MRS-BLM Unit 31 MEC Remedial Action
Technical Information Paper
Former Fort Ord, California

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Draft

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

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1.0 Introduction

This Technical Information Paper (TIP) describes the munitions and explosives of concern (MEC) remedial action (RA) that was performed by KEMRON Environmental Services (KEMRON) with Gilbane as a subcontractor at Munitions Response Site (MRS) - Bureau of Land Management (BLM) Unit 31 (Figure 1). The planned RA at Unit 31 consisted of surface MEC remediation and digital geophysical mapping (DGM) of the entire site following a prescribed burn. The prescribed burn planned for Unit 31 was not conducted in 2017 or 2018 due to lack of days that met the required conditions as outlined in the prescribed burn plan. The United States Department of the Army (Army) subsequently made a decision not to conduct a prescribed burn in 2019 due to fiscal constraints. As the current contract [Worldwide Environmental Remediation Services (WERS) Contract # W912DY-10-D-0027, Task Order No. CM 01] will expire before the next burn season, this report was prepared to provide the remedial actions implemented by KEMRON as part of the Unit 31 burn preparation.

This TIP addresses MEC RA work conducted in areas where mechanical mastication was conducted. The Unit 31 primary burn containment area (the work area completed within the unit) is 316 feet wide inside of the perimeters of the unit. Specific details regarding the Unit 31 containment area are specified in the *Final MRS-BLM Units 25 and 31 Prescribed Burn Plan, Former Fort Ord, California* (Presidio of Monterey Fire Department, 2016). Field work at the site was initiated in June 2015 (vegetation mastication) and was completed in August 2017 (DGM). This TIP addresses MEC RA work conducted in the primary burn containment portion of Unit 31 and other areas where vegetation was cut in support of the planned prescribed burn in accordance with the *Final, Site-Specific Work Plan Munitions and Explosives of Concern Remedial Action, MRS-BLM Units 25 and 31, Former Fort Ord, California* (Final Units 25/31 SSWP; KEMRON, 2016a) and 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).

Vegetation clearance in the northern portion of Unit 31 was initiated in June 2015 to support planned prescribed burns in adjacent Units 11 and 12. This phase of work was conducted in accordance with the Final Unit 23 SSWP (KEMRON, 2015). In this TIP, the permanent fuel breaks surrounding the unit are not included as part of Unit 31.

1.1 Site Location

Unit 31 is approximately 103 acres and is located in the southeastern portion of the Impact Area Munitions Response Area (MRA), within the MRS-BLM. Unit 31 lies to the east of Orion Road, west of Impossible Canyon Road, north of Hugo Road and south/southwest of Mercury Road. These roads are part of the permanent fuel break network and are not included as part of Unit 31. Figure 1 provides a location map of Unit 31, and Figure 2 shows road locations.

1.2 Purpose

This TIP is intended to document where surface MEC remediation and DGM data collection occurred within Unit 31. This TIP provides the following information:

- Scope of Work (Section 2.0);
- Remedial work completed and reasons for remedial work modifications for Unit 31, if applicable;
- Summary of MEC and munitions debris (MD) (Section 4.0) removed 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 6.0); and
- Conclusion (Section 8.0).

1.3 Vegetation and Habitat Type

Central maritime chaparral (CMC) is the dominant habitat type within the project area. CMC is a dominant habitat type at Fort Ord and is identified as a protected plant community in the *Installation-Wide Multispecies Habitat Management Plan (HMP) Former Fort Ord, California* [HMP; U.S. Army Corps of Engineers (USACE), 1997]. This habitat supports approximately 50 to 85% of the total distribution of several rare, threatened, and endangered plants occurring at Fort Ord, which are designated as protected under the HMP (USACE, 1997). Other habitats present include limited areas of coast live oak woodland, coastal scrub, and grassland.

The dominant shrub species observed within the project area during the baseline monitoring include shaggy-barked manzanita (*Arctostaphylos tomentosa* ssp. *tomentosa*), chamise (*Adenostoma fasciculata*), Monterey ceanothus (*Ceanothus rigidus*), and black sage (*Salvia mellifera*). These shrub species contribute most of the overall vegetative cover. HMP-listed shrub species present include Hooker's manzanita (*A.*

hookeri), sandmat manzanita (*A. pumila*), Monterey ceanothus, and Eastwood's goldenbush (*Ericameria fasciculata*).

Baseline studies conducted in 2014 identified the presence of two HMP annual plant species, Monterey spineflower (*Chorizanthe pungens* var. *pungens*) and sand gilia (*Gilia tenuiflora* ssp. *arenaria*) (Tetra Tech Inc., 2015). Seaside bird's-beak is known to occur in the vicinity, but was not identified within the project site during baseline surveys. Yadon's piperia was identified within the site in 2010 and 2013 along the fuelbreaks on Mercury and Orion Roads. Two HMP wildlife species have the potential to occur within the project site, black legless lizard (*Anniella pulchra* ssp. *nigra*) and California tiger salamander (CTS; *Ambystoma californiense*); however, neither species was encountered during project activities.

The project site is within the Natural Resource Management Area which is designated for transfer to BLM and will remain undeveloped as habitat reserve. Chapter 3 of the HMP (USACE, 1997) describes mitigation measures that must be implemented during MEC investigation and remediation. In addition, the *Reinitiation of Formal Consultation for Cleanup and Property Transfer Actions Conducted at the Former Fort Ord, Monterey County, California. (2017-F-0094)* [Programmatic BO; U.S. Fish and Wildlife Service (USFWS) 2017] contains terms and conditions and reasonable and prudent measures that need to be implemented during MEC activities to minimize and reduce impacts to listed species.

1.4 Applicable or Relevant and Appropriate Requirements

Applicable or relevant and appropriate requirements (ARARs) were outlined in the *Final Record of Decision Impact Area Munitions Response Area Track 3 Munitions Response Site Former Fort Ord, California* (Track 3 ROD; Army, 2008). The performance of this remedial action was in compliance with the ARARs outlined in that document.

2.0 Scope of Work

The scope of work for the project addressed in this TIP included vegetation clearance through mechanical means, technology-aided surface MEC removal, and DGM survey in Unit 31. Only Unit 31 prescribed burn preparation was completed. Figure 1 provides a general site layout of Unit 31.

2.1 Vegetation Clearance

Vegetation clearance in the northern portion, approximately 13 acres, of Unit 31 to support planned prescribed burns in Units 11 and 12 began in June 2015 and was completed in November 2015. Vegetation clearance in an additional 44 acres of Unit 31 was completed in July 2016. Mechanical mastication was performed in these areas, approximately 57 acres. In areas where mechanical mastication could not be performed, manual vegetation removal was performed in accessible areas. These areas are shown on Figure 2. A prescribed burn within Unit 31 will occur in the future.

Vegetation clearance outside of the unit boundary was conducted to support the planned prescribed burn in Unit 31. These areas are shown on Figure 2. Work grids associated with the RA in Unit 31 are shown on Figure 3.

2.2 Technology-Aided Surface Munitions and Explosives of Concern Removal

Technology-aided surface MEC removal in the northern portion of Unit 31 to support planned prescribed burns in Units 11 and 12 began in July 2015 and was completed in November 2015. Technology-aided surface MEC removal in the remainder of Unit 31 primary containment area started in June 2016 and was completed in September 2016. Technology-aided surface MEC removal was also conducted in vegetation cutting areas within Units 13, 17, and 20 (Figure 3).

Lanes approximately five feet in width were placed across grids and Schonstedt magnetometers were used by unexploded ordnance (UXO) personnel to conduct technology-aided surface MEC removal. During the technology-aided surface MEC removal, 79 MEC items were recovered from Unit 31. An additional two subsurface MEC items were removed from Vernal Pond 16 in Unit 13. All MEC items are shown in Tables 1 and 3 and Figure 4. Cumulative results for the Unit 31 RA are shown in Tables 2 and 4. Further detail regarding the MEC items removed from Vernal Pond 16 is included in the *Pond 16 Impact Area MRA Geophysical Anomaly Investigation Technical Information Paper Former Fort Ord, California* (KEMRON, 2019a).

During the technology-aided surface MEC removal in areas outside of Unit 31, 20 MEC items were recovered and are shown in Tables 1 and 3,and Figure 4.

Quality control/quality assurance (QC/QA) processes were implemented in accordance with the Final Units 25/31 SSWP (KEMRON, 2016a), the Final Unit 23 SSWP (KEMRON, 2015) and the *Final Quality Assurance Project Plan, Volume II, Appendix A, Munitions and Explosives of Concern Remedial Action, Former Fort Ord, California* (MEC QAPP; KEMRON, 2016b).

2.3 Digital Geophysical Mapping Survey

The DGM survey was conducted with vehicle-towed EM61-MK2A arrays starting in October 2015 (northern portion of Unit 31 in support of prescribed burns planned for Units 11 and 12) and was completed in August 2017 (remainder of the Unit 31 primary containment area). Figure 6 depicts the DGM data collected in Unit 31. Cumulative results for the Unit 31 RA are shown in Tables 2 and 4.

Measurement quality objectives were met and QC/QA processes were implemented in accordance with the Final Units 25/31 SSWP (KEMRON, 2016a) and the MEC QAPP (KEMRON, 2016b). Measurement performance criteria were evaluated according to the standards specified in the Final Units 25/31 SSWP (KEMRON, 2016a), the Final Unit 23 SSWP (KEMRON, 2015) and the MEC QAPP (KEMRON, 2016b). Specific criteria that were evaluated included Global Positioning System (GPS) accuracy, static background and response tests, dynamic background and response tests (IVS), velocity, minimum along track sampling and across track coverage, accurate detection of Blind Seeds with respect to both response and positioning, surveillance of field methods, and reprocessing of field data. Each of these criteria were evaluated separately with results recorded in the project database and subsequently reviewed by the QC Geophysicist. All QC criteria were determined to have been met by the QC Geophysicist. Appendix B includes the USACE DGM QA Approval and Discussion for Unit 31.

Due to extreme terrain within Unit 31, approximately 3 acres of the 57 acres where mechanical mastication was performed were inaccessible to DGM survey. These areas are shown on Figure 6. DGM survey was not performed in areas outside of Unit 31.

3.0 Approved Changes During Field Work

Unit 31 work was performed in accordance with the Final Unit 23 SSWP (KEMRON, 2015) and Final Units 25/31 SSWP (KEMRON, 2016a). *Field Work Variance 007 to the Draft Final, Site-Specific Work Plan, Munitions and Explosives of Concern Remedial Action, Units 25 and 31, Former Fort Ord, California* (KEMRON, 2016b) added additional work area within Unit 17. Some additional vegetation cutting within Unit 9 was identified after the Units 25/31 SSWP (KEMRON, 2016a) and burn plan were submitted. Although Unit 31 is approximately 103 acres, only 57 acres received technology-aided surface removal and 54 acres received DGM survey. Technology-aided surface MEC removal and DGM survey will be performed in the remainder of the unit following a future prescribed burn.

4.0 Summary of MEC/MD Removed

Seventy-seven surface MEC items were encountered and removed from Unit 31 and 22 surface MEC items were encountered and removed from outside Unit 31 as part of MEC remediation activities described in this TIP. Two subsurface MEC items were removed from Vernal Pond 16 in Unit 13. Further detail regarding the MEC items removed from Vernal Pond 16 is included in the *Pond 16 Impact Area MRA Geophysical Anomaly Investigation Technical Information Paper Former Fort Ord, California* (KEMRON, 2019a). All MEC items removed as part of MEC remediation activities described in this TIP are in Tables 1 and 3. These MEC items are shown in Figure 4.

The MD removed from Unit 31 as part of MEC remediation activities described in this TIP was recorded based on weight per 100-foot by 100-foot grid. An estimated 26,731 pounds of MD were removed. Density of MD weights by grid is shown on Figure 5.

Targets and target debris within Unit 31 were removed and recycled to allow surface MEC removal and DGM to be conducted. Range-Related Debris (RRD) and Other Debris (OD) removed as part of MEC remediation activities described in this TIP was recorded based on weight per 100-foot by 100-foot grid. An estimated 17,344 pounds of RRD and OD were removed as part of MEC remediation activities.

5.0 Quality Control/Quality Assurance (QC/QA)

This section discusses the QC and QA procedures that were used at the project area.

5.1 Quality Control

QC is conducted by the Contractor. All QC measures were conducted by the Unexploded Ordnance Quality Control Specialist (UXOQCS) and by the QC Geophysicist. A discussion of the pertinent QC measures and procedures is included in the following sections.

5.1.1 Analog QC

5.1.1.1 Field Activities

During surface removal operations in Unit 31, the UXOQCS was responsible for visually observing teams and conducting periodic spot checks to ensure grids were receiving complete coverage during the surface removal phase. The UXOQCS performed analog QC survey of at least 10% of completed surface MEC removal grids. All grids passed 10% analog QC surveys performed by the UXOQCS.

Additionally, surface blind seeds were emplaced by the UXOQCS before and during technology-aided surface removal field operations. All surface blind seeds were located in the field by the UXO teams.

5.1.1.2 Database Activities

The UXOQCS reviewed every entry received from personnel in the field during each phase of work prior to entry in the database. Each entry was reviewed for completion of field QC, MEC and MD nomenclature, completion of a given grid, and ultimate disposition of MEC items.

5.1.2 DGM QC

The DGM QC standards and procedures were outlined in the Final Units 25/31 SSWP (KEMRON, 2016a) and subsequent project quality documents. The QC Geophysicist was responsible for planning and executing QC oversight of geophysical activities and ensuring compliance with geophysical QC requirements. Specifically, the QC Geophysicist was responsible for the following:

- Reviewing and approving the qualifications of geophysical staff,

- Planning and ensuring the acceptable performance and completion of all geophysical QC activities,
- Reviewing the geophysical QC and DGM data, target lists, and dig results as specified in the Final Units 25/31 SSWP (KEMRON, 2016a) and subsequent updates,
- Establishing the known and blind seed item and location control program,
- Identifying quality problems and verifying that appropriate corrective actions were implemented for geophysical activities, and
- Ensuring that the requisite geophysical QC records, including submittals, were generated and retained as prescribed.

In order to keep track of weekly events and statistics, a weekly QC report was delivered to the Project Geophysicist and the QA Geophysicist. This included all pertinent information for the week as well as cumulative information about the project including, but not limited to, information such as grids surveyed, personnel, average acreage per day, and QC blind seeds located.

The QC Geophysicist had daily access to all geophysical QC and DGM data and was on site intermittently as needed after the completion of the initial inspections for geophysical activities. He was also on site as needed for meetings and seeding. The QC Geophysicist reported to the Contractor Quality Control Systems Manager (CQCSM) and supported the UXOQCS. All QC criteria were determined to have been met by the QC Geophysicist.

5.2 Quality Assurance

QA is conducted by the USACE Ordnance and Explosives (OE) Safety Specialist and the USACE QA Geophysicist.

5.2.1 Analog Quality Assurance

USACE Surface Removal Quality Assurance Documentation is provided in Appendix A. QA performed includes placement of QA seeds and a minimum 10% analog survey of each grid where surface MEC removal was performed. Appendix A documents dates when QA surveys were completed for each grid within the project area.

5.2.2 DGM Quality Assurance

The *Unit 31 Final Quality Assurance Report, Digital Geophysical Operations*, is included as Appendix B. All DGM data for Unit 31 has been reviewed and approved by the USACE QA Geophysicist.

5.2.3 Corrective Action Requests

During the course of the project area field operations, the USACE issued no Corrective Action Requests (CARs).

6.0 Observations of Evidence of Potential Soil Contamination

During field operations, UXO field personnel noted the presence of features or items that indicate small arms training. This information has been provided to basewide range assessment (BRA) personnel and is being used as part of the BRA program. However, additional BRA evaluation of the densely vegetated area of Unit 31 where a future prescribed burn is planned should be conducted following the prescribed burn and surface MEC removal. Further detail is provide in the *Sampling Results Technical Memorandum, Basewide Range Assessment Investigation, Site 39, Unit 31, Phase 1, Former Fort Ord, California* (KEMRON, 2019b).

7.0 Environmental Protection

7.1 Description of Impacts and Mitigation Measures

The project area is within the Natural Resource Management Area which is designated for transfer to BLM as undeveloped habitat reserve as described in the HMP (USACE, 1997). The HMP describes special land restrictions and habitat management requirements within habitat reserve areas. Habitat reserve areas support plant and animal species protected under the Endangered Species Act; implementation of mitigation measures identified in the HMP are required to minimize potential adverse impacts to listed species. Vegetation in the project area consists primarily of impacted non-native grassland. Please refer to Section 1.3 for a description of the vegetation and HMP species present within Unit 31.

The activities conducted on the site included the following: mowing and hand-cutting of vegetation to support subsurface MEC removal, pruning of oak trees, vehicle use to support surface MEC removal, DGM, and soil sampling.

Mitigation measures to reduce impacts to protected species during MEC remedial actions are described the HMP (USACE, 1997) and the Programmatic BO (USFWS, 2017). Mitigation and other environmental protection measures that were implemented during this project are summarized below:

- *Minimize Disturbance Associated with OE Removal:* Disturbances were limited to those required for the above-mentioned activities. As required by the HMP, existing roads were used with the exception of where it was necessary to traverse the site using tracked vehicles in order to access excavation sites, remove piles of debris, remove vegetation, and conduct the DGM portion of the MEC removal. Additionally, access roads, staging areas, and other appurtenant facilities were sited to avoid impacts HMP plant and wildlife species.
- *Avoid Disturbance of Monterey Spineflower, Sand Gilia, and Seaside Bird's-Beak Populations:* Moderate to high densities of Monterey spineflower and low densities of sand gilia were identified within the project site during baseline studies conducted in 2014 (Tetra Tech, Inc., 2015). As such, areas where populations of sand gilia and Monterey spineflower occur were avoided when siting staging areas and access routes. Additionally, most work was conducted outside of the germination/blooming season for Monterey spineflower and sand gilia, and disturbances were limited to the minimum required for to complete the above-mentioned activities. However, soil sampling activities were necessary during the blooming period and the Project Biologist provided close monitoring of the activities, including identifying on-foot access routes and sample locations that

would avoid the species. Seaside bird's-beak was not observed within the project site during these surveys.

- *Conduct Employee Education Program*: Training for all supervisors and field personnel was conducted by the Project Biologist. Any new personnel also received biological training prior to working on the site. Training included information on rare, threatened, and endangered species on the site, including a description of the species, their protected status, a list of measures to be implemented to avoid and reduce impacts to these species and their habitat, and contact information to report unforeseen impacts to HMP species. Additionally, a Habitat Checklist was prepared by the Project Biologist that outlined specific avoidance and minimization measures, which were communicated to the project supervisors prior to work initiation.

- *Minimize Impacts to Black Legless Lizard:* Supervisors and field personnel were trained during the Employee Education Program to identify black legless lizard, and were informed of the potential for this species to occur within the project site and the established protocol if any individuals were encountered. However, no black legless lizards were observed during the course of this work.

- *Minimize Impacts to California Linderiella, California Tiger Salamander, and Red-legged frog:* Supervisors and field personnel were trained during the Employee Education Program to identify California tiger salamander and California red-legged frog, and were informed of the potential for these species to occur within the project site and the established protocol if any individuals were encountered. Vernal Pool 16 is present within the project site, in Unit 13. However, no California tiger salamanders or California red-legged frogs were observed during the course of this work.

- *Invasive Weed Control:* In order to reduce the spread of invasive weeds, existing roads were used to the greatest extent feasible and all equipment coming from off-site was required to be pressure-washed prior to entering habitat reserve areas.

- *Erosion Control:* To reduce erosion concerns on bare mineral normal vehicle access was restricted to existing roads. Tracked vehicles were used to conduct vegetation removal and DGM surveys over the site. KEMRON monitored the work site for potential erosion problems and a final inspection was conducted by the Project Biologist.

7.2 Biological Monitoring

In 2014, prior to the initiation of work, baseline studies were conducted within the project area to document the location and abundance of HMP shrub and annual plant species and habitats; the results of these surveys are presented in the *2014 Biological Monitoring Report for Unit 25 and 31; Units 06, 07, 10, 33, WGBA*

and MOUT; Units 04, 11, 12, and 23N; Units 14 and 19; and MRS-16, Former Ford Ord prepared by Tetra Tech, Inc. in 2015. Follow-up monitoring will be conducted by an Army contractor according to the 2017 Programmatic BO (USFWS, 2017) to document the recovery of HMP species and habitat. Follow-up monitoring is not addressed in this report.

8.0 Conclusion

Technology-aided surface MEC removal has been completed in all grids within the primary burn containment line in Unit 31. Areas where technology-aided surface MEC removal was and was not completed are shown on Figure 4. Technology-aided surface MEC removal and DGM survey in Unit 31 occurred as intended within the scope of work. A summary of survey and removal methods completed by total grids for the Unit 31 RA is shown in Table 4.

Based on the Final Units 25/31 SSWP (KEMRON, 2016a), sensitive fuze type munitions were not expected in Unit 31. A single sensitive fuze type munition (projectile, 40mm, high explosive, M383) was encountered and removed from Unit 20.

DGM data collection just north of Hugo Road was limited due to steep terrain.

Technology-aided surface MEC removal has been completed in all grids within the primary burn containment line in Unit 31. Remedial actions in preparation for the planned prescribed burn in Unit 31 were implemented from 2015 to 2018. Completion of the remaining RA within Unit 31 is pending a prescribed burn.

9.0 References

KEMRON Environmental Services, Inc. (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.* [Administrative Record (AR)# OE-0862B].

KEMRON, 2016a. *Final, Site-Specific Work Plan Munitions and Explosives of Concern Remedial Action, MRS-BLM Units 25 and 31, Former Fort Ord, California.* (AR# OE-0880B).

KEMRON, 2016b. *Field Work Variance 007 to the Draft Final, Site-Specific Work Plan, Munitions and Explosives of Concern Remedial Action, Units 25 and 31, Former Fort Ord, California.* (AR# OE-0880A.5).

KEMRON, 2019a. *Pond 16 Impact Area MRA Geophysical Anomaly Investigation Technical Information Paper Former Fort Ord, California.* (AR# OE-0954A).

KEMRON, 2019b. *Sampling Results Technical Memorandum, Basewide Range Assessment Investigation, Site 39, Unit 31, Phase 1, Former Fort Ord, California.* (AR# BW-2856A).

Presidio of Monterey Fire Department, 2016. *Final MRS-BLM Units 25 and 31 Prescribed Burn Plan, Former Fort Ord, California.* (AR# OE-0881B).

Tetra Tech, Inc., 2015, *2014 Biological Monitoring Report for Unit 25 and 31; Units 06, 07, 10, 33, WGBA and MOUT; Units 04, 11, 12, and 23N; Units 14 and 19; and MRS-16, Former Ford Ord.* (AR# BW-2739).

U.S. Army Corps of Engineers (USACE), 1997. *Installation-Wide Multispecies Habitat Management Plan (HMP) Former Fort Ord, California*. (AR# BW-1787).

United States Department of the Army, 2008. *Final Record of Decision Impact Area Munitions Response Area Track 3 Munitions Response Site Former Fort Ord, California.* (AR# OE-0647).

United States Department of the Interior, Fish and Wildlife Service (USFWS), 2017. *Reinitiation of Formal Consultation for Cleanup and Property Transfer Actions Conducted at the Former Fort Ord, Monterey County, California. (2017-F-0094).* (AR# BW-2747A).

Tables

Table 1
MEC Items Encountered and Removed During Operations Covered in TIP

Date Found	Item Number	Item Type	Qty	Description	Operation	Unit
7/8/2015	A3J6A1-1-1	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/8/2015	A3J6A1-1-3	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/9/2015	A3J5A9-1-3	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/14/2015	A3J5B6-1-1	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/14/2015	A3J5B6-1-2	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/14/2015	A3J5B6-1-3	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/14/2015	A3J5B7-1-1	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/15/2015	A3J5B8-1-1	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/15/2015	A3J5B8-1-2	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/15/2015	A3J5B8-1-4	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/15/2015	A3J5B8-1-6	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/15/2015	A3J5B8-1-8	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/15/2015	A3J5B8-1-9	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/15/2015	A3J5B9-1-2	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/15/2015	A3J5B9-1-3	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/15/2015	A3J5B9-1-6	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/15/2015	A3J5B9-1-9	UXO	1	Projectile, 37mm, low explosive, MK I	Surface Removal	31
7/16/2015	A3I3J0-1-1	DMM	1	Fuze, grenade, igniting, M201	Surface Removal	31
7/16/2015	A3J4A9-1-1	UXO	1	Grenade, hand, smoke, M18 series	Surface Removal	31
7/16/2015	A3J5B0-1-3	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/16/2015	A3J5B0-1-5	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/16/2015	A3J5B0-1-6	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/16/2015	A3J5B0-1-7	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/20/2015	A3J5C0-1-3	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/20/2015	A3J5C0-1-4	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/20/2015	A3J5C0-1-5	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/20/2015	A3J5C0-1-6	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/20/2015	A3J5C8-1-2	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/20/2015	A3J5C8-1-3	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/21/2015	A3J4B7-1-1	UXO	1	Projectile, 75mm, Shrapnel, MK I	Surface Removal	31
7/21/2015	A3J4C6-1-1	UXO	1	Projectile, 75mm, Shrapnel, MK I	Surface Removal	31
7/21/2015	A3J5A5-1-2	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/22/2015	A3J5B4-1-1	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/23/2015	A3J5A3-1-2	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/23/2015	A3J5B3-1-3	UXO	1	Projectile, 37mm, low explosive, MK I	Surface Removal	31
7/27/2015	A3J4B5-1-1	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/27/2015	A3J4B5-1-3	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/27/2015	A3J4B5-1-7	UXO	1	Projectile, 75mm, Shrapnel, MK I	Surface Removal	31
7/28/2015	A3J4C5-1-2	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/29/2015	A3J4B4 -1-7	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/29/2015	A3J4B4 -1-8	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/29/2015	A3J4B4 -1-9	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
8/4/2015	A3J4B3-1-1	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/6/2016	A3I4J5-1-1	DMM	1	Fuze, grenade, hand, M217	Surface Removal	31
7/11/2016	A3I4J2-1-1	UXO	1	Projectile, 155mm, shrapnel, MK 1	Surface Removal	31
7/11/2016	A3I5J6-1-1	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/11/2016	A3I5J6-1-2	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/12/2016	A3I5J8-1-1	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/13/2016	A3J5A0-2-2	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/18/2016	A3I3H7-1-1	UXO	1	Projectile, 37mm, low explosive, MK I	Surface Removal	31
7/18/2016	A3I3H8-1-1	UXO	1	Projectile, 37mm, low explosive, MK I	Surface Removal	31
7/18/2016	A3I5J9-1-3	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/18/2016	A3I5J9-1-4	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/18/2016	A3I5J9-1-6	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/18/2016	A3I5J9-1-9	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/19/2016	A3I5I9-1-1	UXO	1	Projectile, 60mm, mortar, high explosive, M49 series	Surface Removal	31
7/20/2016	A3I5I0-1-2	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31

Table 1
MEC Items Encountered and Removed During Operations Covered in TIP

Date Found	Item Number	Item Type	Qty	Description	Operation	Unit
7/21/2016	A3I6H1-1-6	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/21/2016	A3I6H1-1-7	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/25/2016	A3I5H0-1-2	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
7/28/2016	A3H3H9-1-1	UXO	1	Projectile, 40mm, practice, M781	Surface Removal	31
7/28/2016	A3I5F9-1-1	UXO	1	Projectile, 37mm, low explosive, MK II	Surface Removal	31
7/28/2016	A3I5F9-1-2	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	31
8/2/2016	A3H3G7-1-1	UXO	1	Projectile, 40mm, practice, M781	Surface Removal	31
8/2/2016	A3H3G8-1-1	UXO	1	Projectile, 37mm, low explosive, MK II	Surface Removal	31
8/2/2016	A3H3G9-1-1	UXO	1	Projectile, 75mm, high explosive, MK I	Surface Removal	31
8/2/2016	A3I6D1-1-1	UXO	1	Projectile, 60mm, mortar, high explosive, M49 series	Surface Removal	31
8/4/2016	A3H5F9-1-1	UXO	1	Projectile, 75mm, Shrapnel, MK I	Surface Removal	31
8/4/2016	A3H5G9-1-1	UXO	1	Projectile, 75mm, Shrapnel, MK I	Surface Removal	31
8/10/2016	A3I6B4-1-1	UXO	1	Rocket, 2.36inch, high explosive antitank, M6	Surface Removal	31
8/15/2016	A3I3D7-1-1	UXO	1	Projectile, 37mm, low explosive, MK I	Surface Removal	31
8/17/2016	A3H6H1-1-1	UXO	1	Fuze, bomb, nose, M103	Surface Removal	31
8/17/2016	A3I3C7-1-1	UXO	1	Projectile, 37mm, low explosive, MK I	Surface Removal	31
8/25/2016	A3I4A8-1-1	UXO	1	Projectile, 37mm, low explosive, MK I	Surface Removal	31
8/25/2016	A3I4A8-1-2	UXO	1	Projectile, 37mm, low explosive, MK II	Surface Removal	31
8/30/2016	A3H5I5-1-1	DMM	1	Fuze, grenade, hand, M215	Surface Removal	31
9/6/2016	A3H5E5-1-1	UXO	1	Grenade, hand, practice, MK II	Surface Removal	31
9/6/2016	A3H5J1-1-1	UXO	1	Projectile, 37mm, low explosive, MK I	Surface Removal	31
9/8/2016	A3H5H4-1-1	UXO	1	Cap, blasting, electric, M6	Surface Removal	31
9/7/2016	A3J7E3-1-1	UXO	1	Grenade, hand, smoke, white phosphorous, M15	Surface Removal	13
8/29/2016	B3A6F8-1-1	UXO	1	Projectile, 37mm, low explosive, MK I	Surface Removal	13
9/8/2016	A3J7E2-1-1	UXO	1	Projectile, 60mm, mortar, high explosive, M49 series	Surface Removal	13
9/13/2016	A3J7H1-1-1	UXO	1	Projectile, 75mm, high explosive, M48	Surface Removal	13
8/31/2016	B3A7C3-1-1	UXO	1	Projectile, 75mm, high explosive, MK I	Surface Removal	13
10/24/2018	Pond16	UXO	1	Projectile, 4.2inch, mortar, high explosive, M329 series	Subsurface Removal	13
10/24/2018	Pond16	UXO	1	Signal, illumination, ground, M125 series	Subsurface Removal	13
1/23/2015	B3C6D2-1-1	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	20
10/31/2016	B3B6I3-1-1	UXO	1	Projectile, 37mm, low explosive, MK I	Surface Removal	20
11/2/2016	B3B6J5-1-1	UXO	1	Projectile, 37mm, low explosive, MK I	Surface Removal	20
10/19/2016	B3B6G4-1-1	UXO	1	Projectile, 37mm, low explosive, MK I	Surface Removal	20
10/19/2016	B3B6G4-1-2	UXO	1	Projectile, 37mm, low explosive, MK I	Surface Removal	20
10/3/2016	B3A6I0-1-1	UXO	1	Projectile, 75mm, shrapnel, MK I	Surface Removal	20
10/31/2016	B3B6I3-1-1	UXO	1	Projectile, 75mm, shrapnel, MK I	Surface Removal	20
11/28/2016	B3C6B4-1-1	UXO	1	Projectile, 81mm, mortar, high explosive, M43 series	Surface Removal	20
10/5/2016	B3B6A9-1-1	UXO	1	Projectile, 37mm, low explosive, MK II	Surface Removal	20
10/5/2016	B3B6A8-1-1	UXO	1	Projectile, 37mm, low explosive, MK II	Surface Removal	20
11/28/2016	B3C6A4-1-1	UXO	1	Projectile, 37mm, low explosive, MK II	Surface Removal	20
11/30/2016	B3C6C3-1-1	UXO	1	Projectile, 37mm, low explosive, MK II	Surface Removal	20
11/17/2016	B3C6A3-1-1	UXO	1	Projectile, 37mm, low explosive, MK II	Surface Removal	20
10/26/2016	B3B6I5-1-1	UXO	1	Signal, illumination, ground, white star cluster, M18A1	Surface Removal	20
2/7/2017	B3F7D4-1-1	UXO	1	Projectile, 40mm, high explosive, M383	Surface Removal	20
		Total =	**101**			

Table 2
Cumulative Results of the Remedial Action

Parameter	Unit 31 Totals	Unit 13 Totals	Unit 17 Totals	Unit 20 Totals
Surface removal acreage	57	17	4	10
Analog subsurface removal acreage	0	0	0	0
Digital Subsurface removal acreage	0	0	0	0
DGM survey acreage	54	17	4	10
MEC items	79	7*	0	15
Total Estimated MD Weight (lbs) (all units)	26,731			
Total Estimated RRD and OD (lbs) (all units)	17,344			

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

Subsurface MEC removal was conducted in Vernal Pond 16 in Unit 13. Further detail is provided in the *Pond 16 Impact Area MRA Geophysical Anomaly Investigation Technical Information Paper Former Fort Ord, California.*

* Two of the Unit 13 MEC items were from the Vernal Pond 16 subsurface MEC removal.

Table 3
MEC Recovered by Type During Remedial Action

Description	Unit 31	Unit 13	Unit 20
Cap, blasting, electric, M6	1	--	--
Fuze, bomb, nose, M103	1	--	--
Fuze, grenade, hand, M215	1	--	--
Fuze, grenade, hand, M217	1	--	--
Fuze, grenade, igniting, M201	1	--	--
Grenade, hand, practice, MK II	1	--	--
Grenade, hand, smoke, M18 series	1	--	--
Grenade, hand, smoke, white phosphorous, M15	--	1	--
Projectile, 40mm, high explosive, M383	--	--	1
Projectile, 155mm, shrapnel, MK 1	1	--	
Projectile, 37mm, low explosive, MK I	11	1	4
Projectile, 37mm, high explosive, MK II	--	--	5
Projectile, 40mm, practice, M781	2	--	--
Projectile, 60mm, mortar, high explosive, M49 series	2	1	--
Projectile, 75mm, high explosive, MK I	1	1	--
Projectile, 75mm, high explosive, M48	--	1	--
Projectile, 75mm, Shrapnel, MK I	5	--	2
Projectile, 81mm, mortar, high explosive, M43 series	49	--	2
Projectile, 4.2inch, mortar, high explosive, M329 series	--	1	--
Rocket, 2.36inch, high explosive antitank, M6	1	--	--
Signal, illumination, ground, M125 series	--	1	--
Signal, illumination, ground, white star cluster, M18A1	--	--	1
Totals	**79**	**7***	**15**

All items were UXO except for three items from Unit 31: one fuze, grenade, igniting, M201, one fuze, grenade, hand, M217, and one fuze, grenade, hand, M215.

* Two of the Unit 13 MEC items were from the Vernal Pond 16 subsurface MEC removal.

Table 4
Summary of Survey and Removal Methods by Grids

Activity	Unit 31 Grids	Unit 13 Grids	Unit 17 Grids	Unit 20 Grids
Surface Removal	370	139	27	70
Analog Subsurface Removal	0	0	0	0
Digital Subsurface Removal	0	0	0	0
DGM Survey	350	139	27	70

DGM - Digital Geophysical Mapping

Subsurface MEC removal was conducted in Vernal Pond 16 in Unit 13. Further detail is provided in the *Pond 16 Impact Area MRA Geophysical Anomaly Investigation Technical Information Paper Former Fort Ord, California.*

Figures

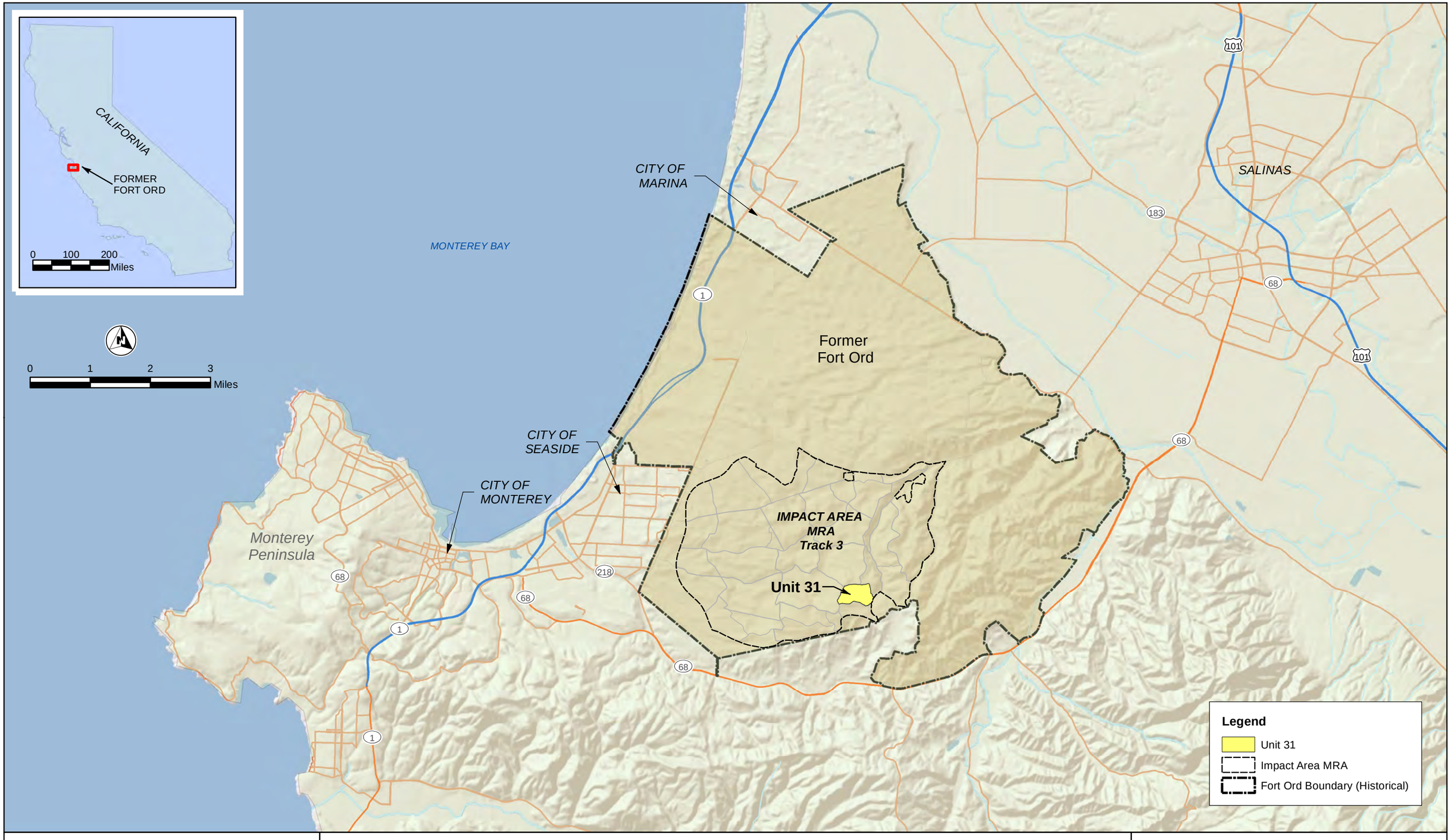

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Figure 1

Track 3 Impact Area MRA
Regional Location Map

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Figure 2

Vegetation Clearance

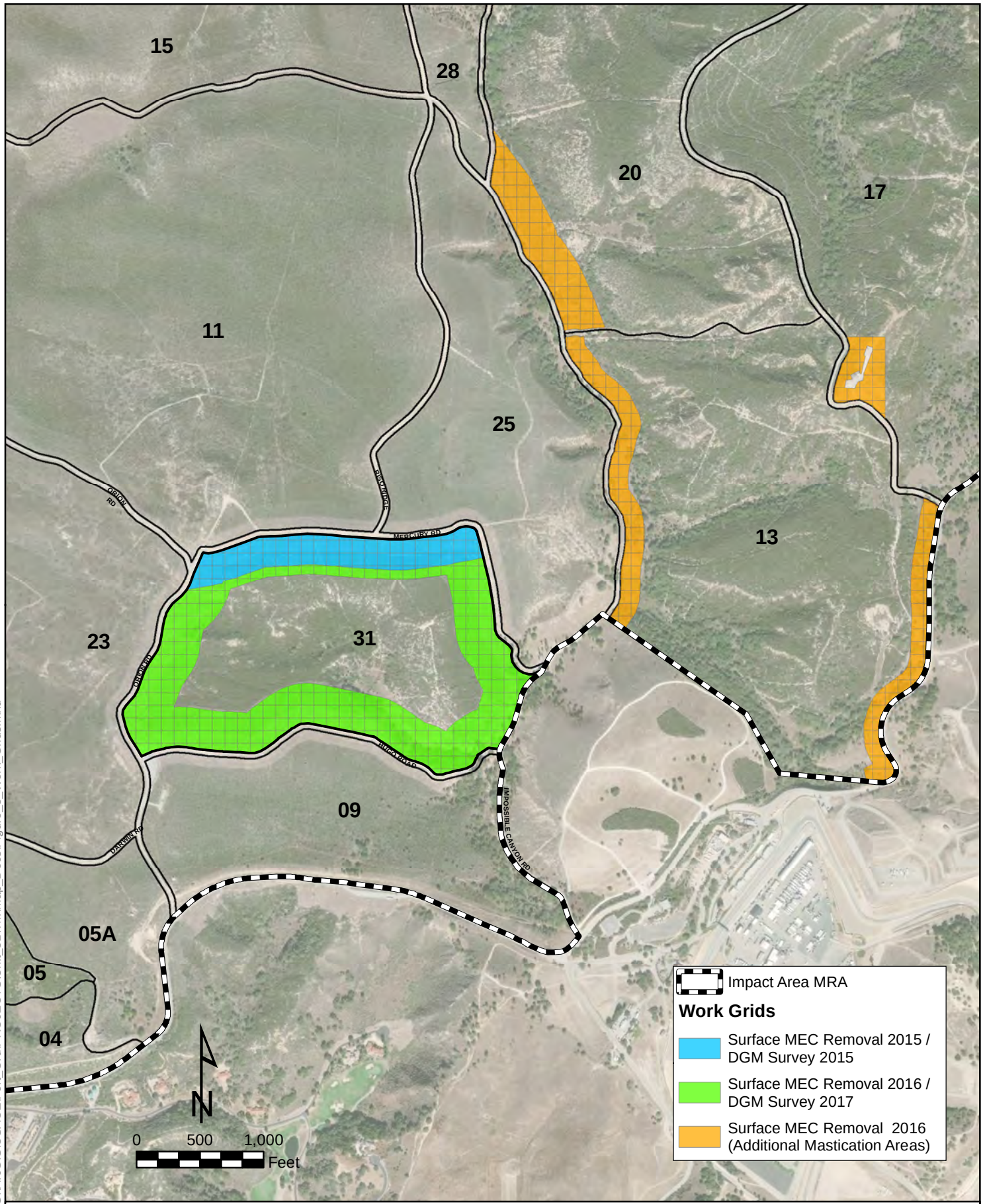

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Figure 3

Work Grids

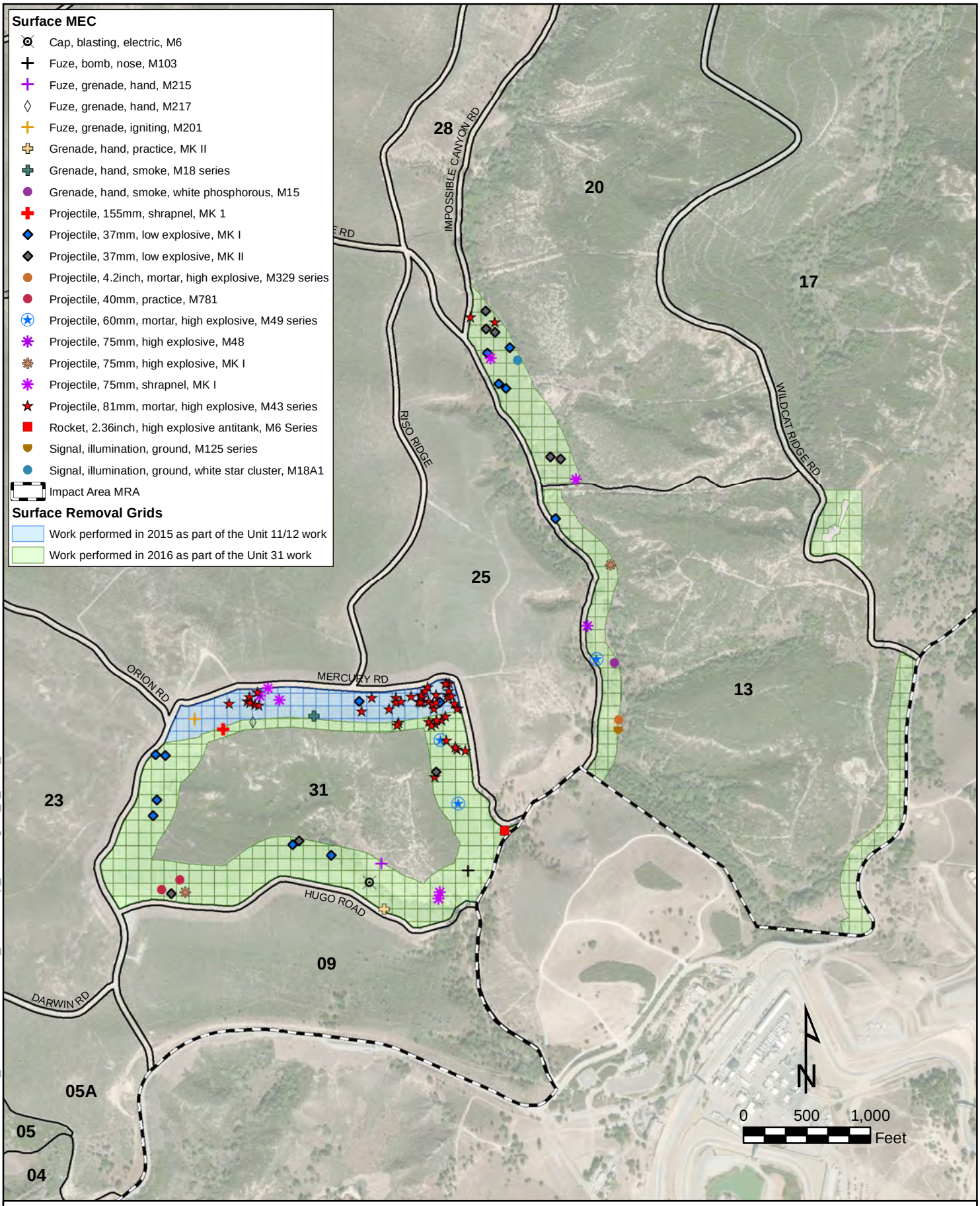

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Figure 4

MEC Removed During Remedial Action

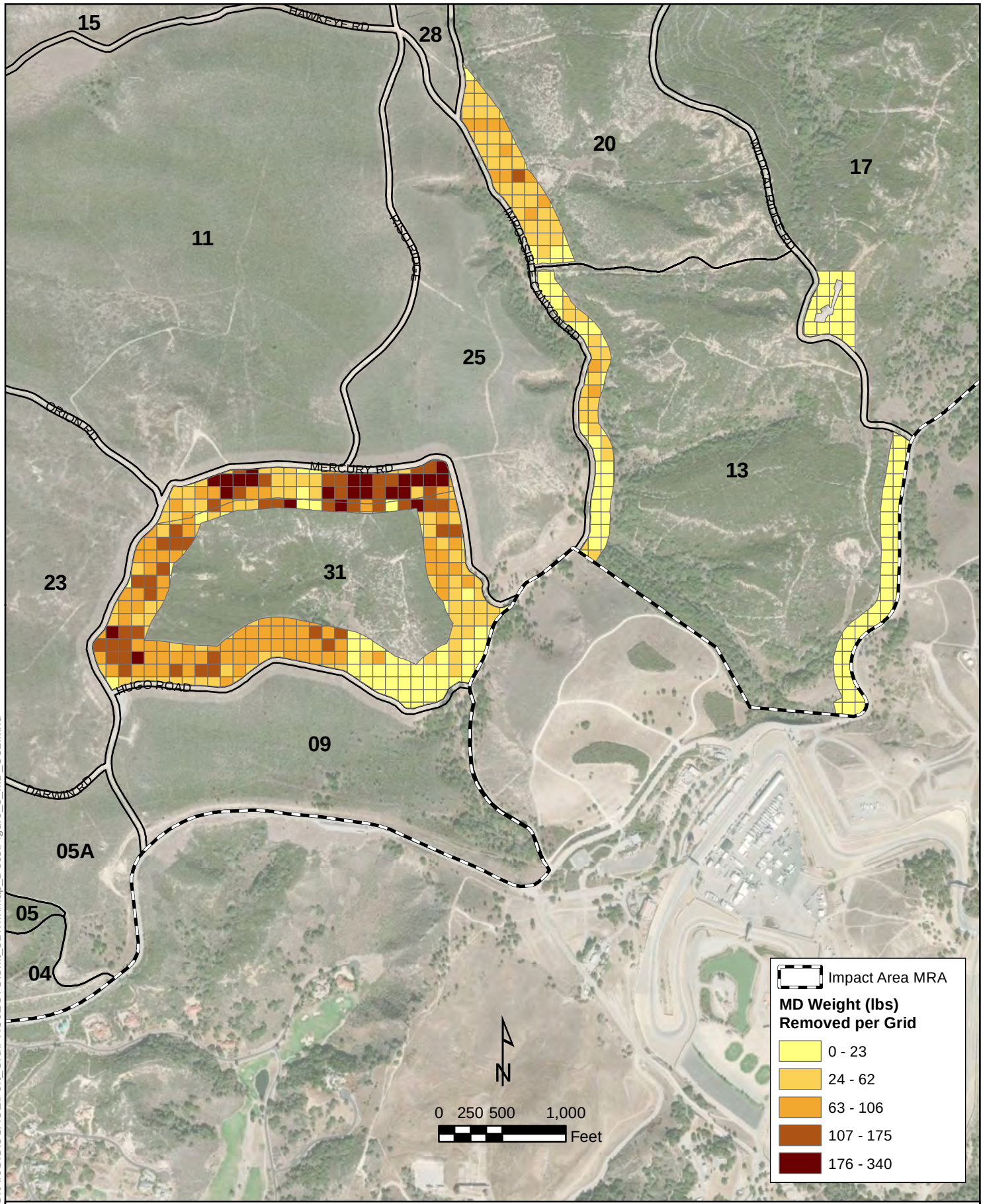

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Figure 5

Weight of Surface MD Removed Per Grid

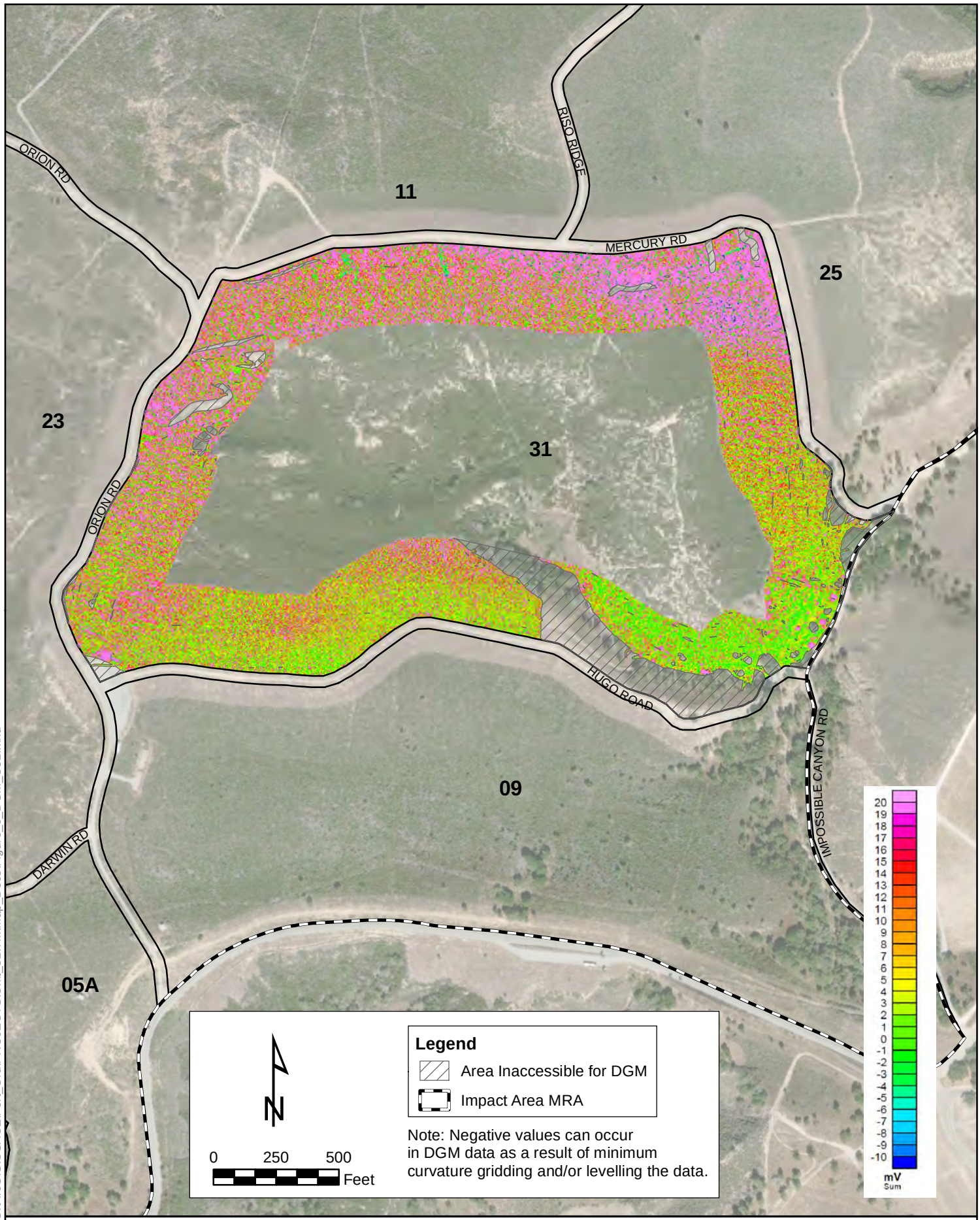

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Figure 6

DGM Survey Results

Appendix A

Analog Quality Assurance Results

Appendix A
Analog QA Record

Survey Type	Unit ID	Grid Type	Grid ID	Date Analog Surface Op QA Complete
Analog	31	Containment Line	A3I5J6	7/22/2015
Analog	31	Containment Line	A3I5J7	7/22/2015
Analog	31	Containment Line	A3J5A0	7/22/2015
Analog	31	Containment Line	A3J5A6	7/22/2015
Analog	31	Containment Line	A3J5A7	7/22/2015
Analog	31	Containment Line	A3J5A8	7/22/2015
Analog	31	Containment Line	A3J5A9	7/22/2015
Analog	31	Containment Line	A3J5B0	7/22/2015
Analog	31	Containment Line	A3J5B6	7/22/2015
Analog	31	Containment Line	A3J5B7	7/22/2015
Analog	31	Containment Line	A3J5B8	7/22/2015
Analog	31	Containment Line	A3J5B9	7/22/2015
Analog	31	Containment Line	A3J5C0	7/22/2015
Analog	31	Containment Line	A3J5C6	7/22/2015
Analog	31	Containment Line	A3J5C7	7/22/2015
Analog	31	Containment Line	A3J5C8	7/22/2015
Analog	31	Containment Line	A3J5C9	7/22/2015
Analog	31	Containment Line	A3J5D0	7/22/2015
Analog	31	Containment Line	A3J5D9	7/22/2015
Analog	31	Containment Line	A3J6A1	7/22/2015
Analog	31	Containment Line	A3J6B1	7/22/2015
Analog	31	Containment Line	A3J6C1	7/22/2015
Analog	31	Containment Line	A3I4J0	7/29/2015
Analog	31	Containment Line	A3I4J6	7/29/2015
Analog	31	Containment Line	A3I4J9	7/29/2015
Analog	31	Containment Line	A3J4A0	7/29/2015
Analog	31	Containment Line	A3J4A6	7/29/2015
Analog	31	Containment Line	A3J4A7	7/29/2015
Analog	31	Containment Line	A3J4A8	7/29/2015
Analog	31	Containment Line	A3J4A9	7/29/2015
Analog	31	Containment Line	A3J4B0	7/29/2015
Analog	31	Containment Line	A3J4B6	7/29/2015
Analog	31	Containment Line	A3J4B7	7/29/2015
Analog	31	Containment Line	A3J4B8	7/29/2015
Analog	31	Containment Line	A3J4B9	7/29/2015
Analog	31	Containment Line	A3J4C0	7/29/2015
Analog	31	Containment Line	A3J4C6	7/29/2015
Analog	31	Containment Line	A3J4C7	7/29/2015
Analog	31	Containment Line	A3J4C8	7/29/2015
Analog	31	Containment Line	A3J4C9	7/29/2015
Analog	31	Containment Line	A3I5J1	7/30/2015
Analog	31	Containment Line	A3I5J2	7/30/2015
Analog	31	Containment Line	A3I5J3	7/30/2015
Analog	31	Containment Line	A3I5J4	7/30/2015
Analog	31	Containment Line	A3I5J5	7/30/2015
Analog	31	Containment Line	A3J5A1	7/30/2015
Analog	31	Containment Line	A3J5A2	7/30/2015
Analog	31	Containment Line	A3J5A3	7/30/2015
Analog	31	Containment Line	A3J5A4	7/30/2015
Analog	31	Containment Line	A3J5A5	7/30/2015

Appendix A
Analog QA Record

Survey Type	Unit ID	Grid Type	Grid ID	Date Analog Surface Op QA Complete
Analog	31	Containment Line	A3J5B1	7/30/2015
Analog	31	Containment Line	A3J5B2	7/30/2015
Analog	31	Containment Line	A3J5B3	7/30/2015
Analog	31	Containment Line	A3J5B4	7/30/2015
Analog	31	Containment Line	A3J5B5	7/30/2015
Analog	31	Containment Line	A3J5C1	7/30/2015
Analog	31	Containment Line	A3J5C2	7/30/2015
Analog	31	Containment Line	A3J5C3	7/30/2015
Analog	31	Containment Line	A3J5C5	7/30/2015
Analog	31	Containment Line	A3I3I0	8/18/2015
Analog	31	Containment Line	A3I3I8	8/18/2015
Analog	31	Containment Line	A3I3I9	8/18/2015
Analog	31	Containment Line	A3I3J0	8/18/2015
Analog	31	Containment Line	A3I3J8	8/18/2015
Analog	31	Containment Line	A3I3J9	8/18/2015
Analog	31	Containment Line	A3I4I1	8/18/2015
Analog	31	Containment Line	A3I4J1	8/18/2015
Analog	31	Containment Line	A3I4J2	8/18/2015
Analog	31	Containment Line	A3I4J3	8/18/2015
Analog	31	Containment Line	A3I4J4	8/18/2015
Analog	31	Containment Line	A3I4J5	8/18/2015
Analog	31	Containment Line	A3J3A0	8/18/2015
Analog	31	Containment Line	A3J3A8	8/18/2015
Analog	31	Containment Line	A3J3A9	8/18/2015
Analog	31	Containment Line	A3J3B0	8/18/2015
Analog	31	Containment Line	A3J4A1	8/18/2015
Analog	31	Containment Line	A3J4A2	8/18/2015
Analog	31	Containment Line	A3J4A3	8/18/2015
Analog	31	Containment Line	A3J4A4	8/18/2015
Analog	31	Containment Line	A3J4A5	8/18/2015
Analog	31	Containment Line	A3J4B1	8/18/2015
Analog	31	Containment Line	A3J4B2	8/18/2015
Analog	31	Containment Line	A3J4B3	8/18/2015
Analog	31	Containment Line	A3J4B4	8/18/2015
Analog	31	Containment Line	A3J4B5	8/18/2015
Analog	31	Containment Line	A3J4C3	8/18/2015
Analog	31	Containment Line	A3J4C4	8/18/2015
Analog	31	Containment Line	A3J4C5	8/18/2015
Analog	31	Containment Line	A3J5C4	9/22/2015
Analog	31	Containment Line 2	A3I4I2	7/18/2016
Analog	31	Containment Line 2	A3I4I3	7/18/2016
Analog	31	Containment Line 2	A3I4J0	7/18/2016
Analog	31	Containment Line 2	A3I4J2	7/18/2016
Analog	31	Containment Line 2	A3I4J3	7/18/2016
Analog	31	Containment Line 2	A3I4J4	7/18/2016
Analog	31	Containment Line 2	A3I4J5	7/18/2016
Analog	31	Containment Line 2	A3I4J6	7/18/2016
Analog	31	Containment Line 2	A3I4J7	7/18/2016
Analog	31	Containment Line 2	A3I4J8	7/18/2016
Analog	31	Containment Line 2	A3I4J9	7/18/2016

Appendix A
Analog QA Record

Survey Type	Unit ID	Grid Type	Grid ID	Date Analog Surface Op QA Complete
Analog	31	Containment Line 2	A3I5I2	7/18/2016
Analog	31	Containment Line 2	A3I5I3	7/18/2016
Analog	31	Containment Line 2	A3I5I4	7/18/2016
Analog	31	Containment Line 2	A3I5I5	7/18/2016
Analog	31	Containment Line 2	A3I5I6	7/18/2016
Analog	31	Containment Line 2	A3I5J1	7/18/2016
Analog	31	Containment Line 2	A3I5J2	7/18/2016
Analog	31	Containment Line 2	A3I5J3	7/18/2016
Analog	31	Containment Line 2	A3I5J4	7/18/2016
Analog	31	Containment Line 2	A3I5J5	7/18/2016
Analog	31	Containment Line 2	A3I5J6	7/18/2016
Analog	31	Containment Line 2	A3I5J7	7/18/2016
Analog	31	Containment Line 2	A3J4A6	7/18/2016
Analog	31	Containment Line 2	A3J4A7	7/18/2016
Analog	31	Containment Line 2	A3J4A8	7/18/2016
Analog	31	Containment Line 2	A3J4A9	7/18/2016
Analog	31	Containment Line 2	A3I5G0	8/2/2016
Analog	31	Containment Line 2	A3I5G8	8/2/2016
Analog	31	Containment Line 2	A3I5G9	8/2/2016
Analog	31	Containment Line 2	A3I5H0	8/2/2016
Analog	31	Containment Line 2	A3I5H8	8/2/2016
Analog	31	Containment Line 2	A3I5H9	8/2/2016
Analog	31	Containment Line 2	A3I5I0	8/2/2016
Analog	31	Containment Line 2	A3I5I8	8/2/2016
Analog	31	Containment Line 2	A3I5I9	8/2/2016
Analog	31	Containment Line 2	A3I5J0	8/2/2016
Analog	31	Containment Line 2	A3I5J8	8/2/2016
Analog	31	Containment Line 2	A3I5J9	8/2/2016
Analog	31	Containment Line 2	A3I6G1	8/2/2016
Analog	31	Containment Line 2	A3I6G2	8/2/2016
Analog	31	Containment Line 2	A3I6H1	8/2/2016
Analog	31	Containment Line 2	A3I6H2	8/2/2016
Analog	31	Containment Line 2	A3I6I1	8/2/2016
Analog	31	Containment Line 2	A3I6J1	8/2/2016
Analog	31	Containment Line 2	A3J5A0	8/2/2016
Analog	31	Containment Line 2	A3J5A8	8/2/2016
Analog	31	Containment Line 2	A3J5A9	8/2/2016
Analog	31	Containment Line 2	A3J6A1	8/2/2016
Analog	31	Containment Line 2	A3H3H0	8/4/2016
Analog	31	Containment Line 2	A3H3H3	8/4/2016
Analog	31	Containment Line 2	A3H3H4	8/4/2016
Analog	31	Containment Line 2	A3H3H5	8/4/2016
Analog	31	Containment Line 2	A3H3H6	8/4/2016
Analog	31	Containment Line 2	A3H3H7	8/4/2016
Analog	31	Containment Line 2	A3H3H8	8/4/2016
Analog	31	Containment Line 2	A3H3H9	8/4/2016
Analog	31	Containment Line 2	A3H3I0	8/4/2016
Analog	31	Containment Line 2	A3H3I2	8/4/2016
Analog	31	Containment Line 2	A3H3I3	8/4/2016
Analog	31	Containment Line 2	A3H3I4	8/4/2016

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Analog QA Record

Survey Type	Unit ID	Grid Type	Grid ID	Date Analog Surface Op QA Complete
Analog	31	Containment Line 2	A3H3I5	8/4/2016
Analog	31	Containment Line 2	A3H3I6	8/4/2016
Analog	31	Containment Line 2	A3H3I7	8/4/2016
Analog	31	Containment Line 2	A3H3I8	8/4/2016
Analog	31	Containment Line 2	A3H3I9	8/4/2016
Analog	31	Containment Line 2	A3H3J3	8/4/2016
Analog	31	Containment Line 2	A3H3J4	8/4/2016
Analog	31	Containment Line 2	A3H3J5	8/4/2016
Analog	31	Containment Line 2	A3H3J6	8/4/2016
Analog	31	Containment Line 2	A3H3J7	8/4/2016
Analog	31	Containment Line 2	A3I3G0	8/4/2016
Analog	31	Containment Line 2	A3I3G6	8/4/2016
Analog	31	Containment Line 2	A3I3G7	8/4/2016
Analog	31	Containment Line 2	A3I3G8	8/4/2016
Analog	31	Containment Line 2	A3I3G9	8/4/2016
Analog	31	Containment Line 2	A3I3H0	8/4/2016
Analog	31	Containment Line 2	A3I3H6	8/4/2016
Analog	31	Containment Line 2	A3I3H7	8/4/2016
Analog	31	Containment Line 2	A3I3H8	8/4/2016
Analog	31	Containment Line 2	A3I3H9	8/4/2016
Analog	31	Containment Line 2	A3I3I0	8/4/2016
Analog	31	Containment Line 2	A3I3I7	8/4/2016
Analog	31	Containment Line 2	A3I3I8	8/4/2016
Analog	31	Containment Line 2	A3I3I9	8/4/2016
Analog	31	Containment Line 2	A3I4G1	8/4/2016
Analog	31	Containment Line 2	A3I4H1	8/4/2016
Analog	31	Containment Line 2	A3I4I1	8/4/2016
Analog	31	Containment Line 2	A3I4J1	8/4/2016
Analog	31	Containment Line 2	A3H3E4	8/10/2016
Analog	31	Containment Line 2	A3H3F0	8/10/2016
Analog	31	Containment Line 2	A3H3F3	8/10/2016
Analog	31	Containment Line 2	A3H3F4	8/10/2016
Analog	31	Containment Line 2	A3H3F5	8/10/2016
Analog	31	Containment Line 2	A3H3F6	8/10/2016
Analog	31	Containment Line 2	A3H3F7	8/10/2016
Analog	31	Containment Line 2	A3H3F8	8/10/2016
Analog	31	Containment Line 2	A3H3F9	8/10/2016
Analog	31	Containment Line 2	A3H3G0	8/10/2016
Analog	31	Containment Line 2	A3H3G3	8/10/2016
Analog	31	Containment Line 2	A3H3G4	8/10/2016
Analog	31	Containment Line 2	A3H3G5	8/10/2016
Analog	31	Containment Line 2	A3H3G6	8/10/2016
Analog	31	Containment Line 2	A3H3G7	8/10/2016
Analog	31	Containment Line 2	A3H3G8	8/10/2016
Analog	31	Containment Line 2	A3H3G9	8/10/2016
Analog	31	Containment Line 2	A3I5C0	8/11/2016
Analog	31	Containment Line 2	A3I5C9	8/11/2016
Analog	31	Containment Line 2	A3I5D0	8/11/2016
Analog	31	Containment Line 2	A3I5D9	8/11/2016
Analog	31	Containment Line 2	A3I5E0	8/11/2016

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Analog QA Record

Survey Type	Unit ID	Grid Type	Grid ID	Date Analog Surface Op QA Complete
Analog	31	Containment Line 2	A3I5E9	8/11/2016
Analog	31	Containment Line 2	A3I5F0	8/11/2016
Analog	31	Containment Line 2	A3I5F9	8/11/2016
Analog	31	Containment Line 2	A3I6C1	8/11/2016
Analog	31	Containment Line 2	A3I6C2	8/11/2016
Analog	31	Containment Line 2	A3I6C3	8/11/2016
Analog	31	Containment Line 2	A3I6D1	8/11/2016
Analog	31	Containment Line 2	A3I6D2	8/11/2016
Analog	31	Containment Line 2	A3I6D3	8/11/2016
Analog	31	Containment Line 2	A3I6E1	8/11/2016
Analog	31	Containment Line 2	A3I6E2	8/11/2016
Analog	31	Containment Line 2	A3I6E3	8/11/2016
Analog	31	Containment Line 2	A3I6F1	8/11/2016
Analog	31	Containment Line 2	A3I6F2	8/11/2016
Analog	31	Containment Line 2	A3H5D8	8/16/2016
Analog	31	Containment Line 2	A3H5D9	8/16/2016
Analog	31	Containment Line 2	A3H5E0	8/16/2016
Analog	31	Containment Line 2	A3H5E8	8/16/2016
Analog	31	Containment Line 2	A3H5E9	8/16/2016
Analog	31	Containment Line 2	A3H5F0	8/16/2016
Analog	31	Containment Line 2	A3H5F8	8/16/2016
Analog	31	Containment Line 2	A3H5F9	8/16/2016
Analog	31	Containment Line 2	A3H5G0	8/16/2016
Analog	31	Containment Line 2	A3H5G8	8/16/2016
Analog	31	Containment Line 2	A3H5G9	8/16/2016
Analog	31	Containment Line 2	A3H5H0	8/16/2016
Analog	31	Containment Line 2	A3H5H8	8/16/2016
Analog	31	Containment Line 2	A3H5H9	8/16/2016
Analog	31	Containment Line 2	A3H5I0	8/16/2016
Analog	31	Containment Line 2	A3H5I9	8/16/2016
Analog	31	Containment Line 2	A3I5A0	8/16/2016
Analog	31	Containment Line 2	A3I5B0	8/16/2016
Analog	31	Containment Line 2	A3I6A1	8/16/2016
Analog	31	Containment Line 2	A3I6A2	8/16/2016
Analog	31	Containment Line 2	A3I6A3	8/16/2016
Analog	31	Containment Line 2	A3I6A4	8/16/2016
Analog	31	Containment Line 2	A3I6A5	8/16/2016
Analog	31	Containment Line 2	A3I6B1	8/16/2016
Analog	31	Containment Line 2	A3I6B2	8/16/2016
Analog	31	Containment Line 2	A3I6B3	8/16/2016
Analog	31	Containment Line 2	A3I6B4	8/16/2016
Analog	31	Containment Line 2	A3I6B5	8/16/2016
Analog	31	Containment Line 2	A3I6B6	8/16/2016
Analog	31	Containment Line 2	A3H4F1	8/18/2016
Analog	31	Containment Line 2	A3H4F2	8/18/2016
Analog	31	Containment Line 2	A3H4F3	8/18/2016
Analog	31	Containment Line 2	A3H4F4	8/18/2016
Analog	31	Containment Line 2	A3H4G0	8/18/2016
Analog	31	Containment Line 2	A3H4G1	8/18/2016
Analog	31	Containment Line 2	A3H4G2	8/18/2016

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Analog QA Record

Survey Type	Unit ID	Grid Type	Grid ID	Date Analog Surface Op QA Complete
Analog	31	Containment Line 2	A3H4G3	8/18/2016
Analog	31	Containment Line 2	A3H4G4	8/18/2016
Analog	31	Containment Line 2	A3H4G5	8/18/2016
Analog	31	Containment Line 2	A3H4G6	8/18/2016
Analog	31	Containment Line 2	A3H4H0	8/18/2016
Analog	31	Containment Line 2	A3H4H1	8/18/2016
Analog	31	Containment Line 2	A3H4H2	8/18/2016
Analog	31	Containment Line 2	A3H4H3	8/18/2016
Analog	31	Containment Line 2	A3H4H4	8/18/2016
Analog	31	Containment Line 2	A3H4H5	8/18/2016
Analog	31	Containment Line 2	A3H4H6	8/18/2016
Analog	31	Containment Line 2	A3H4H7	8/18/2016
Analog	31	Containment Line 2	A3H4H8	8/18/2016
Analog	31	Containment Line 2	A3H4H9	8/18/2016
Analog	31	Containment Line 2	A3H6F1	8/22/2016
Analog	31	Containment Line 2	A3H6F2	8/22/2016
Analog	31	Containment Line 2	A3H6F3	8/22/2016
Analog	31	Containment Line 2	A3H6G1	8/22/2016
Analog	31	Containment Line 2	A3H6G2	8/22/2016
Analog	31	Containment Line 2	A3H6G3	8/22/2016
Analog	31	Containment Line 2	A3H6H1	8/22/2016
Analog	31	Containment Line 2	A3H6H2	8/22/2016
Analog	31	Containment Line 2	A3H6H3	8/22/2016
Analog	31	Containment Line 2	A3H6I1	8/22/2016
Analog	31	Containment Line 2	A3H6I2	8/22/2016
Analog	31	Containment Line 2	A3H6I3	8/22/2016
Analog	31	Containment Line 2	A3H6I4	8/22/2016
Analog	31	Containment Line 2	A3H6J1	8/22/2016
Analog	31	Containment Line 2	A3H6J2	8/22/2016
Analog	31	Containment Line 2	A3H6J3	8/22/2016
Analog	31	Containment Line 2	A3H6J4	8/22/2016
Analog	31	Containment Line 2	A3I3C4	8/23/2016
Analog	31	Containment Line 2	A3I3C5	8/23/2016
Analog	31	Containment Line 2	A3I3C6	8/23/2016
Analog	31	Containment Line 2	A3I3C7	8/23/2016
Analog	31	Containment Line 2	A3I3C8	8/23/2016
Analog	31	Containment Line 2	A3I3D5	8/23/2016
Analog	31	Containment Line 2	A3I3D6	8/23/2016
Analog	31	Containment Line 2	A3I3D7	8/23/2016
Analog	31	Containment Line 2	A3I3D8	8/23/2016
Analog	31	Containment Line 2	A3I3D9	8/23/2016
Analog	31	Containment Line 2	A3I3E5	8/23/2016
Analog	31	Containment Line 2	A3I3E6	8/23/2016
Analog	31	Containment Line 2	A3I3E7	8/23/2016
Analog	31	Containment Line 2	A3I3E8	8/23/2016
Analog	31	Containment Line 2	A3I3E9	8/23/2016
Analog	31	Containment Line 2	A3I3F0	8/23/2016
Analog	31	Containment Line 2	A3I3F6	8/23/2016
Analog	31	Containment Line 2	A3I3F7	8/23/2016
Analog	31	Containment Line 2	A3I3F8	8/23/2016

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Analog QA Record

Survey Type	Unit ID	Grid Type	Grid ID	Date Analog Surface Op QA Complete
Analog	31	Containment Line 2	A3I3F9	8/23/2016
Analog	31	Containment Line 2	A3H4I0	8/31/2016
Analog	31	Containment Line 2	A3H4I1	8/31/2016
Analog	31	Containment Line 2	A3H4I2	8/31/2016
Analog	31	Containment Line 2	A3H4I3	8/31/2016
Analog	31	Containment Line 2	A3H4I4	8/31/2016
Analog	31	Containment Line 2	A3H4I5	8/31/2016
Analog	31	Containment Line 2	A3H4I6	8/31/2016
Analog	31	Containment Line 2	A3H4I7	8/31/2016
Analog	31	Containment Line 2	A3H4I8	8/31/2016
Analog	31	Containment Line 2	A3H4I9	8/31/2016
Analog	31	Containment Line 2	A3H4J0	8/31/2016
Analog	31	Containment Line 2	A3H4J3	8/31/2016
Analog	31	Containment Line 2	A3H4J4	8/31/2016
Analog	31	Containment Line 2	A3H4J5	8/31/2016
Analog	31	Containment Line 2	A3H4J6	8/31/2016
Analog	31	Containment Line 2	A3H4J7	8/31/2016
Analog	31	Containment Line 2	A3H4J8	8/31/2016
Analog	31	Containment Line 2	A3H4J9	8/31/2016
Analog	31	Containment Line 2	A3I3A4	8/31/2016
Analog	31	Containment Line 2	A3I3A5	8/31/2016
Analog	31	Containment Line 2	A3I3A6	8/31/2016
Analog	31	Containment Line 2	A3I3A7	8/31/2016
Analog	31	Containment Line 2	A3I3B4	8/31/2016
Analog	31	Containment Line 2	A3I3B5	8/31/2016
Analog	31	Containment Line 2	A3I3B6	8/31/2016
Analog	31	Containment Line 2	A3I3B7	8/31/2016
Analog	31	Containment Line 2	A3I3B8	8/31/2016
Analog	31	Containment Line 2	A3I4A0	8/31/2016
Analog	31	Containment Line 2	A3I4A4	8/31/2016
Analog	31	Containment Line 2	A3I4A5	8/31/2016
Analog	31	Containment Line 2	A3I4A6	8/31/2016
Analog	31	Containment Line 2	A3I4A7	8/31/2016
Analog	31	Containment Line 2	A3I4A8	8/31/2016
Analog	31	Containment Line 2	A3I4A9	8/31/2016
Analog	31	Containment Line 2	A3H5D7	9/14/2016
Analog	31	Containment Line 2	A3H5E5	9/14/2016
Analog	31	Containment Line 2	A3H5E6	9/14/2016
Analog	31	Containment Line 2	A3H5E7	9/14/2016
Analog	31	Containment Line 2	A3H5F4	9/14/2016
Analog	31	Containment Line 2	A3H5F5	9/14/2016
Analog	31	Containment Line 2	A3H5F6	9/14/2016
Analog	31	Containment Line 2	A3H5F7	9/14/2016
Analog	31	Containment Line 2	A3H5G4	9/14/2016
Analog	31	Containment Line 2	A3H5G5	9/14/2016
Analog	31	Containment Line 2	A3H5G6	9/14/2016
Analog	31	Containment Line 2	A3H5G7	9/14/2016
Analog	31	Containment Line 2	A3H5H4	9/14/2016
Analog	31	Containment Line 2	A3H5H5	9/14/2016
Analog	31	Containment Line 2	A3H5H6	9/14/2016

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Analog QA Record

Survey Type	Unit ID	Grid Type	Grid ID	Date Analog Surface Op QA Complete
Analog	31	Containment Line 2	A3H5H7	9/14/2016
Analog	31	Containment Line 2	A3H5I4	9/14/2016
Analog	31	Containment Line 2	A3H5I5	9/14/2016
Analog	31	Containment Line 2	A3H5I6	9/14/2016
Analog	31	Containment Line 2	A3H5J4	9/14/2016
Analog	31	Containment Line 2	A3H5F3	9/20/2016
Analog	31	Containment Line 2	A3H5G1	9/20/2016
Analog	31	Containment Line 2	A3H5G2	9/20/2016
Analog	31	Containment Line 2	A3H5G3	9/20/2016
Analog	31	Containment Line 2	A3H5H1	9/20/2016
Analog	31	Containment Line 2	A3H5H2	9/20/2016
Analog	31	Containment Line 2	A3H5H3	9/20/2016
Analog	31	Containment Line 2	A3H5I1	9/20/2016
Analog	31	Containment Line 2	A3H5I2	9/20/2016
Analog	31	Containment Line 2	A3H5I3	9/20/2016
Analog	31	Containment Line 2	A3H5J0	9/20/2016
Analog	31	Containment Line 2	A3H5J1	9/20/2016
Analog	31	Containment Line 2	A3H5J2	9/20/2016
Analog	31	Containment Line 2	A3H5J3	9/20/2016
Analog	31	Containment Line 2	A3I5A1	9/20/2016
Analog	20	Containment Line	B3A6I0	10/20/2016
Analog	20	Containment Line	B3A6I7	10/20/2016
Analog	20	Containment Line	B3A6I8	10/20/2016
Analog	20	Containment Line	B3A6I9	10/20/2016
Analog	20	Containment Line	B3A6J0	10/20/2016
Analog	20	Containment Line	B3A6J7	10/20/2016
Analog	20	Containment Line	B3A6J8	10/20/2016
Analog	20	Containment Line	B3A6J9	10/20/2016
Analog	20	Containment Line	B3B6A0	10/20/2016
Analog	20	Containment Line	B3B6A6	10/20/2016
Analog	20	Containment Line	B3B6A7	10/20/2016
Analog	20	Containment Line	B3B6A8	10/20/2016
Analog	20	Containment Line	B3B6A9	10/20/2016
Analog	20	Containment Line	B3B6B0	10/20/2016
Analog	20	Containment Line	B3B6B6	10/20/2016
Analog	20	Containment Line	B3B6B7	10/20/2016
Analog	20	Containment Line	B3B6B8	10/20/2016
Analog	20	Containment Line	B3B6B9	10/20/2016
Analog	20	Containment Line	B3B6F4	10/31/2016
Analog	20	Containment Line	B3B6F5	10/31/2016
Analog	20	Containment Line	B3B6F6	10/31/2016
Analog	20	Containment Line	B3B6F7	10/31/2016
Analog	20	Containment Line	B3B6F8	10/31/2016
Analog	20	Containment Line	B3B6G3	10/31/2016
Analog	20	Containment Line	B3B6G4	10/31/2016
Analog	20	Containment Line	B3B6G5	10/31/2016
Analog	20	Containment Line	B3B6G6	10/31/2016
Analog	20	Containment Line	B3B6G7	10/31/2016
Analog	20	Containment Line	B3B6H3	10/31/2016
Analog	20	Containment Line	B3B6H4	10/31/2016

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Analog QA Record

Survey Type	Unit ID	Grid Type	Grid ID	Date Analog Surface Op QA Complete
Analog	20	Containment Line	B3B6H5	10/31/2016
Analog	20	Containment Line	B3B6H6	10/31/2016
Analog	20	Containment Line	B3B6I2	11/29/2016
Analog	20	Containment Line	B3B6I3	11/29/2016
Analog	20	Containment Line	B3B6I4	11/29/2016
Analog	20	Containment Line	B3B6I5	11/29/2016
Analog	20	Containment Line	B3B6I6	11/29/2016
Analog	20	Containment Line	B3B6J1	11/29/2016
Analog	20	Containment Line	B3B6J2	11/29/2016
Analog	20	Containment Line	B3B6J3	11/29/2016
Analog	20	Containment Line	B3B6J4	11/29/2016
Analog	20	Containment Line	B3B6J5	11/29/2016
Analog	20	Containment Line	B3B6C5	12/5/2016
Analog	20	Containment Line	B3B6C6	12/5/2016
Analog	20	Containment Line	B3B6C7	12/5/2016
Analog	20	Containment Line	B3B6C8	12/5/2016
Analog	20	Containment Line	B3B6C9	12/5/2016
Analog	20	Containment Line	B3B6D5	12/5/2016
Analog	20	Containment Line	B3B6D6	12/5/2016
Analog	20	Containment Line	B3B6D7	12/5/2016
Analog	20	Containment Line	B3B6D8	12/5/2016
Analog	20	Containment Line	B3B6D9	12/5/2016
Analog	20	Containment Line	B3B6E4	12/5/2016
Analog	20	Containment Line	B3B6E5	12/5/2016
Analog	20	Containment Line	B3B6E6	12/5/2016
Analog	20	Containment Line	B3B6E7	12/5/2016
Analog	20	Containment Line	B3B6E8	12/5/2016
Analog	20	Containment Line	B3C6A1	12/12/2016
Analog	20	Containment Line	B3C6A2	12/12/2016
Analog	20	Containment Line	B3C6A3	12/12/2016
Analog	20	Containment Line	B3C6A4	12/12/2016
Analog	20	Containment Line	B3C6A5	12/12/2016
Analog	20	Containment Line	B3C6B2	12/12/2016
Analog	20	Containment Line	B3C6B3	12/12/2016
Analog	20	Containment Line	B3C6B4	12/12/2016
Analog	20	Containment Line	B3C6C2	12/12/2016
Analog	20	Containment Line	B3C6C3	12/12/2016
Analog	20	Containment Line	B3C6D2	12/12/2016
Analog	20	Containment Line	B3C6D3	12/12/2016
Analog	20	Containment Line	B3C6E2	12/12/2016
Analog	17	Containment Line	B3A8C0	10/20/2016
Analog	17	Containment Line	B3A8C8	10/20/2016
Analog	17	Containment Line	B3A8C9	10/20/2016
Analog	17	Containment Line	B3A8D0	10/20/2016
Analog	17	Containment Line	B3A8D8	10/20/2016
Analog	17	Containment Line	B3A8D9	10/20/2016
Analog	17	Containment Line	B3A8E0	10/20/2016
Analog	17	Containment Line	B3A8E9	10/20/2016
Analog	17	Containment Line	B3A8F0	10/20/2016
Analog	17	Containment Line	B3A8F9	10/20/2016

Appendix A
Analog QA Record

Survey Type	Unit ID	Grid Type	Grid ID	Date Analog Surface Op QA Complete
Analog	17	Containment Line	B3A8G0	10/20/2016
Analog	17	Containment Line	B3A8G9	10/20/2016
Analog	17	Containment Line	B3A8H0	10/20/2016
Analog	17	Containment Line	B3A8H9	10/20/2016
Analog	17	Containment Line	B3A9B2	10/20/2016
Analog	17	Containment Line	B3A9C1	10/20/2016
Analog	17	Containment Line	B3A9C2	10/20/2016
Analog	17	Containment Line	B3A9D1	10/20/2016
Analog	17	Containment Line	B3A9D2	10/20/2016
Analog	17	Containment Line	B3A9E1	10/20/2016
Analog	17	Containment Line	B3A9E2	10/20/2016
Analog	17	Containment Line	B3A9F1	10/20/2016
Analog	17	Containment Line	B3A9F2	10/20/2016
Analog	17	Containment Line	B3A9G1	10/20/2016
Analog	17	Containment Line	B3A9G2	10/20/2016
Analog	17	Containment Line	B3A9H1	10/20/2016
Analog	17	Containment Line	B3A9H2	10/20/2016
Analog	13	Containment Line	B3A6D0	9/8/2016
Analog	13	Containment Line	B3A6E0	9/8/2016
Analog	13	Containment Line	B3A6E9	9/8/2016
Analog	13	Containment Line	B3A6F0	9/8/2016
Analog	13	Containment Line	B3A6F8	9/8/2016
Analog	13	Containment Line	B3A6F9	9/8/2016
Analog	13	Containment Line	B3A6G0	9/8/2016
Analog	13	Containment Line	B3A6G7	9/8/2016
Analog	13	Containment Line	B3A6G8	9/8/2016
Analog	13	Containment Line	B3A6G9	9/8/2016
Analog	13	Containment Line	B3A6H7	9/8/2016
Analog	13	Containment Line	B3A6H8	9/8/2016
Analog	13	Containment Line	B3A6H9	9/8/2016
Analog	13	Containment Line	B3A6I7	9/8/2016
Analog	13	Containment Line	B3A6I8	9/8/2016
Analog	13	Containment Line	B3A6I9	9/8/2016
Analog	13	Containment Line	B3A7B1	9/8/2016
Analog	13	Containment Line	B3A7B2	9/8/2016
Analog	13	Containment Line	B3A7B3	9/8/2016
Analog	13	Containment Line	B3A7C1	9/8/2016
Analog	13	Containment Line	B3A7C2	9/8/2016
Analog	13	Containment Line	B3A7C3	9/8/2016
Analog	13	Containment Line	B3A7D1	9/8/2016
Analog	13	Containment Line	B3A7D2	9/8/2016
Analog	13	Containment Line	B3A7D3	9/8/2016
Analog	13	Containment Line	B3A7E1	9/8/2016
Analog	13	Containment Line	B3A7E2	9/8/2016
Analog	13	Containment Line	B3A7F1	9/8/2016
Analog	13	Containment Line	A3I7E2	9/13/2016
Analog	13	Containment Line	A3I7F1	9/13/2016
Analog	13	Containment Line	A3I7F2	9/13/2016
Analog	13	Containment Line	A3I7F3	9/13/2016
Analog	13	Containment Line	A3I7G1	9/13/2016

Appendix A
Analog QA Record

Survey Type	Unit ID	Grid Type	Grid ID	Date Analog Surface Op QA Complete
Analog	13	Containment Line	A3I7G2	9/13/2016
Analog	13	Containment Line	A3I7G3	9/13/2016
Analog	13	Containment Line	A3I7H1	9/13/2016
Analog	13	Containment Line	A3I7H2	9/13/2016
Analog	13	Containment Line	A3I7H3	9/13/2016
Analog	13	Containment Line	A3I7I2	9/13/2016
Analog	13	Containment Line	A3I7I3	9/13/2016
Analog	13	Containment Line	A3I7J2	9/13/2016
Analog	13	Containment Line	A3I7J3	9/13/2016
Analog	13	Containment Line	A3J7A2	9/13/2016
Analog	13	Containment Line	A3J7A3	9/13/2016
Analog	13	Containment Line	A3J7B2	9/13/2016
Analog	13	Containment Line	A3J7B3	9/13/2016
Analog	13	Containment Line	A3J7B4	9/13/2016
Analog	13	Containment Line	A3J7C2	9/15/2016
Analog	13	Containment Line	A3J7C3	9/15/2016
Analog	13	Containment Line	A3J7C4	9/15/2016
Analog	13	Containment Line	A3J7D2	9/15/2016
Analog	13	Containment Line	A3J7D3	9/15/2016
Analog	13	Containment Line	A3J7D4	9/15/2016
Analog	13	Containment Line	A3J7E1	9/15/2016
Analog	13	Containment Line	A3J7E2	9/15/2016
Analog	13	Containment Line	A3J7E3	9/15/2016
Analog	13	Containment Line	A3J7F1	9/15/2016
Analog	13	Containment Line	A3J7F2	9/15/2016
Analog	13	Containment Line	A3J7F3	9/15/2016
Analog	13	Containment Line	A3J7G1	9/15/2016
Analog	13	Containment Line	A3J7G2	9/15/2016
Analog	13	Containment Line	A3J7H1	9/15/2016
Analog	13	Containment Line	A3J7H2	9/15/2016
Analog	13	Containment Line	A3J7I1	9/15/2016
Analog	13	Containment Line	A3J7I2	9/15/2016
Analog	13	Containment Line	A3J7I3	9/15/2016
Analog	13	Containment Line	A3J7J1	9/15/2016
Analog	13	Containment Line	A3J7J2	9/15/2016
Analog	13	Containment Line	A3J7J3	9/15/2016
Analog	13	Containment Line	B3A7A1	9/15/2016
Analog	13	Containment Line	B3A7A2	9/15/2016
Analog	13	Containment Line	B3A7A3	9/15/2016
Analog	13	Containment Line	A3I9H4	9/20/2016
Analog	13	Containment Line	A3I9H5	9/20/2016
Analog	13	Containment Line	A3I9H6	9/20/2016
Analog	13	Containment Line	A3I9I4	9/20/2016
Analog	13	Containment Line	A3I9I5	9/20/2016
Analog	13	Containment Line	A3I9I6	9/20/2016
Analog	13	Containment Line	A3I9J5	9/20/2016
Analog	13	Containment Line	A3I9J6	9/20/2016
Analog	13	Containment Line	A3J9A5	9/20/2016
Analog	13	Containment Line	A3J9A6	9/20/2016
Analog	13	Containment Line	A3J9B5	9/20/2016

Appendix A
Analog QA Record

Survey Type	Unit ID	Grid Type	Grid ID	Date Analog Surface Op QA Complete
Analog	13	Containment Line	A3J9B6	9/20/2016
Analog	13	Containment Line	A3J9C5	9/20/2016
Analog	13	Containment Line	A3J9C6	9/20/2016
Analog	13	Containment Line	A3J9C7	9/20/2016
Analog	13	Containment Line	A3J9D5	9/20/2016
Analog	13	Containment Line	A3J9D6	9/20/2016
Analog	13	Containment Line	A3J9D7	9/20/2016
Analog	13	Containment Line	A3J9E5	9/20/2016
Analog	13	Containment Line	A3J9E6	9/20/2016
Analog	13	Containment Line	A3J9E7	9/20/2016
Analog	13	Containment Line	A3J9F5	9/20/2016
Analog	13	Containment Line	A3J9F6	9/20/2016
Analog	13	Containment Line	A3H9C1	9/29/2016
Analog	13	Containment Line	A3H9C2	9/29/2016
Analog	13	Containment Line	A3H9C3	9/29/2016
Analog	13	Containment Line	A3H9D1	9/29/2016
Analog	13	Containment Line	A3H9D2	9/29/2016
Analog	13	Containment Line	A3H9D3	9/29/2016
Analog	13	Containment Line	A3H9E1	9/29/2016
Analog	13	Containment Line	A3H9E2	9/29/2016
Analog	13	Containment Line	A3H9E3	9/29/2016
Analog	13	Containment Line	A3H9F1	9/29/2016
Analog	13	Containment Line	A3H9F2	9/29/2016
Analog	13	Containment Line	A3H9F3	9/29/2016
Analog	13	Containment Line	A3H9G1	9/29/2016
Analog	13	Containment Line	A3H9G2	9/29/2016
Analog	13	Containment Line	A3H9H1	9/29/2016
Analog	13	Containment Line	A3H9H2	9/29/2016
Analog	13	Containment Line	A3H9I1	9/29/2016
Analog	13	Containment Line	A3H9I2	9/29/2016
Analog	13	Containment Line	A3H9I3	9/29/2016
Analog	13	Containment Line	A3H9J1	9/29/2016
Analog	13	Containment Line	A3H9J2	9/29/2016
Analog	13	Containment Line	A3H9J3	9/29/2016
Analog	13	Containment Line	A3H9J4	9/29/2016
Analog	13	Containment Line	A3I9A2	10/20/2016
Analog	13	Containment Line	A3I9A3	10/20/2016
Analog	13	Containment Line	A3I9A4	10/20/2016
Analog	13	Containment Line	A3I9A5	10/20/2016
Analog	13	Containment Line	A3I9B3	10/20/2016
Analog	13	Containment Line	A3I9B4	10/20/2016
Analog	13	Containment Line	A3I9B5	10/20/2016
Analog	13	Containment Line	A3I9B6	10/20/2016
Analog	13	Containment Line	A3I9C4	10/20/2016
Analog	13	Containment Line	A3I9C5	10/20/2016
Analog	13	Containment Line	A3I9C6	10/20/2016
Analog	13	Containment Line	A3I9D4	10/20/2016
Analog	13	Containment Line	A3I9D5	10/20/2016
Analog	13	Containment Line	A3I9D6	10/20/2016
Analog	13	Containment Line	A3I9E4	10/20/2016

Appendix A
Analog QA Record

Survey Type	Unit ID	Grid Type	Grid ID	Date Analog Surface Op QA Complete
Analog	13	Containment Line	A3I9E5	10/20/2016
Analog	13	Containment Line	A3I9E6	10/20/2016
Analog	13	Containment Line	A3I9F5	10/20/2016
Analog	13	Containment Line	A3I9F6	10/20/2016
Analog	13	Containment Line	A3I9G5	10/20/2016
Analog	13	Containment Line	A3I9G6	10/20/2016

Appendix B

DGM QA Approval and Discussion

FORMER FORT ORD, CALIFORNIA
UNIT 31
QUALITY ASSURANCE REPORT:
DIGITAL GEOPHYSICAL OPERATIONS

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

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

AUGUST 2019

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 Munitions Response Site (MRS) – Bureau of Land Management (BLM) Unit 31. Work was performed under WERS contract No. W912DY-10-D-0027, Site-Specific Work Plan Munitions and Explosives of Concern Remedial Action, MRS-BLM Units 25 and 31 (Units 25/31 SSWP; KEMRON, 2016b), and 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 (Unit 23 SSWP; KEMRON, 2015). 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 (KEMRON, 2016a), 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 31 were in accordance with project Data Quality Objectives (DQOs) and Measurement Quality Objectives (MQOs), as established in the UFP-QAPP (KEMRON, 2016a). Unit 31 DGM data were collected in their entirety to meet Category B spacing requirements in accordance with the Units 25/31 SSWP (KEMRON, 2015). However, all data additionally meet the modified Category A spacing requirements.

1.1 Site details

Unit 31 is located in the southeastern portion of the Impact Area Munitions Response Area (MRA), as depicted in Figure 1. The unit is bounded by Mercury Road and Hugo Road on the north and south, respectively, and by Orion Road and Impossible Canyon Road on the west and east, respectively. The unit encompasses approximately 103 acres.

Clean-up operations pertinent to DGM activities were initiated with a vegetation clearance followed by an instrument-aided surface removal. Vegetation clearance, instrument-aided surface clearance, and DGM operations were only conducted in the Unit 31 containment line (approximately 57 acres) to support planned prescribed burns of Units 11, 12, and 31. During vegetation clearance and surface clearance, a total of 79 MEC items were removed.

According to the Installation-Wide Multispecies Habitat Management Plan (HMP) for Fort Ord (USACE, 1997), the site will 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. A number of steep cliffs and gullies are present in Unit 31 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 the Unit 31 containment line. 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. All data collected met modified Category A line spacing requirements, with 95% not to exceed a lane spacing of 2 ft. and 99.5% not to exceed a lane spacing of 3 ft. As stated in the MEC Procedures Supplement, the purpose and objective for the Category A DGM surveys is to obtain high quality DGM data in order to pick targets for subsurface removed. The modified Category A lane spacing requirement of 99.5% not to exceed 3 ft. is sufficient to achieve the intent of Category A lane spacing and prevents the unnecessary collection of small data gaps that no impact on target selection. The Unit 31 SSWP requires DGM data to be collected at Category B standards. Unit 31 DGM was collected to modified Category A standards due to the potential for a subsurface removal in the containment line in support of future prescribed burns.

Obstacles and issues with terrain precluded 100% coverage and approximately three acres of Unit 31 were either inaccessible due to the presence of large trees or determined by the UXO Safety to be inaccessible to DGM survey due to steep terrain. All data gaps were appropriately documented in the obstacle files submitted with DGM packages. Figure 2 of this QA report depicts the full DGM dataset for the Unit 31 containment line.

2.2 Field Oversight

Field oversight was performed intermittently throughout the project by both the USACE Project Geophysicist and the OESS. Appropriate field procedures were reviewed and found to be in compliance. Under the WERS Contract No. W912DY-10-D-0027, NAEVA is subcontracted to collect the geophysical data.

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 (ESTCP, 2009) 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. Data were reviewed by the QA Geophysicist to ensure all MQOs were achieved. The QA data review process is described in section 2.4 and a summary of MQOs for towed array DGM operations are given in Table 1. Daily IVS test results for towed array DGM in Unit 31 are shown in Figures 3-6. Further details regarding MQOs are provided in the UFP-QAPP (KEMRON, 2016a).

Production data required the GSV blind seeds placed throughout the Unit 31 containment line, as documented in the UFP-QAPP (KEMRON, 2016a). 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 MQOs and SOPs. Table 2 summarizes the QC seed results for Unit 31.

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. This focused on a review of header files on the pre-processed data (data that has been 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 31 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 and via QC report deliverables. 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 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 geotiff.

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 ft. 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 geotiffs
8) Importing the geotiffs into a GIS

2.5 Discussion

No corrective action requests were issued for data collected in the Unit 31 containment line, however one minor item is worth noting. Multiple IVS seed items exhibited a response above the established MQO (outside coils only) during the afternoon IVS survey on 03/30/2017 (Figure 3). The QC geophysicist noted the response in the QC reports and identified this as an isolated response with no effect on the data quality. The USACE QA geophysicist reviewed the daily QC and production data and confirmed that this was an isolated response. All other IVS item responses and offsets, QC tests, and blind QC seed MQOs were met for that data deliverable, confirming there was no impact on the usability of the DGM data. No corrective action was issued.

3.0 CONCLUSIONS

QA activities by the Government verified KEMRON had an adequate QC program in place and that data collected within the Unit 31 containment line are sufficient and in accordance

with the project DQOs and MQOs. All dynamic DGM data in the Unit 31 containment line meet modified Category A standards.

4.0 REFERENCES

ESTCP, 2009. *Geophysical System Verification (GSV): A Physics-Based Alternative to Geophysical Prove-Outs for Munitions Response.* July.

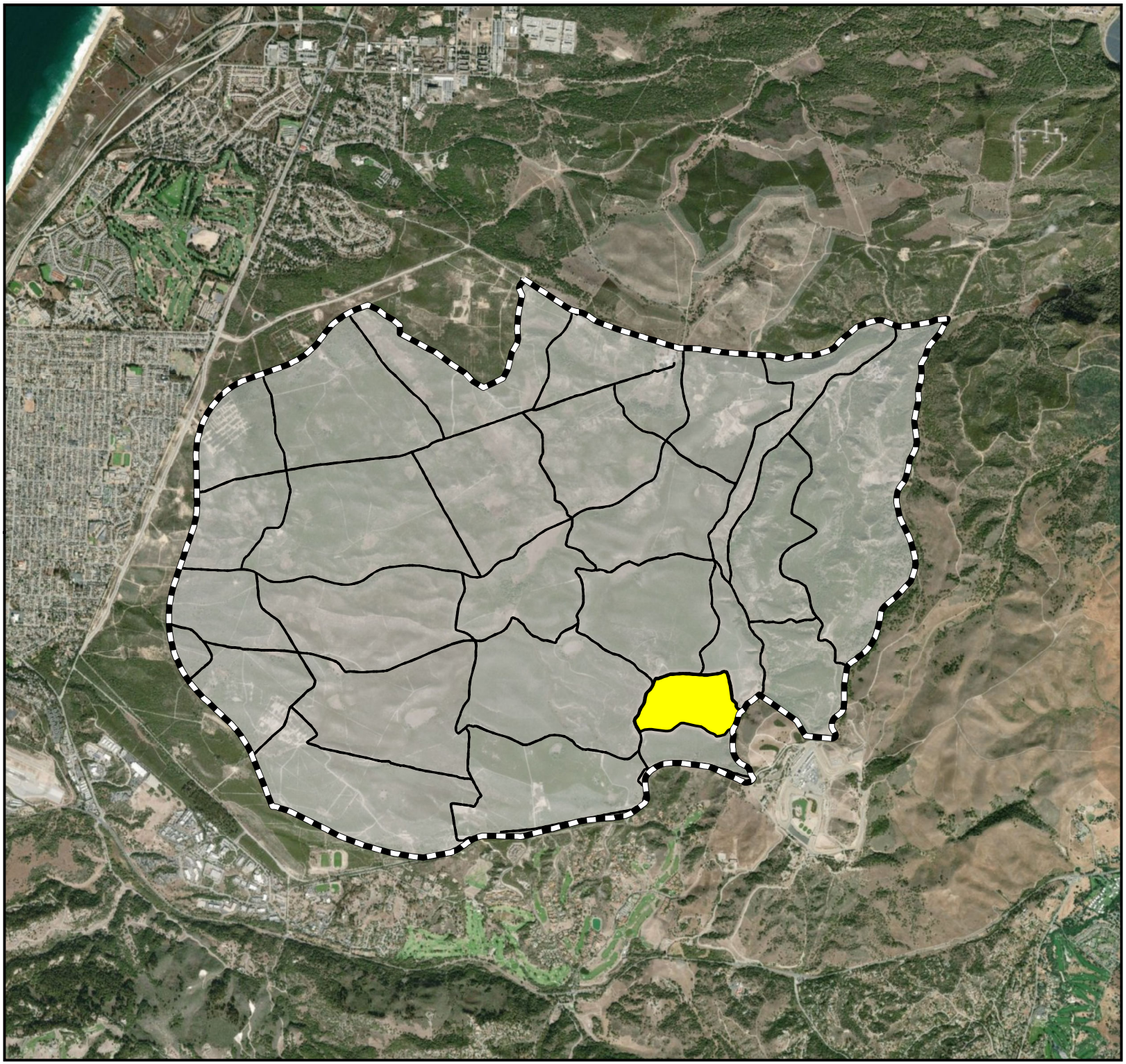
KEMRON, 2015. *Final, Site-Specific Work Plan Munitions and Explosives of Concern Remedial Action, MRS-BLM Units 23 and in Support of Units 11 and 12 Prescribed Burns (includes portions of Units 5A, 9, 25, 28, and 31, Former Fort Ord, California.* December. (OE-0862B)

KEMRON, 2016a. *Final, Quality Assurance Project Plan, Former Fort Ord, California, Volume II, Appendix A, Munitions and Explosives of Concern Remedial Action.* December. (OE-0884A)

KEMRON, 2016b. *Final, Site-Specific Work Plan Munitions and Explosives of Concern Remedial Action, MRS-BLM Units 25 and 31, Former Fort Ord, California.* December. (OE-0880B)

USACE, 1997. *Installation-Wide Multispecies Habitat Management Plan for Former Fort Ord, California (HMP).* April. With technical assistance from Jones and Stokes, Sacramento, California. (BW-1787)

5.0 FIGURES



Legend

- Unit 31
- Impact Area boundary

N

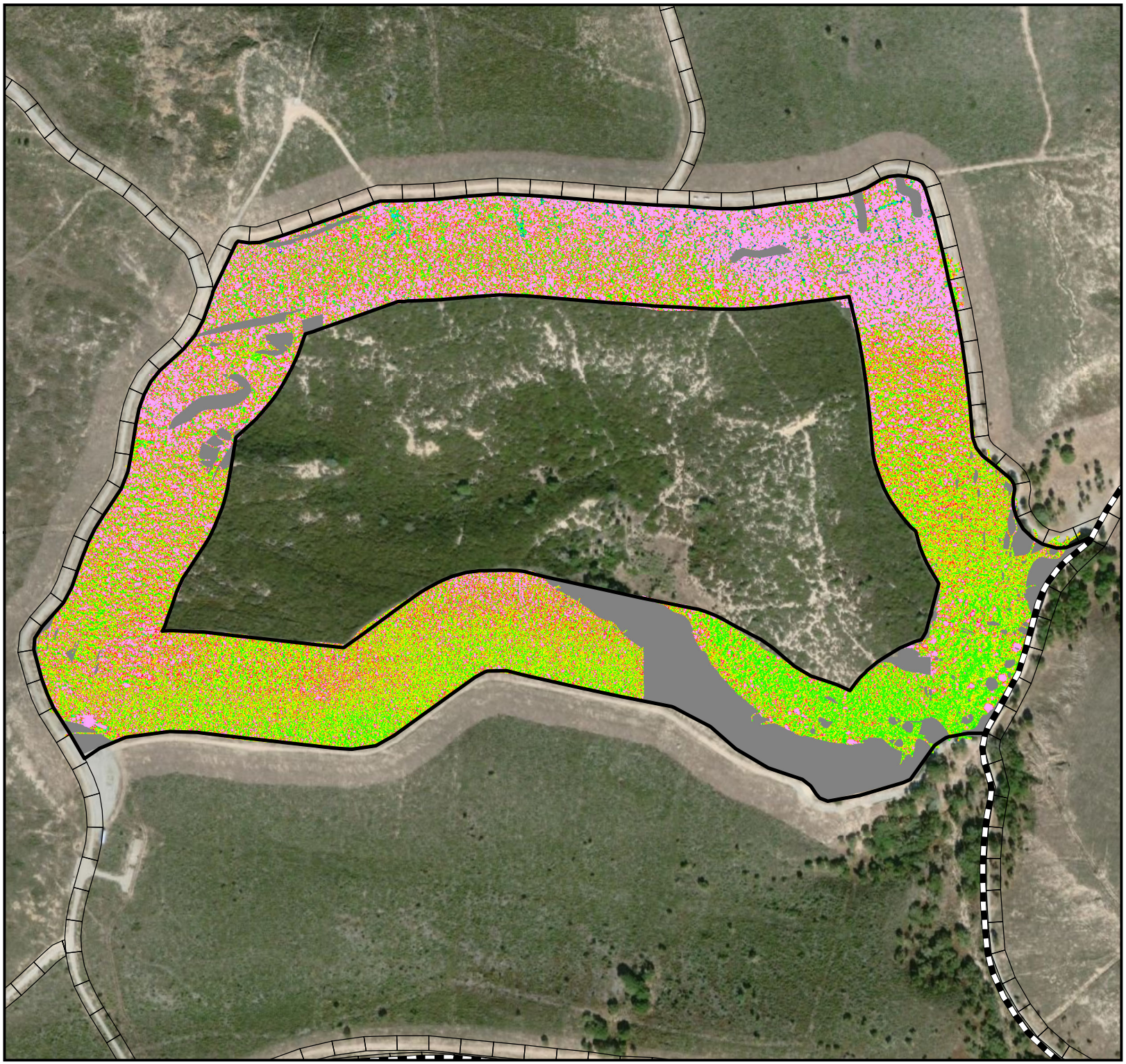
Feet

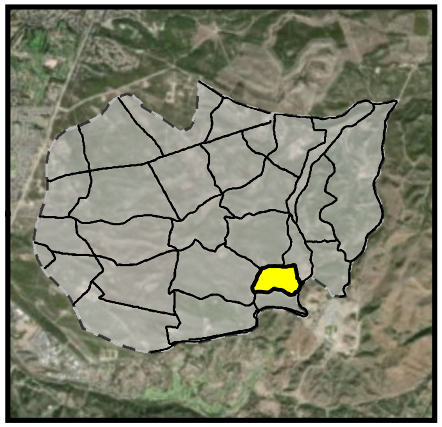
0 2,000 4,000 6,000

U.S. Army Corps of Engineers
Sacramento District

Figure 1

Unit 31
Former Fort Ord, CA





Legend

- Impact Area boundary
- Fuel Breaks
- Gaps

19.2
18.5
17.7
16.9
16.2
15.4
14.6
13.8
13.1
12.3
11.5
10.8
10.0
9.2
8.5
7.7
6.9
6.2
5.4
4.6
3.8
3.1
2.3
1.5
0.8
0.0
-0.8
-1.5
-2.3
-3.1
-3.8
-4.6
-5.4
-6.2
-6.9
-7.7
-8.5
-9.2

mV
CH Sum

N

0 770 **Feet**

U.S. Army Corps of Engineers
Sacramento District

Figure 2

Unit 31 DGM Data
Former Fort Ord, CA

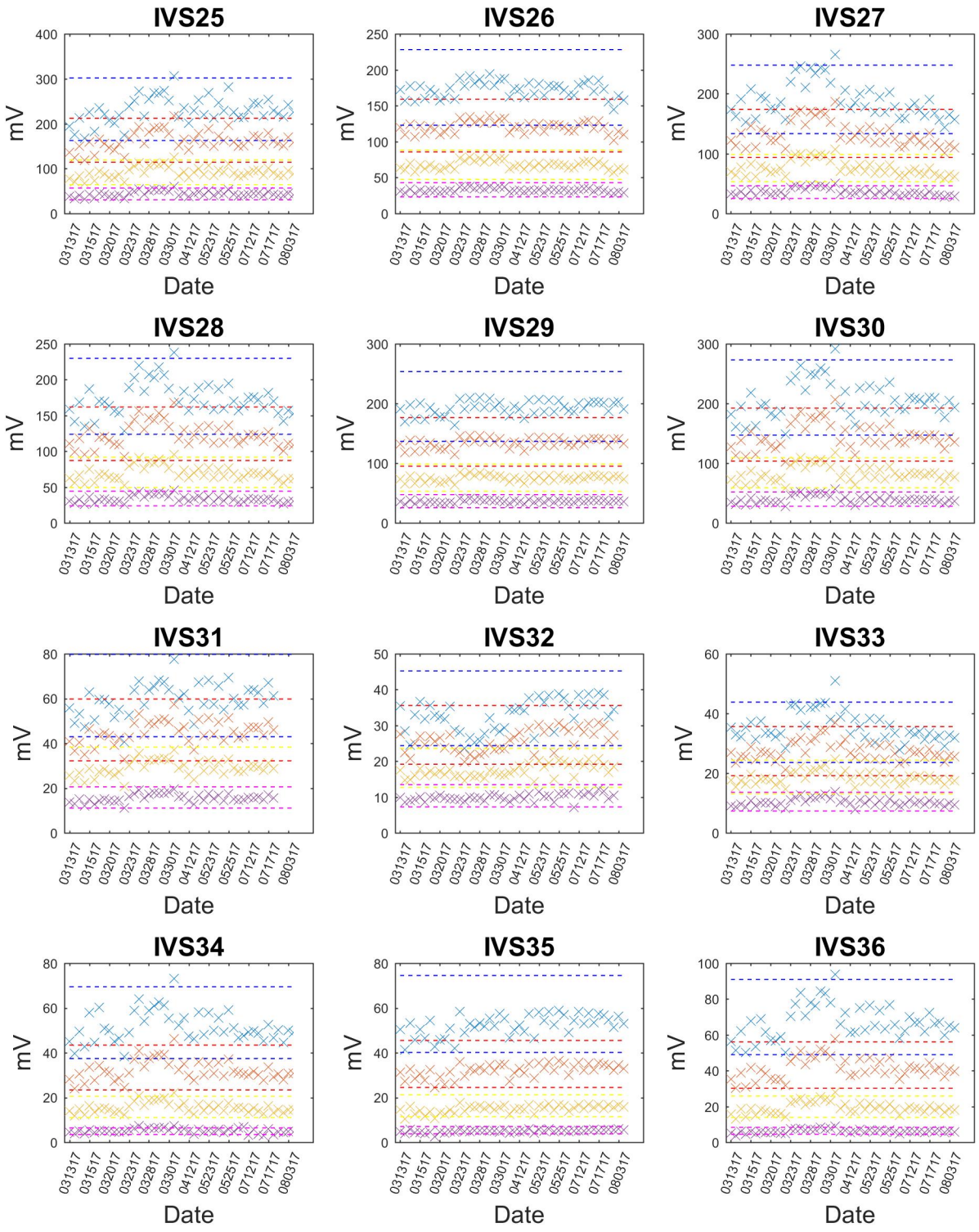


Figure 3. DGM response of IVS items for Unit 31 for each survey day. X symbols represent peak anomaly response for channel 1 (blue), channel 2 (red), channel 3 (yellow), and channel 4 (purple) for each IVS item. Dashed lines represent the allowable variability (+/- 25% of predicted response) established in WS #22.

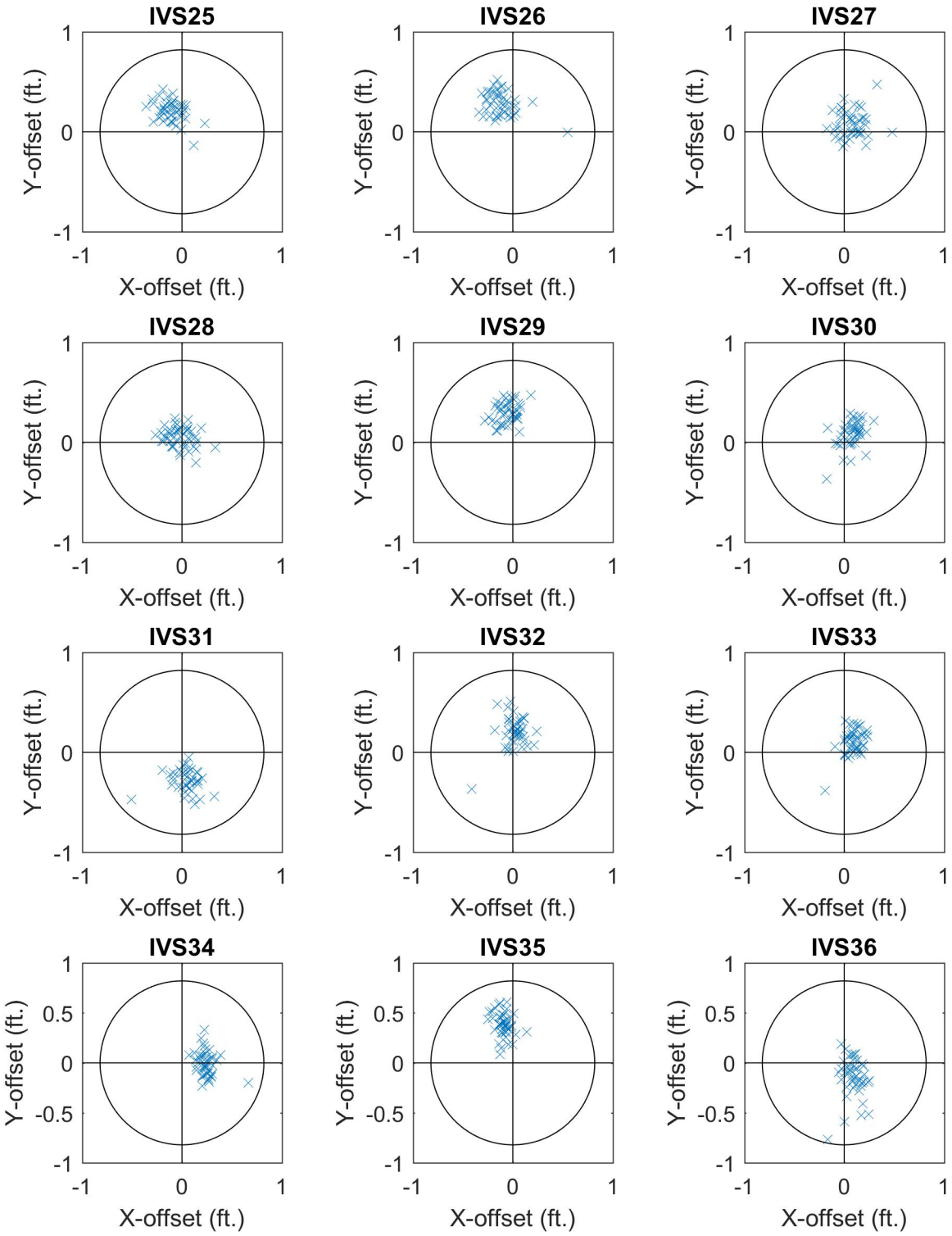


Figure 4. Daily IVS positioning results for Unit 31. Blue X's show the offset between picked DGM anomaly and the IVS ground truth. Black circle shows the maximum acceptable offset (0.82 ft.) established in WS #22.

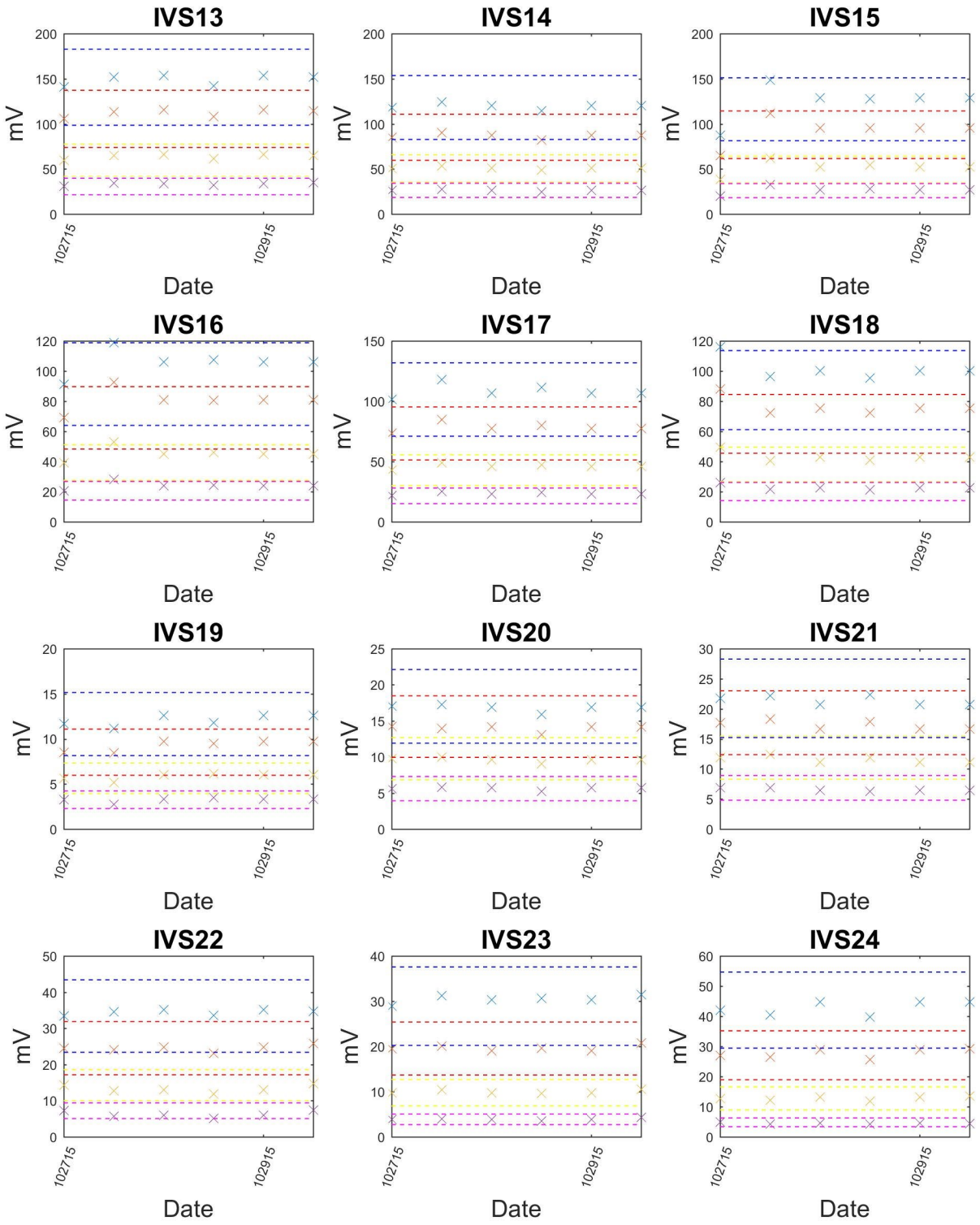


Figure 5. DGM response of IVS items for Unit 31 for each survey day (2015). X symbols represent peak anomaly response for channel 1 (blue), channel 2 (red), channel 3 (yellow), and channel 4 (purple) for each IVS item. Dashed lines represent the allowable variability (+/- 25% of predicted response) established in WS #22.

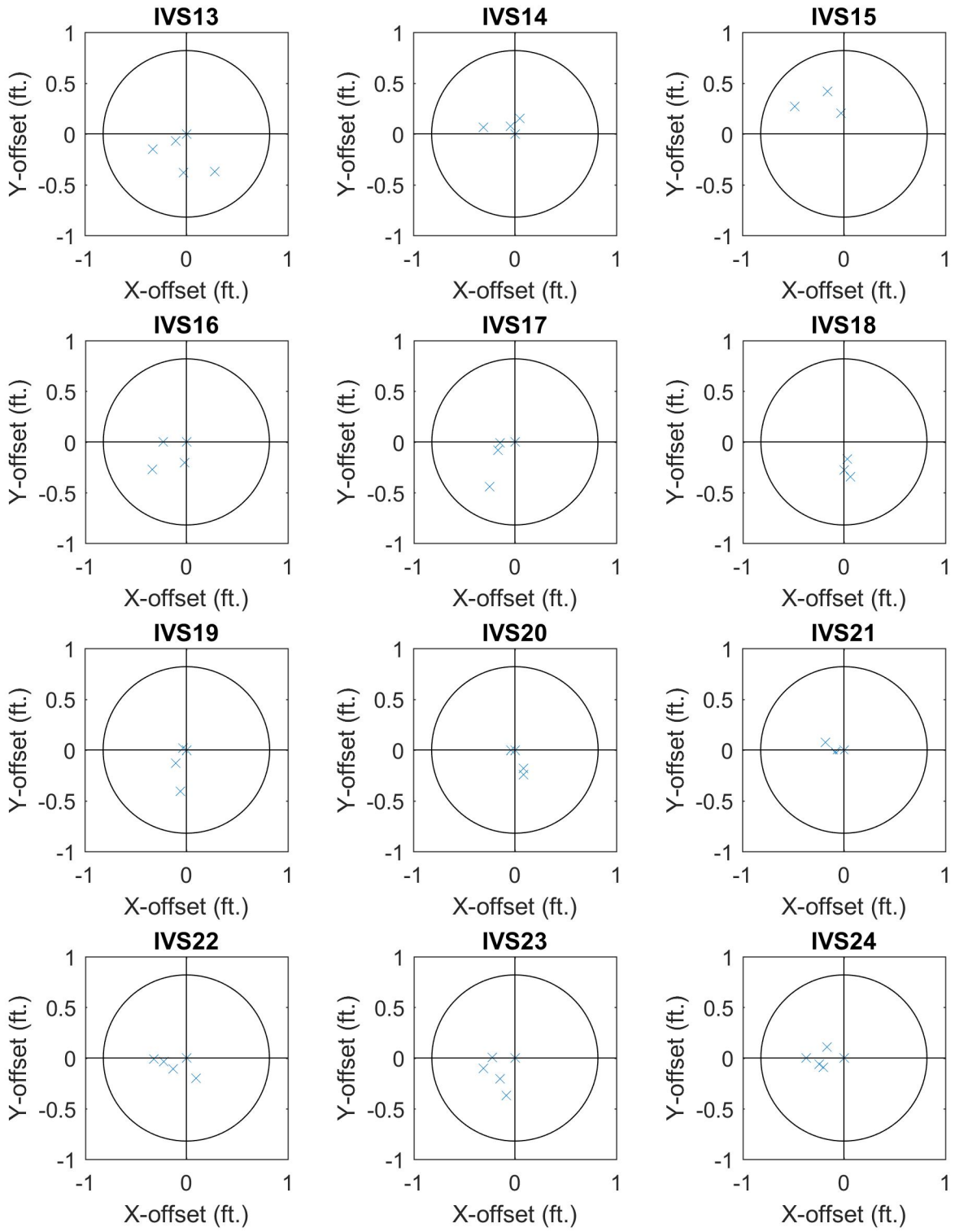


Figure 6. Daily IVS positioning results for Unit 31 (2015). Blue X's show the offset between picked DGM anomaly and the IVS ground truth. Black circle shows the maximum acceptable offset (0.82 ft.) established in WS #22.

6.0 TABLES

Data Type	Data Quality Indicator (DQI)	QC Sample and/or Activity to Assess Measurement Performance	Measurement Quality Objective (MQO)	Frequency	Consequence of Failure (a)
Cable Shake Test	Sensitivity	Instrument Response Tests at the IVS	Cable shake test: 98% of response values will not excseed +/- 2 mV when system cables are moved (for all EM61MK2 channels)	Once Daily (AM)	Do not proceed with DGM field activities until failure is resolved and cable shake test has passed.
Personnel Test	Sensitivity	Instrument Response Tests at the IVS	Personnel test (PP): 98% of response values (due to proximity of data collection personnel) will not exceed +/- 2 mV (for all EM61MK2 channels).	Once Daily (AM)	Do not proceed with DGM field activities until failure is resolved and personnel test has passed.
Tow Vehicle Test	Sensitivity	Instrument Response Tests at the IVS	Tow vehicle test (towed array): 98% of response values (due to elevated two vehicle RPM) will not exceed +/- 2 mV (for all EM61MK2 channels).	Once Daily (AM)	Do not proceed with DGM field activities until failure is resolved and tow vehicle test has passed.
Static repeatability (instrument functionality) (b)	Accuracy/Precision	Instrument Response Tests at the IVS	98% of the daily static background response values (no test object) will not exceed +/- 2 mV of expected baseline response (for all EM61MK2 channels). (d) 98% of the response values to the standard spike test item (a small ISO fixed at an orientation and distance from the sensor to provide an approximately 100 mV response on channel 2 of the EM61MK2) will not exceed +/- 10% of the expected baseline response (for all EM61MK2 channels). (d)	Twice Daily (AM/PM)	If failure occurs during the AM static test, do not proceed with DGM field activities until failure is resolved and AM static test(s) have passed. If failure occurs during PM static test, the day's data fails unless BSI is mapped that day with repeatable anomaly characteristics (see dynamic detection repeatability (GSV blind seeding)).

Along track sampling	Completeness	DGM Data Set or Grid	98% <= 0.65 ft. (20 cm)	By grid or dataset (c)	Submittal fails.
Coverage	Completeness	DGM using GPS Positioning: DGM Data Set or Grid	Category A (towed array): A lane spacing of 2 ft is to be used for the twoed array. 95% (or greater) of the lane spacing is to be at the project design lane spacing of 2 ft. 100% of the lane spacing is to be at 3 ft. No unexplained data gaps. Category B (towed array): A lane spacing of 2 ft is to be used for the towed array. 95% (or greater) of the lane spacing is to be at the project design lane spacing of 2 ft. 98% (or greater) of the lane spacing is to be at 3 ft.	By grid or dataset (c)	Data gaps must be filled in before submittal is accpted.
Dynamic detection repeatability (IVS)	Accuracy/Precision	Instrument Response Tests at the IVS	98% of the dynamic background response values during the daily IVS survey will not exceed +/- 3 mV of expected baseline response (for all EM61MK2 channels). (d) Instrument response to each IVS item will be within +/- 25% or +/- 2 mV(whichever is greater) of the expected baseline response (for all EM61MK2 channels). The baseline response for each IVS item will be the average of the instrument responses to that item measured during the first week of IVS surveys. (d)	Twice Daily (AM/PM)	If failure occurs during the AM IVS test, do not proceed with DGM field activities until failure is resolved and AM dynamic IVS test(s) have passed. If failure occurs during PM IVS test, the day's data fails unless BSI is mapped that day with repeatable anomaly characteristics (see Dynamic Detection Repeatability (GSV blind seeding)).
Dynamic detection repeatability (GSV blind seeding)	Sensitivity/Accuracy/Precision/Completeness	DGM Data Set or Grid	All BSIs must be located. Peak response >75% of maximum expected BSI response. (d)	1 per day per team (# per acre to be based on production rate)	Submittal fails.

Dynamic positioning repeatability (IVS)	Accuracy/Precision	Instrument Response Tests at the IVS	Position offset of IVS targets < 25 cm.	Twice Daily (AM/PM)	If failure occurs during the AM IVS test, do not proceed with DGM field activities until failure is resolved and AM dynamic IVS test(s) have passed. If failure occurs during PM IVS test, the day's data fails unless BSI is mapped that day with repeatable anomaly characteristics (see Dynamic Positioning Repeatability (GSV blind seeding)).
Dynamic positioning repeatability (GSV blind seeding)	Sensitivity/Accuracy/Precision/Completeness	DGM Data Set or Grid	90% positioning offset is <= 25 cm + 1/2 line/sensor spacing and 100% is <= 35 cm + 1/2 line/sensor spacing for digital positioning systems. For Towed Array DGM using 2 ft line spacing (Category A and Category B) and RTK-GPS: 90% <= 22 inches 100% <= 26 inches	1 per team per day (# per acre to be based on production rate - same as dynamic detection repeatability (GSV blind seeding)).	Submittal fails.
Velocity	Completeness	DGM Data Set or Grid	95% of all geophysical measurements with the EM61MK2 will be collected at a speed not to exceed 4 miles per hour (1.8 meters per second)	By grid or dataset (c)	Submittal fails.
Target Selection	Completeness	DGM Data Set or Grid	All dig list targets are selected according to project design as detailed in the SSWP	By grid or dataset (c)	Submittal fails.
Geodetic equipment functionality	Accuracy/Precision	GPS Function check at IVS	GPS position checks will not exceed +/- 3 inches (7.6 cm) from the established baseline position.	Once Daily (AM)	Do not proceed with DGM field activities until failure is resolved and positional check has passed.

Geodetic accuracy	Accuracy/Precision	GPS Function Check of Positional monuments used for RTK-GPS base station(s)	Project control points that are used more than once must be repeatable to within 5 cm (e).	For points used more than once, occupation will be repeated (f) for each point used, either monthly (for frequently used points) or before re-use (if used infrequently) (g).	Reset points not located at original locations or resurvey point.
Verify Field Work Methods	Accuracy/Precision	QC Geophysicist will monitor field team work methods.	Verify work methods are being performed in accordance with MEC QAPP, SOPs, and SSWP.	Daily	Stop work. Generate an RCA, CAR, and CAP (as necessary). Implement corrective actions.
DGM Data Reprocessing	Sensitivity/Accuracy/Precision/Completeness	10% of DGM Data Set or Grid	DGM data will be reprocessed by the QC Geophysicist in accordance with GEO SOP 8 (Geophysical QC).	Daily	Stop work. Generate an RCA, CAR, and CAP (as necessary). Implement corrective actions.

Table 1. DGM MQO table for person-portable EM61 system.

(a) All failures require an RCA.

(b) Duration of data collection is 1 minute for background, 1 minute for spike and 1 minute for second background measurement. All static repeatability is to be compared to original readings to ensure instrument is consistent throughout the project.

(c) The terms grid and dataset refer to logical groupings of data or data collection event. Logical groupings of data are contiguous areas mapped by the same instrument and in the same relative timeframe. These can be grids, acres, or some other unit of area. A data collection event is similar to logical groupings of data but refers to data collected over a contiguous timeframe, such as morning, afternoon, battery life, or some other measure of contiguous time.

(d) For static background, the expected baseline mV response is to be based on an average of all the static background readings collected during the first four days (or first week). For static spike the expected baseline peak mV response is to be based on an average of all the static spike readings collected during the first four days (or first week). For the IVS background, the expected baseline mV response is to be based on an average of all the IVS background readings for the first four days (or first week). For the IVS spike, the expected baseline mV response is to be based on an average of all the IVS spike readings for the first four days (or first week). For GSV BSI items the baseline mV response will be determined by recording an additional survey line that is offset ½ of the planned survey line spacing (1 ft) from the center of the seeded IVS line. This offset line will be recorded twice daily (am/pm) during the first four days (or first week) of DGM operation with the PP system(s) and the baseline mV response to be used for BSIs (for PP and towed array systems) will then be calculated by averaging all of the peak readings for each ISO at this 1 ft offset. Note that separate baselines will be generated and used for the PP and towed-array system static and IVS tests.

(e) GPS base station coordinates that are currently being used are provided by USACE/BRAC.

(f) Repeat occupation means demonstrate the control points being used can be recovered and reoccupied and that they have not moved more than the requirement specification. This can be accomplished using the same methodology used to initially tie the local network to a HARN, CORS, OPUS, or other recognized network, or it can be accomplished by other means that achieve this requirement.

(g) An example of frequently used control points would be points used as RTK DGPS base stations. Infrequently used points could be those used during GPS operations where the control point was used during mapping and then again at some later time for reacquisition and QC statistical sampling. Infrequently used points also could include grid corners; they are used for line and fiducial positioning and then reused for reacquisition or QC statistical sampling.

Note: Although it is highly unlikely, should an area originally categorized and seeded for Category B (i.e. seeded for DGM at a rate of approximately 1 Blind Seed Item (BSI) for every 4 acres and not planned for intrusive investigation) then be upgraded to Category A after DGM has been completed (i.e. should be seeded at a rate of 1 BSI per dig team per day and planned for intrusive investigation), that if the dig team does not have 1 BSI per dig team per day that this would not constitute a QC failure because the density of BSIs installed would have been based on the original selection of this area as Category B. The rationale for stating this scenario is that once the DGM data has been collected, it is impossible to add additional BSIs (i.e. add additional anomalies to the previously collected DGM data). If this scenario does occur, it has been identified in the QAPP and discussed in relation to QC objectives and their pass/fail criteria.

Seed ID	Grid	Reported Sum Response (mV)	Response Passes?	Total Offset (in)	Positioning Passes?
31001G	A3J4B4	275.00	Yes	8.37	Yes
31002G	A3J4B9	294.31	Yes	10.73	Yes
31003G	A3J5B3	285.87	Yes	3.85	Yes
31004G	A3J5B7	312.78	Yes	9.94	Yes
31005G	A3I5J2	436.33	Yes	2.89	Yes
31006G	A3I5I0	511.24	Yes	3.22	Yes
31008G	A3I6B2	424.55	Yes	2.28	Yes
31007G	A3I6F1	302.41	Yes	9.60	Yes
31012G	A3H4H4	583.17	Yes	4.23	Yes
31011G	A3H4I8	400.32	Yes	8.97	Yes
31014G	A3H3G5	593.27	Yes	9.81	Yes
31013G	A3H3H9	313.92	Yes	21.40	Yes
31016G	A3I3G7	394.71	Yes	7.61	Yes
31015G	A3I3A5	300.02	Yes	6.30	Yes
31010G	A3H5G8	420.52	Yes	8.61	Yes
31009G	A3H6H1	251.15	Yes	14.07	Yes

Table 2. Blind QC seed response and positioning results in Unit 31.