BLM Area B Track 2 Ponds Geophysical Anomaly Investigation Technical Information Paper Former Fort Ord, California

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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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List of Acronyms

AGC	Advanced Geophysical Classification
AR	Administrative Record
Army	United States Department of the Army
BLM	United States Bureau of Land Management
CTS	California Tiger Salamander
DGM	Digital Geophysical Mapping
DMM	Discarded Military Munitions
EM61	Geonics EM61-MK2A
FWV	Field Work Variance
KEMRON	KEMRON Environmental Services, Inc.
MD	Munitions Debris
MEC	Munitions and Explosives of Concern
mm	millimeter
MM2x2	MetalMapper 2x2
MPPEH	Material Potentially Presenting an Explosive Hazard
mV	millivolt
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RA	Remedial Action
RD	Remedial Design
ROD	Record of Decision
RRD/OD	Range Related Debris/Other Debris
SOP	Standard Operating Procedure
SRA	Saturated Response Area
SSWP	Site-Specific Work Plan
TIP	Technical Information Paper
TOI	Target of Interest
USACE	United States Army Corps of Engineers
UXO	Unexploded Ordnance
WP	Work Plan

1.0   Introduction

This Technical Information Paper (TIP) describes the Geophysical Anomaly Investigation of the selected Bureau of Land Management (BLM) Area B vernal ponds performed by KEMRON Environmental Services, Inc. (KEMRON), with Gilbane as a subcontractor. This document presents the results of a limited subsurface Munitions and Explosives of Concern (MEC) removal in selected BLM Area B vernal ponds (selected ponds; see Section 1.1) to address the anomalies that potentially represent MEC items in the selected pond areas.

1.1   Purpose and Scope

This document presents the results of a MetalMapper 2x2 (MM2x2) evaluation of selected targets located within the Digital Geophysical Mapping (DGM) pond survey area of the selected BLM Area B ponds, and subsequent intrusive investigation of selected anomalies. Anomalies that potentially represented MEC items within the DGM pond survey areas of the selected BLM Area B ponds were removed to reduce risk during biological surveys. Wetland monitoring requires that biologists enter the inundated areas when the visibility of the surface is obstructed by water and there is a potential for subsurface disturbance. *Final Record of Decision Track 2 Bureau of Land Management Area B and Munitions Response Site 16 Former Fort Ord, California* [Track 2 ROD; United States Department of the Army (Army), 2017] requires construction support for ground-disturbing or intrusive activities. Due to the lack of visibility in inundated areas, construction support and anomaly avoidance are impractical to support access to selected ponds during wet periods. To reduce the risk to personnel performing biological surveys in the BLM Area B ponds, the decision was made to conduct subsurface removal of MEC within the pond boundaries.

Any negative impact to this vernal pond could affect the habitat value for endangered species that might use the pond. To minimize impacts to the sensitive habitat within selected BLM Area B ponds, advanced geophysical classification techniques were utilized to reduce the number of intrusive investigations. Procedures for intrusive investigations were developed and implemented to maintain the integrity of the vernal pool. Anomaly investigations were minimized and standard procedures followed to maintain the integrity of the selected BLM Area B ponds. Section 3.3 and Appendix A provide further detail regarding these procedures.

1.2 Approval Documents

The BLM Area B vernal ponds geophysical anomaly investigation occurred under the following documents:

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

- *Quality Assurance Project Plan Superfund Response Actions Former Fort Ord, California Volume II Munitions Response Appendix B Advanced Geophysical Classification for Munitions Response Quality Assurance Project Plan* (AGCMR-QAPP; KEMRON, 2016b);

- Track 2 ROD; (Army, 2017);

- *Final Work Plan Remedial Design (RD)/Remedial Action (RA) Track 2 Bureau of Land Management Area B and Munitions Response Site 16 Former Fort Ord, California* (Track 2 RD/RA WP; KEMRON, 2017a);

- *Final Site-Specific Work Plan Munitions and Explosives of Concern Remedial Action BLM Area B Former Fort Ord, California* (BLM Area B SSWP; KEMRON, 2017b); and

- *Field Work Variance 021 to the Final Site-Specific Work Plan Munitions and Explosives of Concern Remedial Action, BLM Area B, Former Fort Ord, California* (FWV 021, KEMRON, 2018).

2.0 Site Background

2.1 Background

BLM Area B contains several vernal ponds which are seasonal wetlands. The inundation area of the ponds may vary between years, depending on a number of factors. Due to the seasonality of these resources, the inundation areas of the ponds often vary within the year, and the ponds typically lack water in the dry summer months.

Vernal ponds on the former Fort Ord are known to, or have the potential to, provide habitat for California fairy shrimp (*Linderiella californica*) and breeding habitat for the state and federally threatened California tiger salamander (*Ambystoma californiense*; CTS). Monitoring for biological resources requires that biologists enter the inundated areas when the visibility of the ground surface is obstructed by water. To reduce the risk to personnel performing biological surveys in the BLM Area B vernal ponds, the decision was made to conduct subsurface removal

of MEC within the DGM pond survey area. Removal of MEC is not feasible when water is present in the ponds. Vernal ponds generally retain water throughout much of the year; however, 2016 was a particularly dry year. To take advantage of dry conditions in 2016, a DGM survey was conducted using an EM61. Pond 73 was identified during the remedial action and the DGM survey was conducted in 2017. The EM61 data was used to select anomalies for a limited-scope subsurface MEC removal in the fall of 2018 when the pond was sufficiently dry. Due to the sensitive nature of these resources and the habitat they provide, a person-portable EM61 was used to collect DGM data in order to minimize impacts on the vernal pond environments. Data collection was completed in accordance with standards outlined in the QAPP (KEMRON, 2016a).

2.2   Site Location

BLM Area B is located north of the Impact Area Munitions Response Area (Figure 1). Table 1 and Figure 2 identify the selected ponds in BLM Area B where KEMRON conducted anomaly investigations. The anomaly investigation dig results (Appendix C) provide the dates of work conducted for each pond. Additional ponds are present in BLM Area B; however, these ponds were not included in the anomaly investigation efforts identified in FWV 021 (KEMRON, 2018). Ponds were selected if no previous MEC remediation occurred within their inundation boundaries, and if they were within the remedial work area or within the areas prepared for prescribed burns. As vernal ponds are dynamic systems that often change in size and shape over time, the KEMRON project biologist delineated the DGM pond survey area of the selected ponds in the field. The project biologist considered site specific variables at each selected pond, including topography and vegetation.

Table 1. BLM Area B Track 2 Selected Vernal Ponds

Unit	DGM Pond Survey Area	Pond Area Size (Acres)	Date of DGM Survey	Date of Anomaly Investigations
A	Pond 41	1.9	Oct. 2016 – Dec. 2016	Oct. 2018
	Pond 44	0.2	Oct. 2016 – Dec. 2016	Oct. 2018
B	Pond 3N	0.4	Oct. 2016 – Dec.2016	Oct. 2018
	Pond 3S	0.9	Oct. 2016 – Dec. 2016	Oct. 2018
	Pond 35	0.3	Oct. 2016 – Dec. 2016	Oct. 2018
	Pond 39	0.7	Oct. 2016 – Dec. 2016	Oct. 2018
	Pond 40N	< 0.1	Oct. 2016 – Dec. 2016	Oct. 2018
	Pond 40S	0.7	Oct. 2016 – Dec. 2016	Oct. 2018
	Pond 42	0.5	Oct. 2016 – Dec. 2016	Oct. 2018
	Pond 43	< 0.1	Oct. 2016 – Dec. 2016	Oct. 2018
Adjacent to B-2A	Pond 61	2.2	Oct. 2016 – Dec. 2016	Oct. 2018
B-3E	Pond 60	3.0	Oct. 2016 – Dec. 2016	Oct. 2018
B-3E-NE	Pond 73	1.1	Dec. 2017– Jan. 2018	Oct. 2018

All of the selected ponds in BLM Area B, with the exception of Pond 73, were identified in the *Flora and Fauna Baseline Study of Fort Ord, California* conducted by Jones and Stokes Associates, Inc. for the United States Army Corps of Engineers (USACE, 1992). Project biologists identified Pond 73 in the field during biological monitoring activities associated with the remedial action in Unit B-3E-NE.

3.0 Overview of Investigation

3.1 Geophysical Approach

A joint determination was made by the USACE Ordnance and Explosives Safety Specialist and KEMRON Unexploded Ordnance (UXO) Safety Officer that a DGM survey could occur with UXO escort performing anomaly avoidance. Consequently, the DGM survey personnel were required to be escorted by a UXO technician to properly implement anomaly avoidance procedures.

3.1.1 Data Collection and Anomaly Selection

All data collection was conducted when the pond areas were dry. Quality control/ quality assurance (QA/QC) objectives were met and are detailed in Section 4.0.

As identified in FWV 021 (KEMRON, 2018), DGM surveys occurred in the selected ponds using a person-portable Geonics EM61-MK2A (EM61). Data collection was completed within the DGM pond survey area in accordance with standards outlined in the QAPP (KEMRON, 2016a). Subsurface anomalies were identified in the DGM datasets using a 14 millivolt (mV) sum channel detection threshold, with the exception of Saturated Response Areas (SRAs) and data gaps. No individual anomalies could be identified in SRAs due to elevated responses. SRAs were present in in Ponds 39 and 41. Data gaps were present in portions of the pond areas where vegetation or terrain precluded the use of the EM61.

The FWV 021 (KEMRON, 2018) recommended solution was a limited subsurface MEC removal with AGC, utilizing the Geometrics MM2x2. The MM2x2 was placed directly over anomaly locations to acquire static data in accordance with the AGCMR-QAPP (KEMRON, 2016b). The acquired static data was processed through an inversion modeling routine to estimate the intrinsic parameters of each anomaly source. The results were compared to the known parameters of MEC items in the classification library. Using AGC, each anomaly was classified by category according to its likelihood of being a target of interest (TOI), and the level of investigation was determined (Table 2).

Table 2. AGC Anomalies by Category and Level of Investigation Assigned

Category	Level of Investigation
Category 0 (Cannot analyze)	Target remained on dig list. Targets with an amplitude greater than 4.2 mV were excavated to a depth of 18 inches. Targets with an amplitude less than 4.2mV were checked with a handheld metal detector prior to intrusive investigation. If a signal of appropriate strength was detected, the target was excavated to a depth of 18 inches. If an insufficient signal was detected, the target was identified as false positive, and the investigation was considered complete.
Category 1 (High-confidence TOI)	Intrusively investigated (no maximum depth of investigation).
Category 2 (Inconclusive)	Targets were intrusively investigated to a depth of 18 inches.
Category 3 (High-confidence Non-TOI)	Not investigated.

3.1.2   Anomaly Investigation

KEMRON completed the anomaly investigation within the pond areas (Figures 3A-14B and Table 3) in accordance with the QAPP (KEMRON, 2016a); AGCMR-QAPP (KEMRON, 2016b); Track 2 ROD (Army, 2017); Track 2 RD/RA WP (KEMRON, 2017a); BLM Area B SSWP (KEMRON, 2017b); and FWV 021 (KEMRON, 2018). QA/QC objectives were met and are detailed in Section 4.0. During anomaly investigation activities, specific habitat avoidance and minimization measures were followed. KEMRON conducted work only when the pond areas were suitably dry.

All AGC-selected anomalies (targets) were investigated in October 2018. Due to the high confidence associated with Category 1 targets, all Category 1 targets were intrusively investigated. Category 2 targets were intrusively investigated to a depth of 18 inches. If no anomaly source was located for a Category 2 target, the intrusive investigation was terminated at 18 inches and recorded as an unknown target. Category 3 targets were not intrusively investigated. Category 0 target locations with a response amplitude less than 4.2 mV (channel 2) were investigated using an EM61 in analog mode. If no subsurface metal was detected, the investigation was considered complete and recorded as a false positive. Category 0 target locations with a response amplitude greater than 4.2 mV (channel 2) were intrusively investigated to a depth of 18 inches in accordance with the intrusive investigation Standard Operating Procedures (SOPs) in the QAPP (KEMRON, 2018). If no anomaly source was located for a Category 0 target, the intrusive investigation was terminated at 18 inches and recorded as an unknown target.

In the SRA areas and DGM data gaps, where no targets could be identified, anomaly investigations were conducted using analog methods. In these areas an intrusive investigation occurred using a hand-held metal detector and an EM61 in analog mode. Anomalies identified using the EM61 in analog mode, where the channel 2 response values greater than or equal to 4.2 millivolt (mV)

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(equivalent to the 14mV sum channel detection threshold) were excavated, up to a depth of 18 inches.

3.2   Maintaining Clay Layer During Investigation

The *Wetland Monitoring and Restoration Plan for Munitions and Contaminated Soil Remedial Activities at Former Fort Ord* (Burleson Consulting Inc., 2006) describes the requirements to mitigate impacts on wetland habitats associated with remedial activities. The extent of disturbance to wetland soils and hydrology resulting from the limited subsurface MEC removal depends on both the depth to which soils are removed and the water-holding properties of the soils. An investigation was conducted to map the subsurface structure of a subset of the vernal ponds, which determined the depth to confining clay layers and estimated heterogeneity of soil layering that promotes retention of the water in the ponds (USACE, 2019). If the properties of water retention were to be altered as a result of loss of the bedding properties of the ponds, then this would have adverse effects on the wetland function. In order to cause the least disturbance of the confining clay layers, the anomaly investigations were minimized in lateral dimension. Procedures in the *SOP AGCMR-09, Anomaly Reacquisition and Intrusive Investigation*, as modified by FWV 021 (KEMRON, 2018), were followed as described in Section 3.1.2. A USACE geologist was present during the anomaly investigations to monitor intrusive activities (Appendix B).

3.3   Results

Anomalies investigated within the pond areas resulted in the recovery of MEC items, munitions debris (MD), and range related debris (RRD)/other debris (OD). Results for AGC anomaly investigation digs are included in Appendix C. "Same anomaly" was assigned to excess target(s) when multiple targets identified the same object/signal. If no signal or an insufficient signal was detected at a target location the target was identified as a "false positive" in the dig results. If a signal was detected for a Category 0 or a Category 2 target but the source of the signal was not encountered within the 18-inch excavation, the source was identified as "unknown" (Appendix C). A summary of the AGC anomaly investigation dig results are provided in Table 4 below. Analog investigations of the SRAs and data gaps resulted in investigations in three pond areas (Table 3).

Table 3. Analog Anomaly Investigation (SRAs & Data Gaps) Dig Results

Location	Analog Survey Acres	Investigations	MEC Items Encountered	MD Encountered	RRD and OD Encountered
Pond 39	0.04	6*	0	0	0
Pond 41	0.01	2*	0	0	0
Pond 42	0.14	0	0	0	0.5 pounds**

MEC: Munitions and Explosives of Concern

MD: Munitions Debris

RRD/OD: Range Related Debris/Other Debris

* The source of the signal was not encountered within the 18-inch excavation.

** The 0.5 pounds of RRD/OD was found on the ground surface.

Table 4. Summary of AGC Anomaly Investigation Dig Results

Location	Total Target Count	Dig Results							Unknown[2] Targets	QC Seed Count	Other Results	
		MEC			MD		RRD and OD				Same Anomaly[3] (Targets)	False Positive[4] (Targets)
		Targets	UXO	DMM	Targets	Pounds	Targets	Pounds[1]				
Pond 35	7	0	0	0	0	0	3	36	0	0	1	3
Pond 39	48	0	0	0	3	9.25	14	39.5	1	0	0	30
Pond 3N	9	0	0	0	0	0	4	1	3	0	0	2
Pond 3S	7	0	0	0	1	0.25	2	2.5	0	0	0	4
Pond 40N	1	0	0	0	0	0	0	0	0	0	0	1
Pond 40S	32	0	0	0	6	10.25	14	64.5	4	0	0	8
Pond 41	87	2	2	0	39	92.25	7	51.25	3	2	2	32
Pond 42	27	0	0	0	2	0.75	1	0.75	7	2	0	15
Pond 43	12	0	0	0	2	6	0	0	4	0	3	3
Pond 44	14	0	0	0	4	7	3	1.5	2	0	2	3
Pond 60	18	1	1	0	2	1	2	10.25	3	0	0	10
Pond 61	40	0	0	0	17	19.5	16	59.75	0	2	0	5
Pond 73	11	0	0	0	1	1	6	30	0	0	0	4

MEC: Munitions and Explosives of Concern
DMM: Discarded Military Munitions
MD: Munitions Debris
N: North
QC: Quality Control
S: South
UXO: Unexploded Ordnance
RRD/OD: Range Related Debris/Other Debris
[1] Includes QC seed weight.
[2] If a signal was detected for a Category 0 or a Category 2 target but the source of the signal was not encountered within the 18-inch excavation, the source was identified as "unknown".
[3] "Same anomaly" was assigned to excess target(s) when multiple targets identified the same object/signal.
[4] If no signal or an insufficient signal was detected at a target location the target was identified as a "false positive" in the dig results.

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3.3.1   Summary of MEC/Munitions Debris Removed

During the course of the investigation at the selected ponds, a total of three UXO items were removed from the pond areas (Table 5). A total of 147.25 pounds of MD and 297.5 pounds of RRD/OD were removed during the course of the investigation. Materials removed were disposed of in accordance with *Attachment B Standard Operating Procedure for MEC and MPPEH Management* (UXO SOP 5) of the QAPP (KEMRON, 2016a).

Table 5. BLM Area B Track 2 Selected Vernal Ponds MEC Summary

Unit	Location	Date	Count	Depth (inches)	Type	Description
A	Pond 41	10/18/2018	1	11	UXO	signal, illumination, ground, M125 series
		10/22/2018	1	1	UXO	flare, surface, trip, M49 series
B-3E	Pond 60	10/17/2018	1	4	UXO	projectile, 40mm, high explosive, M406

UXO: Unexploded Ordnance
mm: millimeter

4.0   Quality Control/Quality Assurance

Quality standards for MM2x2 data collection and classification were met and are described in the AGCMR-QAPP (KEMRON, 2016b). The intrusive investigations of selected targets were conducted in accordance with *SOP AGCMR-09, Anomaly Reacquisition and Intrusive Investigation*, as modified by the SOP attached to FWV 021 (KEMRON, 2018) included in Appendix A. The QC Geophysicist completed verification of anomaly resolution for all of these anomalies.

Sixteen QC seed items were emplaced to verify the quality of DGM operations. All 16 DGM QC seed items were detected and selected for further investigation during the EM61 DGM detection survey. Ten of the 16 QC seed items were recovered and removed during surface sweep operations performed after the EM61 DGM detection survey but prior to AGC cued measurements. Appendix C, which reports only subsurface intrusive investigation results, therefore includes only the six QC seed items recovered during DGM-based subsurface removal. The detection, identification for further investigation, and ultimate recovery of all 16 DGM QC seeds successfully verified the quality of DGM operations.

5.0   Environmental Protection

During MEC removal activities at the selected BLM Area B ponds, specific habitat avoidance and minimization measures were followed. Specific measures included; 1) conducting MEC removal work as described in the SOP attached to FWV 021 (KEMRON, 2018) included in Appendix A,

and 2) avoiding work while the pond was inundated. Prior to the start of MEC removal activities, the project biologist flagged the boundaries of the pond to identify the project boundaries and avoid impacts to areas outside of the project site. Only small mechanical equipment or manual equipment was used to remove vegetation when necessary (Ponds 44, 60, and 73). Hand crews limbed several oak trees in Pond 43. The photographs provided in Appendix B are representative displays of the procedures followed during anomaly excavations.

6.0   Conclusion

The investigation performed in selected ponds was consistent with the Track 2 RD/RA WP (USACE, 2017), the Track 2 ROD (Army, 2017), the BLM Area B SSWP (KEMRON, 2017), and FWV 021 (KEMRON, 2018; Appendix A). The anomaly investigation for the selected ponds in BLM Area B is complete. All DGM pond survey areas passed QC/QA inspections and standards.

Figures 3A – 14B show the pond areas and examples of historic inundation for the selected ponds. Potential risk associated with entering the ponds has been reduced over the extent of the pond areas where anomaly investigations occurred. If biological surveys are planned outside the extent of the DGM pond survey areas during wet conditions, the Ordnance and Explosives Safety Specialist and UXO Safety Officer should be consulted for site specific best practices before undertaking field work.

Anomalies that potentially represented MEC items within the DGM pond survey area of selected ponds in BLM Area B were removed to reduce the potential risk to biologists during biological surveys. Biological surveys in BLM Area B selected ponds within the DGM pond survey area may occur without construction support or anomaly avoidance.

7.0   References

Burleson Consulting Inc., 2006. *Wetland Monitoring and Restoration Plan for Munitions and Contaminated Soil Remedial Activities at Former Fort Ord.* [Administrative Record (AR)# BW-2453]

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

KEMRON, 2016b. *Quality Assurance Project Plan Superfund Response Actions Former Fort Ord, California Volume II Munitions Response Appendix B Advanced Geophysical Classification for Munitions Response Quality Assurance Project Plan.* (AR# OE-0868B)

KEMRON, 2017a. *Final Work Plan Remedial Design (RD)/Remedial Action (RA) Track 2 Bureau of Land Management Area B and Munitions Response Site 16 Former Fort Ord, California.* (AR# OE-0899B)

KEMRON, 2017b. *Final Site-Specific Work Plan Munitions and Explosives of Concern Remedial Action BLM Area B Former Fort Ord, California.* (AR# OE-0900B)

KEMRON, 2018. *Field Work Variance 021 to the Final Site-Specific Work Plan, Munitions and Explosives of Concern Remedial Action BLM Area B, Former Fort Ord, California.* (AR# OE-0900B.3)

The United States Department of the Army (Army), 2017. *Final Record of Decision Track 2 Bureau of Land Management Area B and Munitions Response Site 16 Former Fort Ord, California.* (AR# OE-0897)

The United States Army Corps of Engineers (USACE), 1992. *Flora and Fauna Baseline Study of Fort Ord, California.* (AR# BW-1938)

USACE, 2019. *Final Ground-Penetrating Radar Investigation of Vernal Ponds in BLM Area B at former Fort Ord, Monterey, California.* (AR# BW-2864)
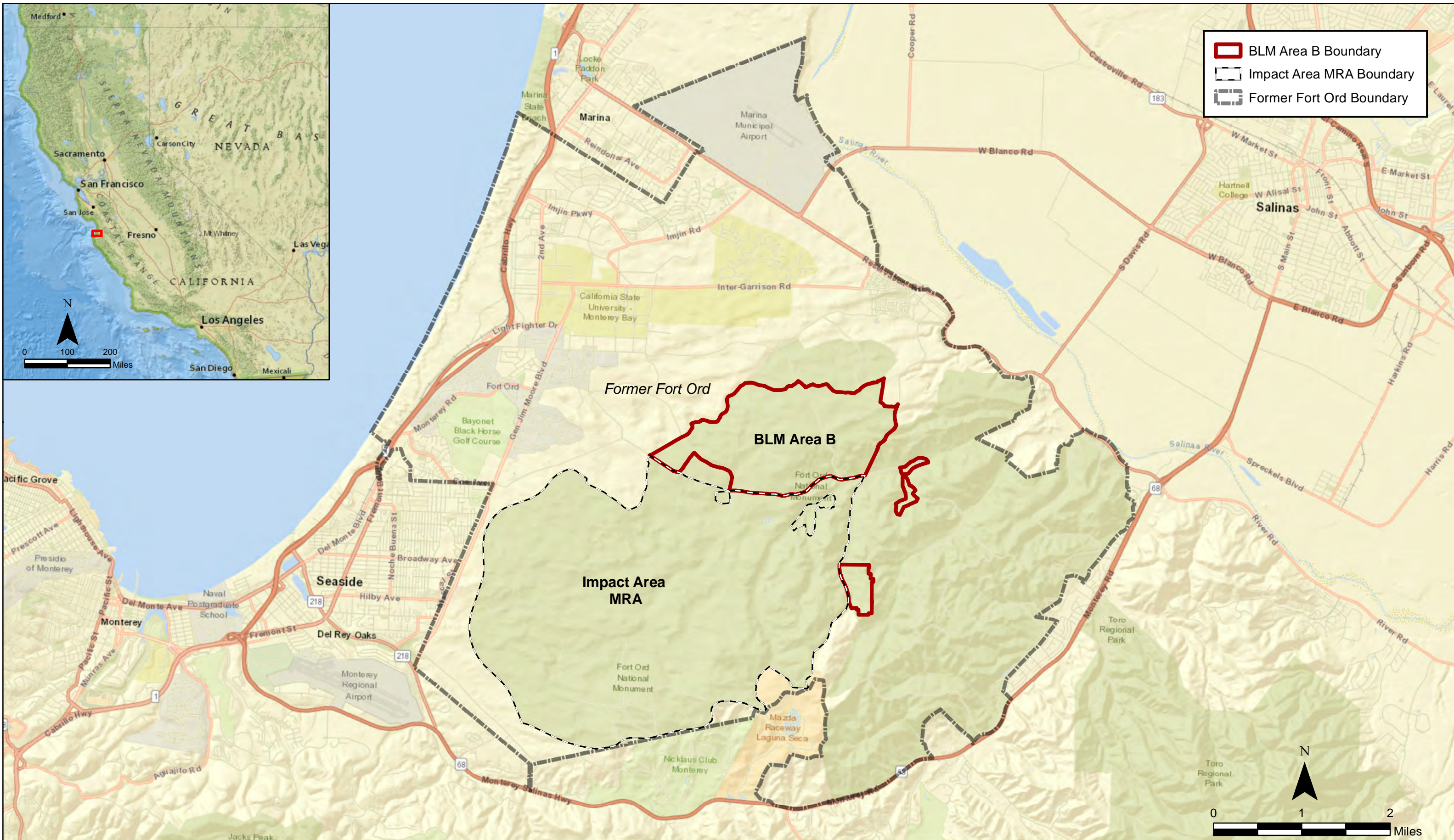
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Figures

BLM Area B Track 2 Ponds
Geophysical Anomaly Investigation
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Figure 1
Location

Legend:
- BLM Area B Boundary
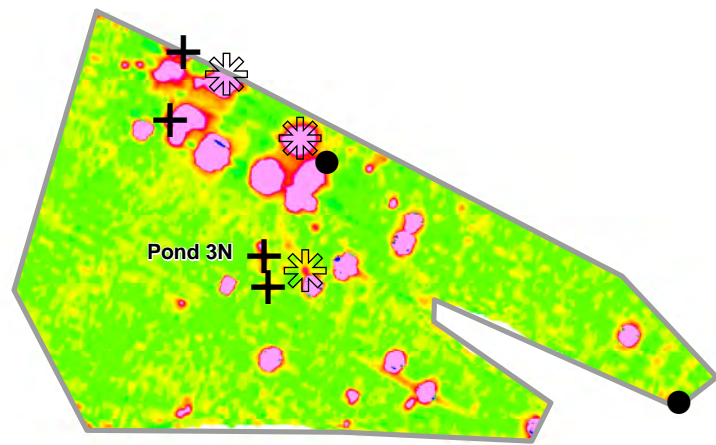- Impact Area MRA Boundary
- Former Fort Ord Boundary

Legend:
- DGM Pond Survey Area
- BLM Area B MEC Remediation Areas
- Unit Boundaries
- BLM Area B Boundary
- Impact Area MRA Boundary

Pond inundation areas may vary between years depending on a number of factors. This figure identifies ponds where limited subsurface MEC removal has been conducted. Additional ponds are present in BLM Area B.
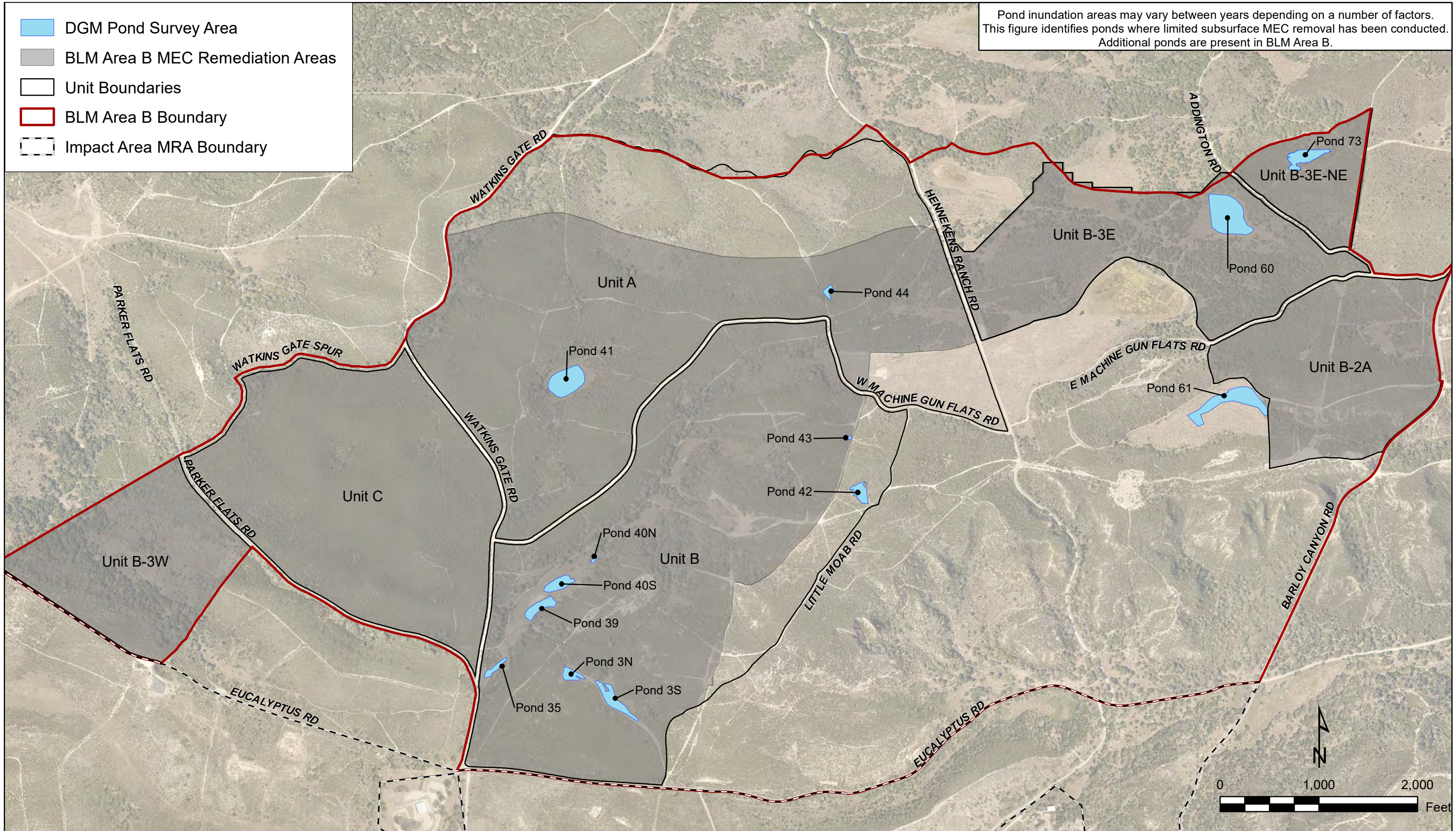
BLM Area B Track 2 Ponds
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Figure 2
Selected Pond Overview

C:\Users\shession\Documents\GIS_Files\PROJECTS\BLM\Area_B\PondTargets\Maps\BLM_ReportFigures\Figure2-PondOverview20181005.mxd   4/22/2019   [06:14 AM]   SHESSION, KEMRON

EM61-MK2A Readings

BLM Area B Boundary

Unit Boundaries

DGM Pond Survey Area (3N ~0.4 acres & 3S ~0.9 acres)

AGC Anomaly Investigation Results - Pond 3N

+ RRD/OD (4 targets, 1 pound)

✳ Unknown Target* (3 targets)

● False Positive** (2 targets)

AGC Anomaly Investigation Results - Pond 3S

⚡ MD (1 target, 0.25 pounds)

+ RRD/OD (2 targets, 2.5 pounds)

● False Positive** (4 targets)

If a signal was detected for a Category 0 or a Category 2 target but the source of the signal was not encountered within the 18-inch excavation, the source was identified as "unknown".
**If no signal or an insufficient signal was detected at a target location the target was identified as a "false positive" in the dig results.

Negative values can occur in DGM data as a result of minimum curvature gridding and/or levelling the data.

Pond 3N

Pond 3S

Unit B

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

Unit B-3E-NE

Unit B-3E

Unit A

Unit B-2A

Unit C

Unit B

0   0.5
Miles

0   200
Feet

N

BLM Area B
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Figure 3A
Ponds 3N & 3S
DGM and Dig Results

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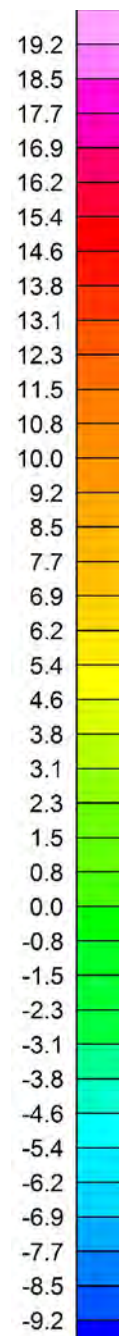ENVIRONMENTAL SERVICES

Gilbane
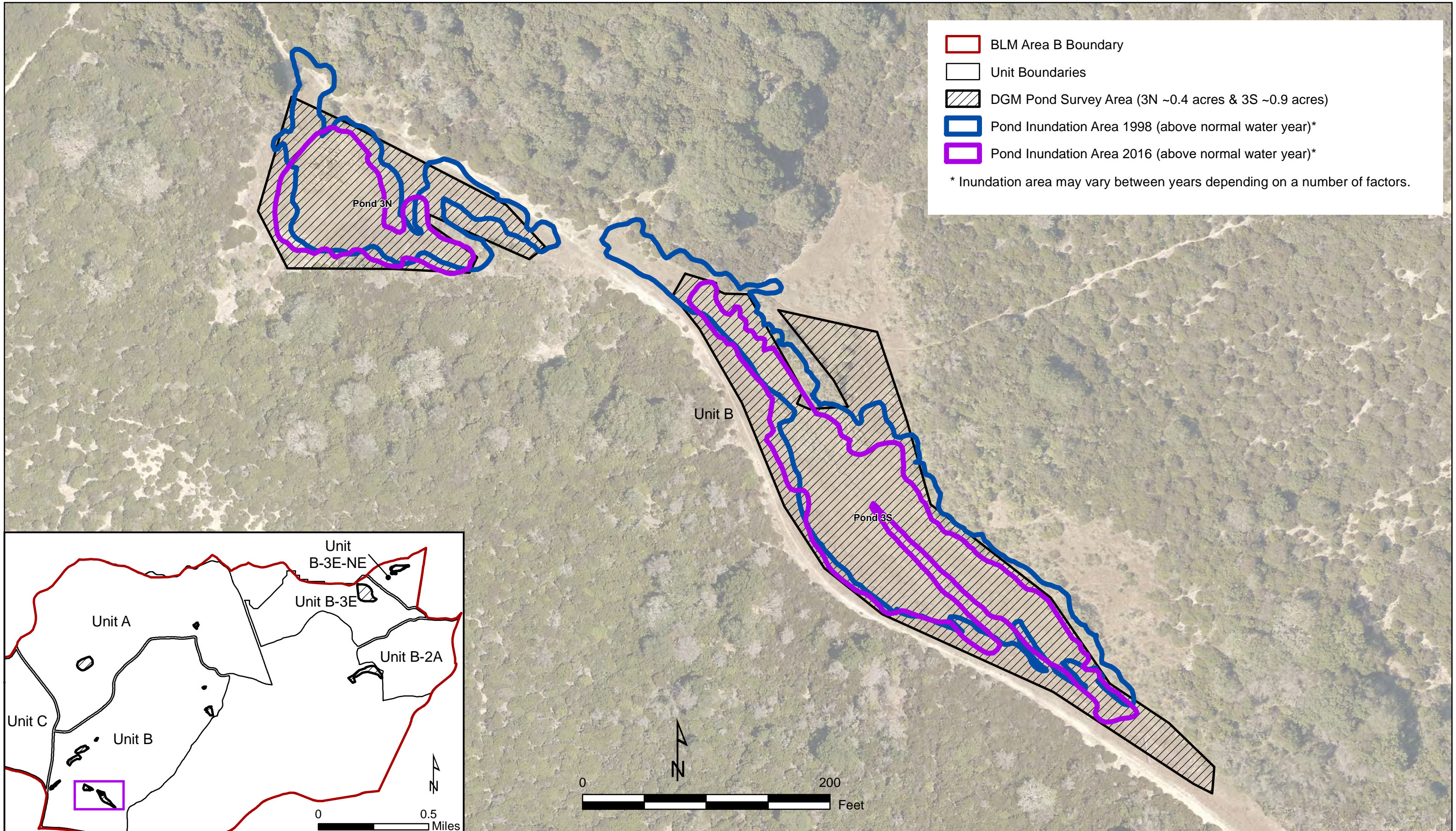
Legend:
- BLM Area B Boundary
- Unit Boundaries
- DGM Pond Survey Area (3N ~0.4 acres & 3S ~0.9 acres)
- Pond Inundation Area 1998 (above normal water year)*
- Pond Inundation Area 2016 (above normal water year)*

* Inundation area may vary between years depending on a number of factors.

Pond 3N

Pond 3S

Unit B

Unit B-3E-NE

Unit B-3E

Unit A

Unit B-2A

Unit C

Unit B

0   0.5 Miles

0   200 Feet

BLM Area B
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Figure 3B
Ponds 3N & 3S
Inundation Area

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EM61-MK2A Readings

mV CH Sum
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

Negative values can occur in DGM data as a result of minimum curvature gridding and/or levelling the data.

Unit B-2A

Legend:
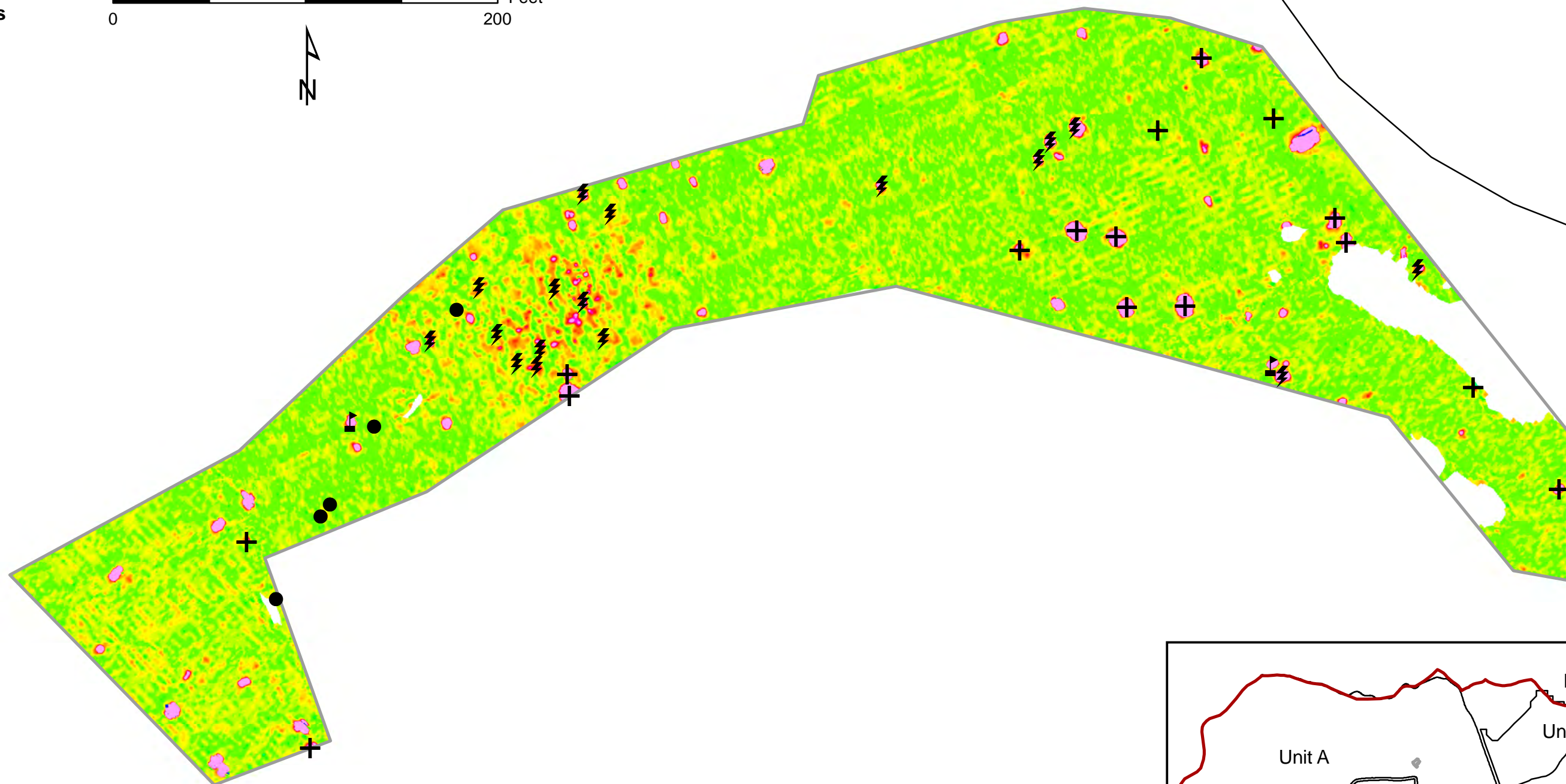
- Unit Boundaries
- BLM Area B Boundary
- DGM Pond Survey Area (~2.2 acres)

*If no signal or an insufficient signal was detected at a target location the target was identified as a "false positive" in the dig results.

AGC Anomaly Investigation Results

- ⚡ MD (17 targets, 19.5 pounds)
- ✚ RRD/OD (16 targets, 59.75 pounds)
- QC Seed (2 targets)
- ● False Positive* (5 targets)

Unit B-3E-NE
Unit B-3E
Unit A
Unit B-2A
Unit C
Unit B
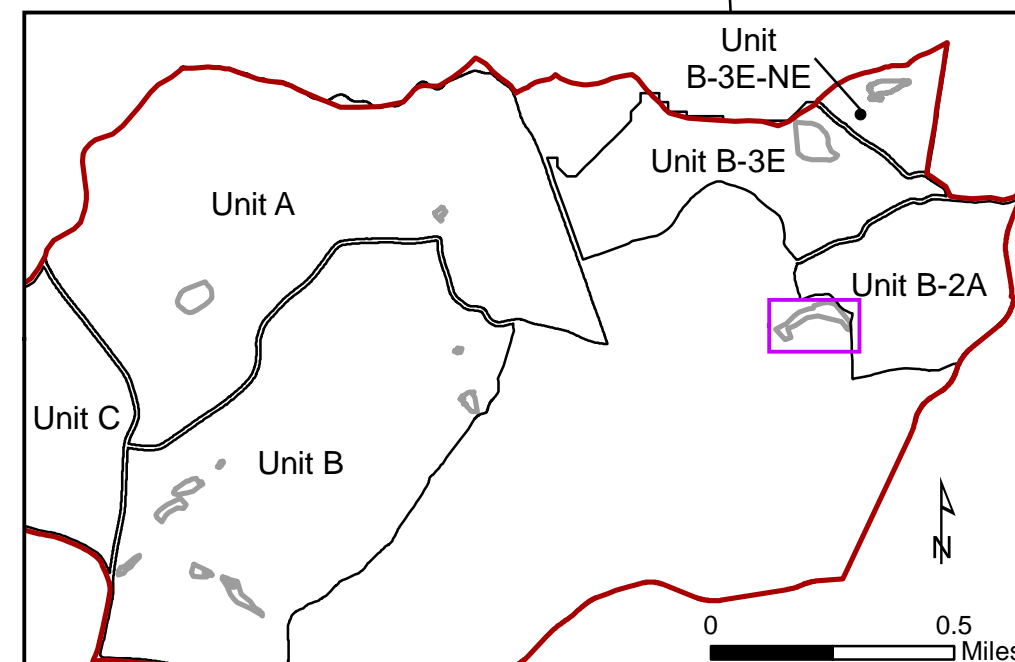
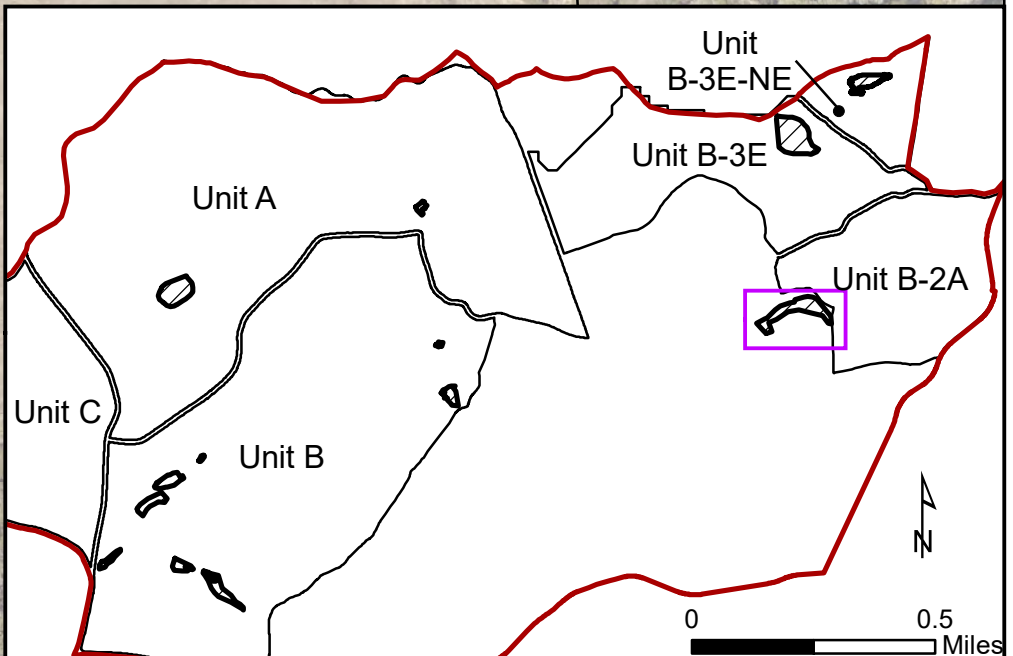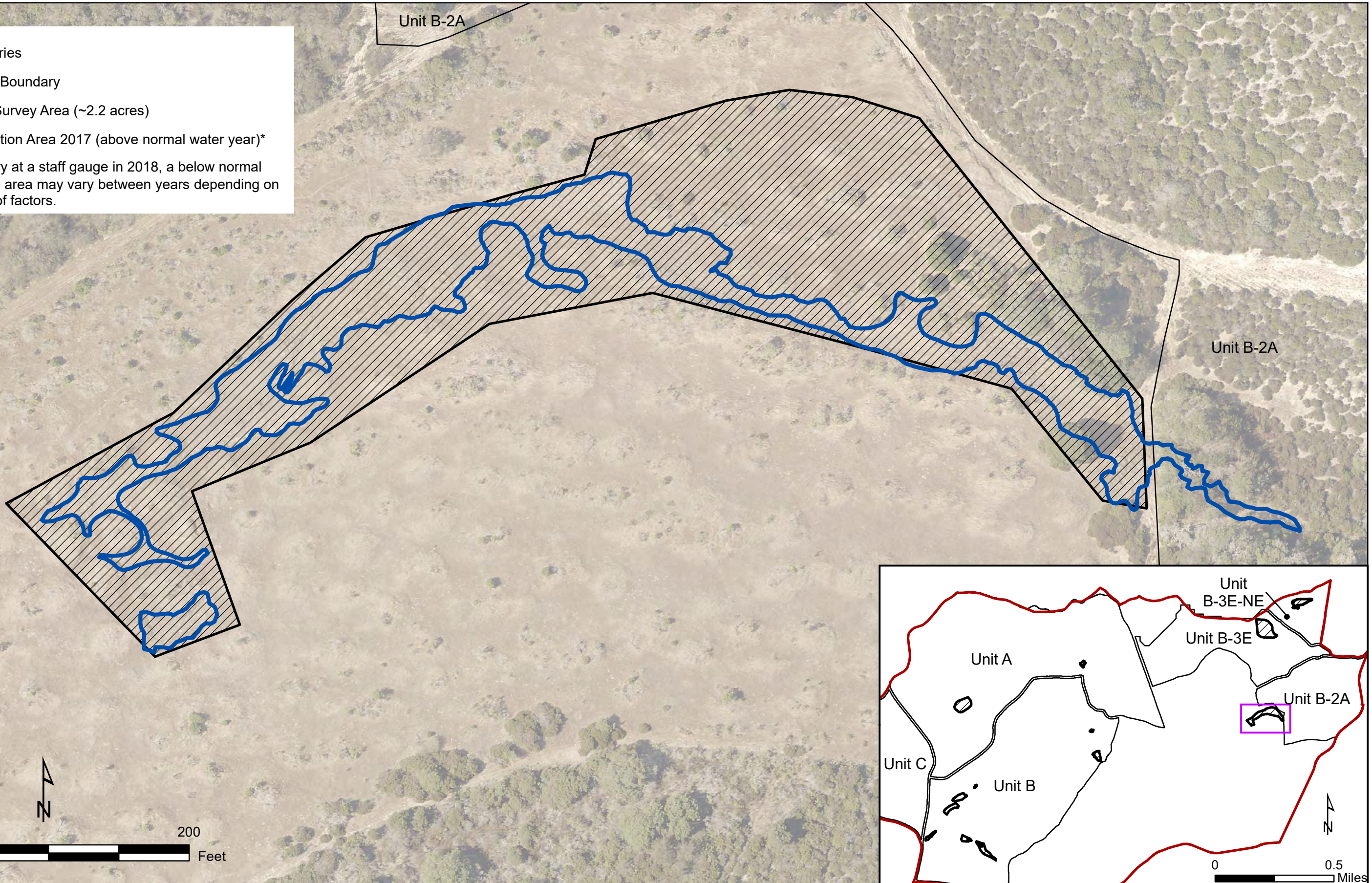**KEMRON** ENVIRONMENTAL SERVICES **Gilbane**

BLM Area B
Geophysical Anomaly Investigation
Technical Information Paper
Former Fort Ord, California

Figure 4A
Pond 61
DGM and Dig Results

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Legend:
- Unit Boundaries
- BLM Area B Boundary
- DGM Pond Survey Area (~2.2 acres)
- Pond Inundation Area 2017 (above normal water year)*

* Pond 61 remained dry at a staff gauge in 2018, a below normal water year. Inundation area may vary between years depending on a number of factors.

Unit B-2A

Unit B-2A

0   200
Feet

Unit A

Unit B-3E-NE

Unit B-3E

Unit B-2A

Unit C

Unit B

0   0.5
Miles

BLM Area B Track 2 Ponds
Geophysical Anomaly Investigation
Technical Information Paper
Former Fort Ord, California
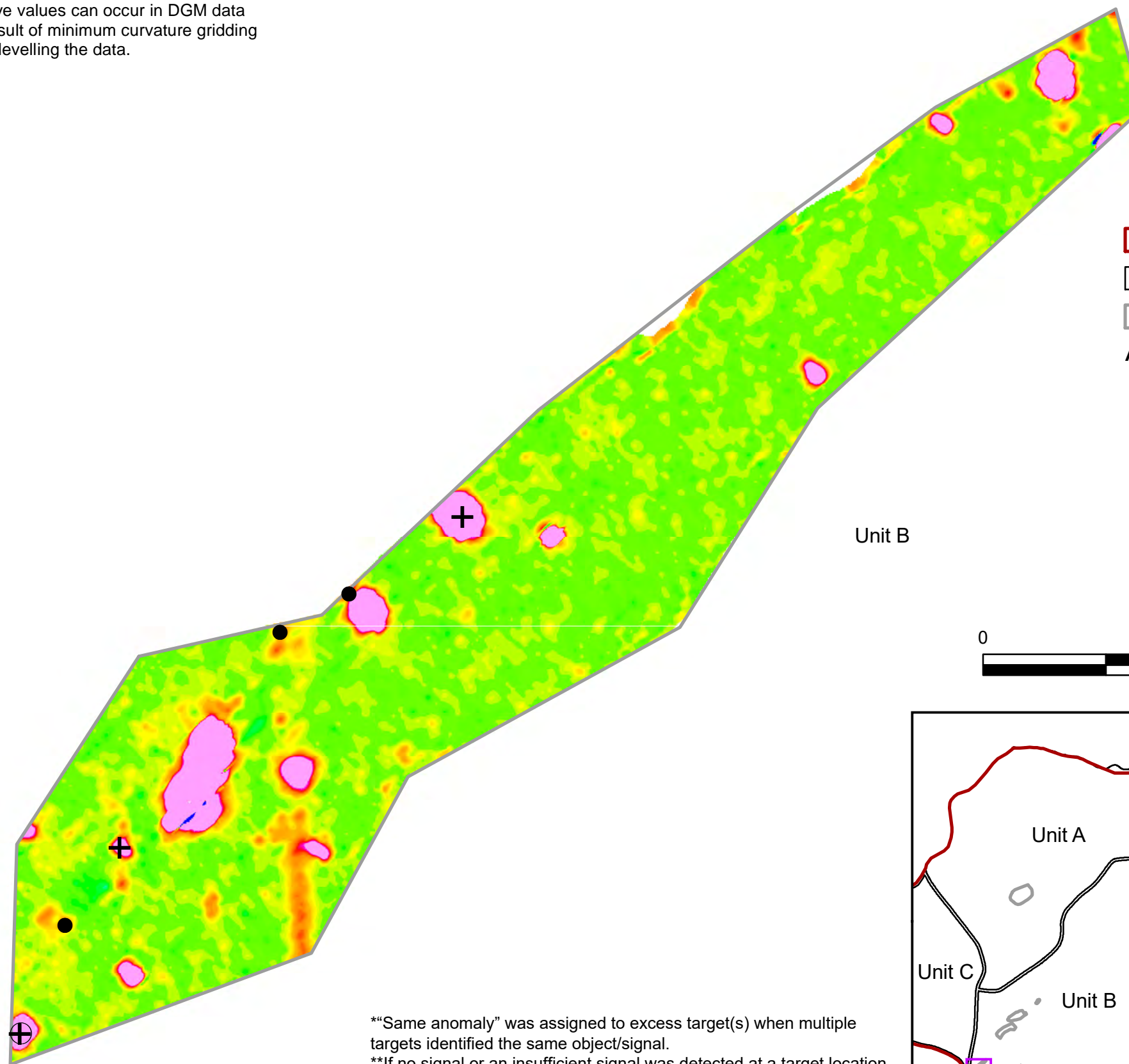
KEMRON ENVIRONMENTAL SERVICES

Gilbane

Figure 4B
Pond 61
Inundation Area

EM61-MK2A Readings

Negative values can occur in DGM data as a result of minimum curvature gridding and/or levelling the data.

mV CH Sum
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
-3.8
-4.6
-5.4
-6.2
-6.9
-7.7
-8.5
-9.2

WATKINS GATE RD

Unit B

Legend

- BLM Area B Boundary
- Unit Boundaries
- DGM Pond Survey Area (~0.3 acres)

AGC Anomaly Investigation Results

- **+** RRD/OD (3 targets, 36 pounds)
- ○ Same Anomaly* (1 target)
- ● False Positive** (3 targets)
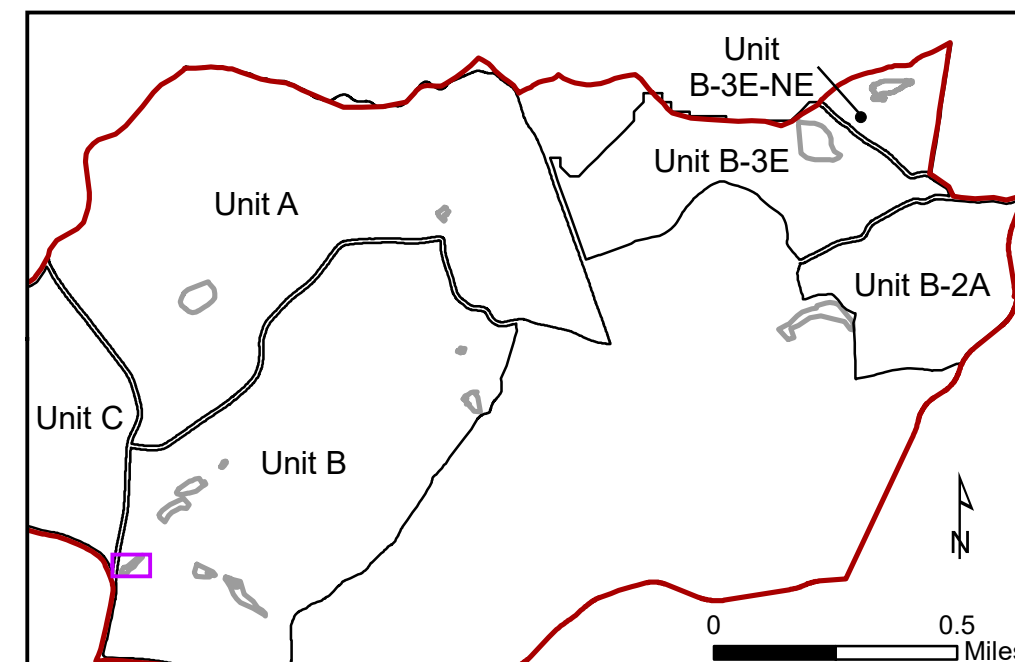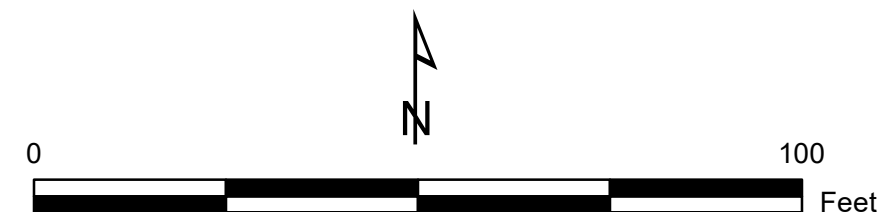
0 — 100 Feet

*"Same anomaly" was assigned to excess target(s) when multiple targets identified the same object/signal.
**If no signal or an insufficient signal was detected at a target location the target was identified as a "false positive" in the dig results.

Unit B-3E-NE
Unit B-3E
Unit A
Unit B-2A
Unit C
Unit B

0 — 0.5 Miles

BLM Area B Track 2 Ponds
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Figure 5A
Pond 35
DGM and Dig Results

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BLM Area B Boundary

Unit Boundaries

DGM Pond Survey Area (~0.3 acres)

Pond Inundation Area 2016 (above normal water year)*

* Pond 35 remained dry in 2018, a below normal water year.
Inundation area may vary between years depending on a number of factors.

Unit C

WATKINS GATE RD

Unit B

0   100
Feet

Unit B-3E-NE

Unit B-3E

Unit A

Unit B-2A

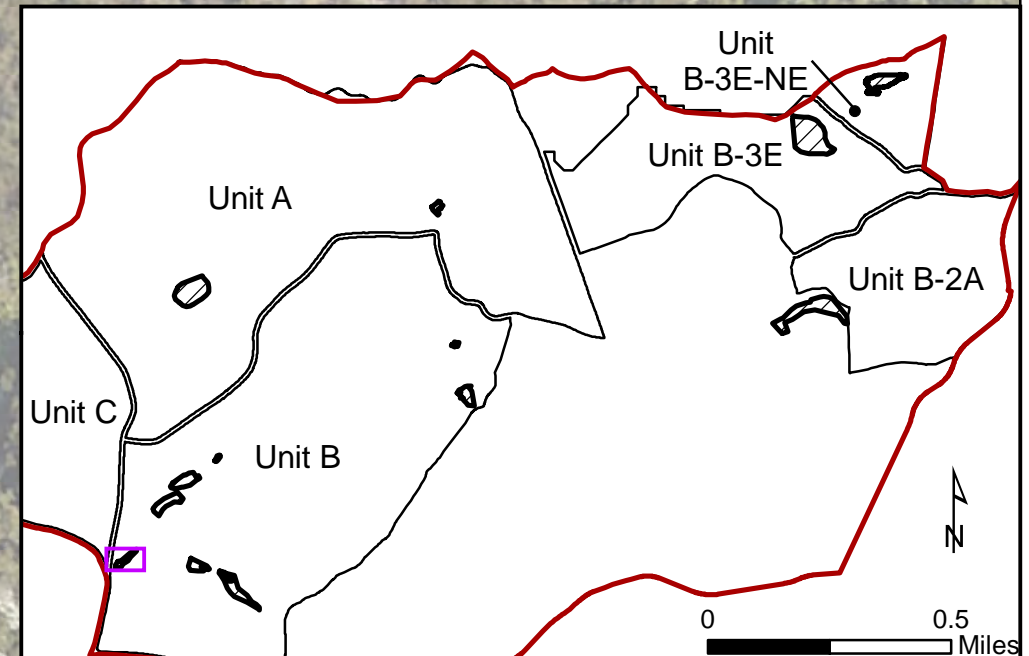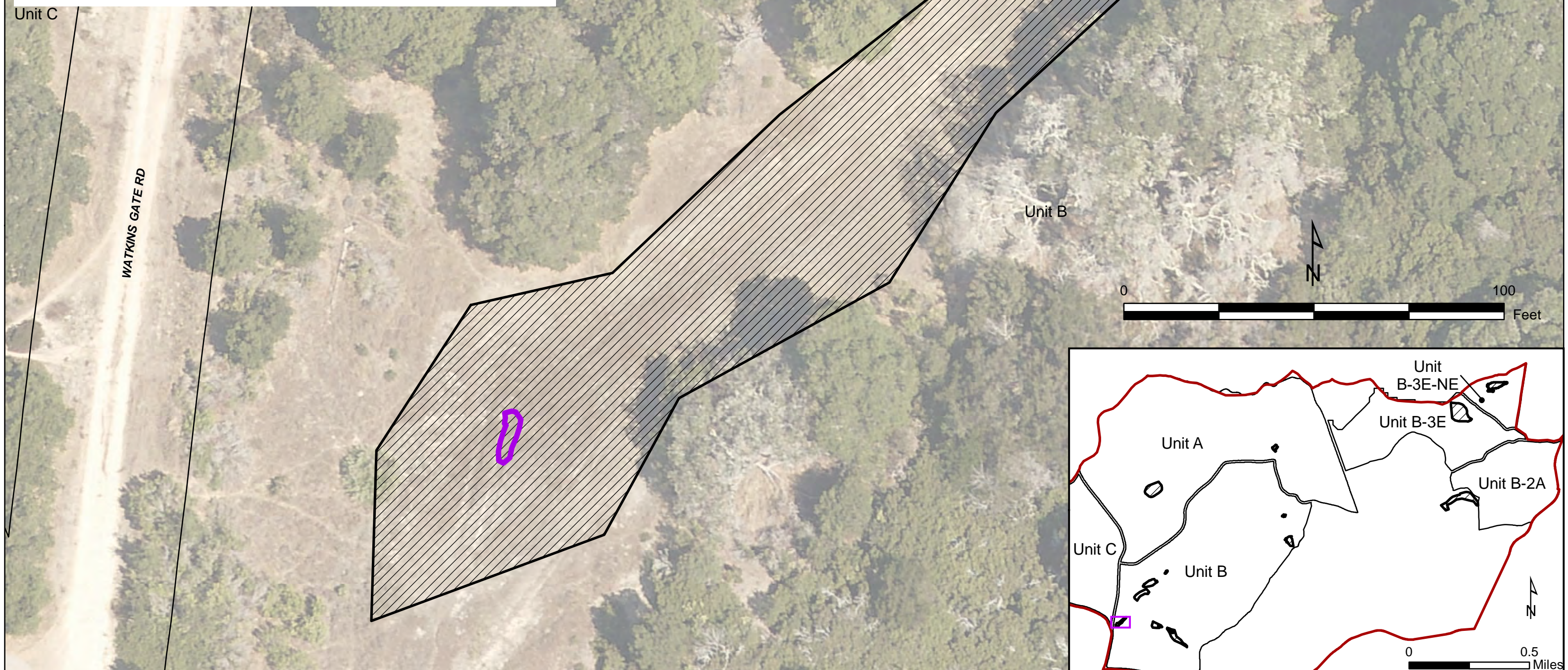Unit C

Unit B

0   0.5
Miles

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BLM Area B
Geophysical Anomaly Investigation
Technical Information Paper
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Figure 5B
Pond 35
Inundation Area
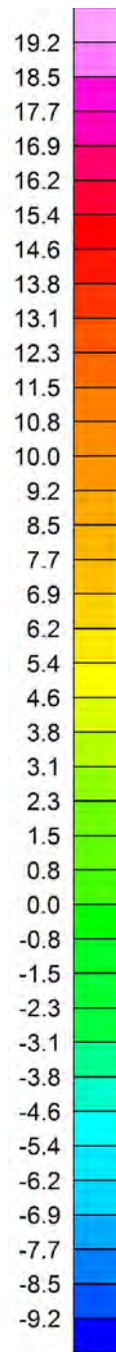
C:\Users\shession\Documents\GIS_Files\PROJECTS\BLM\Area_B\PondTargets\Maps\BLM_ReportFigures\Figure4B-Pond35_20190404.mxd   7/9/2019 [11:22 AM]   SHESSION, KEMRON

EM61-MK2A Readings

mV
CH Sum

Negative values can occur in DGM data as a result of minimum curvature gridding and/or levelling the data.

Feet
0   100

BLM Area B Boundary

Unit Boundaries

DGM Pond Survey Area (~0.7 acres)

AGC Anomaly Investigation Results

⚡ MD (3 targets, 9.25 pounds)

✚ RRD/OD (14 targets, 39.5 pounds)

✳ Unknown Target* (1 target)

● False Positive** (30 targets)

If a signal was detected for a Category 0 or a Category 2 target but the source of the signal was not encountered within the 18-inch excavation, the source was identified as "unknown".

**If no signal or an insufficient signal was detected at a target location the target was identified as a "false positive" in the dig results.

Unit B

SRA 1

SRA 2

Unit B-3E-NE

Unit B-3E

Unit A

Unit B-2A

Unit C

Unit B

0   0.5
Miles

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Geophysical Anomaly Investigation
Technical Information Paper**
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Figure 6A
Pond 39
DGM and Dig Results

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Legend:
- BLM Area B Boundary
- Unit Boundaries
- DGM Pond Survey Area (Pond 39 ~0.7 acres & Pond 40S ~0.7 acres)
- Pond Inundation Area 2016 (above normal water year)*
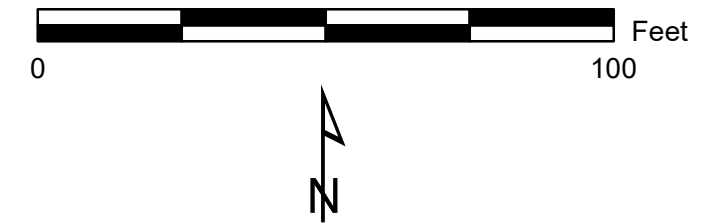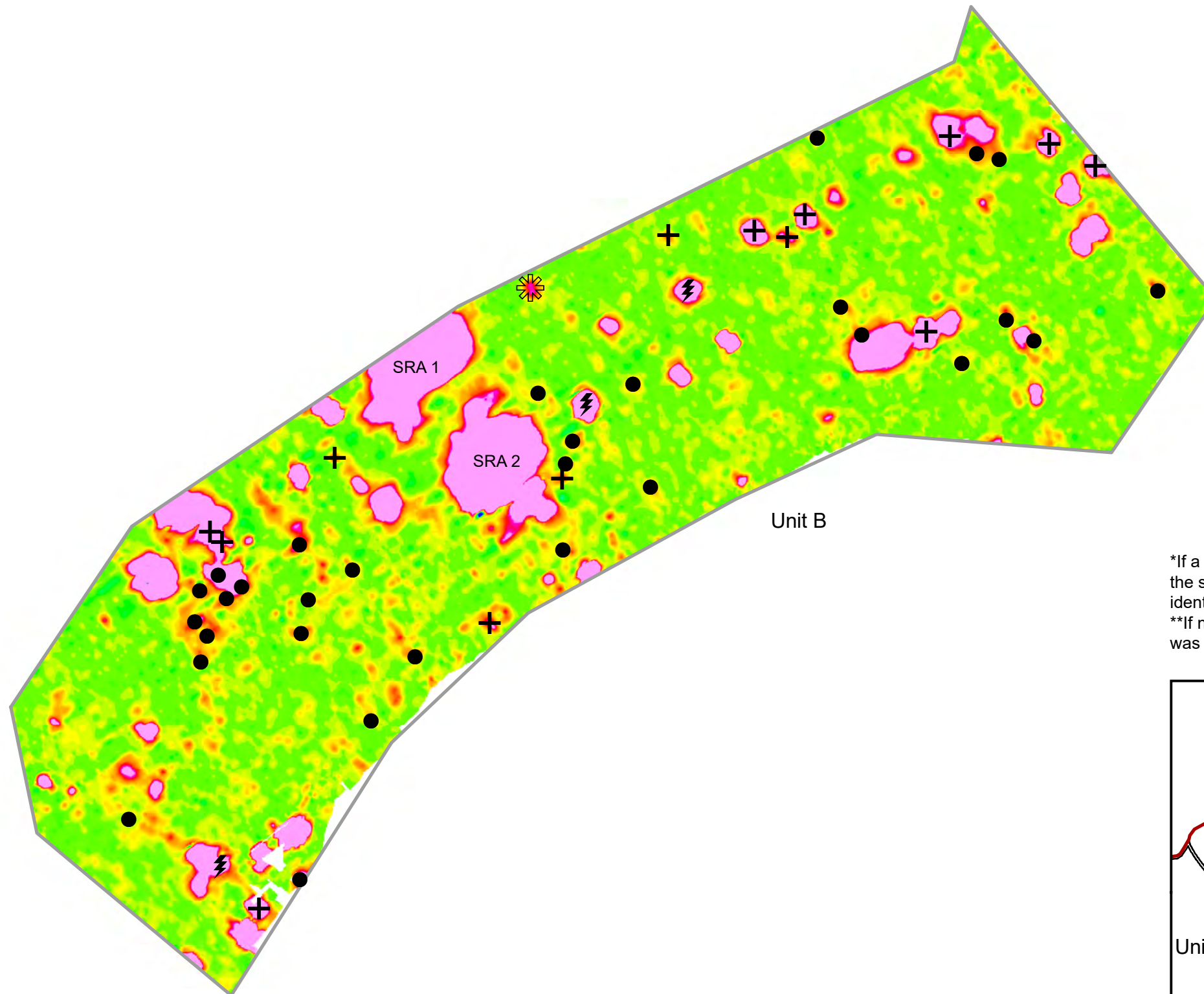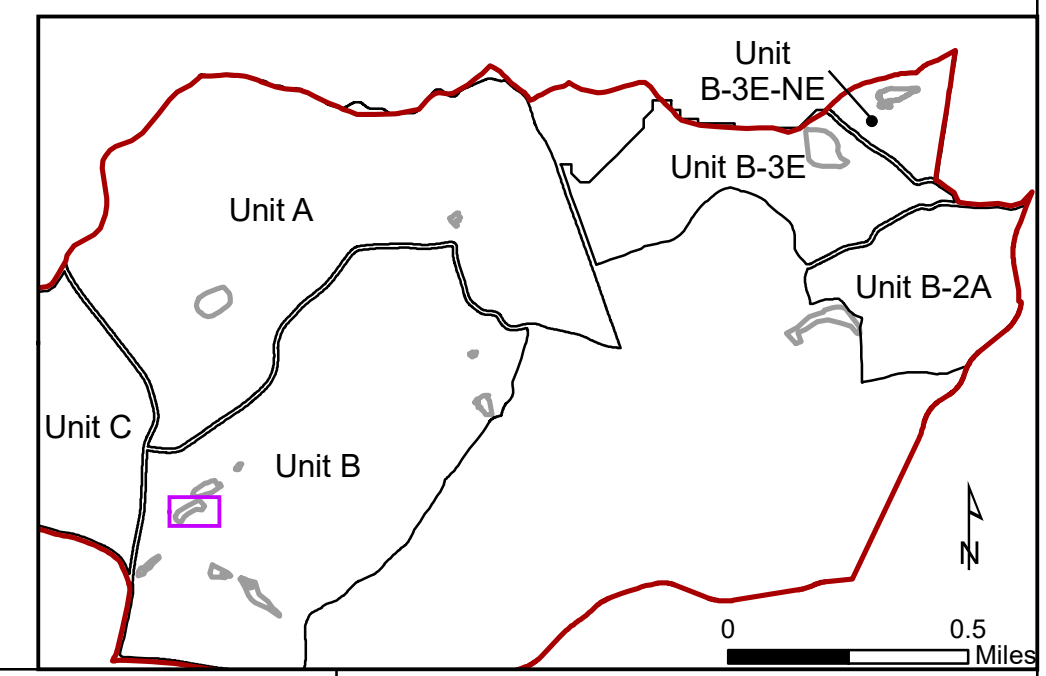- Pond Inundation Area 2017 (above normal water year)*

* Inundation area may vary between years depending on a number of factors.

Unit C
Unit B
Pond 40S
Pond 39
WATKINS GATE RD

0 — 200 Feet

Inset map labels: Unit A, Unit B-3E-NE, Unit B-3E, Unit B-2A, Unit C, Unit B
0 — 0.5 Miles

BLM Area B
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Figure 6B
Ponds 39 & 40S
Inundation Area

EM61-MK2A
Readings
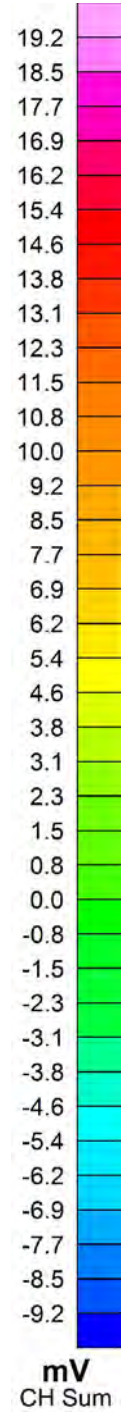
19.2
18.5
17.7
16.9
16.2
15.4
14.6
13.8
13.1
12.3
11.5
10.8
10.0
9.2
8.5
7.7
6.9
6.2
5.4
4.6
3.8
3.1
2.3
1.5
0.8
0.0
-0.8
-1.5
-2.3
-3.1
-3.8
-4.6
-5.4
-6.2
-6.9
-7.7
-8.5
-9.2

mV
CH Sum

Negative values can occur in DGM data
as a result of minimum curvature gridding
and/or levelling the data.

Feet
0   20
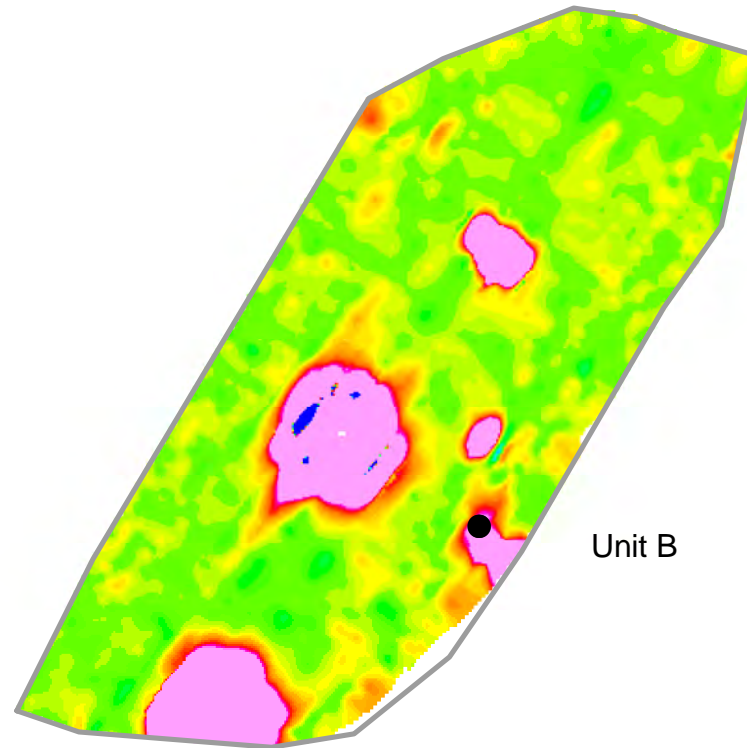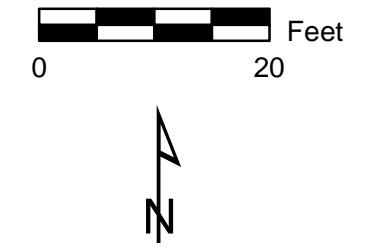
Unit B

BLM Area B Boundary

Unit Boundaries

DGM Pond Survey Area (<0.1 acres)

AGC Anomaly Investigation Result

● False Positive* (1 target)

*If no signal or an insufficient signal was
detected at a target location the target was
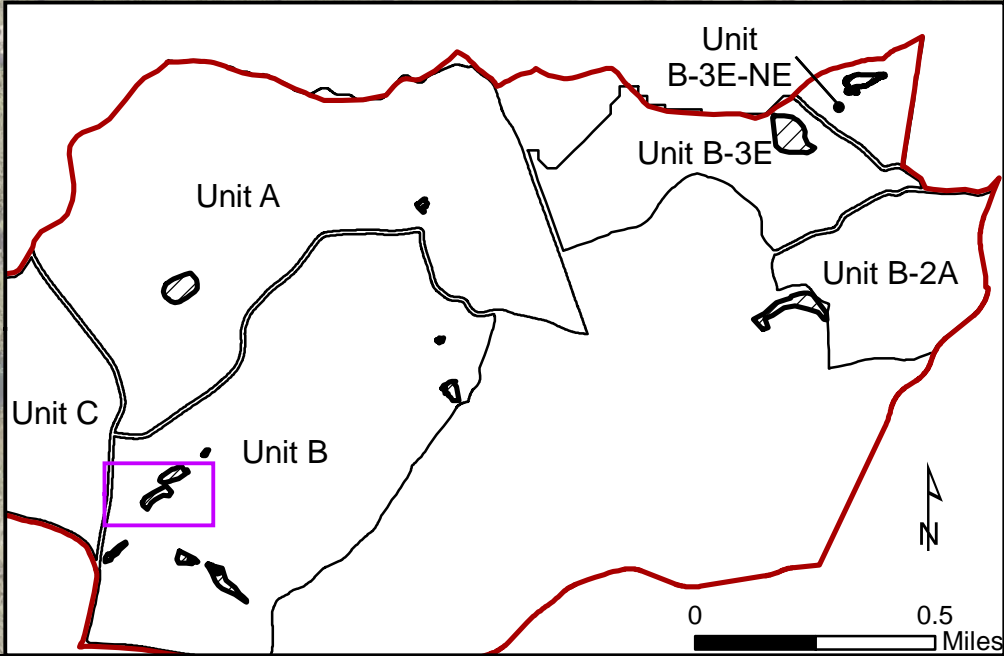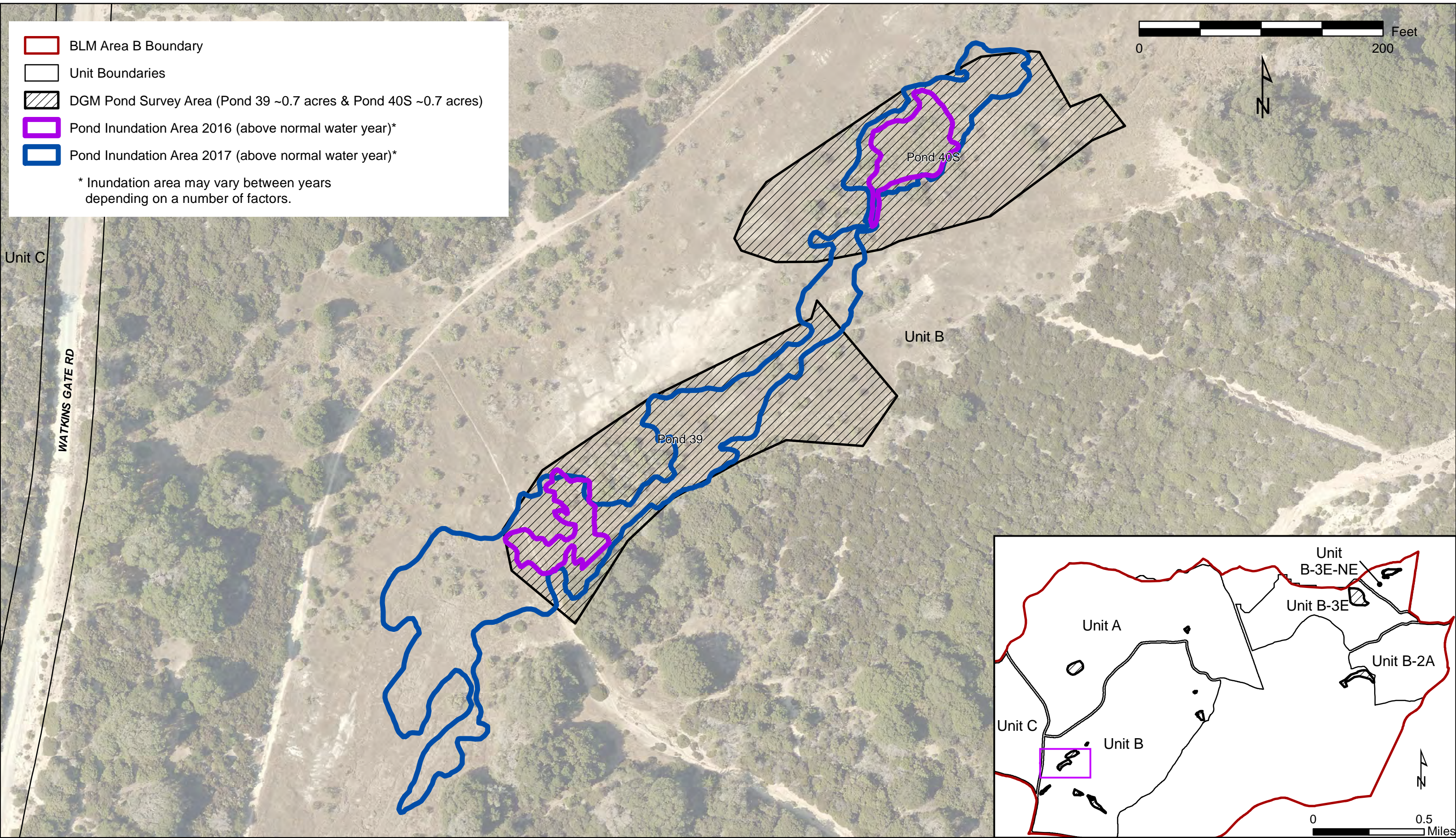identified as a "false positive" in the dig results.

Unit A
Unit B-3E-NE
Unit B-3E
Unit B-2A
Unit C
Unit B

0   0.5
Miles

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Figure 7A
Pond 40N
DGM & Dig Results

Legend:
- BLM Area B Boundary
- Unit Boundaries
- DGM Pond Survey Area (<0.1 acres)
- Pond Inundation Area 2015 (below normal water year)*
- Pond Inundation Areas 2018 (below normal water year)*

* Inundation area may vary between years depending on a number of factors.

Unit B

Inset map labels: Unit A, Unit B-3E-NE, Unit B-3E, Unit B-2A, Unit C, Unit B
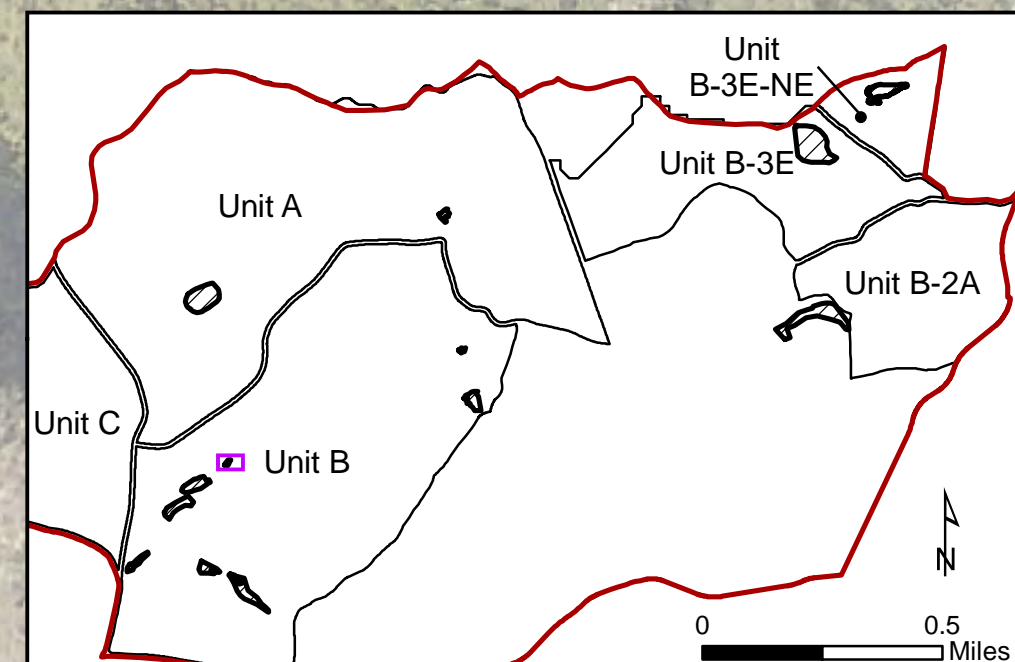
BLM Area B
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Figure 7B
Pond 40N
Inundation Area

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EM61-MK2A Readings

BLM Area B Boundary
Unit Boundaries
DGM Pond Survey Area (~0.7 acres)

AGC Anomaly Investigation Results

⚡ MD (6 targets, 10.25 pounds)

✛ RRD/OD (14 targets, 64.5 pounds)

✳ Unknown Target* (4 targets)

● False Positive** (8 targets)

If a signal was detected for a Category 0 or a Category 2 target but the source of the signal was not encountered within the 18-inch excavation, the source was identified as "unknown".

**If no signal or an insufficient signal was detected at a target location the target was identified as a "false positive" in the dig results.

EM61-MK2A Readings color scale (mV CH Sum):
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

Negative values can occur in DGM data as a result of minimum curvature gridding and/or levelling the data.

Unit B

Inset map labels: Unit A, Unit B, Unit C, Unit B-3E-NE, Unit B-3E, Unit B-2A

Scale: 0 — 0.5 Miles

BLM Area B Track 2 Ponds
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Figure 8A
Pond 40S
DGM & Dig Results

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Legend

- BLM Area B Boundary
- Unit Boundaries
- DGM Pond Survey Area (Pond 39 ~0.7 acres & Pond 40S ~0.7 acres)
- Pond Inundation Area 2016 (above normal water year)*
- Pond Inundation Area 2017 (above normal water year)*

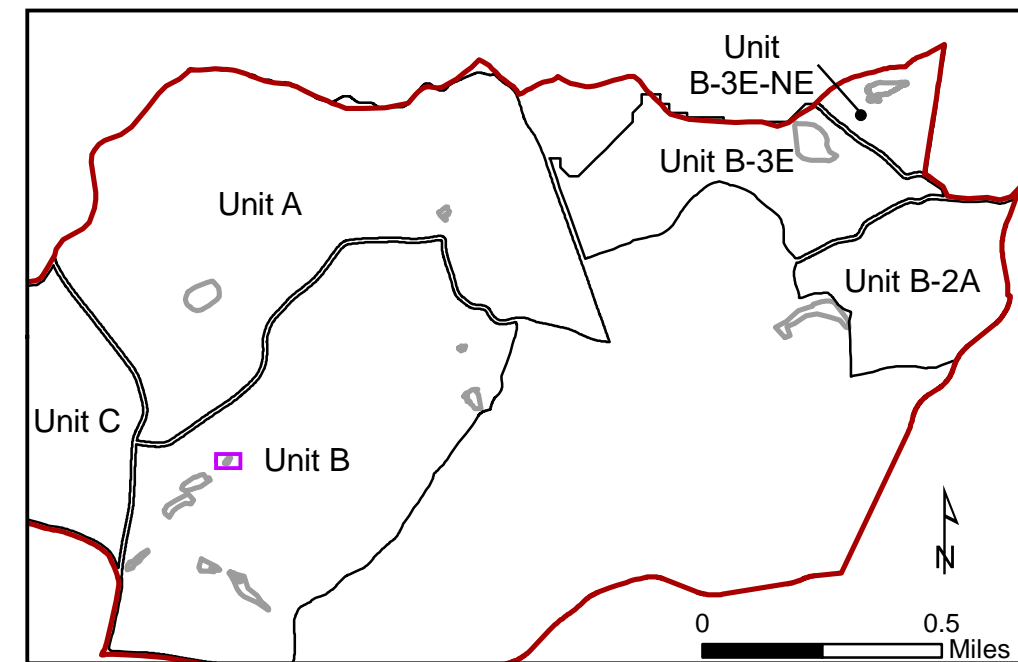* Inundation area may vary between years depending on a number of factors.

Feet
0 — 200

Unit C

WATKINS GATE RD

Pond 40S

Pond 39

Unit B

Inset map labels:

- Unit A
- Unit B-3E-NE
- Unit B-3E
- Unit B-2A
- Unit C
- Unit B

0 — 0.5 Miles

**BLM Area B
Geophysical Anomaly Investigation
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Figure 8B
Ponds 39 & 40S
Inundation Area

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Scale: 0 — 100 Feet

Legend:

- BLM Area B Boundary
- Unit Boundaries
- DGM Pond Survey Area (~3.0 acres)

AGC Anomaly Investigation Results

- ▲ UXO (1 target/item)
- ⚡ MD (2 targets, 1 pound)
- ✛ RRD/OD (2 targets, 10.25 pounds)
- ✳ Unknown Target* (3 targets)
- ● False Positive** (10 targets)

If a signal was detected for a Category 0 or a Category 2 target but the source of the signal was not encountered within the 18-inch excavation, the source was identified as "unknown".

**If no signal or an insufficient signal was detected at a target location the target was identified as a "false positive" in the dig results.

projectile, 40mm, HE, M406

ADDINGTON RD

EM61-MK2A Readings

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

Negative values can occur in DGM data as a result of minimum curvature gridding and/or levelling the data.

Unit B-3E-NE

Unit B-3E

Unit A

Unit B-2A

Unit C

Unit B

0 — 0.5 Miles

BLM Area B Track 2 Ponds
Geophysical Anomaly Investigation
Technical Information Paper
Former Fort Ord, California

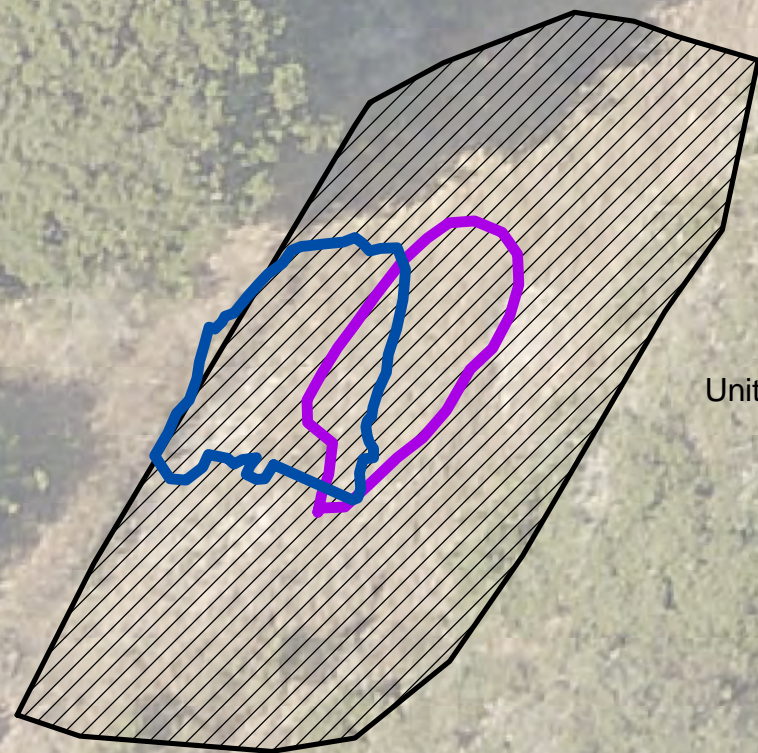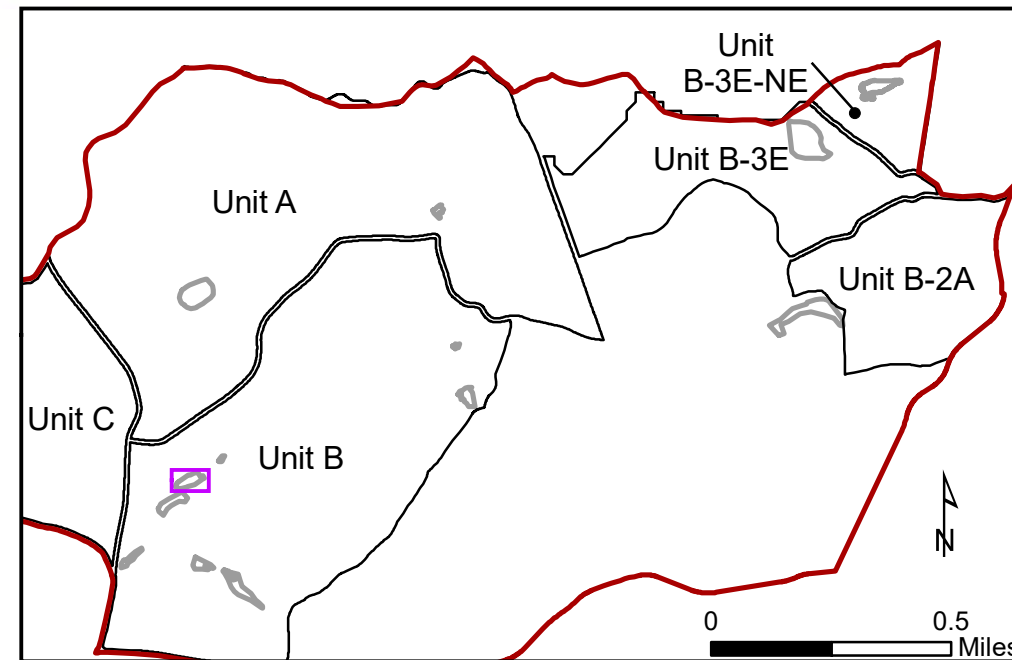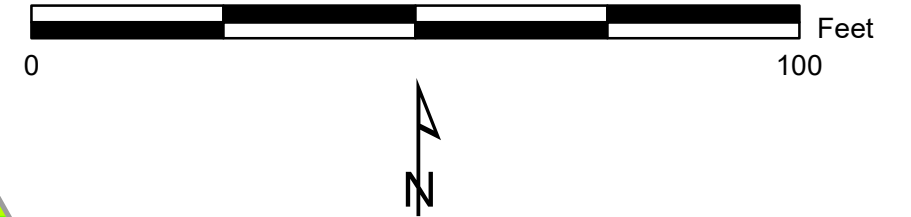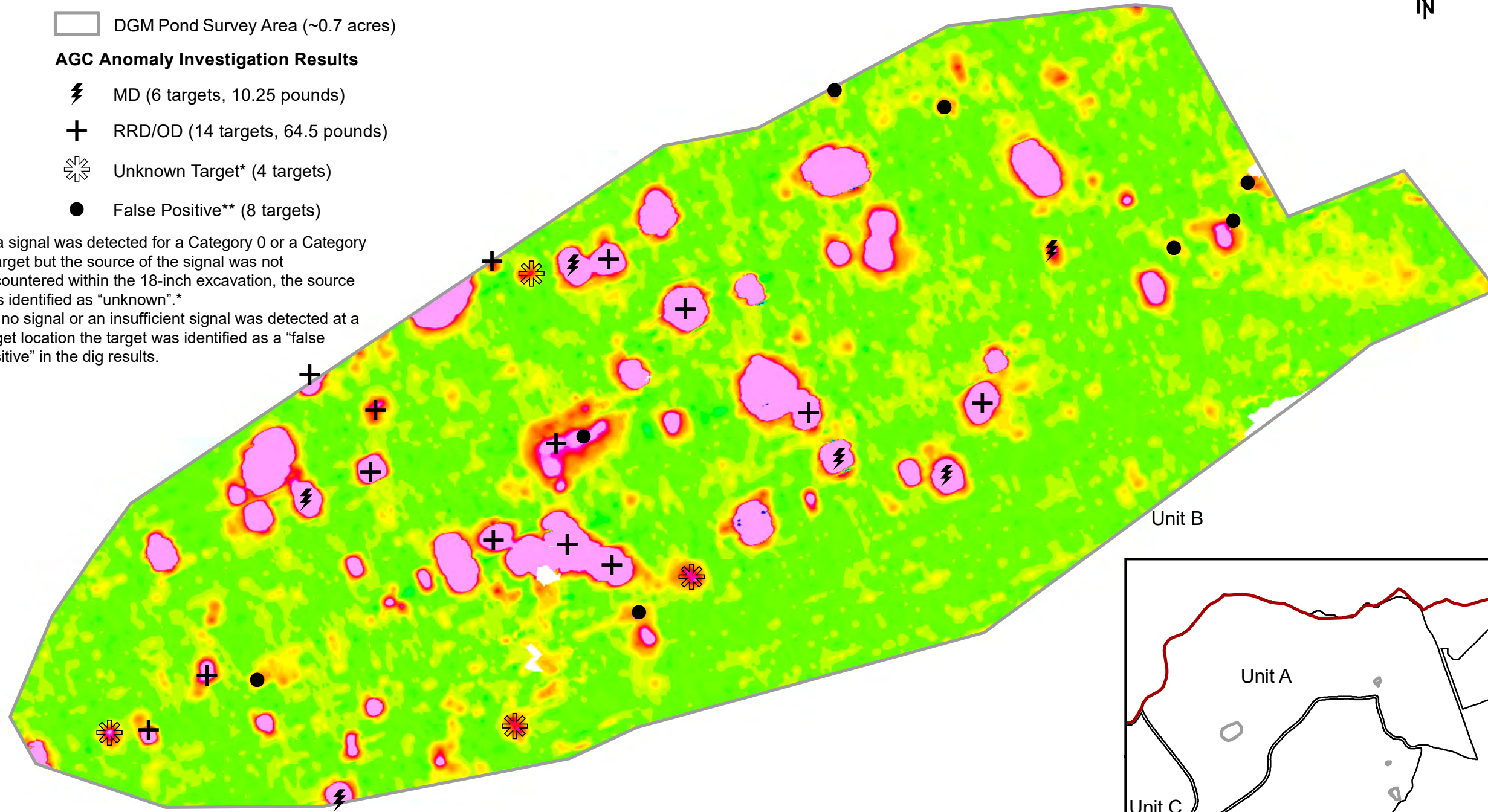KEMRON ENVIRONMENTAL SERVICES

Gilbane

Figure 9A
Pond 60
DGM & Dig Results

Legend

- BLM Area B Boundary
- Unit Boundaries
- DGM Pond Survey Area (~3.0 acres)
- Pond Inundation Area 2015 (below normal water year)*
- Pond Inundation Area 2016 (above normal water year)*

  * Inundation area may vary between years depending on a number of factors.

Unit B-3E-NE
Unit B-3E
Unit A
Unit B-2A
Unit C
Unit B

0   0.5 Miles

0   100 Feet
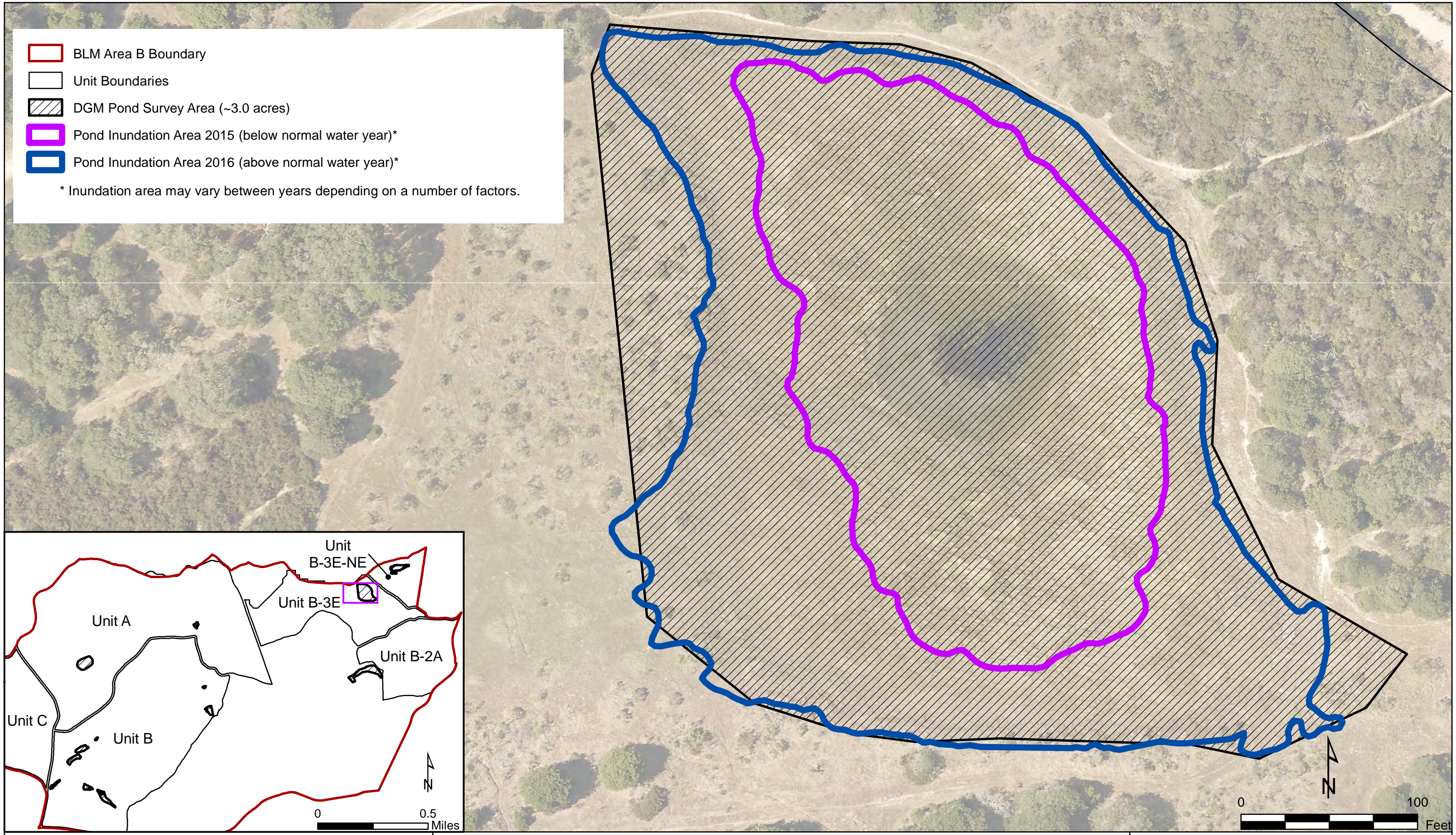
BLM Area B
Geophysical Anomaly Investigation
Technical Information Paper
Former Fort Ord, California

Figure 9B
Pond 60
Inundation Area

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Feet

0   100

N

EM61-MK2A Readings
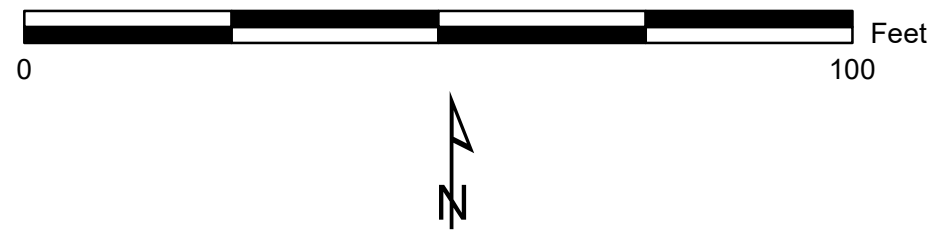
BLM Area B Boundary

Unit Boundaries

DGM Pond Survey Area (~0.5 acres)

ACG Anomaly Investigation Results

⚡ MD (2 targets, 0.75 pounds)

➕ RRD/OD (1 target, 0.75 pounds)

✳ Unknown Target* (7 targets)

QC Seed (2 targets)

● False Positive** (15 targets)

If a signal was detected for a Category 0 or a Category 2 target but the source of the signal was not encountered within the 18-inch excavation, the source was identified as "unknown".

**If no signal or an insufficient signal was detected at a target location the target was identified as a "false positive" in the dig results.

Unit B

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

Negative values can occur in DGM data as a result of minimum curvature gridding and/or levelling the data.

Unit B-3E-NE

Unit B-3E

Unit A

Unit B-2A

Unit C

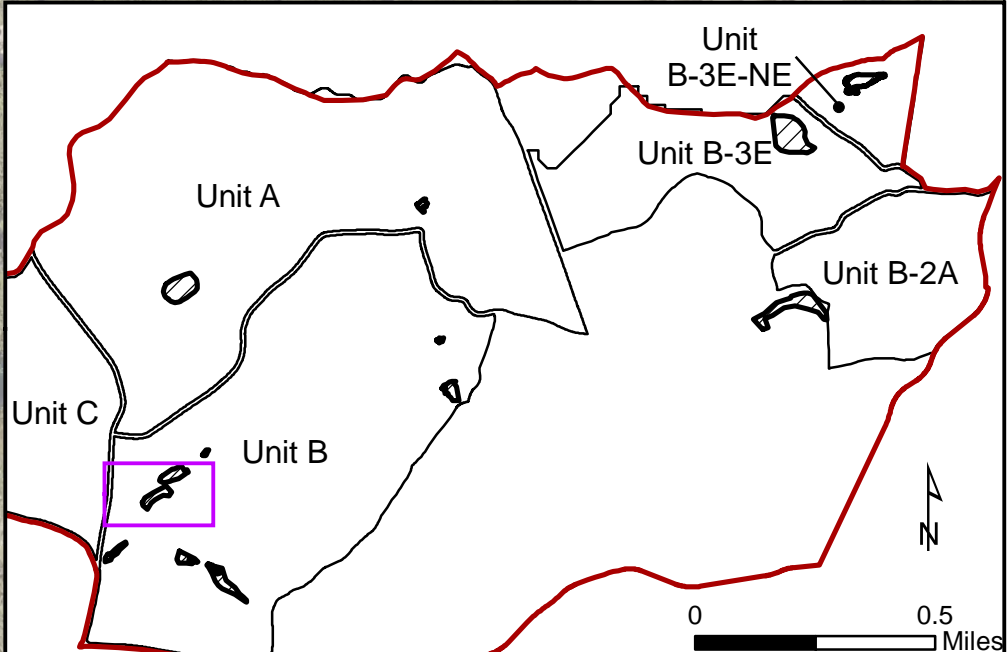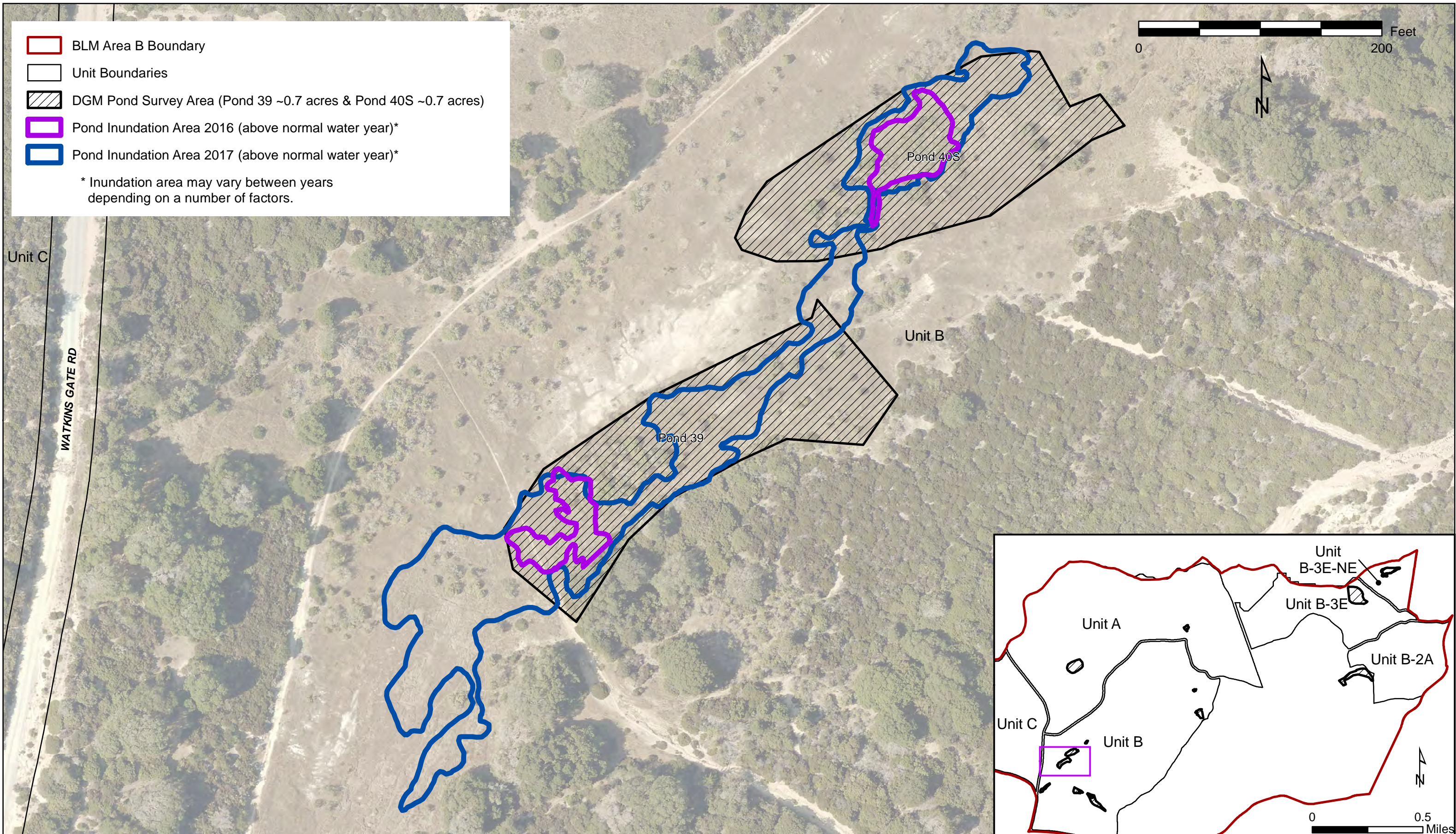Unit B

0   0.25   0.5
Miles

N
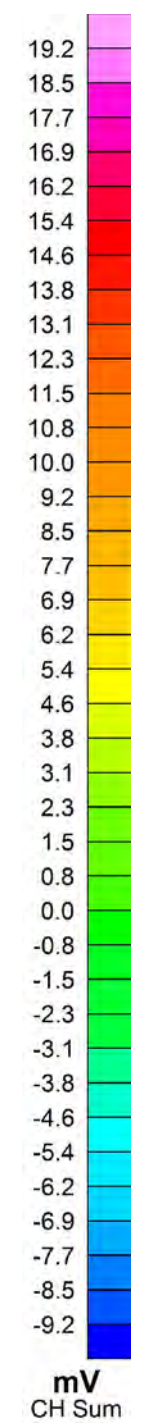
BLM Area B Track 2 Ponds
Geophysical Anomaly Investigation
Technical Information Paper
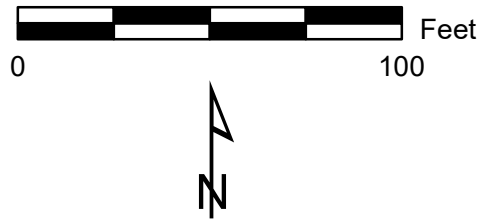Former Fort Ord, California

Figure 10A
Pond 42
DGM & Dig Results

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Legend:

- BLM Area B Boundary
- Unit Boundaries
- DGM Pond Survey Area (~0.5 acres)
- Pond Inundation Areas 2017 (above normal water year)*
- Pond Inundation Areas 2018 (below normal water year)*

  * Inundation area may vary between years
  depending on a number of factors.

Feet
0   100

Unit B

LITTLE MOAB RD

Inset map labels:
Unit B-3E-NE
Unit B-3E
Unit A
Unit B-2A
Unit C
Unit B

0   0.25   0.5
Miles

BLM Area B Track 2 Ponds
Geophysical Anomaly Investigation
Technical Information Paper
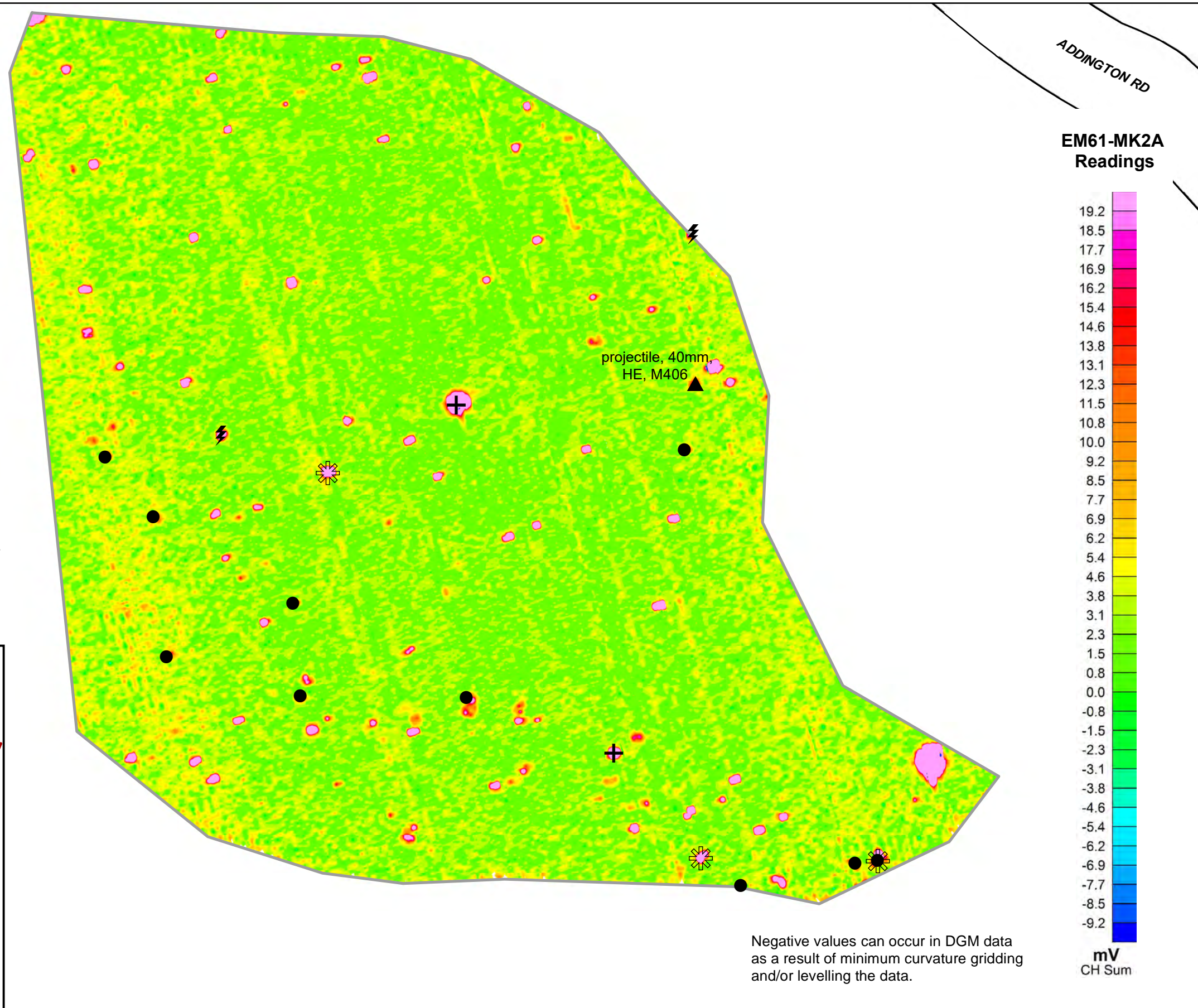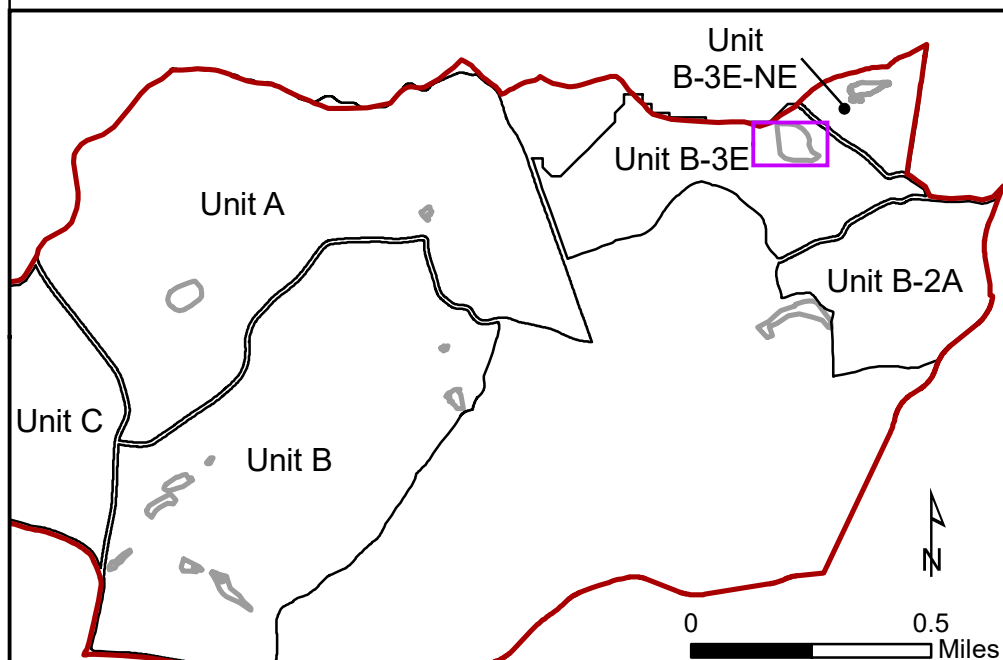Former Fort Ord, California

Figure 10B
Pond 42
Inundation Area

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EM61-MK2A
Readings

mV
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

Negative values can occur in DGM data as a result of minimum curvature gridding and/or levelling the data.

0 ——— 20 Feet
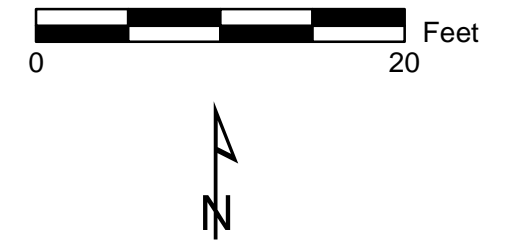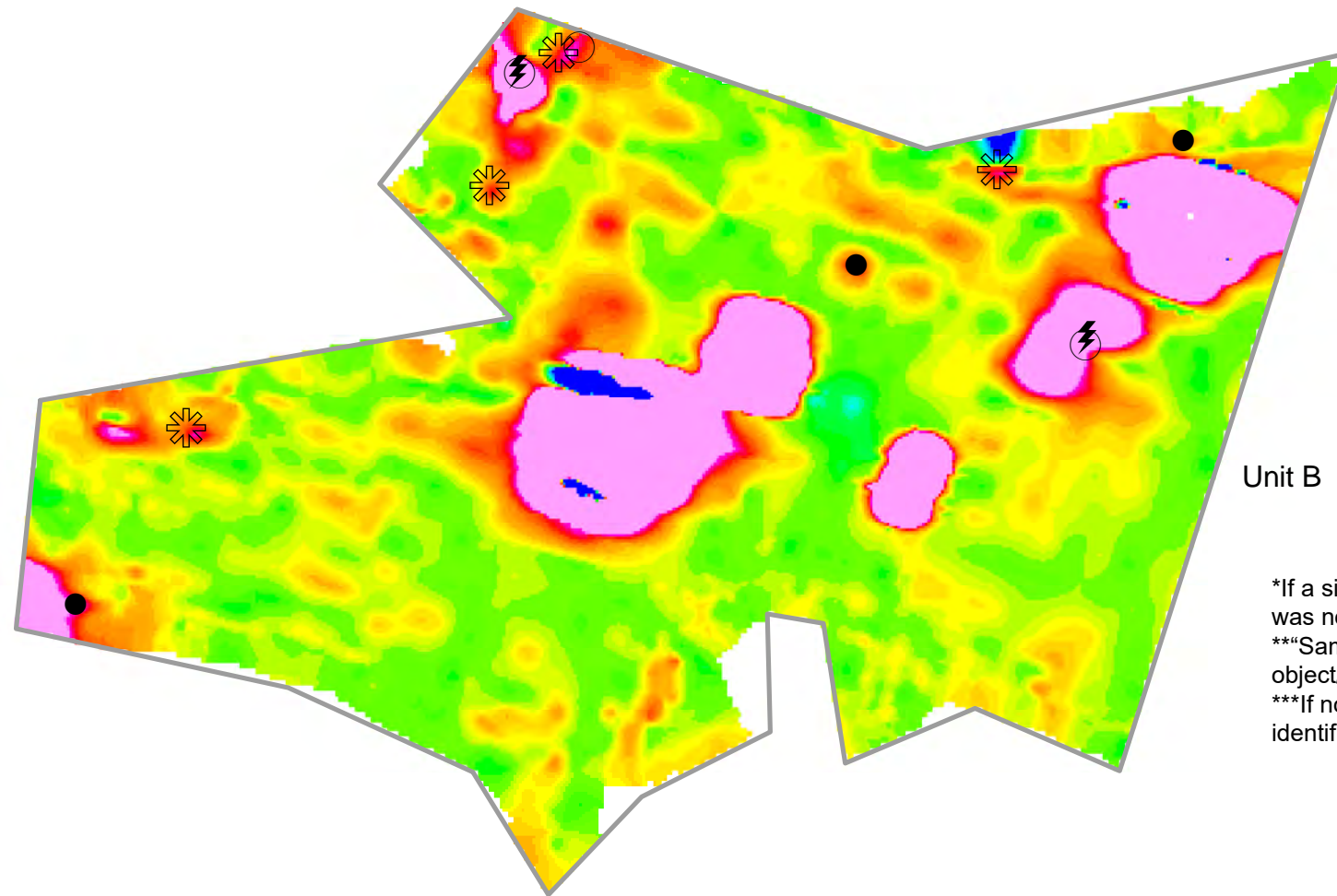
Unit B

BLM Area B Boundary

Unit Boundaries

DGM Pond Survey Area (<0.1 acres)

AGC Anomaly Investigation Results

⚡ MD (2 targets, 6 pounds)

✳ Unknown Targets* (4 targets)

◯ Same Anomaly** (3 targets)

● False Positive*** (3 targets)

*If a signal was detected for a Category 0 or a Category 2 target but the source of the signal was not encountered within the 18-inch excavation, the source was identified as "unknown".
**"Same anomaly" was assigned to excess target(s) when multiple targets identified the same object/signal.
***If no signal or an insufficient signal was detected at a target location the target was identified as a "false positive" in the dig results.

Unit B-3E-NE

Unit B-3E

Unit A

Unit B-2A

Unit C

Unit B

0 ——— 0.5 Miles

KEMRON
ENVIRONMENTAL SERVICES

Gilbane

BLM Area B Track 2 Ponds
Geophysical Anomaly Investigation
Technical Information Paper
Former Fort Ord, California

Figure 11A
Pond 43
DGM & Dig Results

Legend:
- BLM Area B Boundary
- Unit Boundaries
- DGM Pond Survey Area (<0.1 acres)
- Pond Inundation Area 1998 (above normal water year)*
- Pond Inundation Area 2016 (above normal water year)*

* Inundation area may vary between years depending on a number of factors.

Unit B

Unit B-3E-NE
Unit B-3E
Unit A
Unit B-2A
Unit C
Unit B

0   20
Feet

0   0.5
Miles

BLM Area B Track 2 Ponds
Geophysical Anomaly Investigation
Technical Information Paper
Former Fort Ord, California

Figure 11B
Pond 43
Inundation Area

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EM61-MK2A Readings

| mV |
|---|
| 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

Negative values can occur in DGM data as a result of minimum curvature gridding and/or levelling the data.
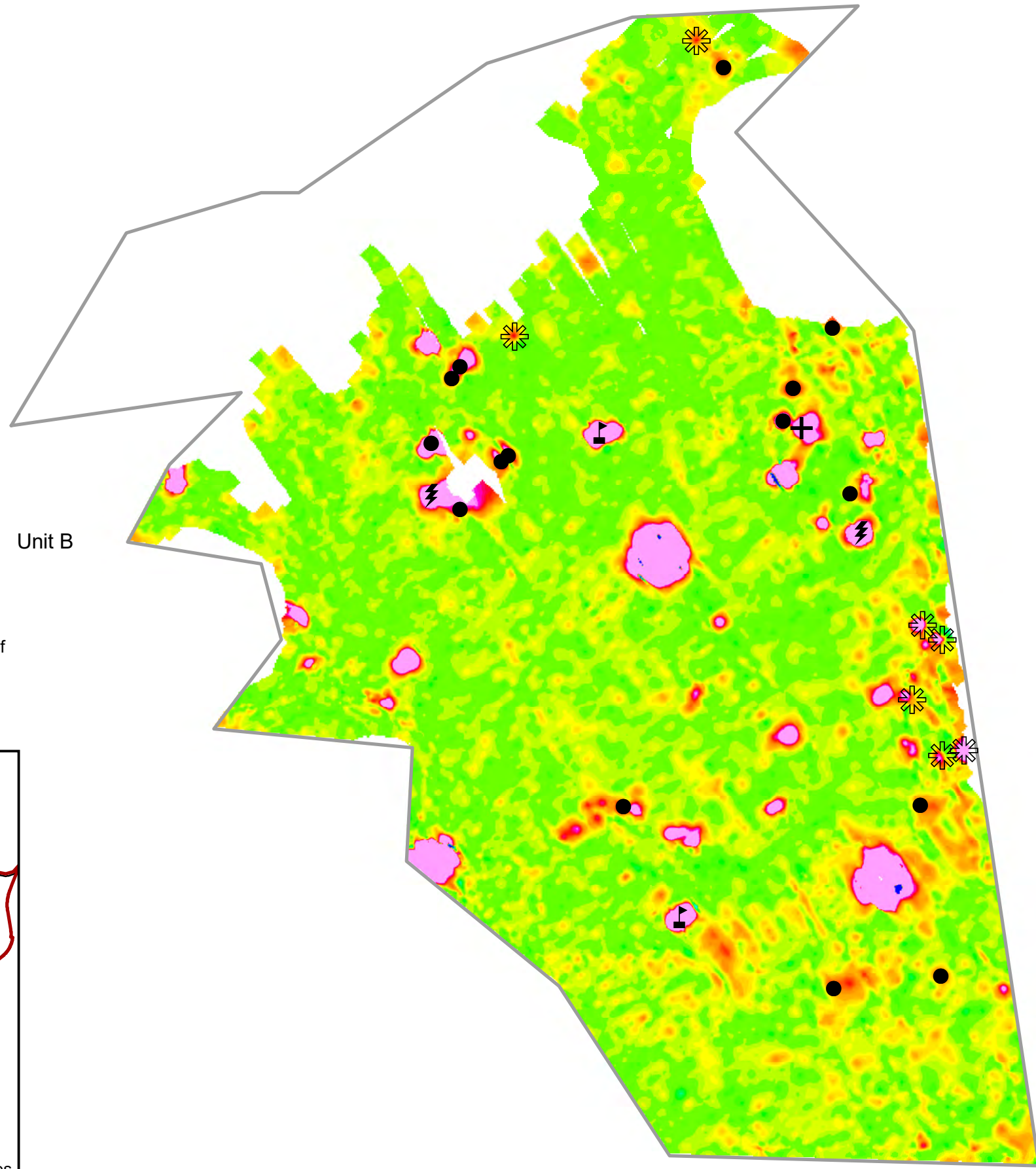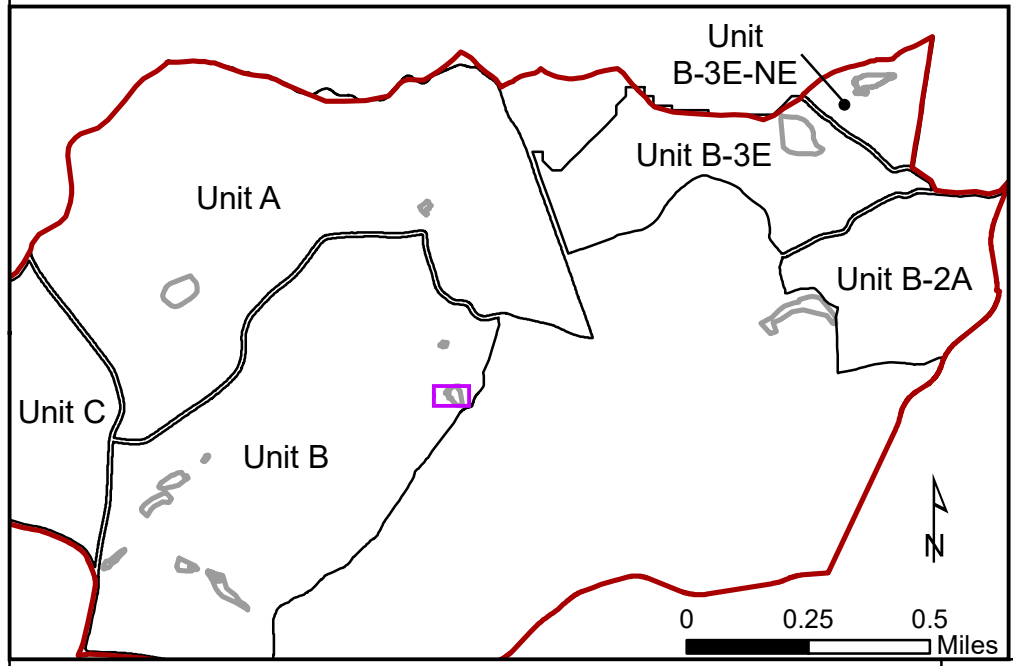
0 — 40 Feet

Unit A
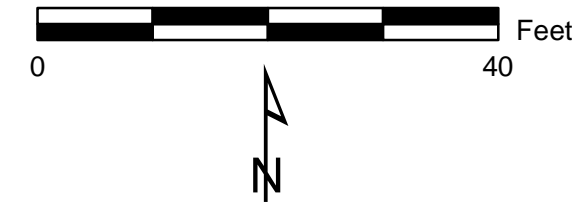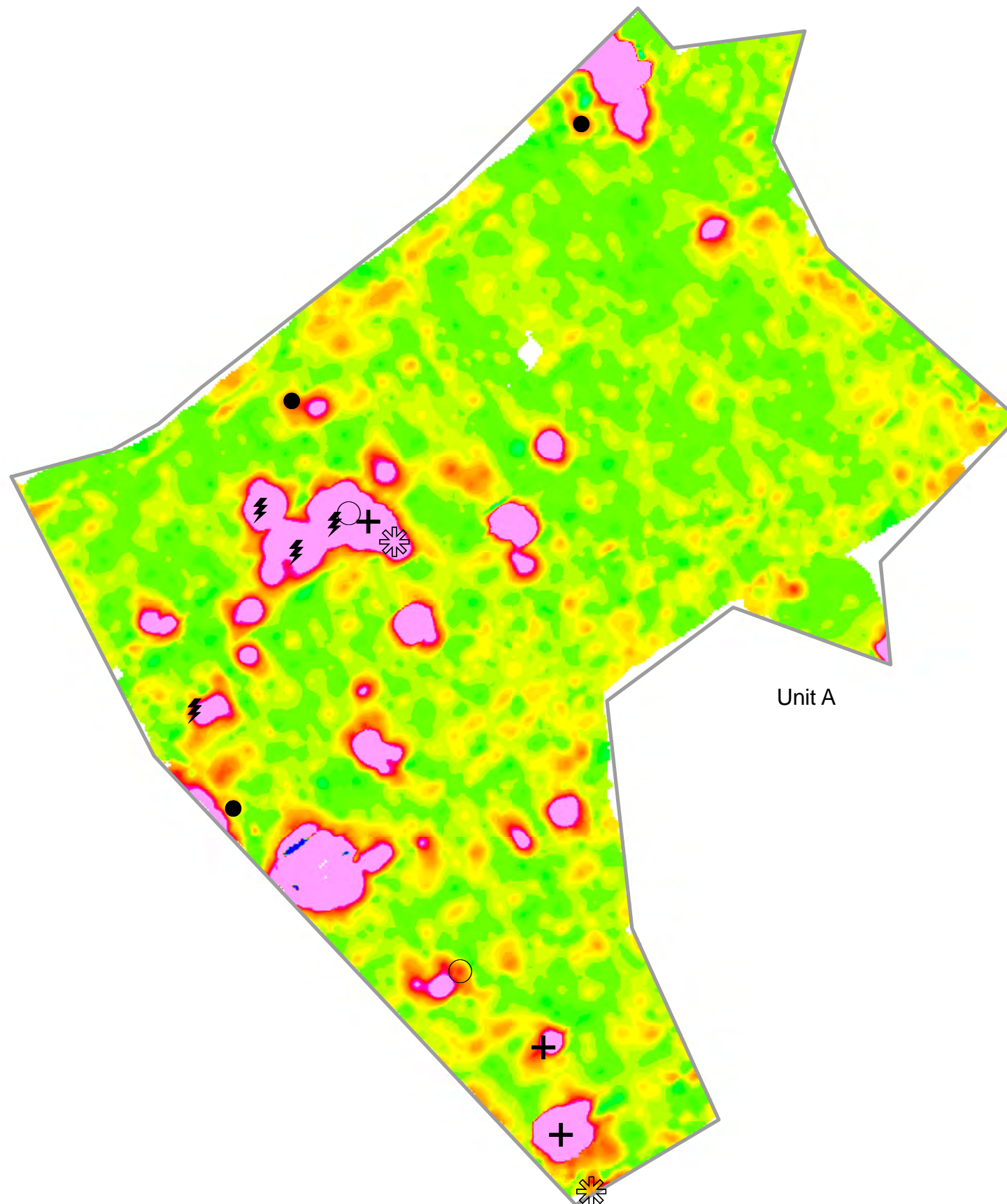
BLM Area B Boundary
Unit Boundaries
DGM Pond Survey Area (~0.2 acres)

AGC Anomaly Investigation Results

⚡ MD (4 targets, 7 pounds)

✛ RRD/OD (3 targets, 1.5 pounds)

✳ Unknown Target* (2 targets)

◯ Same Anomaly** (2 targets)

● False Positive*** (3 targets)

*If a signal was detected for a Category 0 or a Category 2 target but the source of the signal was not encountered within the 18-inch excavation, the source was identified as "unknown".
***"Same anomaly" was assigned to excess target(s) when multiple targets identified the same object/signal.
***If no signal or an insufficient signal was detected at a target location the target was identified as a "false positive" in the dig results.

Unit B-3E-NE
Unit B-3E
Unit A
Unit B-2A
Unit C
Unit B

0 — 0.5 Miles

BLM Area B Track 2 Ponds
Geophysical Anomaly Investigation
Technical Information Paper
Former Fort Ord, California

Figure 12A
Pond 44
DGM & Dig Results

KEMRON ENVIRONMENTAL SERVICES   Gilbane
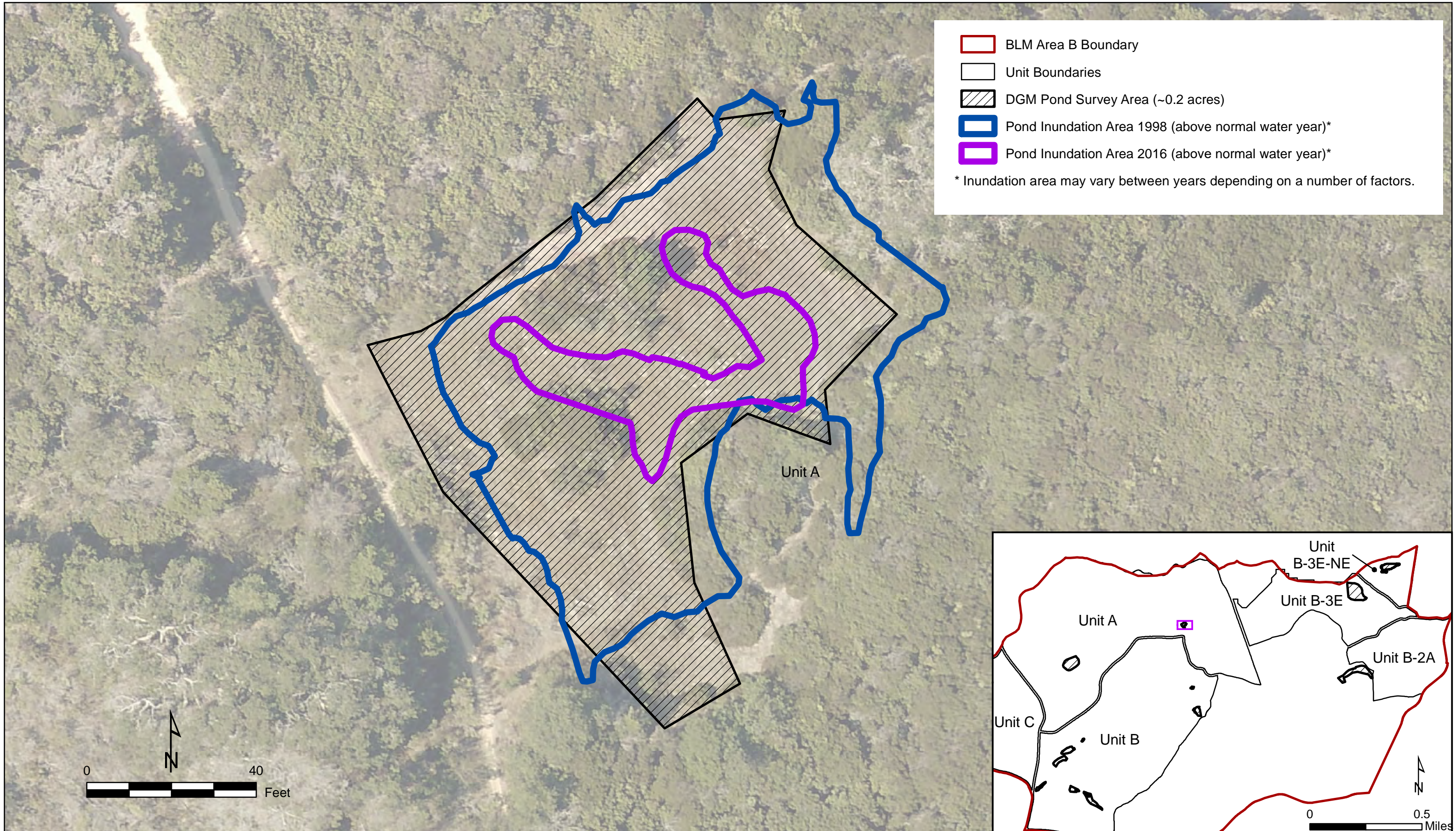
Legend:
- BLM Area B Boundary
- Unit Boundaries
- DGM Pond Survey Area (~0.2 acres)
- Pond Inundation Area 1998 (above normal water year)*
- Pond Inundation Area 2016 (above normal water year)*

* Inundation area may vary between years depending on a number of factors.

Unit A

0   40 Feet

N

Inset map labels: Unit A, Unit B-3E-NE, Unit B-3E, Unit B-2A, Unit C, Unit B

0   0.5 Miles

N

BLM Area B Track 2 Ponds
Geophysical Anomaly Investigation
Technical Information Paper
Former Fort Ord, California

KEMRON ENVIRONMENTAL SERVICES   Gilbane
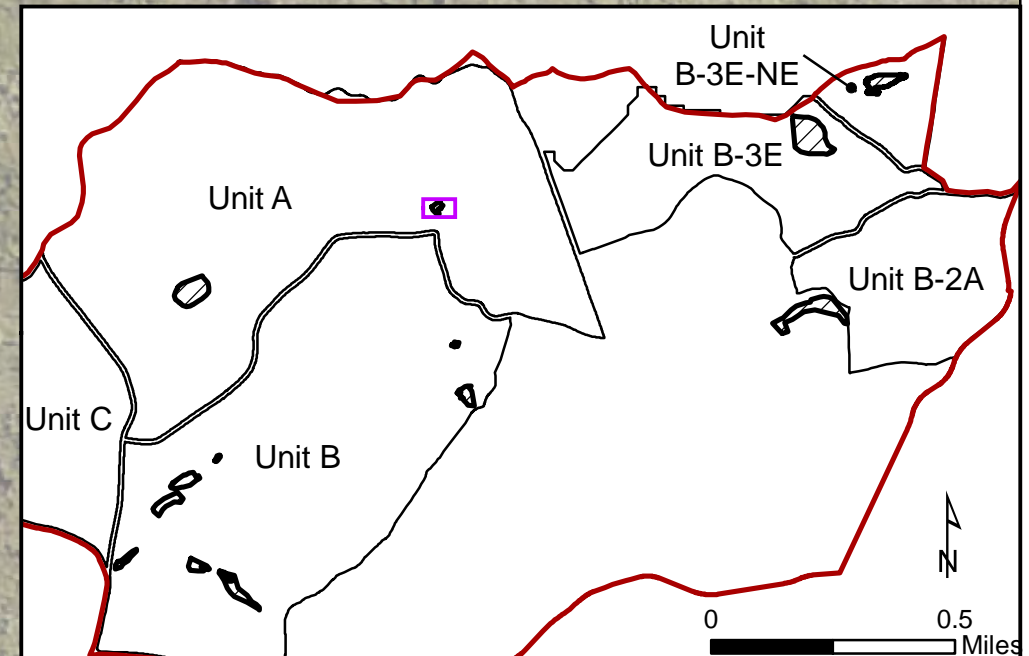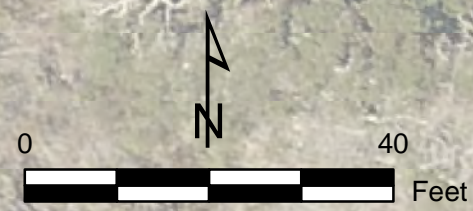
Figure 12B
Pond 44
Inundation Area

EM61-MK2A Readings

mV
CH Sum

Negative values can occur in DGM data as a result of minimum curvature gridding and/or levelling the data.

Unit A

SRA 1

signal, illum, ground, M125 series

flare, surface, trip, M49 series

*If a signal was detected for a Category 0 or a Category 2 target but the source of the signal was not encountered within the 18-inch excavation, the source was identified as "unknown".
**"Same anomaly" was assigned to excess target(s) when multiple targets identified the same object/signal.
***If no signal or an insufficient signal was detected at a target location the target was identified as a "false positive" in the dig results.

Feet
0   100

N

BLM Area B Boundary
Unit Boundaries
DGM Pond Survey Area (~1.9 acres)

AGC Anomaly Investigation Results

★ UXO (2 targets/items)
⚡ MD (39 targets, 92.25 pounds)
✛ RRD/OD (7 targets, 51.25 pounds)
✳ Unknown Target* (3 targets)
⌐ QC Seed (2 targets)
◯ Same Anomaly** (2 targets)
● False Positive*** (32 targets)

Unit B-3E-NE
Unit B-3E
Unit A
Unit B-2A
Unit C
Unit B

0   0.5
Miles

N
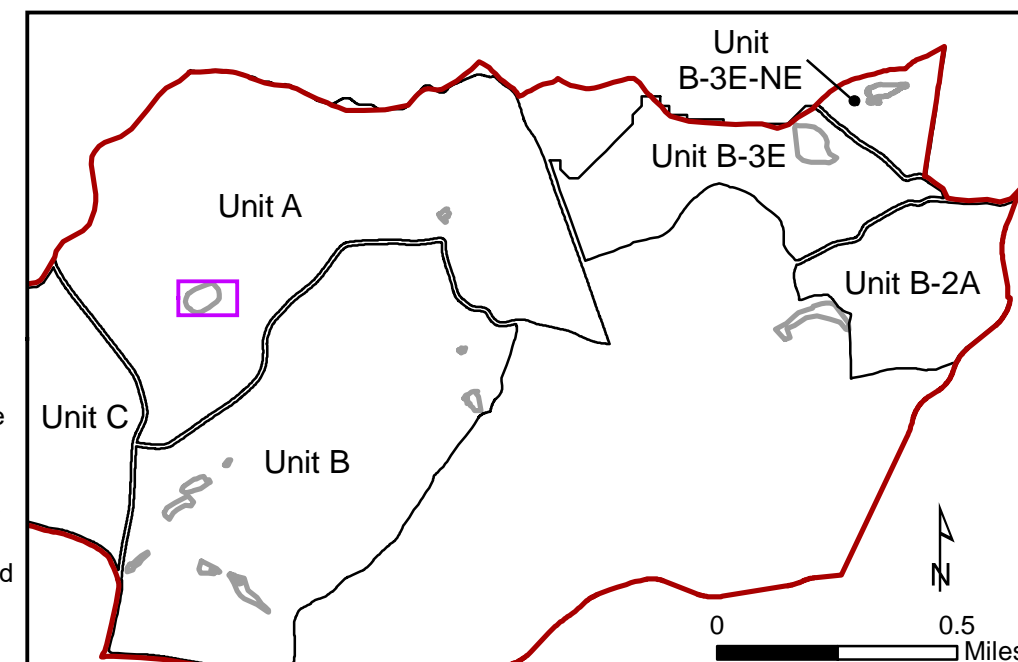
BLM Area B Track 2 Pond
Geophysical Anomaly Investigation
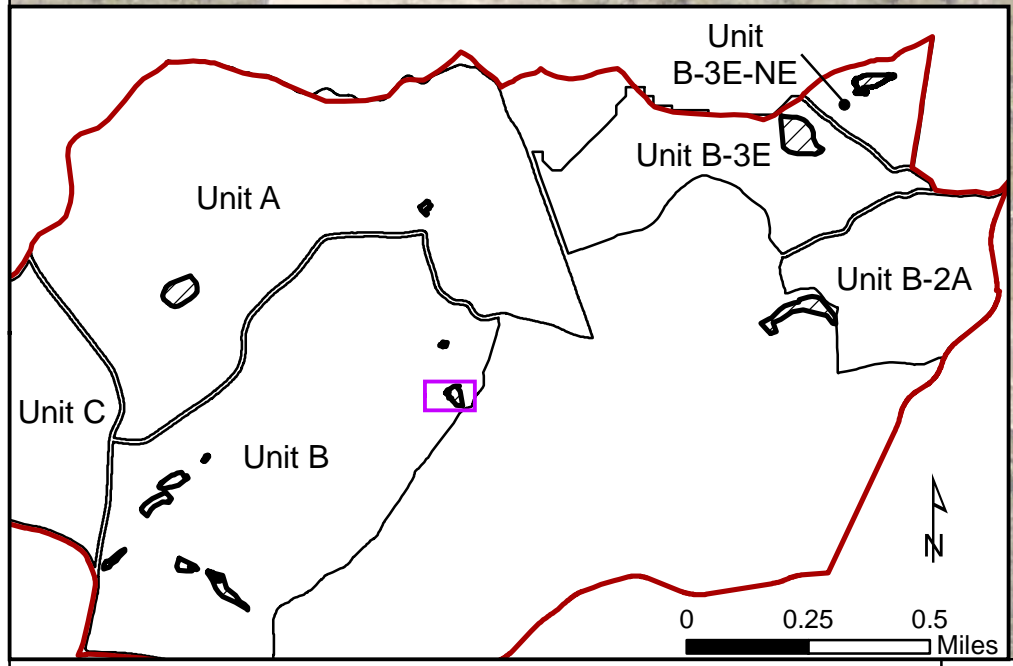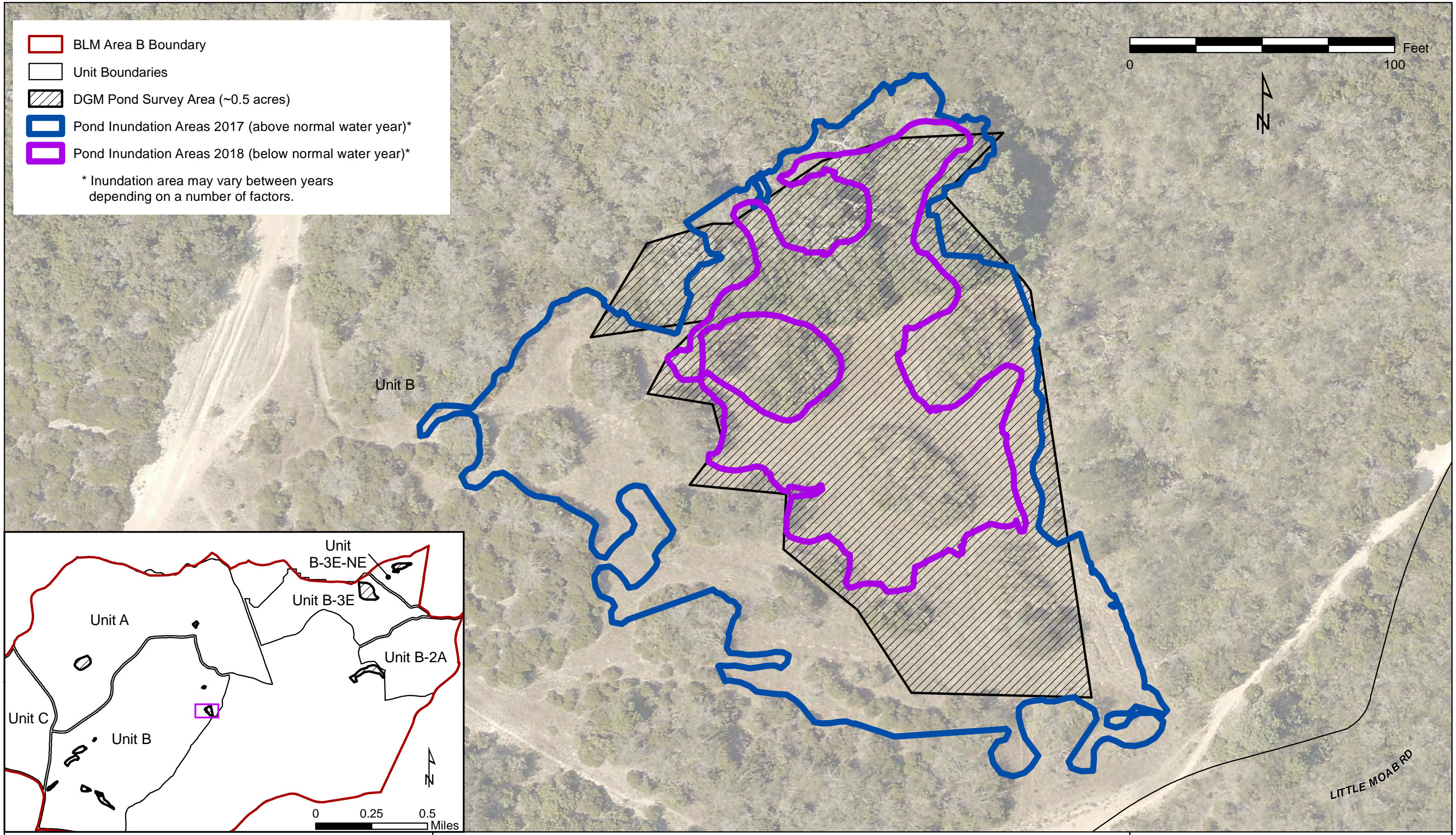**Technical Information Paper**
Former Fort Ord, California

Figure 13A
Pond 41
DGM & Dig Results

KEMRON
ENVIRONMENTAL SERVICES

Gilbane
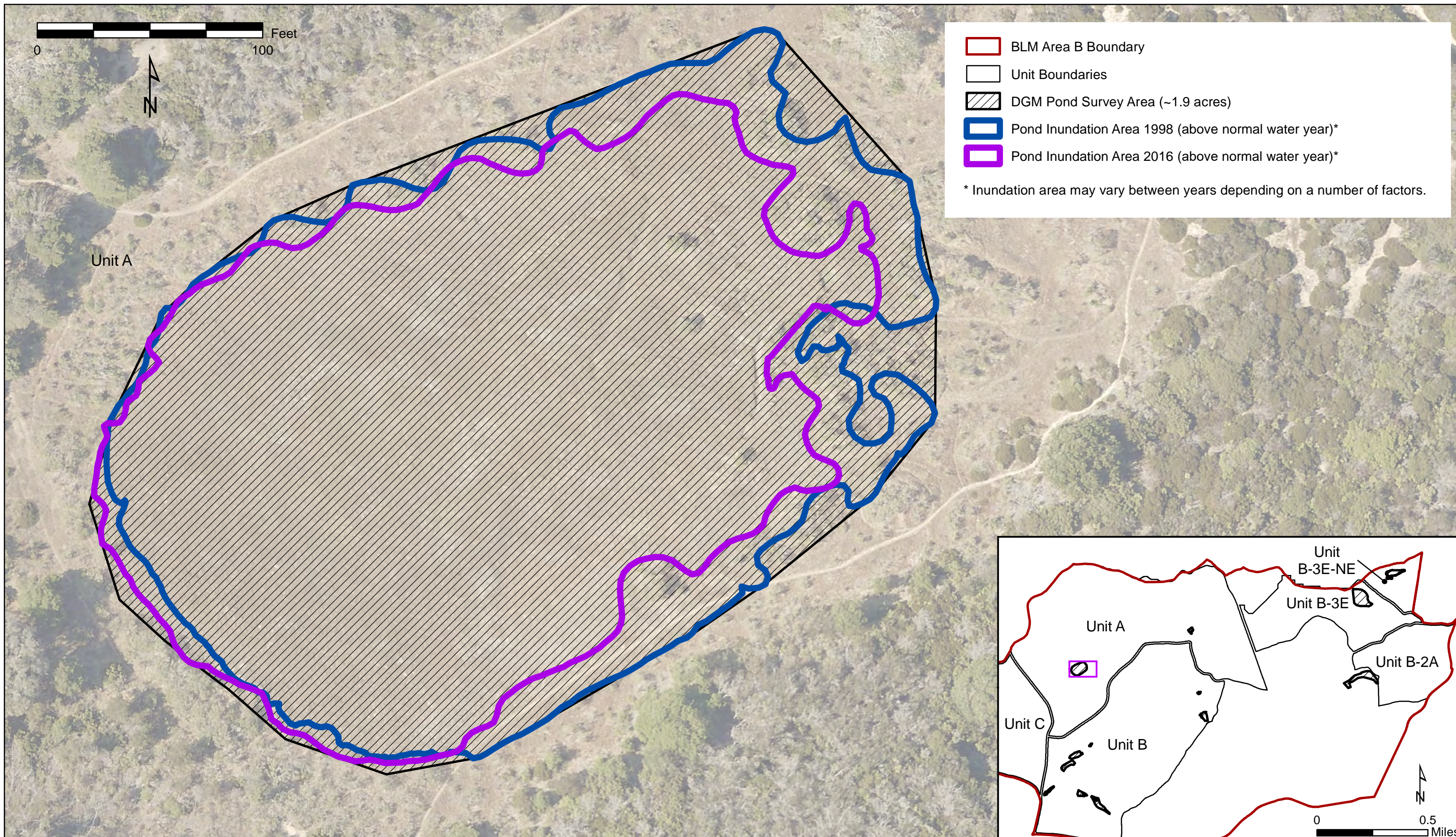
Legend:
- BLM Area B Boundary
- Unit Boundaries
- DGM Pond Survey Area (~1.9 acres)
- Pond Inundation Area 1998 (above normal water year)*
- Pond Inundation Area 2016 (above normal water year)*

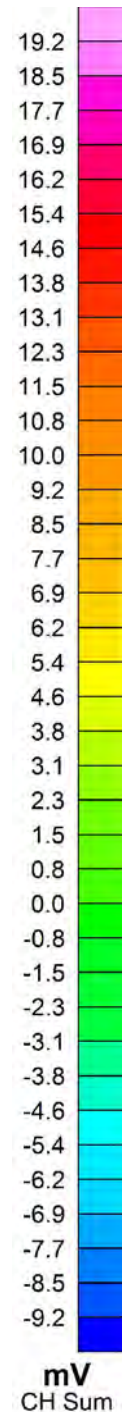* Inundation area may vary between years depending on a number of factors.

Unit A

0 — 100 Feet

Inset map labels: Unit B-3E-NE, Unit B-3E, Unit A, Unit B-2A, Unit C, Unit B

0 — 0.5 Miles

BLM Area B Track 2 Ponds
Geophysical Anomaly Investigation
Technical Information Paper
Former Fort Ord, California

KEMRON ENVIRONMENTAL SERVICES   Gilbane
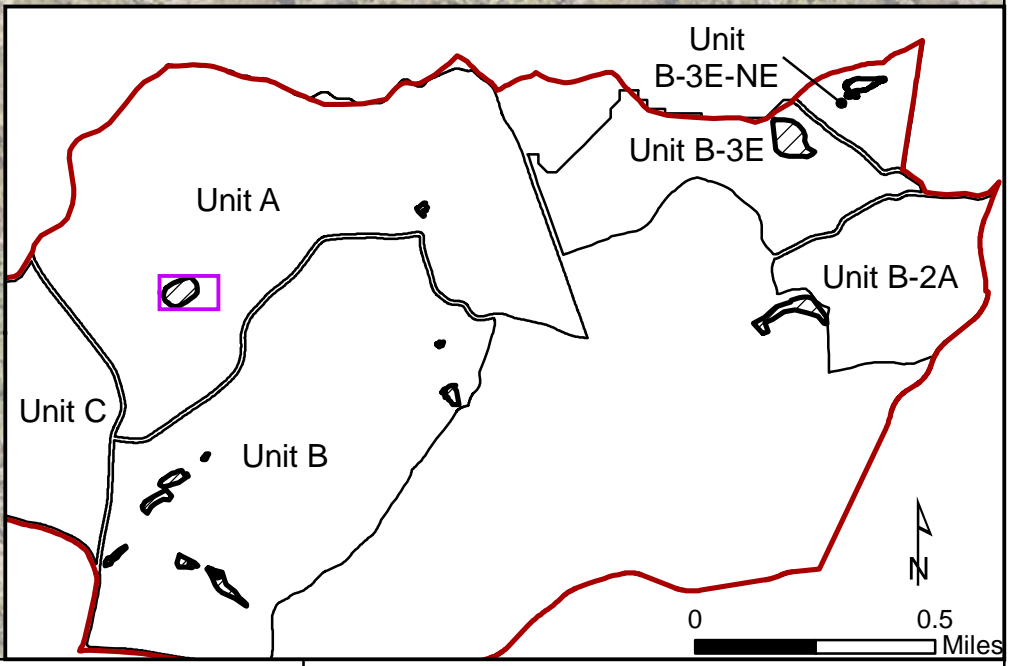
Figure 13B
Pond 41
Inundation Area

C:\Users\shession\Documents\GIS_Files\PROJECTS\BLM\Area_B\PondTargets\Maps\BLM_ReportFigures\Figure12B-Pond41_20190404.mxd   7/9/2019 [11:54 AM]   SHESSION, KEMRON

EM61-MK2A Readings

mV CH Sum
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
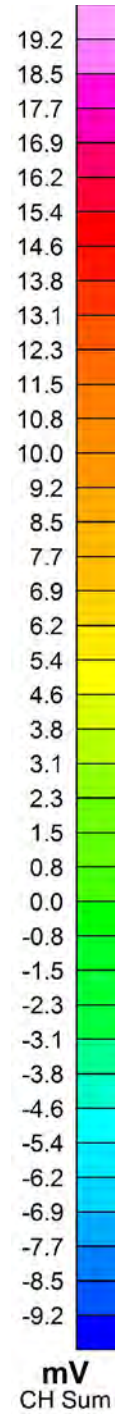
☐ BLM Area B Boundary
☐ Unit Boundaries
☐ DGM Pond Survey Area (~1.1 acres)

AGC Anomaly Investigation Results

⚡ MD (1 target, 1 pound)

✛ RRD/OD (6 targets, 30 pounds)

● False Positive* (4 targets)

*If no signal or an insufficient signal was detected at a target location the target was identified as a "false positive" in the dig results.
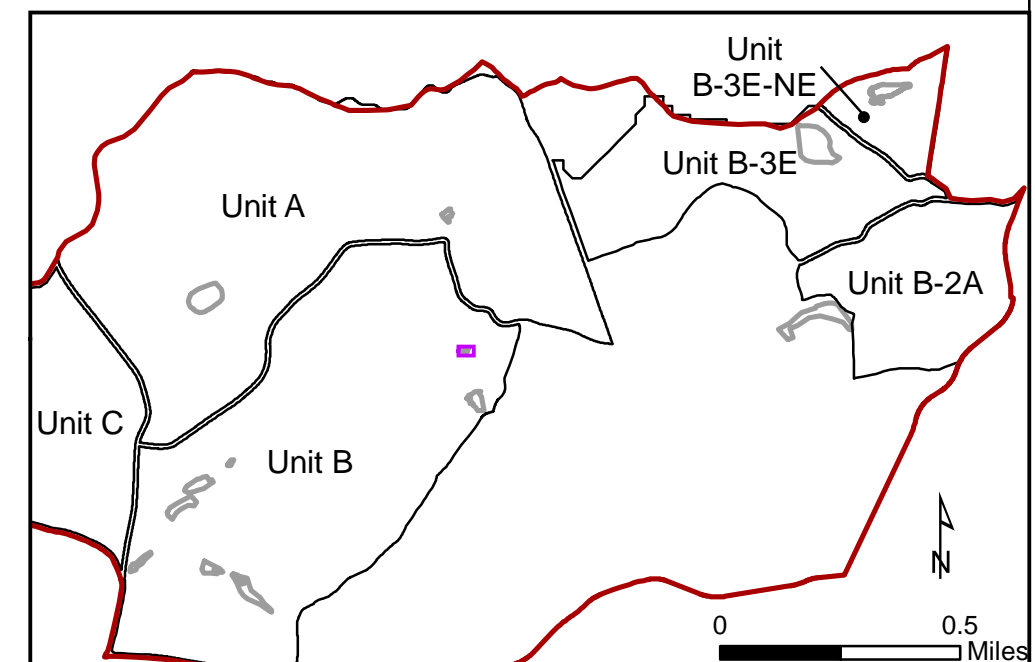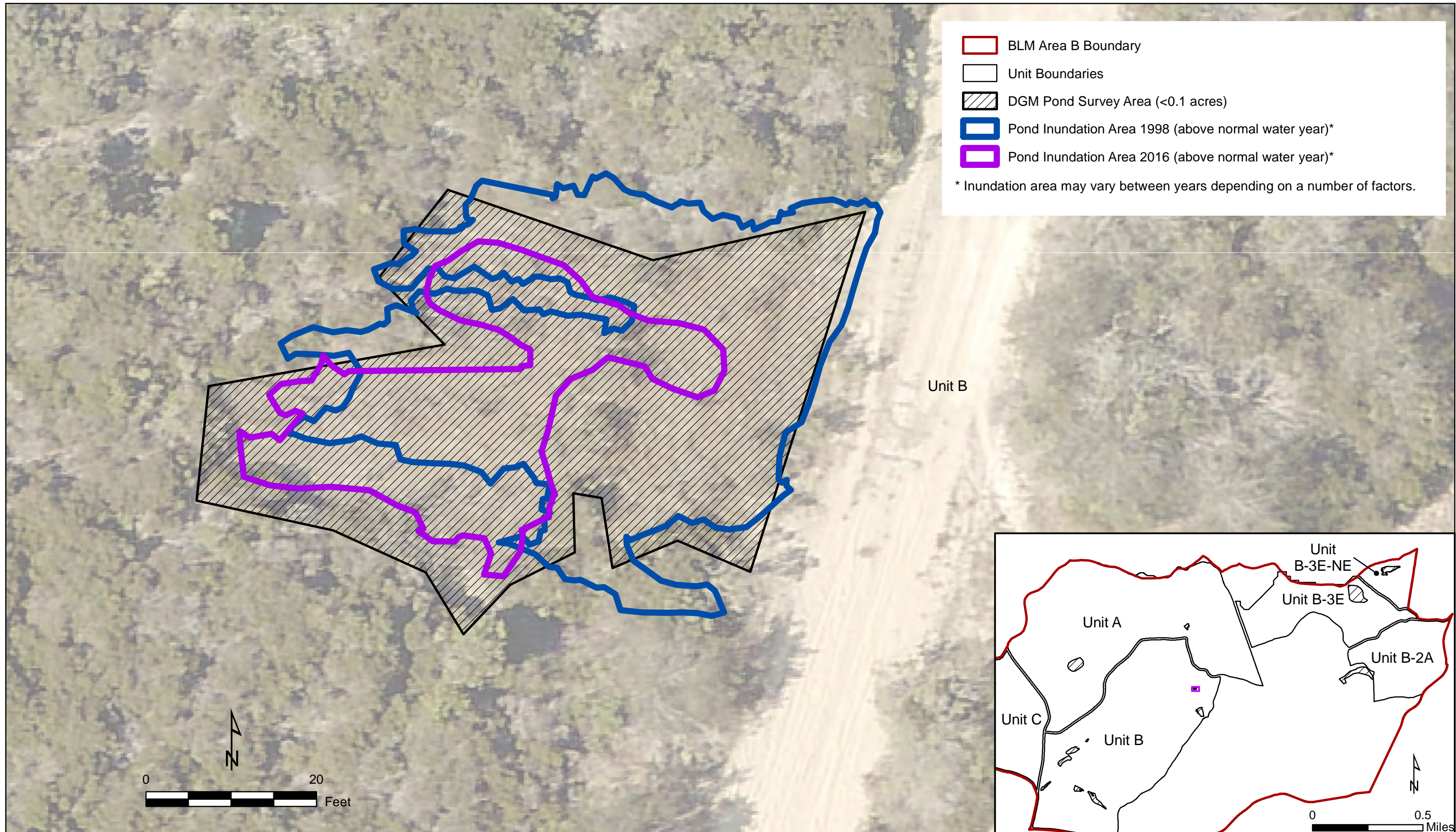
Unit B-3E-NE

Negative values can occur in DGM data as a result of minimum curvature gridding and/or levelling the data.

0 — 100 Feet
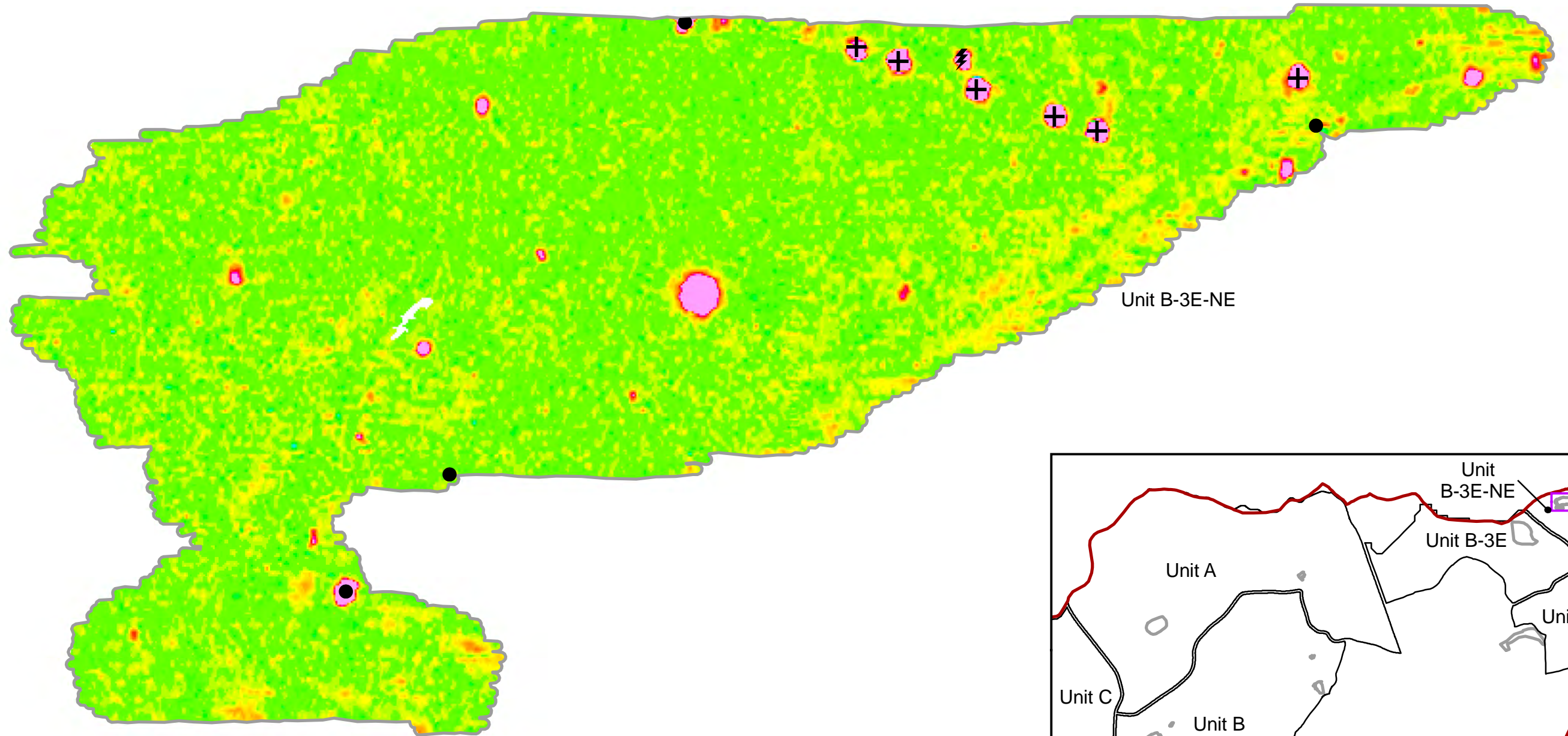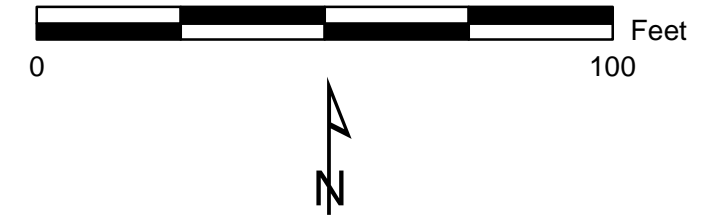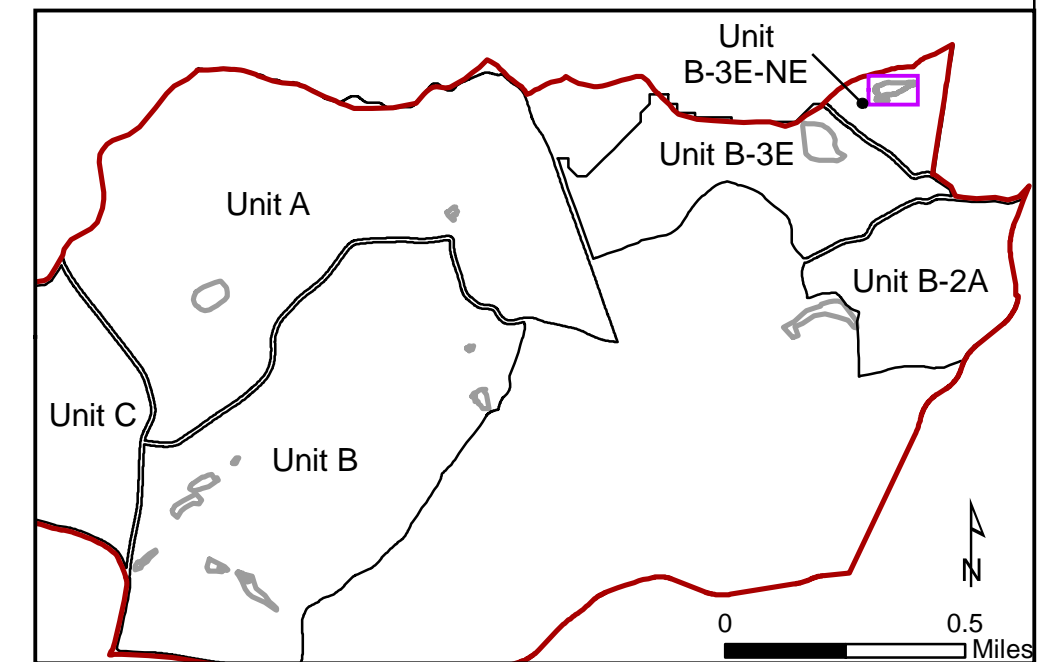
BLM Area B Track 2 Ponds
Geophysical Anomaly Investigation
Technical Information Paper
Former Fort Ord, California

Figure 14A
Pond 73
DGM & Dig Results

C:\Users\shession\Documents\GIS_Files\PROJECTS\BLM\Area_B\PondTargets\Maps\BLM_ReportFigures\Figure13A-Pond73_20190404.mxd   7/9/2019 [11:57 AM]   SHESSION, KEMRON

Legend

- BLM Area B Boundary
- Unit Boundaries
- DGM Pond Survey Area (~1.1 acres)
- Pond Inundation Area 2017 (above normal water year)*
- Pond Inundation Area 2018 (below normal water year)*
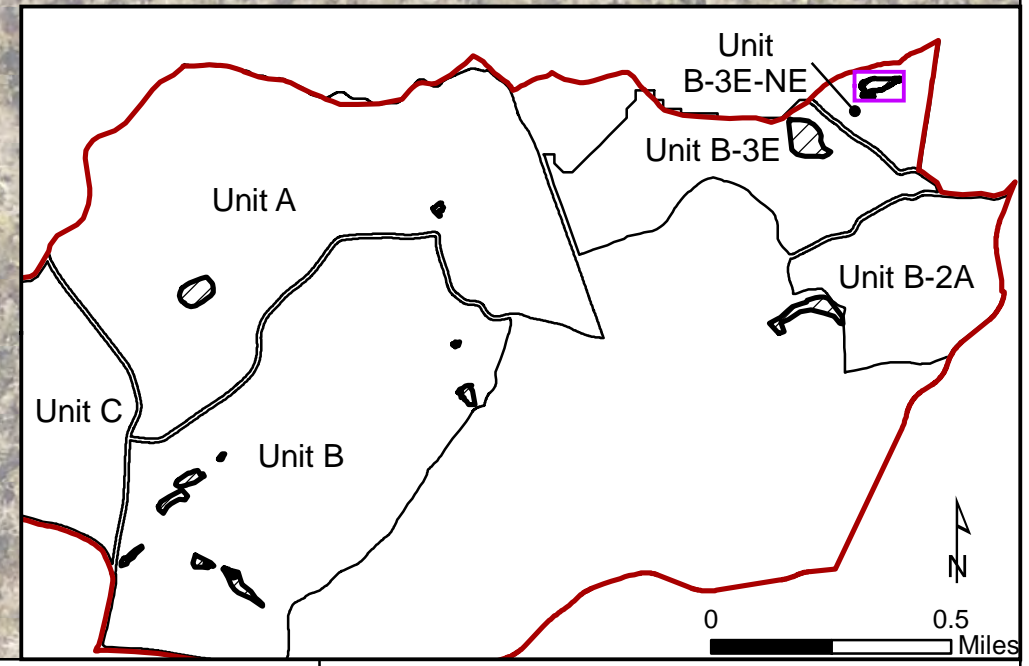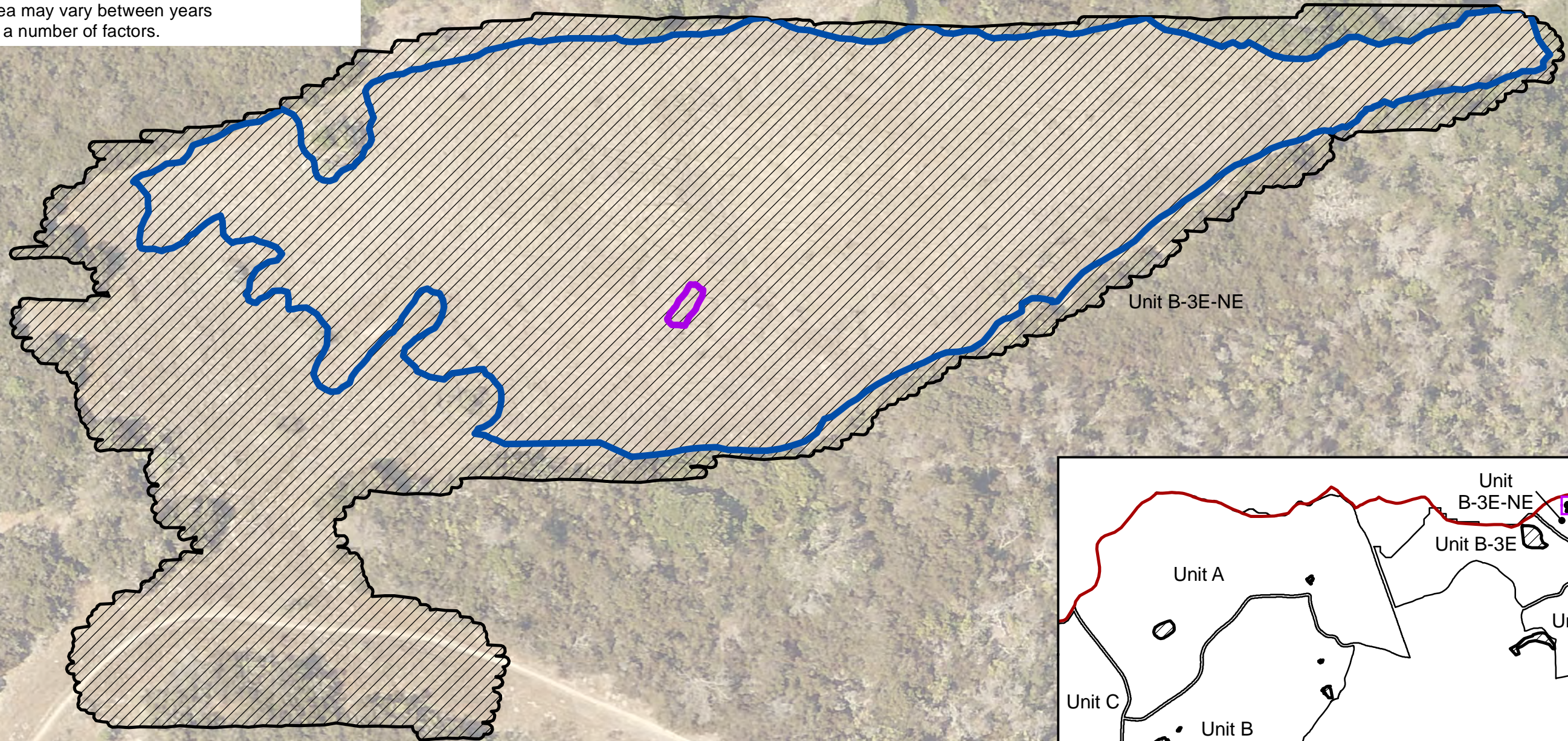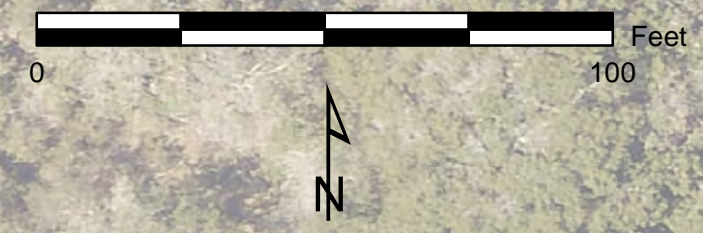
*Inundation area may vary between years depending on a number of factors.

Feet
0   100

Unit B-3E-NE

Inset Map

Unit B-3E-NE
Unit B-3E
Unit A
Unit B-2A
Unit C
Unit B

0   0.5
Miles

BLM Area B Track 2 Ponds
Geophysical Anomaly Investigation
Technical Information Paper
Former Fort Ord, California

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Gilbane

Figure 14B
Pond 73
Inundation Area

Appendix A

Field Work Variance 021

KEMRON

Gilbane

FIELD WORK VARIANCE

Project Name/Number	Fort Ord	**WP**	17
Applicable Document	Final, Site-Specific Work Plan, Munitions and Explosives of Concern Remedial Action, BLM Area B, Former Fort Ord, California (KEMRON, 2017) (OE-0900B)	**Date**	October 5, 2018

Background: Bureau of Land Management (BLM) Area B at the former Fort Ord, CA contains vernal ponds. These ponds are shown on Figure 1. Digital Geophysical Mapping (DGM) and removal of Munitions and Explosives of Concern (MEC) is not feasible when water is present in the ponds. Vernal ponds generally retain water throughout much of the year; however, 2016 was a particularly dry year. To take advantage of dry conditions, DGM surveys occurred in accessible (dry) vernal ponds using an EM61-MK2A in 2016 and anomalies were identified within the data (Table 1). Saturated Response Areas included in Table 1 indicate areas where individual anomalies could not be determined due to an elevated (saturated) response. Due to the sensitive nature of these resources and the habitat they provide, a person-portable EM-61MK2A was used to collect DGM data in order to minimize imp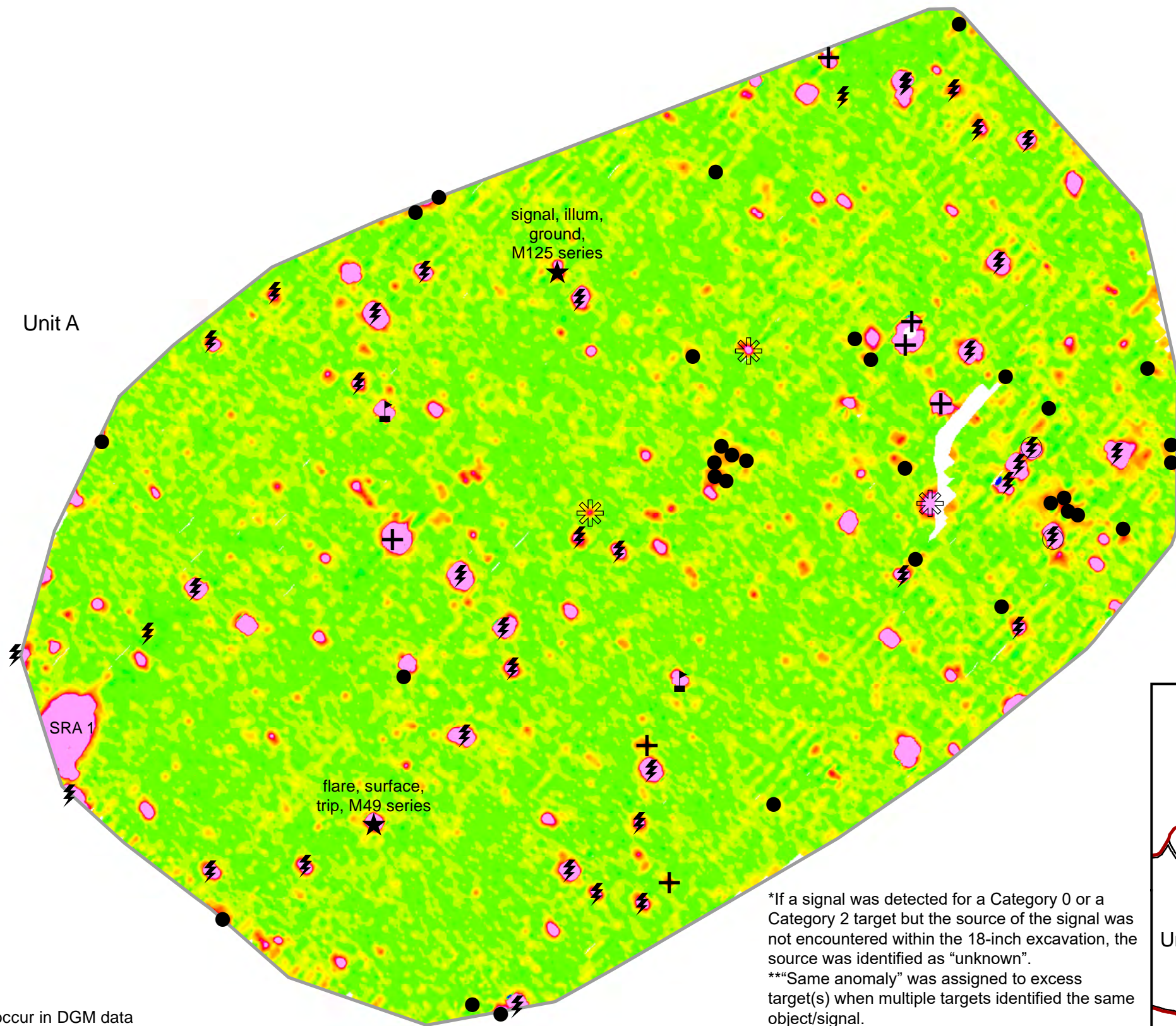acts on the vernal pond environments. Data collection was completed in accordance with standards outlined in the *Final Quality Assurance Project Plan, Superfund Response Actions, Former Fort Ord, Volume II, Munitions Response, Appendix A* (KEMRON, 2016). DGM data collected within the footprints of these vernal ponds are shown on the attached Figures 2 through 14.

Problem Description: Anomalies within the footprints of the ponds should be removed to allow safe access during biological surveys. The potential exists to negatively impact the ability of vernal pools to retain water if anomaly investigation techniques do not maintain the integrity of the clay soil layer at the bottom of the vernal pools. Anomaly investigations should be minimized and standard procedures followed to maintain the integrity of these ponds.

Recommended solution:

Use MetalMapper 2x2 to further evaluate selected targets located within the footprint of the vernal pools. Conduct a limited subsurface removal that addresses the anomalies that potentially represent MEC items in the shallow subsurface. Follow standard operating procedures outlined in Attachment 1. Standards for MetalMapper 2x2 data collection and classification are described in the *Final Quality Assurance Project Plan, Superfund Response Actions, Former Fort Ord, Volume II, Munitions Response, Appendix B* (KEMRON, 2016). Intrusive investigation of selected targets will be conducted in accordance with *SOP AGCMR-09, Anomaly Reacquisition and Intrusive Investigation*, as modified by Attachment 1 and as detailed below. The width of excavation will be limited to what is needed to acquire the target.

- All category 1 targets will be intrusively investigated.
- Category 2 targets less than 18 inches depth will be intrusively investigated. If no target is contacted, intrusive investigations will terminate at 18 inches depth.
- Category 3 targets will not be intrusively investigated.

Category 0 target locations will be checked by UXO dig teams using an EM61 all metals detector. If an anomaly greater than 4.2 mV (channel 2) is still present, the anomaly will be intrusively investigated and cleared in accordance with UXO SOP 3. If no target is contacted, intrusive investigations will be terminated at 18 inches. If no anomaly greater than 4.2 mV is present, the flagged location will not be intrusively investigated.

Impact on present and completed work:

No impact on current or completed work.

Recommended solution/disposition:

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

| Clarification ☐ | Minor Change ☐ | Major Change ☒ |

Affects Budget   Yes ☒   No ☐
Affects Schedule   Yes ☒   No ☐

Signature   Kevin Siemann   Date _____
             Task Manager

Signature   Bradley Olson   Date _____   Signature *Steve Crane* Date **10/9/18**
             SUXOS   *Project Manager*

Signature   cclyde@gilbaneco.com   Date _____   Signature _____ Date **10/9/18**
             COCSM   for   *Deputy Project Manager*

Signature   BRUCE McCLAIN   Date **9Oct18**
             UXOQCS

USACE Approval: If Major Change:

Signature _____ Date **09 OCTOBER 2018**   Signature R. Curtis Payton Date **9 OCT 18**
             OE Safety Specialist   *USACE COR or TM*

Signature _____ Date **09/OCT/2018**
             USACE Project Geophysicist

Attachment 1

Standard Operating Procedure for Soil and Vegetation Handling In Vernal Pools

PURPOSE:

The purpose of this standard operating procedure (SOP) is to describe the process that will be protective of biotic constituents of vernal pools affected by manual soil investigation activities in support of Munitions and Explosives of Concern (MEC) remedial investigations located in the BLM Area B and the Impact Area. Handling of soil and vegetation in aquatic features should be conducted under the guidance of the Wetland Monitoring and Restoration Plan for Munitions and Contaminated Soil Remedial Activities at Former Fort Ord (Burleson 2006); and in accordance with the Installation-Wide Multispecies Habitat Management Plan (HMP; USACE 1997). The work falls under the Programmatic Biological Opinion (PBO; USFWS 2017) issued to the United States Department of the Army to enable compliance with the federal Endangered Species Act and to avoid or minimize, to the extent feasible, take of listed species as well as protecting other species of concern and their habitats.

GEOLOGIC CONDITIONS:

Core sampling and GPR analysis were conducted across eight vernal pools in BLM Area B Subunits A and B. Core sampling identified clay layers with varying sand content present in all vernal pools sampled that became difficult to auger at depths around 10 inches and deeper. Three vernal pools had a second layer of clay around 12 inches that differed in color and texture. Based on the profiles of the cores and GPR results it is expected that most of the target digs will occur within clay layers, and that the excavations will not penetrate past them.

PROCEDURE:

MEC remedial investigation activities in identified vernal pools is required to make the vernal pools safe for entry when they are inundated with water. Targets will be acquired down to 18 inches. For each excavated target, soil will be stockpiled separately to allow for replacement that mirrors preexisting conditions after operations are complete, to the extent feasible. Soil disturbance activities will be conducted when the vernal pools are dry, as determined by the project biologist. Each excavated target will be backfilled with stockpiled soil immediately after the target is acquired.

The soil and vegetation handling process for each anomaly investigation shall be conducted as follows:

1. For each target, prior to any work, a digital photograph should be taken of the target location with an engineer's ruler (Photo 1), and a whiteboard with the following information:

   Date
   Pond number
   Unique target ID

2. In case that the location of the target is overgrown with vegetation, vegetation will be cut around the target and set aside in a pile.

3. During anomaly excavation the top 6 inches of topsoil layer should be removed first and set aside. Subsequent soil layers will be removed at 6 inch intervals down to the target item, but not further than 18 inches. Soils should be separated into piles at 6 inch intervals and managed for easy transfer back into to the excavated area.

4. After acquisition of the target item is complete, a digital photograph should be taken of the excavated area with an engineer's ruler placed in the X and Y axis for estimation of the excavated area. The photograph should also include a whiteboard with the following information:

   Date
   Pond number
   Unique target ID
   Depth of excavation

5. A digital photograph should be taken of the separate soil piles or their samples for each target.

6. The excavated area should be backfilled using soils in the reverse order that were excavated and were set aside. Each layer should be returned to its original position. During backfilling, the soil should be compacted at 6-inch intervals to help preserve the impermeability of the disturbed soil. Use enough water to moisten the soil, but not saturate it to ensure even compaction. Placement of hard chips may require breaking the large fragments of clay into smaller, more readily compacted pieces before placement. Use a compaction and breaker bar to compact the filled area uniformly, by dropping the bar 20 times from 1 foot height across the excavated area with the flat end (Photo 2). The final layer must be the top 6 inches saved from the surface. If vegetation was removed the clippings should be placed back on top of the excavation area.

7. After backfilling of the excavated area is complete, a digital photograph should be taken of the backfilled area with an engineer's ruler placed approximately in the same position as in No. 4 above. The photograph should also include a whiteboard with the following information:

   Date
   Pond number
   Unique target ID
   Depth of excavation

Photograph 1. Suggested example of an engineer's ruler.

Photograph 2. Suggested example of a compaction and breaker bar.

REFERENCES:

[Burleson] Burleson Consulting, Inc. 2006. Wetland monitoring and restoration plan for munitions and contaminated soil remedial activities at former Fort Ord, California.

[USACE] U.S. Army Corps of Engineers. 1997. Installation-wide multi-species habitat management plan for former Fort Ord, California. April. Sacramento, California.

[USFWS] U.S. Fish and Wildlife Service. 2017. Reinitiation of Formal Consultation for Cleanup and Property Transfer Actions Conducted at the Former Fort Ord, Monterey County, California (Original Consultation #8-8-09-F-74, 81440-2009-F-0334).

Tables

Table 1

Pond	Anomaly Count	Saturated Area (sq ft)
Pond 3N	46	
Pond 3S	31	
Pond 40N	7	
Pond 40S	76	
Pond 35	21	
Pond 39	108	1697
Pond 41	164	429
Pond 42	74	
Pond 43	24	
Pond 44	48	
Pond 60	101	
Pond 61	122	
Pond 73	28	
Total:	850	2126

Figures

Legend:
- DGM Pond Survey Areas
- BLM Area B MEC Remediation Areas
- Unit Boundaries
- BLM Area B Boundary
- Impact Area MRA Boundary
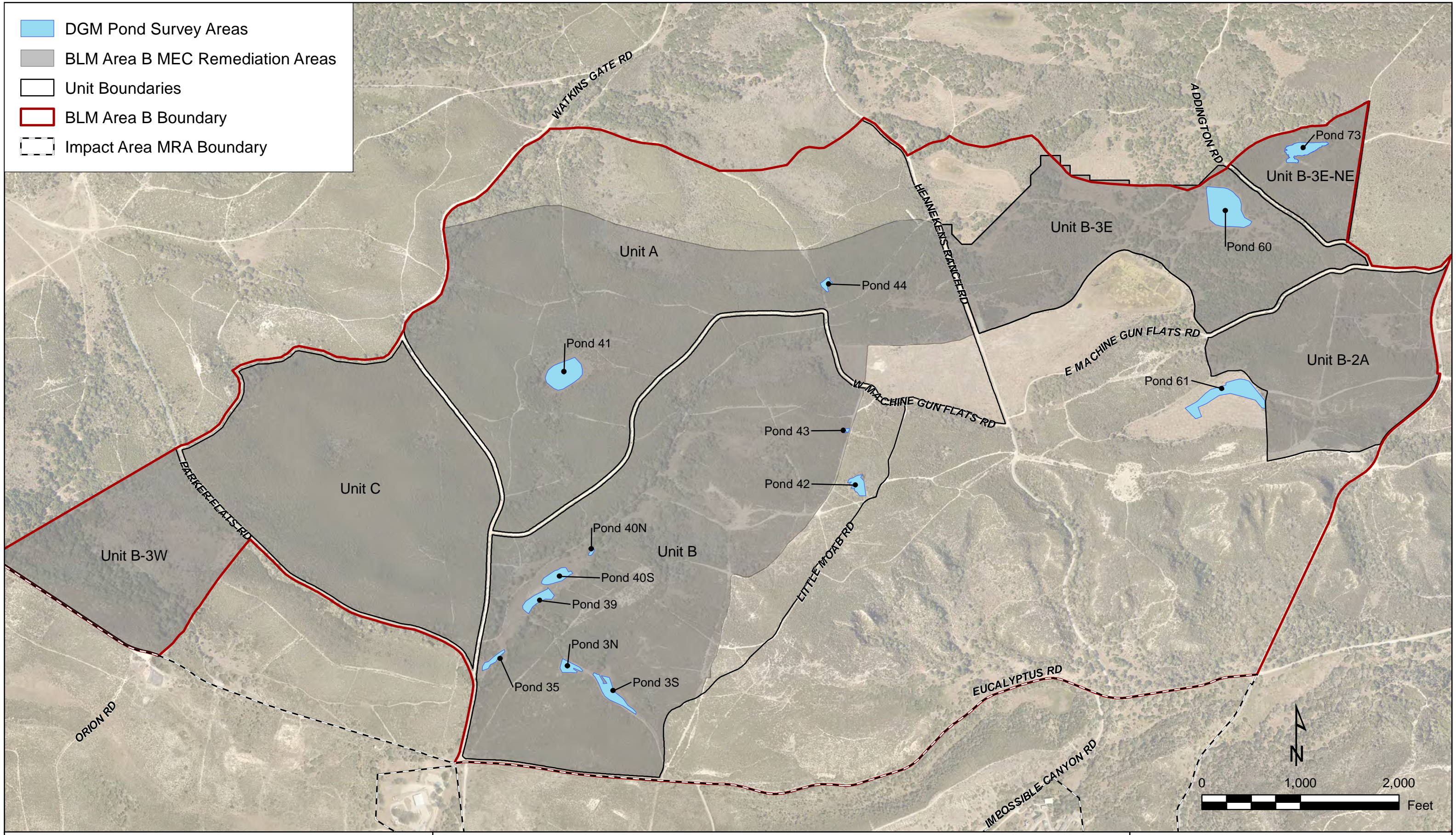
Field Work Variance No. 21

Former Fort Ord, California

Figure 1

Location Map

NAEVA GEOPHYSICS INC.
THE LEADER IN SUBSURFACE DETECTION
Subsurface Geophysical Surveys

Legend

Area of Investigation

Selected Target

Data Gap

mV
Sum Channel

25   0   25
US survey foot
NAD83 / California zone 4 (ftUS)
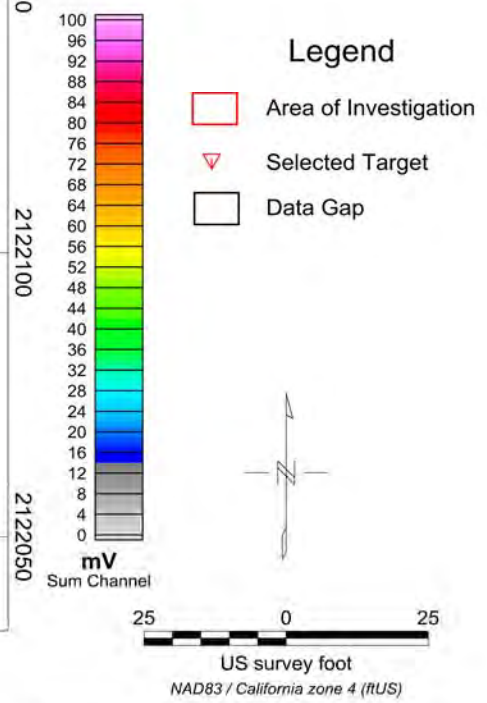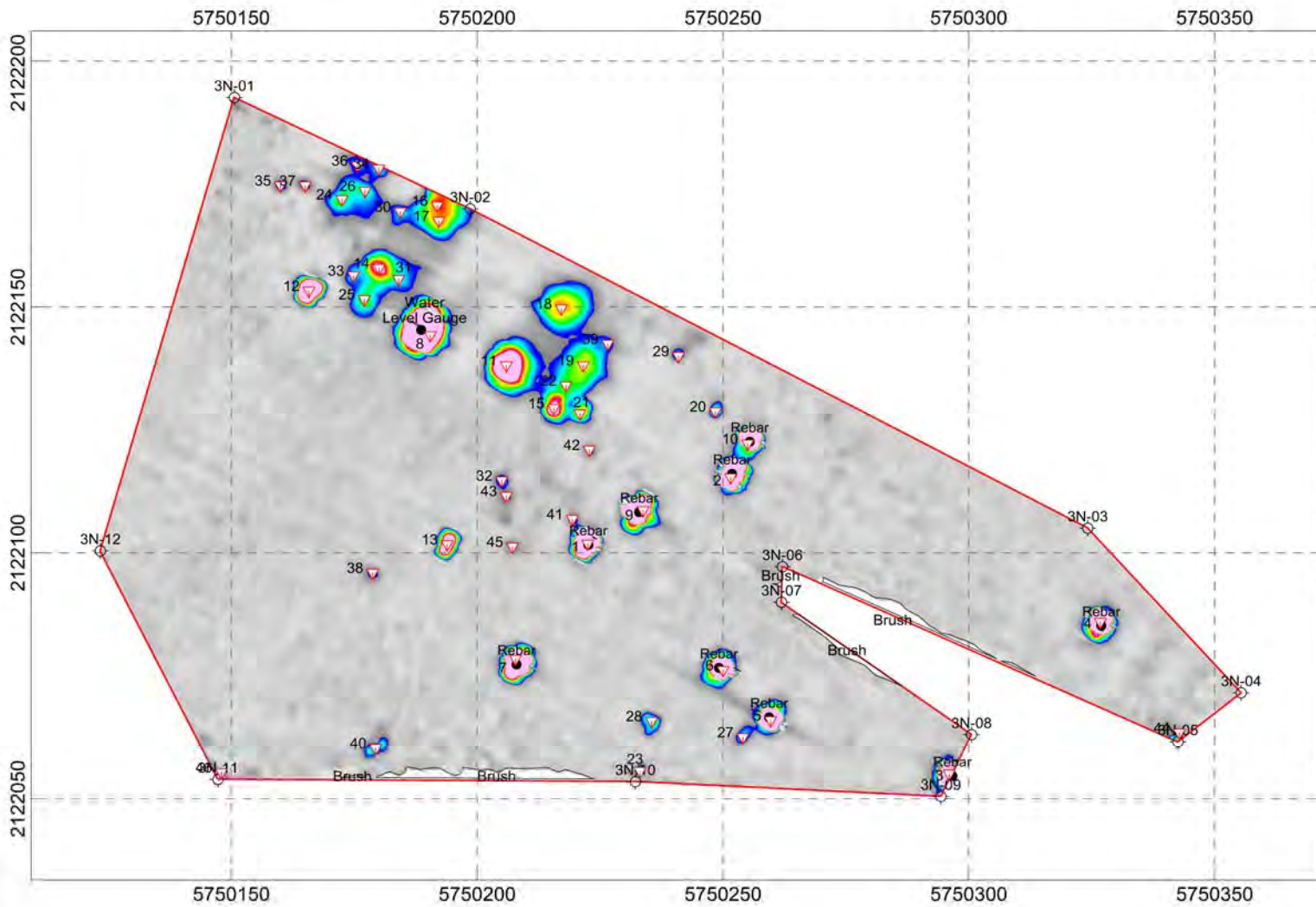
Kemron - Figure 2

EM61 MK2 Bottom Coil PP
Grid Block Pond 3N - Vernal Pond Collection
BLM Area B Munitions Response Area
Former Fort Ord, California

Date of Map Creation: 11/30/2016
Date of Survey: 11/23/2016

NAEVA GEOPHYSICS INC.
THE LEADER IN SUBSURFACE DETECTION
Subsurface Geophysical Surveys

Legend

Area of Investigation

Selected Target

Data Gap

mV
Sum Channel

US survey foot
NAD83 / California zone 4 (ftUS)
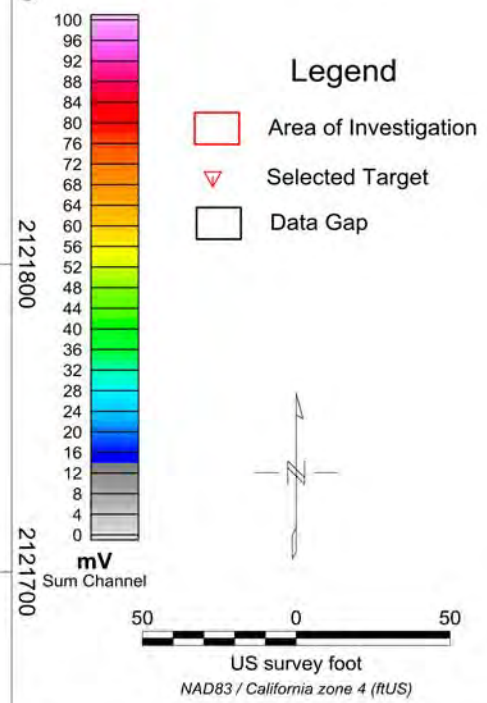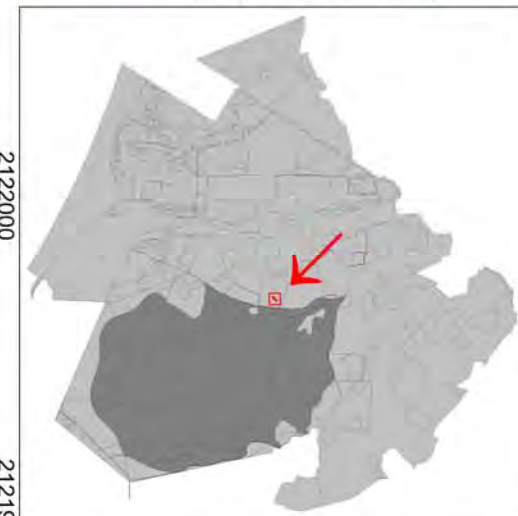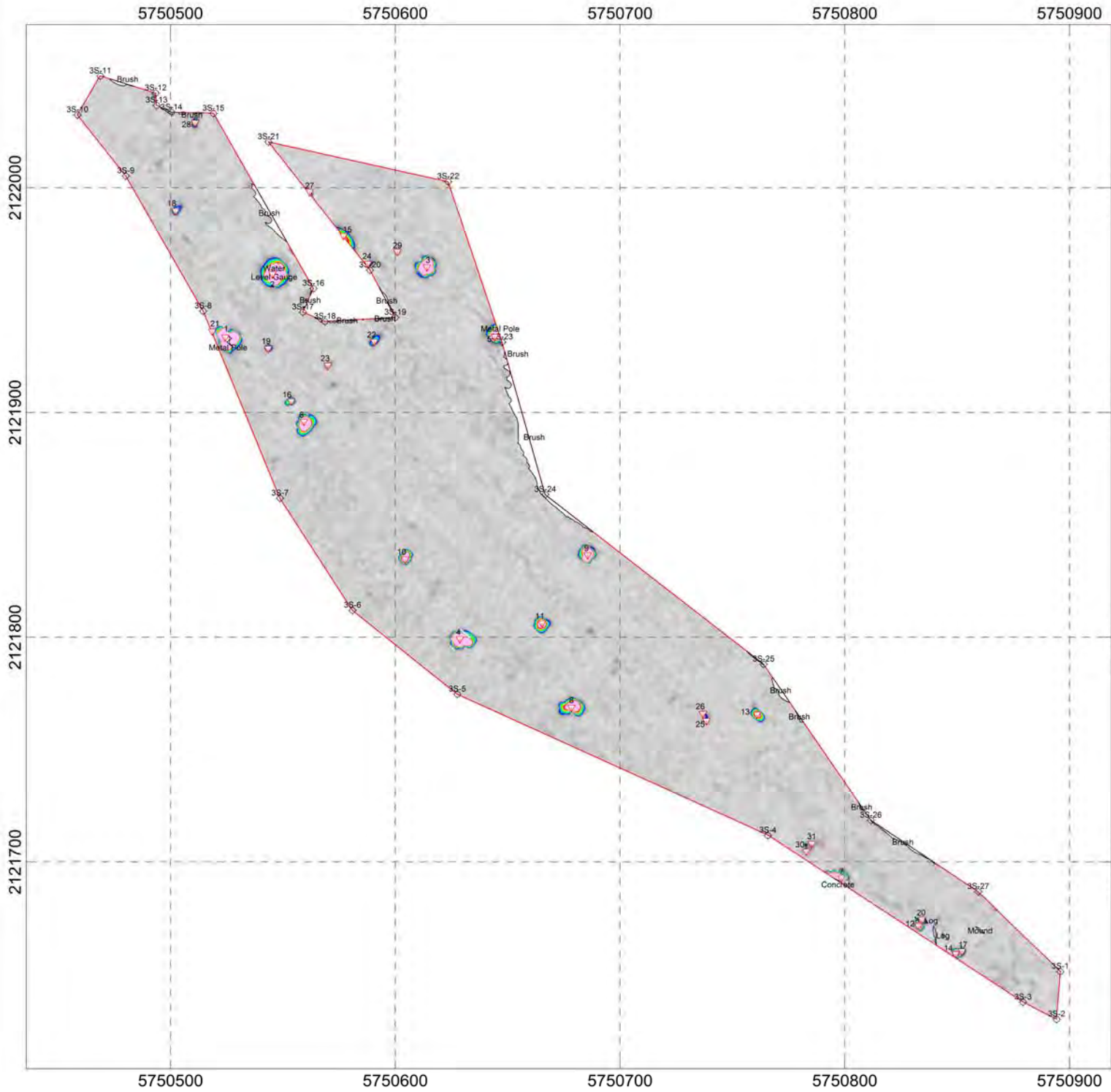
Kemron - Figure 3

EM61 MK2 Bottom Coil PP
Grid Block Pond 3S - Vernal Pond Collection
BLM Area B Munitions Response Area
Former Fort Ord, California

Date of Map Creation: 11/30/2016
Date of Survey: 11/29/2016
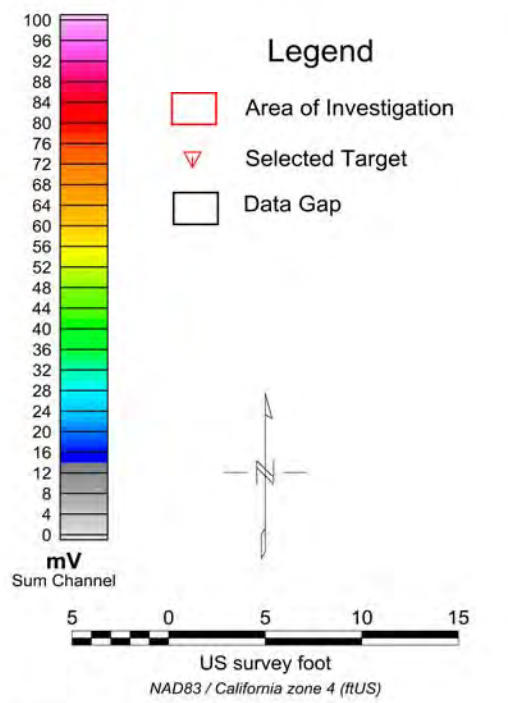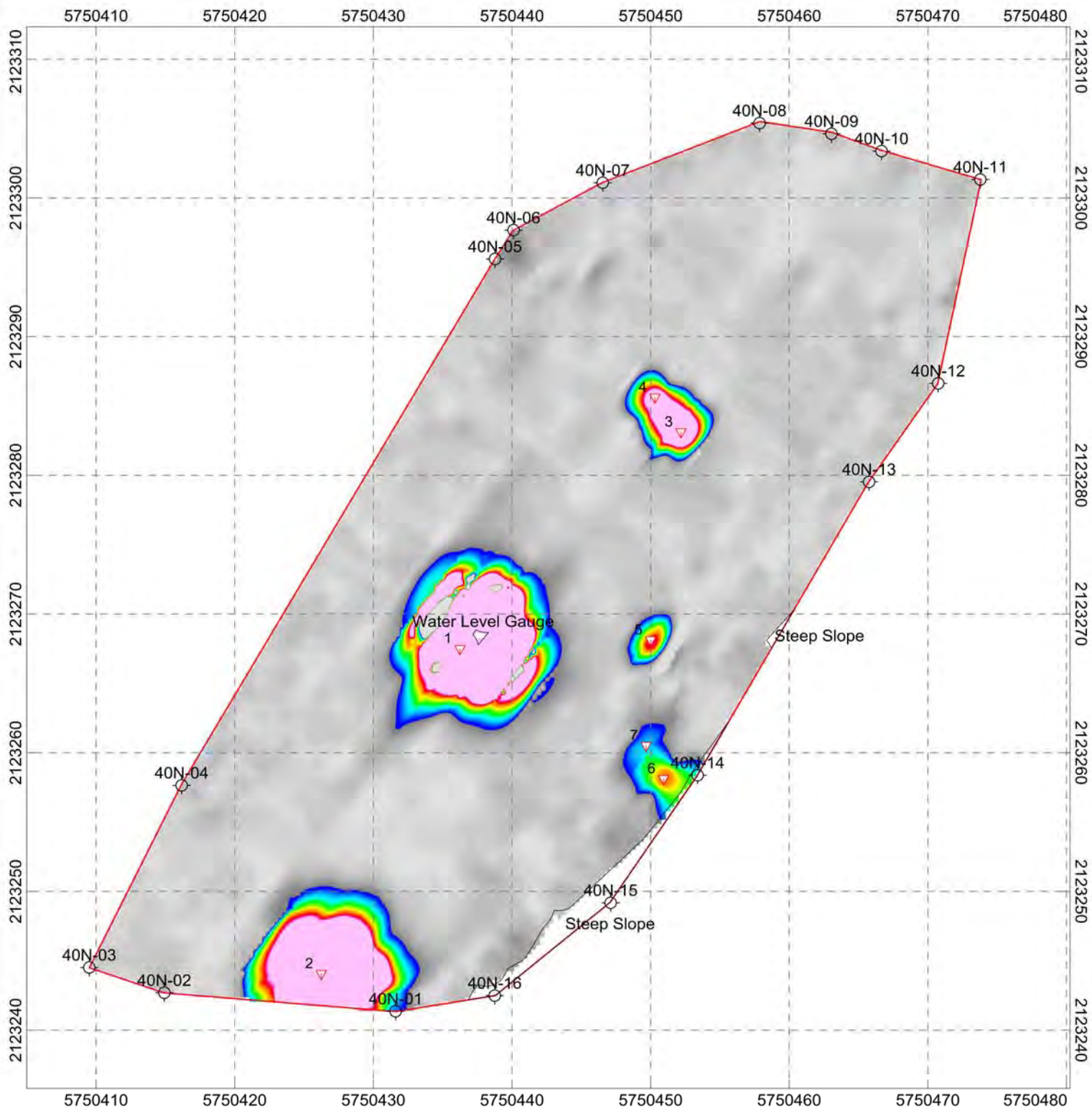
Kemron - Figure 4

EM61 MK2 Bottom Coil PP
Grid Block Pond 40N - Vernal Pond Collection
BLM Area B Munitions Response Area
Former Fort Ord, California

Date of Map Creation: 11/28/2016
Date of Survey: 11/22/2016
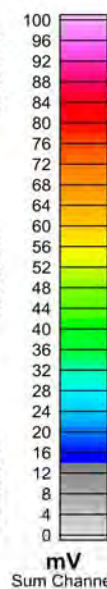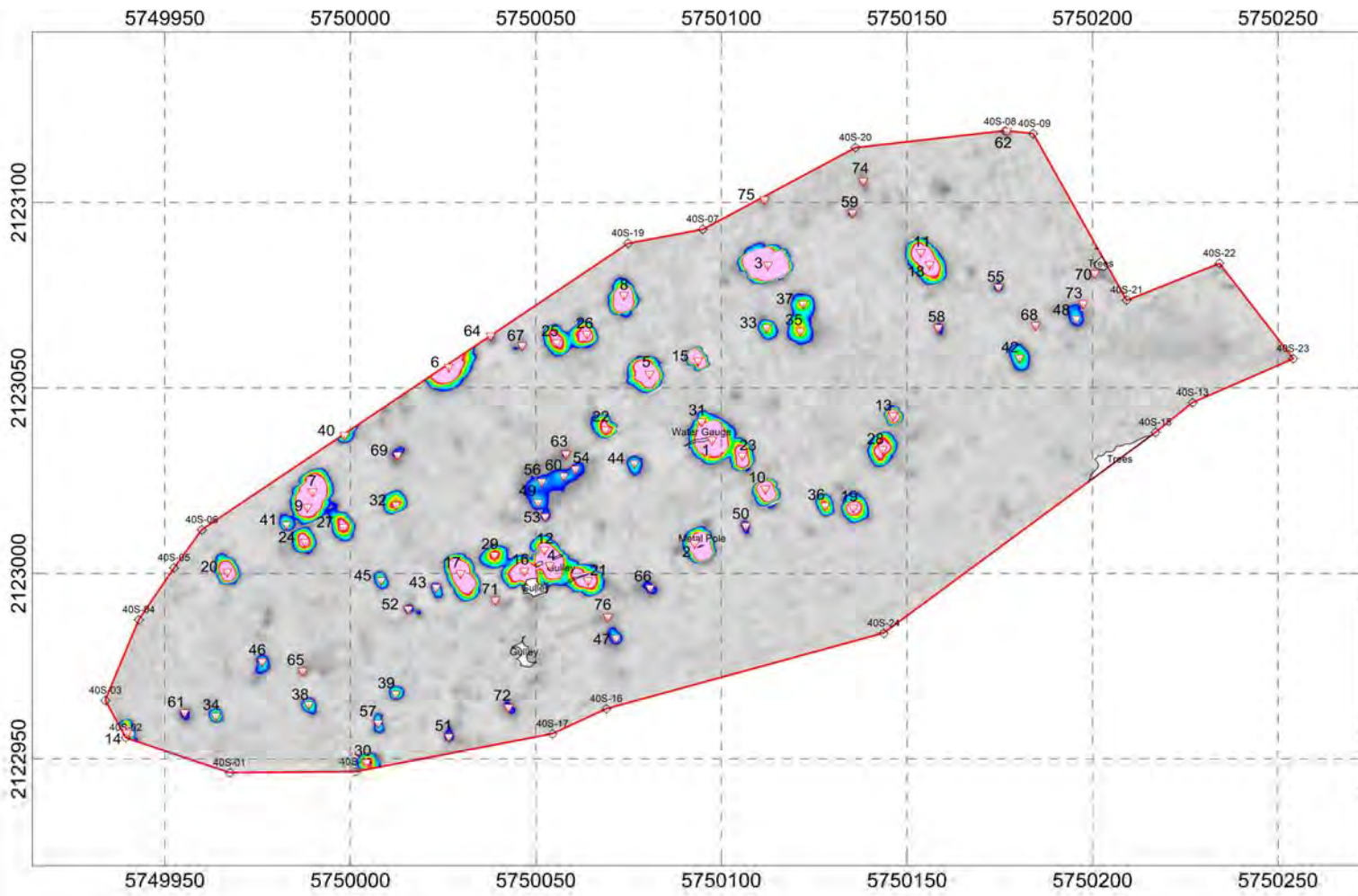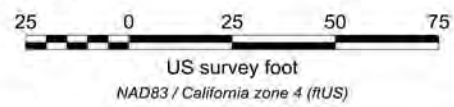
Kemron - Figure 5

EM61 MK2 Bottom Coil PP
Grid Block Pond 40S - Vernal Pond Collection
BLM Area B Munitions Response Area
Former Fort Ord, California

Date of Map Creation: 11/23/2016
Date of Survey: 11/21/2016
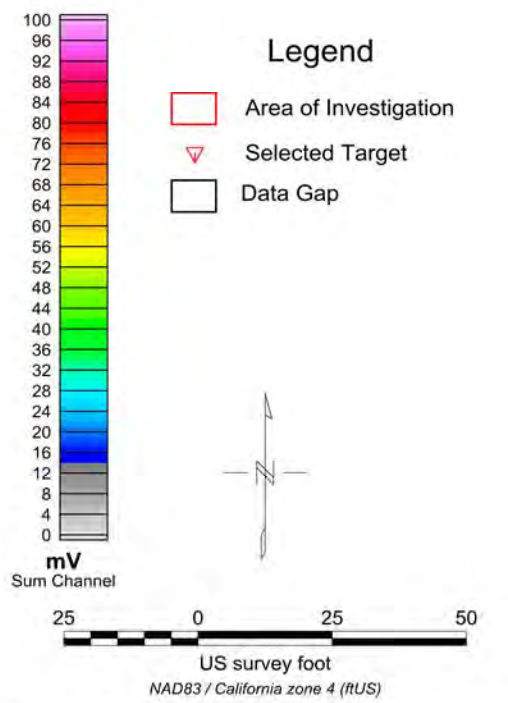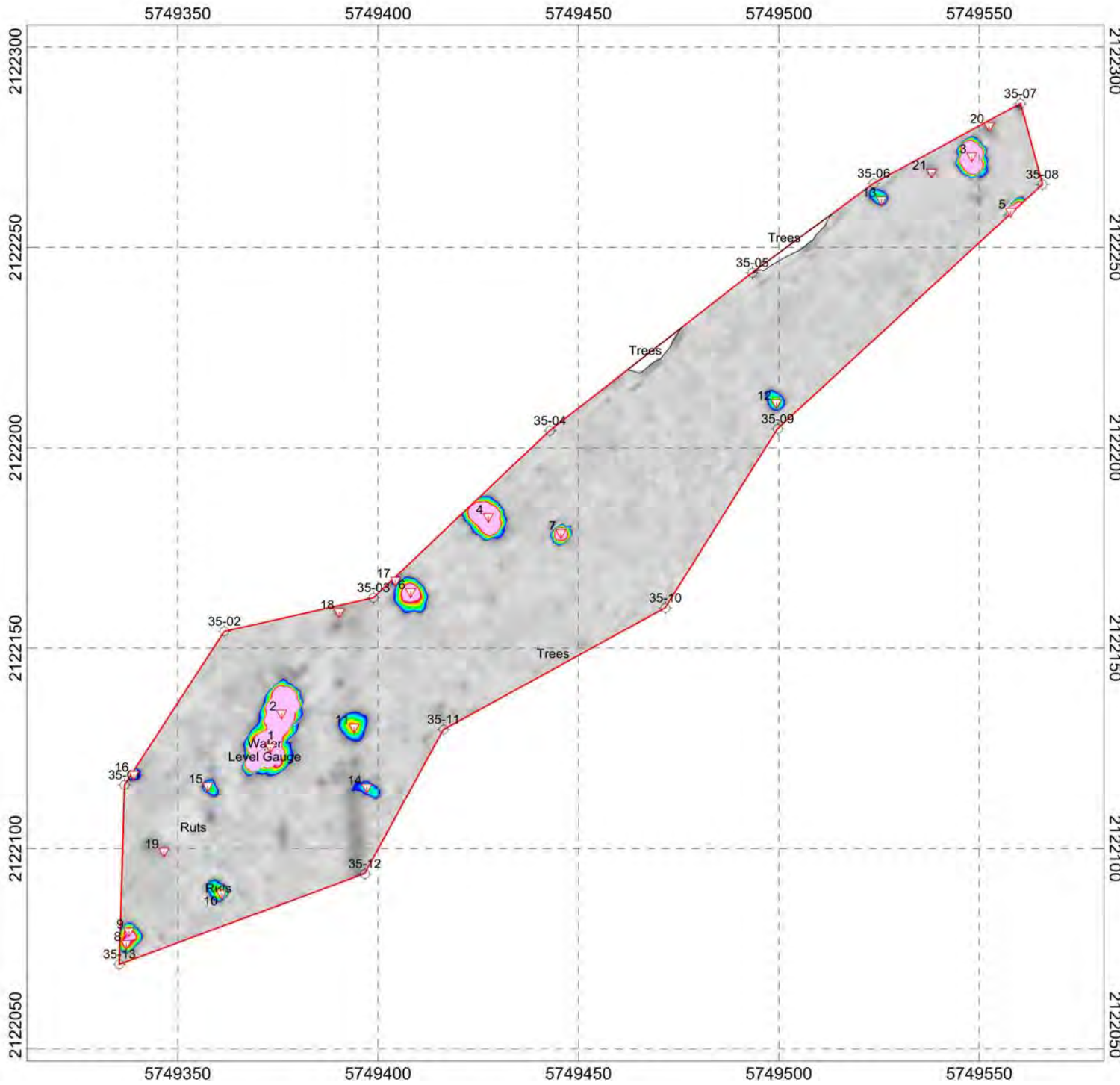
Kemron - Figure 6

EM61 MK2 Bottom Coil PP
Grid Block Pond 35 - Vernal Pond Collection
BLM Area B Munitions Response Area
Former Fort Ord, California

Date of Map Creation: 11/29/2016
Date of Survey: 11/22/2016

NAEVA GEOPHYSICS INC.
THE LEADER IN SUBSURFACE DETECTION
Subsurface Geophysical Surveys

Legend

Area of Investigation

Selected Target

Data Gap

mV
Sum Channel

100
96
92
88
84
80
76
72
68
64
60
56
52
48
44
40
36
32
28
24
20
16
12
8
4

25   0   25   50   75
US survey foot
NAD83 / California zone 4 (ftUS)
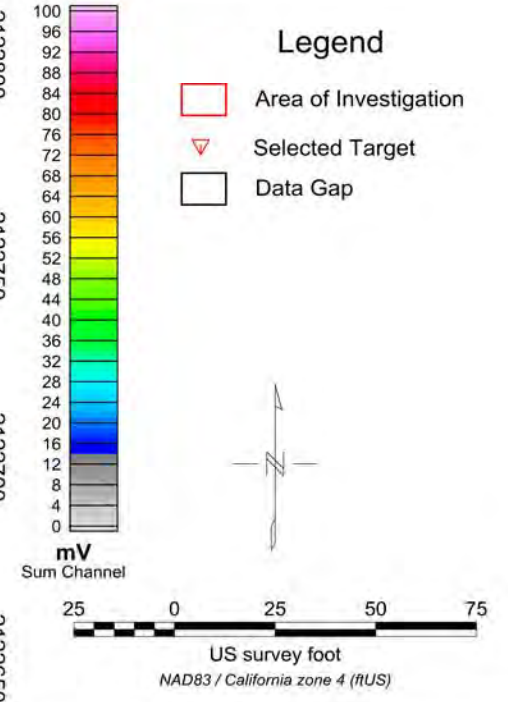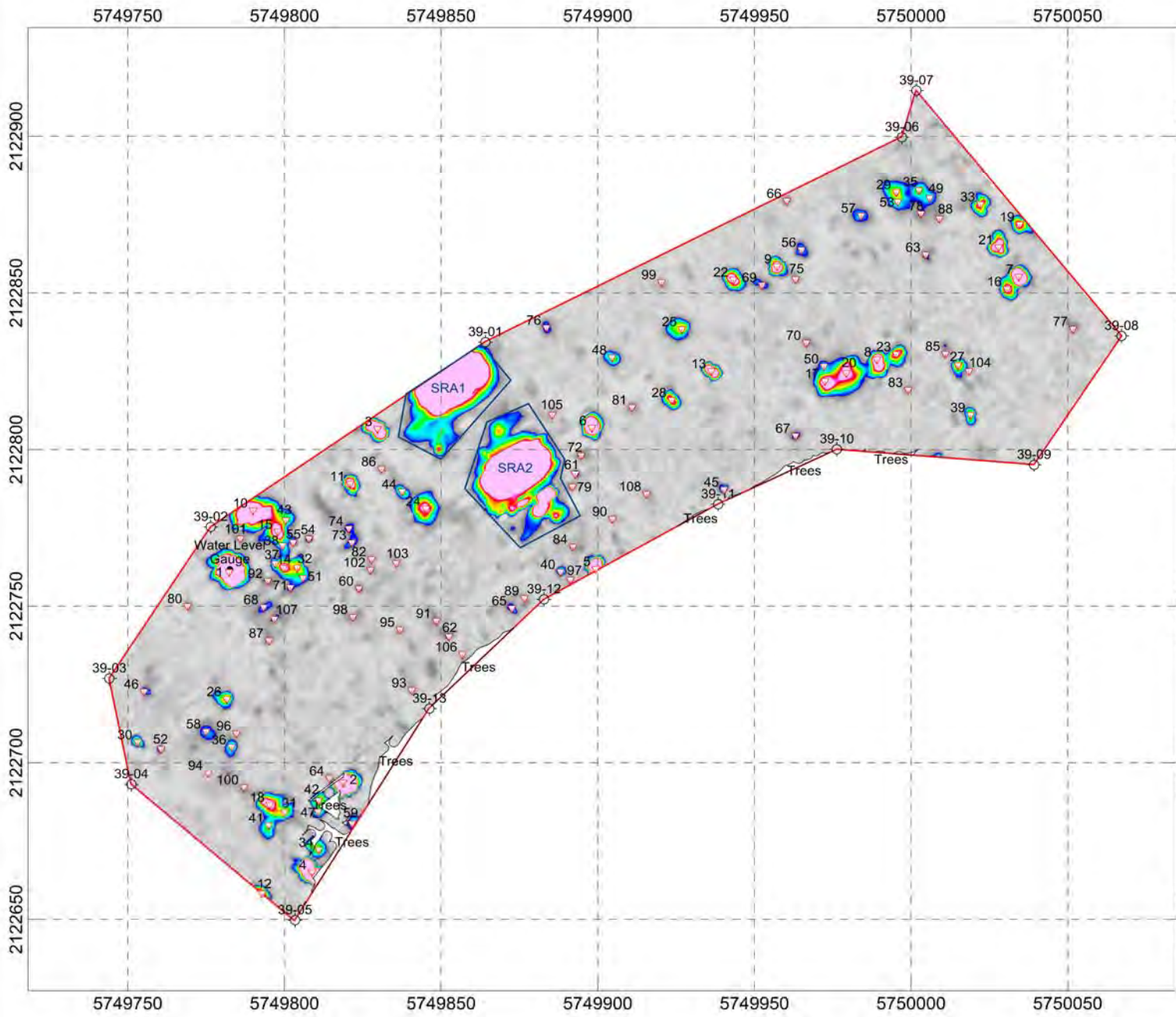
Kemron - Figure 7

EM61 MK2 Bottom Coil PP
Grid Block Pond 39 - Vernal Pond Collection
BLM Area B Munitions Response Area
Former Fort Ord, California

Date of Map Creation: 11/21/2016
Date of Survey: 11/17/2016

NAEVA GEOPHYSICS INC.
THE LEADER IN SUBSURFACE DETECTION
Subsurface Geophysical Surveys

Legend

Area of Investigation

Selected Target

Data Gap

mV
Sum Channel

US survey foot
NAD83 / California zone 4 (ftUS)
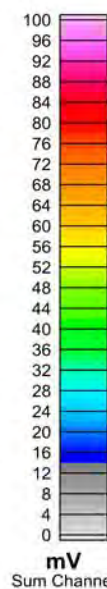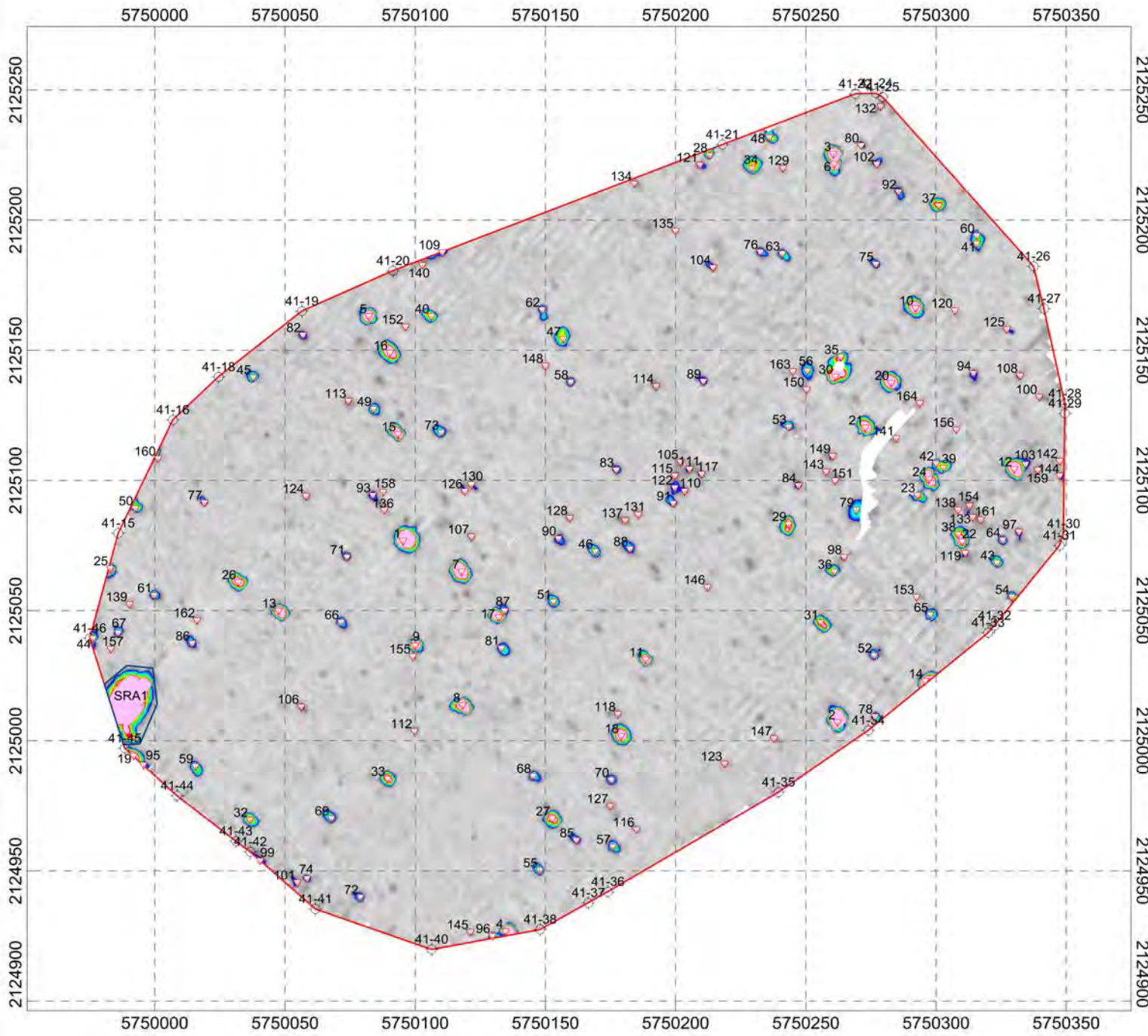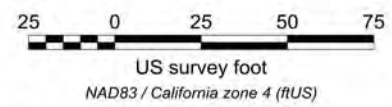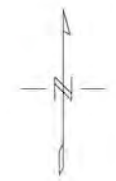
Kemron - Figure 8

EM61 MK2 Bottom Coil PP
Grid Block Pond 41 - Vernal Pond Collection
BLM Area B Munitions Response Area
Former Fort Ord, California

Date of Map Creation: 11/08/2016
Date of Survey: 11/01/2016 - 11/03/2016

NAEVA GEOPHYSICS INC.
THE LEADER IN SUBSURFACE DETECTION
Subsurface Geophysical Surveys

Legend

Area of Investigation

Selected Target

Data Gap

mV
Sum Channel

100
96
92
88
84
80
76
72
68
64
60
56
52
48
44
40
36
32
28
24
20
16
12
8
4
0

25   0   25

US survey foot
NAD83 / California zone 4 (ftUS)
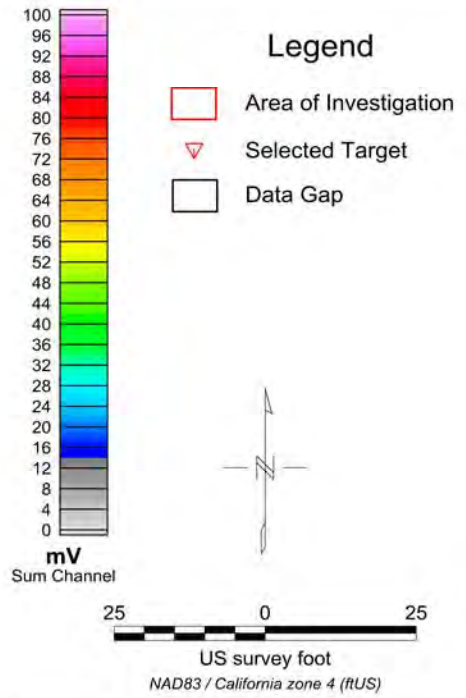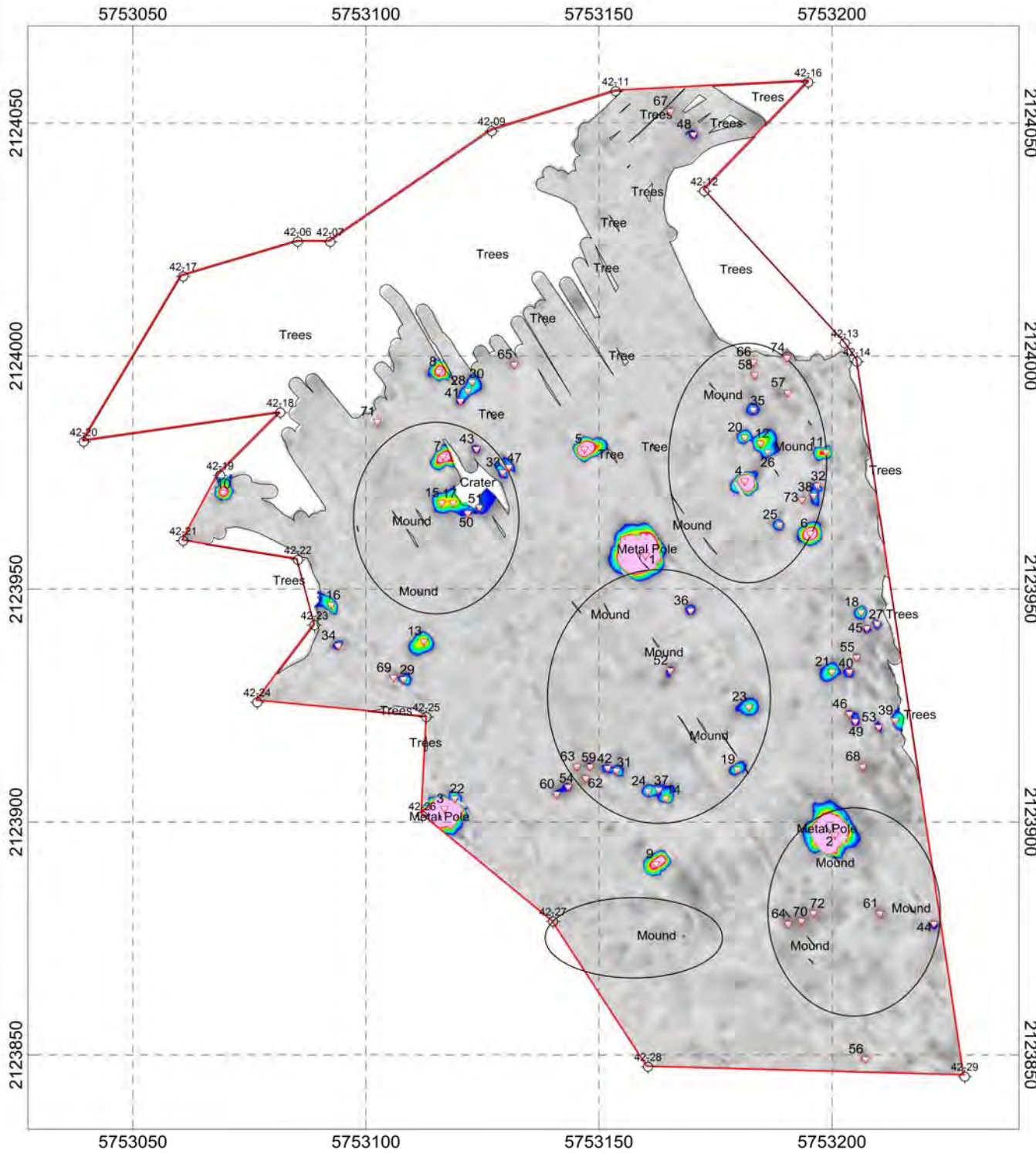
Kemron - Figure 9

EM61 MK2 Bottom Coil PP
Grid Block Pond42 - Vernal Pond Collection
BLM Area B Munitions Response Area
Former Fort Ord, California

Date of Map Creation: 11/21/2016
Date of Survey: 11/15/2016 - 11/16/2016
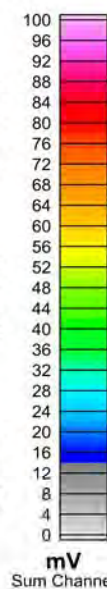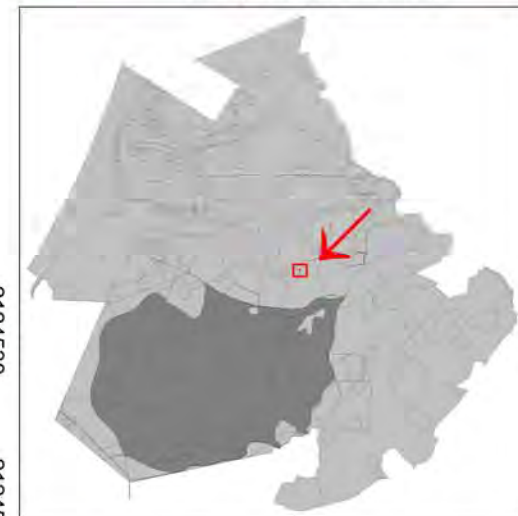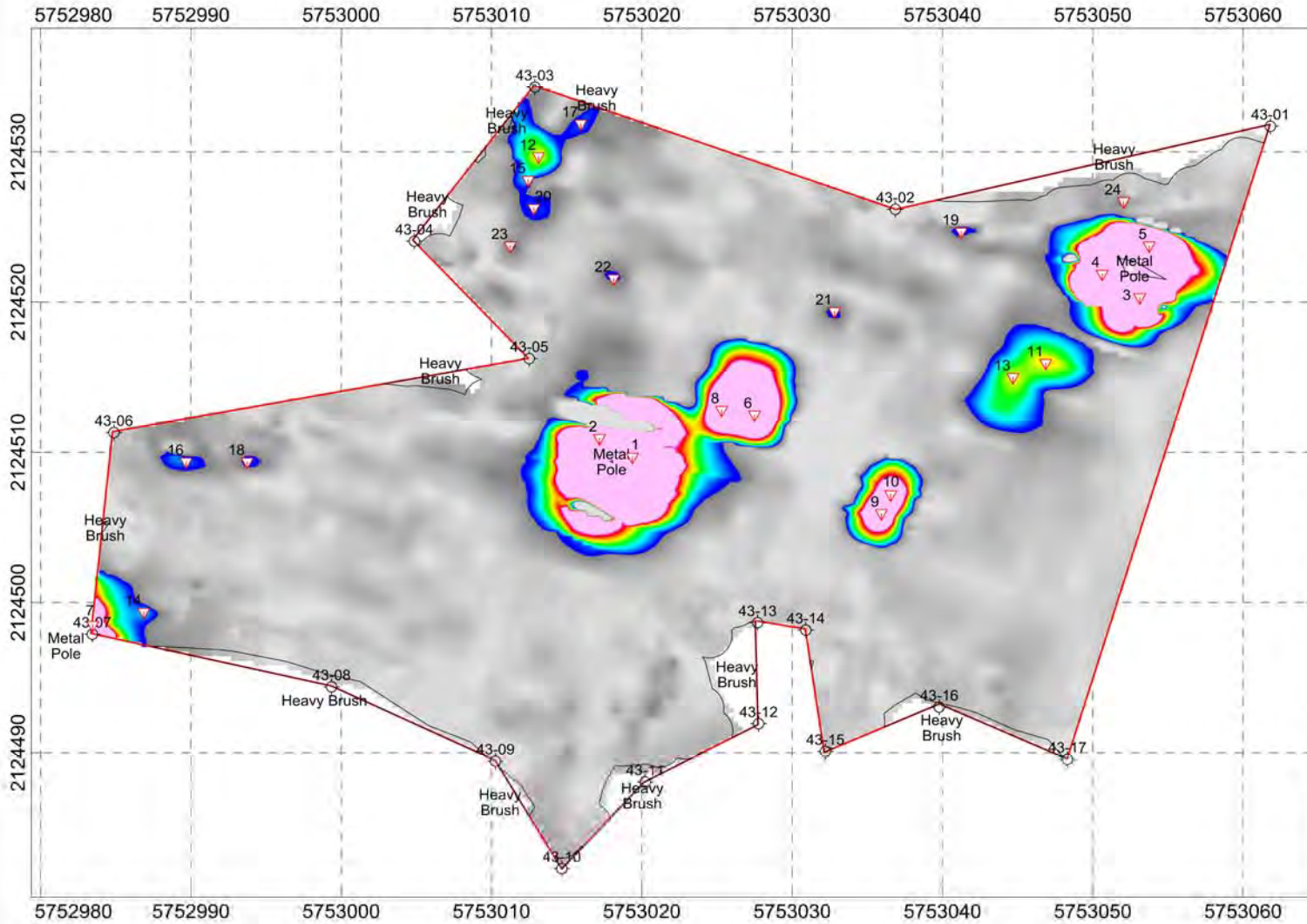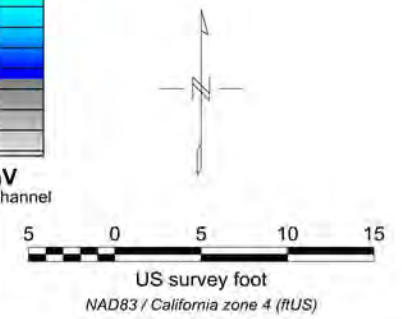
Kemron - Figure 10

EM61 MK2 Bottom Coil PP
Grid Block Pond 43 - Vernal Pond Collection
BLM Area B Munitions Response Area
Former Fort Ord, California

Date of Map Creation: 11/16/2016
Date of Survey: 11/15/2016
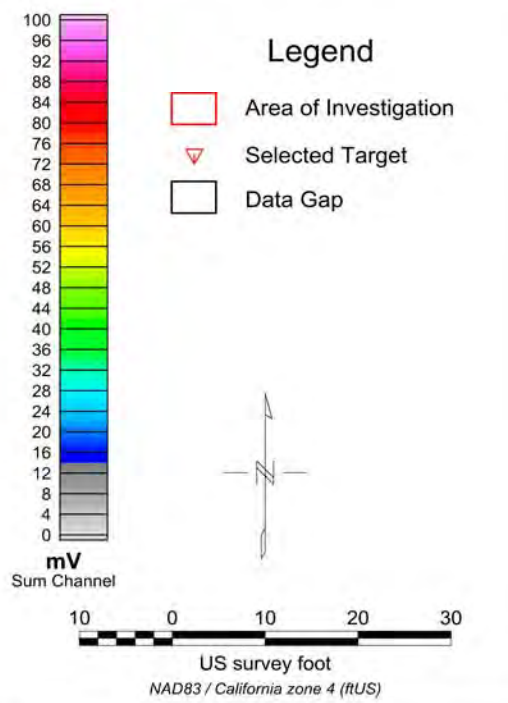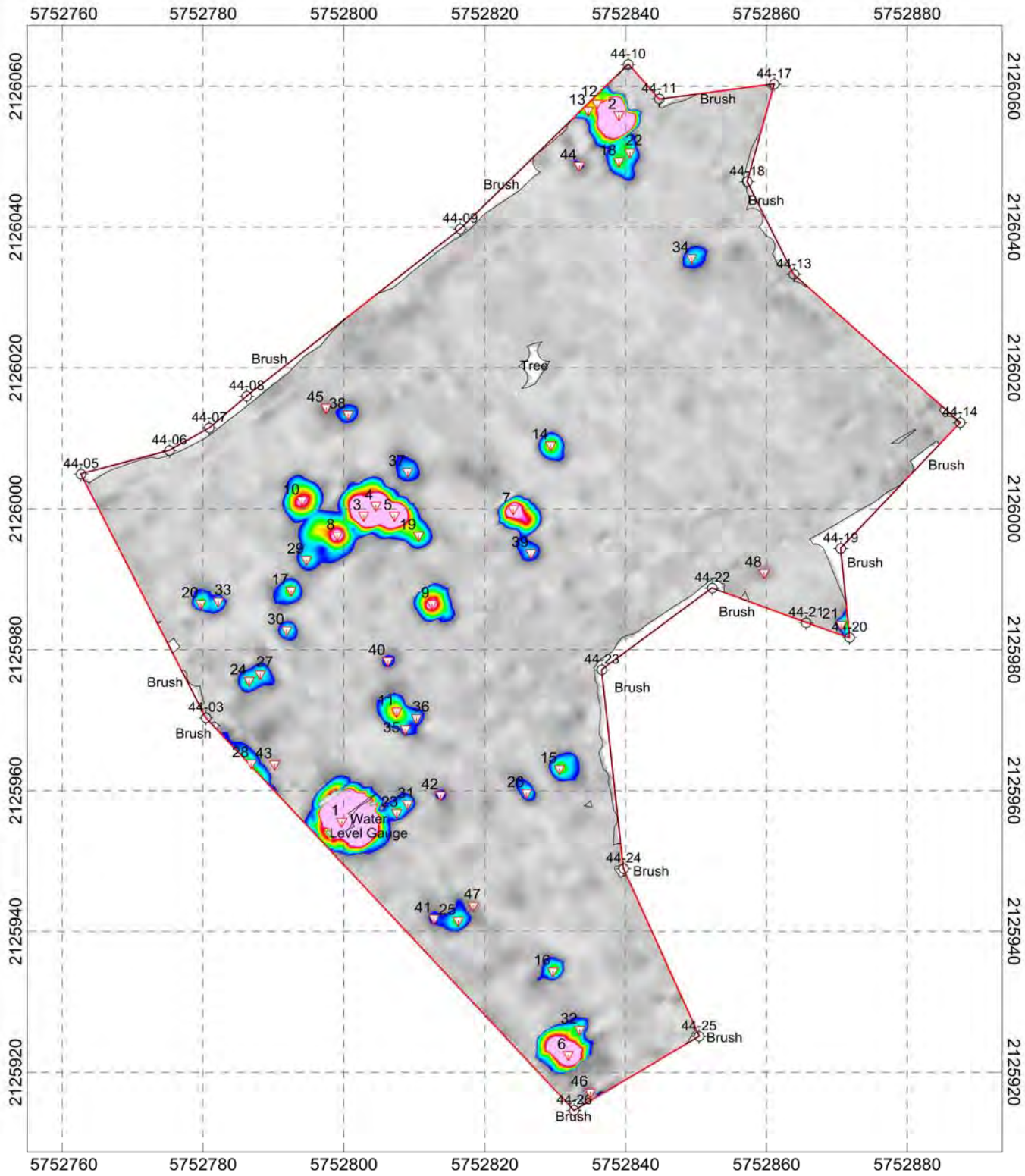
Kemron - Figure 11

EM61 MK2 Bottom Coil - PP
Grid Block Pond 44 - Vernal Pond Collection
BLM Area B Munitions Response Area
Former Fort Ord, California
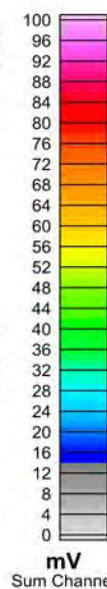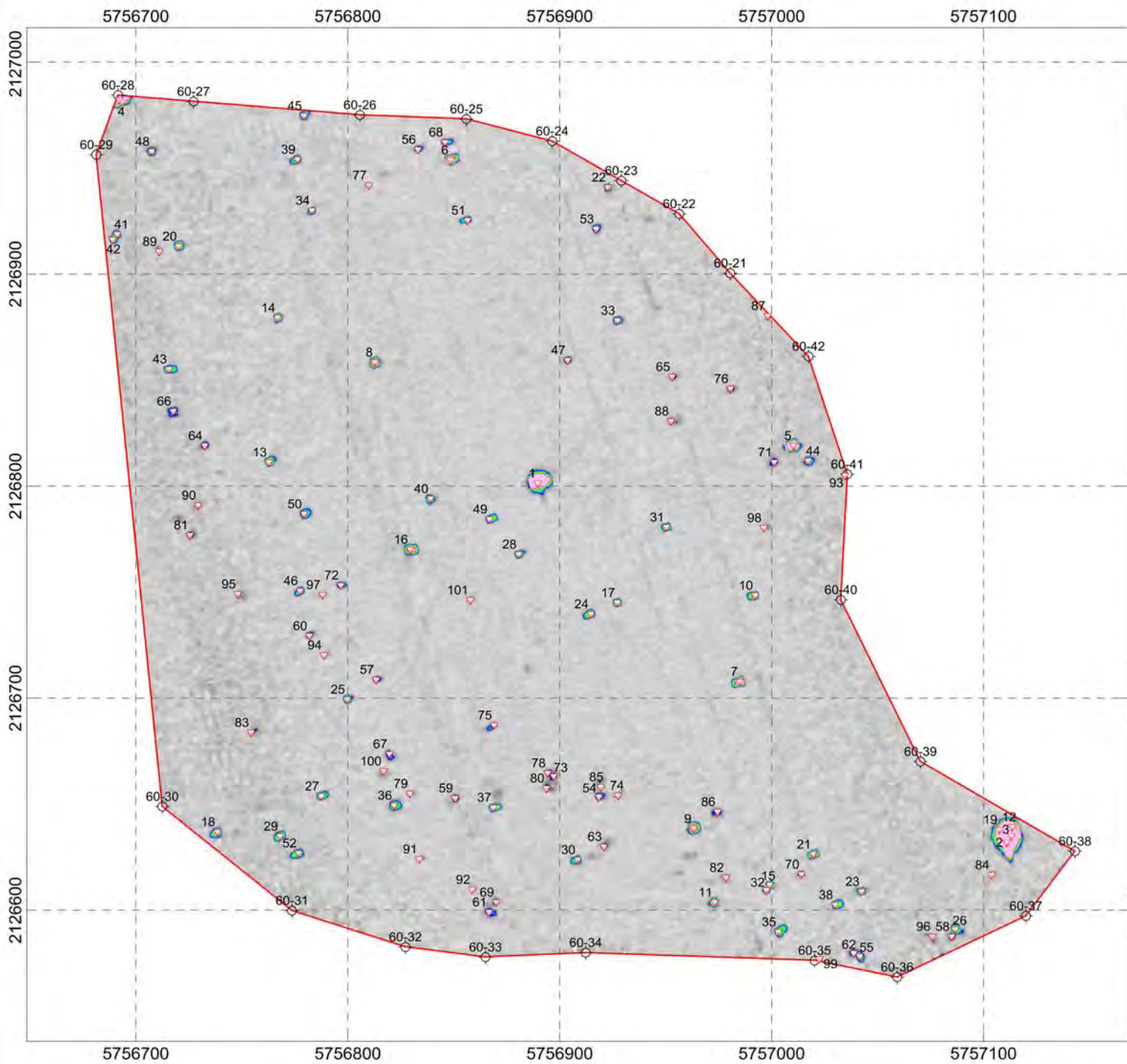
Date of Map Creation: 11/03/2016
Date of Survey: 10/26/2016-10/31/2016
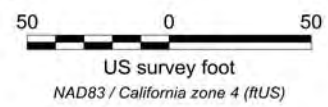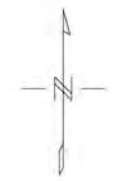
Kemron - Figure 12

EM61 MK2 Bottom Coil - PP
Grid Block Pond 60 - Vernal Pond Collection
BLM Area B Munitions Response Area
Former Fort Ord, California
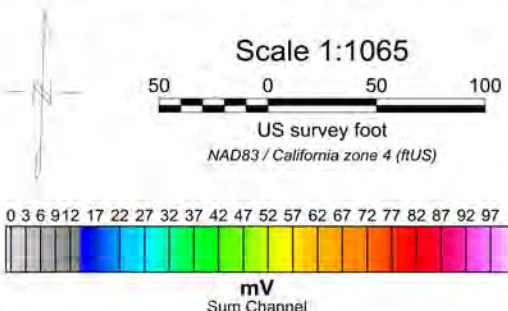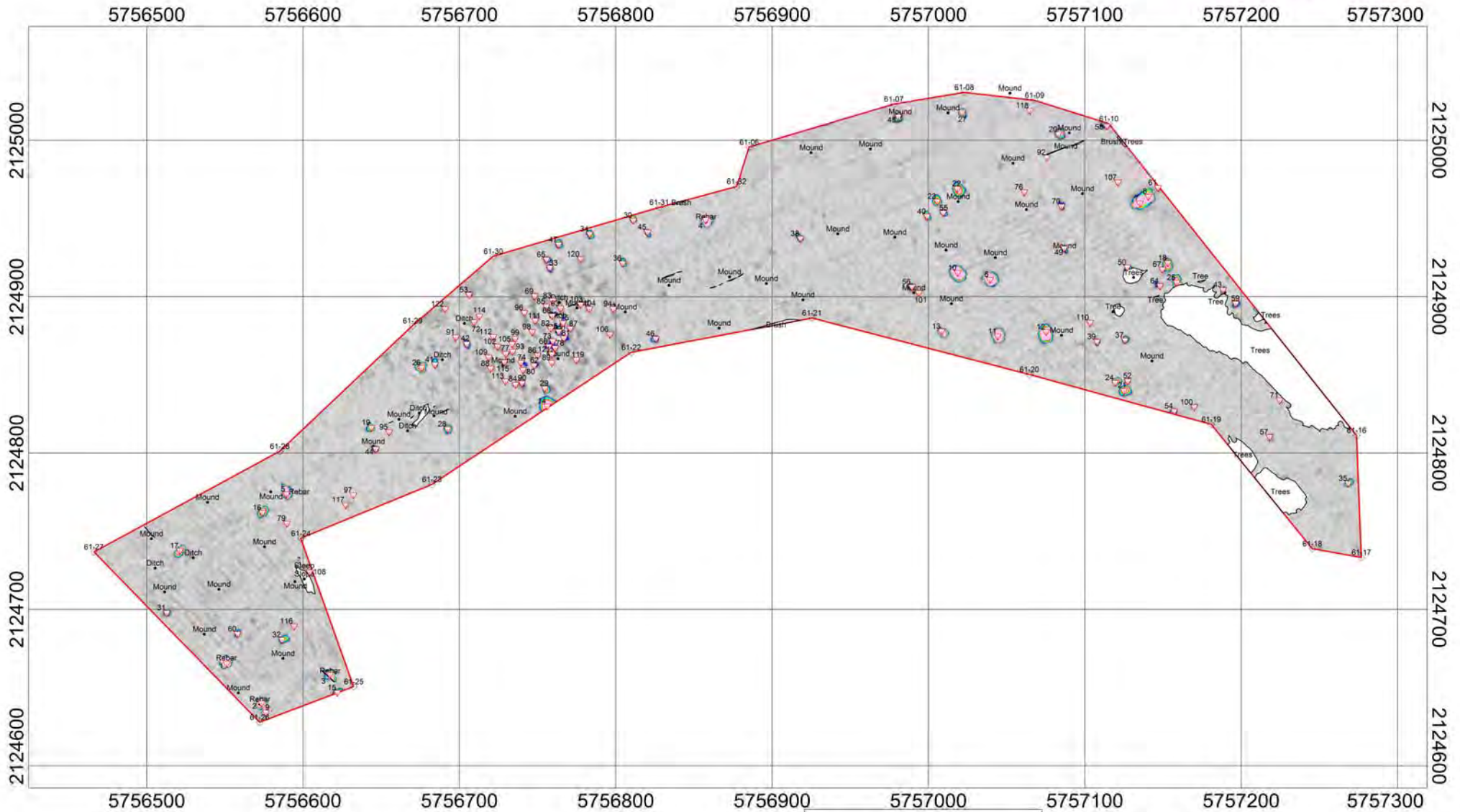
Date of Map Creation: 11/03/2016
Date of Survey: 10/26/2016-10/31/2016

Kemron - Figure 13

EM61 MK2 Bottom Coil PP
Grid Block Pond 41 - Vernal Pond Collection
BLM Area B Munitions Response Area
Former Fort Ord, California
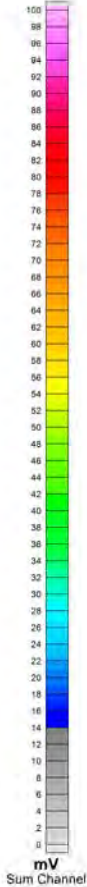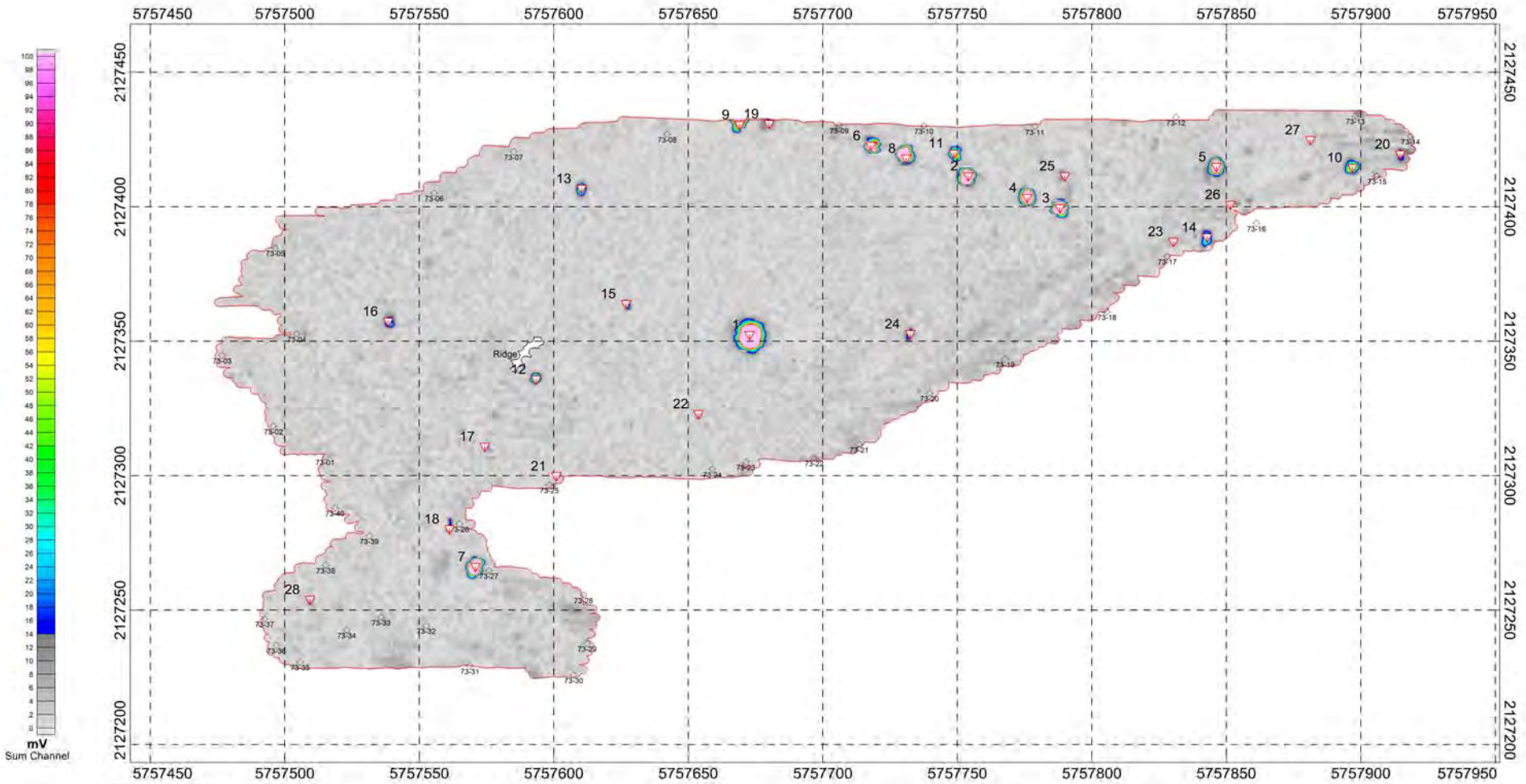
Date of Map Creation: 11/08/2016
Date of Survey: 11/01/2016 - 11/03/2016
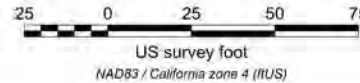
Kemron - Figure 14

EM61 MK2 Bottom Coil - Person Portable
Grid Block Pond 73 - Vernal Pond Collection
BLM Area B Munitions Response Area
Former Fort Ord, California

Date of Map Creation: 01/02/2018
Dates of Survey: 12/11/2015 - 12/12/2017

Legend

Area of Investigation

Selected Target

Data Gap

US survey foot
NAD83 / California zone 4 (ftUS)

mV
Sum Channel

Distribution List: FWV 021, Final Site-Specific Work Plan Munitions and Explosives of Concern Remedial Action, BLM Area B, Former Fort Ord, California

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

Approved: PAYTON.R.CURTIS.II.1231979707

Digitally signed by PAYTON.R.CURTIS.II.1231979707
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=PAYTON.R.CURTIS.II.1231979707
Date: 2018.10.26 09:22:55 -07'00'

R. Curtis Payton, II, PG
Project Manager
U.S. Army Corps of Engineers

Appendix B

USACE Geologist Photos

Appendix B
USACE Geologist Photos
Unique Target ID 1218
Pond Number 3N

DATE 10 OCT 2018
POND NUMBER 3N
UNIQUE TARGET ID 1218
DEPTH OF EXCAVATION Pre

Photo 1. Prior to excavation.

10/10/2018 11:40

Appendix B
USACE Geologist Photos
Unique Target ID 1218
Pond Number 3N

Photo 2. During excavation.

Appendix B
USACE Geologist Photos
Unique Target ID 1218
Pond Number 3N

Photo 3. During excavation.

Photo 4. Post excavation.

Appendix B
USACE Geologist Photos
Unique Target ID 1330
Pond Number 39

Photo 1. Prior to excavation

Appendix B
USACE Geologist Photos
Unique Target ID 1330
Pond Number 39

Photo 2. During excavation.

Appendix B
USACE Geologist Photos
Unique Target ID 1330
Pond Number 39

Photo 3. Post excavation.

Appendix B
USACE Geologist Photos
Unique Target ID 1889
Pond Number 61

Photo 1. Prior to excavation.

Appendix B
USACE Geologist Photos
Unique Target ID 1889
Pond Number 61

Photo 2. During excavation.

10/15/2018 08:47

Appendix B
USACE Geologist Photos
Unique Target ID 1889
Pond Number 61

Photo 3. During excavation.

Appendix B
USACE Geologist Photos
Unique Target ID 1889
Pond Number 61

Photo 4. Post excavation.

Appendix B
USACE Geologist Photos
Unique Target ID 1920
Pond Number 61

DATE 15 Oct 2018
POND NUMBER 61
UNIQUE TARGET ID 1920
DEPTH OF EXCAVATION PRe
Start 0807
END

10/15/2018 08:18

Photo 1. Prior to excavation.

Appendix B
USACE Geologist Photos
Unique Target ID 1920
Pond Number 61

Photo 2. During excavation.

Appendix B
USACE Geologist Photos
Unique Target ID 1920
Pond Number 61

Photo 3. Post excavation.

Photo 1. Prior to excavation.
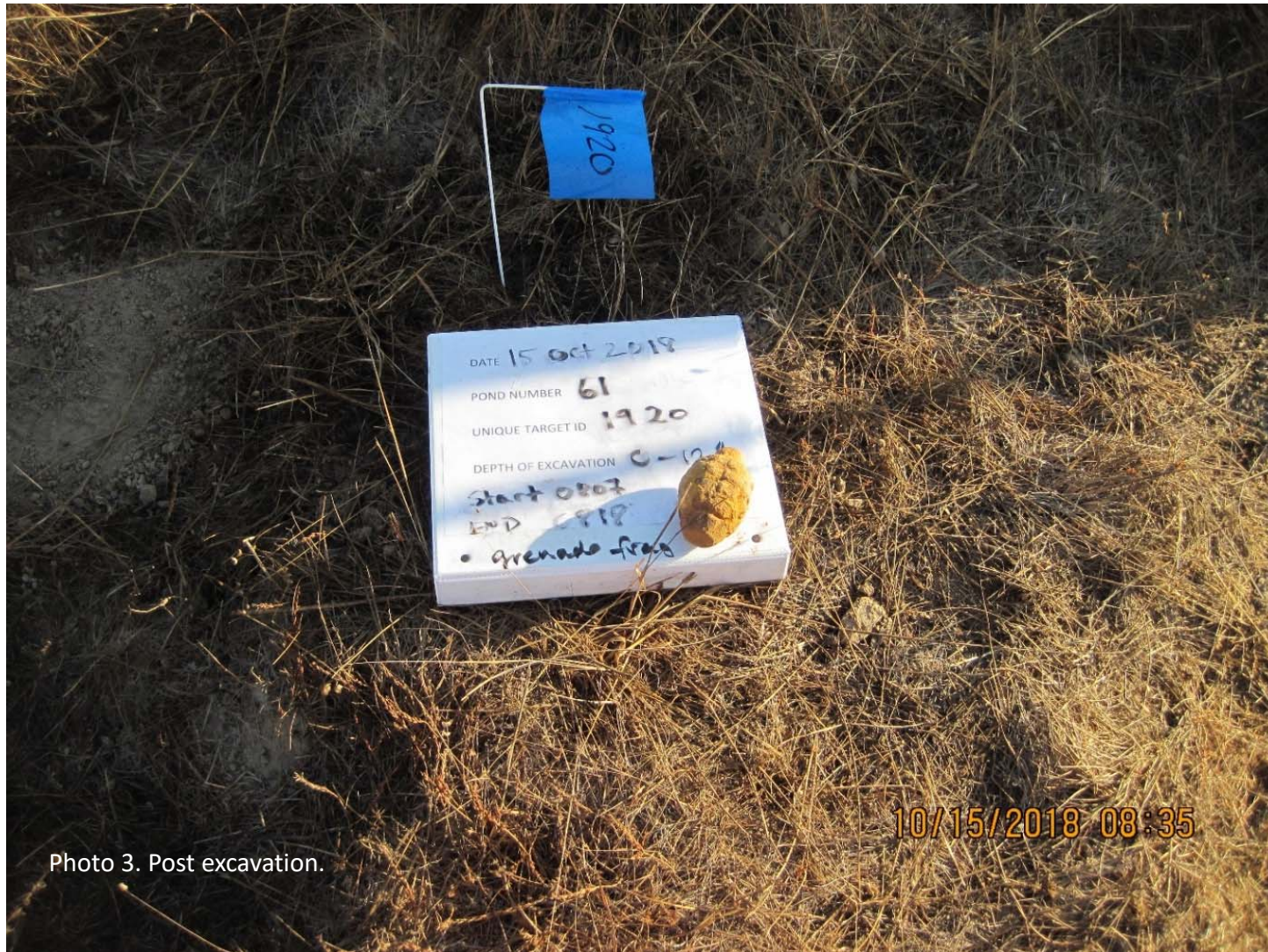
Photo 2. During excavation.

Appendix B
USACE Geologist Photos
Unique Target ID 1542
Pond Number 41

Photo 3. Post excavation.

Appendix C

AGC Anomaly Investigation Dig Results

AGC Anomaly Investigation Dig Results

Location	Local Target ID	Category	Easting (State Plane)	Northing (State Plane)	Date	Type*	Expected Depth (inches)	Actual Depth (inches)	MD (pounds)	MEC or MD Description	RRD and OD (pounds)**	RRD and OD Description
						Pond 35						
Pond 35	1249	1	5749427	2122183	10/15/2018	RRD/OD	12.41	12	0	--	35	Scrap Metal
Pond 35	1253	2	5749337	2122077	10/15/2018	RRD/OD	6.38	4	0	--	0.5	Scrap Metal
Pond 35	1254	2	5749338	2122078	10/15/2018	*Same Anomaly*	6.27	Same as local target 1253				
Pond 35	1260	2	5749358	2122115	10/15/2018	RRD/OD	10.26	7	0	--	0.5	Rebar
Pond 35	1262	0	5749404	2122167	10/15/2018	*False Positive*	3.24	0	0	--	0	--
Pond 35	1263	0	5749390	2122159	10/15/2018	*False Positive*	12.27	0	0	--	0	--
Pond 35	1264	0	5749347	2122099	10/15/2018	*False Positive*	-3.93	0	0	--	0	--
						Pond 39						
Pond 39	1271	2	5749898	2122808	10/15/2018	MD	6.40	7	1	Assorted MD Components	0	--
Pond 39	1273	2	5749990	2122828	10/16/2018	RRD/OD	7.34	11	0	--	5	Sign Post
Pond 39	1274	2	5749957	2122859	10/16/2018	RRD/OD	10.95	7	0	--	3	Scrap Metal
Pond 39	1279	0	5749800	2122762	10/15/2018	*False Positive*	15.92	0	0	--	0	--
Pond 39	1280	2	5749797	2122774	10/16/2018	RRD/OD	18.09	12	0	--	0.5	Scrap Metal
Pond 39	1284	1	5750035	2122872	10/16/2018	RRD/OD	4.78	3	0	--	1.5	Scrap Metal
Pond 39	1287	2	5749943	2122855	10/16/2018	RRD/OD	17.12	16	0	--	10	Sign Post
Pond 39	1290	1	5749926	2122838	10/16/2018	MD	18.81	18	8	projectile, 81mm, mortar, HE, M43 series	0	--
Pond 39	1296	2	5749800	2122684	10/15/2018	MD	16.37	7	0.25	Assorted MD Components	0	--
Pond 39	1298	2	5750023	2122878	10/16/2018	RRD/OD	3.87	6	0	--	0.5	Metal Spike
Pond 39	1299	2	5749811	2122673	10/15/2018	RRD/OD	14.04	5	0	--	5	Scrap Metal
Pond 39	1303	2	5749801	2122771	10/15/2018	RRD/OD	5.03	4	0	--	0.25	Metal Spike
Pond 39	1315	0	5749972	2122827	10/15/2018	*False Positive*	3.51	0	0	--	0	--
Pond 39	1316	0	5749806	2122759	10/15/2018	*False Positive*	0.87	0	0	--	0	--
Pond 39	1318	2	5749996	2122880	10/16/2018	RRD/OD	14.13	4	0	--	1.5	Metal Spike
Pond 39	1324	0	5749822	2122681	10/15/2018	*False Positive*	13.54	0	0	--	0	--

AGC Anomaly Investigation Dig Results

Location	Local Target ID	Category	Easting (State Plane)	Northing (State Plane)	Date	Type*	Expected Depth (inches)	Actual Depth (inches)	MD (pounds)	MEC or MD Description	RRD and OD (pounds)**	RRD and OD Description
Pond 39	1325	0	5749824	2122756	10/15/2018	*False Positive*	13.16	0	0	--	0	--
Pond 39	1326	0	5749893	2122792	10/15/2018	*False Positive*	16.22	0	0	--	0	--
Pond 39	1327	0	5749852	2122740	10/16/2018	*False Positive*	9.81	0	0	--	0	--
Pond 39	1330	2	5749872	2122750	10/15/2018	RRD/OD	12.17	9	0	--	1.5	Scrap Metal
Pond 39	1331	0	5749960	2122879	10/15/2018	*False Positive*	8.56	0	0	--	0	--
Pond 39	1333	0	5749793	2122750	10/15/2018	*False Positive*	-7.36	0	0	--	0	--
Pond 39	1334	2	5749952	2122853	10/16/2018	RRD/OD	17.26	16	0	--	10	Sign Post
Pond 39	1335	0	5749967	2122834	10/15/2018	*False Positive*	5.20	0	0	--	0	--
Pond 39	1336	0	5749802	2122756	10/15/2018	*False Positive*	-63.37	0	0	--	0	--
Pond 39	1337	0	5749895	2122798	10/16/2018	*False Positive*	5.78	0	0	--	0	--
Pond 39	1338	0	5749821	2122770	10/16/2018	*False Positive*	-7.15	0	0	--	0	--
Pond 39	1341	2	5749883	2122839	10/16/2018	Unknown	14.26	18	0	--	0	--
Pond 39	1342	0	5750052	2122838	10/15/2018	*False Positive*	2.21	0	0	--	0	--
Pond 39	1343	0	5750003	2122875	10/16/2018	*False Positive*	4.31	0	0	--	0	--
Pond 39	1344	0	5749892	2122788	10/15/2018	RRD/OD	1.65	6	0	--	0.25	Scrap Metal
Pond 39	1346	0	5749911	2122813	10/15/2018	*False Positive*	13.72	0	0	--	0	--
Pond 39	1348	0	5749999	2122819	10/15/2018	*False Positive*	7.58	0	0	--	0	--
Pond 39	1349	0	5749892	2122769	10/15/2018	*False Positive*	13.28	0	0	--	0	--
Pond 39	1350	0	5750011	2122831	10/15/2018	*False Positive*	2.26	0	0	--	0	--
Pond 39	1351	0	5749831	2122794	10/15/2018	RRD/OD	0.24	4	0	--	0.25	Scrap Metal
Pond 39	1352	0	5749795	2122739	10/15/2018	*False Positive*	-6.93	0	0	--	0	--
Pond 39	1353	0	5750009	2122874	10/15/2018	*False Positive*	8.00	0	0	--	0	--
Pond 39	1357	0	5749795	2122758	10/15/2018	*False Positive*	4.35	0	0	--	0	--
Pond 39	1358	0	5749841	2122723	10/15/2018	*False Positive*	15.01	0	0	--	0	--
Pond 39	1359	0	5749776	2122697	10/15/2018	*False Positive*	-6.08	0	0	--	0	--
Pond 39	1363	0	5749822	2122747	10/15/2018	*False Positive*	14.38	0	0	--	0	--
Pond 39	1364	0	5749920	2122853	10/16/2018	RRD/OD	6.09	5	0	--	0.25	Wire

AGC Anomaly Investigation Dig Results

Location	Local Target ID	Category	Easting (State Plane)	Northing (State Plane)	Date	Type*	Expected Depth (inches)	Actual Depth (inches)	MD (pounds)	MEC or MD Description	RRD and OD (pounds)**	RRD and OD Description
Pond 39	1368	0	5749836	2122764	10/16/2018	*False Positive*	8.29	0	0	--	0	--
Pond 39	1369	0	5750018	2122825	10/15/2018	*False Positive*	3.23	0	0	--	0	--
Pond 39	1370	0	5749885	2122811	10/15/2018	*False Positive*	-0.27	0	0	--	0	--
Pond 39	1372	0	5749797	2122746	10/15/2018	*False Positive*	9.50	0	0	--	0	--
Pond 39	1373	0	5749916	2122786	10/16/2018	*False Positive*	5.21	0	0	--	0	--
Pond 3N												
Pond 3N	1216	2	5750193	2122172	10/10/2018	Unknown	35.22	18	0	--	0	--
Pond 3N	1218	2	5750218	2122151	10/10/2018	Unknown	22.43	18	0	--	0	--
Pond 3N	1233	0	5750175	2122156	10/10/2018	RRD/OD	14.73	13	0	--	0.25	Nail(s)
Pond 3N	1234	2	5750179	2122179	10/10/2018	RRD/OD	13.17	3	0	--	0.25	Nail(s)
Pond 3N	1239	0	5750227	2122142	10/10/2018	*False Positive*	7.73	--	0	--	0	--
Pond 3N	1241	0	5750219	2122107	10/10/2018	Unknown	49.34	18	0	--	0	--
Pond 3N	1243	0	5750206	2122112	10/10/2018	RRD/OD	7.96	12	0	--	0.25	Nail(s)
Pond 3N	1244	0	5750343	2122063	10/10/2018	*False Positive*	-68.78	0	0	--	0	--
Pond 3N	1245	0	5750207	2122101	10/10/2018	RRD/OD	35.01	5	0	--	0.25	Nail(s)
Pond 3S												
Pond 3S	1201	2	5750592	2121934	10/11/2018	RRD/OD	6.90	11	0	--	1.5	Scrap Metal
Pond 3S	1204	0	5750738	2121763	10/11/2018	RRD/OD	2.26	0	0	--	1	Aluminum Scrap Metal
Pond 3S	1205	0	5750737	2121766	10/11/2018	*False Positive*	5.38	0	0	--	0	--
Pond 3S	1206	0	5750562	2121998	10/11/2018	*False Positive*	3.86	0	0	--	0	--
Pond 3S	1207	0	5750511	2122029	10/10/2018	MD	5.16	4	0.25	projectile, 40mm	0	--
Pond 3S	1209	0	5750783	2121705	10/11/2018	*False Positive*	-2.29	0	0	--	0	--
Pond 3S	1210	0	5750785	2121708	10/11/2018	*False Positive*	3.96	0	0	--	0	--
Pond 40N												
Pond 40N	1453	0	5750450	2123261	10/16/2018	*False Positive*	8.57	0	0	--	0	--
Pond 35												

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Location	Local Target ID	Category	Easting (State Plane)	Northing (State Plane)	Date	Type*	Expected Depth (inches)	Actual Depth (inches)	MD (pounds)	MEC or MD Description	RRD and OD (pounds)**	RRD and OD Description
Pond 40S	1375	2	5750054	2123003	10/16/2018	RRD/OD	14.73	8	0	--	10	Sign Post
Pond 40S	1376	2	5750079	2123054	10/17/2018	RRD/OD	13.06	15	0	--	3	Scrap Metal
Pond 40S	1381	1	5750113	2123021	10/17/2018	MD	7.80	9	2	Assorted MD Components	0	--
Pond 40S	1390	2	5750136	2123018	10/17/2018	MD	10.64	9	2	Assorted MD Components	0	--
Pond 40S	1392	2	5750064	2122999	10/16/2018	RRD/OD	15.69	11	0	--	10	Sign Post
Pond 40S	1394	2	5750106	2123031	10/17/2018	RRD/OD	10.55	7	0	--	10	Scrap Metal
Pond 40S	1396	1	5750055	2123063	10/17/2018	MD	10.63	11	2	Assorted MD Components	0	--
Pond 40S	1397	1	5750063	2123064	10/17/2018	RRD/OD	9.03	8	0	--	5	Scrap Metal
Pond 40S	1398	2	5749998	2123013	10/16/2018	MD	6.71	5	2	Assorted MD Components	0	--
Pond 40S	1399	2	5750143	2123034	10/17/2018	RRD/OD	14.02	12	0	--	10	Scrap Metal
Pond 40S	1400	2	5750038	2123004	10/16/2018	RRD/OD	12.62	13	0	--	1	Sign Post
Pond 40S	1401	2	5750005	2122948	10/16/2018	MD	15.16	14	2	Assorted MD Components	0	--
Pond 40S	1403	2	5750012	2123019	10/16/2018	RRD/OD	7.31	7	0	--	3	Scrap Metal
Pond 40S	1405	2	5749964	2122963	10/16/2018	RRD/OD	4.55	4	0	--	0.25	Nail(s)
Pond 40S	1411	1	5749998	2123040	10/16/2018	RRD/OD	12.83	10	0	--	10	Scrap Metal
Pond 40S	1417	2	5749976	2122975	10/16/2018	RRD/OD	8.25	8	0	--	1.5	Scrap Metal
Pond 40S	1427	0	5750052	2123025	10/16/2018	RRD/OD	-1.88	0	0	--	1	Scrap Metal
Pond 40S	1429	0	5750158	2123066	10/17/2018	MD	6.23	6	0.25	Assorted MD Components	0	--
Pond 40S	1430	0	5750135	2123097	10/17/2018	*False Positive*	1.60	0	0	--	0	--
Pond 40S	1431	0	5750057	2123026	10/16/2018	*False Positive*	6.86	0	0	--	0	--
Pond 40S	1432	0	5749955	2122962	10/16/2018	Unknown	18.21	18	0	--	0	--
Pond 40S	1435	0	5750038	2123064	10/16/2018	RRD/OD	6.90	14	0	--	0.5	Nail(s)
Pond 40S	1436	0	5749987	2122974	10/16/2018	*False Positive*	1.49	0	0	--	0	--
Pond 40S	1437	0	5750081	2122996	10/16/2018	Unknown	3.36	18	0	--	0	--

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Location	Local Target ID	Category	Easting (State Plane)	Northing (State Plane)	Date	Type*	Expected Depth (inches)	Actual Depth (inches)	MD (pounds)	MEC or MD Description	RRD and OD (pounds)**	RRD and OD Description
Pond 40S	1438	0	5750046	2123061	10/17/2018	Unknown	6.94	18	0	--	0	--
Pond 40S	1439	0	5750185	2123067	10/17/2018	*False Positive*	5.25	0	0	--	0	--
Pond 40S	1440	0	5750013	2123032	10/16/2018	RRD/OD	10.44	12	0	--	0.25	Wire
Pond 40S	1441	0	5750201	2123081	10/17/2018	*False Positive*	0.57	0	0	--	0	--
Pond 40S	1443	0	5750043	2122964	10/16/2018	Unknown	12.27	18	0	--	0	--
Pond 40S	1444	0	5750198	2123073	10/17/2018	*False Positive*	2.20	0	0	--	0	--
Pond 40S	1446	0	5750112	2123101	10/17/2018	*False Positive*	2.50	0	0	--	0	--
Pond 40S	1447	0	5750069	2122988	10/16/2018	*False Positive*	3.01	0	0	--	0	--
Pond 41												
Pond 41	1454	0	5750095	2125077	10/22/2018	RRD/OD	12.29	0	0	--	10	Sign Post
Pond 41	1456	1	5750261	2125224	10/18/2018	MD	3.18	3	8	projectile, 75mm	0	--
Pond 41	1457	2	5750136	2124926	10/22/2018	MD	4.00	1	1	Assorted MD Components	0	--
Pond 41	1459	1	5750262	2125224	10/22/2018	MD	5.10	3	8	projectile, 75mm	0	--
Pond 41	1460	1	5750117	2125065	10/22/2018	MD	8.64	6	8	projectile, 75mm	0	--
Pond 41	1461	2	5750119	2125013	10/22/2018	MD	1.46	0	1	Assorted MD Components	0	--
Pond 41	1463	1	5750292	2125166	10/18/2018	MD	11.41	6	5	Assorted MD Components	0	--
Pond 41	1464	1	5750189	2125031	10/22/2018	QC Seed	3.18	1	0	--	0.25	Small ISO
Pond 41	1465	1	5750330	2125105	10/18/2018	MD	0.13	0	2	grenade, hand	0	--
Pond 41	1468	1	5750093	2125119	10/18/2018	QC Seed	2.68	1	0	--	0.25	Small ISO
Pond 41	1469	1	5750090	2125150	10/18/2018	MD	11.51	12	8	projectile, 75mm	5	Metal Pipe
Pond 41	1470	2	5750131	2125048	10/22/2018	MD	3.78	1	0.5	Assorted MD Components	0	--
Pond 41	1471	1	5750179	2125002	10/22/2018	MD	9.02	11	8	projectile, 75mm	0	--
Pond 41	1472	2	5749991	2124994	10/22/2018	MD	4.32	2	1	Assorted MD Components	0	--

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Location	Local Target ID	Category	Easting (State Plane)	Northing (State Plane)	Date	Type*	Expected Depth (inches)	Actual Depth (inches)	MD (pounds)	MEC or MD Description	RRD and OD (pounds)**	RRD and OD Description
Pond 41	1473	1	5750282	2125138	10/18/2018	MD	10.03	11	8	Assorted MD Components; projectile, 75mm	0	--
Pond 41	1474	1	5750273	2125121	10/18/2018	RRD/OD	3.91	0	--	--	10	Rommel Stake
Pond 41	1475	1	5750309	2125077	10/18/2018	MD	1.73	0	2	grenade, hand	0	--
Pond 41	1476	1	5750295	2125095	10/18/2018	MD	7.39	6	2	grenade, hand	0	--
Pond 41	1477	1	5750298	2125101	10/18/2018	MD	2.80	1	2	grenade, hand	0	--
Pond 41	1479	1	5750032	2125061	10/22/2018	MD	4.02	4	2	Assorted MD Components	0	--
Pond 41	1480	1	5750153	2124970	10/22/2018	MD	12.28	11	8	projectile, 75mm	0	--
Pond 41	1483	0	5750261	2125140	10/18/2018	RRD/OD	-1.33	0	0	--	15	Barbed Wire
Pond 41	1485	2	5750036	2124969	10/22/2018	MD	5.59	6	0.25	Assorted MD Components	0	--
Pond 41	1486	2	5750089	2124985	10/22/2018	UXO	3.50	1	1	flare, surface, trip, M49 series	0	--
Pond 41	1488	0	5750263	2125147	10/18/2018	RRD/OD	-8.65	0	0	--	15	Wire
Pond 41	1489	1	5750261	2125065	10/18/2018	MD	7.40	6	2	grenade, hand	0	--
Pond 41	1490	1	5750301	2125206	10/18/2018	MD	3.96	1	1	grenade, hand	0	--
Pond 41	1491	1	5750309	2125077	10/18/2018	*Same Anomaly*	1.52	*Same as local target 1475*				
Pond 41	1492	1	5750302	2125106	10/18/2018	MD	5.14	6	2	grenade, hand	0	--
Pond 41	1493	2	5750106	2125163	10/18/2018	MD	7.59	6	0.25	Assorted MD Components	0	--
Pond 41	1495	1	5750302	2125107	10/18/2018	*Same Anomaly*	5.87	*Same as local target 1492*				
Pond 41	1497	2	5749973	2125039	10/22/2018	MD	3.66	2	1	Assorted MD Components	0	--
Pond 41	1498	2	5750037	2125141	10/22/2018	MD	3.44	4	0.5	Assorted MD Components	0	--
Pond 41	1499	2	5750169	2125073	10/22/2018	MD	6.33	6	1	Assorted MD Components	0	--
Pond 41	1500	2	5750156	2125154	10/18/2018	MD	3.42	3	0.5	Assorted MD Components	0	--
Pond 41	1501	2	5750236	2125233	10/18/2018	RRD/OD	2.43	1	0	--	0.25	Construction Debris

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Location	Local Target ID	Category	Easting (State Plane)	Northing (State Plane)	Date	Type*	Expected Depth (inches)	Actual Depth (inches)	MD (pounds)	MEC or MD Description	RRD and OD (pounds)**	RRD and OD Description
Pond 41	1502	2	5750084	2125127	10/22/2018	MD	6.59	4	1	Assorted MD Components	0	--
Pond 41	1510	2	5750176	2124959	10/22/2018	MD	5.81	0	0.25	Assorted MD Components	0	--
Pond 41	1515	2	5750149	2125164	10/18/2018	UXO	12.08	11	1	signal, illum, ground, M125 series	0	--
Pond 41	1518	1	5750298	2125048	10/18/2018	MD	9.80	8	2	grenade, hand	0	--
Pond 41	1522	2	5750067	2124971	10/22/2018	MD	5.47	6	1	Assorted MD Components	0	--
Pond 41	1523	2	5750175	2124985	10/22/2018	MD	5.04	4	0.25	Assorted MD Components	0	--
Pond 41	1532	0	5750269	2125089	10/18/2018	Unknown	3.14	18	0	--	0	--
Pond 41	1534	2	5750134	2125035	10/22/2018	MD	13.72	5	0.25	Assorted MD Components	0	--
Pond 41	1535	2	5750057	2125157	10/22/2018	MD	8.35	6	1	Assorted MD Components	0	--
Pond 41	1538	2	5750162	2124962	10/22/2018	MD	5.23	7	1	Assorted MD Components	0	--
Pond 41	1542	0	5750211	2125138	10/18/2018	Unknown	8.80	18	--	--	0	--
Pond 41	1543	2	5750156	2125077	10/22/2018	MD	7.68	7	0.5	Assorted MD Components	0	--
Pond 41	1545	2	5750285	2125209	10/18/2018	MD	5.97	6	1	Assorted MD Components	0	--
Pond 41	1549	2	5750130	2124923	10/18/2018	*False Positive*	5.65	0	0	--	0	--
Pond 41	1550	0	5750332	2125080	10/18/2018	*False Positive*	1.76	0	0	--	0	--
Pond 41	1551	0	5750265	2125071	10/22/2018	*False Positive*	-4.93	0	0	--	0	--
Pond 41	1552	0	5750040	2124954	10/22/2018	*False Positive*	5.13	0	0	--	0	--
Pond 41	1553	0	5750340	2125132	10/18/2018	*False Positive*	5.37	0	0	--	0	--
Pond 41	1555	2	5750277	2125222	10/18/2018	MD	9.12	9	0.5	Assorted MD Components	0	--
Pond 41	1558	0	5750202	2125107	10/22/2018	*False Positive*	2.89	0	0	--	0	--
Pond 41	1562	0	5750110	2125188	10/18/2018	*False Positive*	1.39	0	0	--	0	--
Pond 41	1563	0	5750203	2125096	10/18/2018	*False Positive*	11.84	0	0	--	0	--

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Location	Local Target ID	Category	Easting (State Plane)	Northing (State Plane)	Date	Type*	Expected Depth (inches)	Actual Depth (inches)	MD (pounds)	MEC or MD Description	RRD and OD (pounds)**	RRD and OD Description
Pond 41	1564	0	5750205	2125104	10/18/2018	*False Positive*	15.72	0	0	--	0	--
Pond 41	1567	0	5750192	2125136	10/18/2018	*False Positive*	7.10	0	0	--	0	--
Pond 41	1568	0	5750200	2125102	10/18/2018	*False Positive*	1.14	0	0	--	0	--
Pond 41	1569	0	5750185	2124966	10/22/2018	RRD/OD	5.34	0	0	--	0.25	Scrap Metal
Pond 41	1570	0	5750210	2125102	10/18/2018	*False Positive*	3.94	0	0	--	0	--
Pond 41	1571	0	5750178	2125010	10/22/2018	RRD/OD	9.71	0	0	--	0.25	Nail(s)
Pond 41	1575	0	5750200	2125097	10/18/2018	*False Positive*	2.17	0	0	--	0	--
Pond 41	1576	0	5750219	2124991	10/22/2018	*False Positive*	4.88	0	0	--	0	--
Pond 41	1581	0	5750159	2125086	10/22/2018	Unknown	10.17	18	0	--	0	--
Pond 41	1582	0	5750241	2125220	10/18/2018	MD	7.61	6	0.25	Assorted MD Components	0	--
Pond 41	1585	0	5750279	2125244	10/18/2018	*False Positive*	4.50	0	0	--	0	--
Pond 41	1586	0	5750314	2125086	10/18/2018	*False Positive*	0.15	0	0	--	0	--
Pond 41	1588	0	5750200	2125196	10/18/2018	*False Positive*	5.64	0	0	--	0	--
Pond 41	1591	0	5750308	2125089	10/18/2018	*False Positive*	-2.91	0	0	--	0	--
Pond 41	1593	0	5750103	2125183	10/18/2018	*False Positive*	6.75	0	0	--	0	--
Pond 41	1595	0	5750347	2125107	10/18/2018	*False Positive*	3.03	0	0	--	0	--
Pond 41	1597	0	5750347	2125102	10/18/2018	*False Positive*	3.40	0	0	--	0	--
Pond 41	1598	0	5750121	2124927	10/22/2018	*False Positive*	-0.57	0	0	--	0	--
Pond 41	1603	0	5750250	2125135	10/18/2018	*False Positive*	9.06	0	0	--	0	--
Pond 41	1604	0	5750261	2125100	10/22/2018	*False Positive*	5.08	0	0	--	0	--
Pond 41	1606	0	5750292	2125055	10/18/2018	*False Positive*	4.55	0	0	--	0	--
Pond 41	1607	0	5750313	2125090	10/18/2018	*False Positive*	4.80	0	0	--	0	--
Pond 41	1608	0	5750099	2125032	10/22/2018	*False Positive*	5.26	0	0	--	0	--
Pond 41	1609	0	5750308	2125120	10/18/2018	*False Positive*	-0.88	0	0	--	0	--
Pond 41	1613	0	5750001	2125108	10/22/2018	*False Positive*	-6.13	0	0	--	0	--
Pond 41	1614	0	5750317	2125085	10/18/2018	*False Positive*	-3.06	0	0	--	0	--

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Location	Local Target ID	Category	Easting (State Plane)	Northing (State Plane)	Date	Type*	Expected Depth (inches)	Actual Depth (inches)	MD (pounds)	MEC or MD Description	RRD and OD (pounds)**	RRD and OD Description
Pond 41	1615	0	5750016	2125046	10/22/2018	MD	6.20	4	0.25	Assorted MD Components	0	--
Pond 41	1616	0	5750245	2125142	10/18/2018	*False Positive*	-6.00	0	0	--	0	--
Pond 41	1617	0	5750294	2125130	10/18/2018	*False Positive*	8.63	0	0	--	0	--
Pond 42												
Pond 42	1619	1	5753148	2123980	10/17/2018	QC Seed	2.93	1	0	--	0.25	Small ISO
Pond 42	1620	1	5753196	2123962	10/17/2018	MD	4.99	3	0.5	Assorted MD Components	0	--
Pond 42	1621	0	5753117	2123978	10/17/2018	*False Positive*	1.24	0	0	--	0	--
Pond 42	1623	1	5753162	2123891	10/18/2018	QC Seed	4.59	1	0	--	0.25	Small ISO
Pond 42	1626	0	5753185	2123981	10/17/2018	RRD/OD	0.60	3	0	--	0.25	Wire
Pond 42	1629	2	5753117	2123969	10/17/2018	MD	3.28	1	0.25	Assorted MD Components	0	--
Pond 42	1632	2	5753207	2123945	10/17/2018	Unknown	14.97	18	0	--	0	--
Pond 42	1634	0	5753181	2123982	10/17/2018	*False Positive*	1.57	0	0	--	0	--
Pond 42	1641	2	5753211	2123942	10/17/2018	Unknown	18.09	18	0	--	0	--
Pond 42	1642	0	5753122	2123992	10/17/2018	*False Positive*	2.50	0	0	--	0	--
Pond 42	1647	0	5753129	2123975	10/17/2018	*False Positive*	7.96	0	0	--	0	--
Pond 42	1649	0	5753183	2123988	10/17/2018	*False Positive*	1.54	0	0	--	0	--
Pond 42	1653	2	5753215	2123922	10/17/2018	Unknown	18.31	18	0	--	0	--
Pond 42	1654	2	5753205	2123931	10/17/2018	Unknown	14.40	18	0	--	0	--
Pond 42	1655	0	5753120	2123990	10/17/2018	*False Positive*	-8.17	0	0	--	0	--
Pond 42	1656	0	5753152	2123912	10/17/2018	*False Positive*	4.46	0	0	--	0	--
Pond 42	1661	0	5753131	2123976	10/17/2018	*False Positive*	-0.74	0	0	--	0	--
Pond 42	1662	0	5753170	2124047	10/17/2018	*False Positive*	6.60	0	0	--	0	--
Pond 42	1664	0	5753122	2123966	10/17/2018	*False Positive*	14.14	0	0	--	0	--
Pond 42	1667	2	5753211	2123921	10/17/2018	Unknown	17.58	18	0	--	0	--
Pond 42	1675	0	5753210	2123880	10/17/2018	*False Positive*	8.75	0	0	--	0	--

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Location	Local Target ID	Category	Easting (State Plane)	Northing (State Plane)	Date	Type*	Expected Depth (inches)	Actual Depth (inches)	MD (pounds)	MEC or MD Description	RRD and OD (pounds)**	RRD and OD Description
Pond 42	1678	0	5753191	2123878	10/17/2018	*False Positive*	17.14	0	0	--	0	--
Pond 42	1679	0	5753132	2123998	10/17/2018	Unknown	0.24	18	0	--	0	--
Pond 42	1681	0	5753165	2124052	10/17/2018	Unknown	16.68	18	0	--	0	--
Pond 42	1682	0	5753207	2123912	10/17/2018	*False Positive*	6.92	0	0	--	0	--
Pond 42	1687	0	5753194	2123969	10/17/2018	*False Positive*	4.34	0	0	--	0	--
Pond 42	1688	0	5753190	2124000	10/17/2018	*False Positive*	14.14	0	0	--	0	--
Pond 43												
Pond 43	1693	1	5753046	2124515	10/17/2018	MD	12.60	13	5	projectile, 60mm, mortar, HE, M49 series	0	--
Pond 43	1694	1	5753013	2124531	10/17/2018	MD	7.17	3	1	Assorted MD Components	0	--
Pond 43	1695	1	5753046	2124515	10/17/2018	*Same Anomaly*	10.91	*Same as local target 1693*				
Pond 43	1696	0	5752987	2124499	10/17/2018	*False Positive*	11.19	0	0	--	0	--
Pond 43	1697	1	5753013	2124531	10/17/2018	*Same Anomaly*	7.41	*Same as local target 1694*				
Pond 43	1699	2	5753015	2124532	10/17/2018	Unknown	8.33	18	0	--	0	--
Pond 43	1699.1	2	5753016	2124532	10/22/2018	*Same Anomaly*	9.97	*Same as local target 1699*				
Pond 43	1700	2	5752993	2124510	10/17/2018	Unknown	7.37	18	0	--	0	--
Pond 43	1701	2	5753041	2124525	10/17/2018	Unknown	11.67	18	0	--	0	--
Pond 43	1703	0	5753033	2124519	10/17/2018	*False Positive*	10.10	0	0	--	0	--
Pond 43	1705	2	5753011	2124524	10/17/2018	Unknown	11.41	18	0	--	0	--
Pond 43	1706	0	5753052	2124527	10/17/2018	*False Positive*	17.01	0	0	--	0	--
Pond 44												
Pond 44	1708	0	5752803	2125999	10/18/2018	MD	5.65	6	5	Assorted MD Components	0	--
Pond 44	1709	0	5752805	2126000	10/18/2018	*Same Anomaly*	11.49	*Same as local target 1708*				
Pond 44	1710	1	5752807	2125999	10/18/2018	RRD/OD	11.00	3	0	--	1	Trash Pit
Pond 44	1711	1	5752831	2125923	10/18/2018	RRD/OD	7.61	7	0	--	0.25	Metal Spike
Pond 44	1713	1	5752798	2125996	10/18/2018	MD	9.23	12	1	Assorted MD Components	0	--

AGC Anomaly Investigation Dig Results

Location	Local Target ID	Category	Easting (State Plane)	Northing (State Plane)	Date	Type*	Expected Depth (inches)	Actual Depth (inches)	MD (pounds)	MEC or MD Description	RRD and OD (pounds)**	RRD and OD Description
Pond 44	1715	2	5752794	2126001	10/18/2018	MD	6.52	5	0.5	Assorted MD Components	0	--
Pond 44	1721	2	5752829	2125934	10/18/2018	RRD/OD	5.92	4	0	--	0.25	Nail(s)
Pond 44	1724	2	5752810	2125997	10/18/2018	Unknown	8.67	18	0	--	0	--
Pond 44	1729	2	5752785	2125976	10/18/2018	MD	12.08	9	0.5	Assorted MD Components	0	--
Pond 44	1748	0	5752790	2125964	10/18/2018	*False Positive*	1.14	0	0	--	0	--
Pond 44	1749	0	5752833	2126049	10/18/2018	*False Positive*	7.20	0	0	--	0	--
Pond 44	1750	0	5752797	2126014	10/18/2018	*False Positive*	11.82	0	0	--	0	--
Pond 44	1751	2	5752835	2125916	10/18/2018	Unknown	12.64	18	0	--	0	--
Pond 44	1752	0	5752818	2125944	10/18/2018	*Same Anomaly*	7.28	Same as local target 1721					
Pond 60												
Pond 60	1754	0	5756890	2126801	10/17/2018	RRD/OD	-13.57	0	0	--	10	Water Meter
Pond 60	1762	2	5756963	2126639	10/17/2018	RRD/OD	2.75	0	0	--	0.25	Scrap Metal
Pond 60	1769	2	5756830	2126770	10/17/2018	Unknown	5.96	18	0	--	0	--
Pond 60	1779	2	5757086	2126588	10/17/2018	Unknown	12.13	18	0	--	0	--
Pond 60	1788	2	5757004	2126590	10/17/2018	Unknown	6.49	18	0	--	0	--
Pond 60	1803	2	5756780	2126787	10/17/2018	MD	6.68	2	0.5	Assorted MD Components	0	--
Pond 60	1810	0	5756813	2126709	10/17/2018	*False Positive*	6.26	0	0	--	0	--
Pond 60	1811	2	5757086	2126589	10/17/2018	*False Positive*	12.01	0	0	--	0	--
Pond 60	1824	2	5757001	2126811	10/17/2018	UXO	5.30	4	0.5	projectile, 40mm, HE, M406	0	--
Pond 60	1831	0	5756894	2126665	10/17/2018	*False Positive*	3.71	0	0	--	0	--
Pond 60	1834	0	5756726	2126777	10/17/2018	*False Positive*	3.79	0	0	--	0	--
Pond 60	1836	0	5756754	2126684	10/17/2018	*False Positive*	7.30	0	0	--	0	--
Pond 60	1840	2	5757000	2126881	10/17/2018	MD	5.40	5	0.5	projectile, 40mm	0	--
Pond 60	1848	0	5756748	2126749	10/17/2018	*False Positive*	-2.36	0	0	--	0	--
Pond 60	1849	0	5757076	2126587	10/17/2018	*False Positive*	5.04	0	0	--	0	--

AGC Anomaly Investigation Dig Results

Location	Local Target ID	Category	Easting (State Plane)	Northing (State Plane)	Date	Type*	Expected Depth (inches)	Actual Depth (inches)	MD (pounds)	MEC or MD Description	RRD and OD (pounds)**	RRD and OD Description
Pond 60	1851	0	5756996	2126780	10/17/2018	*False Positive*	4.20	0	0	--	0	--
Pond 60	1852	0	5757022	2126577	10/17/2018	*False Positive*	2.39	0	0	--	0	--
Pond 60	1853	0	5756817	2126666	10/17/2018	*False Positive*	0.08	0	0	--	0	--
Pond 61												
Pond 61	1855	2	5757040	2124912	10/11/2018	RRD/OD	1.87	2	0	--	5	Scrap Metal
Pond 61	1858	2	5757019	2124915	10/11/2018	RRD/OD	5.63	1	0	--	5	Scrap Metal
Pond 61	1859	2	5757045	2124875	10/11/2018	RRD/OD	0.80	1	0	--	10	Scrap Metal
Pond 61	1860	2	5757075	2124876	10/11/2018	RRD/OD	5.61	4	0	--	5	Scrap Metal
Pond 61	1862	1	5756756	2124829	10/11/2018	RRD/OD	22.08	25	0	--	25	Trash Can
Pond 61	1863	0	5756622	2124647	10/15/2018	RRD/OD	-2.99	0	0	--	1	Rebar
Pond 61	1866	0	5757153	2124922	10/11/2018	RRD/OD	1.09	0	0	--	5	Cable
Pond 61	1867	1	5756643	2124816	10/15/2018	QC Seed	3.52	1	0	--	0.25	Small ISO
Pond 61	1868	2	5757084	2125004	10/11/2018	RRD/OD	3.54	0	0	--	0.25	Aluminum Scrap Metal
Pond 61	1869	1	5757126	2124839	10/11/2018	MD	9.95	8	8	projectile, 75mm	0	--
Pond 61	1870	2	5757018	2124968	10/11/2018	MD	4.86	4	1	Assorted MD Components	0	--
Pond 61	1871	0	5757006	2124961	10/11/2018	MD	1.56	0	0.5	signal, illum	0	--
Pond 61	1872	1	5757120	2124845	10/11/2018	QC Seed	3.93	0	0	--	0.25	Small ISO
Pond 61	1873	1	5757159	2124909	10/11/2018	RRD/OD	3.19	0	0	--	1	Cable
Pond 61	1877	2	5756755	2124841	10/11/2018	RRD/OD	8.11	0	0	--	0.25	Aluminum Scrap Metal
Pond 61	1883	2	5757269	2124781	10/11/2018	RRD/OD	5.55	1	0	--	0.25	Barbed Wire
Pond 61	1886	2	5756918	2124938	10/11/2018	MD	6.28	5	0.25	signal, illum	0	--
Pond 61	1888	1	5757000	2124952	10/11/2018	MD	4.49	3	2	grenade, hand	0	--
Pond 61	1889	1	5756684	2124858	10/15/2018	MD	8.64	3	1	grenade, hand	0	--
Pond 61	1895	2	5756763	2124934	10/11/2018	MD	8.01	6	0.25	Assorted MD Components	0	--
Pond 61	1899	0	5756763	2124878	10/11/2018	MD	12.78	1	0.25	Assorted MD Components	0	--

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Location	Local Target ID	Category	Easting (State Plane)	Northing (State Plane)	Date	Type*	Expected Depth (inches)	Actual Depth (inches)	MD (pounds)	MEC or MD Description	RRD and OD (pounds)**	RRD and OD Description
Pond 61	1904	2	5756990	2124905	10/11/2018	RRD/OD	10.76	6	0	--	0.5	Scrap Metal
Pond 61	1907	2	5757196	2124895	10/11/2018	MD	4.35	3	0.25	Assorted MD Components	0	--
Pond 61	1919	0	5757225	2124834	10/11/2018	RRD/OD	7.14	6	0	--	0.25	Scrap Metal
Pond 61	1920	2	5756709	2124885	10/15/2018	MD	12.03	10	2	grenade, hand, frag, MK II	0	--
Pond 61	1924	0	5757061	2124967	10/11/2018	RRD/OD	-0.61	0	0	--	0.25	Aluminum Scrap Metal
Pond 61	1927	2	5756589	2124754	10/15/2018	RRD/OD	7.08	2	0	--	0.25	Wire
Pond 61	1928	2	5756741	2124853	10/15/2018	MD	10.75	6	0.25	Assorted MD Components	0	--
Pond 61	1938	2	5756739	2124844	10/11/2018	MD	13.59	12	0.25	Assorted MD Components	0	--
Pond 61	1939	0	5756698	2124874	10/15/2018	*False Positive*	16.08	0	0	--	0	--
Pond 61	1943	0	5756655	2124813	10/15/2018	*False Positive*	-4.43	0	0	--	0	--
Pond 61	1945	0	5756632	2124773	10/15/2018	*False Positive*	5.35	0	0	--	0	--
Pond 61	1955	0	5757121	2124973	10/11/2018	RRD/OD	9.40	2	0	--	0.25	Nail(s)
Pond 61	1956	0	5756604	2124724	10/15/2018	*False Positive*	4.95	0	0	--	0	--
Pond 61	1957	2	5756719	2124861	10/15/2018	MD	12.19	2	0.25	Assorted MD Components	0	--
Pond 61	1959	2	5756749	2124885	10/11/2018	MD	15.08	0	0.25	Assorted MD Components	0	--
Pond 61	1961	2	5756729	2124846	10/15/2018	MD	10.51	2	0.25	Assorted MD Components	0	--
Pond 61	1965	0	5756627	2124767	10/15/2018	*False Positive*	-8.12	0	0	--	0	--
Pond 61	1967	2	5756774	2124859	10/11/2018	MD	12.71	2	0.25	Assorted MD Components	0	--
Pond 61	1968	2	5756778	2124924	10/11/2018	MD	14.87	10	2.5	Assorted MD Components	0	--
Pond 73												
Pond 73	73001	0	5757571	2127266	10/22/2018	*False Positive*	2	0	0	--	0	--
Pond 73	73009	0	5757601	2127300	10/22/2018	*False Positive*	3	0	0	--	0	--
Pond 73	73011	2	5757788	2127399	10/22/2018	RRD/OD	7	1	0	--	5	Sign Post

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Location	Local Target ID	Category	Easting (State Plane)	Northing (State Plane)	Date	Type*	Expected Depth (inches)	Actual Depth (inches)	MD (pounds)	MEC or MD Description	RRD and OD (pounds)**	RRD and OD Description
Pond 73	73015	0	5757669	2127431	10/22/2018	*False Positive*	2	0	0	--	0	--
Pond 73	73018	2	5757753	2127411	10/22/2018	RRD/OD	8	1	0	--	5	Sign Post
Pond 73	73019	2	5757776	2127404	10/22/2018	RRD/OD	8	2	0	--	5	Sign Post
Pond 73	73020	2	5757719	2127424	10/22/2018	RRD/OD	12	6	0	--	5	Sign Post
Pond 73	73021	2	5757731	2127419	10/22/2018	RRD/OD	6	3	0	--	5	Sign Post
Pond 73	73022	2	5757749	2127420	10/22/2018	MD	9	3	1	Assorted MD Components	0	--
Pond 73	73024	2	5757846	2127415	10/22/2018	RRD/OD	7	2	0	--	5	Sign Post; Target Box; Trash Pit
Pond 73	73026	0	5757852	2127401	10/22/2018	*False Positive*	18	0	0	--	0	--

-- No data or not applicable
ID: Identification
ISO: Industry Standard Object
MEC: Munitions and Explosives of Concern
MD: Munitions Debris
QC: Quality Control
UXO: Unexploded Ordnance
RRD/OD: Range Related Debris/Other Debris

*If a signal was detected for a Category 0 or a Category 2 target but the source of the signal was not encountered within the 18-inch excavation, the source was identified as "unknown".
*"Same anomaly" was assigned to excess target(s) when multiple targets identified the same object/signal.
*If no signal or an insufficient signal was detected at a target location the target was identified as a "false positive" in the dig results.

**QC seed weights are included in this column.

Appendix D

USACE QA Approval and Discussion

FORMER FORT ORD, CALIFORNIA
BLM AREA B VERNAL PONDS
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

BLM Area B Vernal Ponds

BLM Area B Vernal Ponds

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 BLM Area B vernal ponds. Work was performed under WERS contract No. W912DY-10-D-0027, Site-Specific Work Plan BLM Area B (KEMRON, 2017), and Field Work Variance (FWV) 021 (KEMRON, 2018b). 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 BLM Area B vernal ponds were in accordance with project Data Quality Objectives (DQOs) and Measurement Quality Objectives (MQOs), as established in the UFP-QAPP (KEMRON, 2016a) with modification by FWV 021 (KEMRON, 2018b) and the AGCMR-QAPP (KEMRON, 2016b) with modification by FWV 012 (KEMRON, 2018a). BLM Area vernal ponds were collected in their entirety to meet Category B data standards, with the exception of Pond 73 which met Category A standards.

1.1   Site details

A total of 13 vernal ponds have been identified in BLM Area B and are depicted in Figure 1. The 13 vernal ponds located in BLM Area B encompass a total area of approximately 12.1 acres.

The vernal ponds located at the Former Fort Ord provide breeding habitat to federally and state threatened species, and are considered biologically sensitive habitat. The decision was made to remove MEC from the vernal ponds to allow biologists to safely monitor these species.

DGM was conducted with a person-portable EM61 during October-December of 2016 to take advantage of the dry conditions in the ponds. The narrow window of opportunity to survey the dry ponds before the onset of the rainy season required immediate survey with DGM instruments. Due to the urgency of the survey, the DGM surveys of the vernal ponds occurred prior to surface sweep activities in the ponds.

To minimize disturbance to vernal pond habitat, anomalies detected with the EM61 were cued with the MetalMapper 2x2 (MM2x2) to identify Targets of Interest (TOI) that required intrusive investigation. Cued measurements were collected in August and October of 2018.

2.0   QA ACTIVITES

2.1   Data Collection Methods

Dynamic geophysical data were collected using Geonics EM-61MKII electromagnetic sensors in person-portable mode throughout the identified vernal ponds. 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 as individual transects grouped by vernal pond number. Data collected with the BLM Area B vernal ponds met Category B line spacing requirements, with 95% not to exceed a lane spacing of 2.5 ft. and 98% not to exceed a lane spacing of 3 ft. It was unknown at the time of the DGM surveys (October – December 2016) that the vernal ponds would be selected for intrusive investigation due to the sensitive nature of the habitat, and surveys were designed to be collected at Category B standards. As stated in the UFP-QAPP (KEMRON, 2016a), the objective of Category B DGM surveys is to obtain DGM data of sufficient quality to characterize the site for overall anomaly distribution and density, and is not intended to support subsurface MEC removal. In January of 2018 the PDT decided to intrusively investigate the anomalies identified in the BLM Area B vernal ponds to reduce the risk to biologists conducting surveys within the ponds. After review of the data, the project geophysics team decided that picking targets for cuing on the Category B data would meet the project objective of reducing the risk to biologists, while minimizing further disturbance to the ponds, which were wet at the time of the decision. DGM data gaps and saturated response areas (SRAs) were investigated using a combination of hand-held metal detector and an EM61 in analog mode during intrusive investigation of cued targets. Obstacles and issues with terrain precluded 100% coverage and approximately 0.2 acres of the BLM Area B vernal ponds were either inaccessible due to the presence of vegetation or terrain/cultural features (mounds, craters, and water gauge staff). All data gaps were appropriately documented in the obstacle files submitted with DGM packages. Figures 2-14 of this QA report depicts the full DGM dataset for the BLM Area B vernal ponds.

A total of 313 targets were selected from the dynamic EM61 DGM survey (Figures 2-14) for cued measurement with the MM2x2. Classification data from each measured anomaly was processed, modeled, and classified to determine if the item was safe to leave in place or was a potential TOI to be intrusively investigated and removed. Each anomaly was ranked according to its likelihood of being a TOI: Category 0 – Cannot Analyze, Category 1 – High-Confidence TOI, Category 2 – Inconclusive, and Category 3 – High-Confidence Non-TOI.

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 person-portable DGM operations and MM2x2 AGC cued measurements are given in Tables 1 and 2, respectively. Daily IVS test results for person-portable DGM in BLM Area B vernal ponds are shown in Figures 15-16. Daily IVS test results for MM2x2 AGC cued measurements are shown in Figures 17-18. Further details regarding MQOs are provided in the UFP-QAPP (KEMRON, 2016a) and AGCMR-QAPP (KEMRON, 2016b).

Production data required the GSV blind seeds placed throughout the Vernal Ponds, 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. Due to the sensitive status of the vernal ponds, QC seeds were not planted at their standard 6-inch depth. Rather, QC seeds were lain horizontal on the ground surface and then pushed into the ground to a depth of two inches. 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 3 summarizes the QC seed results for BLM Area B vernal ponds.

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"

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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 Vernal Ponds 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   Data Validation

In addition to verifying and validating the data processing and QC procedures as described above, data validation will typically include validation seeding and the selection and intrusive investigation of validation digs from anomalies classified as non-TOI. To minimize disturbance to the sensitive habitat of the vernal ponds, no validation seeds were placed in the ground and no validation digs were selected.

2.6   Discussion

No corrective action requests were issued for data collected in the BLM Area B vernal ponds, however one item is worth discussion and one minor MQO failure is worth noting. An atypically high number of low-amplitude targets picked from the EM61 data were not detected with the MM2x2, resulting in the target being assigned to Category 0: Cannot Analyze. The QC Geophysicist and QA Geophysicist agreed that the unusually high number of Category 0 targets was likely caused by the source of the EM61 anomaly being removed by the surface sweep operations prior to the cued AGC survey with the MM2x2. Typically these targets are automatically placed on the dig list for intrusive investigation. To minimize disturbance to the vernal pond habitat, an alternative approach was developed and is documented in FWV 021 (KEMRON, 2018b).

Additionally, IVS seed items IVS56 and IVS59 exhibited a response above the established MQO (channel 4 only) during the morning IVS surveys on 11/30/2016 and 11/21/2016, respectively (Figure 15). 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 BLM Area B vernal ponds are sufficient and in accordance with the project DQOs and MQOs. All dynamic DGM data in the BLM Area B vernal ponds meet Category B standards with the exception of Pond 73, which meets Category A standards. Furthermore, anomalies identified as TOI were removed to reduce the potential risk to biologists during biological surveys within the investigation footprint of the BLM Area B vernal ponds.

BLM Area B Vernal Ponds

4.0   REFERENCES

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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
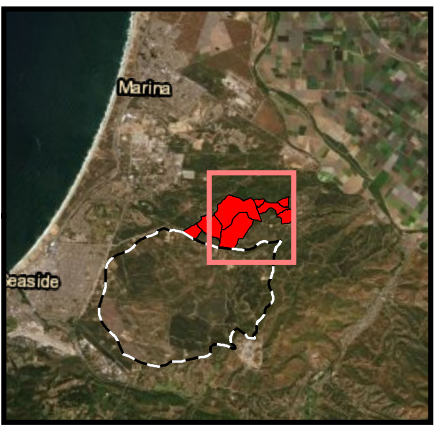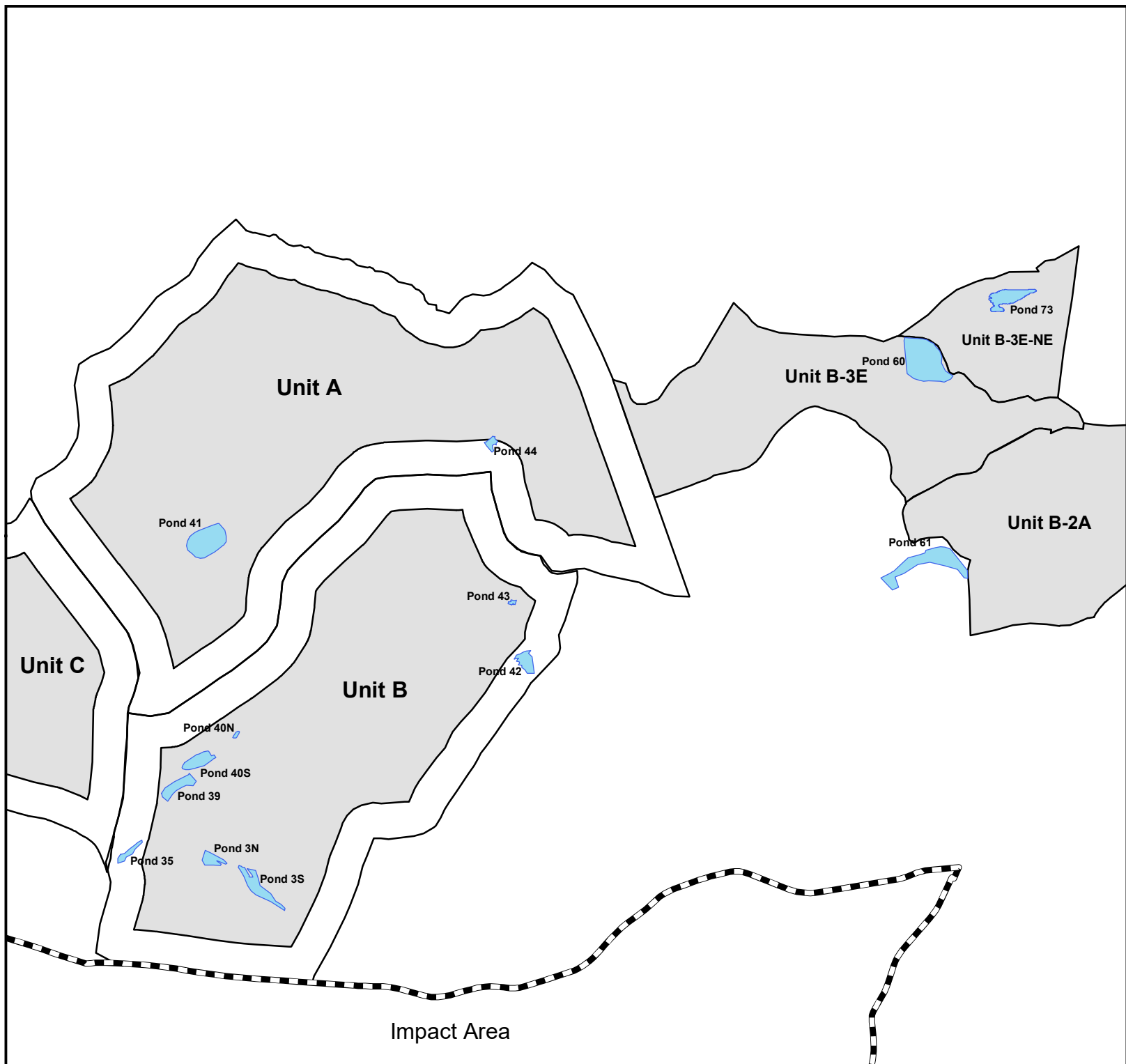
BLM Area B Vernal Ponds

Figure 1

BLM Area B Vernal Ponds
Former Fort Ord, CA

Legend

+ Targets

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

Unit A

Unit B

Unit B-3E

Unit B-3E-NE

Unit B-2A

Impact Area

N

Feet

0 10 20 30 40
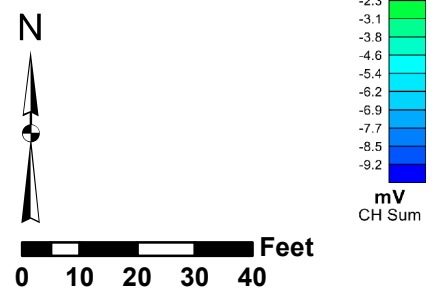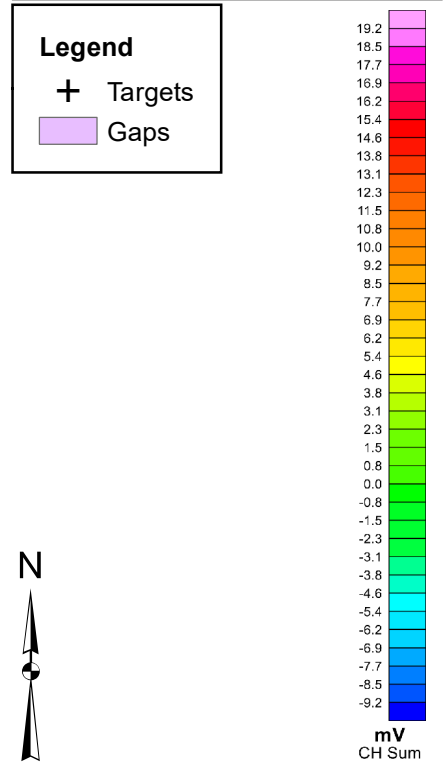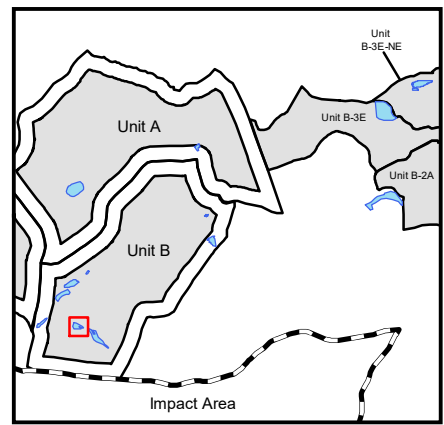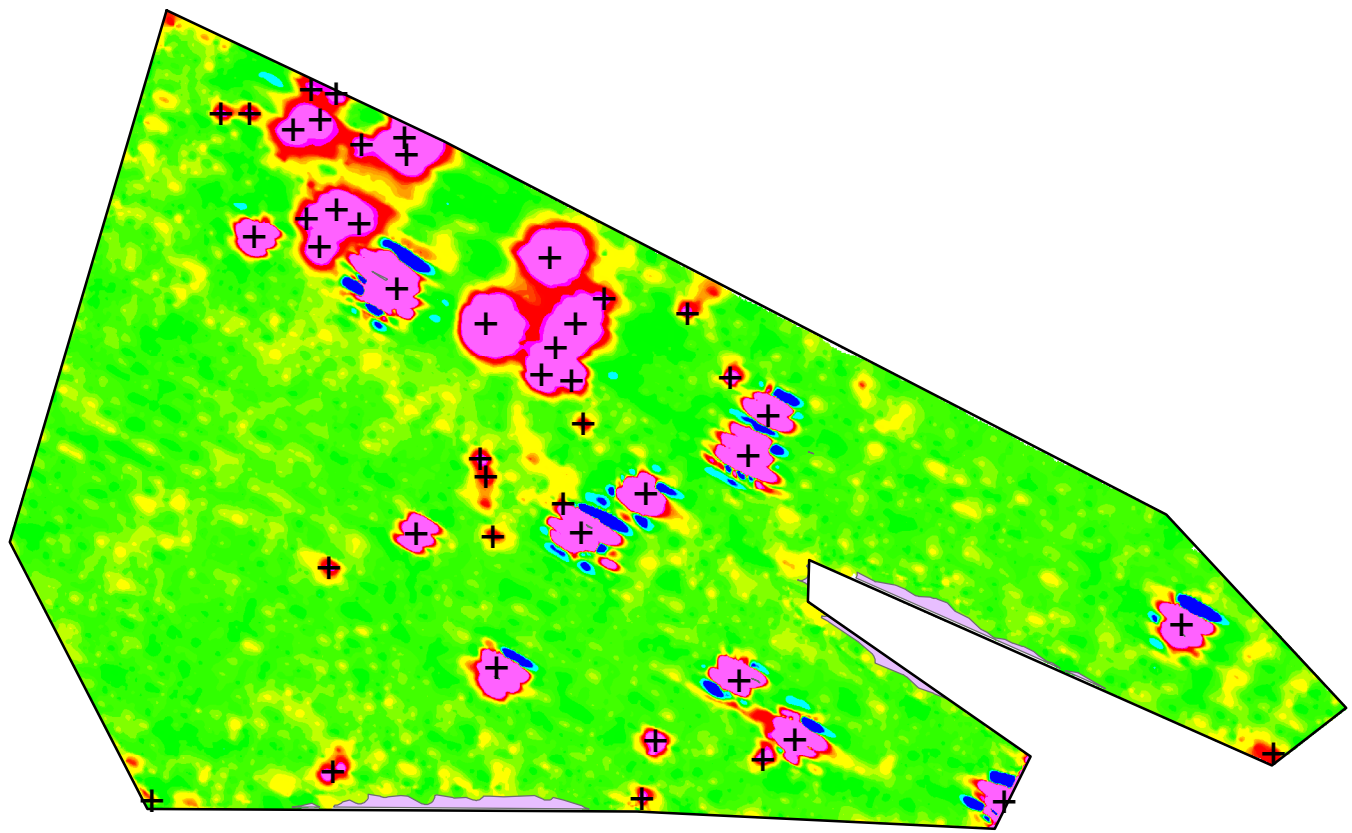
U.S. Army Corps of Engineers
Sacramento District

Figure 2

Pond 3N DGM data
Former Fort Ord, CA

Legend

+ Targets

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

Feet

0   30   60   90   120
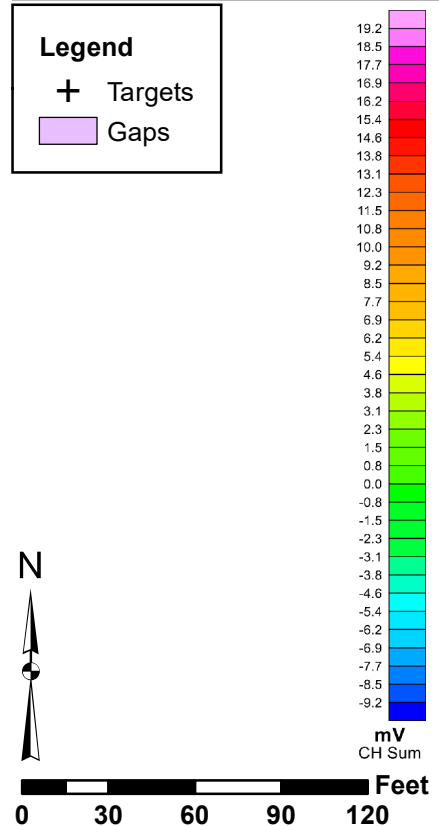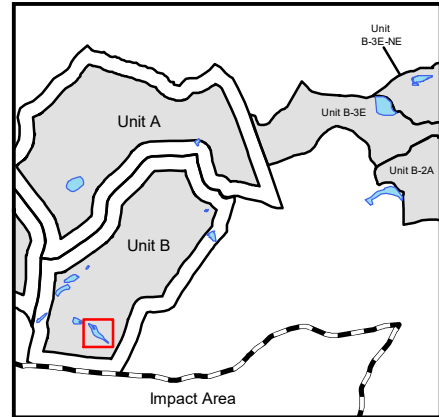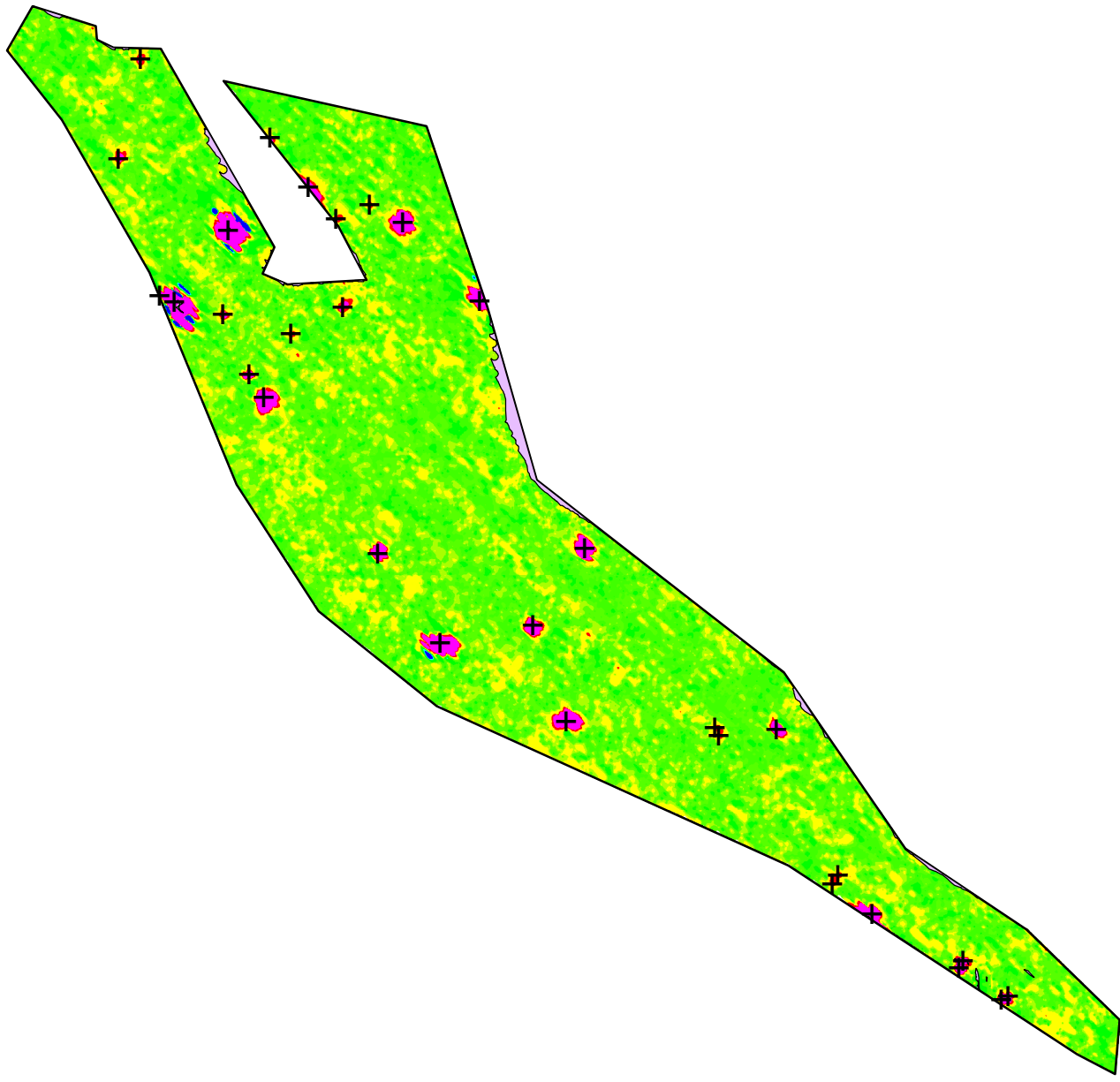
U.S. Army Corps of Engineers
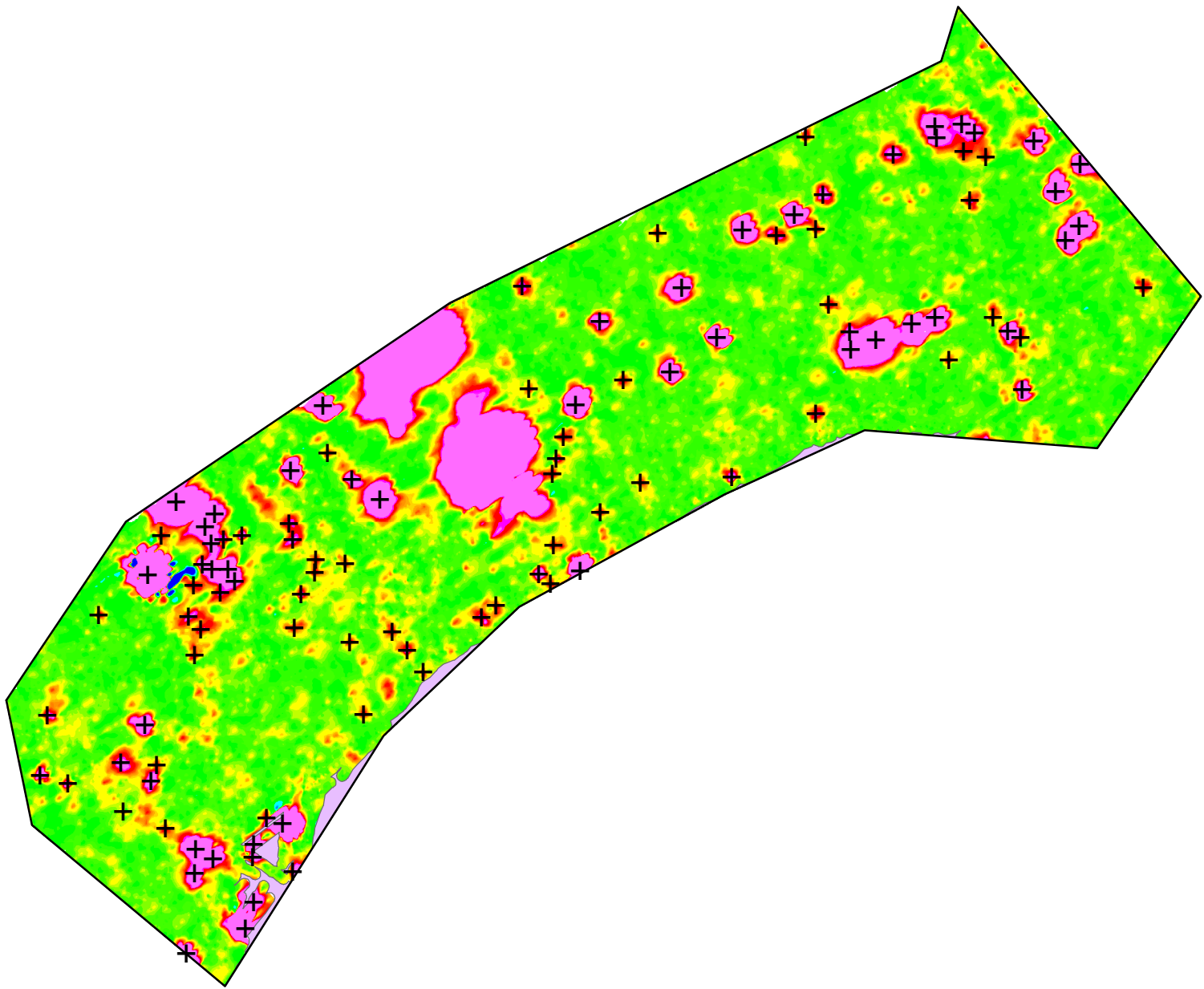**Sacramento District**

Figure 3

Pond 3S DGM data
Former Fort Ord, CA

Unit B-3E-NE

Unit A

Unit B-3E

Unit B-2A

Unit B

Impact Area

Legend

+ Targets

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

Unit B-3E-NE

Unit A

Unit B-3E

Unit B-2A

Unit B

Impact Area

N

Feet

0   10   20   30   40
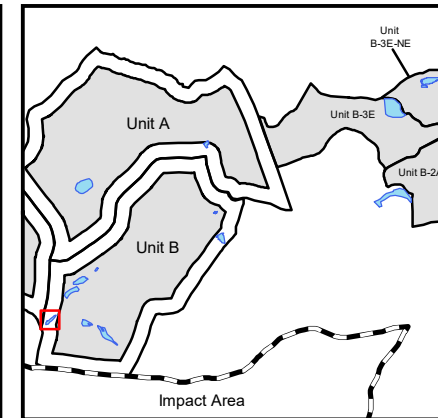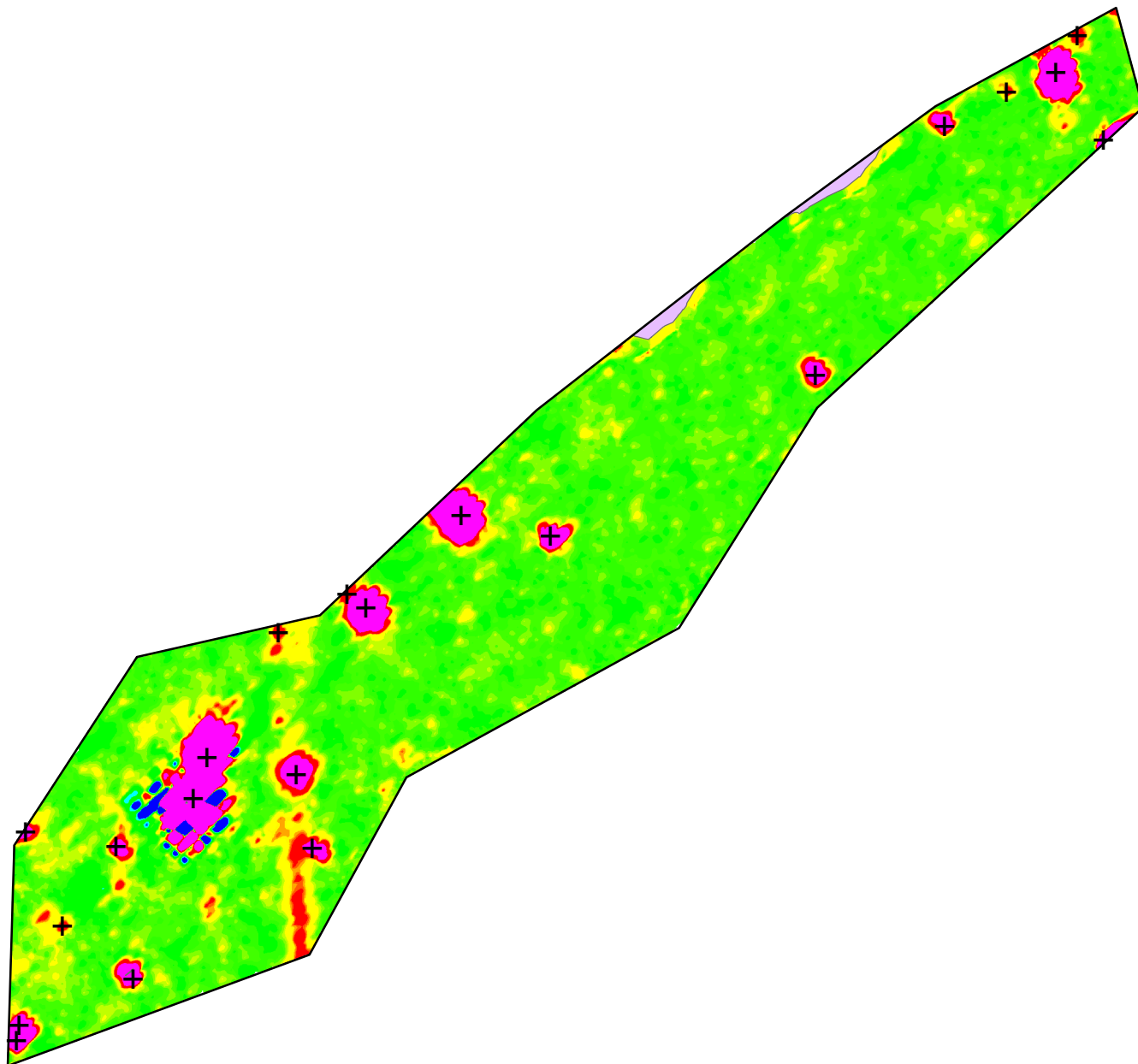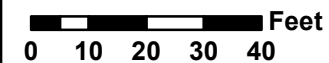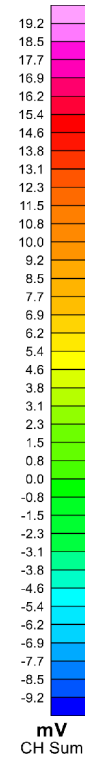
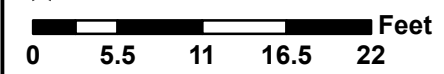**U.S. Army Corps of Engineers**
Sacramento District

Figure 4

Pond 35 DGM data
Former Fort Ord, CA

Legend

+ Targets

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

Feet

0 10 20 30 40
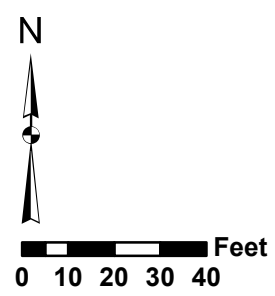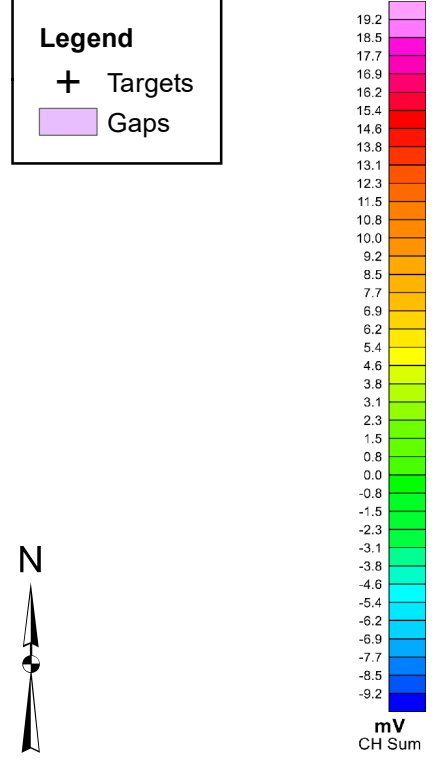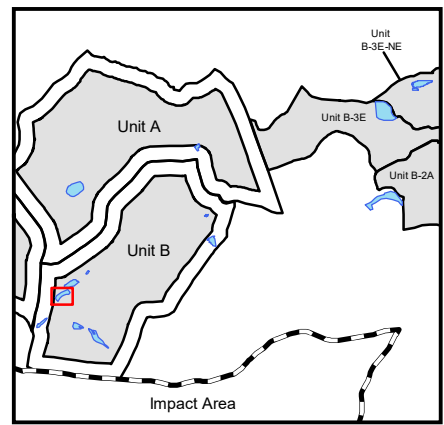
U.S. Army Corps of Engineers
Sacramento District

Figure 5

Pond 39 DGM data
Former Fort Ord, CA

Unit B-3E-NE

Unit A

Unit B-3E

Unit B-2A

Unit B

Impact Area

Legend
+ Targets
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

Feet
0   5.5   11   16.5   22
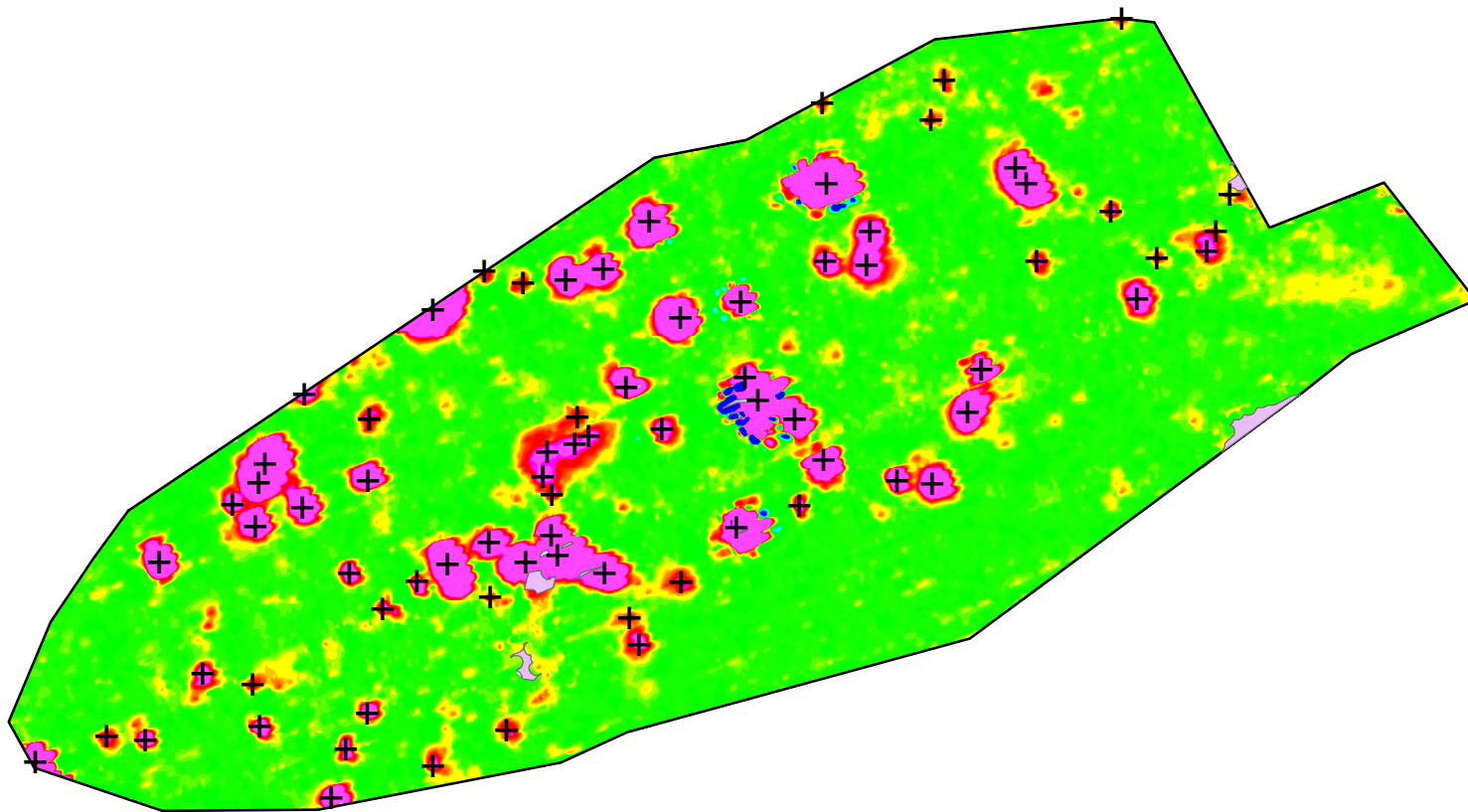
Unit A
Unit B-3E
Unit B-3E-NE
Unit B-2A
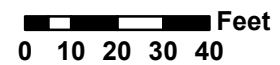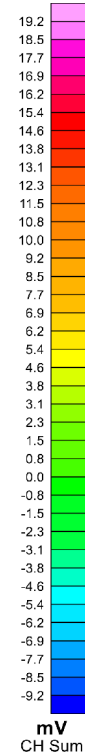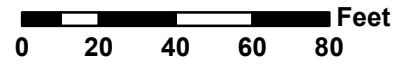Unit B
Impact Area

N
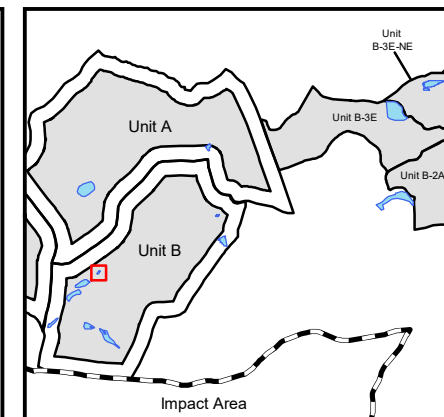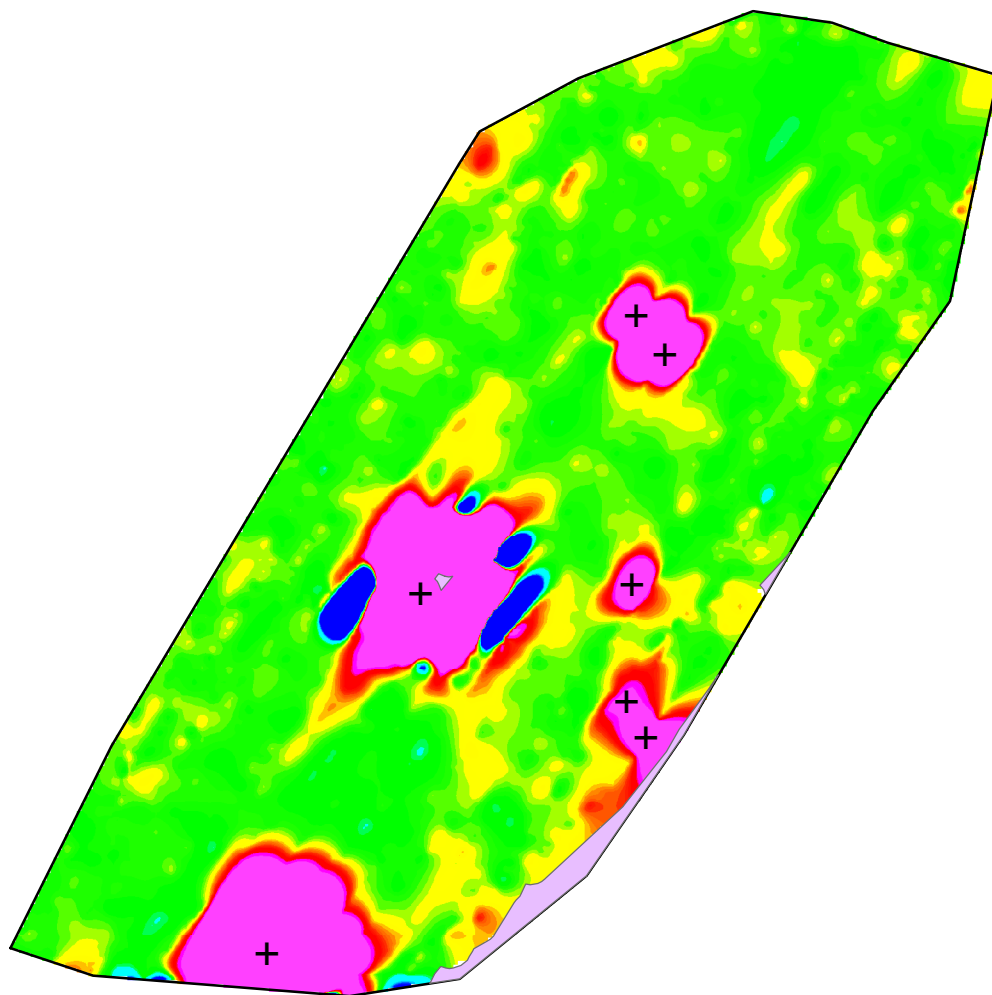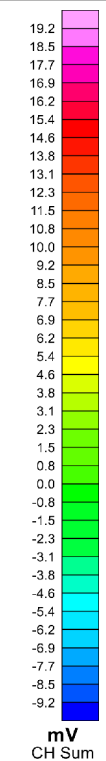
U.S. Army Corps of Engineers
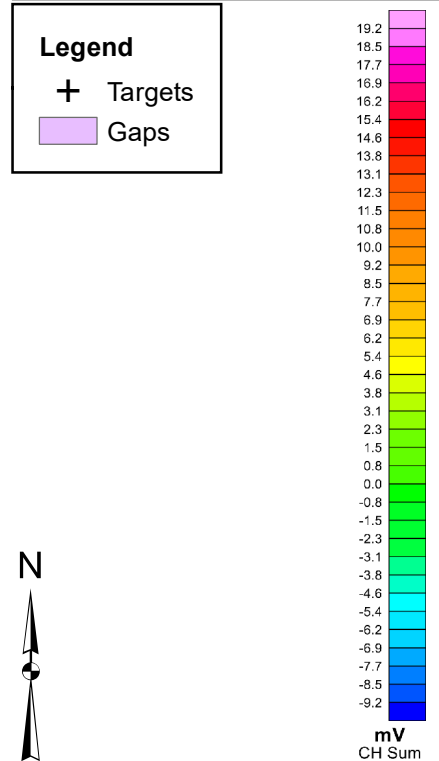Sacramento District

Figure 6

Pond 40N DGM data
Former Fort Ord, CA

Legend

+ Targets

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

Feet
0 10 20 30 40
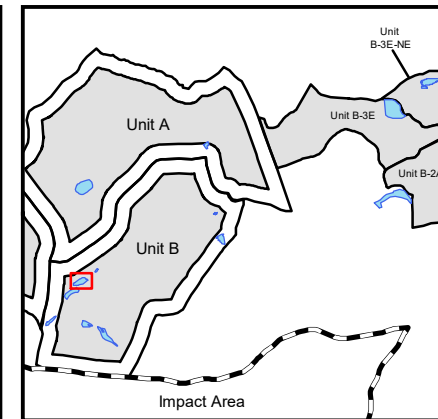
U.S. Army Corps of Engineers
Sacramento District

Figure 7

Pond 40S DGM data
Former Fort Ord, CA

Unit B-3E-NE

Unit A

Unit B-3E

Unit B-2A

Unit B

Impact Area

Legend

- **+** Targets
- 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

Feet

0   20   40   60   80
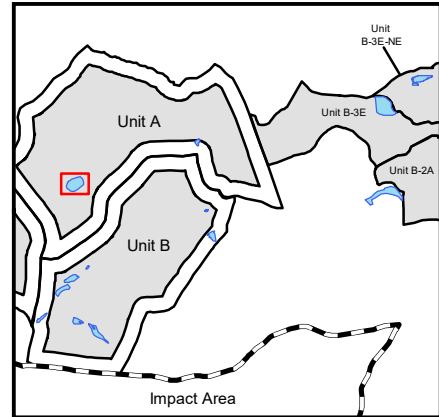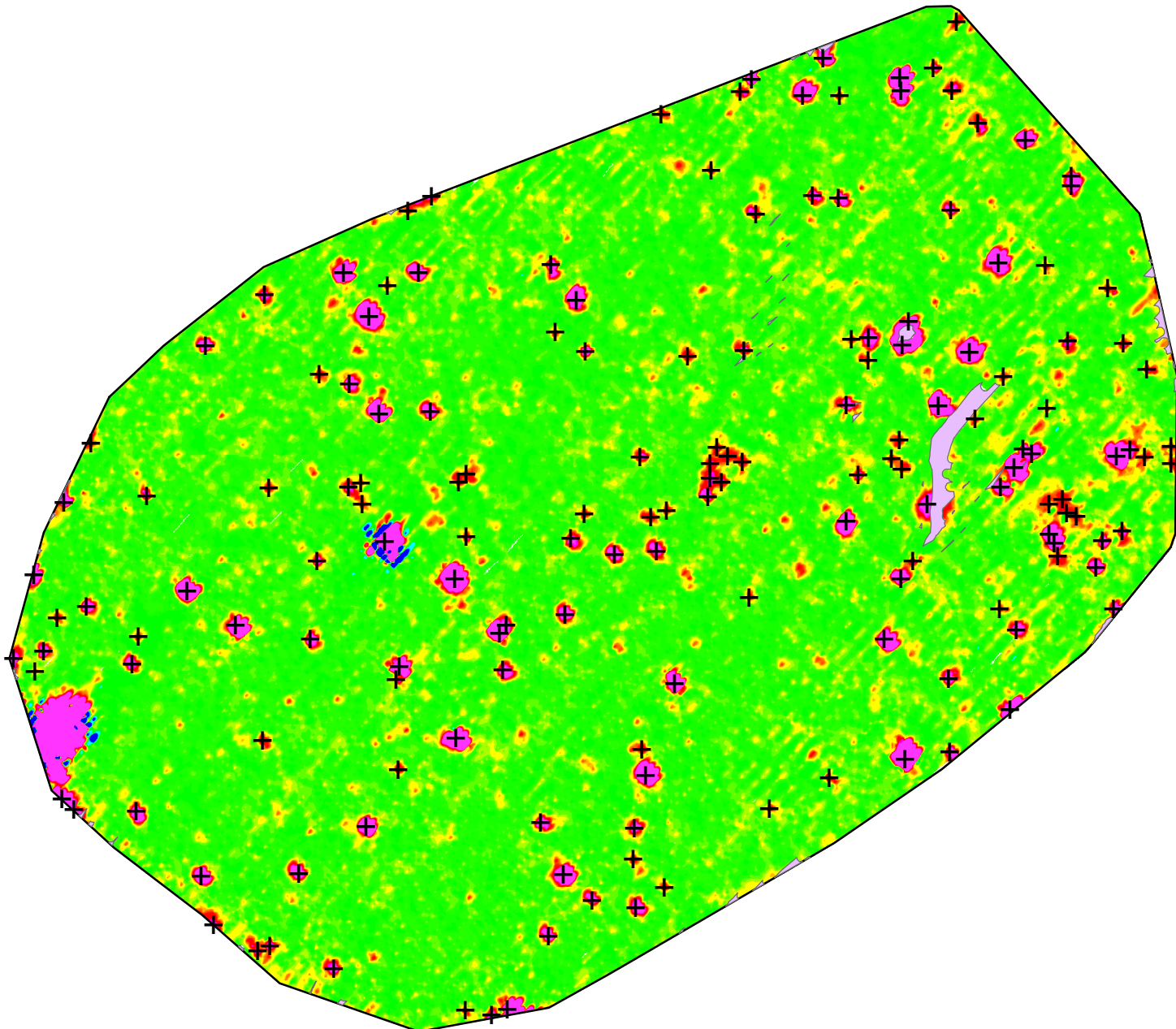
U.S. Army Corps of Engineers
Sacramento District

Figure 8

Pond 41 DGM data
Former Fort Ord, CA

Unit
B-3E-NE

Unit A

Unit B-3E

Unit B-2A

Unit B

Impact Area

Legend

+ Targets

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

Feet

0 10 20 30 40
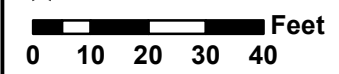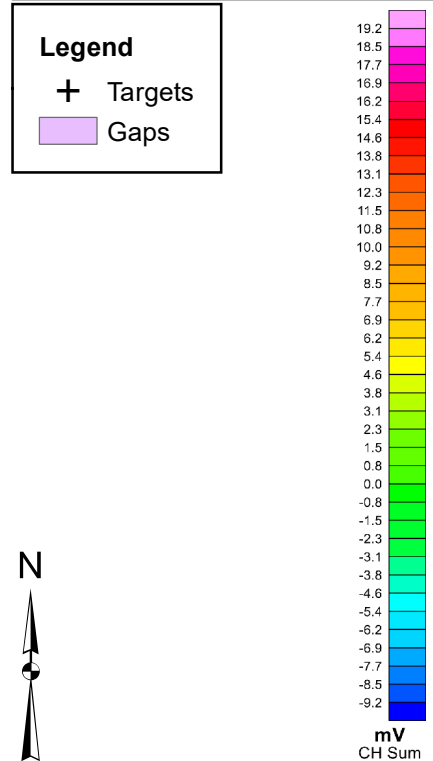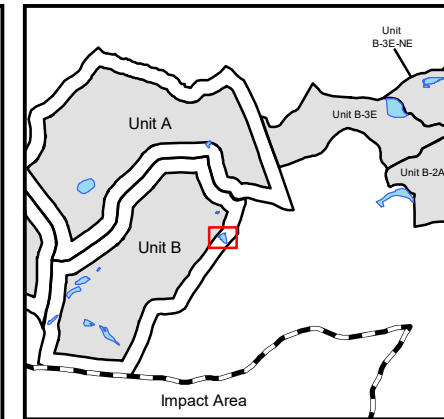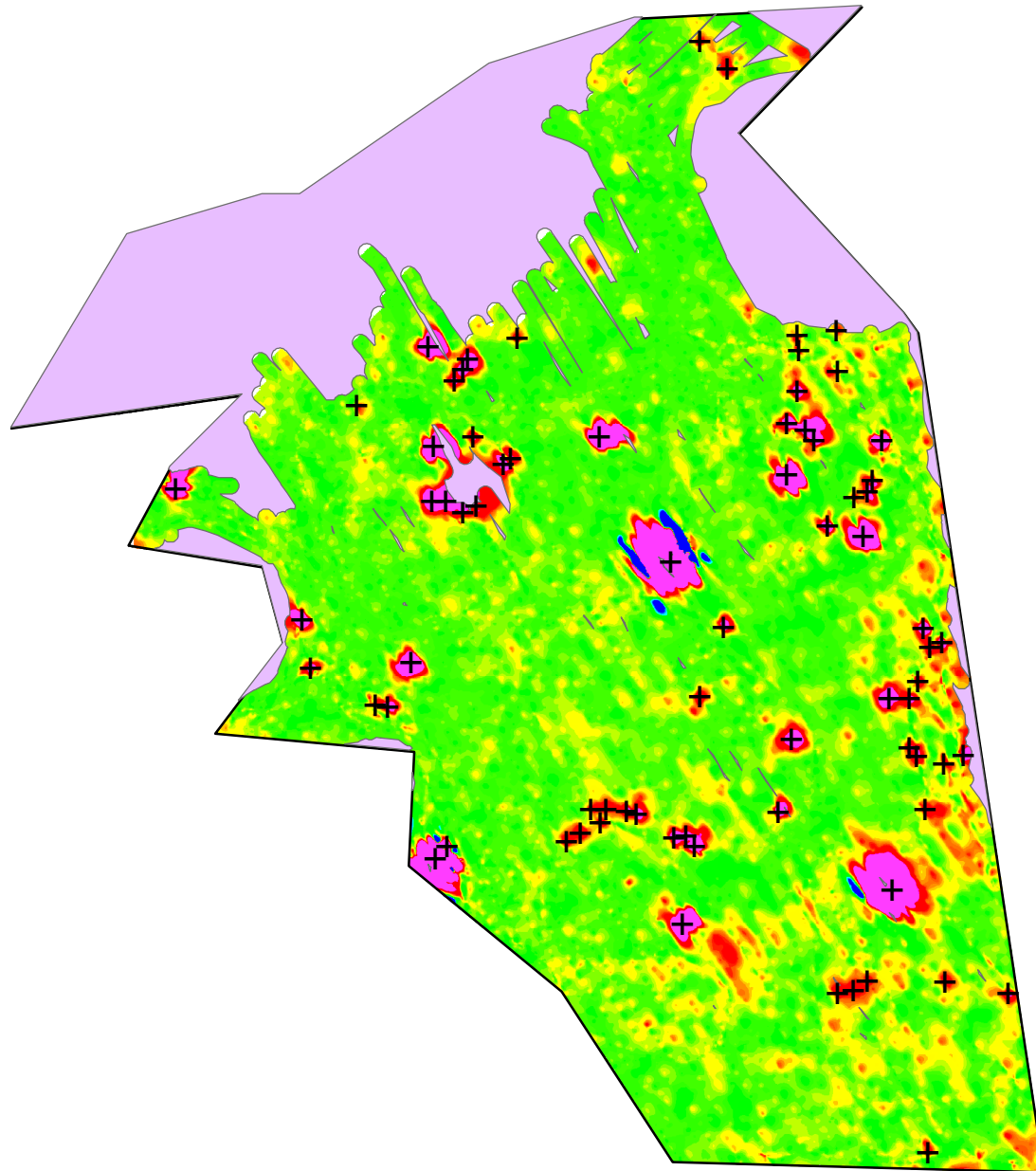
U.S. Army Corps of Engineers
Sacramento District

Figure 9

Pond 42 DGM data
Former Fort Ord, CA

Unit B-3E-NE

Unit A

Unit B-3E

Unit B-2A

Unit B

Impact Area

Legend

+ Targets

Gaps

mV
CH Sum

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

N

Feet
0   5.5   11   16.5   22
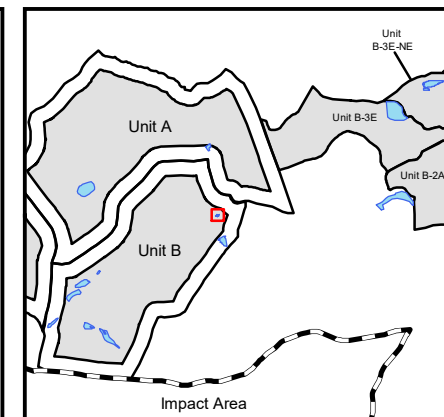
U.S. Army Corps of Engineers
Sacramento District
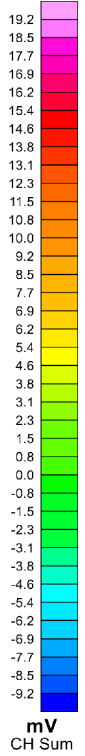
Figure 10

Pond 43 DGM data
Former Fort Ord, CA

Unit B-3E-NE
Unit A
Unit B-3E
Unit B-2A
Unit B
Impact Area

Legend

+ Targets

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

Feet

0   10   20   30   40
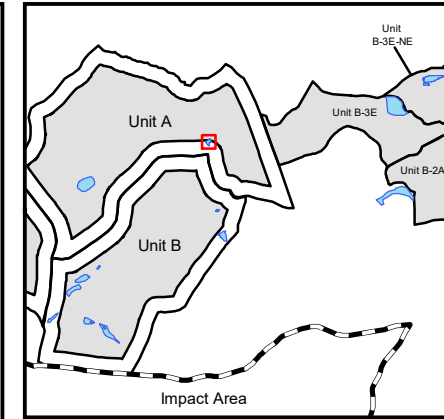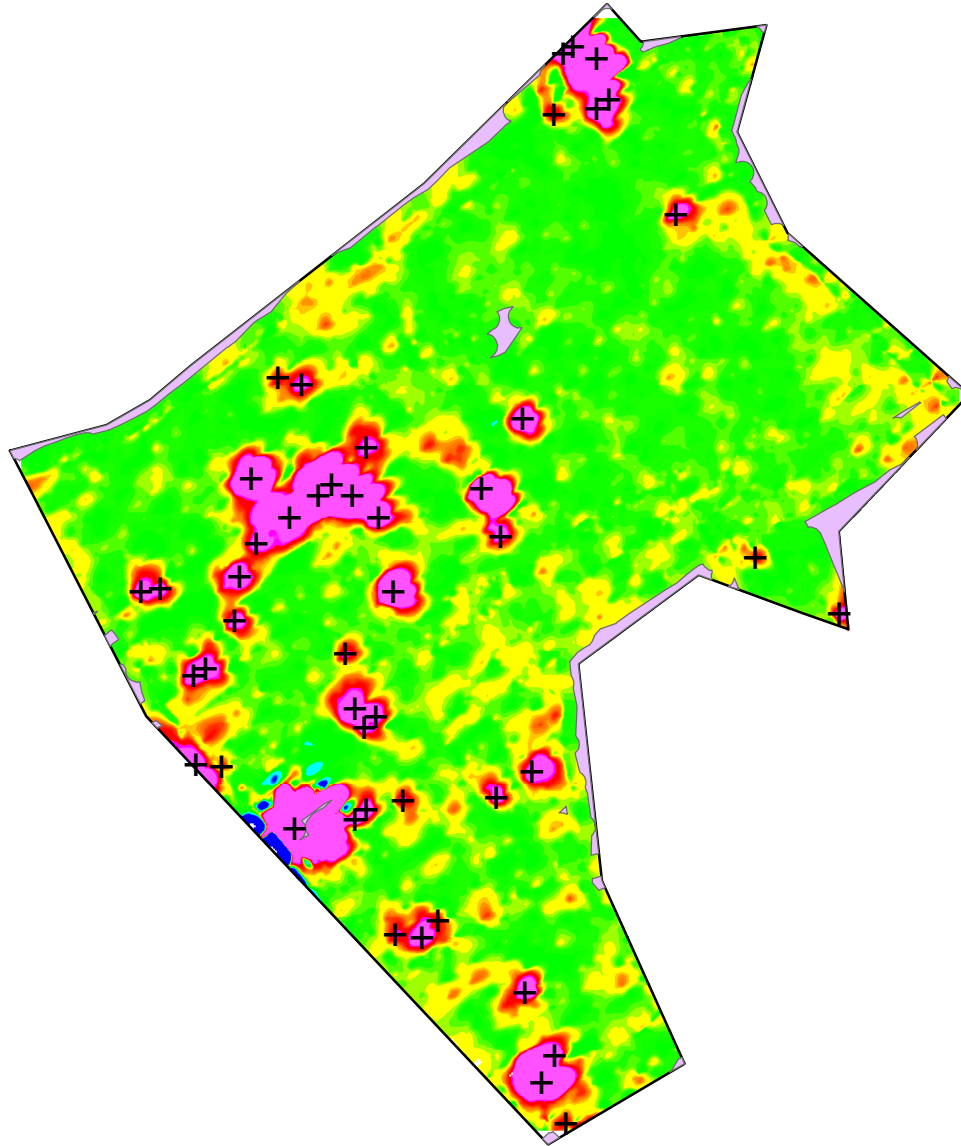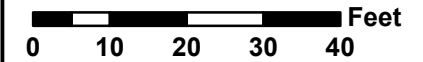
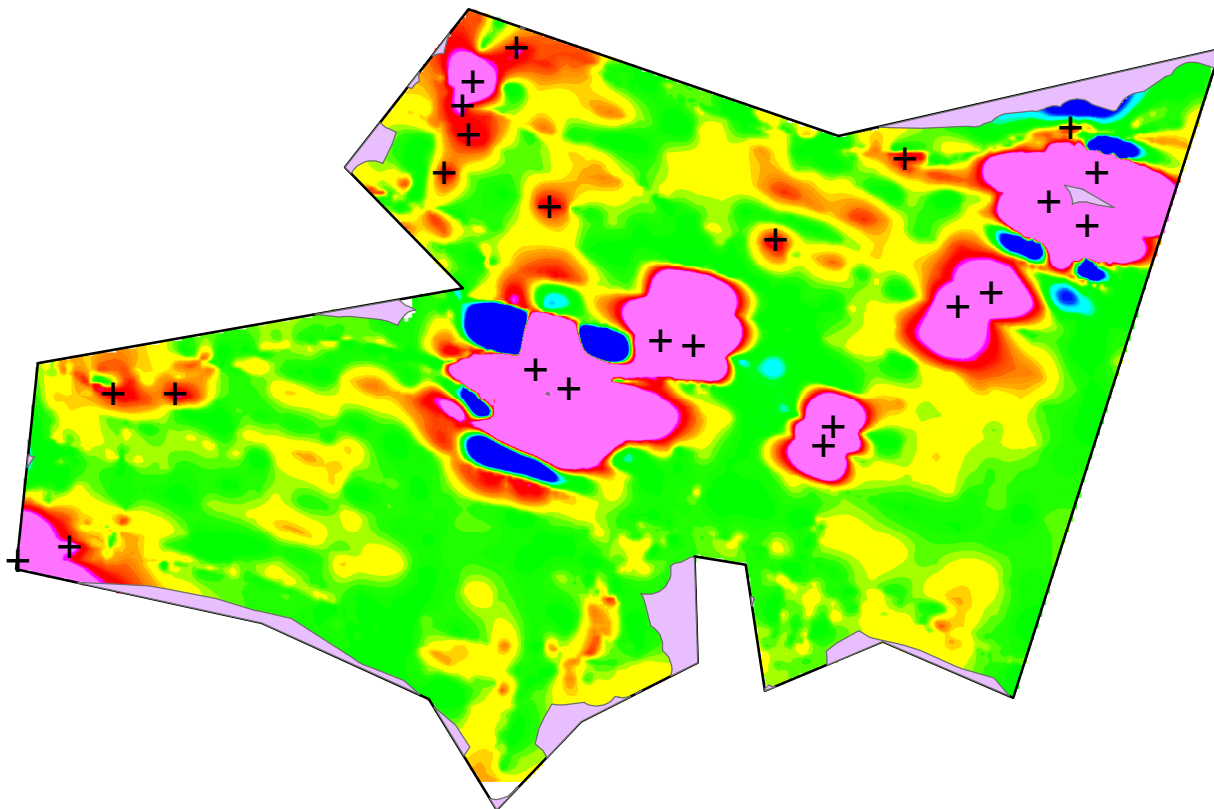**U.S. Army Corps of Engineers**
Sacramento District

Figure 11
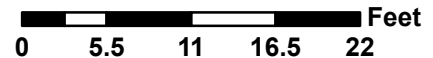
Pond 44 DGM data
Former Fort Ord, CA
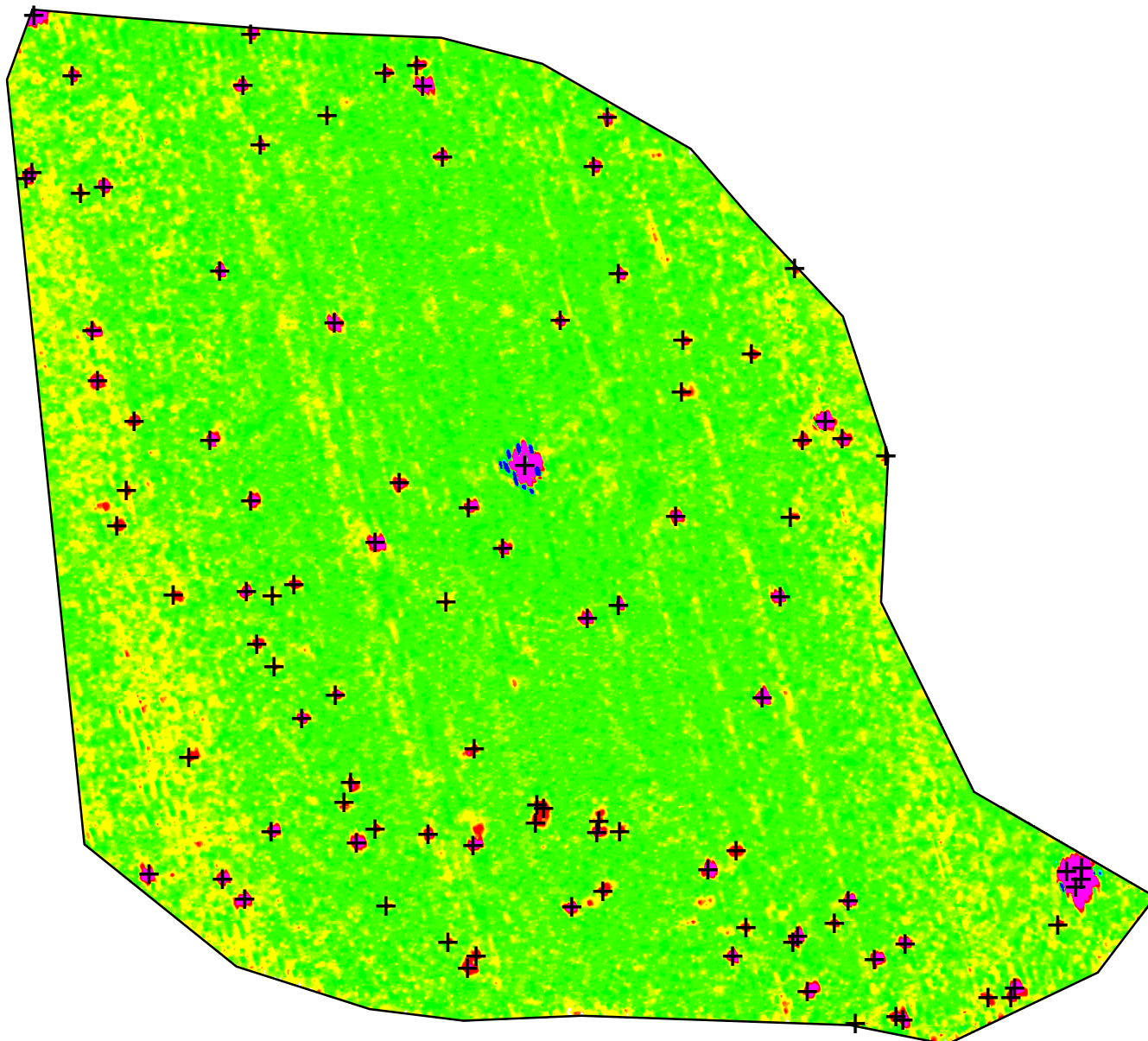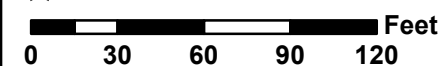
Figure 12

Pond 60 DGM data
Former Fort Ord, CA

Legend

+ Targets

Gaps

mV
CH Sum

Feet

0   30   60   90   120

N

Unit A

Unit B

Unit B-3E

Unit B-3E-NE

Unit B-2A

Impact Area

Legend

+ Targets

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

Feet
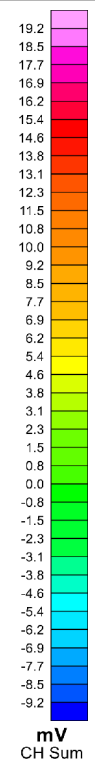
0   40   80   120   160
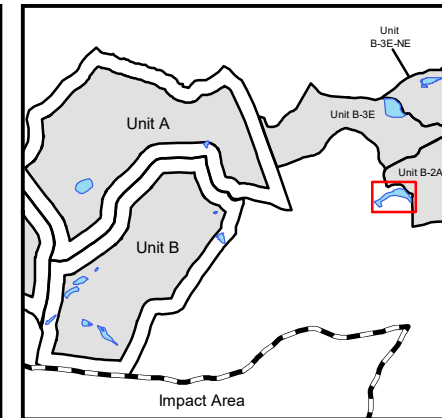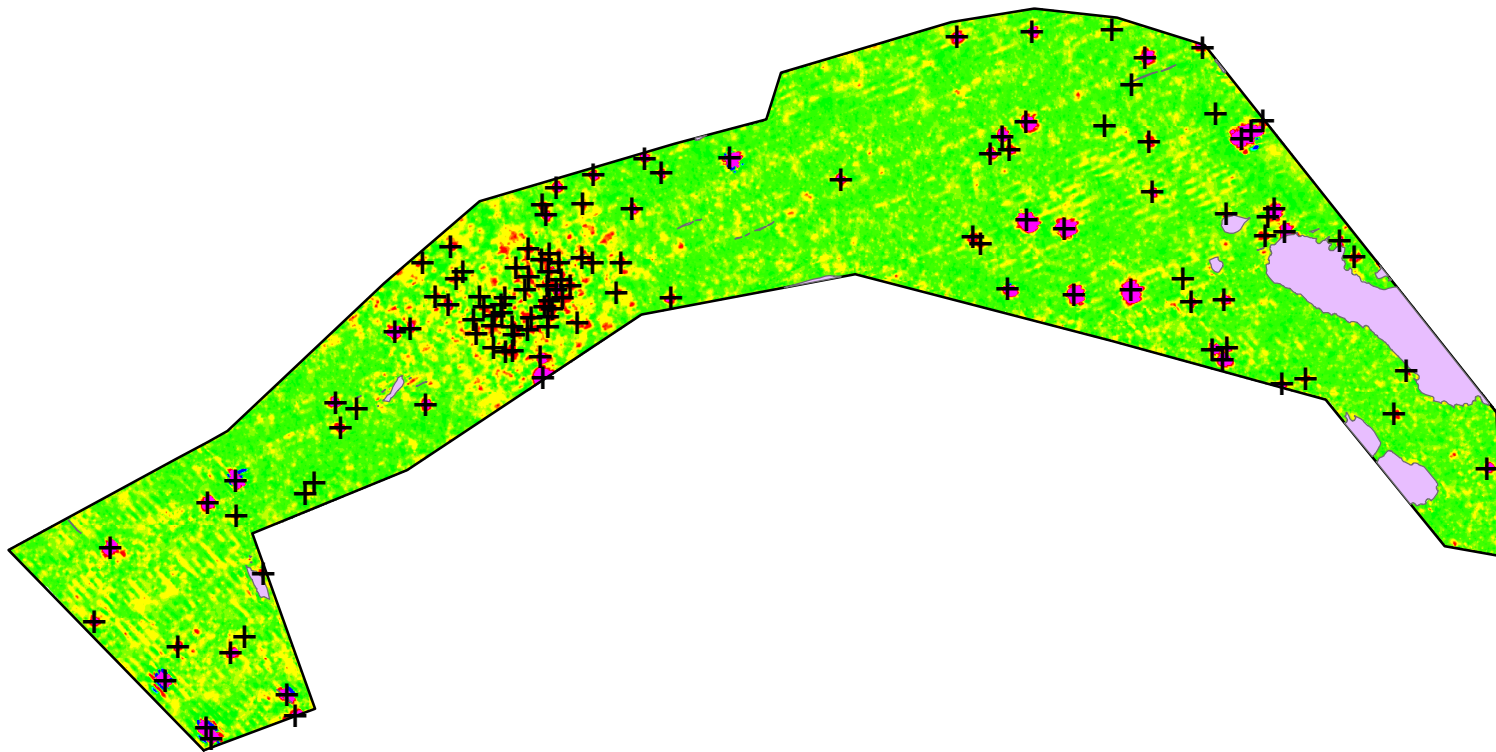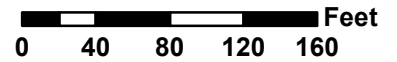
U.S. Army Corps of Engineers
Sacramento District

Figure 13

Pond 61 DGM data
Former Fort Ord, CA

Legend

+ Targets

Gaps

mV
CH Sum

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

N

Feet

0   30   60   90   120
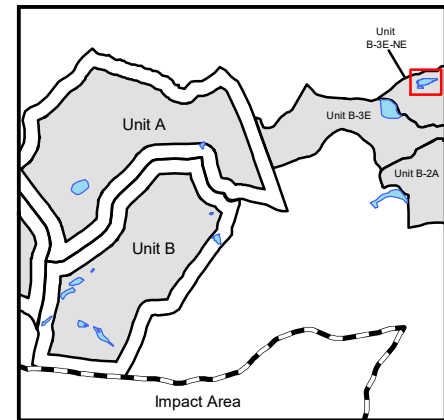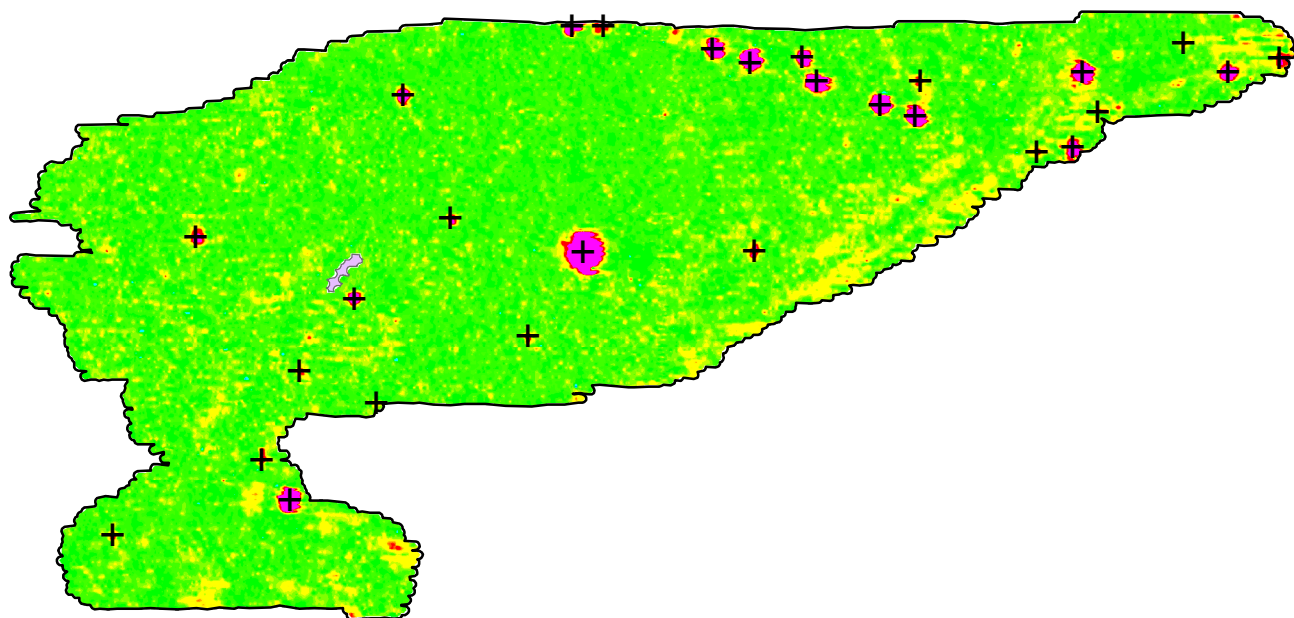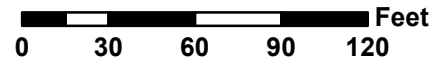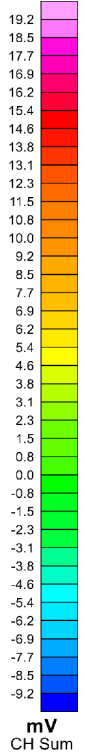
**U.S. Army Corps of Engineers
Sacramento District**

Figure 14

Pond 73 DGM data
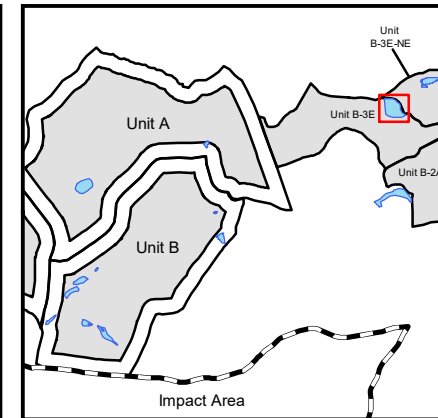Former Fort Ord, CA

Unit B-3E-NE

Unit A

Unit B-3E

Unit B-2A

Unit B

Impact Area
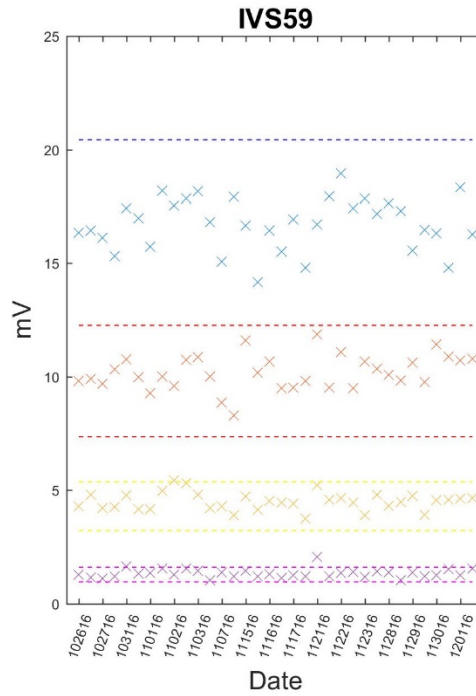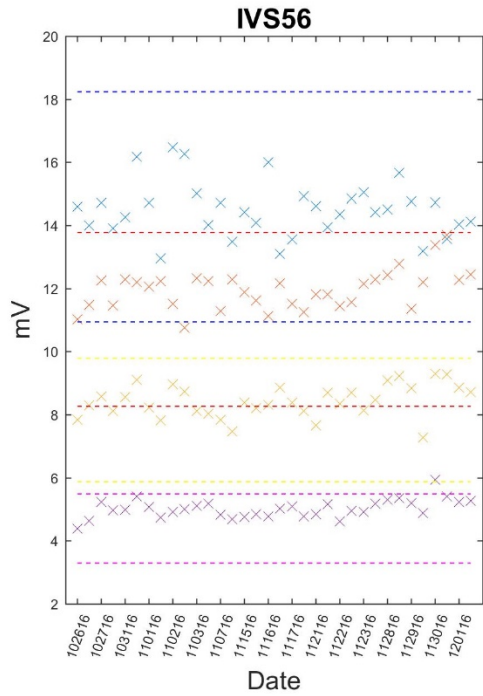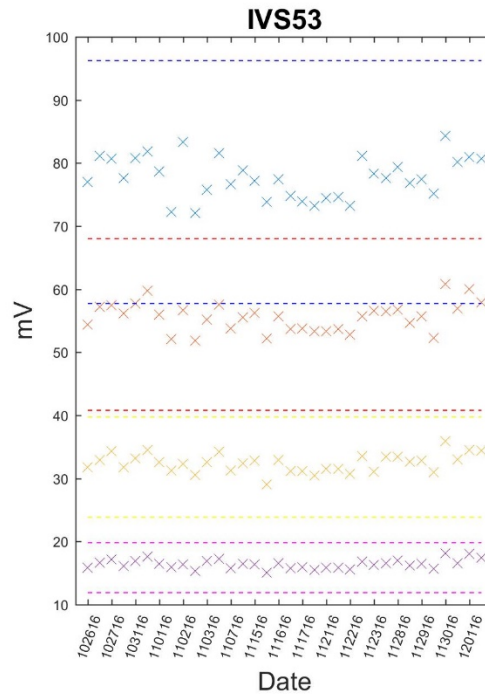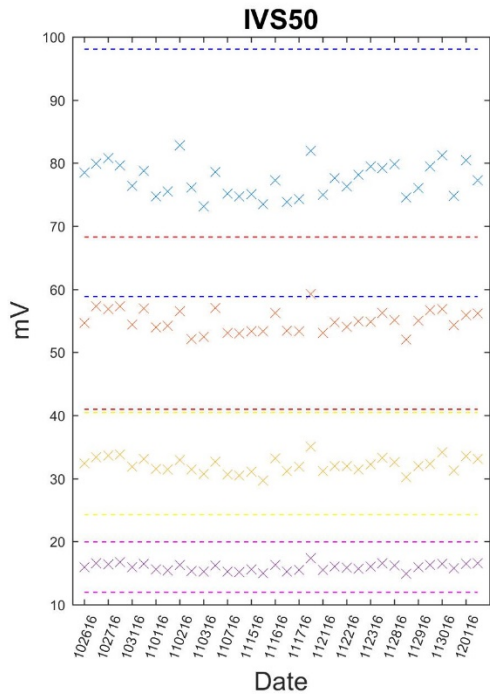
Figure 15. DGM response of IVS items for BLM Area B vernal ponds for each survey day. X symbols represent peak anomaly response for channel 1 (blue), channel 2 (red), channel 3 (yellow), and channel 4 (purple) for each IVS item. Dashed lines represent the allowable variability (+/- 25% of predicted response) established in WS #22. NOTE: For IVS item IVS59, the channel 1 lower limit variability dashed line (blue) is covered up by the channel 2 upper limit variability dashed line (red) because the channel 1 lower limit variability is equal to the Channel 2 upper limit variability.
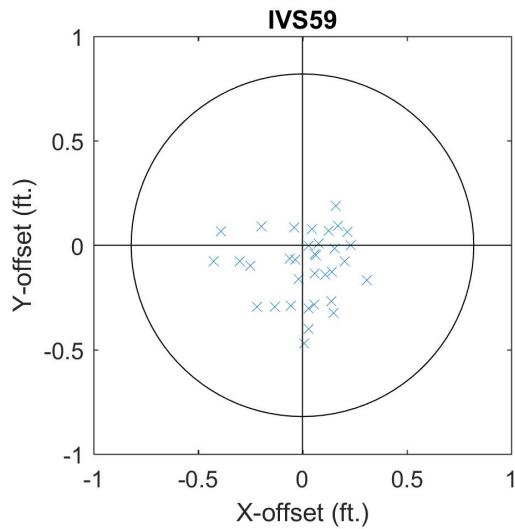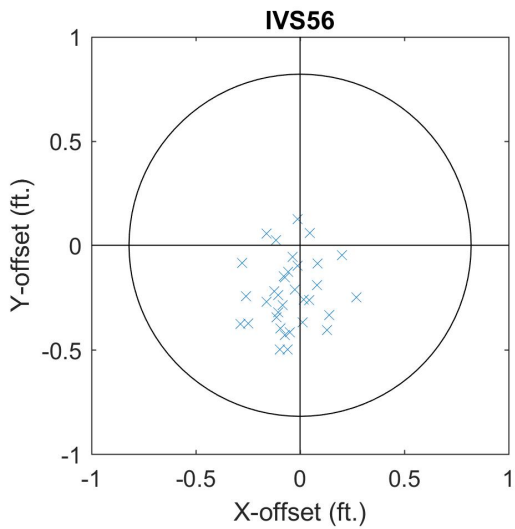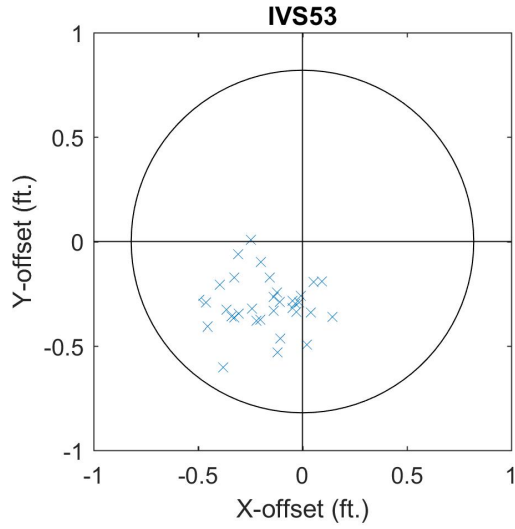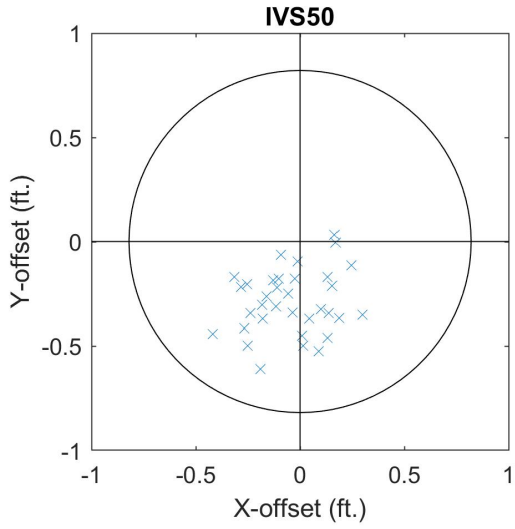
Figure 16. Daily IVS positioning results for BLM Area B vernal ponds. Blue X's show the offset between picked DGM anomaly and the IVS ground truth. Black circle shows the maximum acceptable offset (0.82 ft.) established in WS #22.
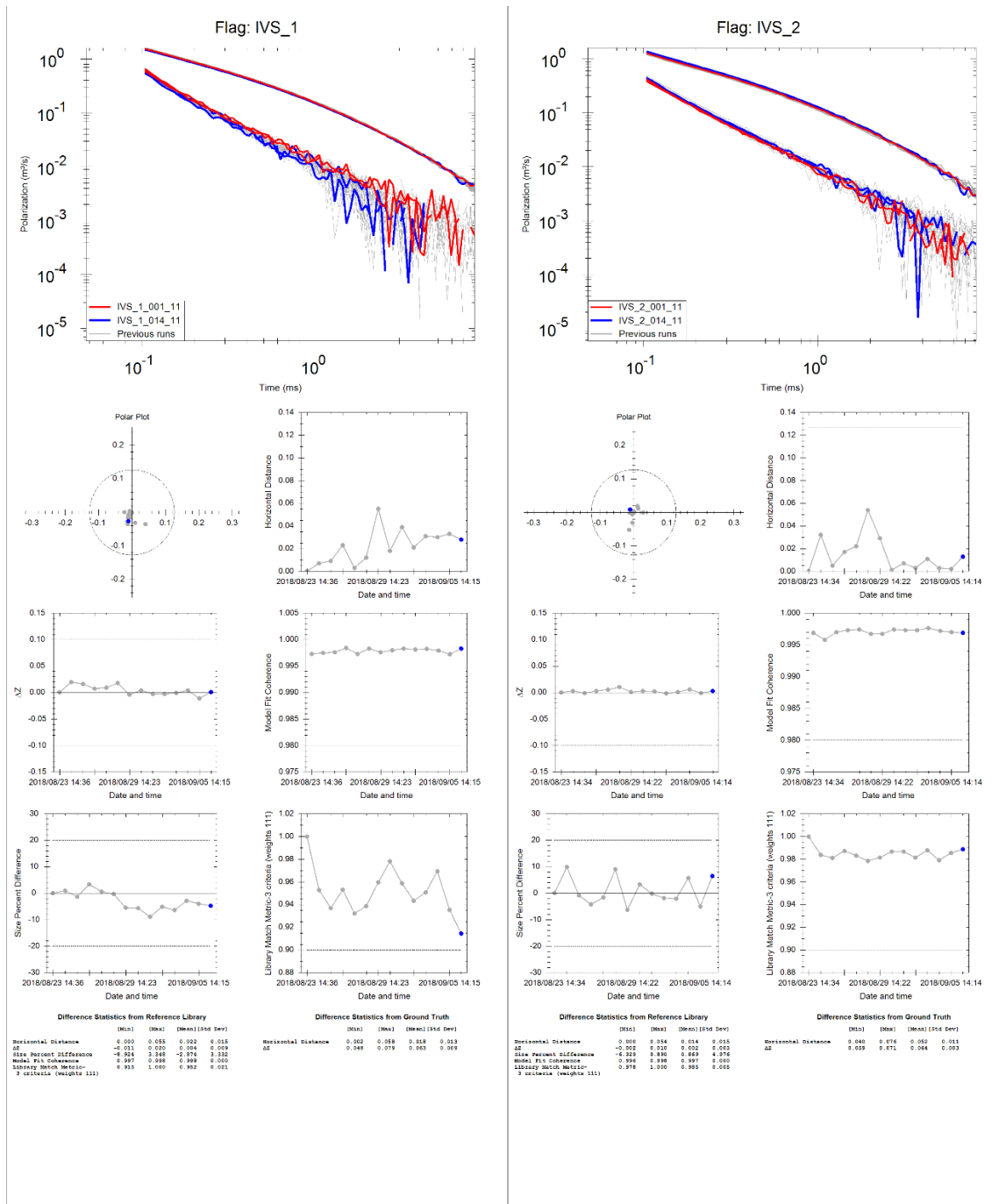
Figure 17. Upper plots show inverted polarizabilities for IVS items. Lower plots show daily MM2x2 QC tests for IVS items IVS_1 and IVS_2. Gray dots show all previous measurements, blue dot shows most recent measurement, and dashed lines show MQO acceptance criteria thresholds. MQOs are further discussed in FWV 012 to the AGCMR-QAPP.
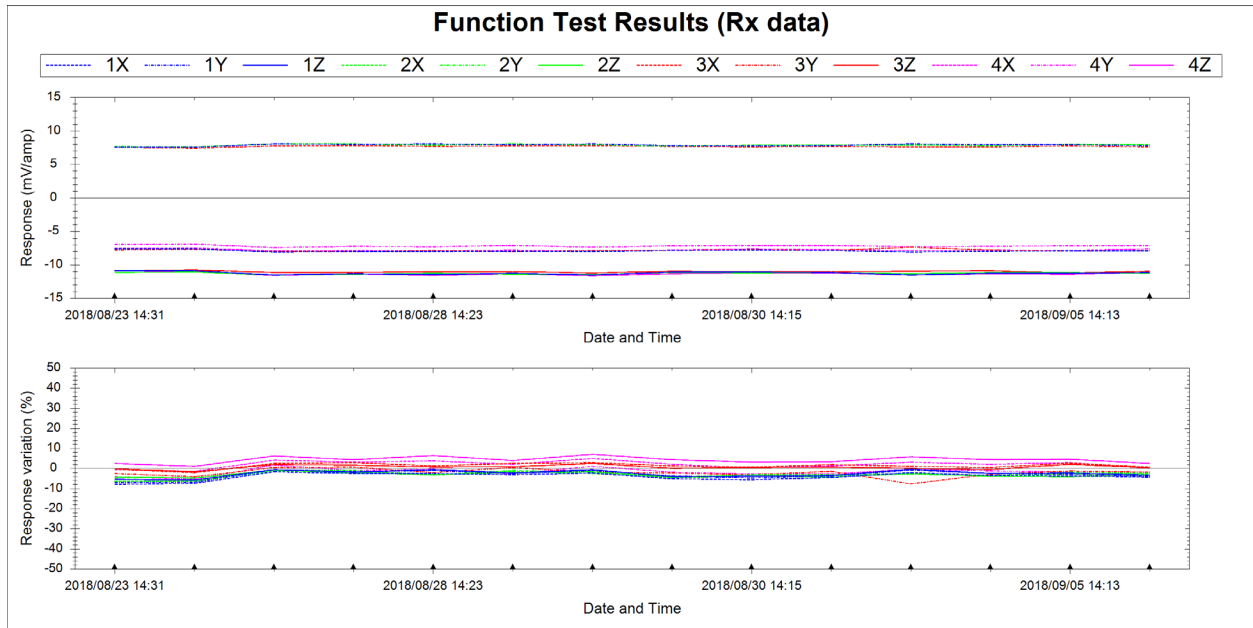
Figure 18. Daily QC results for MM2x2 sensor function test.

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.

MQO	DFW/SOP Reference	Frequency	Responsible Person/Report Method	Acceptance Criteria	Failure Response
QC seed item placement	Place Subsurface QC Seeds/ SOP AGCMR-03	Evaluated for each QC seed item	QC Geophysicist / Final Seed Report	Each seed item has been buried away from the immediate vicinity of strong anomalies, the burial parameters have been recorded with 1-inch precision for locations, 2-inch precision for depths, and 10° precision for inclinations and azimuths, and a photograph has been taken of the item in place.	CA: Replace the seed item, if necessary, or reacquire burial parameter information prior to commencement of data acquisition activities.
Verify correct MetalMapper 2x2 assembly	Cued Classification Survey/ SOP AGCMR-01	Once following assembly	Data Acquisition Geophysicist/Assembly Checklist	As specified in SOP AGCMR-01, Assembly Checklist	CA: Make necessary adjustments and re-verify
Initial sensor function test (five measurements over an emplaced IVS item, 1 with item directly under center of array and 1 each with item centered under each diagonal quadrant of the array). Derived polarizabilities for each measurement are compared to the classification library using UXA	Cued Classification Survey/ SOP AGCMR-01/ SOP AGCMR-08	Once following assembly	Data Acquisition Geophysicist/Assembly Checklist/Lead Data Processor	Library Match metric ≥ 0.95 for each of the five sets of inverted polarizabilities	CA: make necessary repairs/adjustments and re-verify
Initial sensor function test (five measurements over an emplaced IVS item, 1 with item directly under center of array and 1 each with item centered under each diagonal quadrant of the array). Modeled locations are compared to the known location of the schedule 80 small industry standard object (ISO 80) for each measurement.	Cued Classification Survey/ SOP AGCMR-01/ SOP AGCMR-08	Once following assembly	Data Acquisition Geophysicist/Assembly Checklist/Lead Data Processor	Modeled location of each measurement is under the correct quadrant of the TEMTADS sensor array	CA: make necessary repairs/adjustments and re-verify

MQO	DFW/SOP Reference	Frequency	Responsible Person/Report Method	Acceptance Criteria	Failure Response
Initial IVS background measurement (five background measurements – 1 centered at the flag and 1 offset 15 inches (40cm) in each cardinal direction)	Cued Classification Survey/ SOP AGCMR-02/ SOP AGCMR-07/ SOP AGCMR-08	Once during initial system IVS test	Data Acquisition Geophysicist/Initial IVS Technical Memorandum/ Lead Data Processor	Decay amplitudes are below the selected background threshold at each offset background location	CA: reject/replace BG location
Initial derived polarizabilities accuracy (IVS)	Cued Classification Survey/ SOP AGCMR-02/ SOP AGCMR-07/ SOP AGCMR-08	Once during initial system IVS test	Lead Data Processor and Gilbane Project Geophysicist/Initial IVS Technical Memorandum	Library Match metric ≥ 0.9 for each set of inverted polarizabilities	RCA/CA
Initial derived target position accuracy (IVS)	Cued Classification Survey/ SOP AGCMR-02/ SOP AGCMR-07/ SOP AGCMR-08	Once during initial system IVS test	Lead Data Processor and Gilbane Project Geophysicist/Initial IVS Technical Memorandum	All IVS item fit locations within 5 inches of ground truth locations	RCA/CA
Ongoing IVS background measurements	Cued Classification Survey/ SOP AGCMR-02/ SOP AGCMR-07/ SOP AGCMR-08	Twice daily as part of IVS testing	Lead Data Processor and Gilbane Project Geophysicist/tracking summary	All decay amplitudes lower than project threshold and qualitatively agree with initial measurement	RCA/CA CA assumption: rejection of BG measurement (unless RCA indicates system failure)
Ongoing derived polarizabilities precision (IVS)	Cued Classification Survey/ SOP AGCMR-02/ SOP AGCMR-07/ SOP AGCMR-08	Twice daily as part of IVS testing	Lead Data Processor and Gilbane Project Geophysicist/tracking summary	Library match to initial polarizabilities metric ≥ 0.9 for each set of three inverted polarizabilities	RCA/CA
Ongoing derived target position precision (IVS)	Cued Classification Survey/ SOP AGCMR-02/ SOP AGCMR-07/ SOP AGCMR-08	Twice daily as part of IVS testing	Lead Data Processor and Gilbane Project Geophysicist/tracking summary	All IVS item fit locations within 5 inches of average of derived fit locations	RCA/CA
Initial measurement of production area background locations	Cued Classification Survey/ SOP AGCMR-04/ SOP AGCMR-08	Once per background location	Data Acquisition Geophysicist and Lead Data Processor/ tracking summary	All decay amplitudes lower than project threshold	CA: reject BG location and find alternate
Ongoing production area background measurement frequency	Cued Classification Survey/ SOP AGCMR-04/ SOP AGCMR-07	Evaluated for each background measurement	Data Acquisition Geophysicist/failures noted in field log and tracking summary	Time separation between background measurement and anomaly measurement < 2 hour	CA: reject data that does not have a corresponding background measurement recorded within acceptable time period
Ongoing production area background measurement	Cued Classification Survey/ SOP AGCMR-04/ SOP AGCMR-07/ SOP AGCMR-08	Evaluated for each background measurement	Lead Data Processor and Gilbane Project Geophysicist/tracking summary	All decay amplitudes lower than project threshold and qualitatively agree with initial measurement	CA: background measurement rejected and reacquired

MQO	DFW/SOP Reference	Frequency	Responsible Person/Report Method	Acceptance Criteria	Failure Response
Transmit current levels	Cued Classification Survey/ SOP AGCMR-07	Evaluated for each sensor measurement	Data Acquisition Geophysicist/failures noted in field log and tracking summary	Peak transmit current ≥ 5.5 amps	CA: reject data acquired with current levels outside of the acceptable range
Initial anomaly (flag) location interrogated	Cued Classification Survey/ SOP AGCMR-07/ SOP AGCMR-08	Evaluated for each flag position	Data Acquisition Geophysicist/failures noted in field log and tracking summary	For each anomaly, a measurement must be acquired with the center of the array < 16 inches from the flag location.	CA: Reacquire measurement at flag location
Position data are valid (1 of 2)	Cued Classification Survey/ SOP AGCMR-07	Evaluated for each sensor measurement	Data Acquisition Geophysicist/failures noted in field log and tracking summary	GPS status flag indicates RTK fix	RCA/CA
Position data are valid (2 of 2)	Cued Classification Survey/ SOP AGCMR-07/ SOP AGCMR-08	Evaluated for each sensor measurement	Data Acquisition Geophysicist/Lead Data Processor/tracking summary	Orientation data valid Data input string checksum passes	RCA/CA
Confirm inversion model supports classification (1 of 2)	Cued Classification Survey/ SOP AGCMR-08	Evaluated for all models derived from a measurement (i.e., single item and multi-item models)	Lead Data Processor and Gilbane Project Geophysicist/tracking summary	Derived model response must fit the observed data with a fit coherence > 0.8	CA: If no valid model is derived, classify as inconclusive
Confirm inversion model supports classification (2 of 2)	Cued Classification Survey/ SOP AGCMR-08	Evaluated for derived target	Lead Data Processor and Gilbane Project Geophysicist/tracking summary	Fit location estimate of item ≤ 15 inches from center of sensor	CA: If no target within 15 inch radius using multi-solver inversion, classify as inconclusive
Confirm all anomalies classified	Cued Classification Survey/ SOP AGCMR-08	Evaluated for each anomaly (flag) location	Lead Data Processor and Gilbane Project Geophysicist/tracking summary	100% of anomalies are classified as: TOI/ Non-TOI/Inconclusive	Documentation required identifying reason for missing data with RCA/CA if necessary. If data cannot be acquired, classify as inconclusive.
Confirm reacquisition GPS accuracy and precision	Intrusive Investigation/ SOP AGCMR-09	Daily	Reacquisition Geophysicist/Daily Report	Benchmark positions repeatable to within 3 inches	CA: Make adjustments and re-verify
Confirm derived features match ground truth (1 of 2)	Intrusive Investigation/ SOP AGCMR-09	Evaluated for all recovered items	QC Geophysicist/QC reports	95% of recovered item positions < 10 inches from predicted position	RCA/CA
Confirm derived features match ground truth (2 of 2)	Intrusive Investigation/ SOP AGCMR-09	Evaluated for all recovered seed items	QC Geophysicist/QC reports	100% of predicted seed item positions < 10 inches from known position	RCA/CA

MQO	DFW/SOP Reference	Frequency	Responsible Person/Report Method	Acceptance Criteria	Failure Response
Classification performance	Intrusive Investigation/ SOP AGCMR-09	For each delivered dig list	QC Geophysicist/QC reports	100% of seed items classified as TOI	RCA/CA
Classification validation	Intrusive Investigation/ SOP AGCMR-09	For each delivered dig list	QC Geophysicist/QC reports	100% of predicted intrusively investigated non-TOI are confirmed to be non-TOI	RCA/CA

Table 2. MetalMapper 2x2 cued measurement MQO table

Seed ID	Grid	Reported Sum Response (mV)	Response Passes?	Total Offset (in)	Positioning Passes?
P41001G	Pond 41	412.23	Yes	7.27	Yes
P41002G	Pond 41	492.30	Yes	6.74	Yes
P60001G	Pond 60	362.34	Yes	6.86	Yes
P60002G	Pond 60	464.09	Yes	4.60	Yes
P43001G	Pond 43	256.70	Yes	9.44	Yes
P40S001G	Pond 40S	391.74	Yes	5.97	Yes
P39001G	Pond 39	234.97	Yes	14.41	Yes
P42001G	Pond 42	367.06	Yes	13.95	Yes
P42002G	Pond 42	168.52	Yes	4.24	Yes
P44001G	Pond 42	167.85	Yes	12.88	Yes
P40N001G	Pond 40N	246.49	Yes	20.32	Yes
P3N001G	Pond 3N	187.54	Yes	15.08	Yes
P3S001G	Pond 3S	381.62	Yes	10.91	Yes
P35001G	Pond 35	318.70	Yes	3.48	Yes
P61001G	Pond 61	351.61	Yes	6.68	Yes
P61002G	Pond 61	261.35	Yes	12.62	Yes

*Table 3. Blind QC seed response and positioning results in BLM Area B vernal ponds. *Note there are 16 QC seed items that were planted for DGM operations and only 6 QC seeds are reported in Appendix C as recovered. 10 QC were recovered during surface sweep operations performed after DGM collection but prior to AGC cued measurements.*

Pond ID	% coverage at 2 feet	% coverage at 2.5 feet	% coverage at 3 feet	Category A	Category B
3N	87.34	97.39	99.27		X
3S	87.90	97.81	99.82		X
35	90.09	98.87	99.97		X
39	87.22	97.38	99.73		X
40N	91.71	98.29	99.84		X
40S	88.29	97.98	99.83		X
41	87.51	97.98	99.87		X
42	87.9	96.9	99.73		X
43	89.14	97.67	99.91		X
44	88.35	97.69	99.92		X
60	87.04	97.47	99.74		X
61	88.24	97.96	99.8		X
73	97.55	99.38	99.97	X	

Table 4. BLM Area B vernal pond lane spacing results.

Appendix E

Responses to Comments

RESPONSES TO COMMENTS

Document:	BLM Area B Track 2 Ponds Geophysical Anomaly Investigation Technical Information Paper, Former Fort Ord, California
Commenting Organization:	United States Environmental Protection Agency Region IX (EPA)
Name:	Maeve Clancy
Date of Comments:	November 14, 2019

Comment:

The statement that removal of MEC is not feasible when water is present in the pond requires further clarification and support. Also, the basis for the determination that construction support and anomaly avoidance are impractical to support access to the ponds should be explained in more detail. These and other issues are addressed in the attached comments.

Response to Comment:

Vernal ponds become inundated during wet season. Biological surveys occur during wet periods, requiring the monitoring personnel to step into inundated areas. Even after surface removal of munitions and explosives of concern (MEC) is completed, the lack of visibility of the ground surface makes it impractical to implement on-call construction support or anomaly avoidance. The subsurface removal described in the Technical Information Paper was conducted within the pond areas to enable biological surveys to occur.

Installation-Wide Multispecies Habitat Management Plan for Former Fort Ord, California (Administrative Record number: BW-1787) requires that work within vernal ponds be conducted in a manner that minimizes or avoids impacts to protected species and sensitive wetland habitat. Procedures for intrusive investigations were developed and implemented to maintain the integrity of the vernal ponds to avoid altering the hydrologic characteristics of the ponds. These procedures can only be effective when the pond areas are suitably dry. Therefore, intrusive investigation is impractical when water is present in the ponds.

Please see the responses provided for specific comments 1 and 2.

General Comment 1:

Table 4, Summary of Advanced Geophysical Classification (AGC) Anomaly Investigation Dig Results, of the BLM Area B Track 2 Ponds Geophysical Anomaly Investigation (the BLM Area B Ponds GAI TIP) provides a listing of the anomalies dug and the results of the investigation. Photographs of five of these anomalies are provided in the Photographs Section of the BLM Area

B Ponds GAI TIP. However, the basis for selection of the photographs of these anomalies for inclusion in the BLM Area B Ponds GAI TIP is not provided, nor is there any discussion of the results of the selected investigation noted in the photographs. In addition, the photographs are difficult to interpret; and consideration should be given to placing each photograph on a separate page.

In addition, Table 5. BLM Area B Track 2 Selected Vernal Ponds MEC Summary, lists the three munitions and explosives of concern (MEC) recovered during the investigation. However, no photographs of these items are included in the BLM Area B Ponds GAI TIP.

Please review the cited portions of the BLM Area B Ponds GAI TIP and provide:

  • A discussion of the selection basis for the photographs provided
  • A photograph of each MEC item recovered during the investigation (or a statement as to why no photographs of the recovered MEC were included)
  • A discussion of the results of the excavations shown in the photographs in the body of the BLM Area B Ponds GAI TIP or a statement as to why no discussion is deemed necessary

In addition, please place each photograph on a separate page to assist in the interpretation of the results of the dig involved.

Response to General Comment 1:

Due to sensitive wetland habitat, procedures for intrusive investigations were developed and implemented to maintain the integrity of the vernal ponds to avoid altering the hydrologic characteristics of the ponds. The procedures are addressed in Attachment 1 to the Field Work Variance (FWV) 021. The requirement for photographs at the target locations was intended to document the habitat-protective procedures rather than to record recovered objects. Photographs were taken at several, but not all, target locations. Photographs were not taken at target locations where MEC were recovered. Photographs of several anomaly locations, before, during and after excavations, were selected for inclusion in the report to show the excavation process. Section 5.0 states "The photographs provided in Appendix B are representative displays of the procedures followed during anomaly excavations." A discussion of the excavations was not deemed necessary in the report, since Tables 3 and 4 provide the investigation results.

The appendix has been updated to provide each photograph on a separate page.

General Comment 2:

The text should explain why the color scale was changed from the colors used on Figures 3A through 14A to the scale used on the Figures in Field Work Variance (FWV) 21. Although both

sets of figures indicate that the color scale represents the sum channel in millivolts (mV), the scale used on the FWV 21 figures appears to have greyed out several anomalies that appear to be 14 mV or higher on Figures 3A through 14A. This appears to have resulted in not identifying some anomalies as targets. For example, there is a red area on Figure 12A that is south of anomalies 24 and 27 on FWV 21 Figure 11. It appears that the color change for the FWV figures greyed this area out, but it seems to be about 14 mV on Figure 12A. Please revise the text to discuss why the color scale was changed and assess whether information was changed or lost during this process.

Response to General Comment 2:

The color scale used in the Technical Information Paper is the standard EM61 MK2 color scale used for Fort Ord published documents. The color scale used in the FWV is a variation of the same color scale that uses shades of grey to depict response values below the 14mV target detection threshold and is generally used only for working documents and internal data review and discussion. Target selection decisions are not based on the color scale of the map, but rather on the actual digital geophysical mapping data and are therefore not impacted by the color scale displayed on a particular map. As discussed in Section 3.1.1, data collection was completed in accordance with standards outlined in *Final Quality Assurance Project Plan, Former Fort Ord, California, Volume II, Appendix A, Munitions and Explosives of Concern Remedial Action* (Administrative Record number: OE-0884A). Subsurface anomalies were identified using a 14 mV sum channel detection threshold described in the QAPP.

Specific Comment 1:

Section 1.1 Purpose and Scope, Page 1: The first paragraph of this section states that, "Due to the lack of visibility in inundated areas, construction support and anomaly avoidance are impractical to support access to selected ponds during wet periods. To make BLM Area B ponds safe for biological surveys, the decision was made to conduct subsurface removal of MEC within the pond boundaries." No further discussion is presented as to the reason that it is impractical to provide construction support and anomaly avoidance. Please revise the cited section to include a discussion of the reasons that construction support and anomaly avoidance are impractical at the noted munitions response site (MRS).

In addition, the statement that the MEC removal was conducted to "make BLM Area B ponds safe for biological surveys," is incorrect. It is correct to state that the MEC removal has reduced the probability of contact with MEC during the biological surveys, and this has reduced the existing MEC hazard. However, it cannot be positively stated that all of the MEC present on the site has been removed. This is further confirmed by the statement in Table 2, AGC Anomalies by Category and Level of Investigation Assigned, where it is noted that none of the Category 3 anomalies were investigated. As Category 3 is defined in the table as "High-confidence NON TOI", it is possible that incorrect categorization of one of these anomalies may have allowed MEC to remain on the

site. Please revise the noted statement to indicate that the risk of contact with MEC during the biological surveys has been reduced, but not positively eliminated. (Note: Also revise the second paragraph of Section 2.1, Background, Page 2 to eliminate the same "safe" statement from the narrative.)

Response to Specific Comment 1:

Vernal ponds become inundated during wet season. Biological surveys occur during wet periods, requiring the monitoring personnel to step into inundated areas. Even after surface MEC removal is completed, the lack of visibility of the ground surface makes it impractical to implement on-call construction support or anomaly avoidance. The subsurface removal described in the Technical Information Paper was conducted to enable biological surveys to occur.

The determination that construction support is not required for future biological survey activities in the BLM Area B vernal ponds is based on the subsurface removal completed in the vernal ponds. As described in Section 3.1.1, the subsurface removal utilized an EM61 digital geophysical mapping (DGM) detection survey to identify subsurface anomalies potentially related to MEC, followed by a MetalMapper 2x2 (MM2x2) advanced geophysical classification (AGC) survey to investigate each detected subsurface anomaly. Gaps in the DGM data were investigated as described in Section 3.1.2. The MM2x2 was utilized to analyze and classify the subsurface anomalies, and those classified as high-likelihood non-targets of interest (Category 3) were left in place. All other subsurface target anomalies were further investigated by UXO dig teams, and intrusively investigated and removed if necessary. Although not all detected anomalies were intrusively investigated, all were evaluated to determine if intrusive investigation was necessary; therefore, the entire vernal pond survey area was investigated, and subsurface removal was completed to support the objective. Text in Sections 1.1 and 2.1 has been revised to state that risk to personnel conducting biological surveys has been reduced.

Section 1.1 has been revised as follows:

> Original: Anomalies that potentially represented MEC items within the DGM pond survey areas of the selected BLM Area B ponds were removed to allow safe access during biological surveys.

> Revised: Anomalies that potentially represented MEC items within the DGM pond survey areas of the selected BLM Area B ponds were removed to reduce risk during biological surveys.

> Original: To make BLM Area B ponds safe for biological surveys, the decision was made to conduct subsurface removal of MEC within the pond boundaries.

Revised: To reduce the risk to personnel performing biological surveys in the BLM Area B ponds, the decision was made to conduct subsurface removal of MEC within the pond boundaries.

Section 2.1 has been updated as follows:

Original: To make the BLM Area B vernal ponds safe for biological surveys, the decision was made to conduct subsurface removal of MEC within the DGM pond survey area.

Updated: To reduce the risk to personnel performing biological surveys in the BLM Area B vernal ponds, the decision was made to conduct subsurface removal of MEC within the DGM pond survey area.

Specific Comment 2:

Section 2.1, Background, Page 3: This section notes that, "Removal of MEC is not feasible when water is present in the ponds." No further discussion of this is provided here, and this assertion is repeated in the Field Work Variance number 021 found at Appendix A. As the mapping and removal of MEC underwater is often done under various conditions elsewhere, please revise the noted section to include a discussion of why the stated assertion is correct for this particular MRS.

Response to Specific Comment 2:

Underwater geophysical mapping was not considered, given the limited areas of potential application at Fort Ord. KEMRON conducted work only when the pond areas were suitably dry. In 2016, geophysical data was collected. In 2018, intrusive investigations occurred. Any negative impact to the vernal ponds could affect the habitat value for endangered species that might use the pond. Procedures for intrusive investigations were developed and implemented to maintain the integrity of the vernal ponds to avoid altering the hydrologic characteristics of the ponds. Intrusive investigation is impractical when water is present in the ponds. Please also see response to the first comment.

Specific Comment 3:

Section 3.1.1, Data Collection and Anomaly Selection, Page 4 and Table 2, AGC Anomalies by Category and Level of Investigation Assigned, Page 5: It is unclear why a 14 millivolt (mV) sum channel detection threshold was selected. Detection thresholds are typically related to the target munition(s), which is/are not specified. As a result, it is unclear if any munitions and MEC were missed. Please revise the text to list the target munition(s) and to explain why the 14 mV sum channel detection threshold was appropriate.

Response to Specific Comment 3:

The 14mV sum channel response threshold is the standard detection threshold used for Fort Ord projects where a specific MEC item is not targeted. A discussion of the 14mV detection threshold is included in Attachment F of the *Final Quality Assurance Project Plan, Former Fort Ord, California, Volume II, Appendix A, Munitions and Explosives of Concern Remedial Action* (Administrative Record number: OE-0884A).

Specific Comment 4:

Section 6.0, Conclusion, Page 9: The last sentence in this section states that, "Biological surveys in BLM Area B selected ponds within the DGM pond survey area may occur without construction support or anomaly avoidance." Please expand the section to provide the basis for elimination of the requirement for construction support or anomaly avoidance, as the site has not been one hundred percent cleared of anomalies that might be MEC. This is of particular concern if the biological surveys to be conducted involve any intrusive activity.

Response to Specific Comment 4:

The determination that construction support is not required for future biological survey activities in the BLM Area B vernal ponds is based on the subsurface removal completed in the vernal ponds. As described in Section 3.1.1, the subsurface removal utilized an EM61 DGM detection survey to identify subsurface anomalies potentially related to MEC, followed by a MM2x2 AGC survey to investigate each detected subsurface anomaly. Gaps in the DGM data were investigated as described in Section 3.1.2. The MM2x2 was utilized to analyze and classify the subsurface anomalies, and those classified as high-likelihood non-targets of interest (Category 3) were left in place. All other subsurface target anomalies were further investigated by unexploded ordnance (UXO) dig teams, and intrusively investigated and removed if necessary. Although not all detected anomalies were intrusively investigated, all were evaluated to determine if intrusive investigation was necessary; therefore, the entire vernal pond survey area was investigated, and subsurface removal was completed to support the objective.

Specific Comment 5:

Figure 8A, Pond 40S DGM & Dig Results and Figure 6A, Pond 39 DGM & Dig Results: It is unclear why the red-shaded area northeast of targets 11 and 18 on Figure 8A were not identified as targets, since a similar area was identified as target 62 on FWV 21, Figure 5. There is a similar red-shaded area between two false positives on Figure 6A that appears to be between targets 62 and 92 on FWV 21, Figure 7. In both cases, the red-shaded areas appear to be about 14 mV on Figure 8A and 6A. Please explain why these red-shaded areas were not selected as targets.

Response to Specific Comment 5:

Figures 6A and 8A do not depict all detected DGM targets but rather display only those that were classified as potential targets of interest (identified for further investigation) through the advanced classification process. Detected targets that were classified as high-likelihood non-targets of interest through the AGC process were left in place without the need for intrusive investigation.

Specific Comment 6:

Appendix C, AGC Anomaly Investigation Dig Results Table and Appendix D, Table 3, Blind QC seed response and positioning results in BLM Area B vernal ponds: It is unclear why the Appendix C AGC Anomaly Investigation Dig Results Table does not include all of the blind seeds. Table 3 in Appendix D indicates that 16 blind seeds were installed, but there are only six industry standard objects (ISO) identified in Appendix C. Section 2.3, Geophysical System Verification, in Appendix D states, "All blind QC [quality control] seeds were detected." Please revise Appendix C to include the missing ISO blind seeds or revise the Appendix D text to explain why 10 ISO blind seeds are missing from Appendix C.

Response to Specific Comment 6:

The second paragraph in Section 4.0 has been updated to the following: "Sixteen QC seed items were emplaced to verify the quality of DGM operations. All 16 DGM QC seed items were detected and selected for further investigation during the EM61 DGM detection survey. 10 of the 16 QC seed items were recovered and removed during surface sweep operations performed after the EM61 DGM detection survey but prior to AGC cued measurements. Appendix C, which reports only subsurface intrusive investigation results, therefore includes only the 6 QC seed items recovered during DGM-based subsurface removal. The detection, identification for further investigation, and ultimate recovery of all 16 DGM QC seeds successfully verified the quality of DGM operations."