (i.e. unrestricted redevelopment).

64
65 Because of the difficult terrain, field characterization data for MEC was collected using a
66 combination of grids, Delineation Transects, Mountain Transects, and Cluster Transects (called
67 data collection transects or clusters in the Draft EE/CA Report). More details concerning the
68 determination of the EE/CA sampling sectors is contained in the approved Final Site-Specific
69 Work Plan for the Bravo Area (FW, 2001).

70
71 Geophysically-based data collection and surface/subsurface characterization were performed
72 on a combination of grids, Delineation Transects, Cluster Transects (data collection transects),
73 and Mountain Transects.

74 **2.1.2.1 Site Preparation**

75 Land surveyors with UXO avoidance support established and staked grid corners and transect
76 waypoints. For grids, UXO technicians using Schonstedts or Whites metal detectors removed
77 MEC-related items prior to brush clearing activities to prepare the grids for digital geophysical
78 mapping. For the data collection and delineation transects, UXO technicians performed surface
79 clearance and brush cutting along the transect routes, also using Schonstedts or Whites metal
80 detectors prior to digital geophysical data collection. Because of the steep terrain, surface
81 clearance on the mountain transects was performed by UXO Technicians concurrently with
82 navigation and analog data collection activities using Whites metal detectors. Any surface
83 MEC-related material recovered during this work phase was recorded for use in the Bravo
84 characterization.

85 **2.1.2.2 Geophysical Data Collection**

86 Following surface clearance and removal of brush from each grid and transect, geophysical
87 data was collected to identify metallic subsurface items. Digital geophysical data was collected
88 using the Geonics EM61 (EM61) in grids and along Delineation Transects and Cluster
89 Transects within the MRS-11 area. For the Mountain Transects, analog geophysical data was
90 acquired using a White's metal detector or Schonstedts and anomaly counts based on audible
91 instrument tones were recorded.

92 **2.1.2.2.1 Digital Geophysical Mapping (DGM) of Grids.** Geophysical data were
93 collected for grids within the MRS-11 area using an Ultra-Sonic Ranging and Data System
94 (USRADS) for positioning and an EM61 high resolution metal detector to acquire DGM data.
95 EM61 data was acquired for each USRADS setup using a line spacing of approximately 2.5 ft.

96 Geophysical data was digitally recorded at a rate of 10 readings per second, and position data
97 at a rate of 1 reading per second. Twenty-nine grids were collected, designated as B171 and a
98 series of grids designated B5xx.

99 **2.1.2.2.2 DGM of Transects.** EM61 data was collected along the Delineation Transects
100 and most Cluster Transects using differentially corrected GPS positioning based on pre-
101 established waypoints. Geophysical data was digitally recorded at a rate of 10 readings per
102 second, and position data at a rate of 1 reading per second.

103
104 Only a few portions of Delineation Transects totaling less than 2,500 feet are present along the
105 western margin of MRS-11. Since these Delineation Transect data were collected for anomaly
106 distribution information only, intrusive activities were not performed along these transects,
107 however surficial munitions-related items, were noted if present.

108
109 A total of 41 Cluster Transects, designated m31Mxxx, were collected in MRS-11. EM61 data
110 was collected on twelve parallel 200-foot segments and connecting 25 or 50-foot side
111 segments, defining a rectangular “zigzag” data collection pattern. Although data were digitally
112 recorded, processed and interpreted, intrusive personnel primarily used the flags placed during
113 the acquisition effort by the field team to guide the intrusive program. The flag placement
114 enabled crews to more quickly locate anomalies selected for reacquisition by the geophysicists.
115 During data acquisition, the digital data from the EM61 were “paused” when an audible
116 response occurred, and a pin flag placed at the location of the audible response. After placing
117 the pin flag, the digital data recording process was restarted.

118
119 Due to the constraints of the extreme terrain in the mountains, no digital geophysical data was
120 recorded on the Mountain Transects, which were divided into 290-foot segments. For the
121 Mountain Transects, analog geophysical data (anomaly counts) was acquired using a White's
122 metal detector for a 3-4-foot (ft.) wide path on 24 initial 15-foot wide transects (designated T01-
123 T24). A Schonstedt was used to collect anomaly counts on 41 supplemental 5-foot wide
124 transects (T25-T65). Analog anomaly counts were based on field crews manually recording the
125 number of audible signals heard on each transect segment.

126 **2.1.2.2.3 DGM Anomaly Selection.** As a general guideline, a single target location was
127 selected within a 3.5-ft radius of the peak intensity value of the EM61 for the grid data. Peak
128 intensity values separated by more than 3.5-ft were interpreted as individual target locations,
129 unless the morphology of the anomaly suggested that a single target was probable. This
130 determination is intuitive and depends upon the experience of the interpreter. The target
131 selections were classified as primary or secondary based on the overall anomaly characteristics
132 (amplitude, shape, estimated depth and size, field notes describing above ground features, and
133 any surface clearance, historical, and excavation data from the surrounding area). Primary
134 anomalies were those thought to potentially represent a 37mm projectile or larger ordnance
135 item. Primary and secondary targets (A and B target classification) were also selected for the
136 transect data based on the anomaly characteristics of the EM61 line data. The primary and
137 secondary classification was used to assist in the sampling program for grids and transects
138 where only a percentage of the targets were excavated.

139 **2.1.2.2.4 Anomaly Reacquisition.** The target reacquisition process for the grids utilized
140 USRADS positioning using the same set up points that were used during data acquisition. The
141 field crew occupied the selected target locations and interrogated the immediate area with the
142 EM61 sensor (hand-held version, which was used for this task only). A pin flag was placed at
143 each target location and relevant data (i.e., target id, distance from interpreted location,

144 comments, etc.) was digitally logged to a field palmtop and uploaded to the data management
145 computer at the end of each day. No target reacquisition was required nor completed for the
146 Delineation Transects or Mountain Transects as anomaly locations were flagged in the field
147 during data collection. Target reacquisition for several interpreted Cluster Transects was
148 performed using the same overall method except that a measuring tape was used to locate
149 targets along the transect segments relative to the waypoint locations.

150 **2.1.2.3 Grids**

151 Twenty-nine grids totaling approximately 14.7 acres were geophysically mapped and intrusively
152 investigated within the MRS-11 area. Twenty percent of the grids were chosen at the discretion
153 of the BCT and 80 percent of the grid locations were chosen at random locations (for areas with
154 less than 40 degrees slope). Grid locations were adjusted as necessary due to terrain features
155 and sector boundaries. Discretionary grids were placed 1) In areas where ordnance was found
156 during field reconnaissance; 2) In areas where known range fans or suspect training areas were
157 historically located; 3) Along topographic features which may have served as a backstop for
158 firing of artillery; 4) In areas along sector boundaries to determine if those boundaries between
159 probable areas of differing MEC density are appropriately located; and 5) To fill in larger gaps in
160 coverage where no randomly selected grids happened to fall. One 0.5-acre grid was
161 104.5x102-ft, the other 27 were 147.5-ft square.

162
163 For the initially planned 0.5 acres grids, geophysical data was collected over half of each grid
164 based on field considerations of terrain and vegetative cover clearance. During the course of
165 fieldwork, a field change request (FCR) was implemented replacing planned data collection
166 transects in Sector M3-1L with additional grids. These grids were laid out as half-acre grids and
167 geophysical data was collected over the full area of each grid.

168 **2.1.2.4 Delineation Transects**

169 Delineation Transects were used to further define the boundaries of areas suspected of high
170 MEC concentration (which were not present in the MRS-11 area). Delineation Transects are
171 3.5 feet wide with varying lengths. EM61 data was collected along the Delineation Transects to
172 document the distribution of metallic anomaly densities. Only a few Delineation Transect
173 segments totaling a little less than 2,500 feet (0.2 acres) are present along the western margin
174 of MRS-11. No intrusive investigations were performed, although surface results along the
175 transect paths were noted. Dig sheets were not prepared for the Delineation Transects
176 because intrusive activities were not planned for them.

177
178 No surface munitions-related items were found over the limited extent of the Delineation
179 Transects in MRS-11.

180 **2.1.2.5 Cluster Transects**

181 Each of the 41 Cluster Transects (also referred to as data collection transects in the EE/CA)
182 consisted of a series of twelve 200-foot long, 3.5 foot wide parallel transects spaced 25 to 50-
183 feet apart (depending on site conditions) covering a rectangular area of between 0.75-1.5 acres.
184 A total of 41 Cluster Transects covering approximately 10 acres were performed in the MRS-11
185 area. Flags were placed at anomaly locations during data collection based on audible response
186 of the EM61. Approximately 7.9 acres of Cluster Transects were intrusively investigated.

187
188 All geophysically mapped Cluster Transects in this area were intrusively investigated unless
189 they did not yield any audible EM anomaly signals during data collection. All flagged anomalies,
190 located based on audible signals from the EM61, were dug.

191 **2.1.2.6 Mountain Transects**

192 Mountain Transects were used in the mountainous areas of Bravo. Mountain Transects were
 193 meandering paths that followed the contour of the land. Mountain transects were laid out in
 194 areas containing slopes greater than 40 degrees. Transects were placed in order to achieve a
 195 wide geographic distribution across mountainsides that may have been used as backstops for
 196 artillery firing and generally followed contours across the flanks of the mountains, with one to
 197 three transects placed across each significant mountainside. Subsurface metallic anomalies
 198 identified by the UXO Technicians using Schonstedts or Whites handheld detectors were
 199 marked with pin flags.

200
 201 Two phases of Mountain Transects were performed. The initial phase of Mountain Transects
 202 (T01-T24) were conducted in 2002. Approximately 7.5 miles of transects, 15 feet in width, were
 203 collected, generally following the topographic contours of the hillsides. One anomaly was
 204 intrusively investigated for every 290 foot segment along the 7.5 miles of mountain transects
 205 walked. If no anomalies were present on a given segment, two were intrusively investigated on
 206 the next. A total of 136 anomalies were intrusively investigated, representing 10 digs per acre
 207 for the approximately 13.6 acres of transect area covered.

208
 209 The second, supplemental phase of Mountain Transects was conducted in 2004. Five foot wide
 210 transects (T25-T65) were performed over approximately 12.5 miles totaling approximately 7.6
 211 acres. As less than 40 anomalies were encountered on every 290-foot segment, all 222
 212 anomalies encountered were intrusively investigated.

213 **2.1.3 EE/CA Results for MRS-11**

214 **2.1.3.1 Intrusive Results**

215 As indicted in Table 2-1, a total of 43.8 acres of the M3-Remainder Area-PR sector comprising
 216 MRS-11 were intrusively characterized during the EE/CA, including a total of 28.5 acres of
 217 geophysically-based characterization in the grids and Cluster Transects. We note that no MEC
 218 items were recovered during the EE/CA in the Army designated sector (M3 Remainder Area –
 219 PR) which corresponds to MRS-11. One 37mm projectile HE was found on Mountain Transect
 220 T13 in M3-1L Suspect Area 2-PR which was used to delineate a separate MRS-10 within MRS-
 221 11. No other MEC items had been found in previous studies.

222
 223

Table 2-1 EE/CA Intrusive Investigation

EE/CA Tasks	Area
Grids	14.7 acres
Cluster Transects	13.8 acres
Mountain Transects – Initial	13.6 acres (7.5 miles)
Mountain Transects – Supplemental	7.6 acres (12.3 miles)
Total acres investigated	49.7 acres
Total acres investigated (geophysically-based)	28.5 acres

224 Notes:

225 Mountain Transects were conducted with handheld sensors only

226 Approximately 0.2 acres of Delineation Transects were not intrusively investigated

227
 228
 229
 230
 231

Munitions debris recovered in the EE/CA (Table 2-2) consisted predominantly of various
 grenades, flares, smokes, signals, and 37mm projectiles, with a few (5) 75mm shrapnel rounds
 as follows:

232

Table 2-2 Munitions Debris Recovered in MRS-11 In The EE/CA Investigation

MD Items	No. below 6-in Depth/ Maximum Depth (in)	Items Found in Grids	Items Found in Cluster Transects	Items Found in Mountain/ Supplemental Transects
37mm APT/TPT projectile	3/23"	14	10	32
Rifle Grenade, Illumination	0/6"	12	0	0
Rifle Grenade, Smoke	0/2"	2	0	0
Signal, Ground Smoke	0/3"	3	5	0
Signal, Ground, Illumination	0/1"	2	0	1
Practice Grenade	0/6"	3	0	1
Grenade, Smoke	0/0"	0	1	1
Grenade Pieces	0/5"	2	3	0
Flares	0/0"	1	0	0
Simulator, Smoke Pot, Mine, Other	0/3"	1	1	3
35mm Subcaliber Rocket, Practice	0/0"	0	1	0
75mm Shrapnel	0/3"	0	0	5
60mm projectile, illumination	0/0"	0	0	1
Fuze, Fuze pieces	0/2"	1	0	3
Misc. Fragments (not fragmentation)	0/2"	1	1	1

233

234 No 40mm grenades or pieces of 40mm grenades were found within MRS-11, in the 50x50-foot
 235 step out grid from the EBP, or anywhere near the single DMM find in the EBP. The single
 236 40mm grenade found along the road during the previous clearance of the EBP appears to be
 237 DMM unrelated to training activities in or immediately adjacent to MRS-11.

238

239 All 37mm MD encountered were non-explosively hazardous solid shot rounds. 75MM shrapnel
 240 MD was found only on the mountain transects. No fragmentation from HE rounds was found.

241 2.1.3.2 UXO Calculator Based Evaluation

242 The Army used UXO Calculator (ver. 1.4.2) to evaluate if the geophysically-based intrusive
 243 sampling performed during the EE/CA was sufficient to characterize the sector and to support
 244 "significant public usage" of this sector (Table 2-2). We note that the UXO Calculator tool has
 245 evolved into the current UXO Estimator, which yields fractionally different numbers but the same
 246 results for these data inputs. Sampling sufficient to demonstrate a MEC density of 0.1 UXO/acre
 247 or less with a 90% confidence level was utilized to support "significant public usage" of the
 248 property consistent with USACE-Engineering Support Center Huntsville (USAESCH) guidance
 249 at that time. Residential use would use less than 0.1 MEC/acre and passive recreational land
 250 use would use less than 1.0 MEC per acre so the most conservative case was used. Based on
 251 the UXO Calculator, a minimum of 22.8 acres of geophysically-based intrusive investigation
 252 would need to be performed without a MEC find to have a 90% confidence level that there were
 253 less than 0.1 MEC/acre in the sector.

254

255

256

257

258

259

Table 2-3 EE/CA UXO Calculator For M3-Remainder Area-PR

UXO Calculator	Input	Output
Sector Area	1112 acres	
Target MEC Density	0.1 MEC/acre	
Confidence Level	90%	
Minimum Intrusive Sampling Area Required		22.6 acres
Actual Intrusive Sampling Area (geophysically -based)	28.5 acres	
MEC Found	0	
Sufficient Characterization Performed?		Yes

260

261 Sufficient characterization was performed to meet the UXO Calculator criteria. As a larger than
 262 required area of 28.5 acres was intrusively characterized without a MEC find, the final UXO
 263 Calculator confidence level that less than 0.1 MEC/acre are present is 94.6%. Alternately, there
 264 is a 90% confidence level that the MEC density is less than 0.084 MEC/acre. A high confidence
 265 level that there are less, and perhaps substantially less than 0.1 MEC/acre are present is further
 266 supported by the additional 21.2 acres of Mountain Transects that were performed (without a
 267 MEC find) in areas too steep for geophysical mapping.

268 2.1.3.3 MEC Hazard Assessment

269 MEC hazard was evaluated using the Interim Guidance for the Ordnance and Explosives Risk
 270 Impact Assessment (OERIA) (USACE, March 2001) methodology to qualitatively evaluate the
 271 level of potential exposure to MEC and corresponding level of MEC protectiveness indicated to
 272 exist in the various sectors of the Bravo Area. Application of OERIA involved the direct analysis
 273 of site conditions relative to the:

- 274 • Nature of MEC present, or suspected of being present, in each area.
- 275 • Characteristics of the accessibility and stability of each area.
- 276 • Recreational or occupational activities expected to be performed in the area under
 277 projected future land use.

278

279 The OERIA results are summarized below. See the EE/CA for additional detail.

280 2.1.3.3.1 Risk Factors for the M3 Remainder Area-PR Sector

281 The following Risk Factors were selected for OERIA analysis:

- 282 • High explosive items or debris found – No.
- 283 • Ordnance Type – as parts of munitions items were encountered that functioned as
 284 designed, but none which had any explosive hazard, Category 0 (Inert OE or scrap) was
 285 selected. Category 1 (practice ordnance (fired or unfired)) was not selected as no items,
 286 including the 75mm projectiles, were encountered which had any energetic material.
- 287 • Ordnance Sensitivity – Category 0 (all non-energetic items) was selected as none of the
 288 MD items recovered had unburned energetic material or other explosive hazard.
- 289 • Ordnance Depth Range – Surface (26.5%), 0-1-foot bgs (67.5%), and >1 foot (6%). As
 290 no MEC was encountered, the depth distribution of MD was utilized.
- 291 • Ordnance Density – 90% confidence level that the MEC density is less than 0.084
 292 MEC/acre based on the UXO Calculator results.
- 293 • Site Accessibility – No restrictions to site access are present.
- 294 • Site Stability – Site Stable was selected as MEC was deemed unlikely to be exposed by
 295 natural events.
- 296 • Current Use Human Exposures – Recreational use, significant contact probability, and
 297 low (occasional) population were selected.

- 298 • Future Use Human Exposures – Passive recreation, significant contact probability, and
299 low (occasional) population were selected, noting a high likelihood of near term reuse.

300 **2.1.3.3.2 OERIA Baseline MEC Hazard Assessment**

301 Based on the OERIA assessment, the M3 Remainder Area – PR sector associated with MRS-
302 11 was assessed with a Baseline impact level. This has a Protectiveness Level associated with
303 Alternative 1 – No Further Action for both current and future use.

304 **2.1.3.4 ADEM-Non-Concurrence with No Further Action Recommendation**

305 The Draft Bravo EE/CA contained numerous errors and points of contention with ADEM. ADEM
306 and the Army had several subsequent meetings and rounds of comment responses, but
307 significant points of disagreement remained and the EE/CA was never finalized. The results of
308 the Draft Bravo EE/CA have been utilized to justify ADEM-approved Action Memoranda for
309 many of the Bravo MRSs, however major differences remain, primarily involving 1) the
310 adequacy, and quality of the QC documentation; and 2) the Army's recommendation of No
311 Further Action for the M3 Remainder Area-PR sector.

312 **2.2 Supplemental Investigation of Yahou Lake Lakebed**

313 Alabama was in record drought conditions in the fall of 2007 and Yahou Lake, originally 12.5
314 acres in area, was down to 2.75 acres, leaving approximately 9.75 acres of formerly
315 inaccessible dry lakebed exposed (Figure 2-2). On 24-26 September 2007 Matrix UXO
316 Technicians investigated the accessible dry areas of the lakebed using Schonstedt
317 magnetometers and a White XLT metal detectors to locate near & sub-surface metallic
318 anomalies. During a surface sweep utilizing 5-foot sweep lanes, MD consisting of one rifle
319 grenade illumination, expended and one slap flare, expended were encountered. A total of 64
320 subsurface metallic anomalies were marked with pin flags and each location was recorded with
321 a hand held global positioning system (GPS) unit for future reacquisition and intrusive
322 investigation. Each anomaly was qualitatively logged as high priority (strong) or low priority
323 (small and weak) by the UXO Technician (Figure 2-2). Thirty-three were field classified as high
324 priority and 31 as low priority.

325
326 On 15-16 October 2007, Matrix UXO technicians investigated the 33 high priority flagged
327 anomalies using mag and dig techniques. One additional expended slap flare was encountered
328 at 2 inches at location 223. Non-MEC-Scrap (Cultural Debris) was encountered at 27 locations
329 and geologic response (hot rocks) at 5 locations. No munitions-related material other than the
330 flares and illumination round was encountered. A brief operations report along with the anomaly
331 coordinates and dig results are included in Appendix I of this document.

332 **2.3 Construction Support**

333 Matrix UXO Technicians provided construction support for various construction activities
334 occurring within MRS-11 as needed (Appendix H).

335 **2.3.1 Eastern Bypass Buffer Zone Slivers**

336 The EBP right-of-way was previously cleared for MEC to depth in 2001-2002 (FW, 2001).
337 Based on the final design of the EBP, a 200-foot buffer from the shoulders of the road slightly
338 exceeds the previously cleared right-of-way at four "slivers" along the right-of-way which extend
339 into MRS-11 (Figure 2-3). As part of EBP construction, which involved significant modification of
340 the terrain within the right-of-way, the Alabama Department of Transportation (ALDOT) needed
341 to install a fence along the (steep sloped) perimeter boundary of the right-of-way and requested
342 construction support for the safe installation of the fence and to avoid any potential future road
343 closings from any future work in MRS-11 in adjacent areas along their fence line lying within a

344 200 foot buffer of the road. We note that the 50-foot step-out grid associated with the 40mm
345 grenade DMM found during the EBP clearance is contained within Sliver #4.

346 Construction support was performed by Matrix on 23-24 September 2009 along four small
347 slivers (Sliver #1 through Sliver #4) totaling 0.82 acres along the EBP boundary that extend up
348 to 60 feet into MRS-11 (Figure 2-3). The sliver boundaries were previously staked out by the
349 surveyors Barge Waggoner Sumner & Cannon, Inc. during which time Matrix provided anomaly
350 avoidance. Because of the small size of the slivers and the steep slopes involved, Matrix
351 cleared the four sliver areas to the depth of detection using mag and dig procedures on 5 foot
352 lanes using Schonstedts. Fall protection was utilized as required. One blasting cap, which is
353 believed to be related to ongoing EBP road construction and not to former military operations
354 was found in sliver #4. No other MEC or MD were encountered. A total of 153 lbs. of non-MEC
355 Scrap, including a kitchen sink, was removed. ALDOT subsequently installed the boundary
356 fence in October 2009 without incident. The operational report for this construction support task
357 is included in Appendix H.

358 **2.3.2 IAR Overpaving Construction Support**

359 In April 2009, Matrix UXO Technicians provided six days of construction support for the
360 overpaving of the IAR between MRS-2 and the southern boundary of MRS-11. Construction
361 support consisted of screening the shoulders of the road within 3 feet of the edge of the
362 pavement with handheld sensors and intrusively investigating metallic anomalies to 8 inches
363 bgs which might be impacted by overpaving activities. No munitions-related material (MEC,
364 MD, or SAA) was encountered. A total of 205 lbs. of non-MEC scrap was removed. Daily
365 operations reports for the construction support are included in Appendix H. The IAR overpaving
366 was subsequently completed in June 2009 without incident.

3.0 SUPPLEMENTAL CHARACTERIZATION

This work was performed under the Munitions Response Site 11 SSWP (Matrix, 2012b). This SCR is intended to supplement and to verify the results of the MEC characterization performed by the Army as documented in the 2004 Draft EE/CA (TTFWI, 2004). Much of the terrain of MRS-11 is extremely rugged with steep slopes where performing DGM is problematic.

A three-phase supplemental characterization for MEC of the 1013-acre MRS-11 was performed. Refer to Map 1 for the locations of the transects and grids which were characterized:

- Phase 1: Surface characterization of potential MEC along designated wide transect lanes;
- Phase 2: Follow-up surface clearance (final product) activities of 100-foot grids around MEC finds;
- Phase 3: Follow-up subsurface clearance of grids where MEC was found using DGM-based or analog-based techniques depending on the terrain and the nature of the items found.

A boundary survey for MRS-11 was also performed by a professional land surveyor relative to existing first-order benchmarks for incorporation into the site Geographical Information System (GIS). Land survey information, including grid corners and transect waypoints is included in Appendix B.

3.1 Phase 1 – Wide Transect Surface Characterization

3.1.1 Phase 1 Transect Design

Based on the previous MRS-1, -2, -3, -6, and -8 MEC remediations completed in the Bravo MRA, impact/target areas were expected to be greater than 500 feet across with respect to MEC finds and significantly larger with respect to munitions fragmentation/debris fields. For these MRSs, 49% of all MEC items (3,183 of 6,498) were recovered during the pre-vegetation removal surface sweep or the pre-DGM aggressive surface clearance activities. Therefore, it was expected that supplemental characterization consisting mostly of surface investigation in MRS-11 would be appropriate to verify that the EE/CA results were representative and if any previously unknown munitions training areas or impact areas are present. Visual Sampling Plan (VSP) software was utilized to provide a statistically defensible sampling design based on the feature that is being looked for. In this case, a survey consisting of detector aided reconnaissance along transects will detect, with 95% confidence, a 37mm impact area consistent with those that have previously been encountered at McClellan (see SSWP Appendix F). This 40.5 acre supplemental characterization area is larger than both the 6 acre (full) characterization area for 95% confidence level that there is less than 0.5 MEC/acre calculated by UXO Estimator and the Army Engineer Manual (EM) 1110-1-4009's recommended minimum 3% of area.

Twenty-eight (28) 20-foot wide north-south transects were installed spaced 480 feet apart (500-foot center to center) totaling 40.5 acres (4% of the MRS-11 area). The transects are coincident with the Alabama State Plane 500-foot and 1,000-foot easting lines (and the McClellan grid system). The transects are identified as T0001 through T0028, respectively, from west to east. Each transect is its own Unit of Production (UoP), consisting of multiple 100-ft segments. Transect waypoints (survey pins and labeled witness stakes) were installed at the MRS boundaries and at every Alabama State Plane 100-foot northing increment along each transect by a professional land surveyor with a UXO Technician providing anomaly avoidance support. Survey data is presented in Appendix B. Transect way points were incremented from south to north along each transect (e.g. T0005-00, T0005-01, etc.), and each 100-foot transect segment

46 is identified by its southern waypoint. We note that the transect waypoints were laid out such
47 that they were coincident with the (100-foot) grid corner locations of the McClellan grid system.

48 UXO Technicians using Schonstedts and Whites metal detectors performed a handheld
49 detector-aided (surface) reconnaissance of the transects from the end of February through May
50 2012. The transect centerline was established by pulling tape between the transect waypoints.
51 Two 5-foot lanes were established and swept on each side of the centerline making a 20-foot
52 swath. MEC-scrap, and non-MEC scrap weights were recorded on a PDA for each transect
53 segment as well as the location, identification (ID), and disposition data for any MEC items
54 encountered.

55 **3.1.2 Phase 1 Transect Results**

56 A detector aided reconnaissance was performed on twenty-eight (28) 20-foot wide transects
57 totaling 40.5 acres in accordance with the SSWP. The transect results are summarized in Table
58 3-1 below and are plotted on Map 1. The transect segments on Map 1 are color coded by the
59 type of material encountered – red for MEC, orange for MD, yellow for SAA, and green for non-
60 munitions-related cultural debris (CD) encountered. Where more than one type of material was
61 found, the color of the highest type (for MEC>MD>SAA>CD) was plotted.

62 **3.1.2.1 MEC**

63 A total of 4 surficial MEC items were recovered from the transects which resulted in conducting
64 Phase 2 and Phase 3 work activities as described in the SSWP. Photographs of all MEC items
65 are included in the photo log (Appendix D). A grenade (smoke) and a slap flare were found
66 southeast of Yahou Lake on Transects T0009 and T0010, respectively, near the Former Mock
67 Village at Yahou Lake, Parcel 130Q-X. A grenade fuze was found on T0020 near the IAR. The
68 fourth MEC item was a 75mm shrapnel round encountered on T0022 approximately 250 feet
69 from the MRS-2 boundary. This item was found during installation of the transect waypoints
70 prior to the actual transect sweep. 75mm shrapnel rounds were common in MRS-2 and multiple
71 step-outs were performed along the adjacent portions of the MRS-2 boundary as part of the
72 MRS-2 remediation. For the purposes of the Phase 3 follow-on work, only the 75mm shrapnel
73 round was considered to be penetrating ordnance.

74 **3.1.2.2 Munitions Debris and Small Arms Ammunition**

75 No munitions debris (MD) or small arms ammunition (SAA) was encountered in 816 (90.6%) of
76 the transect segments. Little or no MD was encountered in the portions of MRS-11 west of the
77 EBP, along or near the southern boundary of MRS-11, or in the eastern 2/3 of MRS-11 - except
78 for small areas proximal to MRS-2 and the IAR.

79
80 Munitions-related material (MD plus the 4 MEC items and SAA), consisting of 104 items totaling
81 227 pounds (lbs.), was encountered on only 85 (9.4%) of the 901 transect segments. This
82 averages to 2.6 items or 5.6 lbs. per acre of surficial munitions-related material over the 40.5
83 acres characterized. However, most (61%) of the surficial MD was concentrated in an
84 approximately 80-acre sub-area containing the northern portions of T007-T0014 south of MRS-
85 7. In this sub-area, which had no MEC associated with it, 136 lbs. of the 227 lbs. of munitions-
86 related material was recovered. The transects over the remaining 92% of MRS-11 contained
87 only 91 lbs. of munitions-related material (approximately 2.5 lbs./acre). For reference, during
88 the adjacent MRS-2 remediation approximately 24.7 lbs./acre of munitions-related material was
89 recovered during surface sweep operations.

90

91 Very little MD (3 items) and no SAA was found in the four transect segments where the four
92 MEC items were found. Munitions-related material and frequency encountered is tabulated on
93 Table 3-2 below.

94
95 The MD items recovered consisted primarily of solid 37mm APT rounds with lesser amounts of
96 various flares, smokes, and other small man-portable practice/training items which are
97 consistent with the EE/CA CSM. The only odd item found was the 75mm shrapnel round
98 (MEC), which is presumably related to MRS-2. No high explosive rounds or fragmentation from
99 high explosive rounds, other than MD from one 37mm (HE), were encountered on the transects.

100 **3.1.2.3 Non-MEC Scrap**

101 A total of 169.5 lbs. of metallic non-MEC scrap was encountered on the transects. This
102 averages to about 4.2 lbs./acre, which is an extremely low density compared to other areas of
103 McClellan. For example, during the MRS-2 MEC remediation about 27.2 lbs./acre of non-MEC
104 scrap was recovered during the surface sweep. This indicates that relatively little activity of any
105 kind occurred in MRS-11.

Table 3-1 Results from Transects

Transect/ Segments	MEC/ Segment	MD/SAA Segments	MEC+MD Scrap Wt (lbs.)	MD and SAA	Non- MEC Scrap Wt. (lbs.)	Non-MEC Scrap
T0001 00-02		00	0.5	Small Arms Ammo	7	Barbed Wire;Chain Link Fence Piece(s);Metal Pipe
T0002 00-07			0	N/A	0.5	Metal Spike
T0003 00-09		06	3	60mm Mortar (Illumination)	0	N/A
T0004 00-12			0	N/A	4	Metal Can(s);Metal Rod
T0005 00-14		03, 09, 12	2	(2) Grenade (Smoke)	1	Metal Can(s)
T0006 00-04			0	N/A	.5	Metal Debris
T0007 00-36		09, 11, 12, 21, 28, 31, 34	13	(7) 37mm APT;Grenade (Smoke);Slap Flare	6	Cable;Metal Can(s);Nail(s);Wire
T0008 00-39		21, 34, 37	10	(3) 37mm APT; (2) Rifle Grenade (Illumination)	7	Aluminum Can(s);Cable;Metal Can(s);Metal Rod
T0009 00-43	Grenade (Smoke) / 09	17, 30, 31, 33, 35, 36, 37, 38, 39, 40, 41	70	(23) 37mm APT	50	Aluminum Can(s); Bolt(s); Cable; Metal Can(s);Metal Plate;Wire
T0010 00-50	Slap Flare / 14	24, 28, 31, 34, 37, 39, 41, 42, 43, 45, 46, 47, 48, 49	39.5	(13) 37mm APT, Fuze	15	Aluminum Can(s); Bolt(s); Horseshoe(s);Metal Debris ;Metal Plate;Metal Rod;Wire
T0011 00-52		03, 08, 09, 10, 38, 43, 44, 46, 48, 49	19	(4) Rifle Grenade (Illumination), (6) 37mm APT	2.5	Aluminum Can(s); Horseshoe(s);Metal Can(s)
T0012 00—53		00, 44, 45, 46, 47, 48	11	(5) 37mm APT, 60mm Mortar (Illumination)	2	Metal Can(s)
T0013 00-51		38, 47	4.5	(2) 37mm APT, (1) 37mm (HE)	19.5	Wire, Cable;Metal Debris;Metal Rod; Metal Plate; Hinge(s)
T0014 00-50		45, 46	4	(2) 37mm APT	3	Aluminum Can(s);Metal Can(s);Wire; Chain linkfence pieces
T0015 00-52		33, 41	5	Rifle Grenade (Illumination), (2) 37mm APT	1.5	Metal Can(s);Wire
T0016 00-57		24, 41, 42	4	(2) Rifle Grenade (Illumination), 37mm APT	4	Metal Can(s);Metal Debris; Nails
T0017 00-55		09, 16, 41, 44	5	(2) Rifle Grenade (Illumination);Small Arms Ammo	13.5	Metal Plate(s); Metal Can(s)
T0018 00-42		14	3	Rifle Grenade (Illumination)	4.5	Metal Can(s);Metal Plate;Wire
T0019 00-42		02, 04, 06, 10, 18	12	(3) Trip Flare: Fuze;Grenade (Practice); Rifle Grenade (Illumination)	4.5	Metal Can(s);Metal Rod

107
108**Table 3-1 Results from Transects (continued)**

Transect/ Segments	MEC/ Segment	MD/SAA Segments	MEC+MD Scrap Wt (lbs)	MD and SAA	Non- MEC Scrap Wt (lbs)	Non-MEC Scrap
T0020 00-44	Grenade Fuze / 13	11, 39	5	Grenade (Practice); Fuze	5.5	Barbed Wire;Metal Debris;Aluminum Can(s)
T0021 00-45		10, 11, 12, 16, 43	10.5	(3) 60mm Mortar (Illumination);Grenade (Practice);Trip Flare; Fuze	6	Aluminum Can(s);Fence Post/Cap;Metal Rod; Wire
T0022 00-48	75mm Shrapnel/ 44		5	N/A	6.5	Aluminum Can(s);Cable;Metal Debris;Rebar
T0023 00-33			0	N/A	0	N/A
T0024 00-14			0	N/A	4	Cable;Wire
T0025 00-12		03	1	Grenade (Practice)	0	N/A
T0026 00-04			0	N/A	0.5	Metal Debris
T0027 00-03			0	N/A	0	N/A
T0028 00-02			0	N/A	0	N/A

Notes: N/A=not applicable, Wt=weight

109
110**Table 3-2: Summary of Munitions-Related Material on Transects**

Item	Quantity	Item	Quantity
37mm (64 APT and 1 HE)	65	Grenade, Practice	4
Rifle grenade (illum.)	13	Trip Flare	4
60mm mortar (illum.)	5	Slap Flare (1 MEC)	2
Fuze (various)(1 MEC)	5	SAA	2
Grenade (smoke) (1 MEC)	4	75mm Shrapnel (MEC)	1

Notes: illum. = illumination

111 3.2 Phase 2 Surface Clearance (Final Product) of Grids

112 As MEC was encountered during Phase 1 of the investigation, Phase 2 (surface clearance –
113 final product of adjacent grids where MEC was found) and Phase 3 (subsurface clearance of
114 grids where MEC was found) were performed.

115 3.2.1 Phase 2 Surface Clearance (Final Product) Design

116 Phase 2 consisted of a 100% detector-aided surface clearance (final product) of a four to five
117 acre area designed to get best fit coverage of a 200-foot radius around each MEC item using
118 16-18 whole 100-foot by 100-foot grids defined by the McClellan grid system.

119 Two additional MEC items were recovered during the initial round of surface clearance (final
120 product) which resulted in two “step-outs” of follow-on surface clearance (final product) on
121 additional 100 ft. x 100 ft. grids (also based on best-fit of whole grids within a 200-foot radius).
122 Surface clearance (final product) was performed on a total of 86 grids lying within approximately

123 200 feet of the surface MEC items found (Map 1). Two grids which impinged on previously
124 cleared MRS-2 step-outs, were stopped at the step-out boundary.

125 **3.2.1.1 Site Preparation**

126 The existing McClellan 100x100-foot grid system was utilized to define best fit whole grids
127 covering a 200 foot radius around each surface MEC find. A professional land surveyor with a
128 Matrix UXO Technician providing anomaly avoidance support, was utilized to set grid corners
129 consisting of survey pins and labeled witness stakes. Survey data is provided in Appendix B.

130 **3.2.1.2 Surface Clearance (Final Product)**

131 A UXO team led by a UXO Tech III (Team Leader) performed the surface clearance in each
132 grid. The team established control lanes approximately 5 feet in width using ropes stretched
133 from measuring tapes along the grid edges. Approved handheld sensors (Schonstedts and
134 Whites) were used to assist in detection and removal of metal objects on the surface and below
135 the loose vegetative cover.

136
137 MEC was consolidated for disposal and items unacceptable to move were marked for blow-in-
138 place (BIP) procedures at the end of each day. All scrap underwent an initial inspection to
139 ensure it was explosives-free and then staged along the boundary of the grid in designated
140 areas. MD, including re-inspected MD resulting from UXO disposal operations, were kept
141 segregated from non-MEC scrap through final disposition. MD and non-MEC scrap were re-
142 inspected for subsequent pickup and transported to a temporary holding area for QC and QA
143 inspection, certification and final disposition at an off-site recycling facility.

144
145 The UXO Team Leader recorded summary data from the surface clearance into their PDAs.
146 Total non-MEC and MD (MEC scrap) weights for each grid as well as the identification, weight,
147 and additional positional and location data for each MEC item were logged. PDA data was
148 checked and synchronized with the project databases daily.

149 **3.2.2 Surface Clearance (Final Product) Results**

150 The surface clearance (final product) results for the 86 grids totaling 19.7 acres are presented in
151 Table 3-3. The locations of the grids are shown in Map 1, with the grids color coded by the type
152 of material encountered – red for MEC, orange for MD, yellow for SAA, and green for non-
153 munitions-related material encountered. Where more than one type of material was found, the
154 color of the highest type (MEC>MD>SAA) was plotted. The munitions-related material and
155 frequency encountered is summarized on Table 3-4 below.

156 **3.2.2.1 Surface MEC**

157 Two MEC items were found during the initial round of surface clearance (final product). A
158 37mm (HE) round was found in N110E138, near MRS-2. A grenade (HE) was found in
159 N088E131 near the IAR. A step-out of additional surface clearance (final product) grids was
160 performed in each of these areas and subsurface clearance was performed in each grid
161 containing a MEC item per the SSWP. No other surface MEC was found. For the purposes of
162 Phase 3, the 37mm (HE) was considered penetrating ordnance and the grenade (HE) was
163 considered non-penetrating ordnance.

164 **3.2.2.2 Surface MD and SAA**

165 Very low quantities and densities of MD consisting of practice and training aids were found in
166 the 19.7 acres of surface clearance (final product) grids (Table 3-3). The quantities of
167 munitions-related material found in each of the three surface clearance subareas (grouping the
168 two adjacent areas by Yalou Lake together) are grouped and tabulated in Table 3-4.

- 169 • The few MD items recovered in the 28 grids located near the IAR consisted of two solid
170 37mm APT, two rifle grenades (illumination), SAA, and a fuze. No MD correlating with
171 the single grenade MEC item was found.
- 172 • The MD recovered for the 32 grids located southeast of Yahou Lake included 9
173 expended grenades (smoke), 2 37mm APT, 2 rifle grenades (illumination), SAA, and a
174 fuze.
- 175 • The MD recovered from the 26 grids located near MRS-2, included only three fuzes and
176 a rifle-grenade illumination grenade. No 37mm fragmentation or 75mm shrapnel
177 correlating with the MEC items were found.

178
179 No munitions-related material was encountered in 53 (61%) of the 86 grids. Very limited
180 amounts of munitions-related material were recovered (MD plus the 2 MEC items and SAA),
181 consisting of 38 items totaling 42 lbs. This averages to 1.7 items or 2.1 lbs. per acre (0.4 items
182 or 0.5 lbs. per grid) of surficial munitions-related material over the 19.7 acres characterized. For
183 reference, during the MRS-2 remediation approximately 24.7 lbs. per acre of munitions-related
184 material was recovered during surface clearance operations. Put in a different way, VSP
185 predicts that munitions training areas where MEC are present are surrounded by substantial
186 fringe areas where “high” concentrations of MD are present. In the grids surrounding the MEC
187 find locations in MRS-11, higher densities of MD which could be indicative of munitions training
188 areas were not found.

189 **3.2.2.3 Non-MEC Scrap**

190 A total of 311.5 lbs. of metallic non-MEC scrap was encountered on the surface clearance (final
191 product) grids. This averages to about 15.8 lbs./acre, which is a low density compared to other
192 areas of McClellan. For example, during the MRS-2 MEC remediation about 27.2 lbs./acre of
193 non-MEC scrap was recovered during the surface sweep. This is another line of evidence
194 indicating relatively little military activity of any kind occurred in MRS-11.

195
196

197

Table 3-3 Intrusive Results From Surface Clearance (Final Product) Grids

GridID	MEC +MD Scrap Wt (lbs.)	MEC	MD and SAA	NonMEC Scrap Wt (lbs.)	Non-MEC Scrap
N084E129	0.5		Grenade (Practice)	4	Metal Can(s)
N084E130	0		N/A	1	Metal Can(s)
N085E128	1		60mm Mortar (Illumination)	0.5	Aluminum Can(s);Hinge(s)
N085E129	0.5		Grenade (Practice)	1	Aluminum Can(s);Nail(s)
N085E130	1		Rifle Grenade (Illumination)	5	Metal Debris;Metal Pipe;Metal Rod
N085E131	0		N/A	15	Barbed Wire;Metal Rod
N086E128	1		SAA	2	Bolt(s);Metal Can(s)
N086E129	0		N/A	2	Barbed Wire;Metal Plate
N086E130	0		N/A	4	Barbed Wire
N086E131	1		Trip Flare	50	Barbed Wire
N086E132	0		N/A	25	Barbed Wire
N087E128	1		Rifle Grenade (Illumination)	2	Metal Can(s)
N087E129	2		Trip Flare	25	Metal Can(s);Metal Pipe
N087E130	3		Grenade (Practice);Trip Flare	50	Barbed Wire;Horseshoe(s);Metal Can(s)
N087E131	0		N/A	3	Barbed Wire;Metal Can(s)
N087E132	2		Trip Flare	0	N/A
N087E133	0		N/A	0	N/A
N088E129	0		N/A	2	Metal Can(s)
N088E130	2		Trip Flare	7	Chain Link Fence Piece(s);Metal Can(s);Metal Spike
N088E131	5	Grenade (HE)	N/A	6	Aluminum Scrap Metal;Metal Can(s);Metal Rod;Wire
N088E132	0.5		Fuze	0.5	Metal Can(s)
N088E133	0		N/A	5	Metal Debris
N089E130	0		N/A	2	Metal Debris
N089E131	3		Trip Flare	25	Cable;Metal Can(s);Metal Debris; Metal Pipe;Metal Rod;Metal Spike
N089E132	2		Grenade (Practice)	3	Metal Debris
N089E133	2		60mm Mortar (Illumination); Rifle Grenade (Illumination)	0	N/A
N090E131	0		N/A	2	Metal Can(s);Metal Debris;Wire
N090E132	0		N/A	2	Metal Debris
N092E074	0		N/A	7	Metal Can(s);Wire
N092E075	0		N/A	5	Commo Wire;Metal Can(s);Wire

198 **Table 3-3 Intrusive Results From Surface Clearance (Final Product) Grids (Continued)**

GridID	MEC +MD Scrap Wt (lbs)	MEC	MD and SAA	NonMEC Scrap Wt (lbs)	NonMEC Scrap
N093E073	1		SAA	10	Commo Wire;Metal Can(s)
N093E074	0		N/A	8	Aluminum Can(s);Cable;Commo Wire;Metal Can(s);Metal Plate
N093E075	0		N/A	7	Metal Can(s);Metal Debris
N093E076	1		Grenade (Smoke)	10	Metal Can(s);Metal Debris;Metal Plate;Wire
N094E073	1		Rifle Grenade (Illumination)	8	Commo Wire;Metal Can(s)
N094E074	0.5		Grenade (Smoke)	5	Commo Wire;Metal Can(s)
N094E075	0		N/A	8	Bolt(s);Commo Wire;Metal Can(s);Metal Rod
N094E076	1		Grenade (Smoke)	10	Commo Wire;Metal Can(s);Metal Rod;Nail(s)
N094E079	0		N/A	1	Metal Can(s)
N094E080	0		N/A	1	Metal Can(s)
N095E073	1		Grenade (Smoke)	10	Metal Can(s)
N095E074	0		N/A	7	Metal Can(s);Metal Pipe
N095E075	1		Grenade (Smoke)	50	Metal Can(s);Metal Debris;Metal Pipe;Metal Plate;Metal Rod
N095E076	2		Grenade (Smoke)	15	Commo Wire;Metal Can(s);Wire
N095E078	3		37mm APT;Grenade (Smoke)	2	Aluminum Scrap Metal;Metal Can(s)
N095E079	0		N/A	2	Metal Can(s);Wire
N095E080	0		N/A	15	Metal Can(s);Metal Plate;Wire
N095E081	1		Rifle Grenade (Illumination)	1	Metal Can(s)
N096E074	0		N/A	15	Metal Can(s);Metal Spike
N096E075	0		N/A	5	Commo Wire; Metal Can(s);Metal Spike;Wire
N096E078	0.5		Grenade (Smoke)	2	Commo Wire;Metal Can(s)
N096E079	0.5		Grenade (Smoke)	4	Commo Wire;Metal Can(s);Metal Pipe;Metal Rod
N096E080	0		N/A	2	Metal Can(s);Metal Rod
N096E081	0		N/A	2	Aluminum Can(s);Aluminum Scrap Metal;Metal Can(s);Metal Rod;Wire
N097E078	4		Fuze;37mm APT; SAA	3	Metal Can(s); Nail(s)
N097E079	0		N/A	4	Metal Can(s)
N097E080	0		N/A	7	Concrete (Reinforced);Metal Can(s);Metal Rod;Wire
N097E081	0		N/A	8	Metal Can(s);Metal Rod

199 **Table 3-3 Intrusive Results From Surface Clearance (Final Product) Grids (Continued)**

GridID	MEC +MD Scrap Wt (lbs)	MEC	MD and SAA	NonMEC Scrap Wt (lbs)	NonMEC Scrap
N098E079	0		N/A	7	Bolt(s);Metal Can(s);Wire
N098E080	0		N/A	5	Metal Can(s);Metal Debris;Wire
N108E138	0		N/A	0	N/A
N109E136	0		N/A	0	N/A
N109E137	0		N/A	5	Metal Debris
N109E138	0		N/A	0	N/A
N109E139	0		N/A	0	N/A
N110E136	0		N/A	0	N/A
N110E137	0		N/A	1	Metal Debris
N110E138	3	37mm (HE)	N/A	0	N/A
N110E139	0		N/A	0	N/A
N110E140	0		N/A	0	N/A
N110E141	0		N/A	0	N/A
N111E136	0		N/A	1	Metal Debris
N111E137	0		N/A	0	N/A
N111E138	0		N/A	0	N/A
N111E139	2		Fuze	3	Metal Plate
N111E140	0		N/A	0.5	Horseshoe(s)
N111E141	0		N/A	0	N/A
N112E137	0		N/A	0	N/A
N112E138	2		Fuze	0	N/A
N112E139	0		N/A	0	N/A
N112E140	0		N/A	0	N/A
N112E141	2		Fuze	0	N/A
N113E138	1		Rifle Grenade (Illumination)	0.5	Metal Can(s)
N113E139	0		N/A	1	Metal Rod
N113E140	0		N/A	0.5	Metal Can(s)
N113E141	0		N/A	0.5	Hinge(s)
N/A= not applicable, Wt=weight					

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210 **Table 3-4 Quantities of Munitions-Related Material in Surface Clearance (Final Product)**
 211 **Grids**

Item	Total	In Grids By the IAR	In Grids By Yahou Lake	In Grids By MRS-2
Rifle Grenade (Illumination)	6	3	2	1
Trip Flare	6	6	0	0
Grenade (Practice)	4	4	0	0
60mm Mortar (Illumination)	2	2	0	0
Grenade(HE)(MEC)	1	1	0	0
Grenade (Smoke)	9	0	9	0
Small Arms Ammunition	3	1	2	0
37mm APT	2	0	2	0
Fuze	5	1	1	3
37mm (HE)(MEC)	1	0	0	1
Totals	39	18	16	5

212

213 3.3 Phase 3 Subsurface Clearance of Grids

214 MEC items found on transects were assigned to the grids in which they were found. Subsurface
 215 clearance was performed for each grid in which a MEC item was found. As the recovered MEC
 216 item found in grids (near Yahou Lake and the IAR were non-penetrating ordnance (e.g. grenade
 217 (HE), grenade (smoke), slap flare, and a grenade fuze) a 1-foot clearance using analog
 218 methods was performed for four grids. Both the Em61 (analog mode) and approved handheld
 219 sensors were utilized. The 37mm (HE) and 75mm shrapnel round found near the MRS-2
 220 boundary were considered penetrating ordnance so a clearance to depth of detection was
 221 performed on these two grids. As DGM could not be safely performed in these grids due to
 222 excessive slopes, analog methods with approved handheld sensors were utilized to perform a
 223 mag and dig clearance to the depth of detection for these two grids.

224 3.3.1 Site preparation

225 Grids and grid corners had already been established for the surface clearance (final product)
 226 investigation phase. After the surface clearance (final product) had been performed, the six
 227 grids slated for subsurface clearance were grubbed. Brush, undergrowth, and tress less than 3
 228 inches in diameter were removed by a grubbing contractor supported by a UXO Technician
 229 escort.

230 3.3.2 Subsurface Clearance

231 Phase 3 of the Supplemental Characterization consisted of a subsurface clearance of any grid
 232 in which a MEC item was found during Phase 1 or Phase 2.

233 Clearance to 1 foot (Analog)

- 234 • Grids N094E074 and N096E079 southwest of Yahou Lake
- 235 • Grids N086E130 and N088E131 near the IAR

236 Clearance to Depth of Detection (Analog)

- 237 • Grids N112E140 and N110E138 near MRS-2

238 As analog clearance (mag and dig) methods were utilized for all grids, the procedures were the
239 same except for the depth of clearance. A UXO team led by a UXO Tech III (Team Leader)
240 performed the clearances using standard mag and dig clearing techniques. Five foot clearance
241 lanes were established and approved handheld sensors were utilized. Schonstedts (GA-92/52),
242 Vallons (VMH) and Whites (DFX) instruments were used for clearance to 1 foot and the
243 Schonstedts and Vallons were used for clearance to depth of detection. Anomalies were
244 identified with UXO Technicians utilizing the approved hand held instruments along each lane
245 prior to being intrusively investigated.

246 Intrusive work was performed by UXO Technicians with direction and supervision from UXO
247 qualified personnel (UXO Tech IIs or higher). UXO Tech Is were utilized under the direct
248 supervision of a UXO Tech II for manual excavation or under the direct supervision of a UXO
249 Tech III for mechanical excavation. If a mini-excavator was used, UXO Technicians were
250 responsible for hand digging anomalies to 12 inches prior to utilizing mechanical assistance. All
251 excavations were performed by carefully digging to the side of the suspected MEC item until a
252 positive identification was made. Excavation operations, whether by hand or using the mini-
253 backhoe, employed a layered approach, meaning that soil was removed in lifts of 6 inches or
254 less. After the target item was exposed, debris/dirt were cleared only enough to permit positive
255 identification of the item. As no additional MEC items were found, no demolition operations
256 were performed.

257 All scrap underwent an initial in-grid inspection to ensure it was explosives-free and then staged
258 along the boundary of the grid. MD was kept segregated from non-MEC scrap through final
259 disposition. MD and non-MEC scrap were re-inspected for subsequent pickup and transported
260 to a temporary holding area for QC and QA inspection, certification via DoD Form 1348-1, and
261 final disposition at an off-site recycling facility.

262 Dig results were recorded on PDAs using drop-down menus and then incorporated into the site
263 GIS/database daily. Grid data logged included total non-MEC and total MD (MEC scrap)
264 weights for each grid and additional positional and descriptive data for MEC items.

265 **3.3.3 Subsurface Clearance Results**

266 The subsurface clearance results for the 6 grids (totaling 1.4 acres) are presented in Table 3-5.
267 The locations of the grids are shown in Map 1. Heavy, solid grid boundary lines indicate
268 clearance to 1 foot and heavy dashed grid boundary lines indicate clearance to depth of
269 detection. The grids are color coded by the type of material encountered – red for MEC, orange
270 for MD, yellow for SAA, and green for non-munitions-related material encountered. Where more
271 than one type of material was found, the color of the highest type (MEC>MD>SAA) was used for
272 the shading of the grid. The munitions-related material and frequency encountered is
273 summarized on Table 3-6 below.

274 **3.3.3.1 Subsurface MEC**

275 No MEC was encountered during the subsurface clearance of the six grids.

276 **3.3.3.2 Subsurface MD and SAA**

277 Very low quantities and densities of MD consisting of practice and training aids were found in
278 the 1.4 acres of the 6 subsurface clearance grids (Table 3-5). The quantities of munitions-
279 related material found in each of the three surface clearance subareas are grouped and
280 tabulated in Table 3-6.

- 281 • The two clearance to 1 foot grids southeast of Yahou Lake – the only subsurface MD
282 found was a practice grenade.

- The two clearance to 1 foot grids near the IAR - MD consisted of a 37mm APT and 1 trip flare along with a little SAA totaling 4 lbs.
- The two clearance to depth grids near MRS-2 – No MD or SAA was found in the subsurface.

No subsurface munitions-related material was found in 3 (50%) of the 6 grids. Very limited amounts of MD was recovered, consisting of 4 items totaling about 6 lbs. This averages to 2.8 items or 2 lbs. per acre of inert subsurface MD over the 1.4 acres characterized. For reference, during the adjacent MRS-2 remediation approximately 252 lbs. per acre of munitions-related material was recovered during clearance to 1 foot operations and 364 lbs. per acre was recovered for clearance to depth operations.

VSP predicts that munitions training areas where MEC are present would be surrounded by substantial fringe areas where “high” concentrations of MD are present. In the grids where MEC was found, negligible subsurface MD densities were identified indicating that training areas are not present.

3.3.3.3 Non-MEC Scrap

A total of 27 lbs. of metallic non-MEC scrap was encountered in the six subsurface clearance grids. This averages to about 19.3 lbs./acre, which is a low density compared to other areas of McClellan and is probably biased high due to the results of one grid (15 lbs.) near the picnic area by Yahu Lake.

Table 3-5 Intrusive Results From Subsurface Clearance Grids

GridID	MD Scrap Wt	MEC	MD and SAA	NonMEC Scrap Wt	NonMEC Scrap (Cultural Debris)
Clearance to 1-Foot Grids					
N094E074	0		N/A	2	Aluminum Can(s);Metal Debris
N096E079	2		Grenade (Practice)	15	Aluminum Can(s); Aluminum Scrap Metal; Angle Iron;Banding Material;Barbed Wire;Bolt(s);Metal Pipe
N086E130	1		Small Arms Ammo	4	Barbed Wire
N088E131	3		37mm APT; Trip Flare	4	Bolt(s);Horseshoe(s);Metal Can(s);Nail(s);Wire
Clearance to Depth Grids					
N112E140	0		N/A	2	Barbed Wire
N110E138	0		N/A	0	N/A
Notes: N/A= not applicable, Wt=weight					

Table 3-6 Quantities of MD and SAA in Subsurface Clearance Grids

Item	Quantity	Item	Quantity
Grenade(Practice)	1	Trip Flare	1
37mm APT	1	Small Arms Ammunition	1

311 **3.4 Demolition Operations and Waste Disposal**

312 **3.4.1 Demolition Operations**

313 Demolition operations were conducted in Phase 1 and Phase 2 of the MRS-11 MEC
 314 characterization. Consolidated demolition operations were conducted at the existing intentional
 315 detonation area located in MRS-7. Items deemed not safe to move were rendered safe by BIP
 316 demolition procedures. The six items explosively investigated which contained energetic
 317 materials are listed in Table 3-7 below.

318 **Table 3-7 MEC Summary**

Demolition Method	Item	Final Disposition	Fuze Status	Fired Status	Fill Material
Consolidated	75mm Shrapnel	MEC	Unfuzed	Fired	HE
Consolidated	Grenade (Smoke)	MEC	Unfuzed	Unfired	Pyrotechnic
Consolidated	Slap Flare	MEC	Fuzed	Unfired	Pyrotechnic
Consolidated	Grenade Fuze	MEC	Fuzed	Unfired	HE
Consolidated	Grenade (HE)	MEC	Fuzed	Unfired	HE
BIP	37mm (HE)	MEC	Fuzed	Fired	HE

320

321 **3.4.2 Waste Disposal**

322
 323 MEC-related scrap and non-MEC-related scrap were sorted and inspected in accordance with
 324 the SSWP and DoD Instruction 4141.62 "Management and Disposition of Material Potentially
 325 Presenting an Explosive Hazard" (December 2004). This inspection process insured that MEC
 326 and non-MEC-scrap were properly sorted, demilitarized as needed, secured and did not present
 327 an explosive hazard. Following this inspection program, non-MEC scrap and demilitarized MD
 328 was released to a local scrap recycler with a signed DoD 1348-1A custody document. The
 329 containers of all scrap remained secured until it was processed and a certificate of disposition
 330 issued (See Appendix I).

4.0 QUALITY CONTROL/QUALITY ASSURANCE

This section discusses the Quality Control (QC) and Quality Assurance (QA) programs that were implemented during the MEC characterization of MRS-11. This section summarizes the DQOs and discusses the three phases of QC, and the results of the QC program. As no clearance to depth grids amenable to DGM were encountered, no DGM and no DGM QC was performed. QC documentation is provided in Appendix E.

4.1 Data Quality Objectives

The following approved Data Quality Objectives (DQOs) were used for this project.

Database Management

- MEC identification and intrusive data will be recorded and backed up.

Land Surveying

- Survey/positional accuracy – due to canopy cover, conventional survey methods were used by a PLS to survey the MRS boundary, transect waypoints, and grid corners. Accuracy of these systems was within +/- 1 in.

GPO Certification/Geophysical Sensor Performance Criteria

- The geophysical sensors must be approved for the work task (detecting 95% of seeds).
 - Detector-aided Reconnaissance and Surface Clearance (final product):
 - Vallon VMH (large & small head)
 - Schonstedt GA-92XT/52CX
 - Whites DFX 300/XLT
 - One Foot Clearance:
 - Vallon VMH (large & small head)
 - Schonstedt GA-92XT/52CX
 - Whites DFX 300
 - Geonics EM61-MK2 (analog mode)
 - Clearance to Depth:
 - Vallon VMH (large & small head)
 - Schonstedt GA-92XT/52CX
- Sensors and personnel must be certified as having successfully passed the Geophysical Prove-Out (GPO).

Detector-aided Reconnaissance (Transects) Performance Criteria (not a final clearance product)

- Sensors approved/certified for use in the GPO for surface sweep will be utilized.
- All UXO surface clearance personnel must perform a successful daily instrument functional check at the FCA to verify that the instruments are working properly.
- No MEC items missed.

Brush Clearing

- Vegetation cut to acceptable levels as deemed appropriate by the UXO Quality Control Specialist (UXOQCS).

Analog Geophysical Equipment Performance Criteria

- Approved sensors will be utilized for each task.
- The UXO Technicians and sensors must be certified in the GPO test grid as having successfully passed the GPO.

Surface Clearance (final Product)

- Each UXO surface clearance team must perform a daily instrument functional check at a function check area (FCA) to verify that the instruments are working properly.
- All blind seed items will be recovered.

- No missed surface MEC.
- Subsurface Clearance**
- All hand-held detectors will perform successful daily performance checks in accordance with standard operating procedures (SOPs) or manufacturer's specifications at FCA.
 - All blind seed items will be recovered.
 - Positively identify 100% of MEC items as to type, fuze, condition, and filler based on knowledge/training/reference material.
 - The UXOQCS will verify the identification of 100% of all MEC items.
 - No MEC items missed per Table 4-1 performance criteria (relative to clearance to 1 foot or clearance to depth)

Table 4-1 Clearance to Depth of Detection Performance Criteria

MEC Item	Clearance Depth
Mk II Hand Grenade	0 – 14 in.
37mm Projectile	0 – 14 in.
M9 Rifle Grenade	0 – 18 in.
2.36-in. Rocket	0 – 24 in.
3.5-in. Rocket	0 – 24 in.
75mm Projectile	0 – 30 in.
3-in. Stokes Mortar	0 – 32 in.
60mm Mortar Projectile	0 – 24 in.
81mm Mortar Projectile	0 – 30 in.
3.8-in. Projectile Shrapnel	0 – 24 in.
4.2-in. Mortar Projectile	0 – 36 in.
105mm Projectile	0 – 36 in.
155mm Projectile	0 – 48 in.
AT Mine	0 – 6 in.

4.2 QC Seeding
 A total of 12 QC seeds were placed – one per UoP for surface clearance (final product) and one per grid for subsurface clearance (Table 4-3) to test that the clearance operations were successfully implemented. All (100%) seeds were recovered.

Table 4-2 QC Seed Summary

Seed Category	Acres / UoPs-Grids	No. of QC Seeds	QC Seeds Recovered	Comments
Surface Clearance	19.7 / 6 UoPs	6	6	1/UoP
Mag&Dig clearance to 1ft	0.9 / 4 grids	4	4	1/grid
Mag&Dig clearance to depth of detection	0.5 / 2 grids	2	2	1/grid

4.3 Three Phase QC Program
 A three-phase QC inspection program was implemented as a means to verify accomplishment of the Definable Features of Work Table 10-3 of the SWPP. This program consisted of Preparatory, Initial, and Follow-up QC inspections. Work did not begin on a definable feature of work (DFW) until a successful preparatory phase inspection was completed and documented. Inspection/ surveillance logs are included in Appendix E. As DGM was not performed due to difficult terrain, DGM-specific QC steps/functions are not discussed.

75 **4.3.1 Preparatory Phase Inspection**

76 The Preparatory Phase was a pre-operational briefing and training prior to production start. It
77 consisted of a briefing by the QC team and Senior Unexploded Ordnance Supervisor (SUXOS)
78 for specific tasks. The briefing covered QC check sheet specifics and any SOPs relating to the
79 task. During the briefing, the QC team and operations personnel identified specific procedures,
80 and equipment needed to accomplish the task.

81 **4.3.2 Initial Phase Inspection**

82 The QC team conducted an initial phase inspection the first time a DFW was performed. This
83 inspection checked that preliminary work met work plan specifications, was safely executed,
84 and that an acceptable level of workmanship was achieved.

85 **4.3.3 Follow-up Phase Inspections**

86 Follow-up inspections ensured continued SSWP compliance, workmanship quality, and safety.
87 The UXO QC team observed specific portions of the task in progress while on site. Established
88 procedures briefed at the QC preparatory briefings and initial inspections were observed.
89

90 Step 5 of the QC process consisted of post excavation grid inspections to verify workmanship.
91 This QC step utilized MIL-STD-1916, verification level III. The SSWP specified three levels of
92 QC state (tightened 35%, normal 25%, or relaxed 15%) which determined the minimum
93 percentage of targets in a UoP that QC was required to check. The QC state for each team was
94 based on its work history and quality performance. All teams started at the normal level and the
95 QC state for each grid is recorded on each QC/QA Inspection report contained in Appendix E.

96 **4.3.4 Unit of Production (UoP) Certification**

97 The UoP Certification Packages document each UoP successfully passing the QC steps and
98 are included in Appendix E. All UoPs passed the certification requirements.

99 **4.4 Deficiency Notice Reports (DNR)**

100 The QC staff identified, documented, and tracked deficiencies during the course of field
101 activities in accordance with the SSWP. In addition, they were tasked to recommend corrective
102 actions, through a "root cause analysis" approach, and verify corrective actions were
103 implemented and any rework satisfactorily accomplished. The QC staff identified two DNRs
104 during this project which are summarized in Table 4-3 below. The DNRs are included in
105 Appendix E. Where rework was indicated, the rework was reinspected by the UXOQCS and
106 found to be of acceptable quality.
107
108

109

Table 4-3: MRS-11 Characterization DNRs

DNR	Activity	Condition/Root Cause	Corrective Action
001	Detector aided reconnaissance (transect)	Matrix QC found missed MEC-Scrap on transect T0009. Root cause believed to be failure to sweep/investigate 100% of lane due to difficult terrain and a UXO tech working with a not fully healed injury.	Reworked T0009 segments 29- 43 corresponding to that day's work.
002	Surface clearance (final product)	Team missed, but UXOQC found, a surface QA seed in grid N087E128 adjacent to the IAR. Root cause was that the miss was due to high noise levels from adjacent traffic.	Reworked areas within 40-ft of IAR in 9 grids contiguous to the IAR.

110

111 4.5 Quality Assurance

112 Because Matrix self-performed the MRS-11 MEC Characterization, the MDA hired USA
 113 Environmental, Inc. (USAE) to perform an independent third party QA of the final product
 114 clearance tasks. Matrix QA performed joint QA/QC inspections of the characterization
 115 transects, which were not final clearance work products. QA inspections and QA/QC
 116 acceptance reports of these UoPs are provided in Appendix F.

117
 118 The QA consisted of planting blind QA seeds and an intrusive inspection of all final product
 119 grids and UoPs. USAE placed a total of 6 blind QA seeds in the surface clearance (final
 120 product) grids and another six blind QA seed in the subsurface clearance grids (Table 4-4). All
 121 seeds were recovered.

122

123

Table 4-4 QA Seed Summary

Seed Category	Acres / UoPs-Grids	No. of QA Seeds	QA Seeds Recovered	Comments
Surface Clearance	19.7 / 6 UoPs	6	6	1/UoP. One (1) seed recovered by UXOQCS DNR-2
Mag&Dig 1ft clearance	0.9 / 4 grids	4	4	1/grid
Mag&Dig Clearance to Depth of Detection	0.5 / 2 grids	2	2	1/grid

124

125 No QA DNRs were issued.

126

127 As reported in the USAE Operations Reports in Appendix F, the QC process of the MEC
 128 clearance contractor (Matrix) was validated, and USAE found the work acceptable for all
 129 applicable grids. The Operations Reports include details of the specific grid clearance areas.

130

1 **5.0 CONCLUSIONS AND RECOMMENDATIONS**

2
3 A three-phase supplemental characterization for MEC was performed over the 1013-acre MRS-
4 11.

- 5 • Phase 1: Surface characterization of potential MEC along 40.5 acres of 20-ft wide north-
6 south transect lanes spaced 480-ft apart;
- 7 • Phase 2: Follow-up surface clearance (final product) activities of 100-foot grids around
8 MEC finds (including step-outs);
- 9 • Phase 3: Follow-up subsurface clearance of grids where MEC was found.

10 **5.1 Phase 1 Transects**

11 Based on the previous MRS-1, -2, -3, -6, and -8 MEC remediations completed in the adjacent
12 portions of the Bravo MRA, impact/target areas are expected to be greater than 500 feet across
13 with respect to MEC finds and significantly larger with respect to munitions fragmentation/debris
14 fields. As nearly half (3183 of 6498) of all MEC recovered in these MRSs were found on the
15 surface, the supplemental characterization consisting mostly of surface investigation is
16 appropriate to determine if any previously unknown munitions training areas are present in
17 MRS-11. VSP software was utilized to provide a statistically defensible sampling design - in
18 this case, the transect survey will detect, with 95% confidence, a 37mm impact area consistent
19 with those that have previously been encountered at McClellan (see SSWP Appendix F).

20
21 Twenty-eight (28) 20-foot wide north-south transects were installed spaced 480 feet apart (500-
22 foot center to center) totaling 40.5 acres (4% of the MRS-11 area). The transects, T0001
23 through T0028, consisted of 100-ft segments delineated by surveyed waypoints. Matrix UXO
24 Technicians using Schonstedts and Whites metal detectors performed a handheld detector-
25 aided reconnaissance of the transects, recording MEC and the MD and non-MEC scrap weights
26 for each segment on a PDA.

27 **5.1.1 MEC on Transects**

28 A total of 4 surficial MEC items were found on the 40.5 acres of transects.

- 29 • Grenade (smoke) and a slap flare - southeast of Yahu Lake on Transects T0009 and
30 T0010
- 31 • Grenade fuze - on T0020 near the IAR
- 32 • 75mm shrapnel round - on T0023 approximately 250 feet from MRS-2

33
34 For the purposes of the Phase 3 follow-on work, only the 75mm shrapnel round was considered
35 to be penetrating ordnance. The other three items were considered to be non-penetrating
36 training items.

37 **5.1.2 Other Material Found on Transects**

38 No munitions-related material (MD or MEC or SAA), was found on 816 (90.6%) of the 901
39 transect segments. Munitions-related material consisting of 102 items totaling 222.5 pounds
40 (lbs.) was encountered on 85 (9.4%) of the 901 transect segments. This averages to 2.5 items
41 or 5.5 lbs. per acre of surficial munitions-related material over the 40.5 acres characterized.
42 However, most (61%) of the surficial MD was concentrated in an approximately 80-acre sub-
43 area containing the northern portions of T007-T0014 south of MRS-7. In this sub-area, which
44 had no MEC associated with it, 136 lbs. of the 227 lbs. of munitions-related material was
45 recovered. The approximately 37 acres of transects over the other 92 percent of MRS-11

46 contained only 91 lbs. of munitions-related material (approximately 2.5 lbs./acre). For
47 reference, during the adjacent MRS-2 remediation approximately 24.7 lbs./acre of munitions-
48 related material was recovered during surface sweep operations.
49

50 The MD items recovered consisted primarily of solid 37mm APT rounds with lesser amounts of
51 various flares, smokes, and other small man-portable practice/training items which are
52 consistent with the EE/CA CSM. The only odd item found was the 75mm shrapnel round
53 (MEC), which is presumably related to MRS-2. No high explosive rounds or fragmentation from
54 high explosive rounds, other than MD from one 37mm (HE), were encountered on the transects.
55

56 Very little MD (3 items) was found in the four transect segments where the four MEC items were
57 found.
58

59 Little or no MD was encountered in the portions of MRS-11 west of the EBP, along or near the
60 southern boundary of MRS-11, or in the eastern 2/3 of MRS-11 - except for small areas
61 proximal to MRS-2 and the IAR.

62 **5.2 Phase 2 Surface Clearance (Final Product) of Grids**

63 Phase 2 consisted of a 100% detector-aided surface clearance (final product) of a four to five
64 acre area around each MEC item using whole 100-foot by 100-foot grids using the McClellan
65 grid system. The area was designed to get best fit coverage of a 200-foot radius around each
66 MEC item. Two additional MEC items were recovered during the initial round of surface
67 clearance (final product) which drove two “step-outs” of follow-on surface clearance (final
68 product) on additional 100 ft. x 100 ft. grids (also based on best-fit of whole grids within a 200-
69 foot radius).

70 Surface clearance (final product) was performed on 86 grids totaling 19.7 acres.

71 **5.2.1 MEC in Surface Clearance (Final Product) Grids**

72 Two MEC items were found during the initial round of surface clearance (final product):

- 73 • 37mm (HE) round – in grid N110E138, near MRS-2.
- 74 • Grenade (HE) - in grid N088E131 near the IAR.

75
76 A step-out of additional surface clearance (final product) grids was performed in each of these
77 areas. No other surface MEC was found. For the purposes of Phase 3, the 37mm (HE) was
78 considered penetrating ordnance and the grenade (HE) was considered non-penetrating
79 ordnance.

80 **5.2.2 Other Material Found on Surface Clearance (Final Product) Grids**

81 Very low quantities and densities of MD consisting of pieces of various practice and training aids
82 were found in the 19.7 acres of surface clearance (final product) grids. The munitions-related
83 material found are grouped into three areas as follow:

- 84 • The 28 grids located near the IAR – the few MD encountered consisted of two solid
85 37mm APT rounds, two rifle grenades (illumination), SAA, and a fuze. No MD
86 correlating with the single grenade MEC item was found.
- 87 • The 32 grids located southeast of Yalou Lake – MD consisted of 9 expended grenades
88 (smoke), 2 37mm APT, 2 rifle grenades (illumination), SAA, and a fuze.
- 89 • The 26 grids located near MRS-2 – MD consisted of only three fuzes and a rifle-grenade
90 illumination. No 37mm fragmentation or 75mm shrapnel correlating with the MEC items
91 were found.
92

93 No munitions-related material (MEC or MD or SAA) was encountered in 53 (61%) of the 86
94 grids. Very limited amounts of MD and SAA were recovered - consisting of 36 items totaling
95 less than 40 lbs. This averages to 1.8 items or 2 lbs. per acre of surficial MD over the 19.7
96 acres characterized. For reference, during the MRS-2 remediation approximately 24.7 lbs. per
97 acre of munitions-related material was recovered during surface clearance operations.

98
99 VSP predicts that munitions training areas where MEC are present are surrounded by
100 substantial fringe areas where “high” concentrations of MD are present. In the grids
101 surrounding the MEC find locations, higher densities of MD which could be indicative of
102 munitions training areas were not found.

103 **5.3 Subsurface Clearance Results**

104 Subsurface clearance was performed in each of the 6 grids (totaling 1.4 acres) where MEC was
105 found.

106 **5.3.1 Subsurface MEC**

107 No MEC was encountered during the subsurface clearance of the six grids.

108 **5.3.2 Other Material Found on Subsurface Clearance**

109 Very low quantities and densities of MD consisting of practice and training aids were found in
110 the 1.4 acres of the 6 subsurface clearance grids (Table 3-5). The quantities of munitions-
111 related material found in each of the three subsurface clearance subareas (grouping the two
112 grids by Yahou Lake together) are grouped and tabulated in Table 3-6.

- 113 • The two clearance to 1 foot grids southeast of Yahou Lake – the only subsurface MD
114 found was a practice grenade.
- 115 • The two clearance to 1 foot grids near the IAR - MD consisted of a 37mm APT and 1 trip
116 flare along with a little SAA totaling 4 lbs.
- 117 • The two clearance to depth grids near MRS-2 – No MD or SAA was found in the
118 subsurface.

119 No subsurface munitions-related material was found in 3 (50%) of the 6 grids. Very limited
120 amounts of MD was recovered, consisting of 4 items totaling about 6 lbs. This averages to 2.8
121 items or 2 lbs. per acre of inert subsurface MD over the 1.4 acres characterized. For reference,
122 during the adjacent MRS-2 remediation approximately 252 lbs. per acre of munitions-related
123 material was recovered during clearance to 1 foot operations and 364 lbs. per acre was
124 recovered for clearance to depth operations.

125
126 VSP predicts that munitions training areas where MEC are present would be surrounded by
127 substantial fringe areas where “high” concentrations of MD are present. In the grids where MEC
128 was found, negligible subsurface MD densities were identified indicating that training areas are
129 not present.

130 **5.3.3 Summary Totals for the Supplemental MEC Characterization**

131 Areas Characterized:

- 132 • Phase 1 Wide Surface Transects – 28 transects/40.5 acres
- 133 • Phase 2 Surface Clearance (Final Product) Grids – 68 grids/19.7 acres
- 134 • Phase 3 Subsurface Clearance Grids – 6 grids/1.4 acres

135 Material Recovered:

- 136 • MEC – 6 (all on surface)
- 137 • MD/SAA – 268.5 lbs.
- 138 • Non-MEC Scrap – 505 lbs.

139 **5.4 Calculated MEC Density**

140 For surface clearance (final product) (19.7 acres), surface (transect) characterization (40.5
141 acres), and subsurface clearance (1.4 acres) a total of about 59.2 acres (after removing
142 overlap) were characterized and 6 MEC items were found (all on the ground surface) giving a
143 worst case average *surface* MEC density of 0.1/acre for the areas characterized.

144
145 A MEC density of 0.1 MEC/acre is the USACE default where public usage of an area is
146 significant (e.g. unrestricted use). Because different levels and depths of characterization in the
147 EE/CA and the SCR phases are being compared, UXO Estimator or VSP can't be used to
148 directly calculate confidence levels for the MRS-wide MEC density. However, it can be stated
149 that the SCR results are consistent with the EE/CA results which calculated a 94.6% confidence
150 level that less than 0.1 MEC/acre are present. If it is assumed that all MEC are on the surface
151 and that all characterization data are of equal quality, then UXO Estimator analysis of the field
152 data (109 total acres characterized with 6 MEC finds) yields an average MEC density of 0.06
153 MEC per acre is calculated with a 93% confidence level that less than 0.1 MEC/acre are present
154 in MRS-11. Eliminating the two finds associated with MRS-2 yields an average MEC density of
155 0.045 MEC per acre with a 99% confidence level that less than 0.1 MEC/acre are present (and
156 a 67% confidence level that less than 0.05 MEC/acre are present).

157
158 The calculated UXO density of 0.1 MEC/acre implies that a maximum of 100 MEC could
159 potentially be present in MRS-11 at a (very) high confidence level of approximately 95%.
160 However, there are multiple lines of evidence which indicate that the actual MEC density is likely
161 substantially lower than this number for the following reasons:

- 162 • In the EE/CA, no MEC was found on an additional 21.2 acres of Mountain Transects
163 were performed which was not factored into the EE/CA UXO density calculation.
- 164 • A surface assessment of 9.75 acres of Yahou Lake lakebed during the drought of 2007
165 did not encounter any MEC (and only MD associated with flares/illumination rounds).
- 166 • No military munitions-related material was found in 2009 during construction support in
167 MRS-11 of slivers along the EBP boundary and along the IAR.
- 168 • No new range training or impact areas were identified during SCR characterization.
- 169 • Large stretches of MRS-11 were found to be entirely free of any surficial munitions-
170 related material.
- 171 • Where encountered, surface MD consisted of non-explosively hazardous training or
172 practice items which were present at extremely low densities - more than an order of
173 magnitude lower than were found in adjacent MRSs.
- 174 • Two (33%) of the MEC encountered during this supplemental characterization were
175 clustered by MRS-2 and strongly appear to relate to MRS-2, not MRS-11.
- 176 • The remaining four (surface) MEC found were clustered along the IAR and by Yahou
177 Lake which were known areas of activity, but which were not ranges, when McClellan
178 was operational. These are consistent with a CSM where training or practice items not
179 associated with organized military live fire activities may be rarely present at random
180 locations due to improper disposal or unauthorized use in non-range areas.
- 181 • Phase 2 follow-on surface clearance of approximately 200-ft step-outs around each
182 MEC find have documented the extent of MEC and MD around each find and have
183 removed or significantly reduced any residual MEC hazard from these areas.
- 184 • Phase 1 and Phase 2 surface characterization and clearance results, with the exception
185 of a small area proximal to the MRS-2 boundary and step-outs, confirmed the premise
186 that, if present MEC would be expected to be present only on the surface or very shallow
187 subsurface.

- 188 • Phase 3 follow-on subsurface clearance of grids in which surface MEC was found did
189 not find any subsurface MEC. With the possible exception of the area adjacent to the
190 MRS-2 boundary, there was no indication of undiscovered subsurface MEC issues in
191 MRS-11.
- 192 • Minimal densities of MD and SAA were encountered across the vast majority of MRS-11.
- 193 • No MEC and minimal densities of MD were encountered in the subsurface.

194 **5.5 Conceptual Site Model**

195 The predominant types of munitions-related material encountered were pieces of flares,
196 illumination rounds, smoke grenades, practice grenades, 37mm APT rounds, and SAA – i.e.
197 inert training and practice items.

198
199 The VSP-based transect survey demonstrated, with 95% confidence, that a 37mm impact area
200 consistent with those that have previously been encountered at McClellan is not present.

201
202 The two MEC (75mm shrapnel and 37mm (HE)) found near the MRS-2 boundary and multiple
203 step-outs of that boundary appear to be related to MRS-2 activities. These items were also the
204 only penetrating MEC encountered. We have concluded that these items are stray rounds
205 associated with MRS-2 and should be logically handled as an extension of MRS-2, rather than
206 MRS-11.

207
208 All other MEC and MD encountered were practice or training aids and except for the inert 37mm
209 APT MD, non-penetrating ordnance which would be expected to be found on the surface. Aside
210 for a small area near the MRS-2 boundary, the supplemental characterization results confirm
211 the premise that MEC, if present, is expected to be found on the surface or in the very shallow
212 subsurface only.

213
214 The remaining four (surface) MEC found were clustered along the IAR and by Yahou Lake
215 which were known areas of activity when McClellan was operational. These are consistent with
216 a CSM where rare, random training or practice items not associated with organized military live
217 fire activities may be present on the surface (essentially anywhere on McClellan).

219 **5.6 Summary Conclusions**

220 Based on this supplemental characterization and the previous EE/CA investigation, over 103
221 acres (10%) of MRS-11 have been characterized. The VSP-based transect survey
222 demonstrated, with 95% confidence, that a 37mm impact area consistent with those that have
223 previously been encountered at McClellan is not present. Less than 0.1 MEC per acre appear
224 to be present within the MRS as a whole. What little MEC is present appears to be
225 concentrated near the MRS-2 boundary and previous areas of military activity (not actual
226 training ranges) near the IAR and Yahou Lake. Boundaries have been placed around these
227 areas based on the extent of munitions-related material recovered covering approximately 5%
228 of the MRS (Figure 5-1). In the remaining 95% of MRS-11, no MEC has been encountered and
229 only extremely low densities of MD, which was almost exclusively associated with non-
230 explosively hazardous practice and training items, were found during the EE/CA and this
231 supplemental characterization.

232
233 The results of this supplemental characterization are consistent with the overall findings of the
234 EE/CA that less than 0.1 MEC/acre are present for the MRS-11 area. What little MEC are
235 present appear to be confined to three small sub-areas which have been delineated by the
236 supplemental characterization. Residual MEC hazard for these small areas has been

237 substantially mitigated by surface clearance of approximately 200-foot step-outs around each
238 MEC find.

239
240 The EE/CA OERIA MEC hazard assessment for the M3 Remainder Area – PR sector
241 associated with MRS-11 was assessed with a Baseline impact level which had a Protectiveness
242 Level associated with Alternative 1 – No Further Action for both current and future use. The
243 supplemental characterization results confirm this finding for approximately 95% of MRS-11
244 where no MEC and only negligible amounts of MD, which were almost exclusively associated
245 with non-explosively hazardous practice and training items, were found.

246 **5.7 Recommendations**

247 Based on the results of this SCR in conjunction with the Draft EE/CA results, the following future
248 actions are recommended for MRS-11 (Figure 5-1):

- 249
- 250 • 11 acres near MRS-2 – clearance to depth of detection to remove hazard due to stray
251 and possibly penetrating rounds associated with MRS-2 training activities.
- 252 • 13.2 acres along the IAR – clearance to 1 foot to remove hazard from surface/near
253 surface (non-penetrating) MEC where limited or unorganized training may have
254 occurred. This is not to include the IAR itself, whose subgrade extends several feet
255 below ground surface and which was previously overpaved using UXO construction
256 support - during which no munitions-related material was encountered.
- 257 • 17.4 acres southeast of Yahou Lake – clearance to one foot to remove MEC hazard
258 from surface/near surface (non-penetrating) MEC where limited or unorganized training
259 may have occurred.
- 260 • 53.9 acres on the northern portions of transects T0008-T0012 adjacent to MRS-7 –
261 surface clearance to remove MEC hazard from an increased concentration of 37mm
262 MD. It is noted that portions of this area will be cleared to the depth of detection as a
263 result of step-outs from MRS-7 which will be performed in accordance with the MRS-7
264 MEC remediation SSWP.
- 265 • 917.9 acres (remainder of MRS-11) – No further action with land use controls (LUCs).
266 No MEC or munitions training areas have been found in these areas. The presence of
267 negligible amounts of non-explosively hazardous MD consisting of practice and training
268 items indicates a MEC hazard is not present and the area is suitable for unrestricted
269 future use. The recommended LUC is deed notification.
- 270
- 271
- 272

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- 46