MRS-BLM Unit 28 MEC Remedial Action Technical Memorandum

Former Fort Ord, California

Prepared for:

U.S. Army Corps of Engineers
Sacramento District
1325 J Street
Sacramento, California 95814-2922

Prepared by:

KEMRON Environmental Services, Inc.
1359A Ellsworth Industrial Blvd.
Atlanta, GA 30318
404-636-0928

November 2017

Table of Contents

List of Tables

List of Figures

List of Appendices

Unit 28 MEC Remedial Action Technical Memorandum

1.0 Introduction

This Technical Memorandum (TM) describes the munitions and explosives of concern (MEC) remedial action (RA) that was performed by KEMRON Environmental Services (KEMRON) with Gilbane as a subcontractor within Munitions Response Site (MRS) - Bureau of Land Management (BLM) Unit 28 (Figure 1). Field work at the site was initiated in July 2015 (vegetation mastication) and was completed in June 2017 (digital geophysical mapping [DGM]). This TM summarizes the work applicable to Unit 28 that was conducted in accordance with the *Final, Site-Specific Work Plan Munitions and Explosives of Concern Remedial Action, MRS-BLM Unit 28, Former Fort Ord, California* (Final SSWP; KEMRON, 2016) and Field Work Variance (FWV) 010, which is described further in Section 3.0. Work completed in the southern portion of Unit 28 to support planned prescribed burns was conducted in accordance with the *Final Site-Specific Work Plan, Munitions and Explosives of Concern Remedial Action, MRS-BLM Unit 23 and in Support of Units 11 and 12 Prescribed Burns (includes portions of Units 5A, 9, 25, 28 and 31, Former Fort Ord, California* (Final Unit 23 SSWP; KEMRON, 2015). In this TM, the "project area" does not include the permanent fuel breaks surrounding the units nor the footprint of the Military Operations in Urban Terrain (MOUT) Site 100-foot buffer. Subsurface MEC removal within the MOUT Site 100-foot buffer was previously reported in the *Draft Final Technical Information Paper (TIP), MOUT Site Buffer, MEC Remedial Action, Former Fort Ord, California* (ITSI-Gilbane, 2014).

1.1 Site Location

Unit 28 is approximately 107 acres and is located in the northeastern portion of the MRA, within the MRS-BLM. Unit 28 lies to the east of Riso Ridge Road, west of Impossible Canyon Road, north of Hawkeye Road, and ends to the north at Tongue Ridge. Figure 1 provides a location map of Unit 28.

1.2 Purpose

The *Final Work Plan, Remedial Design/Remedial Action (RD/RA), Track 3 Impact Area MRA, former Fort Ord, California* (U.S. Army Corps of Engineers [USACE], 2009) specifies that the U.S. Department of the Army (Army) will prepare a TM for the U.S. Environmental Protection Agency (EPA) and California Department of Toxic Substances Control (DTSC) to present a review of the results of both the surface remediation and the DGM data.

The TM is to evaluate surface remediation and DGM information to determine if additional subsurface remediation is required, based on information gathered following completion of the Final SSWP (KEMRON, 2016), or as requested by the future property recipient and identified in coordination with the Army. This TM provides the following information:

- Scope of Work (Section 2.0) for Unit 28;
- Remedial work completed at Unit 28, and reasons for remedial work modifications for Unit 28, if any;
- Summary of MEC and munitions debris (MD) (Section 4.0) removed from Unit 28 during technology-aided surface MEC removal activities;
- Observation of evidence of potential soil contamination for evaluation under the Site 39/Basewide Range Assessment (BRA) Program (Section 5.0);
- Detail regarding any recommendations for subsurface MEC remediation within Unit 28, either specific to portions of the site or as a whole;
- Conclusions/Summary of Recommendations (Section 7.0) for Unit 28, either specific to portions of the site or as a whole.

2.0 Scope of Work

The scope of work for the project addressed in this TM included vegetation clearance, technology-aided surface MEC removal, and DGM survey across Unit 28. Unit 28 totals approximately 107 acres. The "project area" discussed in this TM constitutes 102 acres where surface removal and DGM were conducted. The MOUT Site 100-foot Buffer is not addressed in this TM.

Figure 1 provides a general site layout of Unit 28.

2.1 Vegetation Clearance

Vegetation clearance in the southern portion of Unit 28 to support planned prescribed burns began in July 2015 and was completed in August 2015. Vegetation clearance in the remainder of Unit 28 was completed in January 2016. Mechanical mastication was performed in all accessible areas, approximately 61 acres. In areas where mechanical mastication could not be performed, manual vegetation removal was performed in accessible areas, approximately 25 acres. Due to extreme terrain, approximately 15 acres did not receive vegetation removal (See Figure 1 of FWV 010). Approximately one acre within Unit 28 did not require vegetation clearance due to a lack of vegetation.

2.2 Technology-Aided Surface Munitions and Explosives of Concern Removal

Technology-aided surface MEC removal in the southern portion of Unit 28 to support planned prescribed burns began in began in September 2015 and was completed in October 2015. Technology-aided surface MEC removal in the remainder of Unit 28 restarted April 2016 and was completed in May 2017. Lanes approximately five feet in width were placed across grids and Schonstedt magnetometers were used by unexploded ordnance (UXO) personnel to conduct surface MEC removal. Prior to the RA, seven MEC (UXO) items were recovered from Unit 28 and are shown in Table 1 and Figure 2. During the vegetation clearance and technology-aided surface MEC removal, 212 MEC items were recovered and are shown in Tables 2 and 4 and Figure 5. Cumulative results for the Unit 28 RA are shown in Tables 3 and 5. Quality control/quality assurance (QC/QA) processes were implemented in accordance with the Final SSWP (KEMRON, 2016). The planned surface MEC removal grids are shown in Figure 2.

Approximately 12 acres of Unit 28 has been determined by UXO safety personnel to be inaccessible to surface MEC removal due to extreme terrain (See Figure 2 of FWV 010).

2.3 Digital Geophysical Mapping Survey

The DGM survey was conducted with vehicle-towed EM61-MK2A arrays in November 2015 (southern portion of Unit 28 in support of prescribed burns) and was completed in June 2017 (remainder of Unit 28). Figure 3 depicts the DGM data collected at Unit 28. Cumulative results for the Unit 28 RA are shown in Tables 3 and 5. Measurement quality objectives were met and QC/QA processes were implemented in accordance with the Final SSWP (KEMRON, 2016). Appendix C includes the USACE DGM QA Approval and Discussion for Unit 28.

Due to extreme terrain within Unit 28, approximately 39 acres were inaccessible to DGM survey. These areas are visible on Figure 3. These areas were documented in FWV 010 discussed in Section 3.0 and included in Appendix A of this document.

3.0 Approved Changes During Field Work

Unit 28 work was performed in accordance with the Final Unit 23 SSWP (KEMRON, 2015) and Final SSWP (KEMRON, 2016), with the following exceptions documented by the FWV included in Appendix A and outlined below:

- 010 (AR# OE-0859b.2) Noted areas where vegetation removal, surface MEC removal and DGM survey were and were not completed. Approximately 12 acres of Unit 28 was determined by UXO safety personnel to be inaccessible to surface MEC removal due to extreme terrain. Approximately 39 acres of Unit 28 was determined by UXO safety personnel to be inaccessible to DGM survey due to extreme terrain. Recommended an evaluation in the TM based on the results of the surface MEC removal and DGM data to determine the likelihood of surface MEC remaining in the 12 acres.

4.0 Summary of MEC/MD Removed

Seven MEC (UXO) items were encountered and removed from Unit 28 as part of activities which occurred prior to the activities described in this TM. These items are also shown in Table 1 and Figure 2.

Two hundred and twelve MEC items were encountered and removed as part of MEC remediation activities described in this TM. All MEC items removed as part of MEC remediation activities described in this TM are shown in Tables 2 and 4. These MEC items are shown in Figure 5.

The MD removed from Unit 28 as part of MEC remediation activities described in this TM was recorded based on weight per 100-foot by 100-foot grid. An estimated 24,583 pounds of MD were removed. Density of MD weights by grid are shown on Figure 4.

Targets and target debris remaining within Unit 28 were removed and recycled to allow surface MEC removal and DGM to be conducted. No latrine pits were documented as part of this RA. Range-Related Debris (RRD) and Other Debris (OD) removed as part of MEC remediation activities described in this TM was recorded based on weight per 100-foot by 100-foot grid. An estimated 34,780 pounds of RRD and OD were removed as part of MEC remediation activities.

5.0 Observations of Evidence of Potential Soil Contamination

During field operations, UXO field personnel noted the presence of any features or items that might indicate small arms training, including, but not limited to, mounds and berms, structures, and concentrations of bullets, machine gun links and other munitions-related items. This information has been provided to BRA personnel and is being used as part of the BRA program. Reconnaissance and identification of potential sampling locations is complete. Development of a sampling plan is in progress.

6.0 Recommendations for Additional Subsurface MEC Remediation

The Track 3 Record of Decision (ROD) identifies the types of areas where additional work (e.g., subsurface MEC removal) would be conducted. Other than the network of fuel break roads and 100-foot buffers, subsurface MEC removals can be conducted in areas to address specific risk and/or land use needs, such as BLM restoration sites. These areas are to be identified in the TM and evaluated.

Factors that will be considered when determining whether additional actions are necessary include, but are not limited to: (1) explosive hazards associated with MEC recovered; (2) the proximity to potential receptors; (3) the density of MEC recovered; and (4) consistency with Applicable or Relevant and Appropriate Requirements (e.g., Habitat Management Plan and Biological Opinions).

Based on the Final SSWP (KEMRON, 2016), sensitive fuze type munitions were expected in Unit 28. During the MR described in this TM, 119 MEC items with sensitive fuzes were encountered and removed. MEC items with sensitive fuzes and historic target locations are shown in Table 6 and Figure 6. All MEC items with sensitive fuzes removed in Unit 28 were located in the southern third of the unit, southeast of the intersection of Chinook Road and Riso Ridge. This southern third of the unit is identified as an area of concern in Unit 28 with regard to the potential for MEC items with sensitive fuzes to remain in the shallow subsurface. This area also coincides with a relatively higher density of recovered MD (Figure 4), recovered RRD and OD. It also coincides with a relatively higher density of subsurface metal as shown on Figure 3.

The Army is currently conducting a field study designed to provide more information about how areas/grids where MEC of the type containing sensitive fuzes were recovered during surface removal could be addressed in the future. A recommendation on this issue will be deferred until after the completion of the field study and the short term recommendations for the southern third of Unit 28 are as follows:

- Areas where MEC with sensitive fuzes were located will be monitored with enhanced procedures during annual surface area monitoring,

- All future MEC removal actions be monitored for indications of subsurface MEC with sensitive fuzes,
- Authorized personnel entering this unit will initially receive updated MEC safety and recognition training.

A joint Army-BLM inspection summary is provided in Appendix B. This summary describes areas such as erosion features and a reroute where planned reuse by the BLM may require additional subsurface MEC removal. Figures detailing these areas are included as part of Appendix B.

No additional subsurface MEC removal beyond that discussed in the joint Army-BLM inspection summary is recommended for Unit 28.

Approximately 12 acres of Unit 28 did not receive surface MEC removal. Based on the results of the surface MEC removal performed in adjacent areas and the DGM data collected in these same area, the likelihood of MEC remaining in this acreage is considered low. The inaccessible areas are marked by extreme terrain that is highly eroded. Munitions items that may have impacted these areas during training activities most likely ended up at the bottom of the slopes. Any items remaining on the surface at the bottom of the slope would have been removed during surface MEC removal activities (Figure 5).

7.0 Conclusions/Summary of Recommendations

Technology-aided surface MEC removal has been completed in all accessible grids within Unit 28. Areas where technology-aided surface MEC removal was and was not completed are shown on Figure 5. Technology-aided surface MEC removal and DGM survey in Unit 28 occurred as intended within the scope of work. Areas where DGM survey was not performed are shown on Figure 3. A summary of survey and removal methods completed by total grids for the Unit 28 RA is shown in Table 5.

RA objectives have been met for this unit. No additional subsurface MEC remediation beyond that discussed in the joint Army-BLM inspection summary is recommended for Unit 28. Based on the results of the surface MEC removal performed in Unit 28, the likelihood of MEC remaining in the 12 acre area where surface MEC removal was not performed is considered low. No additional surface MEC remediation is recommended for Unit 28.

8.0 References

Gilbane, 2015, *Draft Final Impact Area MRA 100-foot Buffer, MEC Remedial Action, Technical Information Paper, Former Fort Ord, California*. (AR OE-0854A)

ITSI-Gilbane, 2014, *Draft Final Technical Information Paper, MOUT Site Buffer, MEC Remedial Action, Former Fort Ord, CA* (OE-0801A)

KEMRON, 2015, *Final Site-Specific Work Plan, Munitions and Explosives of Concern Remedial Action, MRS-BLM Unit 23 and in Support of Units 11 and 12 Prescribed Burns (includes portions of Units 5A, 9, 25, 28 and 31, Former Fort Ord, California* (OE-0862B)

KEMRON, 2016, *Final, Site-Specific Work Plan Munitions and Explosives of Concern Remedial Action, MRS-BLM Unit 28, Former Fort Ord, California* (AR OE-0859B)

U.S. Army Corps of Engineers (USACE), 2009, *Final Work Plan, Remedial Design/Remedial Action, Track 3 Impact Area Munitions Response Area, Former Fort Ord, California.* (AR OE-0660K)

Tables

Table 1

MEC Items Encountered and Removed Prior to Operations Covered in TM

Date Found	Grid	Depth (in)	Qty	Unit	Item Type	Risk Code	Description
8/25/1993	LB3-MI08-SB10	0	1	28	UXO	3	Grenade, hand, fragmentation, M67
11/18/2003	LB3-MI09-SG10	0	1	28	UXO	999	Ash, Pyrotechnic
11/18/2003	LB3-MI09-SF08	0	1	28	UXO	1	Grenade, hand, practice, M69
9/26/2012	HA041	0	4	28	UXO	3	Projectile, 81mm, mortar, high explosive, M43 series

Table 2
MEC Items Encountered and Removed During Operations Covered in TM

Date Found	Item Number	Item Type	Qty	Description	Operation	Easting SP	Northing SP
6/2/2016	1467001	UXO	1	Fuze, grenade, igniting, M201	Surface Removal	5753565	2120312
5/11/2016	1467125	UXO	1	Fuze, grenade, igniting, M201	Surface Removal	5752545	2119515
4/11/2016	1467489	UXO	1	Fuze, grenade, igniting, M201	Surface Removal	5753802	2120430
6/8/2016	1467190	UXO	1	Fuze, grenade, hand, M206 series	Surface Removal	5752985	2120105
4/26/2016	1467274	DMM	1	Grenade, hand, fragmentation, M67	Surface Removal	5752620	2118930
5/23/2016	1467328	DMM	1	Grenade, hand, fragmentation, M67	Surface Removal	5752490	2119415
5/2/2016	1467076	DMM	1	Grenade, hand, fragmentation, MK II	Surface Removal	5752522	2119636
5/2/2016	1467098	DMM	1	Grenade, hand, fragmentation, MK II	Surface Removal	5752580	2119670
5/2/2016	1467123	DMM	1	Grenade, hand, fragmentation, MK II	Surface Removal	5752515	2119610
5/11/2016	1467256	DMM	1	Grenade, hand, fragmentation, MK II	Surface Removal	5752515	2119545
5/2/2016	1467298	DMM	1	Grenade, hand, fragmentation, MK II	Surface Removal	5752520	2119630
5/31/2016	1467335	DMM	1	Grenade, hand, fragmentation, MK II	Surface Removal	5752215	2119145
5/11/2016	1467392	DMM	1	Grenade, hand, fragmentation, MK II	Surface Removal	5752540	2119560
5/11/2016	1467469	DMM	1	Grenade, hand, fragmentation, MK II	Surface Removal	5752520	2119540
5/11/2016	1467510	DMM	1	Grenade, hand, fragmentation, MK II	Surface Removal	5752530	2119555
4/26/2016	1467553	DMM	1	Grenade, hand, fragmentation, MK II	Surface Removal	5752770	2119765
5/2/2016	1467583	DMM	1	Grenade, hand, fragmentation, MK II	Surface Removal	5752547	2119626
5/2/2016	1467590	DMM	1	Grenade, hand, fragmentation, MK II	Surface Removal	5752510	2119635
1/17/2017	1470996	UXO	1	Grenade, rifle, smoke, white phosphorous, M19A1	Surface Removal	5750585	2115590
2/9/2017	1472247	UXO	1	Grenade, rifle, smoke, white phosphorous, M19A1	Surface Removal	5750410	2115710
4/6/2017	1474419	UXO	1	Grenade, rifle, smoke, white phosphorous, M19A1	Surface Removal	5750415	2115165
4/26/2017	1474837	UXO	1	Grenade, rifle, smoke, white phosphorous, M19A1	Surface Removal	5750450	2114945
4/27/2017	1474997	UXO	1	Grenade, rifle, smoke, white phosphorous, M19A1	Surface Removal	5750455	2114945
4/19/2017	1474666	UXO	1	Grenade, rifle, smoke, M22 series	Surface Removal	5750375	2115017
1/23/2017	1470871	UXO	1	Projectile, 4.2inch, mortar, high explosive, M3 series	Surface Removal	5750280	2115440
12/8/2016	1470136	UXO	1	Projectile, 4.2inch, mortar, high explosive, M329 series	Surface Removal	5750202	2115540
12/5/2016	1470006	UXO	1	Projectile, 37mm, high explosive, MK II	Surface Removal	5751285	2117040
9/18/2015	1464724	UXO	1	Projectile, 37mm, low explosive, MK I	Surface Removal	5750378	2114315
9/18/2015	1465053	UXO	1	Projectile, 37mm, low explosive, MK I	Surface Removal	5750450	2114330
9/16/2015	1465106	UXO	1	Projectile, 37mm, low explosive, MK I	Surface Removal	5750450	2114160
9/23/2015	1465390	UXO	1	Projectile, 37mm, low explosive, MK I	Surface Removal	5750353	2114512
11/16/2016	1470225	UXO	1	Projectile, 37mm, low explosive, MK I	Surface Removal	5750850	2116930
1/9/2017	1470321	UXO	1	Projectile, 37mm, low explosive, MK I	Surface Removal	5750179	2115090
1/9/2017	1470336	UXO	1	Projectile, 37mm, low explosive, MK I	Surface Removal	5750150	2115055
12/15/2016	1470491	UXO	1	Projectile, 37mm, low explosive, MK I	Surface Removal	5750342	2115514
1/12/2017	1470829	UXO	1	Projectile, 37mm, low explosive, MK I	Surface Removal	5750760	2116070
1/31/2017	1471691	UXO	1	Projectile, 37mm, low explosive, MK I	Surface Removal	5750428	2115605
2/6/2017	1471752	UXO	1	Projectile, 37mm, low explosive, MK I	Surface Removal	5750690	2115755
3/21/2017	1474023	UXO	1	Projectile, 37mm, low explosive, MK I	Surface Removal	5750390	2115305
4/26/2017	1474805	UXO	1	Projectile, 37mm, low explosive, MK I	Surface Removal	5750448	2114935
9/21/2015	1464744	UXO	9	Projectile, 40mm, high explosive, M381	Surface Removal	5750435	2114470
9/21/2015	1464878	UXO	1	Projectile, 40mm, high explosive, M381	Surface Removal	5750435	2114465
9/28/2015	1465172	UXO	13	Projectile, 40mm, high explosive, M381	Surface Removal	5750330	2114683
9/23/2015	1465245	UXO	1	Projectile, 40mm, high explosive, M381	Surface Removal	5750350	2114550
12/27/2016	1470040	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	5750115	2115115
12/21/2016	1470050	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	5751030	2116650
12/6/2016	1470065	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	5750080	2115240
12/13/2016	1470085	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	5750130	2115615
12/5/2016	1470117	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	5750140	2115599
12/22/2016	1470210	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	5750070	2115175
12/5/2016	1470236	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	5750150	2115590
12/13/2016	1470520	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	5750180	2115612
12/27/2016	1470538	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	5750095	2115185
11/22/2016	1470563	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	5750635	2116740
1/19/2017	1470633	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	5750015	2115440
1/25/2017	1470726	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	5750170	2115450
5/3/2017	1474963	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	5750370	2114898
9/15/2015	1464910	UXO	1	Projectile, 40mm, parachute, star, M662	Surface Removal	5750512	2114120
10/1/2015	1465168	UXO	1	Projectile, 57mm, high explosive, M306 series	Surface Removal	5750335	2114742
9/22/2015	1465256	UXO	1	Projectile, 57mm, high explosive, M306 series	Surface Removal	5750135	2114845
9/30/2015	1465309	UXO	1	Projectile, 57mm, high explosive, M306 series	Surface Removal	5750214	2114785
10/1/2015	1465339	UXO	1	Projectile, 57mm, high explosive, M306 series	Surface Removal	5750362	2114741
10/1/2015	1465455	UXO	1	Projectile, 57mm, high explosive, M306 series	Surface Removal	5750425	2114715
10/1/2015	1465520	UXO	1	Projectile, 57mm, high explosive, M306 series	Surface Removal	5750425	2114730
9/30/2015	1465585	UXO	1	Projectile, 57mm, high explosive, M306 series	Surface Removal	5750247	2114723
2/28/2017	1473337	UXO	1	Projectile, 57mm, high explosive, M306 series	Surface Removal	5750640	2115825

Table 2
MEC Items Encountered and Removed During Operations Covered in TM

Date Found	Item Number	Item Type	Qty	Description	Operation	Easting SP	Northing SP
10/2/2015	1465411	UXO	1	Projectile, 60mm, mortar, high explosive, M49 series	Surface Removal	5750212	2114907
9/22/2015	1465605	UXO	1	Projectile, 60mm, mortar, high explosive, M49 series	Surface Removal	5750150	2114845
4/21/2016	1467347	UXO	1	Projectile, 60mm, mortar, high explosive, M49 series	Surface Removal	5752515	2119890
12/14/2016	1470013	UXO	1	Projectile, 60mm, mortar, high explosive, M49 series	Surface Removal	5750175	2115290
12/28/2016	1470417	UXO	1	Projectile, 60mm, mortar, high explosive, M49 series	Surface Removal	5750255	2115185
12/6/2016	1470492	UXO	1	Projectile, 60mm, mortar, high explosive, M49 series	Surface Removal	5750050	2115541
1/24/2017	1471239	UXO	1	Projectile, 60mm, mortar, high explosive, M49 series	Surface Removal	5750115	2115360
3/8/2017	1472838	UXO	1	Projectile, 60mm, mortar, high explosive, M49 series	Surface Removal	5750320	2115420
3/6/2017	1473007	UXO	1	Projectile, 60mm, mortar, high explosive, M49 series	Surface Removal	5750430	2115425
3/6/2017	1473167	UXO	1	Projectile, 60mm, mortar, high explosive, M49 series	Surface Removal	5750430	2115445
3/28/2017	1473374	UXO	1	Projectile, 60mm, mortar, high explosive, M49 series	Surface Removal	5750220	2115340
3/20/2017	1473388	UXO	1	Projectile, 60mm, mortar, high explosive, M49 series	Surface Removal	5750350	2115365
3/27/2017	1473402	UXO	1	Projectile, 60mm, mortar, high explosive, M49 series	Surface Removal	5750240	2115370
3/21/2017	1473526	UXO	1	Projectile, 60mm, mortar, high explosive, M49 series	Surface Removal	5750330	2115310
3/27/2017	1473677	UXO	1	Projectile, 60mm, mortar, high explosive, M49 series	Surface Removal	5750260	2115370
3/23/2017	1473906	UXO	1	Projectile, 60mm, mortar, high explosive, M49 series	Surface Removal	5750290	2115390
10/1/2015	1465114	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	5750316	2114749
10/1/2015	1465197	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	5750384	2114735
10/2/2015	1465493	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	5750242	2114875
10/2/2015	1465564	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	5750275	2114810
10/1/2015	1465636	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	5750366	2114712
12/28/2016	1470510	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	5750150	2115190
5/3/2017	1475191	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	5750305	2114820
5/3/2017	1475272	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	5750310	2114805
5/8/2017	1475401	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	5750285	2114990
5/31/2016	1467021	UXO	1	Rocket, 2.36inch, high explosive antitank, M6	Surface Removal	5752450	2119195
6/13/2016	1467102	UXO	1	Rocket, 2.36inch, high explosive antitank, M6	Surface Removal	5751270	2118090
4/26/2016	1467116	UXO	1	Rocket, 2.36inch, high explosive antitank, M6	Surface Removal	5752975	2119770
6/13/2016	1467243	UXO	1	Rocket, 2.36inch, high explosive antitank, M6	Surface Removal	5751240	2118085
6/1/2016	1467472	UXO	1	Rocket, 2.36inch, high explosive antitank, M6	Surface Removal	5751710	2118280
6/13/2016	1467506	UXO	1	Rocket, 2.36inch, high explosive antitank, M6	Surface Removal	5751235	2118075
5/23/2016	1467508	UXO	1	Rocket, 2.36inch, high explosive antitank, M6	Surface Removal	5751480	2118570
6/21/2016	1468214	UXO	1	Rocket, 2.36inch, high explosive antitank, M6	Surface Removal	5751260	2117655
10/31/2016	1469795	UXO	1	Rocket, 2.36inch, high explosive antitank, M6	Surface Removal	5751220	2117935
5/24/2016	1467135	DMM	1	Rocket, 2.36inch, practice, M7	Surface Removal	5751540	2118460
9/21/2015	1464952	UXO	1	Rocket, 3.5inch, high explosive antitank, M28 series	Surface Removal	5750090	2114950
9/22/2015	1465189	UXO	1	Rocket, 3.5inch, high explosive antitank, M28 series	Surface Removal	5750160	2114830
10/2/2015	1465395	UXO	1	Rocket, 3.5inch, high explosive antitank, M28 series	Surface Removal	5750320	2114820
5/10/2016	1467209	UXO	1	Simulator, launching, antitank guided missile and rocket, M22	Surface Removal	5751385	2118520
1/11/2017	1470037	UXO	1	Projectile, 75mm, high explosive, MK I	Surface Removal	5750845	2116535
1/31/2017	1471356	UXO	1	Projectile, 90mm, high explosive antitank, M371A1	Surface Removal	5750490	2115660
11/22/2016	1469994	UXO	12	Projectile, 40mm, high explosive, M406	Surface Removal	5750735	2116740
11/22/2016	1470266	UXO	1	Projectile, 40mm, high explosive, M406	Surface Removal	5750710	2116710
11/22/2016	1470287	UXO	1	Projectile, 40mm, high explosive, M406	Surface Removal	5750705	2116706
11/22/2016	1470302	UXO	5	Projectile, 40mm, high explosive, M406	Surface Removal	5750703	2116707
11/22/2016	1470406	UXO	6	Projectile, 40mm, high explosive, M406	Surface Removal	5750730	2116730
11/22/2016	1470475	UXO	2	Projectile, 40mm, high explosive, M406	Surface Removal	5750707	2116710
12/8/2016	1470513	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750840	2116370
1/17/2017	1470603	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/17/2017	1470615	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/18/2017	1470637	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750406	2115215
1/17/2017	1470686	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/17/2017	1470695	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/18/2017	1470714	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2115215
1/18/2017	1470771	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2115215
1/19/2017	1470772	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750090	2115450
1/17/2017	1470808	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/17/2017	1470810	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/17/2017	1470811	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/25/2017	1470882	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750170	2115450
1/17/2017	1470896	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/17/2017	1470899	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/17/2017	1470908	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/17/2017	1470941	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/19/2017	1470942	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750090	2115450
1/17/2017	1470945	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530

Table 2
MEC Items Encountered and Removed During Operations Covered in TM

Date Found	Item Number	Item Type	Qty	Description	Operation	Easting SP	Northing SP
1/17/2017	1470954	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/25/2017	1470991	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750160	2115470
1/18/2017	1471012	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2115230
1/18/2017	1471070	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750403	2115216
1/17/2017	1471098	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/17/2017	1471180	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/17/2017	1471190	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/17/2017	1471227	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/17/2017	1471245	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/18/2017	1471254	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750406	2115215
1/17/2017	1471270	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/30/2017	1471905	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750460	2115595
2/9/2017	1472296	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750410	2115710
3/7/2017	1473161	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750335	2115450
3/7/2017	1473254	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750335	2115450
3/7/2017	1473315	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750325	2115455
3/23/2017	1473387	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750290	2115390
3/23/2017	1473518	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750260	2115385
3/23/2017	1473762	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750275	2115390
3/23/2017	1473879	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750290	2115380
3/23/2017	1473887	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750290	2115380
5/3/2017	1474776	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
5/3/2017	1474801	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
5/3/2017	1474834	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
5/3/2017	1474850	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
5/3/2017	1474972	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
5/3/2017	1475022	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
5/3/2017	1475077	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
5/3/2017	1475139	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
5/3/2017	1475151	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
5/3/2017	1475212	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
5/3/2017	1475258	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
5/3/2017	1475324	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
5/3/2017	1475331	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
5/3/2017	1475350	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
1/12/2017	1470609	UXO	1	Blocks, demo, C4	Surface Removal	5750845	2116040
5/26/2016	1467072	UXO	1	Grenade, hand, fragmentation, M26 Series	Surface Removal	5752485	2119240
5/11/2016	1467342	UXO	1	Grenade, hand, fragmentation, M26 Series	Surface Removal	5752535	2119515
5/17/2016	1467373	UXO	1	Grenade, hand, fragmentation, M26 Series	Surface Removal	5752705	2119405

Table 3
Cumulative Results

Parameter	Unit 28 Totals
Surface removal acreage	90
Analog subsurface removal acreage	0
Digital Subsurface removal acreage	0
DGM survey acreage	62
MEC items	212
Total Estimated MD Weight (lbs)	24,583
Total Estimated RRD and OD (lbs)	34,780

DGM - Digital Geophysical Mapping
MEC - Munitions and Explosives of Concern
MD - Munitions Debris
RRD - Range Related Debris
OD - Other Debris

Table 4
MEC Recovery Information

Description	Unit 28 Totals
Fuze, grenade, igniting, M201	3
Fuze, grenade, hand, M206 series	1
Grenade, hand, fragmentation, M67	2
Grenade, hand, fragmentation, MK II	12
Grenade, rifle, smoke, white phosphorous, M19A1	5
Grenade, rifle, smoke, M22 series	1
Projectile, 4.2inch, mortar, high explosive, M3 series	1
Projectile, 4.2inch, mortar, high explosive, M329 series	1
Projectile, 37mm, high explosive, MK II	1
Projectile, 37mm, low explosive, MK I	13
Projectile, 40mm, high explosive, M381	24
Projectile, 40mm, high explosive, M383	13
Projectile, 40mm, parachute, star, M662	1
Projectile, 57mm, high explosive, M306 series	8
Projectile, 60mm, mortar, high explosive, M49 series	16
Projectile, 81mm, mortar, high explosive, M43 series	9
Rocket, 2.36inch, high explosive antitank, M6	9
Rocket, 2.36inch, practice, M7	1
Rocket, 3.5inch, high explosive antitank, M28 series	3
Simulator, launching, antitank guided missile and rocket, M22	1
Projectile, 75mm, high explosive, MK I	1
Projectile, 90mm, high explosive antitank, M371A1	1
Projectile, 40mm, high explosive, M406	27
Cartridge, 40mm, high explosive, M383	54
Blocks, demo, C4	1
Grenade, hand, fragmentation, M26 Series	3

Table 5
Summary of Survey and Removal

Activity	Unit 28 Grids
Surface Removal	585
Analog Subsurface Removal	0
Digital Subsurface Removal	0
DGM Survey	515

DGM - Digital Geophysical Mapping

Table 6

Sensitive Fuze MEC Items Encountered and Removed During Operations Covered in TM

Date Found	Item Number	Item Type	Qty	Description	Operation	Easting SP	Northing SP
9/21/2015	1464744	UXO	9	Projectile, 40mm, high explosive, M381	Surface Removal	5750435	2114470
9/21/2015	1464878	UXO	1	Projectile, 40mm, high explosive, M381	Surface Removal	5750435	2114465
9/28/2015	1465172	UXO	13	Projectile, 40mm, high explosive, M381	Surface Removal	5750330	2114683
9/23/2015	1465245	UXO	1	Projectile, 40mm, high explosive, M381	Surface Removal	5750350	2114550
12/27/2016	1470040	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	5750115	2115115
12/21/2016	1470050	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	5751030	2116650
12/6/2016	1470065	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	5750080	2115240
12/13/2016	1470085	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	5750130	2115615
12/5/2016	1470117	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	5750140	2115599
12/22/2016	1470210	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	5750070	2115175
12/5/2016	1470236	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	5750150	2115590
12/13/2016	1470520	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	5750180	2115612
12/27/2016	1470538	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	5750095	2115185
11/22/2016	1470563	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	5750635	2116740
1/19/2017	1470633	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	5750015	2115440
1/25/2017	1470726	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	5750170	2115450
5/3/2017	1474963	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	5750370	2114898
1/31/2017	1471356	UXO	1	Projectile, 90mm, high explosive antitank, M371A1	Surface Removal	5750490	2115660
11/22/2016	1469994	UXO	12	Projectile, 40mm, high explosive, M406	Surface Removal	5750735	2116740
11/22/2016	1470266	UXO	1	Projectile, 40mm, high explosive, M406	Surface Removal	5750710	2116710
11/22/2016	1470287	UXO	1	Projectile, 40mm, high explosive, M406	Surface Removal	5750705	2116706
11/22/2016	1470302	UXO	5	Projectile, 40mm, high explosive, M406	Surface Removal	5750703	2116707
11/22/2016	1470406	UXO	6	Projectile, 40mm, high explosive, M406	Surface Removal	5750730	2116730
11/22/2016	1470475	UXO	2	Projectile, 40mm, high explosive, M406	Surface Removal	5750707	2116710
12/8/2016	1470513	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750840	2116370
1/17/2017	1470603	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/17/2017	1470615	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/18/2017	1470637	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750406	2115215
1/17/2017	1470686	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/17/2017	1470695	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/18/2017	1470714	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2115215
1/18/2017	1470771	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2115215
1/19/2017	1470772	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750090	2115450
1/17/2017	1470808	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/17/2017	1470810	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/17/2017	1470811	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/25/2017	1470882	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750170	2115450
1/17/2017	1470896	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/17/2017	1470899	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/17/2017	1470908	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/17/2017	1470941	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/19/2017	1470942	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750090	2115450
1/17/2017	1470945	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/17/2017	1470954	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/25/2017	1470991	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750160	2115470
1/18/2017	1471012	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2115230
1/18/2017	1471070	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750403	2115216
1/17/2017	1471098	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/17/2017	1471180	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/17/2017	1471190	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/17/2017	1471227	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530

Table 6
Sensitive Fuze MEC Items Encountered and Removed During Operations Covered in TM

1/17/2017	1471245	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/18/2017	1471254	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750406	2115215
1/17/2017	1471270	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750530	2115530
1/30/2017	1471905	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750460	2115595
2/9/2017	1472296	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750410	2115710
3/7/2017	1473161	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750335	2115450
3/7/2017	1473254	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750335	2115450
3/7/2017	1473315	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750325	2115455
3/23/2017	1473387	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750290	2115390
3/23/2017	1473518	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750260	2115385
3/23/2017	1473762	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750275	2115390
3/23/2017	1473879	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750290	2115380
3/23/2017	1473887	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750290	2115380
5/3/2017	1474776	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
5/3/2017	1474801	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
5/3/2017	1474834	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
5/3/2017	1474850	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
5/3/2017	1474972	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
5/3/2017	1475022	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
5/3/2017	1475077	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
5/3/2017	1475139	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
5/3/2017	1475151	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
5/3/2017	1475212	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
5/3/2017	1475258	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
5/3/2017	1475324	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
5/3/2017	1475331	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
5/3/2017	1475350	UXO	1	Cartridge, 40mm, high explosive, M383	Surface Removal	5750405	2114998
			119				

Note: An unarmed fuze poses a relatively lower hazard than an armed fuze.

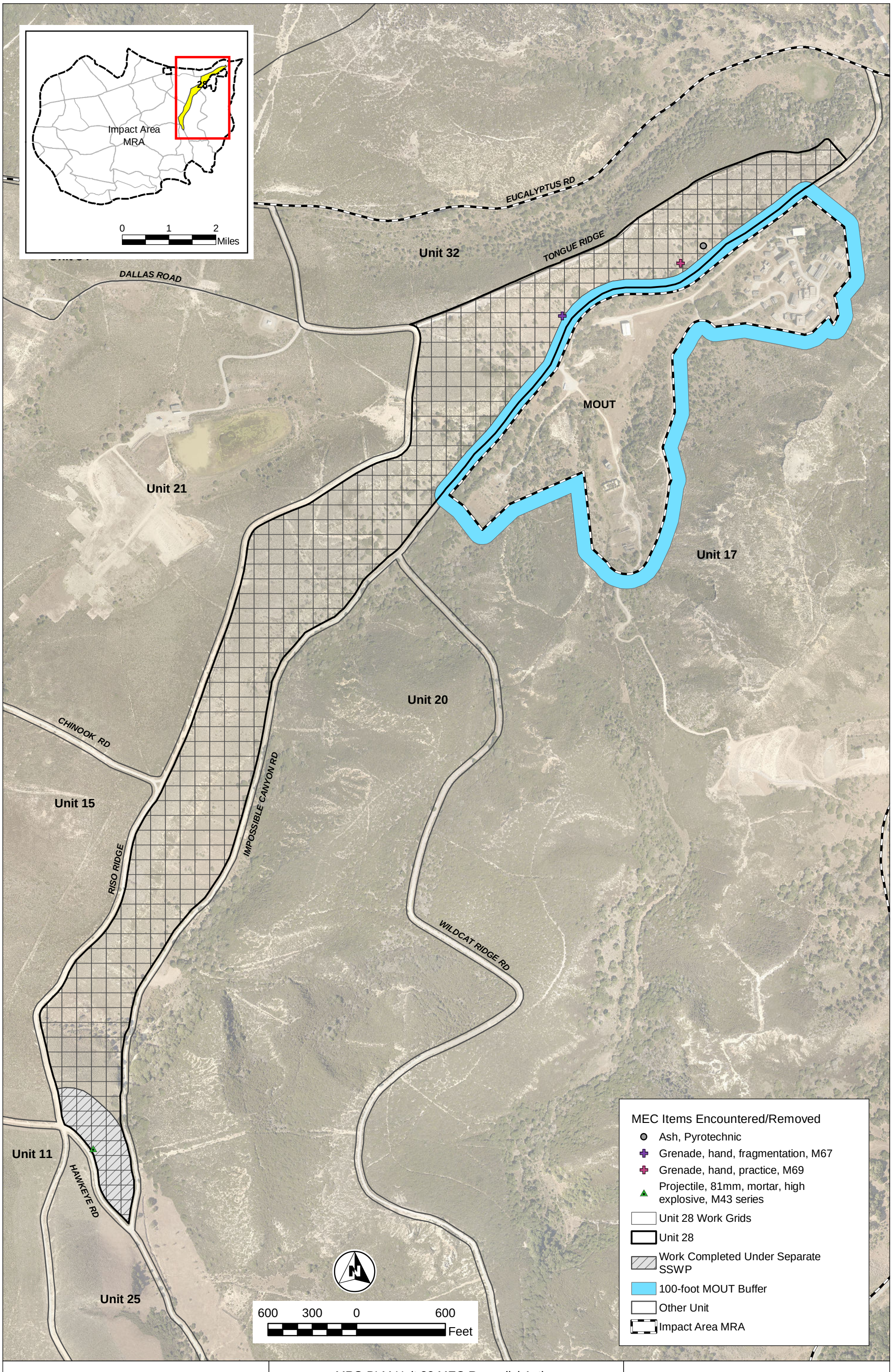
Figures

MRS-BLM Unit 28 MEC Remedial Action
Technical Memorandum
Munitions and Explosives of Concern
Former Fort Ord, California

Figure 1

Unit 28
Location Map

G:\ArcGIS\USACE\Fort_Ord\PROJECTS\Unit_28\RA_TM\Map_docs\Site_Location_Map.mxd 9/27/2017 [11:42 AM] KCHOLAK, Gilbane

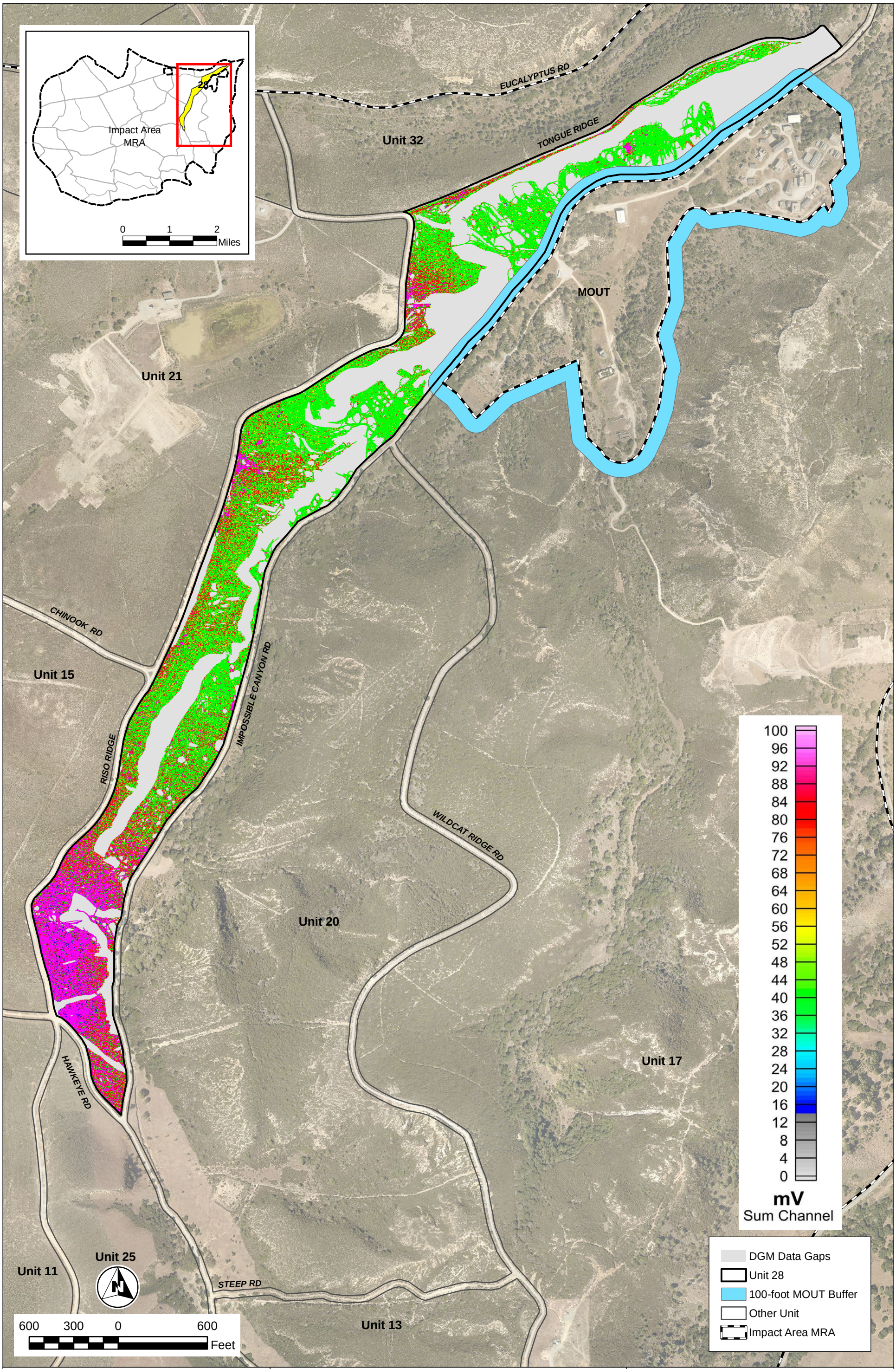


MRS-BLM Unit 28 MEC Remedial Action
Technical Memorandum
Munitions and Explosives of Concern
Former Fort Ord, California

Figure 2

MEC Finds Prior to Remedial Action
Unit 28

G:\ArcGIS\USACE\Fort_Ord\PROJECTS\Unit_28\RA_TM\Map_docs\U28_PriorMEC_detail.mxd 9/27/2017 [12:26 PM] kcholak, Gilbane

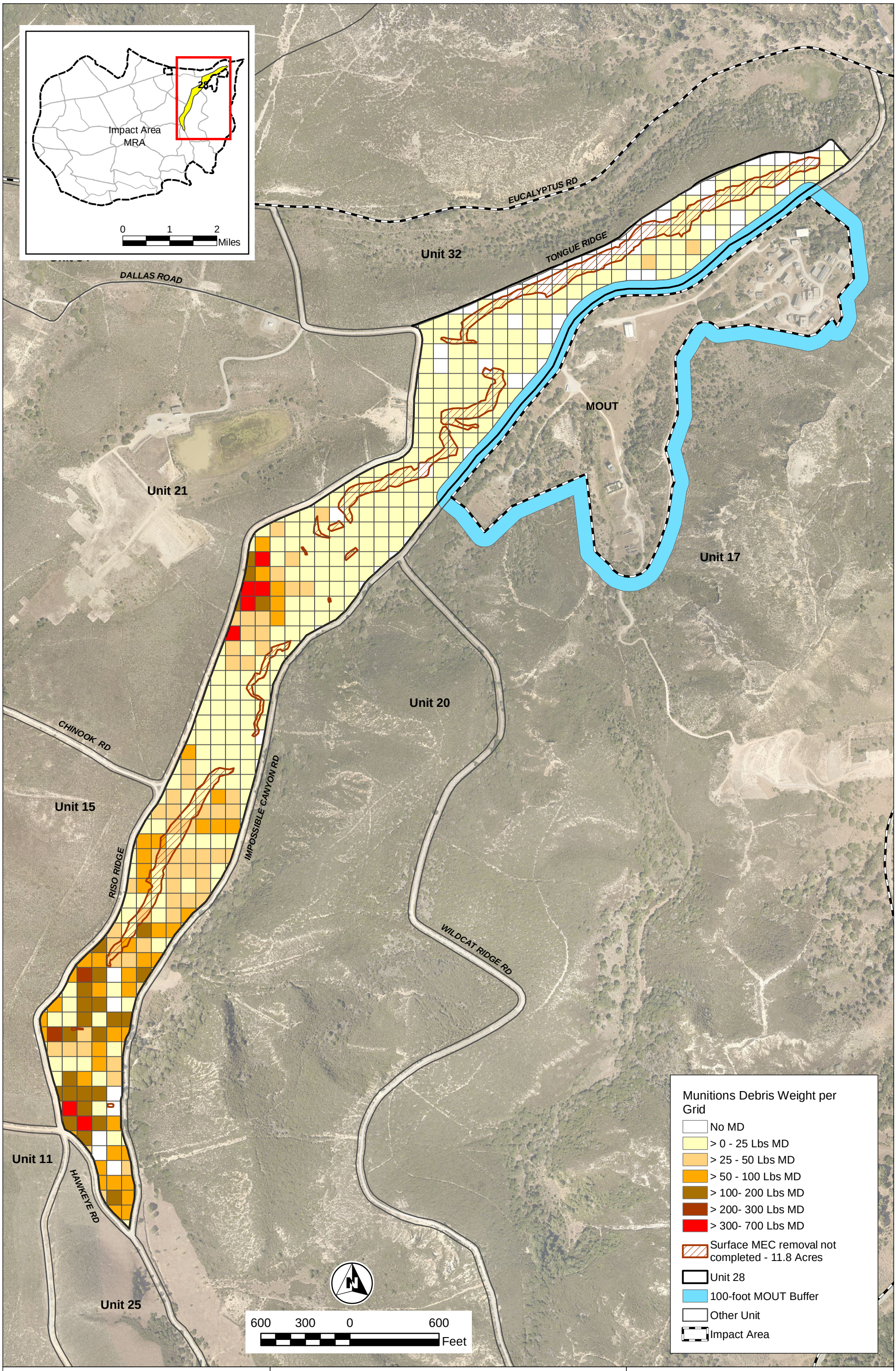


MRS-BLM Unit 28 MEC Remedial Action
Technical Memorandum
Munitions and Explosives of Concern
Former Fort Ord, California

Figure 3

DGM
Unit 28

G:\ArcGIS\USACE\Fort_Ord\PROJECTS\Unit_28\RA_TM\Map_docs\U28_DGM_detail.mxd 9/27/2017 [10:49 AM] kcholak, Gilbane

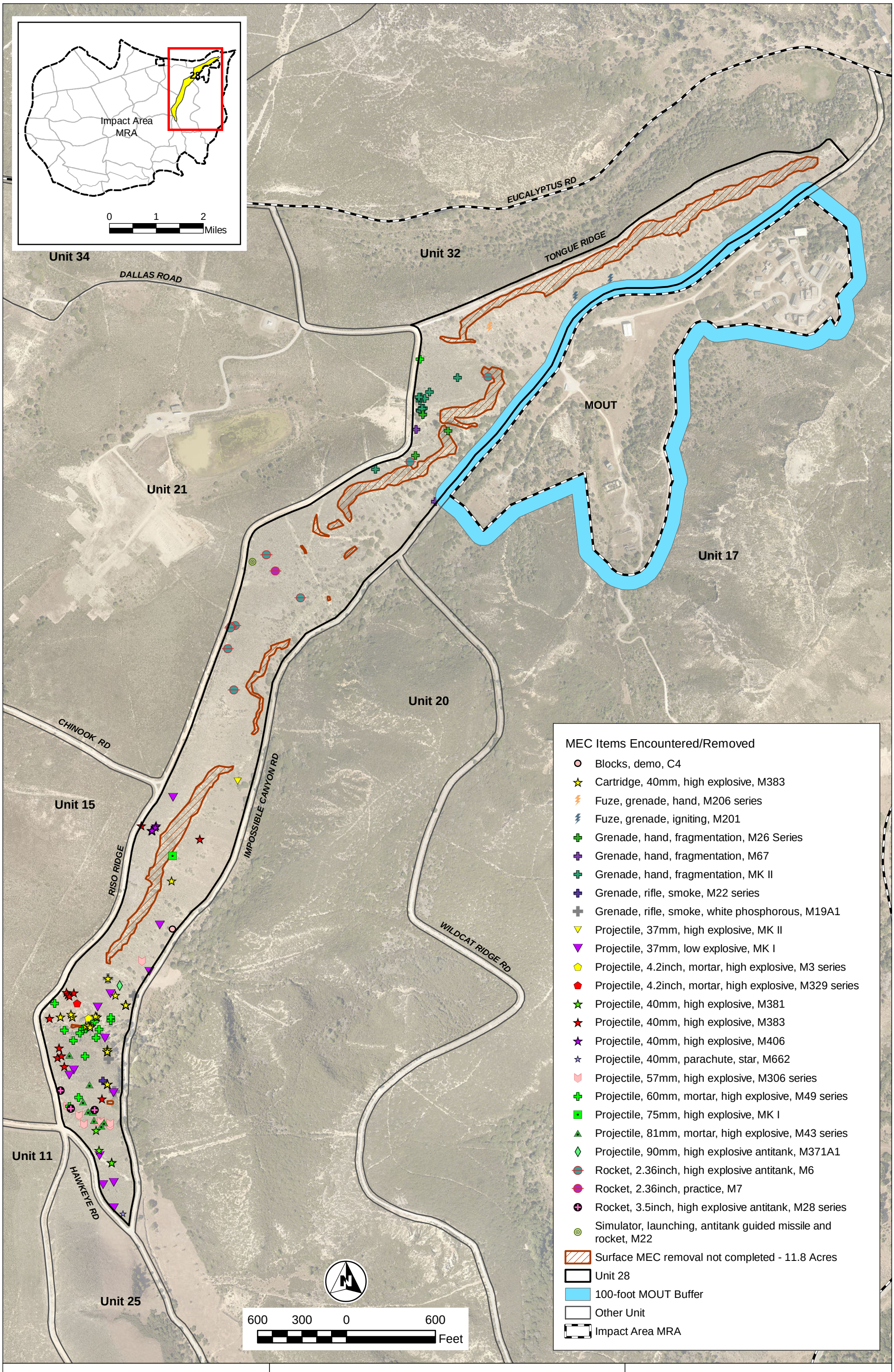


MRS-BLM Unit 28 MEC Remedial Action
Technical Memorandum
Munitions and Explosives of Concern
Former Fort Ord, California

Figure 4

Munitions Debris Weight by Grid
Unit 28

G:\ArcGIS\USACE\Fort_Ord\PROJECTS\Unit_28\RA_TM\Map_docs\U28_MDweight.mxd 9/27/2017 [10:50 AM] kcholak, Gilbane



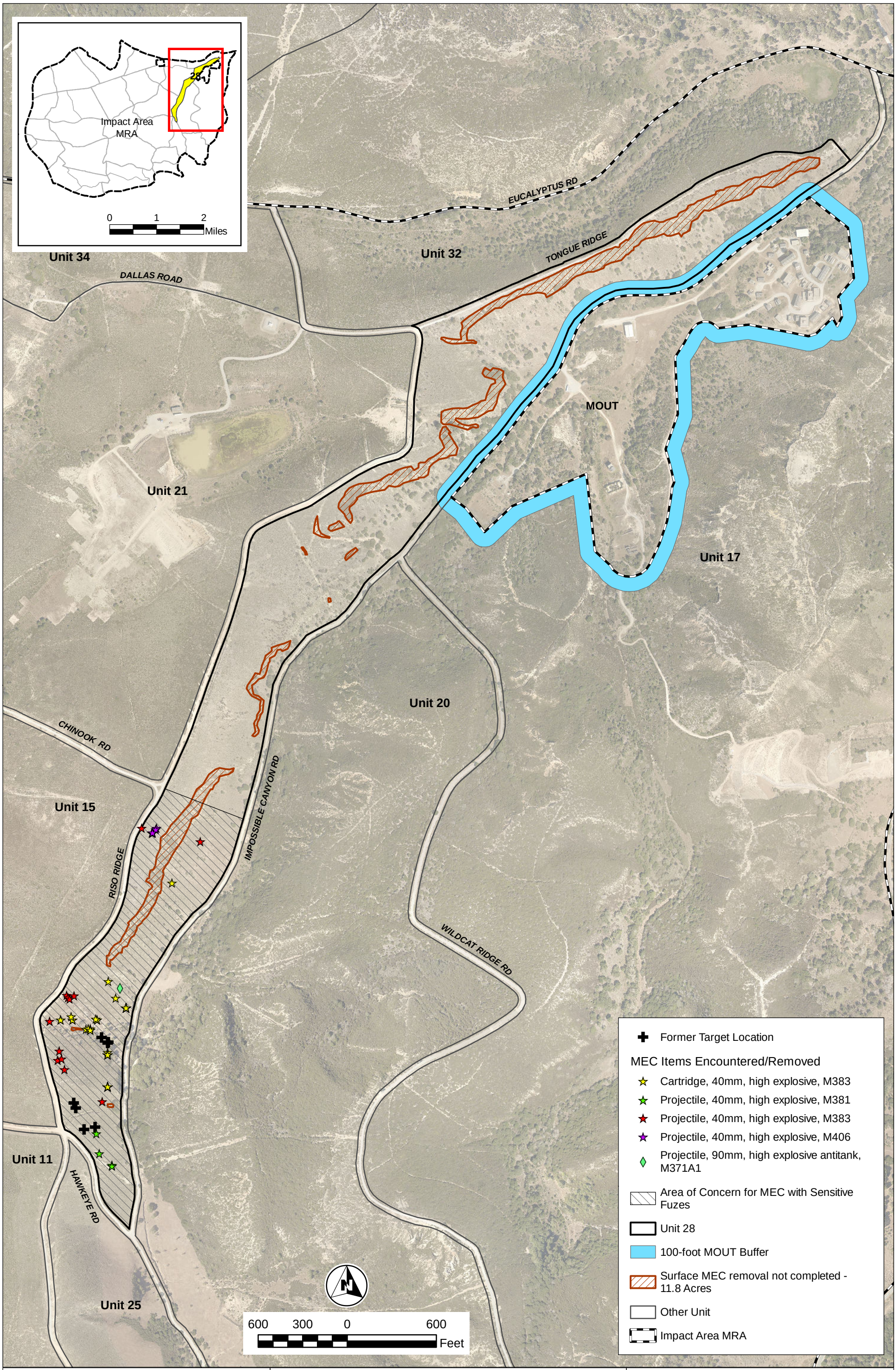
KEMRON ENVIRONMENTAL SERVICES Gilbane

MRS-BLM Unit 28 MEC Remedial Action
Technical Memorandum
Munitions and Explosives of Concern
Former Fort Ord, California

Figure 5

MEC Finds During Remedial Action
Unit 28

G:\ArcGIS\USACE\Fort_Ord\PROJECTS\Unit_28\RA_TM\Map_docs\U28_MEC_detail.mxd 9/27/2017 [11:50 AM] kcholak, Gilbane



MRS-BLM Unit 28 MEC Remedial Action
Technical Memorandum
Munitions and Explosives of Concern
Former Fort Ord, California

Figure 6

Location of UXO with Sensitive Fuze
Unit 28

G:\ArcGIS\USACE\Fort_Ord\PROJECTS\Unit_28\RA_TM\Map_docs\U28_SensitiveFuse.mxd 9/27/2017 [11:55 AM] kcholak, Gilbane

Appendix A

Field Work Variances

Kemron Gilbane

Field Work Variance No. 010

FIELD WORK VARIANCE

Project Name/Number	Fort Ord	**WP**	07
Applicable Document	Final, Site-Specific Work Plan Munitions and Explosives of Concern Remedial Action, MRS-BLM Unit 28, Former Fort Ord, California (OE-0859B)	**Date**	August 17, 2017

Problem Description:

The *Final, Site-Specific Work Plan Munitions and Explosives of Concern Remedial Action, MRS-BLM Unit 28, Former Fort Ord, California* (Kemron, 2016), specifies the following:

- Section 2.5.2, Manual and/or Mechanical Vegetation Removal: "Due to the presence of some extreme terrain as shown on Figure 6 (not shown), some areas may not have vegetation removed. The determination to not remove vegetation may result from either personnel safety issues or the potential for causing significant erosion problems."
- Section 2.5.4, Technology-Aided Surface MEC Removal: "Due to the presence of some extreme terrain as shown on Figure 6 (not shown), some areas may not have technology-aided surface removal performed. The determination to not conduct technology-aided surface removal may result from personnel safety issues. Areas where technology-aided surface removal is not conducted will be documented and evaluated during the TM process for the potential for MEC items to be present on the surface."
- Section 2.5.5, DGM: "Following surface MEC removal, DGM survey will be conducted in accessible areas. Site conditions (e.g. difficult terrain) may prevent digital geophysical survey from being conducted in certain areas; these areas will be documented in the TM."

Areas where vegetation removal was and was not completed are shown on Figure 1. Approximately 12 acres of Unit 28 (Figure 2) has been determined by UXO safety personnel to be inaccessible to surface MEC removal due to extreme terrain. Approximately 39 acres of Unit 28 (Figure 3) has been determined by UXO safety personnel to be inaccessible to DGM survey due to extreme terrain. Figure 4 shows areas where vegetation removal was not completed overlain with areas where surface MEC removal was not completed due to extreme terrain.

Recommended solution:

Document these areas in the TM. Conduct an evaluation in the TM based on the results of the surface MEC removal and DGM data to determine the likelihood of surface MEC remaining in the 12 acres shown on Figure 2.

Impact on present and completed work:

No impact on present and completed work.

Recommended solution/disposition:

KEMRON Gilbane

Field Work Variance No. 010

Page 2 of 6

Incorporate this FWV as an appendix to the existing Final Work Plan.

Clarification ☐ Minor Change ☐ Major Change ☒

Affects Budget Yes ☐ No ☒

Affects Schedule Yes ☐ No ☒

Signature _____ Date 8/17/17
Task Manager

Signature _____ Date 8/17/17
SUXOS

Signature _____ Date 8/17/17
Project Manager

Signature _____ Date 8.17.17
CQCSM

Signature Kevin J. Siemann Digitally signed by Kevin J. Siemann DN: C=US, E=ksiemann@gilbaneco.com, O=Gilbane Company, OU=Gilbane Company, CN=Kevin J. Siemann Date: 2017.08.17 14:08:45-07'00' Date 8/17/17
Deputy Project Manager

Signature _____ Date 8-17-17
UXOQCS

for Erin Carlson

USACE Approval: If Major Change:

Signature _____ Date 17 AUG 2017
OE Safety Specialist

Signature EISEN.DAVID.E.1231985146 Digitally signed by EISEN.DAVID.E.1231985146 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=EISEN.DAVID.E.1231985146 Date: 2017.09.12 08:41:41 -07'00' Date _____
USACE COR or TM

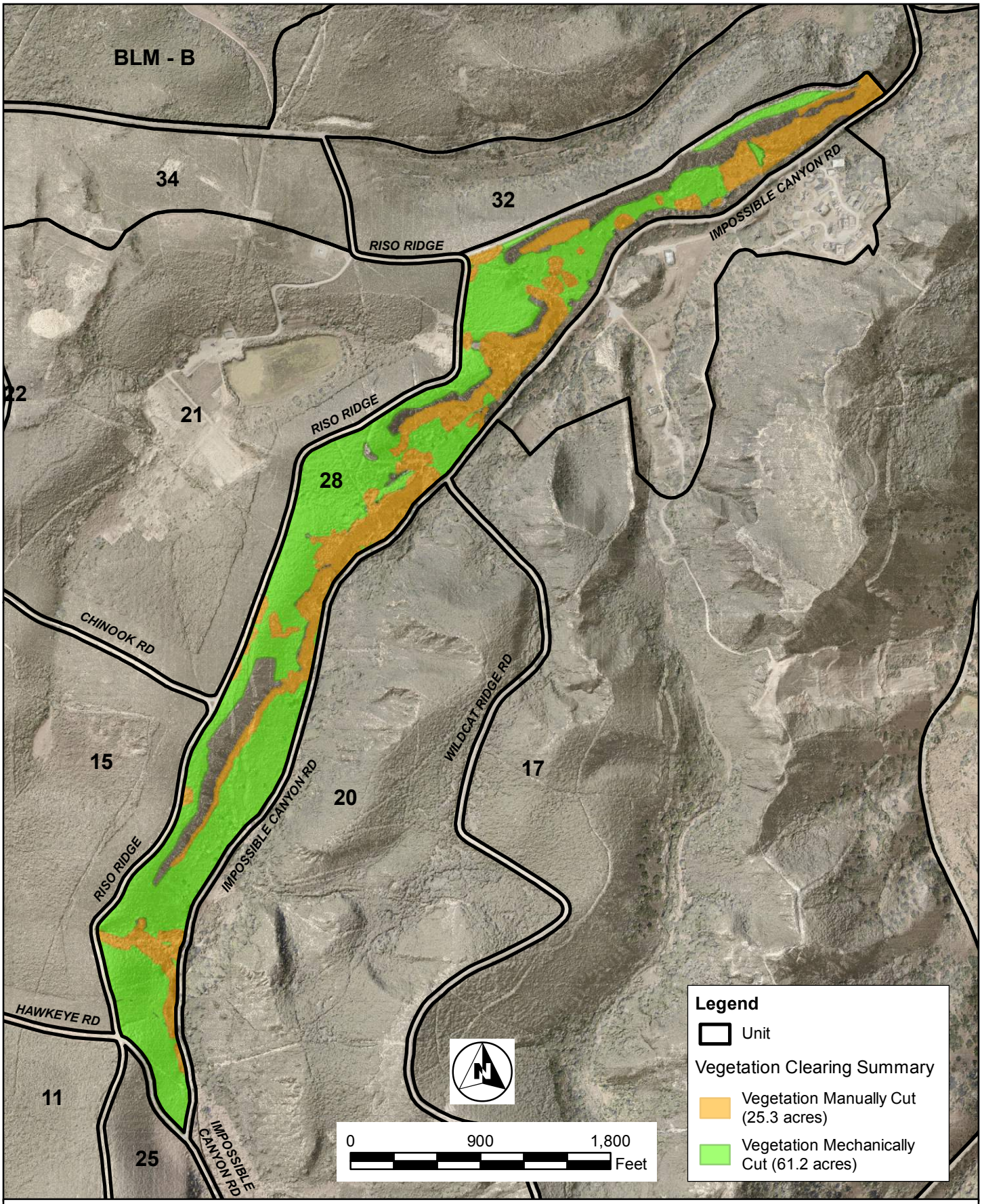
Signature LINDSAY.KYLE.M.1529297226 Digitally signed by LINDSAY.KYLE.M.1529297226 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=LINDSAY.KYLE.M.1529297226 Date: 2017.09.11 22:09:45 -07'00' Date _____
USACE Project Geophysicist

Distribution List: FWV 010, Final Site-Specific Work Plan Munitions and Explosives of Concern Remedial Action, MRS-BLM Unit 28, Former Fort Ord, California

Email	Paper/CD	Name	Organization	Address	City, State	Zip
1		Mr. Duane Balch	Department of the Army USACE	1325 J Street	Sacramento, CA	95814
1		Mr. Michael Wheeler	Department of the Army USACE	1325 J Street	Sacramento, CA	95814
1		Mr. John Jackson	Department of the Army USACE	1325 J Street	Sacramento, CA	95814
1		Mr. Kyle Lindsay	Department of the Army USACE	1325 J Street	Sacramento, CA	95814
1		Mr. Therman Franks	Department of the Army USACE	4101 Jefferson Plaza NE	Albuquerque, NM	87109
1		Mr. David Eisen	Department of the Army USACE	4463 Gigling Road	Seaside, CA	93955
1		Mr. James Britt	Department of the Army USACE	4463 Gigling Road	Seaside, CA	93955
1		Mr. William Collins	Department of the Army, Fort Ord BRAC	4463 Gigling Road	Seaside, CA	93955
1		Ms. Natalie Gordon	Chenega Corporation	4463 Gigling Road	Seaside, CA	93955
1		Ms. Chieko Nozaki	Chenega Corporation	4463 Gigling Road	Seaside, CA	93955
1		Mr. Eric Morgan	Bureau of Land Management, Fort Ord National Monument	940 2nd Avenue	Marina, CA	93933
1		Ms. Maeve Clancy	U.S. Environmental Protection Agency, Region IX	75 Hawthorne Street, Mail SFD-8-3	San Francisco, CA	94105
1		Mr. Tom Hall	Tech Law, Inc.	7 Shore Point	North Little Rock, AR	72116
1		Mr. Robert Young	Tech Law, Inc.	235 Montgomery Street, Suite 717	San Francisco, CA	94104
1		Mr. Vlado Arsov	California Department of Toxic Substances Control (DTSC)	8800 California Center Drive	Sacramento, CA	95826
1		Mr. Steve Crane	KEMRON Environmental Services	4522 Joe Lloyd Way	Monterey, CA	93944
1	1	Ms. Audrey Johnson	KEMRON Environmental Services	4522 Joe Lloyd Way	Monterey, CA	93944
	1	Mr. Mike Weaver	Fort Ord Community Advisory Group (FOCAG)	52 Corral De Tierra Road	Salinas, CA	93908
	1	Ms. LeVonne Stone	Fort Ord Environmental Justice Network (FOEJN)	P.O. Box 361	Marina, CA	93933
1	1	Admin Record	Fort Ord BRAC	4463 Gigling Road	Seaside, CA	93955

Approved: _____

David Eisen
USACE Project Manager



Document Path: G:\ArcGIS\USACE\Fort_Ord\PROJECTS\Unit_28\FWV\Map_Docs\FWV_U28_VegClearance.mxd 9/14/2017 1:55:07 PM lcarr - Gilbane

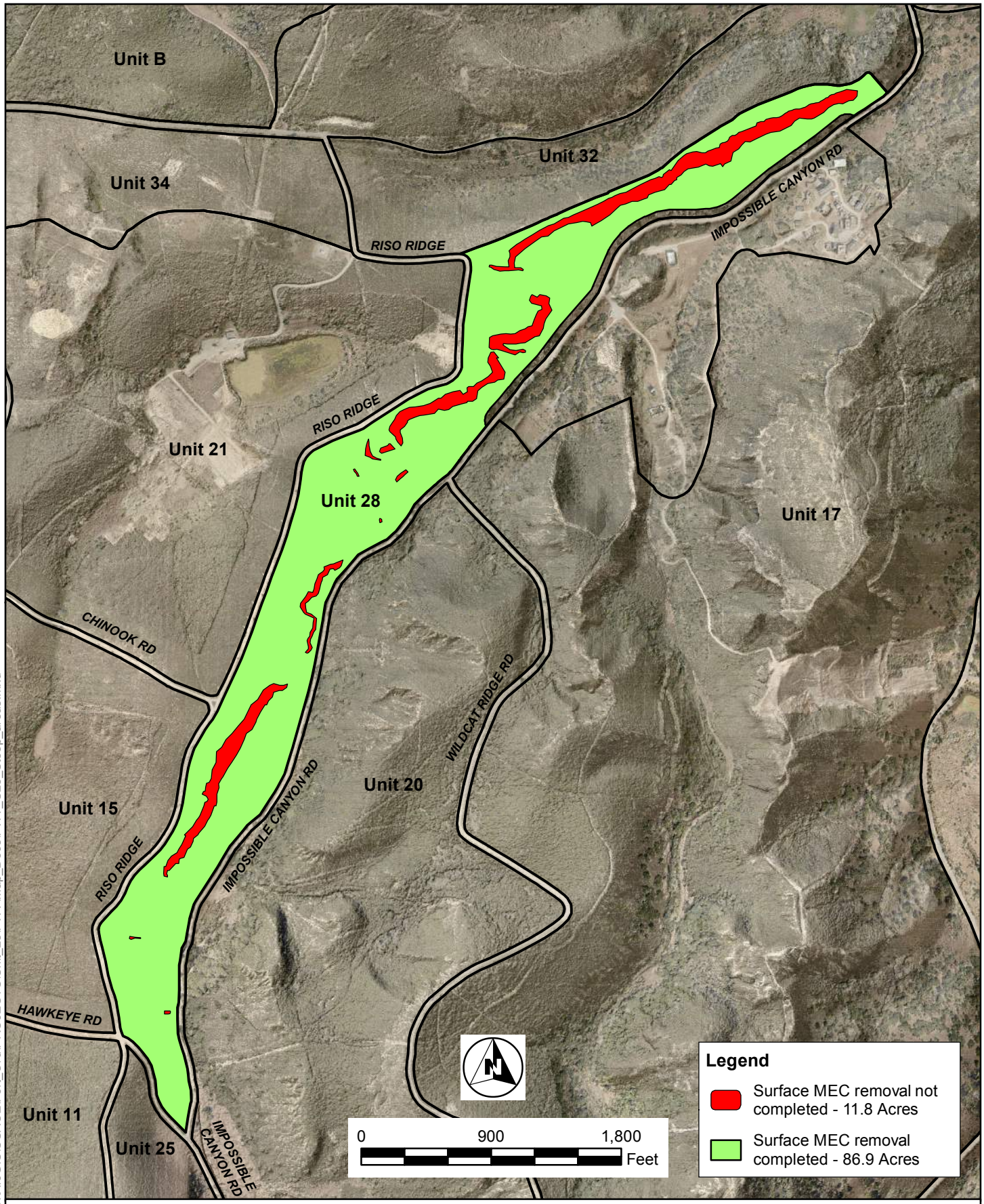
KEMRON ENVIRONMENTAL SERVICES

Gilbane

Former Fort Ord
Impact Area MRA MEC Removal

Figure 1

Vegetation Removal
Unit 28 - FWV 010



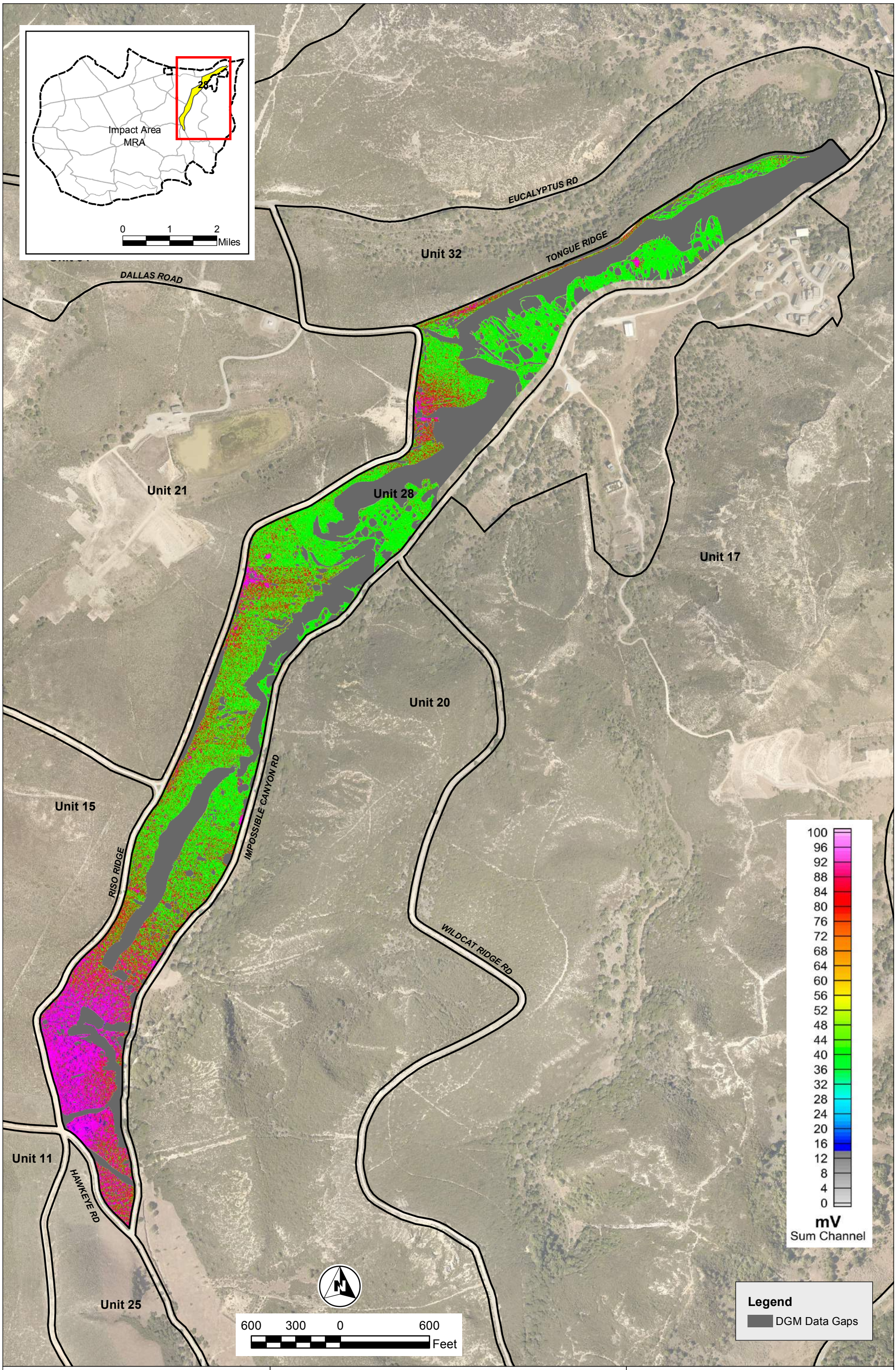
Document Path: G:\ArcGIS\USACE\Fort_Ord\PROJECTS\Unit_28\FWV\Map_Docs\FWV_U28_Steep_areas.mxd

KEMRON ENVIRONMENTAL SERVICES

Gilbane

Former Fort Ord
Impact Area MRA MEC Removal

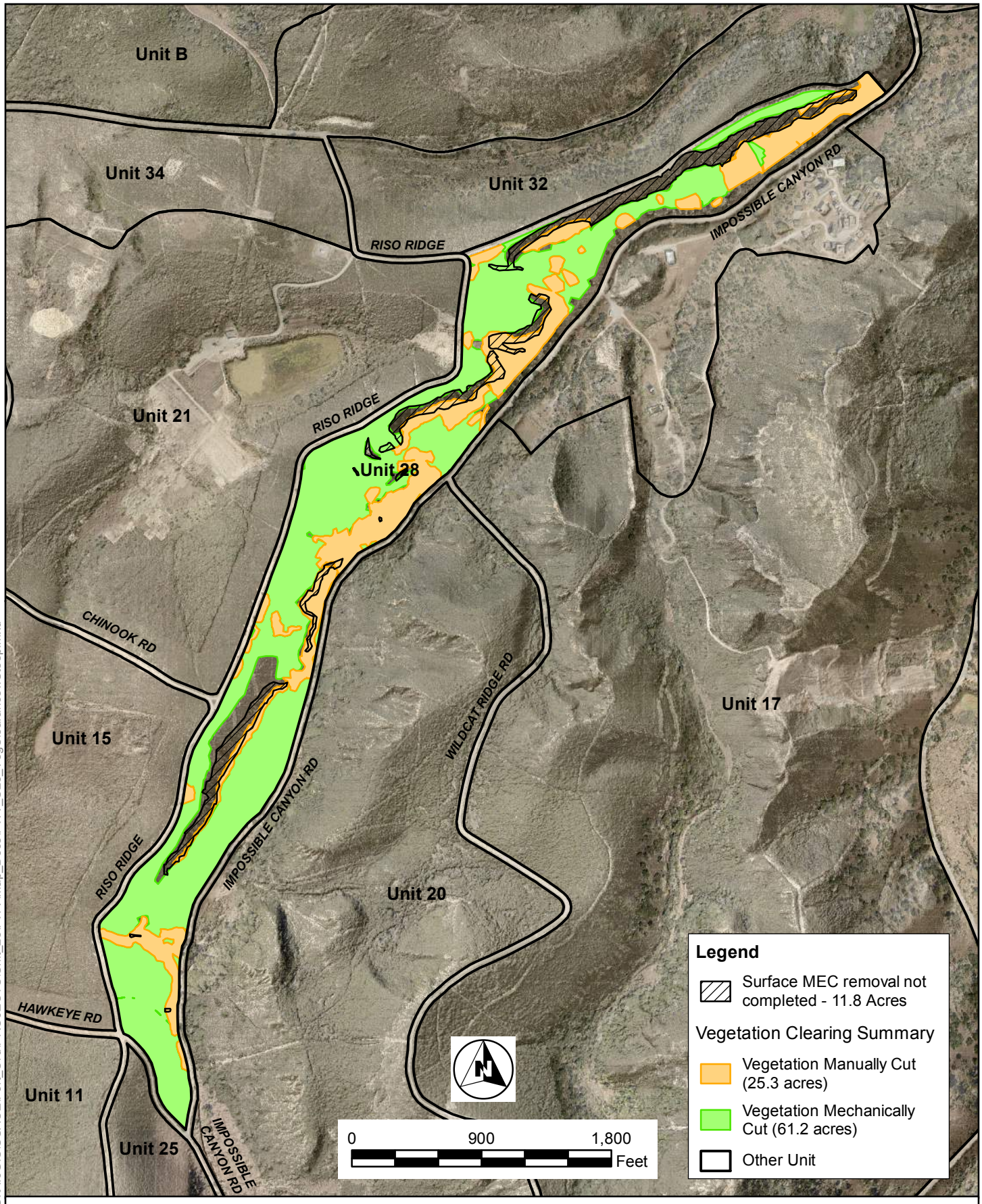
Figure 2
Surface MEC Removal Complete and Not Complete
Unit 28 - FWV 010



Former Fort Ord
Impact Area MRA MEC Removal

Figure 3
DGM Data Map
Unit 28 - FWV 010

G:\ArcGIS\USACE\Fort_Ord\PROJECTS\Unit_28\FWV\Map_Docs\FWV_U28_DGM.mxd 9/15/2017 [13:10 PM] lcarr, Gilbane



Document Path: G:\ArcGIS\USACE\Fort_Ord\PROJECTS\Unit_28\FWV\Map_Docs\FWV_U28_VegClearancewSteep.mxd

KEMRON ENVIRONMENTAL SERVICES

Gilbane

Former Fort Ord
Impact Area MRA MEC Removal

Figure 4
Vegetation Removal and Surface MEC Incomplete
Unit 28 - FWV 010

Appendix B

Army-BLM Joint Inspection Summary

Post-Remediation Inspection Summary

Subject: Joint Post-Remediation Inspection by the Army and Bureau of Land Management (BLM) of Munitions Response Site (MRS) – BLM Unit 28.

Area of Inspection: Unit 28

Date: 2 August 2017

Attendees: Eric Morgan, BLM; Dave Eisen - Program Manager, United States Army Corps of Engineers (USACE); Curtis Payton – Program Manager, USACE; Natalie Gordon, Chenega Support Services, Fort Ord Base Realignment and Closure (BRAC)

References:

1. *Final Site-Specific Work Plan, Munitions and Explosives of Concern Remedial Action, MRS-BLM Unit 28, Former Fort Ord, CA (Kemron, 2016)(AR#OE-0859B).*
2. *Final Record of Decision (*ROD*), Impact Area Munitions Response Area (*MRA*), Track 3 Munitions Response Site (*MRS*), Former Fort Ord, California* (United States Department of the Army [Army], 2008)(AR#OE-0647).
3. *Final Site-Specific Work Plan, Munitions and Explosives of Concern Remedial Action, MRS-BLM Units 15, 21, 32, and 34, Former Fort Ord, CA (Shaw, 2010)(AR-OE0711B).*

Background: In accordance with the Track 3 ROD, the Army conducted a surface and limited subsurface MEC removal action and Digital Geophysical Mapping (DGM) of the designated Unit within the Impact Area. An inspection by the Army with the participation of BLM, the future property recipient and land manager, of Army's completed munitions and explosives of concern (MEC) removal action was conducted to determine the areas that may require additional subsurface removal action, or future construction support, due to BLM's planned use (e.g. habitat restoration, erosion control measures, fuel break maintenance, etc).

It is an Army responsibility to conduct remedial actions that prepare the property for BLM's safe management and use. The Army will provide MEC removal and/or construction support for BLM's ground disturbing activities as jointly agreed upon prior to property transfer. It is anticipated that BLM will receive Unit 28 property upon completion of a suitable MEC remediation of all adjoining lands designated Munitions Response Site (MRS)-BLM (anticipated completion 2023). With the transfer of the property, responsibility for construction support of subsurface activities will be in accordance with the ROD.

Comments to the Unit 28 Site-Specific Work Plan (SSWP) were provided by BLM prior to the start of MEC removal actions. Those comments and the Army's response to comments are provided with this memo as Attachment 1. The Army has completed the actions described in the SSWP for Unit 28. Additional subsurface MEC removal may be required as identified in the Technical Memorandum (TM).

Objective: This joint inspection provided an on-site assessment of Unit 28. The inspection included a visual assessment of the unit from the perimeter fuel breaks around the unit, and involved a discussion of the actions necessary to attain MEC safety conditions suitable for subsequent future use as described by the BLM. The current status of vegetation cover and evidence of the impacts of MEC removal operations on topographic features and habitat were evaluated. BLM intended future use activities within the area, to include potential construction activities and a description of a likely schedule for those activities (pre or post-transfer), were all considered. The Army provided a preliminary assessment of the MEC safety requirements where appropriate for support of any subsurface activities proposed by BLM.

The inspection is intended to determine a mutually acceptable pre-transfer course of action to achieve a suitable MEC safety status for locations of concern within the unit. The Army will evaluate completed MEC removal work, DGM, and surface monitoring data for all comment locations to determine an appropriate level of MEC construction support required for future BLM activities in those areas. An interim determination will be included in the TM and the remedial action report for the subject area and a final determination of construction support requirements will be included in the Track 3 remedial action completion report.

Comments - Erosion: Two areas were noted by BLM as requiring erosion control work: 1) along the north side of Hawkeye Road southeast of the intersection with Riso Ridge Road, and 2) along the east side of Riso Ridge Road just north of the intersection with Hawkeye Road (see Figure 1). Both areas of erosion are the result of excess runoff from Hawkeye and Riso Ridge Roads and both areas of concern extend outside of the 45 foot cleared-to-depth fuel break footprint. The Army will provide additional soils to backfill these erosion areas and, and provide construction support for BLM erosion control activities as required. BLM suggested during the inspection to use onsite soils to backfill the areas. The Army and BLM will coordinate the work to address these areas of erosion in the future.

Both areas require erosion repairs that may involve grading work extending into Unit 28 beyond the 45 foot cleared-to-depth fuel break footprint. Additional subsurface MEC removal will be required at location 1 before erosion control activities involving ground

disturbance begin. Location 2 may not require additional ground disturbing work beyond the 45 foot cleared-to-depth fuel break footprint where the addition of fill soil will address the issue. The Army and BLM are evaluating the most cost effective methods to address erosion. Discussion about how to proceed is forthcoming.

An area of previous erosion was identified east of Riso Ridge Road, north of Chinook Road and adjacent to Historical Area 37 (HA-37) to the west (Figure 2). The erosion scar shows there is evidence of soil stabilization and vegetation regrowth following previous erosion control grading on Riso Ridge Road to divert water flow from that area. No work on this second area is necessary at this time and the area will be monitored for continued recovery.

Comments – Fuel Breaks and Roads: BLM noted a concern with the current location of Impossible Canyon Road, which serves as the eastern boundary of Unit 28. As Impossible Canyon Road (ICR) extends south from Wildcat Ridge Road, it coincides with the natural canyon drainage system, and sections of the road do converge with the drainage bottom itself at some points (See Figure 3). This situation is high risk for continued erosion problems including the potential for the road to be damaged and curtail access. BLM requests the Army to evaluate the feasibility of subsurface MEC removal at a higher elevation along the hillside west of ICR's current location to support a potential BLM road realignment and construction. The Army will review DGM data for the proposed locations of road realignment and discuss with BLM the options to relocate ICR as requested.

BLM requested the MEC removal status of Tongue Ridge Road, which forms the northern boundary of Unit 28 (Figure 4). In their comments to the Draft SSWP for Units 15, 21, 32 and 34, BLM stated that they would "retain this gravel road as an administrative access road and would like the ability to disturb the subsurface along the edges of the road for maintenance purposes." Furthermore, BLM states that the road would not be maintained as a permanent fuel break road, but that it would likely be used to support future burns and BLM "desires a level of cleanup that could support an emergency scrape line (15 feet) being constructed down the ridge to tie in with Eucalyptus Road in case of a wildfire." No subsurface work has been conducted on Tongue Ridge Road and the road does not currently extend to the bottom of the ridge to tie in with either Eucalyptus Road or Impossible Canyon Road. Additional vegetation cutting would likely be required. The Army will review DGM data from the proposed location of this fuel break and provide feasible options for moving forward. Discussion about how to proceed is forthcoming.

Photo 1: Erosion Area 1 (see Figure 1)

Photo 2: Erosion Monitoring Location (see Figure 2)

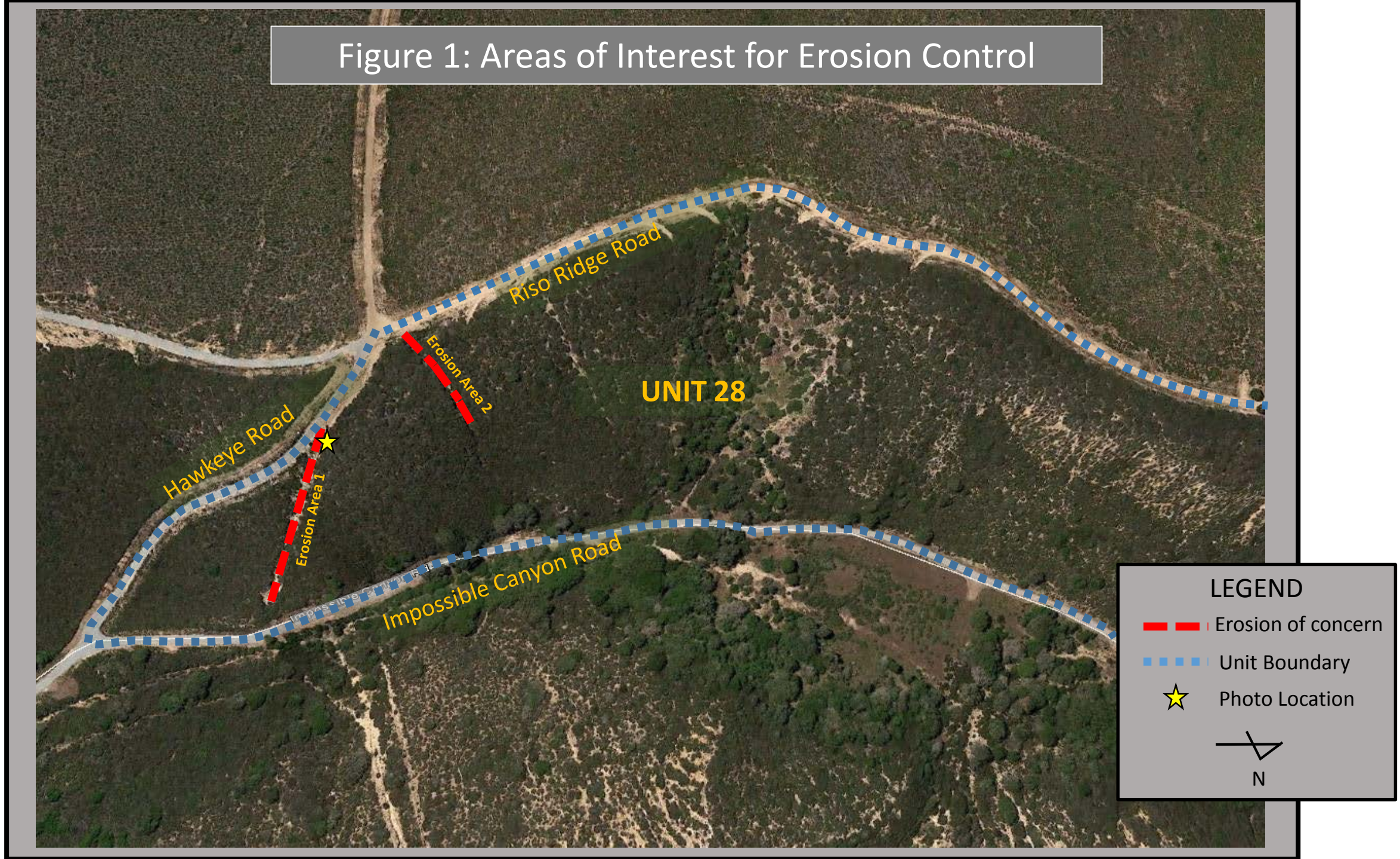


Figure 1: Areas of Interest for Erosion Control
Riso Ridge Road
Erosion Area 2
UNIT 28
Hawkeye Road
Erosion Area 1
Impossible Canyon Road
LEGEND
Erosion of concern
Unit Boundary
Photo Location
N

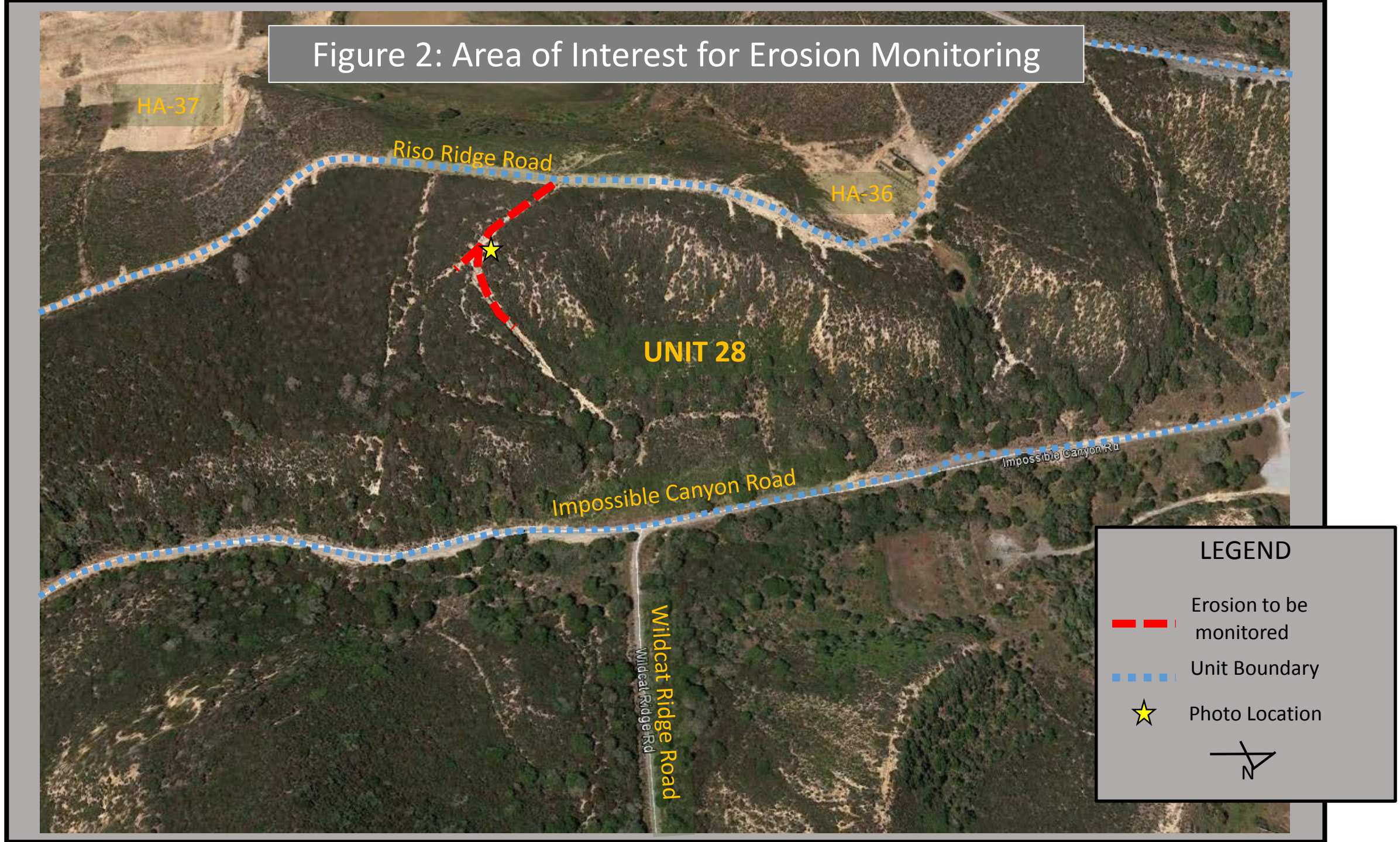


Figure 2: Area of Interest for Erosion Monitoring
HA-37
Riso Ridge Road
HA-36
UNIT 28
Impossible Canyon Road
Impossible Canyon Rd
Wildcat Ridge Road
Wildcat Ridge Rd
LEGEND
Erosion to be monitored
Unit Boundary
Photo Location
N

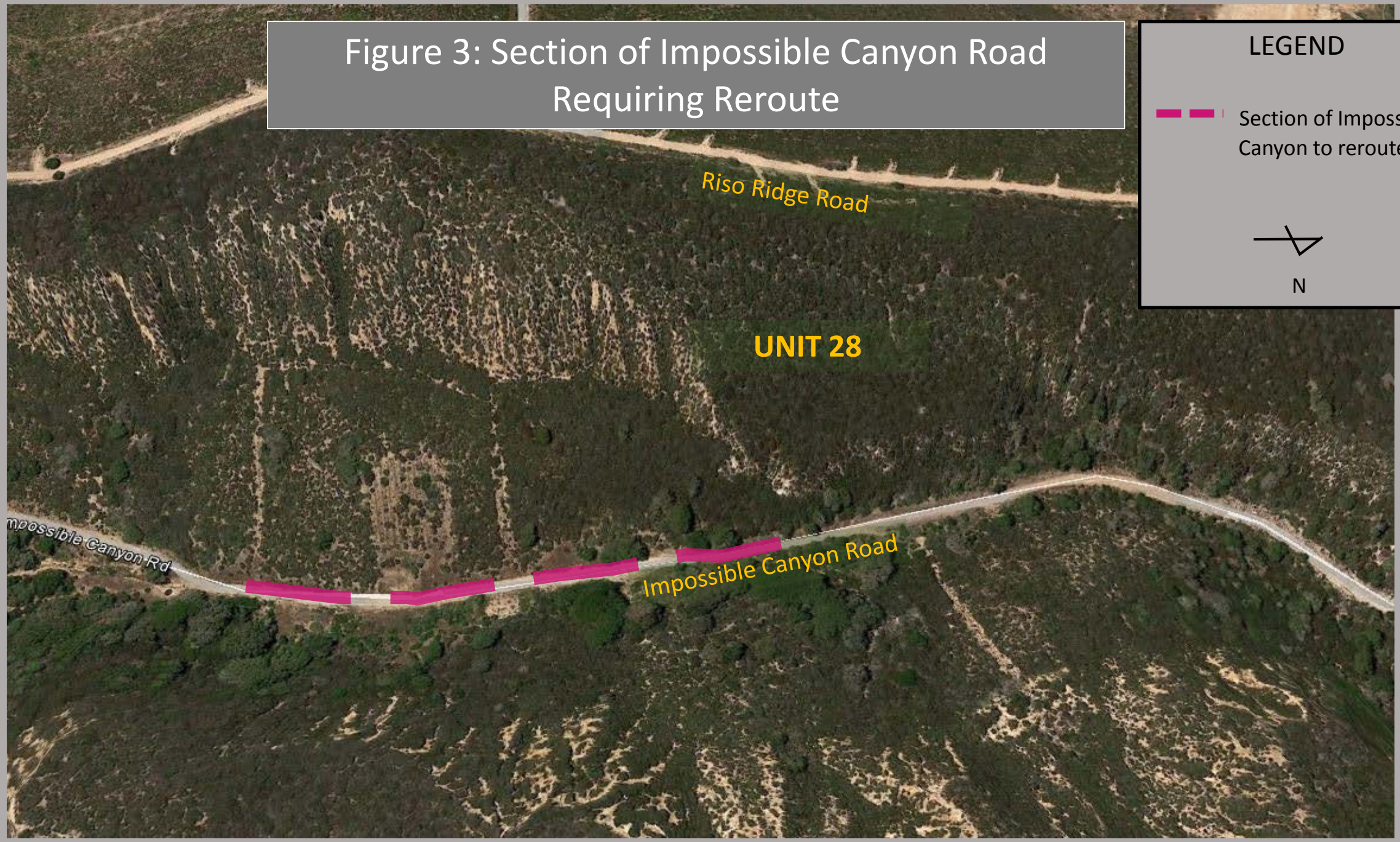
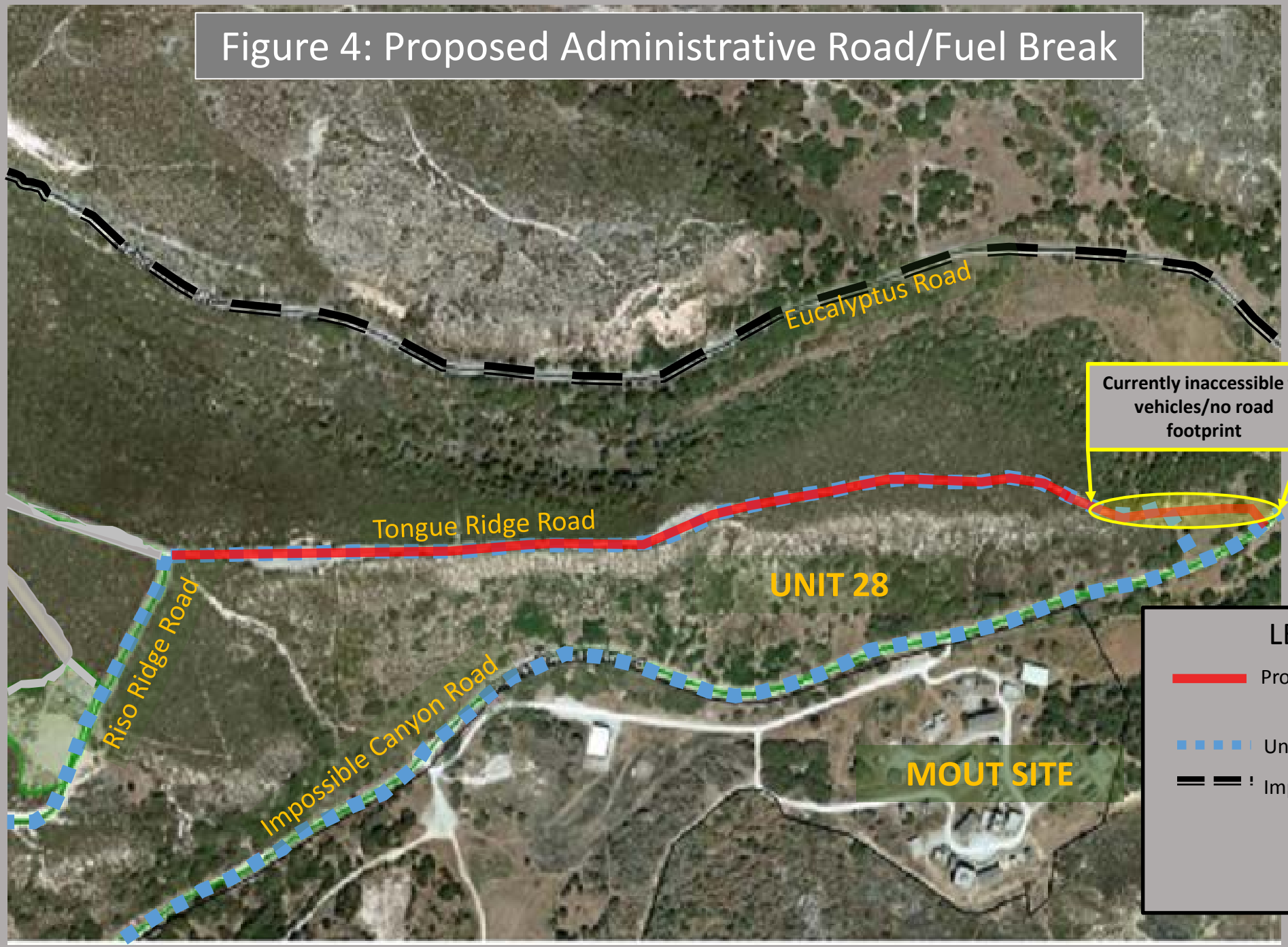


Figure 3: Section of Impossible Canyon Road Requiring Reroute
LEGEND
Section of Impossible Canyon to reroute
N
Riso Ridge Road
UNIT 28
Impossible Canyon Road
mpossible Canyon Rd

Figure 4: Proposed Administrative Road/Fuel Break



KEMRON ENVIRONMENTAL SERVICES

RESPONSES TO COMMENTS

Document:	Draft Final, Site-Specific Work Plan Munitions and Explosives of Concern Remedial Action, MRS-BLM Unit 28
Commenting Organization:	Bureau of Land Management (BLM)
Name:	Eric Morgan
Date of Comments:	January 4, 2016

Specific Comment 1:

The BLM has strong concerns regarding the erosion potential within this unit and is worried that the vegetation that was removed will accelerate erosion in areas that are already gullied. In order to stabilize and restore these erosion features now or in the future, subsurface disturbance would be required around each feature. I have attached 4 diagrams that show the general locations and types of erosion issues.

Unit 28 is bound by Impossible Canyon Road and Riso Ridge Road. Impossible Canyon Road traverses up the canyon and generally parallels the canyon drainage system. Approximately 2,100 feet of this road is located within the drainage bottom itself and has the potential to wash away or form deep gullies. This section of road should be rerouted outside the drainage bottom in order for it to be more sustainable if it is to be used.

Riso Ridge Road and Dallas Ridge Road form the upper border of Unit 28. Each of these road segments historically collected water running down the road or parallel to the road, then diverted the drainage down the slope causing deep erosion scars. We have been working with you for the last 12 months to manage the road runoff, and have had some success redirecting the runoff more efficiently. Much more still needs to be done to stabilize these important fuelbreak roads and the gullies that formed from road drainage discharge.

Finally, the BLM is greatly concerned that Impossible Canyon will continue to have severe erosion failures unless the vast network of gullies and unneeded roads are stabilized and/or restored in Units 9, 13, 20, 25 and 31. Furthermore, a drainage culvert near the intersection of Barloy Canyon Road and South Boundary Road located at Laguna Seca Recreation Area is another great source of concern. This drainage culvert discharges a substantial amount of road runoff from several paved roads into the top of Impossible Canyon and does not appear to have adequate energy dissipation.

Response to Specific Comment 1:

As a result of this comment the Army has coordinated with BLM staff on erosion repair projects to address locations considered critical and in need of near-term repairs. Funding was provided

under the current Service Agreement for BLM to redirect runoff away from erosion-prone areas of Unit 28. Other areas of long-term erosion concern will be evaluated.

As described in Section 2.5.6 of the *Draft Final, Site-Specific Work Plan Munitions and Explosives of Concern Remedial Action, MRS-BLM Unit 28, Former Fort Ord, CA*, a Technical Memorandum (TM) will be developed following completion of the technology-aided surface removal of munitions and explosives of concern (MEC) and digital geophysical mapping (DGM) survey. The TM will provide an evaluation of the surface MEC removal and DGM survey and, if necessary, describe additional recommended remedial actions based on the evaluation. Subsurface MEC removal can be recommended in specific areas to address specific land use needs such as BLM restoration sites. As in the past, as part of the TM process the Army intends to conduct a joint inspection with BLM of the unit to review such areas as described in the comment. The areas will be evaluated for subsurface MEC removal based on the inspection and the results of the completed work.

With regard to other areas of erosion concerns outside Unit 28 (identified in the final paragraph), the Army has been working with BLM on an ongoing basis to address areas of mutual concerns. The Army intends to address erosion issues that arise as a result of MEC remedial actions in coordination with BLM.

Appendix C

DGM QA Approval and Discussion

FORMER FORT ORD, CALIFORNIA
UNIT 28
DRAFT QUALITY ASSURANCE REPORT:
DIGITAL GEOPHYSICAL OPPERATIONS

PREPARED BY
GEOLOGY SECTION
SACRAMENTO DISTRICT
U.S. ARMY CORPS OF ENGINEERS

PREPARED FOR
FORT ORD BASE REALIGNMENT AND CLOSURE (BRAC) OFFICE

SEPTEMBER 2017

1.0 INTRODUCTION

This report covers the Quality Assurance (QA) processes conducted by the U.S. Army Corps of Engineers (USACE) with respect to the collection, processing, and evaluation of digital geophysical data collected by KEMRON Environmental Services, Inc. (KEMRON). The field work was performed in Unit 28. Work was performed under WERS Contract No. W912DY-10-D-0027, Site-Specific Work Plan MRS-BLM Unit 28. The field protocols, database management, and QA reviews were based on a combination of methods previously used in other units and described in the UFP-QAPP Volume II Appendix A, along with additional procedures necessary for ensuring compliance with the WERS MMRP contract and the standard operating procedures performed by KEMRON's subcontractors GILBANE and NAEVA. USACE QA verified that KEMRON had an adequate Quality Control (QC) program in place and that data collected in Unit 28 were in accordance with the project Data Quality Objectives (DQOs) and Measurement Quality Objectives (MQOs), as established in the UFP-QAPP. Unit 28 did not include any areas recommended for subsurface removal and were collected in their entirety to meet Category B data.

1.1 Site details

Unit 28 is located in the northeast portion of the Impact Area Munitions Response Area that is planned to be transferred to BLM, as depicted in Figure 1. The area is bounded on the north by Tongue Ridge and by fuel breaks on the remaining sides. Unit 28 encompasses a total of approximately 102 acres.

Clean-up operations pertinent to DGM activities were initiated with a vegetation clearance followed by an instrument aided surface removal. Unit 28 DGM was collected using the Category B data collection protocols, as no subsurface removal is planned for this unit. During vegetation clearance and surface clearance, a total of 212 MEC items were removed.

According to the Installation-Wide Multispecies Habitat Management Plan (HMP) for Fort Ord (USACE 1997), the site will be transferred to BLM to be used as an undeveloped habitat reserve. The Impact Area is mostly covered by maritime chaparral and grassland habitats. The terrain in the Impact Area is dominated by rolling hills with elevations ranging from 720-900 ft. above sea level (ASL). These hills are composed of sand associated with Pleistocene aged sand dunes that may be as thick as 250 ft. The western edge of the site contains a number of steep cliffs and gullies in Unit 28 that were inaccessible to the DGM survey team, further discussed below.

2.0 QA ACTIVITES

2.1 Data collection methods

Production geophysical data were collected using Geonics EM-61MKII electromagnetic sensors in a multi-coil configuration (towed array) throughout most of the site. The EM-61MKII is a time-domain electromagnetic sensor that generates an electromagnetic pulse, inducing eddy currents within the subsurface. During the off period of the EM pulse, the eddy current decay produces secondary electromagnetic fields within both ferrous and non-ferrous metallic objects. These secondary electromagnetic fields are received and recorded over four averaged time gates per data collection interval (10Hz).

Data were collected either as individual grids or in grid blocks of variable size consisting of multiple grids. With the exception of one grid block discussed in section 2.5, all data collected met the Category B line spacing requirements, with 98% not to exceed a lane spacing of 3 ft. As stated in the MEC Procedures Supplement, the purpose and objective for the Category B DGM surveys is to obtain high quality DGM data in order to characterize the site for overall anomaly distribution and density. Obstacles and issues with terrain precluded 100% coverage and approximately 39 acres of Unit 28 were determined by UXO Safety to be inaccessible to DGM survey due to extreme terrain. All data gaps were appropriately documented in the obstacle file. Figure 2 of this QA report depicts the full DGM dataset for Unit 28.

2.2 Field oversight

Field oversight was performed intermittently throughout the project by both the USACE Project Geophysicist and OESS. Appropriate field procedures were reviewed and found to be in compliance. Under the new WERS Contract No. W912DY-10-D-0027, NAEVA is now subcontracted to collect the geophysical data. As there were no Category A areas, no USACE QA DGM data were collected.

2.3 Geophysical System Verification

Under the WERS contract, USACE and KEMRON fully incorporated the physics based Geophysical System Verification (GSV) approach as described in the July 2009 ESTCP report and supported by EM 200-1-15. GSV includes two methods for providing QA/QC-blind seeding and the instrument verification strip (IVS). IVS data results were recorded on daily QC submittals attached as PDF files to the grid blocks. All data measurement quality objectives were achieved.

Production data required the GSV blind seeds placed throughout the Units, as documented in the UFP-QAPP. By placing blind seeds at an average rate of one per day, the instrument functionality can be tested on a daily basis. Any failures to detect a blind seed could be indicative of an issue with data collection. All blind seeds were small industry standard

objects buried at six inches below ground surface. The blind seeds were placed by the QC Geophysicist. All blind QC seeds were detected and both the responses and positioning were within the requirements of the MPS and SOPs. Table 1 summarizes the results for Unit 28.

Table 1- Unit 28

Seed_ID	Grid	Reported Response	Response Passes?	Total Offset (in)	Positioning Passes?
28001G	B3I9F7	338.73	Yes	4.867460947	Yes
28002G	B3I9E4	398.29	Yes	22.57315148	Yes
28003G	B3I8B9	370.51	Yes	18.20567692	Yes
28004G	B3I8A6	144.84	Yes	21.22199915	Yes
28005G	B3H8H4	228.91	Yes	7.056020399	Yes
28006G	B3H8G3	261.78	Yes	12.72729979	Yes
28007G	B3H8I2	311.16	Yes	1.452446212	Yes
28010G	B3G7F4	315.76	Yes	12.97086766	Yes
28009G	B3G7G1	197.00	Yes	13.54525747	Yes
28008G	B3H7B7	321.12	Yes	8.501532095	Yes
28014G	B3F6H8	233.79	Yes	8.757862746	Yes
28013G	B3G6A9	430.92	Yes	4.061215584	Yes
28012G	B3G7C2	324.44	Yes	10.40219361	Yes
28011G	B3G6E0	309.74	Yes	0.264272586	Yes
28016G	B3F6C5	197.25	Yes	13.56841332	Yes
28015G	B3F6E9	385.16	Yes	4.056017751	Yes
28017G	B3D6I2	196.38	Yes	6.547042085	Yes
28018G	B3E6A3	349.16	Yes	9.442177719	Yes
28019G	B3E6C4	239.43	Yes	4.45361696	Yes
28020G	B3E6E6	320.82	Yes	13.61259712	Yes
28021G	B3E6H7	355.19	Yes	3.090157281	Yes
28022G	B3E6J8	318.34	Yes	8.5435365	Yes
28023G	B3G7H9	308.62	Yes	9.876867522	Yes
28024G	B3G7J0	378.56	Yes	4.070990058	Yes

2.4 Digital data review

A review of digital geophysics data by the USACE was performed to monitor the effectiveness of data processing and consistency of data delivery. Issues that were reviewed in these data included:

1) Missing survey lines within a grid (interline gaps)
2) Point-to-point data gaps along survey lines
3) Bowing out of survey lines beyond 50% of survey line spacing, unless otherwise collected
4) Unreasonable data "spikes"
5) Data incongruity across survey grids (data levels in one grid are not reasonably compatible with data levels in neighboring grids)
6) Inadequate data density along survey traverse
7) Lack of accurate, precise locations; survey line orientation
8) Inadequate/incomplete site survey coverage
9) Missing, incomplete, or noncompliant instrument standardization checks
10) Completeness of file header information and supporting documentation
11) Consistent IVS and GSV results supporting the data quality objectives

To accomplish this, all raw and processed data files were checked by the USACE to ensure that KEMRON followed an appropriate and informative naming convention reflecting the grids surveyed as outlined in the EM 200-1-15. The USACE checked that KEMRON managed the field and processed data in a professional manner, including organization, daily maintenance, and complete documentation. The transfer and delivery of data were achieved via an ftp site where raw (pre-processed) and final processed data was delivered within 5 business days after collection. The USACE performed 100% verification of the accompanying documentation for completeness and accuracy. This focused on a review of header files on the pre-processed data (data that has merged into a single file and synchronized with the GPS data) and processed data to verify that dates were consistent, systems and system sampling parameters were identified, project name and contractor was listed, and all column headers were included and defined. KEMRON also delivered supporting summary sheets that further documented field parameters and processing. All of the summary sheets were reviewed for completeness, verification of calibration data, and consistency to the electronic data file headers.

In order to make the above process more efficient, a grid tracking spreadsheet located in the Unit 28 folder on the FTP site was updated weekly and allowed for the QC Geophysicist and USACE QA Geophysicist to document their verification of each deliverable. Minor issues such as corrupt or incomplete zip files were addressed within the table, major issues were addressed as corrective action requests. The final excel file will be maintained within the Final Data Submittal QC folder on the Fort Ord server.

The procedure for reprocessing and projecting the pseudo-color maps of the DGM Category B data included starting with a 100% review of the data in Geosoft Oasis Montaj to include

re-leveling and re-gridding. These digital data were imported into Geosoft for the generation of pseudo-color maps that were then exported as a georeferenced geotif.

Overall, the general QA digital data review consisted at a minimum of:

1) creating a processed database
2) importing XYZ data
3) calculation of sum channel
4) generating a grid (0.25 cell size and blanking distance of 2-ft) of sum channel
5) plotting the sum channel
6) plotting a symbol cover for the track lines (view coverage)
7) exporting the plots to geotifs
8) importing the geotifs into a GIS

2.5 Corrective Action Request

No corrective action requests were issued for data collected in Unit 28; however two items are of note. First, grid block B3E6D71 did not meet the category B line spacing requirement, with only 97.02% of survey lines not exceeding a lane spacing of 3 ft. This is due to the way the instrument footprint coverage is calculated, which is artificially lowered as a result of the large number of data gaps, and does not indicate a deficiency in the data quality. The issue was noted in both the QC report and Data Processing Report. Data gaps and line spacing were reviewed by the QA geophysicist to confirm there were no effects on data quality. No CAR was issued.

Second, the channel 1 response was occasionally 2-4% outside of the MQO tolerance specified for the static background QC test. This was due to the presence of powerlines adjacent to the IVS location. The issue was isolated to channel 1 and is seen as low anomaly noise spikes in data collected adjacent to power lines. The issue was noted in both the QC report and Data Processing report. All data was reviewed by the QA geophysicist to confirm there were no negative effects on data quality. No CAR was issued.

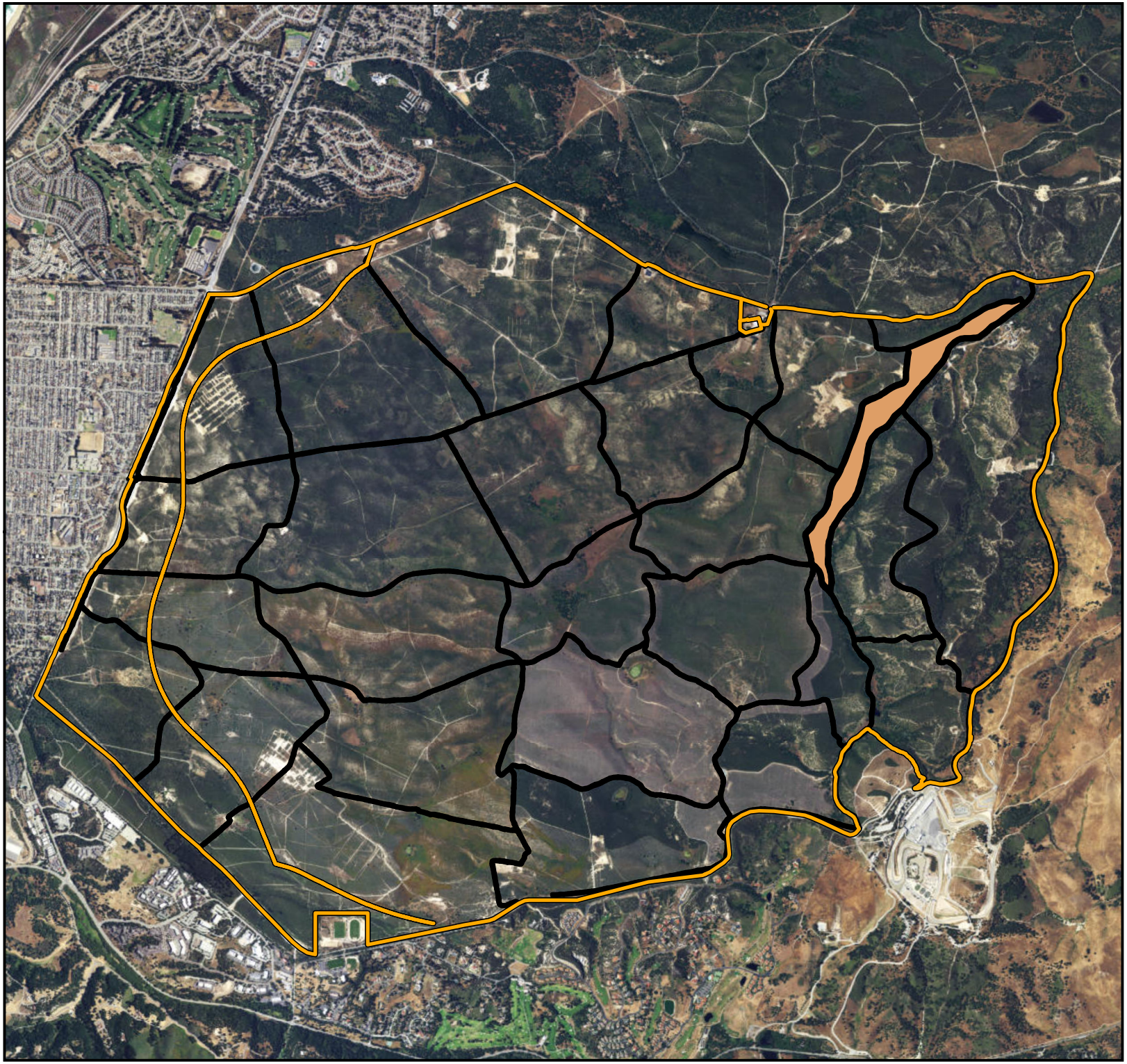
3.0 CONCLUSIONS

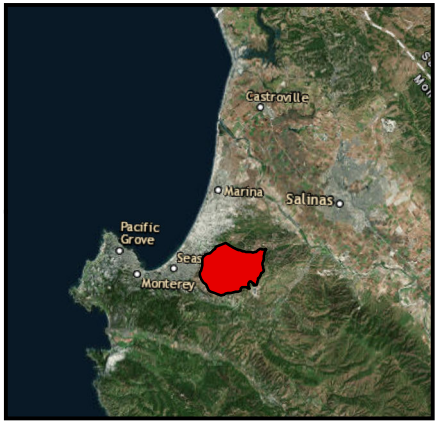
QA activities by the Government verified KEMRON had an adequate QC program in place and that data collected within Unit 28 are sufficient and in accordance with the project DQOs and MQOs.

4.0 LESSONS LEARNED

There are known sources of cultural noise at Fort Ord. Because the purpose of the IVS and QC tests is to test instrument functionality, these areas should be avoided in future placement of IVS locations.

5.0 FIGURES





Legend

- Fuel Breaks
- Fence Line
- Unit 28

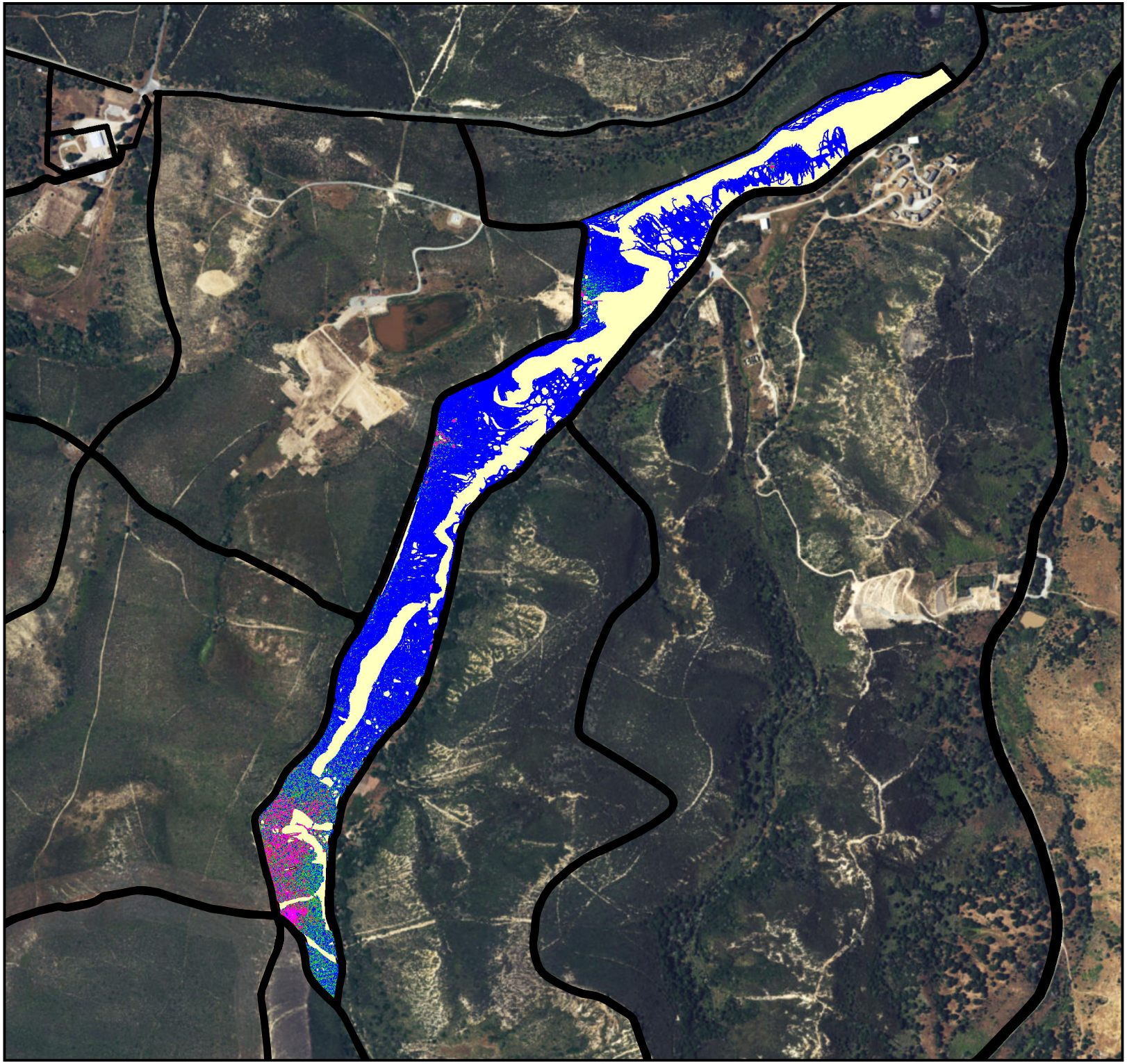
N

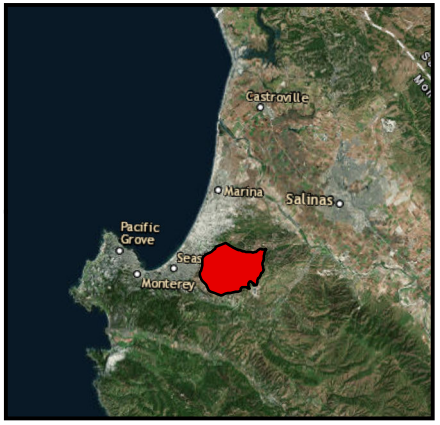
0 2,000 4,000 6,000 Feet

U.S. Army Corps of Engineers
Sacramento District

Figure 1

Unit 28
Former Fort Ord, CA





Legend

- Fuel Breaks
- Unit 28 Data Gaps

13.0
12.0
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
mV

N

0 500 1,000 1,500 2,000 Feet

U.S. Army Corps of Engineers
Sacramento District

Figure 2

Unit 28
Former Fort Ord, CA

Appendix D

Response to Comments

RESPONSES TO COMMENTS

Document:	Draft MRS-BLM Unit 28 Munitions and Explosives of Concern Remedial Action Technical Memorandum, Former Fort Ord, California, September 2017
Commenting Organization:	Department of Toxic Substances Control (DTSC)
Name:	Vlado Arsov
Date of Comments:	October 27th, 2017

General Comment 1:

Comment 1: Page 8, paragraph 4 and page 9, paragraph 2. There appears to be conflicting information between the statements on page 8 and 9. Page 8 states the recommendation about munitions and explosives of concern (MEC) with sensitive fuses will be deferred until the completion of the field study while page 9 says no additional subsurface MEC removal beyond Army-BLM inspection summary is recommended for Unit 28. Please clarify how will be determined handling of MEC with sensitive fuses discovered on this site.

Response to General Comment 1:

The Munitions with Sensitive Fuzes Field Study is intended to present options for addressing subsurface munitions and explosives of concern (MEC), specifically those with sensitive fuzes. The field study does not constitute a MEC remedial action but is being conducted to supplement MEC remedial actions. The objective of the field study is to determine the most cost-effective MEC detection and remediation method for areas with high anomaly density and evidence of munitions with sensitive fuzes by evaluating the performance of multiple geophysical systems. The field study is currently underway. Once completed, the study findings will be used to provide a recommendation regarding MEC with sensitive fuzes in Unit 28. At this the time, no additional subsurface MEC removal beyond that addressed in the Army-BLM joint inspection summary was recommended for Unit 28.

RESPONSES TO COMMENTS

Document:	Draft MRS-BLM Unit 28 Munitions and Explosives of Concern Remedial Action Technical Memorandum, Former Fort Ord, California, September 2017
Commenting Organization:	United States Environmental Protection Agency (EPA)
Name:	Maeve Clancy
Date of Comments:	October 30th, 2017

General Comment 1:

The MRS-BLM Unit 28 Munitions and Explosives of Concern Remedial Action Technical Memorandum (hereinafter referred to as the "MRS-BLM Unit 28 MEC RA TM"), has apparently assigned an incorrect munitions and explosives of concern (MEC) classification to some of the items listed in a number of locations therein. The term "munitions and explosives of concern" and its subcategories are defined as follows, per Volume 8, Glossary, of the Department of Defense Ammunition and Explosives Safety Standards (DoD 6055.09-M, V8), and in the references found therein:

Munitions and Explosives of Concern (MEC). A term distinguishing specific categories of military munitions that may pose unique explosives safety risks:

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

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

Munitions Constituent (MC). Any materials originating from unexploded ordnance, discarded military munitions, or other military munitions; including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions (e.g., TNT, cyclotrimethylenetrinitramine [RDX]) present in high enough concentrations to pose an explosive hazard. (NOTE: This is the definition of MC that constitutes the MEC subcategory of MC and is NOT the definition of all MC, which includes both explosives and other non-explosive constituents of munitions.)

Based upon these definitions, and circumstances noted, the items requiring correction and/or, in some cases, further discussion, are as follows:

- **Table 2, MEC Items Encountered and Removed During Operations Covered in TM, No Page Numbers:** All of the items listed in the table are classified as UXO. This may be erroneous for the following reasons:

    - The items listed as various models of fragmentation grenades (e.g., Grenade, hand, fragmentation, M or Mk number) would all have had the safety pins pulled and would likely have been thrown at a target if they were actually UXO. Also, the normal practice when throwing grenades in training and a "dud" grenade occurs (i.e., one that is thrown but does not detonate) is to stop use of the range (or the affected lane) to prevent a grenade with a hung striker from being propelled into the personnel in the throwing area by the blast from the detonation of a subsequently thrown grenade. When a dud grenade occurs, explosive ordnance disposal (EOD) is contacted and requested to immediately dispose of the dud grenade. Only then does the throwing of grenades resume. The large number of what appears to be dud fired grenades (i.e., UXO) in the northern third of Unit 28 would seem to be extremely unusual and a violation of range safety rules, unless these were unused grenades. If the grenades were unused (i.e., the safety pins are present) they should be classified as discarded military munitions (DMM) instead of as UXO. This should be evaluated and any explanation or correction of the classification made.

    - The item listed as "Rocket, 2.36inch, practice, M7" and classified as UXO is likely unfired, as the warhead is inert and the rocket motor would have been expended and should be inert if it was fired. Also, if it were fired and the motor fully expended, the item would be classified as munitions debris (MD) and not as UXO. If it were found with the motor intact (i.e., unfired), the item would be classified as a DMM and not as UXO, since it has not been fired. The classification of this item as UXO should be evaluated and an explanation provided, or it should be reclassified as noted.

    - The items listed as "Cartridge, 40mm, high explosive, M383" should not be classified as UXO because a cartridge is a complete round and has not been fired. They should be reclassified as DMM. The MEC classification of these items should be reviewed and corrected as necessary in the table.

- **Table 6, Sensitive Fuze MEC Items Encountered and Removed During Operations Covered in TM, No Page Numbers:** This table lists "Projectile, 40mm high explosive, M381," "Projectile, 40mm high explosive, M383," and "Cartridge, 40mm high explosive,

M383" as having sensitive fuzes. In the case of the items classified as "cartridge," the fuzes have not been subjected to the fuze arming and firing forces that occur when the item is propelled down the tube of the firing weapon. As a result, they are unarmed. The fact that the fuzes are unarmed makes the classification of these items as having sensitive fuzes somewhat questionable, as the sensitivity of the fuze, if it is unarmed, is basically irrelevant. A footnote should be added to Table 6 noting the relatively low hazard presented by an unarmed fuze, even if it is classified as sensitive when armed. In addition, as previously noted, the term "cartridge" describes a munition that has not been fired, is a complete round, and it should not be classified as UXO but as DMM when found. This should also be corrected in the table.

Please review the noted items and correct them as required in the cited tables, and at all other locations where they are described or listed in the MRS-BLM Unit 28 MEC RA TM.

Response to General Comment 1:

Table 2: Fragmentation Hand Grenades – Items have been changed to DMM. After further examination of photographs and review of the items discovery information, the description of the items has been changed.

Table 2: Rocket, 2.36inch, practice, M7 – Item has been changed to DMM. After further examination of photograph and review of the item discovery information, the description of the item has been changed.

Tables 2 and 6: Cartridge, 40mm, high explosive, M383 - No changes to Cartridge, 40mm high explosive (HE), M383 should be made. During the surface MEC removal in Unit 28 54 M383 HE 40mm cartridges were located and identified as UXO. The reason for these being identified as UXO is there were indicators these items were cycled through the weapon system. These indicators were in the form of scratches around the ogive from the rifling groves in the barrel. This determination is made by the team leader during verification and identification of the item.

Forty millimeter projectiles require the following to function:

- Set-back – the acceleration of the projectile during firing.
- Rotation – the rotating band around the projectile engages the rifling in the launcher barrel imparting spin to the projectile.
- Impact - Upon graze or impact with the target, the inertial force from impact causes bracket weights to pivot inward forcing the firing pin into the detonator. Concurrently, the detonator detonates the explosive charge causing a blast and fragmentation of the projectile body.

It is possible the cycling of the cartridge through the weapon system could result in a partially armed condition of the cartridge. Hence, all 40mm cartridges fired from or cycled through an M75 or M129 Grenade Launchers or the Mk 19 Model # Grenade Machine Gun are considered to be UXO.

A footnote has been added to Table 6 noting the relatively low hazard presented by an unarmed fuze.