DEPARTMENT OF THE ARMY
US ARMY DEFENSE AMMUNITION CENTER
1 C TREE ROAD
MCALESTER OK 74501-9053

REPLY TO
ATTENTION OF

SJMAC-ESM

14 JAN 2008

MEMORANDUM FOR Department of Defense Explosives Safety Board (DDESB-PE), 2461 Eisenhower Avenue, Alexandria, VA 22331-0600

SUBJECT: Transmittal of Amendment 3 to Conventional Explosives Safety Submission (ESS) McClellan

1. References:

a. Memorandum, Joint Powers Authority (MATRIX Environmental Services, LLC.), 16 Dec 2007, Subject: Transmittal of Amendment 3 to Conventional Explosives Safety Submission (ESS) McClellan

b. Memorandum, Department of Defense Explosives Safety Board DDESB-PE, 16 May 2006, subject: Explosives Safety Submission (ESS) for Portions of Alpha and Bravo Munitions Response Areas, Fort McClellan, AL.

c. DOD 6055.9-STD, Ammunition and Explosives Safety Standards, 5 October 2005.

d. DOD 6055.9-STD, Chapter 12- Board Approved, 14 December 2004.

2. Reference 1.a enclosed amendment 3 to the ESS (reference 1.b.) for the former Ft. McClellan, Anniston, AL is provided for your information IAW reference 1.c. We have reviewed this document against Army and DOD explosives safety criteria and concur.

3. This amendment adds an additional munitions response site (MRS-3), modifies the exclusion zones based on a hazard analysis, and adds an additional intentional detonation area and portable magazine in which to dispose of unfuzed MEC items deemed acceptable to move.

4. Point of contact (POC) is Karl Raue, SJMAC-ESM, DSN 956-8122, commercial (918) 420-8122, fax 8743, Karl.Raue@dac.army.mil.

FOR THE DIRECTOR

Clifford H. Doyle

Encl
As

CLIFFORD H. DOYLE
MEC Team Leader
Explosives Safety Knowledge,
OE and Chemical Division
US Army Technical Center for Explosives Safety

SJMAC-ESM
SUBJECT: Transmittal of Amendment 3 to Conventional Explosives Safety Submission (ESS) McClellan

CF (w/encl):
Office of the Director of Army Safety (DACS-SF/Mr. Patton), 223 23rd Street, Crystal Plaza 5, Suite 980, Arlington, VA 22202
Office of the Assistant Secretary of the Army for Installations & Environment, (Asst. for Munitions) (DESOH/Mr. King), 110 Army Pentagon, Washington, DC 20310-0110
Headquarters, Department of the Army,(DAIM-BD/(Mark Haughs), 600 Army Pentagon, Washington DC 20310-0600
Matrix Environmental Services, L.L.C., (Mr. Richard L. Satkin, P.G.), 180 Headquarters Drive, Building 61, Anniston, Al 36205

Matrix Environmental Services, L.L.C.
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December 16, 2007

Mr. Karl Raue
US Army Technical Center for Explosives Safety
Explosives Safety Knowledge, OE and Chemical
Division
ATTN: SJMAC-ESM (Mr. Raue)
Building 35, 1C Tree Road
McAlester, OK, 74501-9053

Subject: Transmittal of Amendment 3 to Conventional Explosives Safety Submission (ESS) McClellan

Dear Mr. Raue:

Munitions and explosives of concern (MEC) remediation is being conducted for specific munitions response sites at the former Fort McClellan in Anniston, Alabama. Fort McClellan was closed under the Base Realignment and Closure Act (BRAC) as recommended by the 1995 Defense Base Closure Realignment Commission. This MEC remediation work is being conducted to clear land for use in redevelopment, which is covered and funded in accordance with an Environmental Services Cooperative Agreement (ESCA) No. DASW01-03-2-001 between the Department of the Army and Anniston-Calhoun County Fort McClellan Development Joint Powers Authority (JPA). Provisions in the ESCA required the preparation and approval of an ESS through USATCES and DDESB. This amendment adds an additional munitions response site (MRS-3), modifies the exclusion zones based on a hazard analysis and adds an additional intentional detonation area and portable magazine in which to dispose of unfuzed MEC items deemed acceptable to move.

Matrix Environmental Services, LLC. is submitting this ESS amendment on behalf of the JPA. Please contact me at richard_satkin@matrixdesigngroup.com or (256) 847-0780 if you have any questions on this amendment. Thank you very much.

Best regards,

MATRIX ENVIRONMENTAL SERVICES, LLC.

Richard L. Satkin, P.G.
Senior Project Manager

c: Miki Schneider – JPA
Jim Toburen – USATCES

Amendment 03
Explosives Safety Submission (Conventional)

MEC Remediation at McClellan
MRS - 3
Anniston, Alabama

Prepared for the Anniston-Calhoun County Fort McClellan Development Joint Powers Authority

Prepared by:

Matrix Environmental Services, LLC

December 2007

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LIST OF ACRONYMS

AT	Anti-Tank
BATF	Bureau of Alcohol, Tabacoo and Firearms
BIP	Blow In Place
BRAC	Base Realignment And Closure
DDESB	Department of Defense Explosives Safety Board
DID	Data Item Description
DGM	Digital Geophysical Mapping
DoD	Department of Defense
EBP	Eastern Bypass
EE/CA	Engineering Evaluation/Cost Analysis
EM	Electromagnetic
ESS	Explosives Safety Submission
EZ	Exclusion Zone
ft	Foot / Feet
GPO	Geophysical Prove-Out
HE	High Explosive
IAR	Industrial Access Road
IBD	Inhabited Building Distance
JPA	Joint Powers Authority
MEC	Munitions and Explosives of Concern
Mk	Mark
mm	Millimeter
MGFD	Munition with the Greatest Fragmentation Distance
MRA	Munitions Response Area
MRS	Munitions Response Site
MSD	Minimum Separation Distance
NEW	Net Explosive Weight
Q-D	Quantity-Distance
STD	Standard
TTFWI	Tetra Tech Foster Wheeler, Inc.
USACE	United States Army Corps of Engineers
USATCES	U.S. Army Technical Center for Explosives Safety
UXO	Unexploded Ordnance

1.0 PURPOSE OF AMENDMENT

This amendment to the approved Explosives Safety Submission (ESS) for Munitions and Explosives of Concern (MEC) remediation at McClellan (USATCES approval memo dated 22 May 2006) is being submitted primarily to add an additional munitions response site (MRS) MRS-3 to be remediated in the Bravo munitions response area (MRA). Secondary objectives are to modify the exclusion zone and team separation distances in accordance with the new Department of Defense Explosives Safety Board (DDESB) guidance (Technical Update dated September 11, 2007), to add a second intentional detonation area, and to add a portable magazine in which to stage MEC items deemed acceptable to move in order to facilitate work planning and improve the operational logistics at the site.

2.0 PHYSICAL CHANGES FROM APPROVED ESS

2.1 MRS-3

MRS-3 is 399 acres and is located in the western portion of the Bravo MRA along the east and west sides of the Eastern Bypass (EBP) tract on McClellan (see Figure 2-1). The EBP tract on McClellan has been previously remediated (EODT 2001, TTFWI 2005) and is currently secured off and unused pending the approach of ongoing highway construction activities. The MRS will be cleared to depth in locations not designated as part of the McClellan Park System (future land use designation) and cleared to one-foot using mag/dig methods in locations designated as McClellan Park System. The McClellan Park System will be a wildlife habitat/conservation area and signage will be posted prohibiting digging.

Grids, delineation transects and mountain transects were previously used to characterize this area in the Draft Bravo EE/CA (TTFWI 2004). This MRS passes through eight Army-designated subsectors and is described in the following text from south to north. Based on these data described below, the munition with the greatest fragmentation distance (MGFD) selected for this MRS is the **Rocket, 3.5inch HE, M28A2.**

The M3-2H Mortar Area-PR sector consists of approximately 104 acres in the western Bravo MRA bordering the EBP to the southwest. Grids and delineation transects were previously used to characterize this area. Nine Mortars, 60mm, HE, M49 were found on the surface and to depths of 8 inches during field activities in this sector (detailed list in Draft Bravo EE/CA, TTFWI 2004).

The M3-2H Mortar Area-D sector, which consists of approximately 42 acres west of the PR sector. Grids and delineation transects were previously used to characterize this area. Twenty-seven MEC items were found on the surface and to depths of 12 inches during field activities in this sector. The following types of MEC were identified (detailed list in Draft Bravo EE/CA, TTFWI 2004):

- Mortar, 60mm, HE, M49
- Mortar, 60mm, smoke, WP, M302

The M3-1L Rocket Area-D sector consists of approximately 115 acres along the western border of the Bravo MRA to the west of MRS-3-2H. Grids and delineation transects were previously used to characterize this area. Twenty-eight MEC items were found on the surface during field activities in this sector. The following types of MEC items were identified (detailed list in Draft Bravo EE/CA, TTFWI 2004):

- Rocket, 2.36inch HEAT, M6
- Mortar, 60mm, HE, M49

The M3-1H Rocket Area-PR sector consists of approximately 20 acres bounded by the EBP to the east and the Bravo MRA boundary to the west. Grids and delineation transects were previously used to characterize this area. No MEC items were recovered during field activities in this sector.

The M3-1H Mixed Use Area-D sector consists of approximately 169 acres in the northwestern Bravo MRA, bordering the eastern portion of the EBP. Grids and delineation transects were previously used to characterize this area. Nineteen MEC items were found on the surface and to depths of 13 inches during field activities in this sector. The following types of MEC were identified (detailed list in Draft Bravo EE/CA, TTFWI 2004):

- Projectile, 75mm shrapnel, MKI
- Projectile, 3.8inch shrapnel, MKI
- Projectile, 37mm, HE, MKII
- Mortar, 3inch Stokes, practice, MKI
- Mortar, 81mm, HE, M43
- Rocket, 2.36inch HEAT, M6

The M3-1H Grenade Area-PR sector consists of approximately 86 acres along the northern border of the Bravo MRA and borders the EBP to the west and M3-1H Mixed Use Area-D sector to the south. Grids and delineation transects were previously used to characterize this area. Eleven MEC items were found on the surface and to depths of 6 inches during field activities in this sector. The following types of MEC were identified (detailed list in Draft Bravo EE/CA, TTFWI 2004):

- Grenade, rifle, AT, M9
- Grenade, rifle, practice, M11
- Grenade, hand, MKII
- Rocket, 2.36inch HEAT, M6

M3-1L 37mm Projectile Area-D which consists of approximately 180 acres along the north central portion of the Bravo MRA and overlaps the northeastern portions of MRS-3. Grids and delineation transects were previously used to characterize this area. Five MEC items consisting of Projectiles, 37mm, HE, MKII were found from a depth of 1inch to a depth of 4 inches during field activities in this sector.

The M3-3H Rocket/Hand Grenade Area -D sector, which consists of approximately 97 acres along the northern central portion of the Bravo MRA, borders the eastern portion of MRS-3. Grids and delineation transects were previously used to characterize this area. Twenty MEC items were found on the surface and to depths of 2 inches during field activities in this sector. The following types of MEC were identified (detailed list in Draft Bravo EE/CA, TTFWI 2004):

- Rocket, 66mm HEAT, M72
- Rocket, 3.5inch, HE, M28A2
- Grenade, 40mm, HE
- Grenade, hand, practice, M69

2.2 MRS-3 Hazard Assessment

Considering the MEC items found in the eight sectors through which MRS-3 encompasses and the relative remoteness of the area a single MGFD, the **Rocket, 3.5inch HE, M28A2** is being selected

and will be used for the corresponding exclusion zone for MRS-3. The minimum separation distance (MSD, the distance that must be maintained between MEC operations and nonessential personnel for unintentional detonations) will also be the daily exclusion zone (EZ) for removal activities.

USACE has intrusively investigated millions of surface MEC items and subsurface anomalies that have the potential to be unexploded ordnance over the past 15 years on more than 1,000 project locations for FUDS, BRAC, and Active installations. These are extremely conservative estimates. On one project alone, USACE investigated over 3,000,000 anomalies, of which approximately 1.67% were UXO with no accidents or unintentional detonations. For these reasons, the probability of an unintentional detonation, due to project activities, is assessed to be "Extremely Low" and the use of the Hazardous Fragment Distance (HFD) for the MSD for non-essential personnel for unintentional detonations is warranted and authorized.

The Fragmentation Data Review Form for the Rocket, 3.5inch, HE, M28A2 is provided in Table 2-1. The MGFD and corresponding exclusion zone (EZ) distance for MRS-3 is shown on Figure 2-1. The EZ is 235 feet and represents the intentional Quantity-Distance (Q-D) Arc based on the HFD of the Rocket, 3.5inch, HE, M28A2.

There are two inhabited building present within the EZ and are noted on Figure 2-1. Building 3170 is used by Jackson State University and Building 3185A is used by Auburn University Canine Detection Training Center. MEC removal activities in MRS-3 will be coordinated and scheduled when these buildings are not in use.

There is no change in the step-out procedures from the approved ESS. The step-out areas are shown in Figure 2-1.

2.3 Exclusion Zone and Team Distance Modifications

Remediation of MRS-2 is currently ongoing. During the surface sweep a Projectile, 75mm HE, M48 was encountered in MRS-2 east of the Industrial Access Road. A Mortar, 81mm HE, M43 was used to base the original EZ on this porton of the site using the maximum fragmentation distance of 1395 feet. Based on the foregoing Hazard Assessment, we are requesting that the EZ be modified to 234 ft for this area based on the HFD for the Projectile, 75mm HE, M48. The Projectile, 37mm HE, MK II was used to base the original EZ west of the Industrial Access Road using the maximum fragmentation distance of 980 feet. We are requesting the EZ be modified to 90 feet for this area base on the HFD for the Projectile, 37mm HE, MK II. Figure 2-2 is a revised Q-D map for MRS-2 and supersedes Figure 2-1 included in the approved Amendment 2 to the ESS.

Only one inhabited building is present within the EZ's and it is also noted on Figure 2-2. This building is used occassionally by Matrix Environmental Services, LLC; therefore coordination on when the building is being used will not be an issue during MEC operations in MRS-2.

There is no change in the step-outs from the approved ESS in MRS-2.

We propose to also modify the team separation distances (TSD) in accordance with the September 11, 2007 Technical Update, Implementation of DDESB Guidance on Minimum Separation Distances for Unintentional Detonations. The revised TSDs are based on the K40 distance as calculated using the equation ($D=40W^{1/3}$) for the net explosive weight (NEW) of the MGFD. The K40 distances were obtained from the Fragmentation Database (database was provided by Lea Ann Cotton, DDESB on November 7, 2007) and are shown below in Table 2-2.

Table 2-1 Fragmentation Data Review Form for Rocket 3.5 inch HE, M28A2

FRAGMENTATION DATA REVIEW FORM

Database Revision Date 12/31/07

Category:	HE Rounds	DODIC:	H600
Munition:	3.5" M28A2 Rocket Case	Date Record Created:	7/30/2004
		Last Date Record Updated:	7/30/2004
Primary Database Category:	rocket	Individual Last Updated Record:	Crull
Secondary Database Category:	3.5 in	Date Record Retired:	
Munition Case Classification:	Robust		

Munition Information and Fragmentation Characteristics

Explosive Type:	Comp B
Explosive Weight (lb):	1.88000
Diameter (in):	3.5000
Max Fragment Weight (lb):	0.052420
Critical Fragment Velocity (fps):	6126

Theoretical Calculated Fragment Range

HFD [Range to No More Than 1 Hazardous Fragment per 600 Square Feet] (ft):	235
MFR-V [Vertical Range of Max Weight Fragment] (ft):	1128
MFR-H [Horizontal Range of Maximum Weight Fragment] (ft):	1420

Overpressure Distances

Inhabited Building Distance (12 psi), K40 Distance:	56
Inhabited Building Distance (09 psi), K50 Distance:	70
Intentional MSD (0065 psi), K328 Distance:	457

Minimum Thickness to Prevent Perforation

4000 psi Concrete (Prevent Spall):	3.92
Mild Steel:	0.71
Hard Steel:	0.59
Aluminum:	1.53
LEXAN:	4.52
Plexi-glass:	3.00
Bullet Resist Glass:	2.37

Required Sandbag Thickness

Max Fragment Weight (lb)SB:	0.052420
Critical Fragment Velocity (fps)SB:	6126
Kinetic Energy 106 (lb-ft2/s2)SB:	0.9836
Required Wall Roof Sandbag Thickness (in)SB:	24
Expected Maximum Sandbag Throw Distance (ft)SB:	125
Minimum Separation Distance (ft)SB:	200

Water Containment System and Minimum Separation Distance:

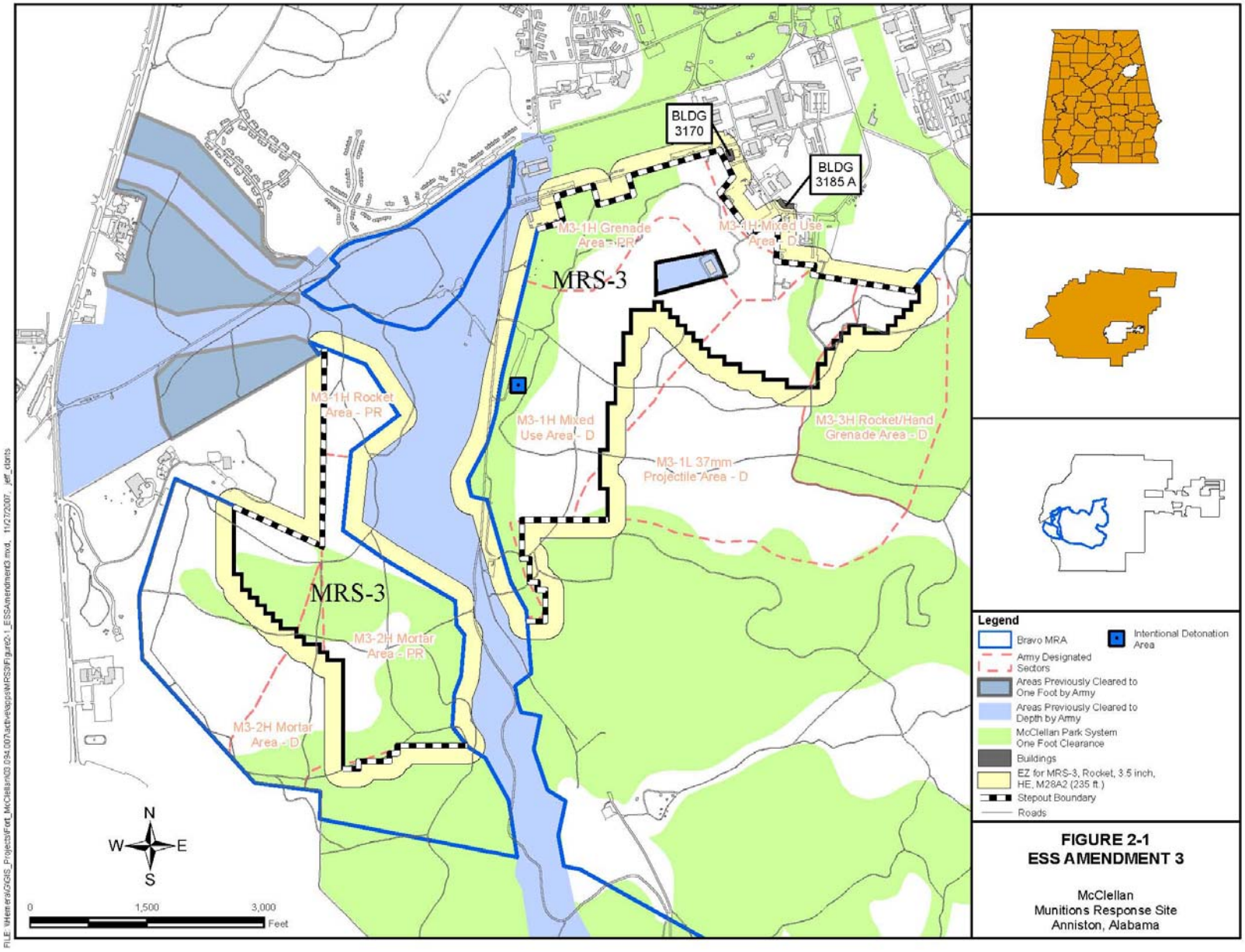
Max Fragment Weight (lb)W:	0.052420
Critical Fragment Velocity (fps)W:	6126
Kinetic Energy 106 (lb-ft2/s2)W:	0.9836
Water Containment System:	1100 gal tank
Minimum Separation Distance (ft)W:	200

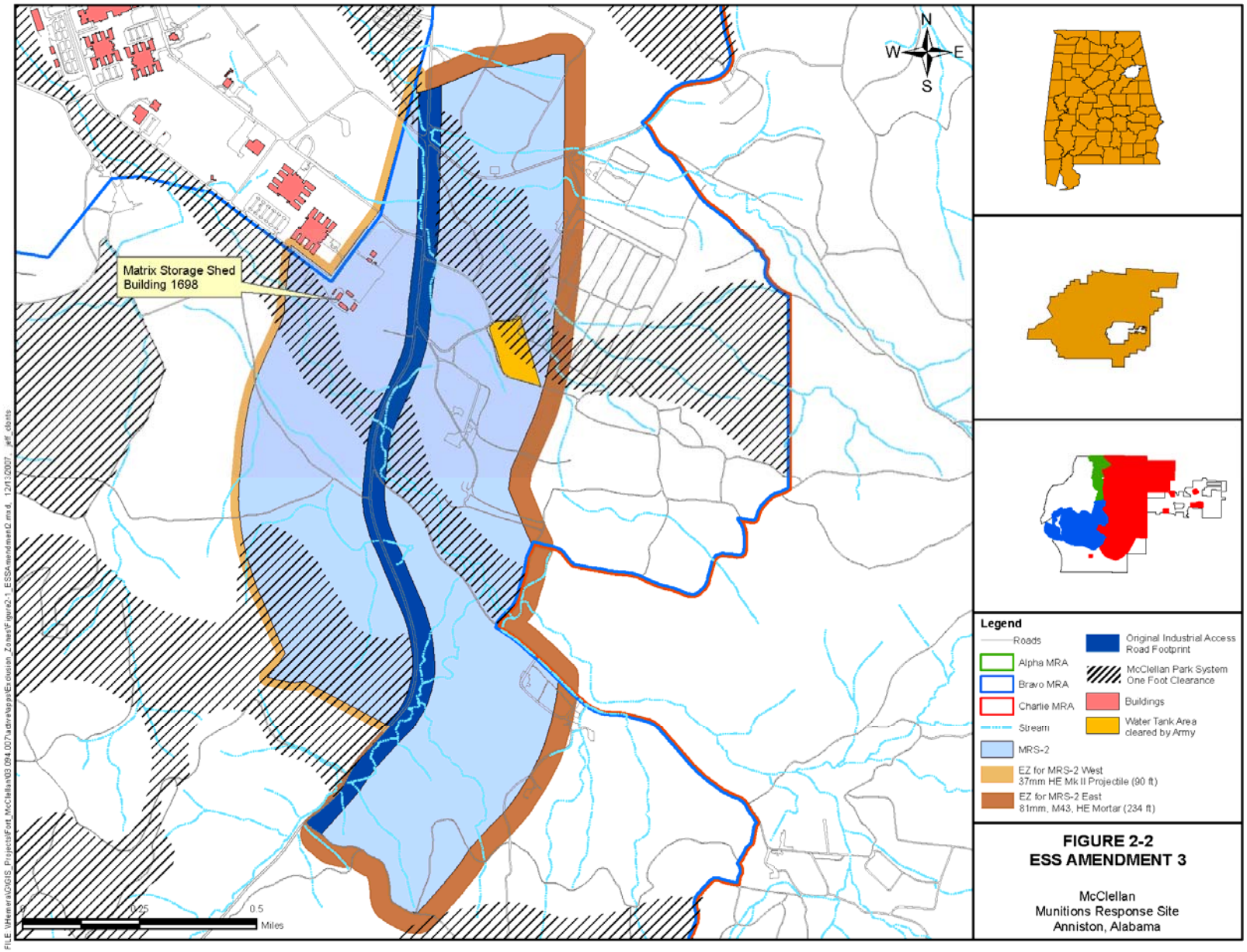
◄ ► Print This Form Close Form

Table 2-2 Team Separation Distances

MRS	MGFD	NEW (lbs)	K40 (feet)
Northern Alpha	Grenade, Rifle, M9	0.25*	26
MRS-2 (East of IAR) MRS-2 (West of IAR)	Projectile, 75mm, HE, M48 Projectile, 37mm, HE, MK II	1.47 0.053	48 16
Planning Area 4	Projectile, 37mm, HE, MK II	0.053	16
MRS-3	Rocket, 3.5inch, HE, M28A2	1.88	56

Note: NEW for the M9 Rifle Grenade were taken from OP 1664, May 1946 thru change 15, January 1969 and TSD was computed using $D=40W^{1/3}$


BLDG 3170
BLDG 3185 A
MRS-3
MRS-3
M3-1H Grenade Area - PR
M3-1H Mixed Use Area - D
M3-1H Rocket Area - PR
M3-1H Mixed Use Area - D
M3-3H Rocket/Hand Grenade Area - D
M3-1L 37mm Projectile Area - D
M3-2H Mortar Area - PR
M3-2H Mortar Area - D
N
W
E
S
0
1,500
3,000
Feet
Legend
Bravo MRA
Intentional Detonation Area
Army Designated Sectors
Areas Previously Cleared to One Foot by Army
Areas Previously Cleared to Depth by Army
McClellan Park System One Foot Clearance
Buildings
EZ for MRS-3, Rocket, 3.5 inch, HE, M28A2 (235 ft.)
Stepout Boundary
Roads
FIGURE 2-1
ESS AMENDMENT 3
McClellan
Munitions Response Site
Anniston, Alabama


N
W
E
S
Matrix Storage Shed
Building 1698
0
0.25
0.5
Miles
Legend
Roads
Alpha MRA
Bravo MRA
Charlie MRA
Stream
MRS-2
EZ for MRS-2 West
37mm HE Mk II Projectile (90 ft)
EZ for MRS-2 East
81mm, M43, HE Mortar (234 ft)
Original Industrial Access
Road Footprint
McClellan Park System
One Foot Clearance
Buildings
Water Tank Area
cleared by Army
FIGURE 2-2
ESS AMENDMENT 3
McClellan
Munitions Response Site
Anniston, Alabama

3.0 PROCESS CHANGES FROM APPROVED ESS

3.1 MRS Specific

The approved Amendment 1 to the ESS provides for an intentional detonation area located south of the Bains Gap Road MRS. Because concurrent clearance activities will be conducted in the eastern and western portions of the Bravo MRA a second intentional detonation area has been designated in the location shown on Figure 3-1. Using the guidance from Paragraph C9.8.4 of the current DoD 6055.9-STD, "DoD Ammunition and Explosives Safety Standards," dated October 5, 2004, the minimum separation distance between intentional detonation areas and non-essential personnel is the larger of the following distances:

1. $d=328w^{1/3}$, where d is the distance in feet and w is the net explosive weight in pounds,
2. 1,250 ft, or
3. The calculated maximum fragment distance from the Fragmentation Database for the MGFD.

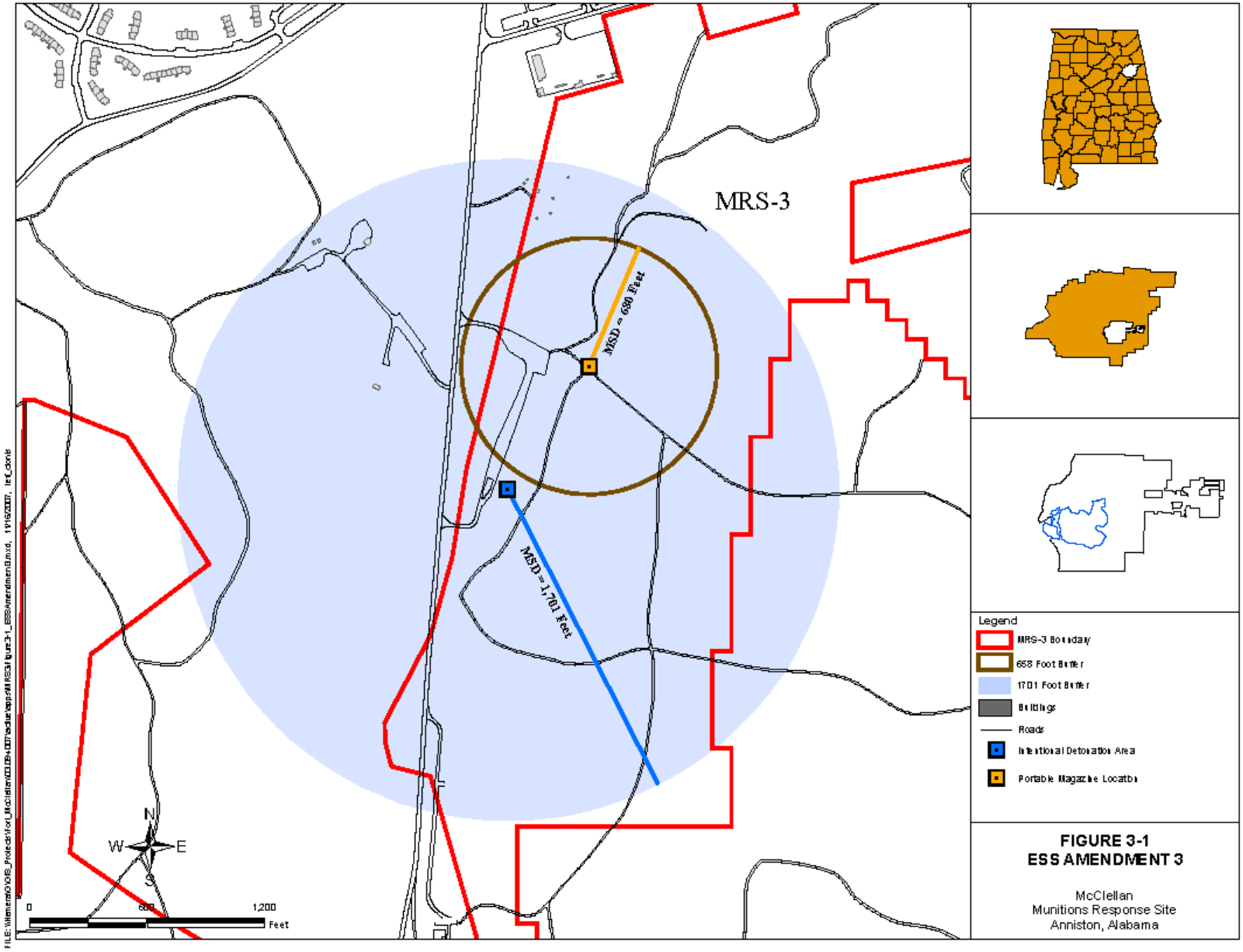
From the approved ESS, the munition with the largest NEW is the 75mm HE, M48 at 1.47 lbs. Using the equation above the distance d calculated would be 373 feet. The MGFD for the 75mm HE, M48 is 1701 feet and therefore the MSD for the intentional detonation area will be 1701 feet as is shown in Figure 3-1. If rounds larger than the 75mm HE, M48 are moved to the intentional detonation area, the MSD will be adjusted accordingly and an amendment to the ESS will be submitted.

3.2 MEC Storage

The approved Amendment 2 to the ESS provides for a BATF Type II portable magazine for storage of up to 100 pounds net explosive weight (NEW) of Hazard Division (HD) 1.1 materials near the intentional detonation area located south of the Bains Gap Road MRS. Given the large separation distance of where concurrent clearance activities will be conducted it makes sense from an operational standpoint to stage a second BATF Type II portable magazine to store MEC items found in the western portion of the Bravo MRA near the second proposed intentional detonation area. The portable explosives storage magazine will be built to meet BATF specifications (see design drawing in Figure 3-2) and stored at least 500 feet from the intentional detonation area.

A NEW limit of 100 lbs will be used for the second portable magazine and its placement will be near the proposed second intentional detonation area. An MSD for non-essential personnel will be established at 658 feet as specified in 6055.9 STD, Table C9.T2. Figure 3-1 shows the site where this portable magazine will be placed and the corresponding MSD arc. This magazine is exempt from lightning protection system requirement stipulated in EM 1110-1-4009 since it is constructed of ¼-inch plate steel, which is above the 3/16-inch wall thickness stipulated in the engineering manual reference for the exemption. The magazine will be grounded and locked using two BATF-approved locks.

MEC items deemed acceptable to move will be transported in closed vehicles whenever possible to the portable magazine and they will not travel any public roadways. The load will be well-braced and, except when in closed vehicles, covered with a fire-resistant tarpaulin or in an appropriate shipping container.


MRS-3
MSD = 680 Feet
MSD = 1,781 Feet
N
W
E
S
0
600
1,200
Feet
Legend
MRS-3 Boundary
658 Foot Buffer
1701 Foot Buffer
Buildings
Roads
Intentional Detonation Area
Portable Magazine Location
FIGURE 3-1
ESS AMENDMENT 3
McClellan
Munitions Response Site
Anniston, Alabama

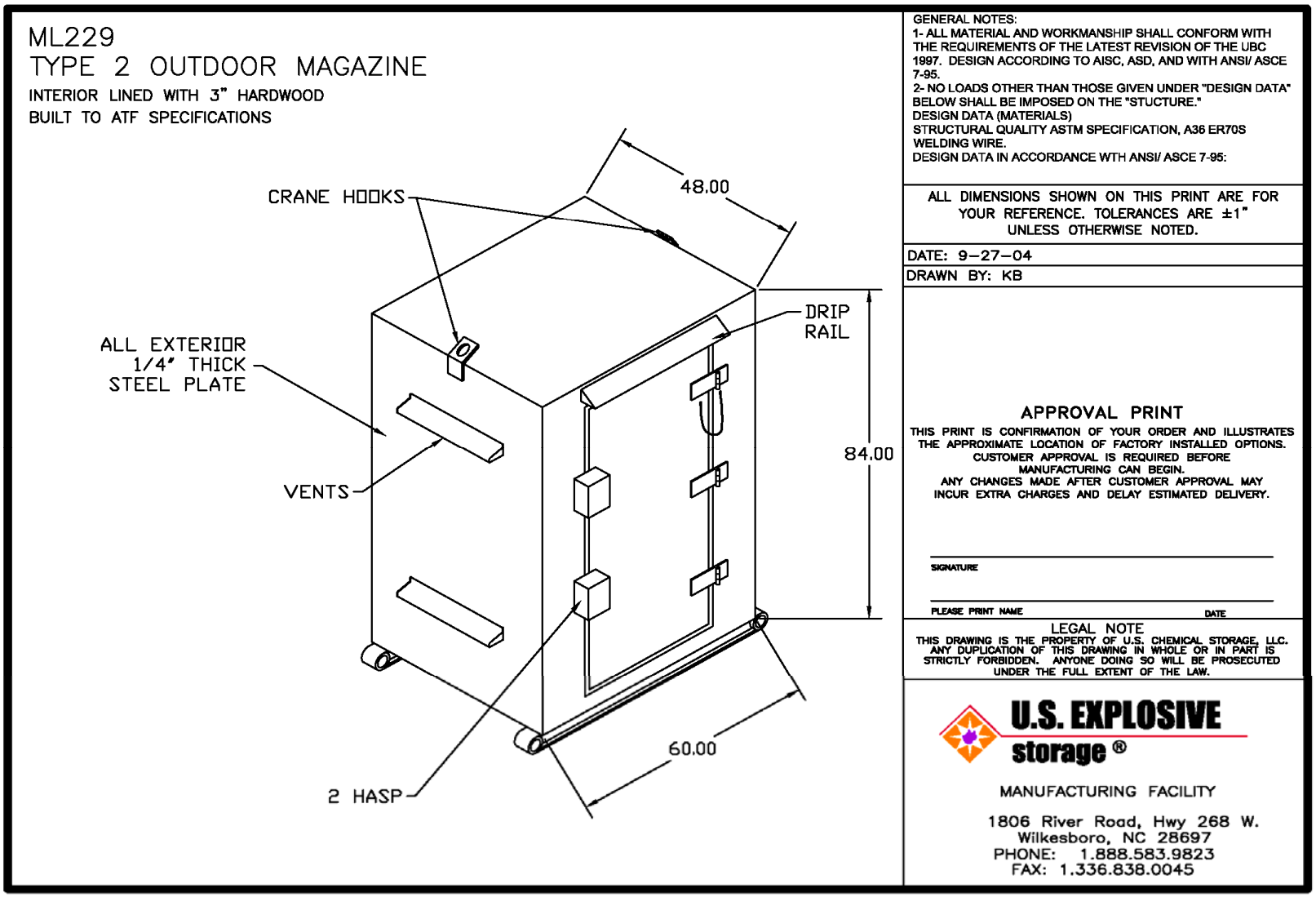


Figure 3-2 MEC Storage